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Prevalence and Correlates of Cardiac Cachexia Among Jordanian Patients With Chronic Heart Failure

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Abstract

Background: Cardiac cachexia is considered as an ominous complication that possibly associated with the terminal stages of chronic heart failure as it consumes the protein-calories reserves of the patients.

Aims: The aims of this study were to identify the prevalence, level, and correlates of cardiac cachexia among Jordanian patients with chronic heart failure.

Methods: A cross-sectional design was employed. A convenient sample of 300 chronic heart failure patients was recruited from accessible chronic heart failure patients who regularly visit the cardiac care clinics at two different hospitals that represent two health sectors in Jordan. A self-developed instrument was used to collect the data for the purpose of this study.

Results: The mean of the total cachexia score of the sample was 5.88. Cardiac cachexia was detected in 58.7% (n= 176) about half of them were having mild cachexia. The prevalence of cardiac cachexia was 13.15%. There were statistically significant correlation between the total cachexia score and some variables that include the patients' age, monthly income, and number of years since diagnosed as chronic heart failure patients; however, number of daily smoked cigarettes wasn't significantly correlated with the total cachexia score.

Conclusion: Cardiac cachexia has not been widely investigated yet. The findings of this study can be used as a baseline data since this study is the first of its kind conducted at the national and regional level. In addition, this study can be useful for determining effective therapeutic modalities that can be employed on behalf of those patients among the health care team; particularly nurses.

Keywords: cardiac cachexia, chronic heart failure (CHF), complication, Jordan

1. Introduction and Background

Cardiac cachexia is one of the most prevalent types of cachexia and it is considered as an ominous complication that possibly associated terminal stages of chronic heart failure (CHF), as it consumes the protein-calories reserves of the CHF patients, particularly elderly adults (Tibor Szabó et al., 2013; Tulman, Tripathi, Abel, & Papadimos, 2012). Indeed, several definitions were adopted to identify cardiac cachexia; however most definitions agreed that it is a wasting, catabolic state that affects the bone, muscle, and fat tissues of the CHF patients, which eventually leads to terminal hemodynamic compromise after the body fails to compensate (Cavey, 2011; Tibor Szabó et al., 2013; Tulman et al., 2012).

Cardiac cachexia is diagnosed when non-edematous weight loss of more than 5% of the pre-morbid normal patient's body weight, without the presence of any other cachectic causes like cancer, thyroid diseases and severe liver diseases, that occurred over a period of at least 6 months (Evans et al., 2008; Letilovic & Vrhovac, 2013; Loncar, Omersa, Cvetinovic, Arandjelovic, & Lainscak, 2014).

In fact, the pathophysiology of cachexia that occurred with CHF patients is not fully understood; because the cardiac cachexia occurred as a result of many factors that contribute in complex imbalances in the catabolic and anabolic processes leading to the wasting and catabolic state (Cavey, 2011; Loncar et al., 2014; Tibor Szabó et al., 2013). Activation of complex series of metabolic, neurohormonal, and immunological processes by the development of CHF, are thought to have roles in the imbalances of the catabolic and anabolic processes (Martins et al., 2014).

According to the most recent statistics, approximately 15% of patients of advanced CHF developed cardiac cachexia (Farkas et al., 2013; Stephan von Haehling & Anker, 2014). However, in USA alone, the number of CHF patients currently is about 5 million and is growing annually with 500,000 new cases (Palus et al., 2011; Stephan von Haehling & Anker, 2010). In Jordan and other developing Middle-East countries, heart diseases are emerging health problem with a proportion of deaths range from 25% to 45% due to increased risk factors with a lack of effective preventive measures (Elhneiti & Al-Hussami, 2017). In Jordan specifically, Coronary Heart Diseases (CHD) is responsible on 35% of the overall deaths (WHO, 2013).

Multiple factors contribute in increasing the risk of cachexia in CHF patients and potentiate its complications. Advancing in age is considered as one of the risk factors of heart failure. According to Lloyd-Jones (2009) and von Haehling (2010), about 5.7 million Americans who are older than 65 years old were hospitalized with heart failure. Von Haehling (2007) review study tried to explain the normal pathophysiology of aging among cardiac cachectic patients. The researchers provided evidences to support that the energy expenditure decreased with advancing of age in most of the CHF patients, but the resting energy expenditure in some patients increased as a result of increase cardiac ventilatory work and resting peripheral oxygen consumption. This small portion of patients was the best candidates for developing of cardiac cachexia. Furthermore, the researchers found a significant ($P<0.0001$) annual reduction in lean body mass about 0.1-0.3 kg associates advancing in age of the CHF patients.

Smoking and its disastrous effect on the cardiac muscle and its role in developing cardiac cachexia in CHF patients were discussed also by many studies in the literature (Ebner et al., 2013; Flouris et al., 2014; Plank et al., 2014). Flouris (2014) and his colleagues studied the effect of second hand smoking on 19 healthy nonsmokers adults and they measured Heart Rate Variability (HRV), serum cotinine, and six cardiac markers that include: Troponin I, Myoglobin, Creatine Kinase-MB (CK-MB), Carbonic Anhydrase III, Fatty Acid Binding Protein, and Glycogen Phosphorylase BB in serum samples. They concluded that second hand smoking suppresses heart rate variability (HRV) in response to changes of emotional or physical efforts. Also, second hand smoking has an observed effect on augmentation of CK-MB and Myoglobin that may lead to a generalized lytic state for the cardiac muscle which appeared for at least two hours post exposure to second hand smoking.

Search in the literature through wide range of electronic data bases engines such as EBSCO, CINAHL and Pub MED was conducted. Unfortunately, no single study about the prevalence, assessment, or management of cardiac cachexia was found among CHF patients in the developing countries in which life styles and cultures expected to influence markedly the research outcomes. The literature revealed contradictions in defining the correlates of cardiac cachexia mostly related to the different sociodemographical characteristics of the CHF patients where the reviewed studies were done.

On the other hand, the variations that existed in the diagnosing of cardiac cachexia, encourage the researcher to dig more in the literature for a non-expensive, valid and reliable instrument which clearly diagnoses cardiac cachexia.

Consequently, the purposes of this study were to identify the prevalence and levels of cardiac cachexia in Jordanian CHF patients and to describe the correlates of cardiac cachexia.

2. Methodology

2.1 Design & Sample

A cross-sectional design was used to conduct this study. The target population was all Jordanian CHF patients who were followed up in the Jordanian hospitals. The accessible population for this study was Jordanian CHF patients who were followed up in two hospitals represent two major health sector in the central part of Jordan; military and governmental.

A convenient sampling technique was used to recruit CHF for the study. The sample size was determined by using power primer analysis based on the statistical tests that will be used to analyze the participants data (Cohen, 1992). A sample size of 200 CHF patients was needed to obtain a power of 0.8, medium effect size, and an alpha of 0.05. To allow for 10% drop-out rate, there was a need to increase the sample by 10 % to reach 220 CHF patients. However, as a result of the availability of participants and to overcome the potential drop-out, the sample size was increased to 300 CHF patients to increase the generalizability of the result and to increase the external validity of the study.

Eligibility criteria were adult Jordanian patients who had chronic heart failure and were able to understand Arabic. Those with known neoplastic, thyroid disorders, nutritional impairments, or any chronic inflammatory conditions were excluded from the study; to exclude other well-known types of cachexia, like cancer and pulmonary cachexia. Furthermore, during the first exposure visit, any patients with signs of fluid overload that may mask the detecting of weight loss were also excluded. Subjects were excluded on the basis of the data gathered from their medical

records that show their eligibility to be recruited for the study. For example, if the records showed that the participant has known neoplastic or nutritional impairment with a repetitive visits to nutritional clinic, the participant will be excluded from the study.

2.2 Instrument

A researcher-developed instrument based on the latest dimensions of cardiac cachexia identification was used in this study (Table 1). Using a combination of anthropometrics measures, biological markers, and clinical manifestations as reported in the available literature was used in this study to detect and diagnose cardiac cachexia among Jordanian CHF patients (Carlson & Dahlin, 2014; Evans et al., 2008; Gabison, Gibbs, Uziely, & Ganz, 2010; Letilovic & Vrhovac, 2013).

The instrument consisted mainly from two parts: patients' sociodemographic data sheet and cardiac cachexia instrument which divided to three main parts: anthropometrics, biomarkers, and clinical manifestation that associated with cardiac cachexia that were measured majorly as what it is followed in cancer cachexia assessment scale based on Common Terminology Criteria for Adverse events (CTCAE) version 4 that were developed by the American National Institute of Health and National Cancer Institute in 2010 (Gabison et al., 2010; NIH & NCI, 2010).

In fact, after extensive search in the literature, no specific instruments were found to measure cardiac cachexia and the targeted variables. Different methods were used to detect cardiac cachexia incidence among CHF patients, which include mainly clinical manifestations, anthropometric measures, biochemical markers, imaging, and functional tests to quantify muscle mass. Unfortunately, there are variations existed in diagnosing cardiac cachexia, even with the use of different methods in detecting cardiac cachexia. However, Gabison and her colleagues built in 2010 a cachexia assessment scale to detect cachexia among cancer patients based on a combination of anthropometric measures, biological markers and clinical manifestations that occurred in cancer cachectic patients similar to the targeted variables for measuring through cardiac cachexia instrument (Gabison et al., 2010). The comprehensive approach and the applicability of assessment that only followed in cancer cachexia scale makes it the building blocks for the cardiac cachexia instrument.

Total cachexia score was calculated by summing up each answered item contained within the cardiac cachexia instrument. The classification of the severity of cardiac cachexia was calculated as per to what is adopted in the cancer cachexia assessment scale based on the CTCAE version 4 (Gabison et al., 2010; NIH & NCI, 2010); where 0 to 2 score = no cachexia; 3 to 18 = mild cachexia; 19 to 24 = moderate cachexia; and 25 to 24 = severe cachexia.

The face and scale content validity of the researcher-developed instrument items were checked by panel of specialized experts in cardiac care nursing and nutrition. All selected experts were PhD-prepared faculty members in the nursing schools at various Jordanian universities. For the content validity, the experts evaluated the relevancy of the developed cardiac cachexia instrument items by using a scale of 1 to 4; where 1 = not relevant, 2 = somewhat relevant, 3 = quite relevant, and 4 = highly relevant. The Scale Content Validity Index (S-CVI) were calculated and found to be 0.93.

Table 1. Cardiac Cachexia Instrument

Item		0	1	2	3	4
Anthropometrics	**% Weight loss during 6 months**	<5%	5%-10%	10%-20%	≥20%	
	BMI	Normal (<19)	Moderate (17-19)		Severe weight loss (<17)	
	AMA (mm) **According to age and gender**	Average (>15th but ≤85th)	Below average (>5th but ≤ 15th)		Wasted (≤5th)	
Biomarkers	**Albumin (g/l)**	35-50	30-<35	20- <30	< 20	
	Createnine **"ULN: Upper Limit of Normal"**	Normal	>ULN - 1.5 X ULN	(>1.5 - 3.0) ULN	(>3.0 - 6.0) ULN	>6.0 X ULN
	Hemoglobin (g/dl)	Normal	10	8-9.9	6.5-7.9	<6.5
	Decrease muscle strength **According to age and gender**	Average	Below average		Poor according	
	Fatigue	No fatigue	Fatigue relieved by rest	Fatigue not relieved by rest; limiting instrumental ADL	Fatigue not relieved by rest, limiting self-care ADL	
Clinical Manifestations	**Anorexia**	No anorexia	Loss of appetite without alteration in eating habits	Oral intake altered without significant weight loss or malnutrition; oral nutritional supplements indicated	Associated with significant weight loss or malnutrition (e.g., inadequate oral caloric and/or fluid intake); tube feeding or TPN indicated	Life-threatening consequences; urgent intervention indicated

2.2 Pilot Study

A pilot study was carried out with a sample of 30 CHF patients who met the inclusion criteria at the military hospital to test the clarity, reliability and feasibility of the instrument. Cronbach's alpha that was calculated and found to be 0.92, indicated high internal consistency reliability when applying the instrument during the pilot study.

2.3 Data Collection Procedure

Before administering the instrument for CHF patients, an official approval of institutional Review Board (IRB) was attained. Then, administrative approval from the institutional review board of the selected hospitals and its administrations were obtained.

A convenient and eligible sample was used based on non-probability sampling technique, which recruits all accessible CHF patients until obtaining the specified targeted sample. The primary researcher was the only data collectors who contacted the participants and administered the instrument of the study. To ensure that all the participants are voluntarily involved in the study, consent forms were distributed to participants before applying the instruments to make sure that CHF patients participation has no influence on their quality of care that was provided for them. The primary researcher provided a short debriefing session for each patient to clarify the purpose, the research procedure and researcher's commitment of ensuring confidentiality and privacy of all

potential participants.

The sociodemographic data were collected by direct questions to the participating CHF patients after brief description for the study researcher and his qualification. NYHA class for every participant was identified through asking direct questions by the researcher according to the known criteria of each class; while the cardiac cachexia instrument were filled according to the participants' measurements and verbal answers. Data collection from the participants started in the 12 of April 2016 and ended in 23 of June 2016.

2.4 Methods of Data Analysis

Data was entered and analyzed using the SPSS Statistical package version 22 using a code book to reduce errors during the data entry phase (Bums and Grove, 2009). Data entry was followed by standard data cleaning procedures to check the accuracy of the data and deal with patterns of missing data if there is any (Bums and Grove, 2009). Descriptive statistics were used to describe the patients' levels of cachexia and its prevalence alongside patients' demographic characteristics. Pearson correlation was employed to examine the correlation between total cachexia score and participants' selected sociodemographic characteristics that were measured as continuous variables. An α-level of 0.05 was set as a level of significance for all statistical procedures executed in this study.

3. Results

3.1 Characteristics of the Sample

From the two different hospitals that belong to two different health sectors inside Jordan, this study recruited three hundred Jordanian CHF patients who were conveniently selected according to the inclusion and exclusion criteria to apply the cardiac cachexia instrument on them. One hundred and sixty CHF patients (53.3% of the total study participants) were recruited from the military hospital, while the rest of the study sample, one hundred and forty CHF patients (46.7%) were recruited from the governmental hospital (Table 2).

Table 2. Sample characteristics

Variable	N	%
Hospital		
Military	160	53.3
Governmental	140	46.7
Gender		
Male	198	66.0
Female	102	34.0
Marital status		
Married	238	79.3
Single, widowed or divorced	62	20.7
Level of education		
Low educational level	173	57.7
High educational level	127	42.3
Employment status		
Employee	108	36.0
Retired	192	64.0
Medical insurance		
Yes	213	71.0
No	87	29.0

Chronic diseases		
No chronic diseases	91	30.3
DM	47	15.7
HTN	149	46.3
Both DM and HTN	23	7.7
NYHA classification		
I	58	19.3
II	130	43.3
III	86	28.7
IV	26	8.7
Smoking status		
Smoker	215	71.7
Non-smoker	85	28.3
Variable	**M (SD)**	**Actual Range**
Age	57.76 (10.66)	39-90
Monthly income	398.78 (168.92)	100-1000
Number of years since diagnosed as CHF	8.66 (5.77)	2-31
Number of smoked cigarettes	22.32 (8.39)	3-50

3.2 Prevalence of Cardiac Cachexia among Jordanian CHF Patients

After calculating the total cachexia score for each participating CHF patient by summing up each answered item contained within the cardiac cachexia instrument, the data analysis revealed that the mean of total cachexia scores of the sample was 5.88 (SD= 6.15) with an actual range of 0-26 (Table 3). After applying the cancer cachexia assessment scale scoring system, the data analysis showed that about 58.7% (n=176) of the participants had cardiac cachexia, while 41.3% (n=124) of them had no cachexia. The accessible population that the study's sample was recruited from was estimated from records of the two selected study hospitals and it was found equal to1338 CHF patients that includes the total of the recruited CHF participants, CHF patients who were not enrolled according to their eligibility, those who did not complete the study and those who declined participation in the study. The prevalence of cardiac cachexia with respect to the accessible population was found about 13.15%.

3.3 Level of Cardiac Cachexia among Jordanian CHF Patients

In order to identify the cardiac cachexia levels and to categorize the participants based on their scores, we also used the cancer cachexia assessment scale method of classifying and identifying the levels of cachexia among the participants (Table 3).

The levels of cardiac cachexia were different across the study sample, and about half of the participants (n=155) having mild cardiac cachexia, while 5.7% (n=17) of them having moderate cardiac cachexia, and 1.3% (n=4) of the participants having severe cardiac cachexia.

Table 3. Prevalence and levels of cardiac cachexia among Jordanian Patients with CHF

Variable	**N**	**%**	**M (SD)**	**Actual Range**
Total cardiac cachexia score	300		5.88 (6.15)	0-26
No cardiac cachexia	124	41.3		0-2
Mild cardiac cachexia	155	51.7		3-18
Moderate cardiac cachexia	017	5.7		19-24
Severe cardiac cachexia	004	1.3		25-36

3.4 The Correlation between Cardiac Cachexia and Sociodemographic Characteristics of Jordanian CHF Patients

Results of the correlations analysis indicated strong significant positive correlation between the total cachexia score and participants' age (r= 0.74, p= 0.001). However, weak significant positive correlations were found between total cachexia score and each of monthly income (r = 0.130, p= 0.024), and number of years since the patient firstly diagnosed of CHF (r= 0.188, p= 0.001). Participants who were older, had a higher monthly income, and diagnosed earlier with CHF reported higher total cachexia scores than other participant. On the other hand, number of daily smoked cigarettes didn't significantly correlated with the total cachexia score (r= -0.083, p= 0.226) (Table 4).

Table 4. Pearson's correlation matrix between all continuous variables with total cachexia score

Variable	Total cardiac cachexia score
1. Age	.74**
2. Monthly income	.130*
3. Number of years since the patient firstly diagnosed of CHF	.188**
4. Number of daily smoked cigarettes	-.083

*Correlation is significant at the 0.01 level (2-tailed).

** Correlation is significant at the 0.05 level (2-tailed).

4. Discussion

4.1 Prevalence and Levels of Cardiac Cachexia among Jordanian CHF Patients

This study was the first study conducted in Jordan to examine cardiac cachexia among CHF patients. The analysis showed that the total cardiac cachexia score in Jordanian CHF patients was relatively high (M= 5.88, SD= 6.15), and about 58.7% (n=176) of the study participants had cardiac cachexia. In fact, this high percentage of cardiac cachexia is reflecting a serious problem that needs an immediate intervention in order to improve medical and nursing practice from one perspective, and to improve the CHF patients' knowledge and behaviors from the other perspective.

A few studies that discuss cardiac cachexia prevalence were found in literature. According to the most recent statistics about cardiac cachexia, approximately 15% of patients of advanced CHF developed cardiac cachexia (Farkas et al., 2013; Stephan von Haehling & Anker, 2014). In our study, the prevalence of cardiac cachexia with respect to the accessible population was found about 13.15% which is around the global prevalence. However, the percentage of cachectic patients in our results open the doors about a serious un-noticed problem that in need to be managed and controlled.

In fact, most of the reviewed studies used only weight loss to detect and diagnosed patients with cardiac cachexia with relatively small convenient samples of patients. Szabó (2014) is one of the recent studies that relied on weight loss to identify about 16% cardiac cachectic patients among 111 CHF patients included in the study. However, the small sample size of the cardiac cachectic patients increases the risk of committing type II error and limit the generalizability of study results.

On the other hand, our study high percentage of cardiac cachexia is congruent with other researches' findings that also relied only on the weight loss to diagnose and identify cardiac cachexia. Araújo (2011) and his colleagues in their study found that about 40% (n= 38) of their total sample of CHF patients (n= 94) had cardiac cachexia based on their weight loss during 6 the last six months. However, being a single center study with small relatively convenient sample with low female proportion limit the generalizability of their results.

In our study, we didn't rely only on the weight loss to diagnose cardiac cachexia. We used a combination of variables, including anthropometrics, biomarkers, and clinical manifestations, to identify the cardiac cachectic patients. The influence of additional criteria to the weight loss for diagnosing cardiac cachexia was in contrast with what Letilovic (2013) found in his study when the percentage of cardiac cachexia decreased from 31% (n= 13) based on weight loss only to 24% (n= 10) after adding the additional criteria of other anthropometrics, biomarkers, and clinical manifestations. However, Letilovic (2013) using of a small number of CHF patients limits the generalizability of the study results.

In related to the levels of cardiac cachexia, our study was the first study that tried to classify cardiac cachexia to levels and to identify the frequencies and percentages for each level. Although the majority of our study participants were cachectic patients (58.7%), fortunately the highest percentage of the cachectic patients were classified as mild cachexia that could be managed successfully with better chances of prognosis when it is compared with the more complicated levels of cardiac cachexia, like moderate and severe levels (Carlson & Dahlin, 2014; Cavey, 2011; Gřiva, 2015). In fact, our classification to levels was similar to what Gabison (2010) used in developing her instrument when she studied 90 cancer patients and found that about 41% (n= 37) of her participant were not having cachexia; while 48% (n=43) of them were mild and 11% (n= 10) had moderate to severe cachexia.

Based on the comparison between our results and other literature studies, our rationales for the observed difference in the levels and percentage of cardiac cachexia are that our study relied on other variables to diagnose cardiac cachexia besides losing body weight only in the last six months as other studies relied on. The increasing number of measured variables and scoring system that were used successfully in our study revealed a relatively similar percentage of cardiac cachexia as it is noticed in the cancer cachexia after using the same criteria.

The other possible rational for these variations in prevalence and percentage of cardiac cachexia in comparison to literature could be related to various social, environmental and cultural variables. The unhealthy life styles of the study participants could be clearly observed through the high percentage of smokers. Among them (71.7%) were smokers which could be considered as one of the leading causes for the resulted high percentage of cardiac cachexia among the participating CHF patients.

4.2 The Correlation between Cardiac Cachexia and Sociodemographic Characteristics of Jordanian CHF Patients

The results revealed on a strong significant positive correlation between the total cachexia score and advancing in age of CHF patients ($r=0.74$, $p=0.001$). This result is in line with other studies in the literature that discussed the role of advancing in age of CHF patients in developing cardiac cachexia. Advancing in age is concurrent with decreasing in the levels of protein and fat synthesis inside the body, which resulted from the ongoing decline in the levels of testosterone and other many anabolic hormones with advancing in age (Cavey, 2011; Jankowska et al., 2006; Morley, Thomas, & Wilson, 2006; Yamada et al., 2013). Moreover, von Haehling (2007) found in his study that the energy expenditure decreased with advancing of age in the CHF patient, and he claimed that there was a significant annual reduction in lean body mass ($P<0.0001$), about 0.1-0.3 kg, that is associated the advancing in age of the CHF patients. Yamada (2013) studied 568 healthy men and 1314 healthy women and found that the muscle mass loss increased with advancing in age; especially after the age of 75 year in both genders.

Our results also revealed on a weak significant positive correlations between the total cachexia score and CHF patient's monthly income ($r= 0.130$, $p= 0.024$), and number of years since the patient firstly diagnosed of CHF ($r=0.188$, $p=0.001$). The positive correlation between numbers of years since diagnosed of CHF and the total cachexia score could be attributed to the advancing in age and its accompanying changes that occurred simultaneously with the increasing of number of the years since firstly diagnosed as CHF patients.

Moreover, the positive correlation of the total cachexia score with number of years since firstly diagnosed as CHF patients could be also attributed to the anxiety, stress, and depression that accompanied the chronic diseases in general and increased their levels simultaneously with increasing number of the suffering years of chronic diseases (Al-Gamal, 2014; Lee, Chung, Suh, & Jung, 2015; Min-Su et al., 2015; Popović et al., 2015). In fact, our result of the significant correlation of the number of years since diagnosed as CHF was in contrast with what Araújo (2011) and his colleagues found when they compared 38 cachectic patients with 56 non-cachectic patients. They found that there was no significant difference between the study groups with respect to time since CHF diagnosis ($p= 0.52$). However, being a single center study with a small sample of patients limited the generalizability of their results. In fact, the comparisons of our results with other studies are not equivalent due to various reasons, including cultural and sociodemographic characteristics of the sample that are different from our recruited sample from a Middle East country like Jordan where unique cultural values and sociodemographics govern and affect the behaviors of CHF patients.

The monthly income and its positive correlation with the total cachexia score are in congruent with other studies that discussed and supported that the higher income people had higher healthy lifestyle behaviors which had effects in decreasing the possibilities of the complicating of CHF and reaching the cachectic state (Eshah, 2011; Goeppel, Frenz, Grabenhenrich, Keil, & Tinnemann, 2016). Furthermore, the higher monthly income is usually associated with presence of better quality of life and with a medical insurance that covers the medical needs for the chronic diseases patients like CHF patients (Lemos, Rodrigues, Paulo Veiga, & Veiga, 2015; Salinas, de Heer,

Lapeyrouse, Heyman, & Guillermo Balcázar, 2015).

The insignificant correlation between number of daily smoked cigarettes and total cachexia score was unpredicted and in contrast with some literature studies that found that the number of daily smoked cigarettes positively correlated with CHF complications like cardiac cachexia (Ebner et al., 2013). Ebner and his colleagues concluded that serum cotinine levels increase when the number of smoked cigarettes increases, and this has a major role in the progression of cardiovascular and metabolic dysfunction in CHF patient that may be complicated in comparison to cardiac cachexia.

4.3 Strengths and Limitations

The major strength of the study lies in the overall number of the sample (n= 300) in comparison with most of the reviewed studies that were conducted with a few number of participants. However, the convenient sampling technique was used to recruit the study participants from only two health sectors without including the private or university-affiliated health sector causes limitation in the external validity and limits the generalizability of the results.

Another major limitation of the current study was related to the main study instrument which developed by the researcher. In fact, after extensive search in the literature, no specific instruments were found to measure cardiac cachexia and the targeted variables. So, the study instrument was built after a thorough and extensive search in the literature to find the measured variables that contribute in cardiac cachexia incidence. However, further testing of psychometric properties is recommended to ensure accurate and valid measurement of the cardiac cachexia.

5. Conclusion & Implications

Cardiac cachexia has not been widely measured and studied yet world widely. The results of this study shed the lights on the cardiac cachexia as a prevalent problem in Jordanian CHF patients that in need for urgent collaborative efforts to fight and decrease its prevalence and pathological consequences. Sociodemographic characteristics of the CHF patients and their chronic diseases have roles in developing cardiac cachexia and should be taken into consideration when dealing with CHF patients and when developing and implementing treatment plans of cardiac cachexia.

5.1 Relevance to Clinical Practice

Indeed, the results of this study can be used as a baseline data about the prevalence and level of cardiac cachexia among Jordanian CHF patients since this study is the first of its kind conducted to examine cardiac cachexia at the national and even the regional level. Establishing baseline data about cardiac cachexia paved the way in front of future researches for it helps the researchers to conduct additional more controlled research studies in terms of their designs and methodologies. In addition, this study can be useful for determining effective therapeutic modalities that can be employed on behalf of cachectic patients among the health care team; particularly nurses, that could be used effectively in decreasing the cardiac cachexia incidence among the CHF patients, like nutritional or patients' educational and patient's families educational programs (Agren, Evangelista, Hjelm, & Strömberg, 2012; Cavey, 2011; Holmes, 2009; Lycholip, Celutkiene, Rudys, Steponenieni, & Laucevicius, 2010; Strasser, 2012).

Nurses and other health care members must have the necessary knowledge and trainings to correctly recognize the cardiac cachexia and differentiate it from other similar disorders, like malnutrition or sarcopenia. Indeed, the researcher's developed instrument to detect and diagnose cachectic CHF patients can be used easily by the nurses and other health team members; since it relied on easily measurable variables that can be assessed rapidly during the routinely follow-up visits or even in the acute care settings.

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Competing Interests Statement

The authors declare that they have no competing or potential conflicts of interest.

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Prevalence and Risk Factors of Cigarette Consumption Among the University of Sharjah Students

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Abstract

Objective: Smoking is considered a major public health problem throughout the world. Although the burden of a disease attributable to smoking occurs among adults yet, the problem originates in the teenage and adolescence when the majority of smokers have their first experience with cigarettes. The objective of this study was to estimate prevalence of cigarette consumption among the University of Sharjah students.

Setting: University of Sharjah, Sharjah campus.

Participants: The total undergraduate student population registered at University of Sharjah (UoS) during the period of study.

Design: A cross-sectional design was followed and included a sample of the University of Sharjah students based on the assumption of a prevalence of 15% and a degree of precision of 5% at the 95% confidence interval for each of the two campuses within the University city (Medical and Health Sciences campus and Non-Medical campus). The designed data collection tool was distributed based on the stratified sampling technique.

Results: The overall prevalence was 28.2% for both sexes. The prevalence of smoking among males accounted for 44.6%, while the prevalence of smoking accounted for 13% in females. The highest percentage of type of smoking was cigarettes 52.2% in males and 78.5% in females followed by medwakh 30.2% in males and water-pipe in females 21.5%. A student at a non-medical college, being a non-national, and having parents who were smokers were the common logistic regression predictors of smoking for both sexes in the sample under study.

Conclusion: Tobacco control strategies and preventive measures in the UAE should start as early as preparatory and high school education and be directed towards school students as it seems that the problem is escalating in prevalence and magnitude.

Keywords: smoking, prevalence, risk factor, university, students, cigarette

1. Introduction

Smoking is considered a major public health problem throughout the world. It is estimated that smoking and tobacco-induced diseases such as chronic bronchitis, bronchial asthma, and lung cancer lead to approximately 5.4 million deaths annually. By 2030, 8.3 million deaths worldwide will be attributed to these diseases, representing 10% of deaths globally (Jafari, Haji Zamani, & Alizadeh, 2011). Although the burden of a disease attributable to smoking occurs among adults yet, the problem originates in the teenage and adolescence when the majority of smokers have their first experience with cigarettes (Polańska, Wojtysiak, Bąk- Romaniszyn, & Kaleta, 2016).

The epidemic of tobacco use among young people is on the rise globally, in developed and developing countries. According to the Global Youth Tobacco Survey (GYTS) conducted from 1999 to 2009, 21% of boys and 17% of girls had smoked cigarettes in the previous 30 days (Öncel, Gebizlioglu, & Aliev, 2011). The epidemic goes back till 2002 as identified by the WHO Tobacco Atlas, when the rate of male adult smokers was 48% in Southeast Asia, 43% in other Asian regions, 38% in Europe, and 35% in North America, while that of female adult smokers was 11%, 11%, 23%, and 21%, respectively (Takeuchi, Morita, Naito, & Hamajima, 2010).

Tobacco consumption in males was estimated to be much higher in Arab nations (24.8-61.7%) compared to

western nations (19.8-46%); whereas it was estimated to be lower for females in Arab nations (0.3-7.9%) compared to western nations (13.7-31.1%) (Mandil et al., 2010). In many developing countries, the prevalence of smoking among women consistently reported to be lower than in men, where women are traditionally stigmatized for using tobacco (Lopez, Collinshaw, & Piha, 1994). Eastern Mediterranean Region (EMR) countries, follow the same trend in gender differences in smoking when it comes to conventional methods of tobacco use (cigarette smoking) (Mandil et al., 2010).

The rate of smoking behaviors was found to be high among adolescents with decrease in the age of onset over the time. An issue of great importance among university students, as an educated population which can affect all the strata of society (Jafari et al., 2011).

In a previous study at the University of Sharjah (Mandil, Hussein, Omer, Turki, & Gaber, 2007), reported that smoking among university students ranged between 13-20% in males, and 9-11% in females students. Another study among students at a Saudi university estimated the overall prevalence of smoking at 14.5%, where smoking among male students was (32.7%), and females (5.9%) (Mandil et al., 2010). The WHO (World Health Organization, 2015), report for UAE revealed that the prevalence of smoking among the youth for both sexes in the UAE 12.5%, 16.5% among males and 8.4% among females.

The objective of this study was to estimate prevalence of cigarette consumption among the University of Sharjah (UoS) undergraduate students enrolled during 2016/2017; and to explore associated risk factors which may contribute to cigarette use among both sexes.

2. Methods

2.1 Study Design

A cross-sectional design was followed for data collection. The study was conducted during the period between March 1st to May10th 2017.

2.2 Sample Size Determination

Sample size for proportion without replacement was calculated (Equation 1) (n=696) and a degree of precision of 4% at the 95% confidence interval for both campuses (Medical and Non-Medical campuses).

$$n = \hat{p}\ (1-p).z_{\frac{\alpha}{2}}^{2}/e^{2} \quad (1)$$

n= sample size, p= proportion (0.5 for smokers and non-smokers, $z_{\frac{\alpha}{2}}^{2} = 1.96^2$, e= degree of precision

2.3 Sampling

The total undergraduate student population registered at University of Sharjah (UoS) during the period of study accounted for 11808 students. The inclusion criteria for the sample included full time student status for both genders, and enrolled at the UoS during the academic year 2016/2017. The sample was stratified into two samples from the two campuses in the University. Medical campus students (includes the medical and health sciences colleges) (n=2121) and Non-Medical campus students (includes all the non-medical colleges, e.g engineering, law, arts, etc;) (n=9687). Further stratification according to gender was followed based on the proportion of male and female students in both campuses. Stratification for the Medical campus yielded a sample of 326 students; where males account for n=42 and females accounted for n=284, and a sample of 370 students for the Non-Medical campus where males accounted for n=143 and females accounted for n= 227. The questionnaire was randomly distributed to the selected samples. Anonymity of participating students was indicated on the cover page of the questionnaire and confidentiality was maintained on all collected questionnaires. The inclusion criteria for the sample were: full time student status (of both genders), enrollment in one of UoS undergraduate programs, during the academic year 2016/2017, with an age range: 17–25 years.

2.4 Data Collection Tool

A questionnaire was developed for data collection based on the Global Adults Tobacco Survey (GATS) (Global Adult tobacco Survey Collaborative Group, 2011). The questionnaire entailed demographic variables as well as possible risk factors including; age (quantitative), gender (male=1, female=2), campus (Medical=1, Non-medical=2), nationality (national=1, non-national=2) are you a smoker? (Yes=1, No=2), have you ever tried smoking, even just a few puffs? (Yes=1, No=2), are you fully aware of the dangers of smoking? (Yes=1, No=2), from where did you get your information about smoking? (1=friends, 2=Media e.g; magazine/ newspapers, 3=my

lectures and studies at the university, 4=other/ specify), do your parents smoke? (1=No, 2=father, 3=mother, 4=both), what is the main reason behind your smoking habit? (1=trying the experience, 2= parents habits, 3=stress relief, 4= friends habits, 5=relatives habits), type of smoke (1=cigarette, 2=chewing tobacco, 3=pipe, 4=medwakh, 5= water-pipe), how often do you smoke? (1=daily, 2=2-4/week, 3=weekly, 4=less often), how many cigarettes per day? (1=1 – 5, 2=6 – 10, 3=10 – 20, 4=20+, 5=Not applicable (I don't smoke cigarettes), monthly cost of smoking (1=100-200 AED, 2=200-400 AED, 3=400-600 AED, 4=600+AED), Is this considered an economic burden to you? (1=Yes, 2=No),

2.5 Statistical Analysis

Data were reviewed for completion and accuracy, and analyzed using the Statistical Package for Social Sciences (SPSS) version 21.0. Descriptive statistics as mean, standard deviation and proportion were used to describe the quantitative and qualitative variables. One sample test, and Chi-square tests were used to observe and measure the association between qualitative variables and outcome variables. Binary logistic regression was used to yield risk factors for a dichotomous outcome variable smoking status (Yes/No). Reference categories for the variables included in the equation for both genders were adjusted as follows; age (17 to below 22 years), non-national students, non-medical colleges, awareness of dangers of smoking, parents being smokers. For both crude and adjusted odds ratios, 95% confidence intervals were calculated. A p-value of <0.05 was considered as statistically significant.

2.6 Ethical Considerations

This study proposal was granted approval by The Ethics Committee of the Medical Campus at the University of Sharjah on March 2017 (Research Ethics Committee, University of Sharjah, 2017).

3. Results

The total number of smokers accounted for 209 students. By using the one sample test for dichotomous variables (smoker/non-smoker), testing the prevalence reported by the WHO (12.5%), the results yielded a significant difference with a prevalence of 28.2%, $p<0.001$ for both sexes in the sample under study. Male smokers accounted for 75.6% of the total number of smokers, whereas, females accounted for 24.4%. The prevalence of smoking among males accounted for 44.6%, while the prevalence of smoking accounted for 13% in females.

Table 1 presents the demographic characteristics of the sample under study by smoking habit. The test of significance yielded a significant association between variables gender (X^2= 90.3)where the highest proportion of smokers were males (75.6%) while the highest proportion of non-smokers were females (63.2%), college (X^2=40.5) where the highest proportion of smokers were enrolled at the non-medical colleges (78.9%) as well as the highest proportion of non-smokers were also enrolled in non-medical colleges (53.6%), ever tried smoking (just a few puffs) (X^2=280.2) where the highest proportion of smokers answered (yes, 93.3%) while the highest proportion of non-smokers answered (no, 67.1%), and parents smoke (X^2=21.3) where the highest proportion of smokers had smoking parents (51.2%) and the highest proportion of non-smokers had non-smoking parents (67.1%) respectively.

Table 1. Demographic characteristics by smoking habit (Sharjah, 2017)

	Smoker (n=209)		**Non-Smoker (n=532)**		**Test of Significance**
	No.	**%**	**No.**	**%**	X^2
Age					
17 – < 22	148	70.8	413	77.6	3.79
22 +	61	29.2	119	22.4	
Gender					
Male	158	75.6	196	36.8	90.33*
Female	51	24.4	336	63.2	
Nationality					
National	48	23.0	156	29.3	3.03
Non-National	161	77.0	376	70.7	

College					
Medical College	44	21.1	247	46.4	40.5*
Non-Medical College	165	78.9	285	53.6	
Awareness of dangers of smoking					
Yes	198	94.7	513	96.4	1.1
No	11	5.3	19	3.6	
Ever tried smoking (just a few puffs) ?					
Yes	195	93.3	135	25.4	280.2*
No	14	6.7	397	74.6	
Parents smoke					
Yes	107	51.2	175	32.9	21.3*
No	102	48.8	357	67.1	

$p < 0.05$.

Table 2 presents the type of smoke by gender. The highest percentage for both genders accounted for cigarettes in males (52.2%) and females (78.5%). Whereas the second highest percentage in males accounted for midwakh (30.2% and water-pipe for females (21.5%). Water-pipe and pipe smoking in males accounted for 6.3% each.

Table 2. Type of smoke by gender (Sharjah, 2017)

	Male (n=205)		**Female (n=65)**	
	No.	**%**	**No.**	**%**
Cigarette	107	52.2	51	78.5
Water-pipe	13	6.3	14	21.5
Medwakh	62	30.2	0	0.0
Pipe	13	6.3	0	0.0
Chewing tobacco	10	4.9	0	0.0

Table 3 presents the significant logistic regression predictors of smoking in males. The variables namely; college (non-medical) (β)= -1.1, p<0.0001), nationality (non-national) (β)= 0.6, p<0.024), and parent is a smoker (β)= -0.6, p<0.007)

Table 3. Logistic regression predictors in smoking males (Sharjah, 2017)

Variable	**B**	**SE**	**Significance**	**Exp(B)**
Constant	1.07	0.4		2.9
College	-1.1	0.3	0.0001	1.9
Nationality	0.6	0.3	0.024	1.8
Parent smoker	-0.6	0.2	0.007	0.7

$p < 0.05$.

Table 4 presents the significant logistic regression predictors of smoking in females. The variables namely; college (non-medical) (β)= -1.1, p<0.001), awareness of danger (β)= 1.6, p<0.04), age (17 to below 22 years) (β)= 0.96, p<0.02) and parent is a smoker (β)= -1.2, p<0.001).

Table 4. Logistic regression predictors in smoking females (Sharjah, 2017)

Variable	B	SE	Significance	Exp(B)
Constant	20.1	0.34		0.54
College	-1.1	0.35	0.001	0.31
Awareness of dangers	1.6	0.81	0.04	4.97
Age (17 - below 22)	0.96	0.4	0.02	2.63
Parent smoker	-1.2	0.4	0.001	0.29

$p < 0.05$.

4. Discussion

The study results reveal an alarming rise in the proportion of smokers among university students (28.2%) for both sexes compared to a previous study conducted in 2008 (12.5%) for both sexes (Mandil et al., 2007) and the results based on the data from the National Study of Population Health in the UAE (NSPHUAE) (2007–2009) which accounted for 13.9% among adolescents between the ages of 13 to 20 years (Barakat-Haddad, Zhang, Siddiqua, & Dghaim, 2015). A high prevalence of smoking among university students was encountered in other studies, 46.9% in Greece (Alexopoulos, Jelastopulu, Aronis, & Dougenis, 2010), 31.6% in Turkey (Öncel et al., 2011), 31% in Gaza, Palestine (Abu Shomar, Lubbad, El Ansari, Al-Khatib, & Alharazin, 2014), and as low as 25.3% in a university in Tehran (Jafari et al., 2011). According to the American College Health Association, approximately 29% U.S. college students report lifetime cigarette smoking (Bennett, Deiner, & Pokhrel, 2017).

Water-pipe smoking continues to be a popular type of tobacco consumption in this region especially for females as previously revealed in other studies (Maziak et al., 2004; WHO, 2006; Badr & Hamada, 2005) yet, another type of tobacco consumption characteristic for the youth in the UAE which is medwakh came second in prevalence among the sample. The popularity of this type of consumption in this country replaces the water-pipe to third place for males, yet the overall prevalence of medwakh and water-pipe (36.5%) was closely similar to previous studies in the area (37.8%) (WHO, 2006).

Badr and Hamada (2005), also reported that prevalence of smoking among females is on the rise and females are being targeted in the marketing strategies of cigarette industry (Badr & Hamada, 2005), this was consistent with the high prevalence yielded in the results contrary to our hypothesis of a lower prevalence owing to the customs and cultures in the region which consider such habits unacceptable for females (Maziak et al., 2004; WHO, 2006; Badr & Hamada, 2005; Al-Mahmoudi & Amin, 2010).

Affiliated to a non-medical college was a predictor of smoking, but the probability of such a predictor is less than 50% owing to the negative beta coefficient. Although there is no evidence regarding the type of education and courses taught at university level and its association with smoking, yet there health related course could contribute to the awareness of dangers of smoking and could have affected the results of the sample under study. In the same context, being a multinational university with a diversity of cultures, where the majority of students at the university are non-nationals could have contributed to the nationality variable where non-national being a predictor of smoking.

Living among non-smoking parents is not necessary a preventive factor towards this unhealthy habit, as non-smoking parents of both male and female students were significantly associated with their smoking status in the sample. Within the same context of negative coefficients, the probability is expected to be less than 50% of the sample owing to the negative beta coefficients yielded from the model. Whereas, contrary to this observation a significant predictive factor for smoking in other studies was having both parents as smokers (Öncel et al., 2011; Barakat-Haddad et al., 2015; Aslam, Zaheer, Rao, & Shafique, 2014; Geidne, Beckman, Edvardsson, & Hulldin, 2016; Merdad, Al-Zahrani, & Farsi, 2007).

Smoke-free environments are protective for young people. They prevent young people from starting to smoke and cause those who do smoke to reduce their smoking (Geidne et al., 2016); therefore more efforts are stringently required for the publics in the UAE towards tobacco control.

5. Conclusion

Tobacco control strategies and preventive measures in the UAE should start as early as preparatory and high school education and be directed towards high school students as it seems that the problem is escalating in prevalence and

magnitude rather than declining. This highlights the importance of supporting anti-tobacco messages and education campaigns targeting families and adolescents regarding the risks of tobacco use. In order to make preventive programs more effective, efforts should be focused on the groups at risk, with a comprehensive approach including multiple factors and involving higher education personnel, parents and the group leaders in tobacco control activities. Projects should be aimed at changing social norms around smoking and providing the youth with knowledge and skills to resist smoking are also needed.

Limitations of the Study

The results of this study were based on a survey in a major university in United Arab Emirates, and are not necessarily representative for the student population of the entire country. Yet compared with similar studies in university settings, the sample was large and randomly selected; therefore, selection bias is less likely to have occurred. An inherent bias for cross sectional studies lies in bias related to the characteristics of the non-respondents. The conservative cultures and beliefs of Arab students especially females may have influenced the response rate and responses on the data collection tool regarding the sensitive topic of the smoking habit in such societies. Being in an academic and research oriented environment, students are exposed to various exhaustive data collection tools throughout the academic year, thus a possibility of response bias is present in the yielded results.

Conflict of Interest Statement

The authors declare no conflicts of interest in this work either financial or scientific with any organization. The authors alone are responsible for the content and writing of the paper.

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Primary Caregivers of People With Severe Mental Illness Experience of Anti-Psychotic Medication: Findings From the Semi-Structured Interviews

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Abstract

Background: Management of schizophrenia is now shifted to the community setting and family caregivers are the primary caregivers. Managing medications is a complex responsibility of family caregivers caring for patients with mental illness. Medication compliance contributes to improve health outcomes and reduced hospitalization for the care service users; however, little is known about attitudes and perception of family caregivers.

Methods: A purposeful sample of 21 family caregivers were included in the study. Semi-structured interview was employed to collect data from the participants between May and October 2015. Thematic analysis approach was used to identify the common pattern in the data.

Results: Four main themes emerged from the study: insight into illness (poor understanding of illness), treatment factor (thinking about medication, poor guidance for medication compliance), resources and support (availability of medication and cost of medication), health care provider factors (communication gap and poor assessment with follow-up, social dysfunction (social isolation, disruption in life routine).

Conclusions: Responsibility for providing care for patients with mental illness are taken place in the community setting and cared by family caregivers. More information resources are required for this role, which requires specific medication management skills and knowledge.

Keywords: adherence, medication, attitude, beliefs, family caregivers

1. Background

Schizophrenia is one of the most serious psychotic disorder which imposes financial, social and emotional constrains (Stuart, 2014). It has a chronic progression with clinical, cognitive, social deterioration as well as it has a frequent episode of remission and relapse and rehospitalisation (Staring et al., 2011). The main reason for relapse and readmission is medication noncompliance, particularly oral form (García et al., 2006). This explains by fears of medication adverse effect and negligence the importance of daily administration drug (Dean, Wragg, Draper, & McDermott, 2011). There is a relatively small body of literature that is concerned with the family caregivers of people with schizophrenia impacts on medication compliance and found including family relative in the treatment process poses positive clinical outcomes, as reducing relapse (Wilk et al., 2008).

Poor service provision and lack of diversification in mental health care in developing countries (e.g. the restricted availability of beds in mental health hospitals) led to major health reforms (WHO, 2011). As a result, the management of schizophrenia shifted from hospitals towards community care (Chan et al., 2009). Nowadays, families are increasingly fundamental in providing essential needs for affected relatives and between 50-80% of people with schizophrenia live with or have daily contact with their families (Lehman & Steinwachs, 1998). However, families may not have basic skills and knowledge to take on the responsibility of caring for people with schizophrenia and family caregivers may be left alone, unsupported or untrained, which is the leading cause of families' physical and psychological health problems (Macleod, Elliott, & Brown, 2011) as well as recurrent relapse with rehospitalisation among people with schizophrenia (Sharif, Shaygan, & Mani, 2012). This conclusion is applicable to families around the globe, as the majority of the reviewed studies directly stated poor knowledge levels of schizophrenia among family caregivers (Pitschel-Walz et al., 2001; Sharif, Shaygan, & Mani, 2012).

The number of people diagnosed with mental illness who need an assistance from their family relative are increasing due to core changes in the population life in developing countries. In Jordan, the number of people diagnosed with mental illness has been dramatically growing, Available data is derived mainly from a recent World Health Organization (WHO) report, which stated that 305 individuals per 100,000 of the Jordanian population suffer from mental illness. About 18,300 individuals have been diagnosed with mental illness, out of whom around half have a diagnosis of schizophrenia, making this a significant health care issue. Schizophrenia is considered the most common type of mental illness treated in mental health services. Approximately 52% of mentally ill individuals who are treated in outpatient clinics have schizophrenia and 49% of hospital in-patients with mental health problems are diagnosed with it (WHO, 2011).

Family caregivers of people with schizophrenia are identified as a primary source of support, their roles are essential in optimizing health related outcomes and being adhered with treatment regime (Reinhard, Levine, & Samis, 2012). Additional supports from the front help line (e.g. parents) are recognized to affect patient psychological and physical life and their acceptability of illness and treatment (Allen, Lima, Goldscheider, & Roy, 2012). Similarly, studies suggest that social and familial supports are crucial in increasing medication adherence among patient with chronic disease (Matthes & Albus, 2014). Collaboration and including family caregivers with their ill relative in treatment process, which is a source of social and emotional support, encompasses mutual understanding of medical problem. However, this phenomenon has been insufficiently explored in schizophrenia.

In addition, a limited number of studies supports the role of family caregivers in preventing or reducing medication non-compliance. Wilk, West, Marcus et al. (2008) noted that risk of noncompliance with antipsychotic medication is reduced three times when the family members are involved in treatment process in comparison with those did not receive family support. However, the family members are frequently excluded from being involved in planning treatment by health care professionals (Perkins, 2002). Interestingly, poor understanding of illness by family members restricts family support required for ill relative diagnosed with schizophrenia (Taj, 2008). Consequently, treatments for mental illness are often sought from traditional and spiritual healers and put them to be more influenced by social and cultural myth associated with mental illness. In addition, it poses a risk to alienate medical treatment and look for traditional treatment (i.e. faith healer) to deal with psychiatric illness (H. Lee et al., 2011).

In developing countries, the preference of treatment of mental illness devoted to traditional healers which is less expensive and conforms with social values and beliefs. This delays in seeking appropriate psychiatric helps resulting in deterioration in client psychiatric symptoms. Consistently, a recent studies by Gearing et al. (2013) and Aloud and Rathur (2009) reported that beliefs and values were the main barriers and challenges for Arab individuals in Middle Eastern-Arab countries with mental illness accessing mental health services or participating in psychosocial treatments and service implementation. Likewise, this finding are supported by another studies on Arab-Muslim population which found a lack of understanding magnifies stigma and tend to tolerate mental health problems for long time before considering any formal treatment (Al-Adawi et al., 2002; Okasha, 1999).

Antipsychotic medication is the first line treatment of psychosis for the first episode psychosis; yet 40% of patients do not take medication as prescribed. Previous research in compared healthcare professional and patients' views suggested that health care providers stressed the importance of patient's insight into medication to increase adherence whilst they underestimated the impact of side effect and family support as a leading factor for nonadherence. Reviews of the literature on predictors of psychiatric medication usage and family variables have showed limited and inconclusive findings. Lacro (2005) reported that family involvement in the treatment process with their mentally ill relative was associated with nonadherence. The major weakness of this study was this conclusion reached based on handful number of studies as well as on global indices of ''family involvement'' and living arrangements. Conversely, Fenton., Blyler, and Heinssen (1997) in his review found that availability of family support or informal family caregivers was linked to higher adherence among outpatient people with schizophrenia. Collectively, these studies examined the presence of family members in treatment process without investigating the role of specific family. Furthermore, family members can be a source of support or conflict when they have exaggerated emotional expression (EE) (Bebbington & Kuipers, 1994; Butzlaff & Hooley, 1998). A study of Kopelowicz et al. (2006) concluded that risk of relapse is three or four times are more likely when family member has high EE compared with family member has low EE.

Medication management has been labelled as one of the major family caregivers task in caring in the community settings (Fortinsky, 2001). For instance, a recent online survey results showed that approximately half of the informal caregivers reported that their major task in caring process devoted to medication management (Brodaty & Green, 2002). This is an essential outcomes as it improves health related outcomes and reduces hospitalization rate (Arlt, Lindner, Rösler, & von Renteln-Kruse, 2008). However, the importance of this caring increases when the

caring receiver diagnosed with cognitive function declines (Cotrell, Wild, & Bader, 2006; Erlen et al., 2013). Consistently, based on the findings of US project on informal caregivers highlighted that informal caregivers role concerning medication management dramatically increased from 54% to 90% when cognitive deficit being sever "advance stage of dementia" (World Health Organization, 2012).

Data from several studies suggest that medication compliance is improved among people with schizophrenia (PwS) who are live with their relative or in close contact with family member (A. Hasan, 2016; Perkins, 2002). Despite this evidence, mental health professionals intend to exclude family caregivers from the treatment process. Little is known about family caregiver's perception and attitudes towards antipsychotic medication. In a recent qualitative study explored the role of the primary caregivers in management process of schizophrenia treatment and reported primary caregivers had essential role in preventing and managing medication non-compliance (A Hasan, 2016).

The research to date has tended to focus on attitude and perspective of people with mental illness towards antipsychotic medication. In light of this, there is need for an investigation of attitude and perspective of close family member (primary caregiver) towards antipsychotic medication. Indeed, existing research on attitudes towards antipsychotic medication has been predominantly utilized quantitative approach and included patient with mental illness with less attention has been paid for family caregivers (Fisher, Cornman, Norton, & Fisher, 2006; Vervoort, Borleffs, Hoepelman, & Grypdonck, 2007). It thus anticipated that an understanding family caregivers attitudes towards antipsychotic medication may reduce medication noncompliance among people with mental illness (Kelly, McCarthy, & Sahm, 2014). Using qualitative methods, this study purposes to gain insight into the experiences of family caregivers about antipsychotic medication.

2. Methods

2.1 Design

Qualitative design is an approach to understand a person's experience from his or her perspective (Trotter, 2012). This approach is suited the purpose of this study as a little is known about this phenomenon, therefore, a qualitative design, based on the inductive approach, was used for the data collection and analysis of family relative's subjective attitudes and perceptions about antipsychotic medication between May and October 2015.

2.2 Participants and Recruitment

Participants were family caregivers of people with mental illness in Jordan. Purposive sampling method was administered to provide diversity in socio-demographic characteristics of interviewees. The inclusion criteria were adult, relative of a people with mental illness, willingness to be interviewed and the ability to talk and explain their experiences. The sampling was based on a maximum variant strategy in terms of levels of education, marital status, and different ages and relationship with mentally ill relative.This sampling strategy enabled the researchers to capture a wide range of views and experiences (Speziale & Carpenter, 2011).

2.3 Data Collection

Semi-structured interviews were employed to elicit participant's responses. Interviews conducted in private room where participants can express their point of views freely. Each interview lasted up 35 minutes and was audio-taped. A reflective diary was used to support the audiotaped data, to collect non-verbal responses of the interviewees as well as renders the participants feel that author was interested in what they were saying. Simple language was used and technical terms were avoided. The majority of interviews were conducted in Arabic language (mother tongue language of the participants). However, some participants preferred to speak in English. Interviews was carried out on individual basis once. A set of open-ended questions was used to guide responses during interviews (e.g. Would you please share with me your experience about your relative medication? Would you describe the problems that arise from usage of medication?). Probing questions were also used during the interviews to improve the depth of data gathering. After 21 interviews, author noticed data redundancy and information saturation. Thus, decision made to cease interviews.

2.4 Ethical Considerations

Ethical approval was granted by the Ethics and Scientific Committees in the Ministry of Health to conduct the study. Potential participants were approached and informed about the study the purpose, the voluntary nature of their participation, and that they could withdraw from the study at any time without presenting reasons and this would not impact on their ill relative medication. Informants confidentiality and anonymity was assured and maintained, Furthermore, permission for audio-recording of interviews was obtained from each participant. Informed consent was obtained from those who agreed to be involved in the study.

2.5 Trustworthiness

Consolidated Criteria for Reporting Qualitative research (COREQ) was consulted to promote (Tong, Sainsbury, & Craig, 2007; Table 1). Also for building research trustworthiness we have to focus on credibility, transferability, dependability and confirmability (Lincoln & Guba, 1985). To address credibility, there is several steps followed to address this point. First, researcher had prolonged engagement with participants to learn the culture and build trust (Lincoln & Guba, 1985). Second, researcher made two transcriptions for each interview by listening to the audio recording on two separate occasions. Then researcher merged the two transcriptions into one final version. Each final transcription was read line by line 2–3 times to identify the main themes. This procedure provided a richer, more meaningful and more credible data set. Moreover, credibility of the current study during data analysis and interpretation was enhanced by showing apparent contradictions in data. Transferability was achieved by selecting a purposeful sample from different psychiatric clinics to illuminate phenomena being studied. In addition, a thick description of the contextual background of the research setting and the participants and credible interpretation is necessary. The dependability of research data is satisfied by using interview guide in order to be consistent. In addition, the transcription strategy was universally similar for all interviews conducted. Digitally recorded interviews were added as another way of enhancing the dependability of obtained data by minimizing any systematic bias and producing plausibility of the account made by interviewees

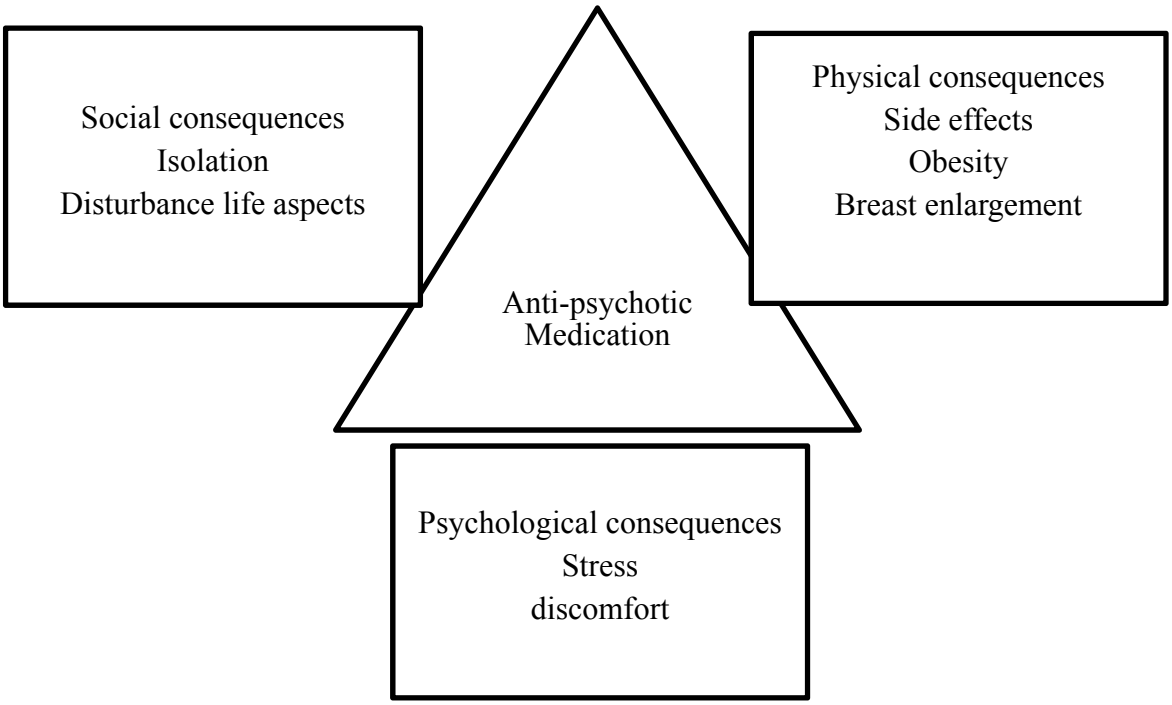

Figure 1. The Impact of Anti-Psychotic Medication on Life Aspects

2.6 Data Analysis

The interviews were audio-recorded and transcribed verbatim, and analyzed using the thematic analysis (TA) approach concurrently with data collection process. This approach was employed as it provides an accessible form of analysis and can be used within different theoretical frameworks (Boyatzis, 1998). TA is extensively used in health research (Braun & Clarke, 2006), by which data is systematically categorised into themes and sub-themes. This approach was employed in this study as it is accessible and flexible within different theoretical frameworks (Braun & Clarke, 2006). Therefore, it is not tied to any epistemological or theoretical assumptions, and can be applied to numerous types of studies. TA can be used to report experiences and to obtain understanding (e.g. regarding interviewees' perceptions) in order to gain the rich (thick) descriptive data. Data analysis in qualitative research is an iterative process from data collection, through interpretation to the writing-up process (Green & Thorogood, 2013). All interviews were analysed manually because the relatively small sample size allowed for this kind of in-depth scrutiny (i.e. due to the small data-set, non-computerised methods were feasible and

appropriate). The first step of analysis was transcribing interviews which assisted author to be familiarized with the data (Pope et al. 2000). Then coding process was performed line by line to generate initial code. The next step included that all similar codes or meanings were collated into potential themes. At the end of this point, all potential themes and sub-themes were identified.

3. Results

The average age of participants were 45 years old and the majority of them were female caregivers. In addition, two third of participants had attained secondary level of education or more. Almost all participants were a primary caregivers and spouse. All interviews were conducted without distraction or repetition. In couple of interviews were the participants invited her husbands to take part due to cultural factors. Five themes emerged: insight into illness, treatment factor, availability of medication and cost of selected brand of medication, health care provider factors and poor instruction about medication.

Table 1. Characteristics of interview participants (Family Members)

Characteristic	Interview Sample
Participants	21
Gender:	
Male	8 (38.1%)
Female	13 (61.9%)
Age (years):	
≤ 20	0 (0)
21-30	2 (9.5%)
31-40	5 (23.8%)
41-50	12 (57.1%)
≥ 51	2 (9.5%)
Education Level:	
Primary School or below	14 (57.1%)
Secondary School	5 (23.8%)
College or above	2 (9.5%)

3.1 Insight into Illness

This theme captures the participants' prior knowledge of schizophrenia which impacts of their understanding, attitudes and perception towards antipsychotic medication.

Poor understanding of illness

This section investigates how the participants' knowledge and understanding of schizophrenia influenced their attitudes towards medication. Data analysis suggested that almost all the participants expressed a limited knowledge of schizophrenia, regardless of age and educational attainment:

*"….. Because you know we do not have any educational opportunities from the Ministry of Health in Jordan to answer our questions….." **(PC1)***

*"… He has been getting treatment from the governmental centre for 10-12 years without any educational support from the centre like teaching us or distributing brochures about the illness….." **(PC2)***

This lack of knowledge around schizophrenia was also evidenced by the fact that more than two-thirds of the interviewees who were interviewed believed that their relative had two personalities and that their interactions with others relied on the predominant personality (aggressive or calm):

*"….. I knew about the illness since I was in school. This illness creates two personalities. One is strong and hostile while other is weak and calm and he communicates with others based on these personalities….." **(PC1)***

*"….. We believed that [schizophrenic] patients had multiple personalities….." **(PC4, Wife)***

Participants' attributed this lack of knowledge about schizophrenia to the social stigma attached with mental illness in Jordanian culture:

*"….. I lived in the village for 23 years; the people there have negative views about mental ill person and their families….." **(PC18)***

*"….. It is a difficult topic to talk about in our culture. We live in the village area where people are not educated, hence my father decided to restrict my sister to our home for more than one year, just to protect our family from the stigma….." **(PC9)***

Moreover, interviewees expressed overwhelming feelings of guilt over their relative's diagnosis with schizophrenia, believing that this was a result of a direct failing on the part of the family:

*"….. Furthermore, I have {ah, ah…..} believed the cause of her illness to be due to a mother's neglect, because I {ah} had worked outside the home for a long time previously….." **(PC6)***

*"….. We believed that her poor communication with our mother was one of the causes of her illness {ah, ah……} because before my mother passed away, she had many arguments with her for unknown reasons [….]. We also thought this illness stemmed from the jealousy of seeing successful people….." **(PC3)***

A different group of participants expressed the belief that their relatives' illness resulted from a demonic possession of their relative's mind, prompting them to say or do inappropriate things. These participants attempted to treat their relative by consulting folk exorcists to dispel these spirits:

*"….. Previously we thought that this illness [schizophrenia] resulted from the possession of devils inside his body which asked him to perform these behaviours. Also, we {ah} thought this illness stemmed from being nervous, stressed or some unknown fear, but after reading this booklet my view changed (McCauley, McKenna, Keeney, & McLaughlin). This illness is out of his control, we should accept him as he is as well as should avoid asking magicians to treat him….." **(PC7)***

Similarly, one participant expressed the view that schizophrenia might be the result of charm, which she asked the magician to remove:

*"….. In the beginning when he started to behave abnormally or say absurd words, I thought someone had cursed him because he was resourceful and active [….]. We went to many people for help but it was no benefit to us….." **(PC8)***

3.2 Treatment Factor

Thinking about medication

This section discusses the participants' views, feelings and thoughts about psychiatric medication and its uses. It seems that participants commonly reported a negative attitude towards medication use. It was noted that this had not been changed over the time which might information attributed as a major cause of relapse.

*"….. I kept telling him to stop taking the medication without informing doctor even though he got lead to serious [relapse], and it's so hard to return a patient's status to baseline […..]….." **(PC1)***

*"….. We know this illness {ah...} can just be treated by herbs […]. If he doesn't take his medicine […]……" **(PC5)***

*"….. For instance, my husband had a blood test for depakin level and his result was 77mg, this one time the result arrived at 100mg, and I thought that the depakin medication was discontinued but it caused him to become more distracted and have poor moods….." **(PC1)***

Similarly, some respondents described that they had previously thought that some of the medication side effects were actually deliberate behaviours exhibited by their relatives. For instance, two respondents said that:

*".....I knew the side effects of the medication, but I believed these side effects […] such as fatigue and muscle spasm were intended behaviour to just sleep…." **(PC8)***

*"….. I would usually say to him that you don't like to do anything because you have everything easily in your life… such as smoking, sleep and food […]……" **(PC9)***

Critical analysis of the two preceding quotes reveals that participants reflected on poor understanding of antipsychotic medication information influenced ill relatives in different ways; some of them deduced side effect of using antipsychotic medication is a deliberate behaviour while others utilised their limited knowledge of medication un by attributing their relative's behaviours to normal personal characteristics.

Likewise, in the current study participants noted an acute consequences of medication usage. of these serious side

effects were obesity, enlarge breast which classified to be the most severe and feared adverse effects of antipsychotic medication

"*…. When he takes medication {….ah..} after three months his body weight duplicated….*"***(PC10)***

*" …. His body parts were abnormal {…..} now he is suffering from tremendous change in his body big abdomen and very large breast…."****(PC12)***

Importantly, the participants mainly spouse in this study identified the negative impact of taking antipsychotic on sexual relationship with their husband. As explained by one participant

*"…. Our emotional relationship has changed in a negative way. I didn't know how can he recover and how should I respond to these changes…."****(PC10)***

Poor guidance for medication compliance

Another view was elicited from a participant interviews were lack of understanding medication mechanism of action and improper discussion with mental health professional results in non-confidence in such medication. In addition, they have stated regarding limited access to obtain valid information about medication and strategies to handle side effects.

"….. We receive medication either with English leaflet or without leaflet. This makes me to be distrust with medication….." (***PC7)***

Conversely, improved understanding of medication information might allow some participants to feel that they were an active part of the treatment process in determining the best medication for their relative:

*"….. If I observed that the medication is not suitable for him and the illness symptoms such as hearing voices or talking to no one have returned, I can return back to the physician to review this medicine….." (****PC4)***

*"….. The main problem we face is in shifting psychiatrists [...] {ah...ah} {….}. There was a lack of original medications. Therefore, they prescribed alternative medication for him […] but he [relapsed] three times on alternative medication […]. When I had adequate information about medication, I started to monitor him and knew the suitable medications for his body….." (****PC5)***

3.3 Resources and Support

Availability of medication and cost of medication

Almost all the interviewed participant reported that shortage in antipsychotic medications in governmental health center medication were a primary reason for non-adherence with medication. The following quotes reflect this reason

*"….. When doctor prescribed Risperdal, we got this medicine from health centre for a nominal price. However, this medicine frequently is out of stock. Its price from the private pharmacy is expensive…. We left him without medication. ....." (****PS4)***

*"….. due to non-availability original medicine, alternative one causes many changes in my body like weight gain and sexual dysfunction….." (****PC6***

In the context of medication, some participants reported taking about need to change all medication to be given as a depot which has less side effects and long duration of action:

*"….. Sometimes he takes a tablet, but he moves it out when I leave….. when doctor prescribed IM injection she is well now. Previously we had a problem when she used to forget to take her medicine on time, especially as some medicines needed to be taken at different times ….." (****PC4)***

In conclusion, the above narrated accounts explicitly highlight that side effects of medication as well as a route of administration have a major role in determining adherence level, which in turn changed some of their views and attitudes towards psychiatric medication in a positive way.

3.4 Health Care Provider Factors

Communication gap and poor assessment with follow-up

The results showed that many participants identified a conflict role for a mental health care provides. More than half of them considered health team discouraged them to have positive influence on improving medication compliance. As illustrated in the comments:

" …. We wait doctor in the waiting area {ah.. for calling our name. but, …. The doctor write prescription immediately based on the last month….."(**PC19)**

*" .... Doctor in the clinic treat many patients every day and they do not have time to chat {…ah…} with everyone(**PC7**)*

*"..... Every doctor follows same system, they {....} look at last prescription and write new one accordingly without asking either patient or family any question....."***(PC13)**

Conversely, some group of participants stated that mental health care team had a positive role in improving their ill relative compliance with medication by providing certain information regarding specific drugs, which in turn helped to develop their confidence. For example, two participants commented that:

*"..... We receive some information on the importance of medication [which] was very useful. Since she started to take [serqual], I did not have confidence in that medicine {....ah} [.....]. This makes me to trust that drug [....]. It became safer for me. As a result, my view had totally changed and I became more comfortable with medicine....." (**PC16**)*

*"..... For instance, my husband had a blood test for depakin level and his result was 77mg, this one time the result arrived at 100mg, and I thought that the depakin medication was discontinued but it caused him to become more distracted and have poor moods. But when I read the booklet and what it said about medication as well as I had asked you about this, I realised that we cannot suddenly stop taking medication. This has improved my emotional status and I have become less stressed, less depressed and less sad....." (**PC17**)*

3.5 Social Dysfunction

The participants in this study strongly stressed the negative social effects of medication in disruption the social life of participants. This theme has two subthemes, including social isolation and lack of marriage opportunity.

Social isolation

Many participants, particularly spouses, conveyed a sense of detachment and reported a stressed relationship with family members due to the latter's lack of awareness concerning schizophrenia and its medication's side effects. This is illustrated by comments about the impact of their relatives misunderstanding of schizophrenia on their interpersonal relationships:

*"..... My illness caused me to lose my job [.....]. My family, especially my parents blamed me and said I pretended to be lazy and tired just because I did not like to work. However, they changed this view when they read the information in the medication booklet; that the medicine produces these effects....." (**PC1**)*

*"..... I felt {…} like my wife's response has become less defensive when she understood {ah...} the many aspects of the illness....." ((**PC4**)*

Additionally, the major impact of medication on social life was associated with disruption in social life and interpersonal relationship. Many of participants attributed this impact to the negative views linked to the mental illness. In Jordan culture, being diagnosed with mental illness and accepts this diagnosis or take antipsychotic medication means disability.

Disruption in life routine

The negative social effects of using antipsychotic medication were identified by some participants as entire disruption in their ill relative life. For instance, they have problem in getting marriage, continue their study or secure an employment.

*"..... in our culture, no one can accept to marry a female diagnosed with mental illness. It looks {ah…ah} like cancer....."(**PC15**)*

*"My son has been dismissed from the university three times… he cannot concentrate… I {ah…} feel he cannot understand as other people...."(**PC18**)*

Another view was noted from the participants in this study that many interviewees, particularly mother stated that their daughters divorced as there was difficulties in playing the role of mother, such as the responsibility of caring for children, or husbands. One participants said:

*".... Her husband divorce her as he noted her aggressive behavior with children...."(**PC19**)*

*".... Now, she is separated from her spouse {....} this occurred three years ago when she started to hear voices and isolate herself...."(**PC21**)*

4. Discussion

This study purposed to understand how family caregivers perceive antipsychotic medications. Two key issues

became apparent in this study: the first was the influence of poor understanding illness nature on their attitudes and experience towards mental illness and antipsychotic medications. The second issue is that the influence of poor insight into illness and its influence various life aspects. Perceptions and attitudes of participants in this study identified in three categories, including physical, social and psychological factors, as illustrated in Figure 1.

The evidence that emerged from the qualitative data in the present study demonstrated that the participants' limited knowledge of schizophrenia was influenced by negative public perceptions. Limited knowledge of schizophrenia was also associated with self-stigma, shameful feelings and a pre-occupation with negative psychological feelings (i.e. depression, low self-esteem), all of which have been linked with lower treatment adherence (Vogel, Wade, & Haake, 2006).

The participants reported various reasons for their stressors from their external or internal environments. The former type of stressor is related to the social stigma attached to mental illness in Jordan. Participants stated that negative community attitudes towards the ill relative or their family members was one of the main sources of stress and that they often needed to change their living place to avoid the social stigma.

Previous studies also reported that family caregivers of psychiatric patients experience stigma, much like the sufferers themselves. As a result, they felt ashamed, isolated and guilty by these societal prejudices and in the caring process (Corrigan, 2004). In addition, other interviewed participants revealed that they were afraid of the impact such social stigma had on their family relatives. The impact of stigma is devastating, especially in those developing countries where the influence of collectivistic culture is prominent (Corrigan, 2004b; Fung, Tsang, & Corrigan, 2008). Interestingly, both PCs and published studies reported that this negative view was directed more towards female psychiatric patients as opposed to male psychiatric patients (S. Lee, 2002; Thara & Srinivasan, 2000). PCs who were interviewed also tended to conceal the fact that their relatives had a mental illness in order to prevent any stigma reaction.

Another form of stressor is situational, such as the deterioration of job status after being diagnosed with a mental illness, leading to grief and sorrow from the PCs. In terms of stress responses, PCs during interviews reported a wide range of ineffective physiological (physical illness) or psychological (sadness, worry, panic) responses. Similar results are also evident in the study of McAuliffe, O'Connor, and Meagher (2014), which explored the family caregivers' experience of caring for ill relatives diagnosed with schizophrenia. The study reported high levels of psychological distress among the family caregivers due to three main reasons: (1) having a lack of knowledge about their relative's illness; (2) realising that this led to a considerable change in their ill relative's life.

Moreover, during the qualitative interviews, PCs often referred to the different treatment modalities (herbal or religion faith) they had resorted to in order to avoid fear and worry from their friends and neighbours. This was also supported by Huang et al. (2009), who stated that family caregivers who had misinterpreted the causes of their relative's illness (schizophrenia) were seen to employ various help-seeking behaviours to cope with the illness, such as herbal medicine.

Another key finding in the present study that family caregivers support is linked with higher use of antipsychotic medication. They might be potentially explained by the fact that family caregivers may reinforce medication usage, setting a therapeutic circular chain of events involving medication usage and supportive transactions with loved ones. Notably, this finding of the present study is consistent with earlier study who found family caregivers behaviors are an effective method to increase medication compliance (Dean et al., 2011; Wilk et al., 2008). Our results are very match with prior research, where family is identified as most important resources for people living with mental illness. Families play an important role in providing care and support. Social support is recognized as one of the most important resources in coping with mental illness and compliance with medication (Fisher, Cornman, Norton et al., 2006; Kelly, McCarthy, & Sahm, 2014).

Family caregivers experience social stigma and exclusion from the community as it is reflected in the study as social isolation. This is consistent with Jordanian culture that social stigma prevails in interdependent society and it extends to people with mental illness as well as family members. One coping technique of the family relative to minimize stigma is that using alternative treatment approach or deny problem existence. The findings of this study are in line with those of who reported that in Arab culture the distinction between physical and psychological health is not widely common as has historically been prevalent in Western Cultures. Arab-Muslim literature reveals that Arab-Muslim do not distinguish emotional or psychological distress from physical illness and the majority of populations tend to somatize their illness in which mental ill patient expresses an emotional disorder in the presentation of physical symptoms (Al-Krenawi, Graham, & Kandah, 2000c; Endrawes, O'Brien, & Wilkes, 2007; Fogel & Ford, 2005). This difficulty in recognizing between illnesses is further increased by the patients' tolerance of their symptoms and their family tolerance of their behavioral problems. Consequently, treatments for

mental illness are often sought from traditional and spiritual healers to the exclusion of professional mental health services (Aloud & Rathur, 2009)

In contrast, the results of the interviews conducted in this study suggest that mental health care provider has both positive and negative role on compliance rate. These results are in agreement with those obtained by Chambers et al. (2011) and Henriques, Costa, and Cabrita (2012), who reported a positive impact of health care providers on medication compliance. This is attributed to the fact that this positive role derived from the scientific knowledge being provided by health care professional. However, participants in this study also noted a negative impact health care team. This differs from previous studies conducted in Western countries due to variation in infrastructure in mental health service as the number of psychiatrist and psychiatric nurses in Jordan are so limited in comparison with developed countries. Moreover, the cost of medication was seen as a barrier to medication compliance, especially those who do not cover by medication insurance. The present study results are in accordance with the findings of a recent study by Bajramovic, Emmerton, and Tett (2014) who highlighted that antipsychotic medication is very expensive which leads to noncompliance. Similarly, Orr et al. (2007)noted that cost of medication led to complete or partial noncompliance.

The findings from this study support the following recommendations to enhance compliance in patients suffering from schizophrenia (Puri, Hall, & Ho, 2013). First, mental health professionals need to increase caregiver's involvement and adapt the communication style to make the information more understandable. Second, mental health professionals need to understand the caregivers' perspectives and provide information to correct misconception. It is important to determine the type of non-compliance (e.g. intentional due to beliefs or unintentional due to practical difficulties). Finally, mental health professionals need to monitor non-compliance in a non-judgmental way.

4.1 Limitations of the Study

The limitations of the current review need to be acknowledged is that forward–backward translation process of interview is probable caused loss of the meaning and/or to have the trans-cultural effect bias. In addition, limited number of studies investigated this phenomenon, with the majority conducted in the USA, Canada and the UK. Ideally, transcript has to be returned and checked by interviewees to verify their completeness, accuracy and validity. However, time constraint was a factor restrict authors to return to participants which might affect the internal validity of this study.

5. Conclusion

There are a growing number of people with mental illness and number of family caregivers who care for ill relative in the community setting. Mental illness and antipsychotic medication is the major challenge to the family, patients and health system and community at broader level. So enhance our understanding about family caregivers experience towards antipsychotic medication enables them to provide adequate social and psychological support to ill relative and cope with illness symptoms.

Ethics Approval and Consent to Participate

The ethical approval was obtained from the Ministry of Health in Jordan. In addition, Consent form was sought from all the study participants.

Consent to Publish

I declare that all participants informed and consented such data are subjects for publication in psychiatry journal.

Availability of Data and Materials

Data are available and ready upon request. Data are kept with the research team

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Psychopharmacological Treatment for Posttraumatic Stress Disorders in Naval Military Subjects

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Abstract

Introduction: Posttraumatic Stress Disorder (PTSD) is a psychiatric syndrome known since 1980 with multiple names in the military field. Its etiology is multicausal, whose predominant factor is the lack of adaptation and managing with events considered traumatic. **Objective:** To describe the clinical characteristics such as the type of psychological and pharmacological treatment received by the naval military with diagnosis of Posttraumatic Stress Disorder at the Psychiatric Unit of Cartagena's Naval Hospital.

Methodology: A descriptive, retrospective cross-sectional study with an associative approach (Crosstabulation). The sample was 242 navy subjects with PTSD diagnosis. The information was collected with a data collection form of medical records. The information analysis was developed through the program SPSS ® 21.0. Chi^2 and value of $p \leq 0.05$ calculation was applied through the crossing of variables.

Results: The most prevalent type of traumatic event was the one represented by combat with the presence of depressive disorders and anxiety with a value of $p \leq 0.05$.

Conclusions: The PTSD severity is related to the severity of the event, in addition if the trumatic event was repetitive.

Keywords: PTSD, posttraumatic stress, epidemiology, comorbidity (psychiatry), war, military, Colombia, stress, trauma, disorder, psychiatry, DeSc

1. Introduction

Post-traumatic stress since 1980 has been known for a wide variety of names that respond to different psychiatric syndromes, including neurosis by combat traumatism (Friedman, Schnurr, & McDonagh-Coyle, 1994, p. 1), it has even been associated with Burnout Syndrome "fatigue by confrontation". Nowadays it is now known that there is no single predisposing effect neither manifestations or unique psychological and social consequences, concerning the way military personnel treat Post-Traumatic Stress Disorder (PTSD), which face war violent situations, as well, for the mistreatment of his superiors, even of his companions (Castaño & Rosado, 2015, p. 37).

Posttraumatic Stress Disorder PTSD is well defined and linked to both psychological and social suffering and dysfunction. It is associated with the way military subjects confront the adverse factors considered as stressful and traumatic, which means, that the PTSD has a direct relation with people personality characteristics (Corzo & Bohórquez, 2009, p. 15). Thus, its etiology is conditioned to the psychological and organic adaptation of the person who suffers it, even considering the existence of genetic predisposition, coupled with conditions such as traumas suffered during childhood, cultural, economic and social aspects that contribute to consider certain phenomena as traumatic actions and therefore to (PTSD) manifestation, reasons which makes it to be considered as a

multifactorial disease (Friedman et al., 1994; Castaño & Rosado, 2015; Corzo & Bohórquez, 2009; Stein, Jang, Taylor, Vernon, & Livesley, 2002). In 1987, the prevalence of post-traumatic stress disorder was between 0.5% and 10.8% for men and between 1.3% and 18.3% for women with a global prevalence of 16.66%, lower than the values reported in Vietnam veterans who was between 20% and 33% (Corzo & Bohórquez, 2009, p. 15). Some studies associate PTSD with other types of disorders such as food disorder, especially in veterans (Mitchell, Porter, Boyko, & Field, 2016), No previous and updated studies about PTSD incidence or prevalence were found, nor studies that show the onset and duration of the disease, however, it is believed that the combination of depression prevalence with PTSD is around 20% among active military personnel, and 30% among veterans (Fink et al., 2016).

The studies carried out in Colombia concerning PTSD in military personnel and public forces subjects, describe that according to the type of trauma psychological and psychopharmacological intervention also varies, where trauma can be classified according to the type of military exercise as its sequelae at short, medium and long term, because the managing strategies by the military subject are different according to the training received (Corzo & Bohórquez, 2009; Friedman et al., 1994; Loaiza & Posada, 2016; Suárez & Peralta, 2016; Vallejo Samudio & Terranova Zapata, 2009).

The objective is to describe the clinical characteristics associated with the type of treatment received by the navy subjects with diagnosis of Posttraumatic Stress Disorder treated at the Navy Hospital Psychiatry Unit.

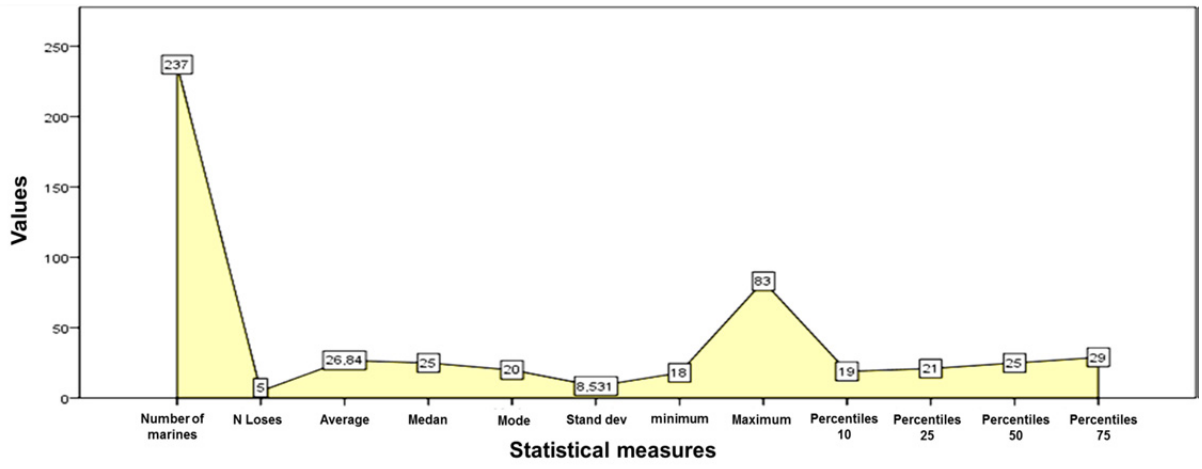
2. Methodology

Type of study, descriptive, retrospective cross-sectional with an associative approach (Crosstabulation). The population was constituted by 650 military personnel diagnosed with PTSD treated at the Navy Hospital Psychiatric Unit from Cartagena de Indias city during the years 2012 to 2014. The sample of 242 military personnel, calculated with a confidence level of 95% and 0.05% error.

Data were taken from clinical profiles that included both socio-demographic variables such as: age, marital status, level of education, risk behaviors, as well as variables that identify patient's clinical comorbidity: traumas during childhood, clinical and psychological behaviors, among others. Data analysis was done with the program SPSS ® 21.0. The associative approach (Crosstabulation) applying the Chi^2 with a value of $p \leq 0.05$.

3. Results

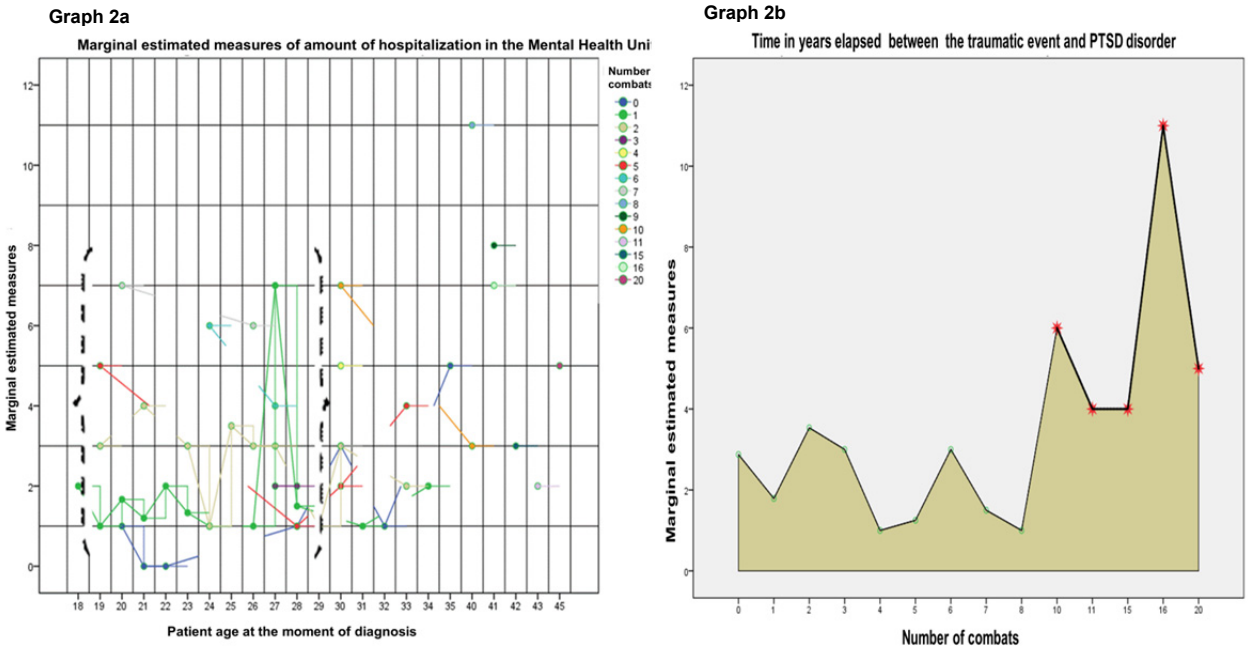
It is observed that 75% of naval personnel were between the ages of 18 and 29, with the majority of the population at the age of 20 at the moment of being diagnosed with Posttraumatic Stress Disorder PTSD. (Graph 1)



Graph 1. Statistical data of age at diagnosis moment

Graph 2 - (2a). When correlating the age at the time of the diagnosis of the disorder with the number of combats and the number of hospitalizations, it was found that it is not necessary to have a great number of combats, even the PTSD was presented in navy subjects that had never been exposed to battles, which it could mean that the disorder is due to other types of events such as mistreatment or aggression (See Table 3). It is observed that when the subject had participated in a greater the number of combat decreases the possibility of early diagnosis of the disorder.

Graph 2 - (2b), describes average number of hospitalizations that navy subject can have even before being diagnosed, which is in an average 1 to 3 hospitalizations and that the most susceptible ones are naval personnel under 29 years.



Graph 2. Correlation between age at the time of diagnosis (PTSD) with the number of combats and hospitalizations and the time elapsed between the traumatic event and the disorder

The navy personnel diagnosed with PTSD, 64.5% come from of urban areas, 79.3% from catholic families and 41.7% were single at the moment of disorder diagnosis. 56.2% of the patients report childhood traumas because child abuse. (Table 1)

There was no association between schooling level with military rank of navy personnel diagnosed with PTSD with a p value of ≥0.05. However, in 62.4% of cases patients have a high school academic level with the rank of marine, followed by 10.3% having the same rank that the previous group but with at a technician or technologist degree (Table 2).

Concerning the type of patient, hospitalized or outpatient, no statistical association was found with the type of psychoactive substance consumed by patients diagnosed with PTSD with a p value of ≥0.05. As for the most consumed substances, it was found that alcohol was the most consumed, 14% in outpatients and 23.1% in hospitalized patients. (See Table 2)

Table 1. Sociodemographic characteristics of Marines diagnosed with PTSD

Civil status		**Religion**		**Childhood trauma**		**Birth origin**	
n (%)		**N (%)**		**n (%)**		**n (%)**	
NDR	2 (0,8)	NDR	5 (2,1)	NDR	95 (39,3)	NDR	5 (2,1)
Married	53 (21,9)	Atheist	1 (0,4)	Sexual abuse	4 (1,7)	Country	81 (33,5)
Single	101 (41,7)	Catholic	192 (79,3)	Physical and Psychological mistreatment	136 (56,2)	Urban	156 (64,5)
Free union	84 (34,7)	Christian	36 (14,9)	No	7 (2,9)	Total	242 (100)
Widow	2 (0,8)	Evangelical	8 (3,3)	Total	242 (100)		
Total	242 (100)	Total	242 (100)				

n: Marine diagnosed with PTSD. (%) Percentage. NDR No data reported in the clinical profile.

It was found that a group of patients consume marijuana in isolation, 7.4% in the outpatients, and 4.5% in the hospitalized, as well a tendency to use other types of substances such as alcohol, cocaine, cigarette, among others. (See Table 2).

Table 2. Characteristics of marines diagnosed with (PTSD) according with military rank and psychoactive substances consumption

		Military Rank				
		Professional Marine	**Regular Marine**	**Petty Officer**	**Ji²**	***p*-value**
		n (%)	**n (%)**	**n (%)**		
Educational level	NDR	0 (0,0)	4 (1,7)	0 (0,0)	12,981	0,112
	Elementary school	0 (0,0)	30 (12,4)	0 (0,0)		
	High school	15 (6,2)	151 (62,4)	1 (0,4)		
	Technician/technologist	3 (1,2)	25 (10,3)	2 (0,8)		
	University	0 (0,0)	11 (4,5)	0 (0,0)		
		Type of patient				
		NRDH	**outpatient**	**Hospitalized**	**Ji²**	***p*-value**
		n (%)	**n (%)**	**n (%)**		
Psychoactive substances consumption	NDR	0 (0,0)	7 (2,9)	11 (4,5)	23,83	0,161
	Alcohol	1 (0,4)	34 (14)	56 (23,1)		
	Alcohol + cigarette	0 (0,0)	20 (8,3)	19 (7,9)		
	Alcohol + cigarette + Hallucinogenic Substances	0 (0,0)	1 (0,4)	1 (0,4)		
	Alcohol + Hallucinogenic Substances	2 (0,8)	7 (2,9)	6 (2,5)		
	Cigarette	2 (0,8)	17 (7)	17 (7)		
	Cigarette + Hallucinogenic Substances	0 (0,0)	2 (0,8)	1 (0,4)		
	Cocaine	0 (0,0)	1 (0,4)	2 (0,8)		
	Cocaine + Marihuana	0 (0,0)	1 (0,4)	5 (2,1)		
	Marihuana	0 (0,0)	18 (7,4)	11 (4,5)		

n: Marine diagnosed with PTSD. (%) Percentage. NDR No data reported in the clinical profile.

An associative approach was found between the type of event that possibly triggered PTSD with psychological disorders with a value of p≥0.05. It was found the presence of depressive and/or Anxiety Disorder (ADD) with exposure to combat in 3.6%, with the dismemberment of a partner or himself at 4.5%, with the fact of having been exposed to physical or psychological mistreatment by a superior in 12.4%, and torture and abduction in 2.9% related to adaptive disorder and / or anxiety. (See Table 3)

Table 3. Event or trauma that may possibly triggered PTSD with the type of Psychological Disorder manifested by the naval military

		Type of event that possibly triggered PTSD								
		NRD n (%)	**Combat n (%)**	**Psychological / Physical Abuse of Superior**	**Dismemberment in Combat n (%)**	**Psychological Mistreatment by Partners**	**Psychological Maltreatment by superior**	**Kidnapping and Torture n (%)**	**Ji²**	***p*-value**
Diagnosed Psychological Disorders	**NRD**	2 (0,8)	16 (6,6)	0 (0,0)	9 (3,7)	6 (2,5)	12 (5)	0 (0,0)		
	Schizophrenia	0 (0,0)	0 (0,0)	0 (0,0)	2 (0,8)	0 (0,0)	0 (0,0)	0 (0,0)		
	Mental retardation	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	1 (0,4)	0 (0,0)	0 (0,0)		
	All disorders	1 (0,4)	5 (2,1)	0 (0,0)	1 (0,4)	0 (0,0)	1 (0,4)	0 (0,0)		
	Adaptive Disorder and/or Anxiety	2 (0,8)	7 (2,9)	0 (0,0)	0 (0,0)	1 (0,4)	3 (1,2)	2 (0,8)	74,927	0,001
	Depressive Disorder + Psychosis	0 (0,0)	0 (0,0)	0 (0,0)	1 (0,4)	0 (0,0)	0 (0,0)	0 (0,0)		
	Depressive disorder and/or Anxiety	6 (2,5)	87 (36,6)	3 (1,2)	11 (4,5)	9 (3,7)	30 (12,4)	7 (2,9)		
	Psychotic Disorder	0 (0,0)	5 (2,1)	0 (0,0)	6 (2,5)	1 (0,4)	2 (0,8)	3 (1,2)		

n: Marine diagnosed with PTSD. (%) Percentage. NDR No data reported in the clinical profile.

An association was found between the psychological disorders, with the type of implemented psychotherapy, with a p value of ≤0.05. The depressive and/or anxiety disorder was the prevailing among the patients and the psychotherapeutic techniques that were used in greater frequency were desensitization plus cognitive behavioral interventions in 49.6%, followed by ocular movements reprocessing techniques in 3.3%. For psychotic disorders, the desensitization technique was used in 2.5%. Likewise, cognitive behavioral interventions, as well as desensitization techniques, were accompanied by medications such as antidepressants, among other mood and behavior modulators with a value of p≤0.05. (See Table 4).

Table 4. Type of psychotherapy applied according with the manifested psychological disorder by navy subjects

		Diagnosed Psychological Disorders									
		NRD n (%)	Schizophrenia n (%)	Mental retardation n (%)	All disorders n (%)	Adaptive Disorder and/or Anxiety n (%)	Depressive Disorder + Psychosis n (%)	Depressive disorder and/or Anxiety n (%)	Psychotic Disorder n (%)	Ji^2	*p*-valué
Type of Implemented Psychotherapy	**NRD**	30 (12,4)	2 (0,8)	0 (0,0)	1 (0,4)	3 (1,2)	0 (0,0)	21 (8,7)	8 (3,3)	135	0,00
	Eye Movement Reprocessing Technique	1 (0,4)	0 (0,0)	1 (0,4)	1 (0,4)	0 (0,0)	1 (0,4)	8 (3,3)	2 (0,8)		
	Isolation and rest	1 (0,4)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	1 (0,4)	0 (0,0)		
	Cognitive Behavioral Interventions	6 (2,5)	0 (0,0)	0 (0,0)	3 (1,2)	7 (2,9)	0 (0,0)	46 (19)	1 (0,4)		
	Medicaments	1 (0,4)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	3 (1,2)	0 (0,0)		
	Ocular + Cognitive Behavioral Interventions	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	1 (0,4)	0 (0,0)	0 (0,0)	0 (0,0)		
	Desensitization Technique	6 (2,5)	0 (0,0)	0 (0,0)	2 (0,8)	4 (1,7)	0 (0,0)	47 (19,4)	6 (2,5)		
	Desensitization Technique + Cognitive Behavioral Interventions	0 (0,0)	0 (0,0)	0 (0,0)	1 (0,4)	0 (0,0)	0 (0,0)	27 (11,2)	0 (0,0)		

n: Marine diagnosed with PTSD. (%) Percentage. NDR No data reported in the clinical profile.

An associative approach was found with a p value of ≤0.05 between the type of implemented psychotherapy and the received psychopharmacological treatment with the mixture of some type of drug. The desensitization technique with 16.5% associated with the use of antidepressants, followed by the use of antidepressants with cognitive behavioral intervention in 12.4%. (Table 5).

Table 5. Use of psychopharmacological treatment with the type of implemented psychotherapy in military navy personnel with diagnosis of PTSD

		Type of Implemented Psychotherapy										
		NRD n (%)	Eye Movement Reprocessing Technique n (%)	Isolation and rest n (%)	Cognitive Behavioral Interventions n (%)	Medicaments n (%)	Ocular n (%)	Ocular + Cognitive Behavioral Interventions n (%)	Desensitization Technique n (%)	Desensitization Technique + Cognitive Behavioral Interventions n (%)	Ji^2	*p*-value
Psychopharmacological Treatment for PTSD	**NRD**	6 (2,5)	0 (0,0)	0 (0,0)	3 (1,2)	0 (0,0)	0 (0,0)	0 (0,0)	2 (0,8)	0 (0,0)	287,1	0,00
	Antidepressant	21 (8,7)	1 (0,4)	1 (0,4)	30 (12,4)	3 (1,2)	6 (2,5)	0 (0,0)	40 (16,5)	2 (0,8)		
	Antidepressant + Mood Modulator	1 (0,4)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)		
	Antidepressant + Antipsychotic	7 (2,9)	0 (0,0)	0 (0,0)	1 (0,4)	0 (0,0)	1 (0,4)	0 (0,0)	1 (0,4)	1 (0,4)		
	Antidepressant + Antipsychotic + Mood Modulator	6 (2,5)	0 (0,0)	0 (0,0)	1 (0,4)	1 (0,4)	0 (0,0)	0 (0,0)	1 (0,4)	2 (0,8)		
	Antidepressant + Benzodiazepine	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	1 (0,4)	0 (0,0)		
	Antidepressant + Mood Modulator	1 (0,4)	0 (0,0)	0 (0,0)	10 (4,1)	0 (0,0)	0 (0,0)	0 (0,0)	6 (2,5)	22 (9,1)		
	Antipsychotic	4 (1,7)	0 (0,0)	0 (0,0)	5 (2,1)	0 (0,0)	5 (2,1)	0 (0,0)	8 (3,3)	0 (0,0)		
	Antipsychotic + Antidepressant	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	1 (0,4)	0 (0,0)		
	Antipsychotic + Benzodiazepine	0 (0,0)	0 (0,0)	0 (0,0)	2 (0,8)	0 (0,0)	0 (0,0)	0 (0,0)	1 (0,4)	0 (0,0)		
	Antipsychotic + Mood Modulator	1 (0,4)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)		
	Antipsychotics	5 (2,1)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)		
	Benzodiazepine	0 (0,0)	0 (0,0)	0 (0,0)	4 (1,7)	0 (0,0)	1 (0,4)	1 (0,4)	2 (0,8)	0 (0,0)		
	Benzodiazepine + Mood Modulator	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	1 (0,4)	0 (0,0)		
	Cognitive Behavioral Interventions	1 (0,4)	0 (0,0)	0 (0,0)	1 (0,4)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)		
	Mood Modulator	12 (5)	0 (0,0)	0 (0,0)	4 (1,7)	0 (0,0)	0 (0,0)	0 (0,0)	1 (0,4)	1 (0,4)		
	Mood Modulator + Antidepressant + Antipsychotic	0 (0,0)	0 (0,0)	0 (0,0)	1 (0,4)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)		
	Mood Modulator	0 (0,0)	0 (0,0)	1 (0,4)	1 (0,4)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)		

n: Marine diagnosed with PTSD. (%) Percentage. NDR No data reported in the clinical profile.

4. Discussion

In our study it was evidenced that the subject can be the victim of a traumatic event or to find out through a third party (Trickey et al., 2012; Van der Kolk, 2000).

Patients with PTSD, consult the doctor for difficulty sleeping, lack of concentration, feeling overly alert or easily frightened, fits of anger, etc. (Van der Kolk, 2000).

Psychoactive substances consumption may be due to the traumatic event causing a demand to the organism (Trickey et al., 2012), which means, the abuse consumption of psychoactive substance, is a self-therapy for PTSD symptomatology (Carvajal, 2002).

Marines with PTSD who are married tend to have violent homes, situation that is often hidden (Medina-Mora et al., 2005).

Our findings showed that 47.9% of the military subjects were diagnosed with some kind of trauma during childhood due to physical and psychological abuse. Brewin, compared a group of civilian population with war veterans, finding risk factors classified into three categories: the first group is sex, age of trauma, and race. The second group consists of educational level, previous trauma and adverse biography in childhood, where the sum of these factors predicts PTSD more consistently, but may vary according to the studied population and the methods used for diagnosis. A third group of predictive effects, such as: personal psychiatric history, history of childhood abuse and family history of mental disorders (Trickey et al., 2012).

PTSD treatment now involves a multidimensional variety of modalities where pharmacological, psychosocial resources are applied (Odriozola & de Corral Gargallo, 1997). Cognitive-behavioral techniques are the most used, especially in more advanced stages of the disorder, the most traditional is the systematic desensitization to implosive techniques using procedures such as "stress inoculation" and exposure (thoughts, imagery, photographs and films) (13, 19), or even the technique of desensitization by means of eye movements (Shapiro, 1989), the reported levels of success in the short and medium term are in some cases comparable and even better than those of pharmacotherapy (Carvajal, 2002), These data are congruent with the techniques used by health personnel, where the most used psychotherapy was cognitive-behavioral treatment, followed by desensitization.

5. Conclusion

The study provides elements of assessment for early identification of posttraumatic stress disorder in military personnel exposed to traumatic actions.

We consider that there is no specific number of combats to present the PTSD, since it depends more on the maturity of the people, type of military training received and whether or not there are previous traumas, even existence of genetic susceptibility.

The treatment received is adjusted with the psychiatric protocols according to the type of psychological disorder.

Competing Interests Statement

The authors declare that they have no competing or potential conflicts of interest.

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A Comparative Study to Determine the Occupational Stress Level and Professional Burnout in Special School Teachers Working in Private and Government Schools

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Abstract

Background and Objective: Healthy work environment is required to provide high quality teaching. Few studies regarding occupational stress and burnout in Indian schools have been conducted. The study aims to determine and compare the occupational stress level and professional burnout in teachers working in private and government schools. 120 private school teachers and 120 government school teachers recruited for this study.

Methods: Chi square test, Student independent t test and ANOVA used for data analysis have been used.

Results: Stress level and burnout level are varies significantly between male and female Indian school. (Chi square value 26.27 and p Value 0.001 in male and chi square value 38.06 and p value 0.001 in female). Government schools (Least Likely 5±0.0, More Likely 10.82±1.99, Most Prone Stress 16.15 ±1.84 have significant difference among them) have higher stress level than Private schools (Least Likely 4.00±1.41, More Likely 9.86±2.29, Most Prone Stress 15.66±1.34 have significant difference among them). Governmental schools having more stress (14.33±3.24) compare to Private schools (13.34±3.51), (t=2.26, p =0.023). Similarly the burnout also having the more in government schools (59.43±11.78) compare to private schools (48.61±11.94), (t=7.07, p=0.001).

Conclusions: The government teachers have more occupational stress compared to the private school teachers in India. Leaders and decision makers required to make early identification and counseling about different factors that influence stress level in private and Government school teachers.

Keywords: occupational stress, professional burnout, government school, private school, analysis of variances

1. Introduction

Today's life is full of challenges. Stress is the very important reaction that the organism displays against teaching environmental situation (Luthans et al., 1994). Stress, means for pressure that people are exposed to in their own life (Jepson & Forrest, 2006). Stress is important problem for developed information societies but also for developing countries. Whenever, there may be differences in these countries in the sources of stress that people face and their degree of heath importance (Bhagat, Steverson, & Segovis, 2007).

In today's scenario with the hustle and bustle in life stress is the most common thing which we can observe, reasons could be numerous but sometime the major would be the occupational stress. Work-related disability and productivity loss as a result of stress and depression are critical determinants of quality of life and contribute significantly to health burden (Lee et al., 2017) as well as indirect medical costs (Ho et al., 2013). As researches

shows that our academic profession is also get affected by stress and positive relationship between occupational stress/burnout. Stress in academic level could be harmful if your mind is not properly centered how will you generate and impart the knowledge. In this research paper researcher try to find out the factors which act as a barrier in pedagogy which affect them physically, mentally and professionally and also assess what are the limitations of the existing research and database helps others to work on this direction (Buunk, 1998; Cydulka, Lyons, Moy, Shay, Hammer, & Mathews, 1989; Naina, Deeya, Mohit, & Arjun, 2015).

Professional stress of higher secondary school teachers, the female HSS teachers compare to more stress than the male higher secondary school teachers (Olive et al., 2016). The reason is that female teachers apart from guiding the terminal stage school students have to look after their family members, they were not able to allocate equal weight age to working as well as family environment, hence this result in enhanced stress level. Married higher secondary school teachers have more stress not compare to unmarried higher secondary school teachers because married teachers are shouldering more responsibility than the unmarried in terms of school work as well as in the family and society, hence they are in the position to satisfy all the dimensions, this results in higher levels of stress from the (Sapna & Ved Prakash, 2013).

Higher secondary school teachers working in government schools have more stress than those working in private higher secondary schools because the government teachers have to fulfill the work and the task given to them time by time from the administration as well as from the government departments (Sunanda, 2017), hence they are more responsible to the government officials than the private school HSS teachers, hence a higher level of stress was evident in the government school teachers. Survey method was used for this study. The sample consisted of 200 post graduate teachers working in two different schools in and around Indian regions. The Occupational Stress Inventory was developed by Dr. Joseph and Dr. Dharmangadan. The five point scale consists of 37 test items are used in this study.

2. Literature Review

2.1 Need and Significance of the Study

Summarized as pre-existing mental health issues during university study (Cuttilian et al., 2016), low motivation among students,Stress sources of information, teachers may be summarized as low motivation among students, discipline, punctuality of time and the heavy work load, assessed by others, schools and colleague relationship, conflict and indefiniteness of roles, very bad working conditions and self-respect, students' behavior problems, not support of colleagues, family and friends (Detert, 2006). "Stress has been defines as the state manifested by the specific syndrome which consists of all the non-specific induced changes within a biological system (Kyriacou, 2001).

Stress was first coined in the biological word at 1930s, but now present decade commonly used in popular parlance. Stress is a feeling of human being reacts to particular action. The human body activating the nervous system and particular problem to facing. This natural action is known as stress response. The biological impact of chronic stress include depressive and anxiety-like behaviors as well as cognitive impairment (Yang et al., 2016) and negative impact on immune system (Lu et al., 2017) and the cardiovascular system (Ho et al., 2010). School teachers have pressure of dealing with so many children's activities in the schools and home at the same time they prepare the next class section (Selye, 1950).

There are some studies in India also regarding stress in school teachers – one done in south India for teachers of university and the other among school teachers in Rajasthan. But none of them used any recognized scale to measure stress. Our study is a significant difference in the outcome, addition to the teacher's stress and burnout through our results, especially in India where more relevant studies exist dealing with these problems. In addition, our study is aimed give an account of how the teachers of different schools and gender are occupying with the increased stress (Sumanta Dawn et al., 2016).

In general, burnout is a negative emotional experience for a person reacting with job related stress – (Selye, 1950). Burnout refers to a workers of widely understand human service occupations including teaching, cluster of physical, emotional and interactional symptoms that include emotional exhaustion, a sense of lacking personal accomplishment and depersonalization of clients- (Akcamete, 2001). Teachers have the stress of dealing with children but they are also educating and helping them to mold these children into high level people in the community. Whenever some rules, regulations, guidelines, performance of all the teachers can have very high levels of stress. Maladaptive Rumination interacts with life stress to predict depressive symptoms (Lu et al., 2014). High level of stress causes people to ascribe greater Global Journal of Health Science http://gjhs.ccsenet.org 5 internal responsibility in failure than in success due to higher level of self-blame (Yeo et al., 2017).

There was an increase of the fact found that in the research linking occupational stress/ professional burnout of the school teachers in the Indian context. For example, studies conducted by (Maslach & Jackson, 1981; Amirtagowri & Thiagarajan, 2005; M. Kaur & S. Kaur, 2007; Kumar, 2007; Reddy, 2007; Chopra, 2009; Reddy & Poornima, 2012), which focused on occupational problems/stress of teachers working in primary/secondary/special schools. Centuries ago scientists recognized that work situation may have adverse health effects. They suggest that the involvement of medical science with work and health problems started with Hippocrates, as early as fifth century BC. A state of mental or emotional strain or tension resulting from adverse or demanding circumstances, (Poornima, Shveta, & David, 2012).

The origin of the word stress can be traced to the old French word stressed meaning ‘narrowness’ or ‘oppression' or the Latin word strict us earning 'drawn tight'. Professional stress manifests in a varied fashion including burnout, depression, anxiety, anger, irritability and/or substance abuse. This in turn affects the personal, interpersonal and social wellbeing of an individual which are conceptually referred as quality of life. Coping with job stress is difficult as it usually depends on a whole range of factors which may or may not be under an individual’s control, (Buunk, 1998).

The research has been done in the private primary school and they concluded that stress level is more in private primary school (Reddy, 2012). Another study was done in the comparison of primary and secondary school and they concluded that stress level is more in primary school (Anbu, 2015). Our study have shown clearly demonstrated that the occupational stress level in teachers working in government/private schools for normal children have significant difference. Another study has recommended doing in the various cultures, based on responsibilities and the type of organization (Ansarul, 2014). Since special school teachers have more responsibilities in teaching special children. It is necessary to determine the occupational stress/burnout in special school teachers working in private/government school.

After review of some literature we have found that lots of work have been done on the occupational stress of a teacher in a different dimension in two different schools i.e. (S. Kaur, 2011) has find out the occupational stress among faculty members in higher education institution and the results showed that the determinants of stress among the administrators are numerous and varied. (Alexander, Gaillard, & Wisner, 2012) Found that the primary school teachers are very highly stressed people, the private primary school teachers also found to be highly stressed in comparison to their government primary school teachers. (Chaly, 2014; Hasan, 2014) Results showed that there is difference in their stress and burnout.

2.2 Conceptual Definition

Occupational Stress: This study explore the compiles the occupation stress and burnout between the government and private schools. Occupational stress as disruption in an individual's physiological and psychological homeostasis that forces them to deviate from usual functioning in interaction with their jobs and work environment, (Allen, Hitt, & Greer, 1982; Oshagbemi, 2000). Occupational stress can a terms of physical and psychological effects of occupation on an individual. Burnout: Stress leads to is known as burnout. The loss of interest, low frustration tolerance and apathy. Private School: A school supported by private organization or private individual. Government School: It’s a free tax supported school controlled by a local authority.

3. Method

3.1 Research Design

It is a cross sectional quantitative design.

3.2 Study Setting

The study was conducted at Kanchipuram district of Tamilnadu state. Kanchipuram district has eight administrative sub divisions. Kanchipuram is considered one of the most education districts in Tamilnadu; Kanchipuram was selected for the study because it has enough number of government and private schools which are distributed. Also more developed district, it was considered as proper setting to conduct the study. The district has 456 schools at secondary level where 4302 teachers are working, 32 only secondary schools were selected for this study.

3.3 Inclusion and Exclusion Criteria

Inclusion Criteria: Both gender, school teachers in government and private schools in rural and urban areas.

Exclusion Criteria: School teachers who is not welling to participate in the study. Written consent form obtained from each individual. Questionnaires developed by other based on the need. Questionnaire was given to the special school teachers in both set up and asked to be filled.

3.4 Sampling and Population

Convenient sampling method used. The population of the study is the school teachers in private and government school. Prepared the list of all schools in the Kanchipuram district. The list obtained from district office of Department of Education, Kanchipuram, and Tamilnadu. The latest list was obtained. The names of all schools of secondary level situated inside Kanchipuram district. Schools classified according to type of school (government or private). Out of 456 schools mentioned in the list, 258 were government schools and 198 were private schools selected. The comparative study was based on 100 special school teachers in both set ups, occupational stress questionnaire, burnout questionnaire. Data have been collected from private and government schools have some criteria for sample collection. Schools were selected by cluster random sampling technique. Based on this we selected 16 schools. And select the teacher in the simple random sampling technique. Cluster sampling method was adopted, because feasibility of the researcher.

4. Data Analyses and Results

Chi square test, Student independent t test and ANOVA used for data analysis have been used.

Table 1, shows the number of male and female in the private school and government school, in this regards 43 male and 77 female in the private school and 43 male and 77 female in the government school. In this study 64.2 % of female compare to 35.8 %of male in private school, similar to the government school. The male population is lesser than the female population in the present study. Detalies regarding the Demographical information shown in the Appendix.

Table 1. The Gender wise distribution among the private and government school

	Male	Female	Total	Chi Square Test	P Value
Private School	43 (35.8)	77 (64.2)	120	0.00	1.00
Government School	43 (35.8)	77 (64.2)	120	1 df	NS

NS – Not statistical significance association between the private school and government school among the gender at 95% ($p > 0.05$). Based on the gender cannot show the significance association difference in the two schools, because the number of People are equally taken, using the chi square test, the chi square value is 0.00 and the p value is 1.00 more than the 0.05.

Table 2, shows more likely with no job stress 90%, most prone stress with high amount of job related stress 87.5%, Most prone stress with moderate amount of stress on the job 67.6%, most prone stress with low amount of job related stress 65.2% and all others less than 50% among the male people have significance association presented in their stress levels and burnout levels. More likely with no job stress 77.8% is lesser than the male, more prone stress with high amount of job related stress 86.7% is lesser than the male, Most prone stress with moderate amount of stress on the job 72.5% is more than the male and all others less than the 50% among the female population have significance association present in their stress levels and burnout levels.

Table 2. The association between the stress levels and burnout among the male and female

Sex	Stress Levels	Burnout Levels					Chi Square Test	P Value
		No Job Stress N (%)	Low Amount of Job-Related Stress N (%)	Moderate Amount of Stress on the Job N (%)	High Amount of Job-Related Stress N (%)	Total N (%)		
Male	Least Likely	1(10)	0(0)	0(0)	0(0)	1(1.2)		
	More Likely	9(90)	8(34.8)	12(32.4)	12(32.4)	2(12.5)	26.27 6 df	0.001 ***
	Most Prone Stress	0(0)	15(65.2)	25(67.6)	14(87.5)	54(62.8)		
Female	Least Likely	2(11.1)	0(0)	0(0)	0(0)	2(1.3)		
	More Likely	14(77.8)	14(34.1)	22(27.5)	2(13.3)	52(33.8)	38.06 6 df	0.001 ***
	Most Prone Stress	2(11.1)	27(65.9)	58(72.5)	13(86.7)	100(64.9)		

***There is a more difference between the stress levels and burnout levels among the male at 95% ($p < 0.05$).

Table 3, shows that least likely value is 1.7% in private school and 0.8% in the government school there is not much difference, more likely value is 36.7% in the private school at the same time 32.5% in the government school there is some difference but not a statistical difference, most prone stress is 61.6% in the private school but 66.7% in the government school here also have some difference not a statistical difference among the stress levels.

Table 3. Determine the occupational stress in special school teachers by using the questionnaire in the private school and Government School

Stress	Private School N (%)	Government School N (%)	Chi Square Test	P Value
Least Likely	2(1.7)	1(0.8)		
More Likely	44(36.7)	39(32.5)	0.868	0.648
Most Prone Stress	74(61.6)	80(66.7)	2 df	NS
Total	120(100)	120(100)		

NS – Not statistical significance association between the Private and Government school using the chi square test among the Stress levels $p = 0.648$ (i.e. $p > 0.05$).

From the Table 4, comparison of stress levels among the private school lease likely 4.00 ± 1.41. Most likely 9.86 ± 2.29 and most prone stress 15.66 ± 1.34 using ANOVA test get statistical significance difference $p = 0.001$ ($p < 0.05$). Comparison of stress levels among the government school lease likely 5.00 ± 0.00, Most likely 10.82 ± 1.99 and most prone stress 16.15 ± 1.84 using ANOVA test get statistical significance difference $p = 0.001$ ($p < 0.05$).

Table 4. Compare the occupational stress in special school teachers by using the questionnaire in the private school and Government School

Stress	Private School					Government School				
	N	Mean	SD	ANOVA	P Value	N	Mean	SD	ANOVA	P Value
Least Likely	2	4.00	1.41			1	5.00	-		
More Likely	44	9.86	2.29	180.74	0.001	39	10.82	1.99	116.51	0.001
Most Prone Stress	74	15.66	1.34		***	80	16.15	1.84		***
Total	120	13.34	3.51			120	14.33	3.24		

*** There is statistical significance difference among the groups at 95% ($p < 0.05$).

From the Figure 1 easy to understand that there is small difference between the private and government school but not a statistical difference from the bar diagram. Table 5, Shows that least likely value is 19.2% in the private school and 4.2% in the government school there is statistical difference, more likely value is 34.2% in the private school at the same time 19.2% in the government school there is more statistical difference, most prone stress is 43.3% in the private school but 54.2% in the government school here also have some statistical significance difference among the burnout levels.

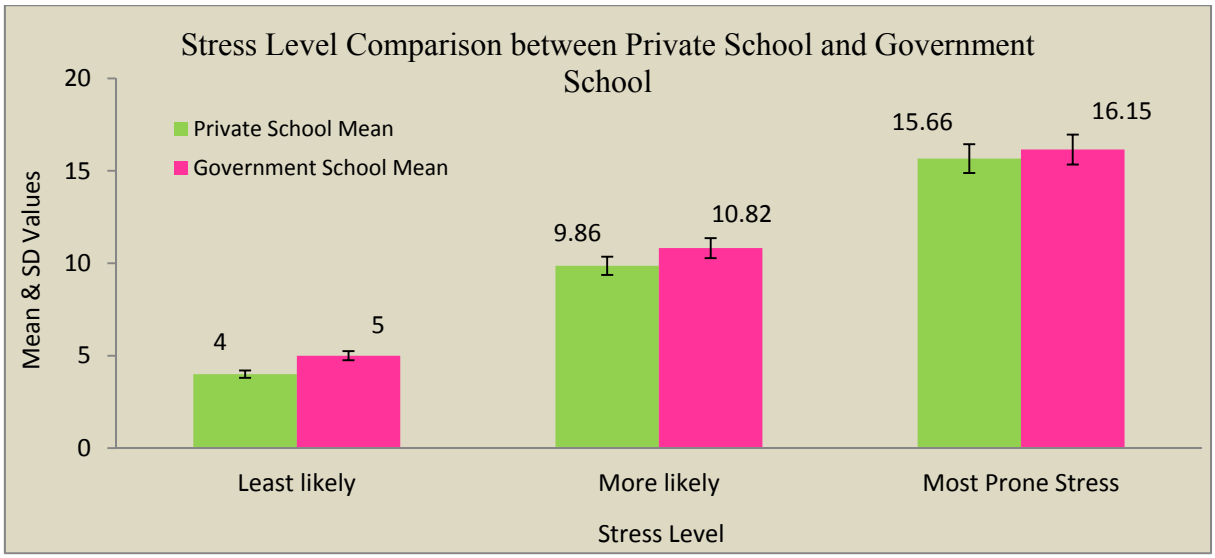

Figure 1. The Comparison between Private School and Government School

Table 5. Determine the professional burnout in special school teachers by using the questionnaire in the government school and Private School

Burnout	**Private School N (%)**	**Government School N (%)**	**Chi Square test**	**P Value**
No Job Stress	23(19.2)	5(4.2)		
Low Amount of Job-Related Stress	41(34.2)	23(19.2)	31.14	0.001
Moderate Amount of Stress On The Job	52(43.3)	65(54.2)	3 df	**
High Amount of Job-Related Stress	4(3.3)	27(22.4)		

** – There is a statistical significance association between the Private and Government school using the chi square test among the burnout levels p = 0.0.001 (i.e. $p < 0.05$).

Figure 2, shows easy to understand that there is a statistical significance difference between the private and

government school using the bar diagram. Table 6, shows comparison of no job stress in the private school 32.22 ± 2.31, Low Amount of Job-Related Stress 42.88 ± 4.70, Moderate Amount of Job-Related Stress 58.44± 4.09 and High Amount of Job-Related Stress 73.75 ± 2.22 using ANOVA test get statistical significance difference $p = 0.001$ ($p < 0.05$). Comparison of no job stress in the government school 32.80 ± 1.79, Low Amount of Job-Related Stress 46.17 ± 6.05, Moderate Amount of Job-Related Stress 60.15 ± 5.98 and High Amount of Job-Related Stress 73.89 ± 2.15 using ANOVA test get statistical significance difference $p = 0.001$ ($p < 0.05$).

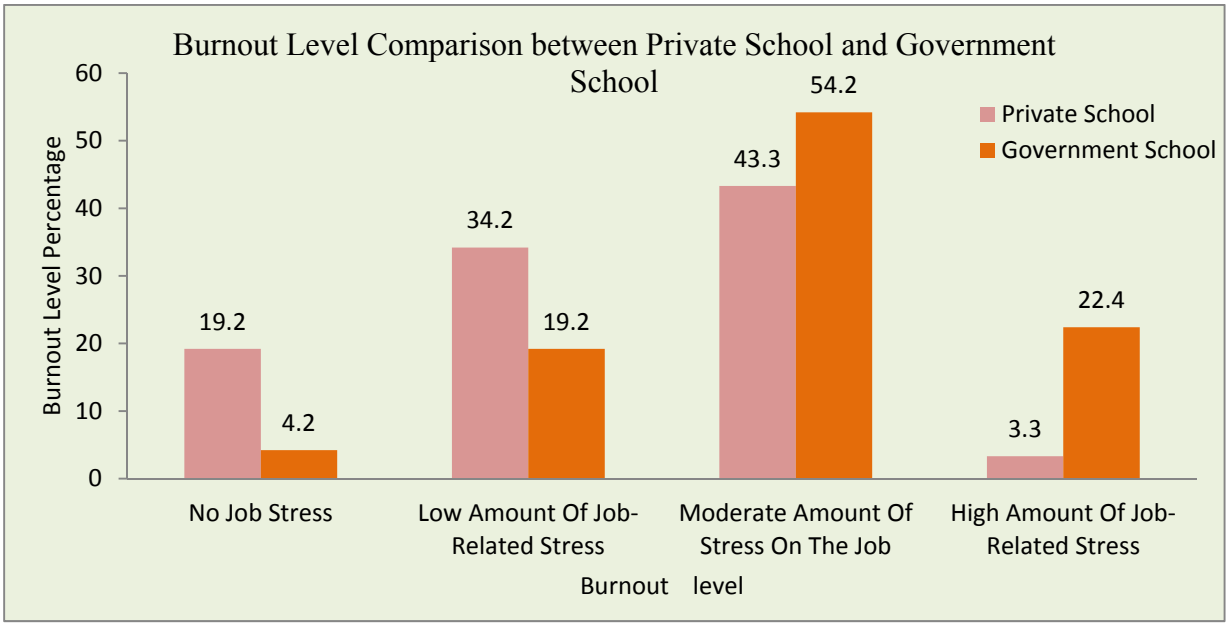

Figure 2. The Burnout Level Comparison between Private School and Government School

Table 6. Compare the some other stress related variables among the private and government schools

Related Stress Variable	Private School				Government School			
	N	Mean ± SD	ANOVA	P Value	N	Mean ± SD	ANOVA	P Value
No Job Stress	23	32.22 ± 2.31	311.56	0.001 ***	5	32.80 ± 1.79	158.85	0.001 ***
Low Amount of Job-Related Stress	41	42.88 ± 4.70			23	46.17±6.05		
Moderate Amount of Job-Related Stress	52	58.44 ± 4.09			65	60.15 ± 5.98		
High Amount of Job-Related Stress	4	73.75 ± 2.22			27	73.89 ± 2.15		

*** - There is a Statistical significance difference within private school among the some Occupational Stress levels at 95% ($p < 0.05$).

From the Figure 3 easy to understand that there is a statistical significance difference between the private and government school using the bar diagram with some related variables are No Job Stress, Low Amount of Job-Related Stress, Moderate Amount of Job-Related Stress and High Amount of Job-Related Stress. Table 7, shows the overall stress comparison between private school and government school for mean and standard deviation are 13.34 ± 3.51 and 14.33 ± 3.24. Similarly overall Burnout comparison between private school and government school for mean and standard deviation are 48.61 ± 11.94 and 59.43 ± 11.78. Using the independent t test to get the statistical significance difference in the stress level $p = 0.025$ ($p < 0.05$) and burnout is $p = 0.001$ ($p < 0.01$). Figure 4, shows the easy to understand that there is a statistical significance difference between the private and government schools using the bar diagram with overall stress and burnout variables.

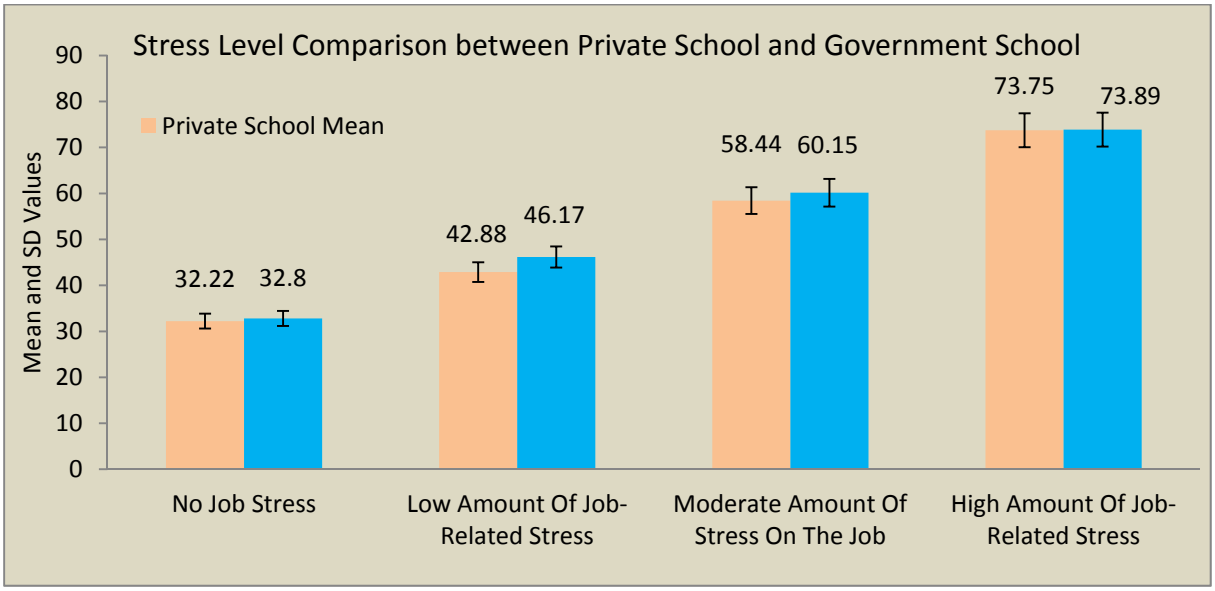

Figure 3. The comparison among the private school and government school how the other variable related with statistical difference

Table 7. To compare the occupational stress/professional burnout in special school teachers working in the Private and Government school

Group Statistics

	Group	N	Mean	SD	Independent t Test	Sig.Level
Stress	Private School	120	13.34	3.51	2.26	0.025 *
	Government School	120	14.33	3.24		
Burnout	Private School	120	48.61	11.94	7.07	0.001 **
	Government School	120	59.43	11.78		

*there is a statistical significance difference between private school and government among the stress at 95% ($p < 0.05$).

**there is a statistical significance difference between private school and government among the burnout at 99% ($p < 0.01$).

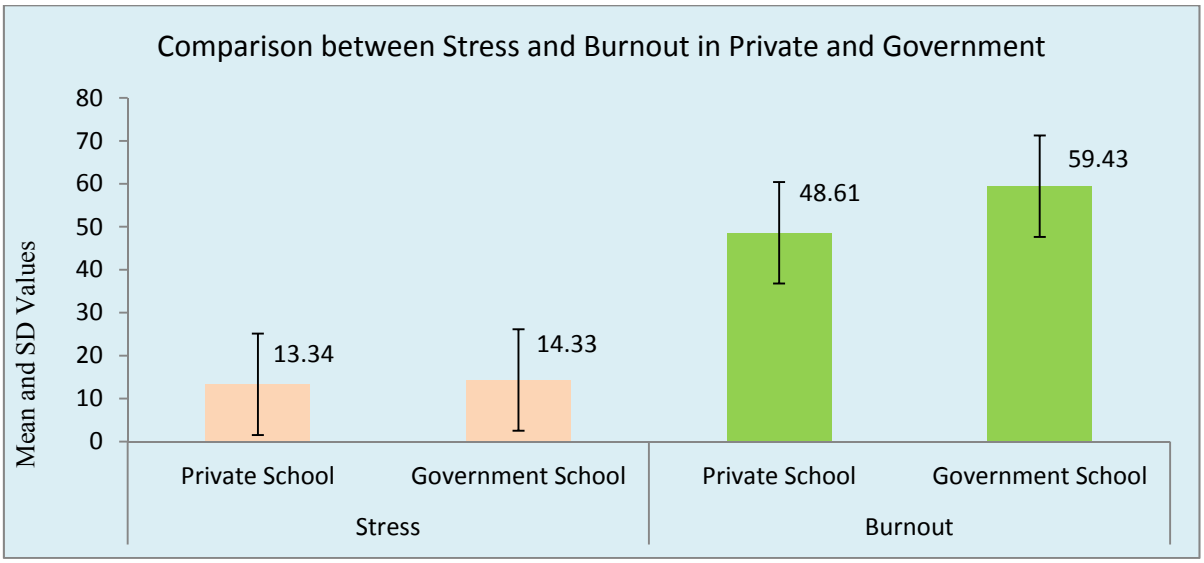

Figure 4. Comparison between Stress and Burnout in the Private and Government schools

5. Discussion

This study has several limtations. Firstly, this is a cross-sectional study and we cannot establish the cause and effect relationship between psychosocial factors and stress (Ho et al., 2011). Stress affects the immunity and causes chronic medical diseases including coronary artery disease (Ho et al., 2010). This study did not report the prevalence of chronic medical diseases which is associated with higher level of stress, poor subjective health and impaired functional status (Niti et al., 2007).

The paper aim is to critical analysis of occupational stress/burnout among the private/government school teacher. Today teaching most stressful professions in the world. Because no similar job to other stressful profession in the world. 75% of the researcher assessing the stress levels of various jobs, teaching came in the top rank. The report, Occupational Stress: Further analysis of the impact of demographic factors and type of job, published in 2000, found that 41.5% of teachers reported themselves 'highly stressed', while 58.5% came into a 'low stress' category, while 36% of teachers felt the effects of stress all or most of the time. In our study around 36.7% and 32.5% of surveyed teachers were moderate to 61.6% and 66.7% severe stressful which was not similar to the result of the study in the private/government school teacher by Health and Safety Executive, USA (41.5%) and with previous study.

Cooper (1991) found the levels of job dissatisfaction and mental ill health higher, In addition, it was found that, with the exception of primary schools, female head teachers in secondary and FHE seem to be suffering significantly greater job dissatisfaction than their male teachers, although this does not translate itself into mental ill health. Male head teachers, on the other hand, seem to suffer more mental ill health than their female teachers. Our study also found that both male and female teachers are having stressed. Our study found that female teachers were less stressful than male teachers which were not similar to findings of Klassen. Our study also proved that teachers with higher workload (Headmaster and Assistant Headmaster) were more stressed.

Millicent (2010) Examined Sources of stress and symptoms of burnout in 51 rural and 46 urban secondary school teachers from 11 school systems in Georgia and North Carolina. In our study the private school teachers significantly more stress from poor working conditions and poor staff relations than did government school teachers. Stress from pupil misbehavior and time pressures was significantly greater than stress from poor working conditions for both private/government school teachers. Poor working conditions and time pressures predicted burnout for private school teachers; pupil misbehavior and poor working conditions predicted burnout for government school teachers.

Our study found a mean difference in the stress levels among the private school teachers have most prone stress 15.66 at the same time mostly like 9.86 and lease like 4.00. The mean difference in the stress levels among the government school teachers have most prone stress 16.15, in the most like 10.82 and lease like 5.99 lesser than the private schools

So it justified the stress with workload. Income is a major determining factor behind the stress level of teachers. But our study found that stress level was high in the governmental school teachers than private. It can be explained by the fact that teachers in governmental position like Head Master/ Assistant Head Master got higher salary compare to private, but the reason their stress level was very high. Because of that we need further study required to identify factors that lead to stress and burnout in governmental and private schools.

6. Conclusion

Occupational therapist has a major role in stress management. This study helps -To give an insight to occupational therapist about the stress level in Private and Government special school teachers. Occupational therapist can help teachers to improve symptom management ability and problem-focused coping skills to raise their life quality (Tan SH et al., 2015). Online cognitive behavior therapy to ensure privacy and cost-effectiveness for teachers (Zhang et al., 2017). To create awareness for Policy makers make early identification and counseling about different factors that influence stress level in private and Government school teachers.

Teaching is quite stressful occupation because increased age and other problems, female sex are non-modifiable stress factors whereas increased remuneration and decreased time to commute to schools can cause decreased stress which is potentially modifiable. A regular increment in remuneration and relocation according to place of residence can decrease the stress level. For female teachers, helping hand from their spouses in household chores may just be a big difference. Sharing responsibility of administrative duties between teachers can decrease the stress level of administrators.

Competing Interests Statement

The authors declare that they have no competing or potential conflicts of interest.

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Appendix

Table 1. Demographical Table

		Private School	Government School	Total
		N (%)	N (%)	N (%)
20-30 Years	Male	34(42)	31(36.5)	65(39.2)
	Female	47(58)	54(63.5)	101(60.8)
31-40 Years	Male	9(37.5)	11(40.7)	20(39.2)
	Female	15(62.5)	16(59.3)	31(60.8)
41-50 Years	Male	-	-	-
	Female	7(100)	4(100)	11(100_
51-60 Years	Male	0(0)	1(25)	1(8.3)
	Female	8(100)	3(75)	11(91.7)

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Access Barriers to Health Services Perceived by People Living With HIV and Their Families

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Abstract

Introducction: The Human Immunodeficiency Virus (HIV) is a retrovirus that destroys the body's T cells. Its advanced stage is the Acquired Immune Deficiency Syndrome (AIDS), since its onset, it has been extensively studied because of an associated burden of morbidity and also to understand the access barriers to diagnostic tests and the required treatment. Objective: To understand the barriers to access health services as perceived by adults living with HIV and their families in the city of Medellín (Colombia).

Methodology: A qualitative investigation by using historical-hermeneutical approach was carried out, involving 23 participants (seropositive patients and their relatives). The information was collected through semi-structured interviews, later codified and analyzed based on Strauss and Corbin's Grounded Theory.

Results: In this study, the access barriers to health services as perceived by adults living with HIV and their families are represented in administrative constraints, affecting economic and interpersonal relationships as well as social nature that materialize the impact of the social stigmas created around the virus on the mental health of seropositive person and their closest affective environment.

Conclusion: The stigma surrounding HIV leads seropositive people and their families to perceive it as a barrier to accessing cultural services, which demands greater intervention efforts by health authorities than other types of barriers in health systems.

Keywords: HIV, acquired immune deficiency syndrome, grounded theory, health system, health services, social stigma

1. Introduction

The first cases of Human Immunodeficiency Virus (HIV) were detected in the cities of New York, Los Angeles and San Francisco in the United States in the late 1970s. These were initially reported in homosexual men but quickly began to be found in other population groups such as users of drug injections, Haitians, sex workers and infected women' chidren. This led to social responses toward the epidemic that were associated with fear and ignorance, which has undoubtedly marked a milestone for the virus' stigma (Bermudez et al., 2015).

According to the Joint United Nations Program on HIV/AIDS (UNAIDS), from the first cases reported in 1981 until the end of 2013, more than 39 million people died as a result of medical complications associated with the virus. In Latin America and the Caribbean, the epidemic behavior has varied, not only in terms of the population groups most exposed to contagion, but also because in comparison with other regions such as North Africa, the Middle East and Central Asia, the representativeness of the virus is low (Wu et al., 2016; Barros, 2015). Nevertheless, this does not stop generating a series of challenges for health systems.

These challenges are: reversing the increase of infection, which has been the goal since the definition of the Millennium Development Goals, ensuring the provision of antiretroviral therapy (ART) and therapeutic adherence

to it, which is manifested in the scientific community to study these aspects in depth; opposing the stigma associated with the virus, fed by the social representations built around the origin of the disease and guaranteeing integral access to health services, mitigating the barriers that may arise (Cabrera, García, & Castell, 2016; Bermúdez et al, 2015; Almanza & Flores, 2012; Laria & Rodríguez, 2013).

However, the barriers to access health services for those living with the virus still persist. Different studies show the difficulties in obtaining services on time like the Elisa test. These late diagnoses thus lead to the aggravation of the infection in those who present it, and the shortcomings of the health structures of countries. In the Colombian context, these are evidenced by constant bureaucratic procedures, denials of treatments, and the constant use of guardianship actions as a mechanism for seeking protection of the fundamental rights, particulary to health. Also make vulnerable groups such as women in poverty face problems in accessing the system's offer. Additionally, the impact of HIV-related stigma also affects the access to health services (Bermúdez et al., 2015; Vega et al., 2015).

Therefore, an investigation was proposed in order to understand the perceived access barriers to health services by adults with HIV and their families in the city of Medellín, by the year 2016. The participants included the relatives of the patients, because although the existing literature has been interested in studying access barriers, few have focused on including the family nucleus, which often are the emotional and economic support of those who have the virus.

2. Methodology

A qualitative research with a historical-hermeneutical approach was carried out during one year. Its objective was to understand the access barriers to health services as perceived by adults living with HIV and their relatives in the city of Medellín (Colombia), by the year 2016. A total of 23 key people participated. These were contacted through the RASA, SIFUTURO and the SanVicente Hospital Foundations of the city of Medellín. It should be noted that, by the date of the study, were registered in the city according to Antioquia's Department of Health (Colombia), maximum health authority of the locality, 1174 cases with a rate of 47.2 infected per 100,000 habitants (Antioquia's Department of Health, 2017).

The selection was made by a theoretical sampling. Although the researchers do not pursue statistical generalizations, given the qualitative nature of the study, the participants are expected to reflect qualitatively the studied phenomenon. Thus, for this case, the greatest possible diversity was sought, based on variables such as age, gender, affiliation with the health system and socioeconomic status. Other aspects such as the distance between the patient's home and the place of delivering health services, as well as information regarding who covers the costs of care for the participants were not considered in the selection of them, since finally the intention of the study was to be able to reveal whether this type of access barriers that are perceived by the target population of this research.

In addition, inclusion criteria were: being of legal age, being diagnosed with HIV or being related to someone with this condition, and receiving health care in the city. As a criterion of exclusion, the suffering of severe mental disorders that prevented voluntary and conscious participation in the research was taken into account. Likewise, as ethical considerations guaranteeing the participation of informants, elements of the Declaration of Helsinki were incorporated. It establishes the obligatory nature of any study involving human beings to submit research projects to an ethics committee and to have as guiding principles beneficence, justice and autonomy, also known as bases of bioethics. In addition, the guidelines of Resolution 8430 of 1993 of the Colombian Ministry of Health were followed. It establishes the scientific procedures to be considered in order to guarantee the protection of the participating subjects.

To collect the information, semi-structured interviews were used in depth, in order to allow an open dialogue with the participants. In order to validate the clarity of the built instrument, a pilot test was done with 4 of the participants, which allowed to improve it and guarantee understanding by the interviewees. These interviews were conducted in Spanish language on an individual basis to each participant, applied directly by the authors, with infected participants and their families separately, in order to avoid biases in their responses.

The interviews were transcribed and codified, taking as referent the Grounded Theory of Anselm Strauss and Juliet Corbin, whicdh within this framework, codification is a process through which the narratives of the participants are fragmented to identify the richness of the data, allowing the understanding of the studied phenomenon.

This theory contemplates three stages of codification: during the first one, called “open”, some so-called descriptive categories arise; during the second, known as “axial”, other analytical titles arise through associations between the first emergent categories; and the third, “selective”, leads to the emergence of the interpretive categories, which allow to determine the core axis to theorize the studied phenomenon. However, due to budgetary issues in the execution of the research, it only reaches the generation of analytical categories, which are presented

as a result in the present manuscript.

3. Results

The research, as mentioned in the methodological section, had a total of 23 participants, 15 of these were women and 8 men, ranging in age from 26 to 55 years old. With regard to their marital status, 16 of them were single, 3 married and 4 lived in free union. In addition, it is worth noting that the 10 of these belonged to socioeconomic status 1 (corresponding to the lowest level in the Colombian classification which variates in a scale from 1 to 6), 13 belonged to 2, 3 and 4 status and only 2 people in the last two status, which reveals an important characteristic in the participants of this studiy and is their belonging to the lower-middle classes of the city.

In light of key informants in this study, access barriers perceived by adults living with HIV and their families in the city of Medellin are associated with administrative and social constraints. Thus, when participants referred to the impact of administrative barriers on the economic situation of those living with HIV and their families, they revealed that the persistent constraints in the Colombian health system lead HIV positive individuals and their families to constantly go to health institutions to demand medication, to process orders for procedures and so on, which involves incurring a series of additional expenses that affect the home economy, as is expressed by different informants:

"Finding so many administrative obstacles implies a greater expense for the family, because there are administrative obstacles that require reprocessing of where we have to spend more money and time".

"Going two and three times a week to the Healthcare Providers Entities requires tickets and having to eat something there, and there is no money for that".

Likewise, participants report that their finances are affected not only by expenses associated with mobility in order to carry out the different procedures demanded by the Colombian health system, but also by spending money on drugs that are not delivered on time and that are necessary to ensure the continuity of treatment, as expressed by some of them:

"Many times they do not generate the orders on time or they give us a very late appointment, so we have to take money from our own pockets to pay for it, which affects the economy a lot".

"The drugs and the appointments are very expensive, this makes the economy worse".

Consequently, the participants referred to the effects of administrative barriers on their family relationships, since the constant procedures to which they must submit, such as standing in long lines and time lost in order to authorize medical orders and other processes, lead them to become easely irritated. Homes are the stage where these changes in behaviors are most perceived. Hence, there are constant tensions that deteriorate the relationship between the HIV-positive individual and his/her environment. This was expressed by different informants:

"The drugs are very expensive, you have to stand in endless lines to be able to claim them and sometimes they do not deliver anything. Then, the moods change and I argue with my family and friends, and that generates a lot of stress".

"When the patient stands in lines to demand orders, he/she is stressed out by long waiting, which generates controversy within the family".

Finally, the interviewees refer to not only administrative barriers in the health system, but also social ones. Among them, it was possible to identify the impact of the stigma created around HIV on the mental health of infected people and their families. The fact that the first reported cases of the disease have occurred in specific population groups like homosexuals, sex workers and intravenous drug users has led to a marked stigma that, even after more than thirty years of the first infected, continues to represent a psychological, social and cultural burden not only for those who are HIV positive, but also for their relatives, as has been exposed throughout this manuscript, are a fundamental support for those living with HIV.

In this sense, the participants expressed a series of statements that highlight the impact of said stigma and other representations of the virus on their mental health, as reflected in the following fragments:

"When I was recently diagnosed it was too hard. I did not want anything because HIV is a taboo, because people from the system reject it".

"The disease affects us all in the family, because one must face discrimination just because one has the disease".

"We have had to go to the psychologist many times because he feels rejected. He has not been able to get a partner because he thinks his illness has already stopped his life".

Thus, in this study, the access barriers to health services as perceived by adults living with HIV and their families are represented in administrative constraints affecting economic and interpersonal relationships as well as others of a social nature that materialize in the impact of the stigmas created around the virus on the mental health of seropositive subjects and their closest affective environment.

4. Discussion

Accessibility and acceptability become recurrent factors of investigation, being conceived as the two great barriers in the full use of health services (Correa & Valencia, 2016). In addition, their study is more frequent in populations considered to be vulnerable —such as older adults, indigenous people, migrants, children, women and patients with chronic and transmissible diseases— as they already pose a series of challenges for health systems (Hirmas et al., 2013; Juárez et al., 2014; Agost & Martín, 2012; Contel, Muntané, & Camp, 2012; De Oliveira et al., 2013).

Thus, communicable diseases such as HIV have become a topic of interest not only because of the impact it has generated for global public health, but also because of the barriers faced by people living with the virus in order to access services of health and prevention of such disease. Although most studies have focused on issues related to antiretroviral treatment (ART) because it is a collective goal to ensure coverage of the entire infected population, without ignoring that such access is conditional on each context (Olivera et al., 2012; Arrivillaga & Salcedo, 2012; Sarang, Rhodes, & Sheon, 2013).

In this regard, the research carried out makes clear three important elements of barriers to accessing health services for people living with HIV, according to the perspectives of users living with HIV and their families. The first element concerns the impact of administrative constraints on the economic situation of HIV-positive individuals and their families.

Some studies on accessibility to health services in the Colombian context, such as that carried out by Vargas & Molina (2009), reveal the existence of administrative barriers in the Gerenal System of Health Social Security (SGSSS by the aronym in spanish), where patient insurance does not guarantee full access to the required services, triggering constant actions of guardianship to enforce health rights and increasing out-of-pocket costs for users; which is consistent with the findings in the first category of research presented in this manuscript. In addition, the results of Lopera, Martínez, & Ray (2011) reflect in the framework of the SGSSS, the interruption of treatment by users due to the shortcomings of the Health Service Provider Institutions. In addition, to a series of other factors that increase the health costs assumed by patients, which in view of the study presented here, is consolidated as an administrative barrier to access to services.

Now, the second element that was highlighted in the study has to do with the effect of administrative barriers on family relations. In this particular finding, it is important to note that the consulted literature shows the perceptions of users and their relationship dynamics only from a healthcare perspective, this is the case of the research carried out by Marín & Chávez (2013), who relate the incidence of administrative barriers in emergency care and the way in which the relationship between the patient, family and healthcare professionals can be hindered (Asela-Molina, 2015). Therefore, the contrasting of this category with existing information from other studies reveals the gap in the field of knowledge, so it is pertinent to encourage the different researchers in areas related to public health and social sciences to investigate in depth the effects that barriers to access to health services can have on family interactions.

Finally, the third key element found in this research has to do with the impact of the stigma created around the virus on the mental health of people living with HIV and their families. Various approaches have been taken in this category, both in the field of public health and social sciences. Some approaches to this topic have been developed by researchers such as Wohl et al (2012), who analyzed aspects such as HIV stigma, depression, stress and social support in Latino and African American men diagnosed with HIV, which supports the results of research presented in this manuscript, reflecting the association between HIV stigma and mental health of those infected.

5. Conclusions

The presence of access barriers to health services has been widely debated, particularly in those countries where the guarantee to the integral attention of the population by the different actors of the health system becomes more complex due to their socioeconomic characteristics. This is the case of Latin American countries like Colombia, where the gap between riches and poors is undoubtedly a key aspect for understanding the barriers that persist in the system.

These become more complex for those groups whose social, economic, cultural, demographic and even epidemiological characteristics acquire the connotation of vulnerable groups. One of the most affected groups are those living with chronic and transmissible diseases, and for the particular case of the results exposed in this

manuscript, people living with HIV and their families.

In this sense, in view of the results found in this research, it can be inferred that the existence of administrative barriers in the Colombian health system negatively impacts the economic situation of those living with the virus and their families, due to the constant procedures that people must carry out to claim medicines, request medical appointments, among others. In addition, this type of barriers leads to altering the relationship between the infected individual and his or her family, since the stress load generated by the constant procedures to which they are exposed is poorly channelled in the home.

Likewise, according to the findings of the study, it is clear what other studies have already addressed, in relation to the impact that the stigma around the virus has on the mental health of HIV-positive people and their families. This is a cultural barrier that, according to the authors, demands greater efforts on the part of health authorities, since they require joint action not only from the actors of the health system, but also from the community in general.

In addition, one of the possible strategies to improve coverage and care for patients with transmisible diseases is telemedicine (Benjumea, Villa, & Valencia, 2016) but this should be based on a national strategy that strengthens the link with patients who cannot travel to health care centres. This requires technological adoption studies to identify the factors that would allow a proper implementation of the strategy (Valencia, Gonzalez, & Castañeda, 2016; Bermudez, Chalela, J.Valencia, & A. Valencia, 2017).

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Competing Interests Statement

The authors declare that they have no competing or potential conflicts of interest.

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Prevalence and Associated Factors of Attention Deficit Hyperactivity Disorder (ADHD) in a Rural Community, Central Thailand: A Mixed Methods Study

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Abstract

Background: Attention Deficit Hyperactivity Disorder (ADHD) is one of the most common behavioral problems among children around the world including Thailand. The disease affects their life, parents and community when left untreated. Most information concerning ADHD in Thailand derives from hospital based studies. The present study aimed to determine the prevalence and associated factors of ADHD in a remote rural community.

Methods: A total of 495 primary school children were screened using the SNAP-IV. Positive screening cases were then diagnosed by pediatric psychiatrists according to the DSM-V criteria. Standardized questionnaires were used to collect demographic data and associated factors. A qualitative study using focus group discussions and indepth interviews was conducted to determine knowledge and perceptions regarding ADHD among teachers and main guardians.

Results: The prevalence of ADHD among children was 2.2%. Univariate and multivariate analysis showed that children with ADHD were associated with both familial and individual factors including being repeatedly inattentive or hyperactive in class, suspended from school, and changing school, a history of bullying and main guardians were not parents. Qualitative data showed that both main guardians and teachers had inadequate knowledge and misperceptions regarding children with ADHD. The local health care system could not detect this problem so the children with ADHD were not properly treated.

Conclusion: Our data emphasized that ADHD was a problem in this remote rural community. Screening tests and referral systems for ADHD should be provided for rural communities.

Keywords: Attention Deficit Hyperactivity Disorder, ADHD, prevalence, associated factors, rural community, Thailand, mixed methods

1. Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is one of the most common mental disorders that develop in children and becomes apparent in preschool and early school years. (Al Hamed et al., 2008) The three predominant subtypes include inattention, hyperactivity-impulsivity and combined inattentive/hyperactive impulsive subtype (combined ADHD)(Homer et al., 2000). The diagnosis of ADHD is based on criteria specified by the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV). (Homer et al., 2000) ADHD was diagnosed in 4.0 to 29.7% of children aged between 6 to 12 years in different geographical areas (Brown et al., 2001; Thomas et al., 2015). In Thailand, one behavioral survey among 7,188 Thai students in grades 1-5 conducted in 2012 estimated the prevalence of ADHD at 8.1% (Visanuyothin et al., 2013).

Several family-related factors such as high birth order, large family size and living with a single parent were shown

to be associated with ADHD symptoms (Abolfotouh et al., 1997; Herrerias, Perrin, & Stein, 2001; Trangkasombat, 2008; Hurtig et al., 2007; Wehmeier, Schacht, & Barkley, 2010). Other factors including low birth weight and artificial infant feeding have also been shown to be significantly associated with ADHD (Sasaluxnanon & Kaewpornsawan, 2005; Nigg & Breslau, 2007). Children with ADHD are associated with a broad range of negative outcomes including depression, school failure and dropout, learning disabilities, conduct disorders among children and adults, failed relationships, workplace underachievement, substance abuse and low self-esteem among adults (Austerman, 2015; van der Meeret et al., 2012).

Nevertheless, the information of ADHD in Thailand is still limited especially in rural communities. Most studies were hospital- or school-based in urban populations (Charnsil & Sriapai, 2011; Muanprasart et al., 2014; Visanuyothin et. al., 2013; Yajai Sitthimongkol & Apinuntavech, 2012). The study aimed to determine the prevalence and associated factors of ADHD in a remote rural community, central Thailand. In addition, a qualitative study was also conducted to determine knowledge and perceptions of teachers and main guardians toward children with ADHD in this community.

2. Method

2.1 Study Populations

The present study was conducted in 2 primary schools in a rural community, Chachoengsao, central Thailand, 154 km east from Bangkok. This remote, isolated community totaled 8,777 villagers, mostly farmers. This study employed a mixed-methods design. A cross-sectional quantitative study identified the prevalence and associated factors of ADHD. A total survey was performed including 158 students in school No. 1 and 377 students in school No. 2. In addition, a qualitative study determined knowledge and perceptions of teachers and main guardians of the children with ADHD. Purposive sampling was also used to select the main guardians of the children who were diagnosed with ADHD for indepth interviews. A total of 15 teachers from =school No. 1 and 21 teachers from the school No. 2 were purposively selected for focus group discussions.

2.2 Detection and Characterization of Children with ADHD

The SNAP-IV Rating Scale, a revision of the Swanson, Nolan and Pelham (SNAP) Questionnaire (Swanson et al., 1992) was conducted to screen the ADHD condition among these children. The items from the DSM-IV (1994) criteria for Attention-Deficit/Hyperactivity Disorder (ADHD) were included for two subsets of symptoms: inattention and hyperactivity/impulsivity (APA, 1994). The Thai version of SNAP-IV showed favorable reliability (Cronbach's alpha: SNAP-IV = 0.93-0.96). Both SNAP-IV scales completed by parents and by teachers proved useful in the screening of ADHD (AUC: SNAP-IV = 0.71-0.81) (AUC: SNAP-IV = 0.55-0.67) (Pityaratstian N et al., 2014). In addition, items were included from the DSM-IV criteria for Oppositional Defiant Disorder. The SNAP-IV is based on a 0 to 3 rating scale (Not at all = 0, Just a little = 1, Quite a bit = 2, and Very much = 3). Subscale scores on the SNAP-IV are calculated by summing the scores on the items in the subset and dividing by the number of items in the subset. The score for any subset is expressed as the average rating-per-item. Both teachers and main guardians had to complete the SNAP-IV. A positive screening of the disease requires a positive result from both SNAP-IV for teachers and main guardians. The result of SNAP-IV separated the included children in 2 groups, i.e., children with negative and positive result of SNAP-IV. The children with positive results were considered at high risk of ADHD and needed to meet pediatric psychiatrists to find a definite diagnosis as indicated in the DSM-V. When ADHD was diagnosed, specialists would give counseling to their guardians about how to understand, manage, and obtain appropriate treatment for their child. On the other hand, for those without a diagnosis of ADHD but showing a positive result on the SNAP-IV, the specialists would recommend how to observe and take care of their child. To determine the associated factors of ADHD among these children, a face-to-face interview using standardized questionnaires was conducted among the main guardians. The questionnaires covered demographic information of children and their parents, children's behaviors and school performance and parents' behaviors.

For the qualitative part, the teachers and main guardians of the ADHD child were purposively selected to participate in focus group discussions or indepth interviews. For indepth interview, 8 main guardians of ADHD children were selected to participate. A total of 12 of the teachers in both schools were selected for the focus group discussion. The conversation was recorded using a voice recorder and recorded conversations were transcribed into text. The data was collected continuously until the contents were saturated

2.3 Data Analysis

For the quantitative study, collected data were checked for accuracy and completeness and were coded and entered using STATA/MP12. Demographic, behavioral data and prevalence was analyzed using descriptive statistics.

Binary logistic regression analysis was used to determine the associated factors of ADHD. The magnitude of association was presented as crude and adjusted odds ratios (ORs) with a 95% confidence interval. The *p*-value of less than 0.05 was considered as statistically significant in this study. For the qualitative study, the text-based data transcribed from the conversation were sorted and coded. Data were revised, organized and summarized for analysis. The methods used included content analysis, direct quotations and selected words to give consideration to actual local words used by the participants.

2.4 Ethical Considerations

This study was reviewed and approved by the Institutional Review Board, Royal Thai Army Medical Department. Consent forms were completed by the main guardian of each child before they participated in the study. For the process of focus group discussion and indepth interview, the questions were treated sensitively and confidentially. When the participants were worried about any question, they did not have to answer. For the children diagnosed with ADHD, this diagnosis was kept for confidential and not disclosed publicly.

2.5 Operational Definitions and Abbreviations

ADHD = Attention Deficit Hyperactivity Disorder

DSM-V = Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition

3. Results

3.1 Quantitative Study Determining the Prevalence and Associated Factors of ADHD

Of 535, 495 students (92.5%) were included in this study. Demographic data of these children are shown in Table 1. In all, 254 (51.3%) were female. The average age of the participants was 9.54 ± 1.75 years (range from 6 to 13). The participants studied in grade one to grade six. Using the SNAP-IV, 79 (16%) and 93 students (17.3%) were positive evaluated by the main guardians and teachers, respectively. A positive result in both main guardian and teacher's evaluation were identified among 33 students (6.7%). Of 33, 30 students were allowed to meet specialists for definite diagnosis. ADHD was identified among 11 students. Other conditions including mental retardation, learning disability with mental retardation, slow learner were diagnosed among 6 students. Thus, the prevalence of ADHD in this population was 2.2%. The prevalence of ADHD in each subgroup and univariate logistic regression analysis for factors associated with ADHD children are shown in Table 1.

Multivariate logistic regression analysis was performed to identify the associated factors of ADHD (Table 2). The associated factors of ADHD included both familial and individual factors. Having a relative as a main guardian, having a history of repeating class, inschool suspension, changing school and having a history of bullying was significantly associated with ADHD

3.2 Qualitative Study of ADHD in the Community

For indepth interviews, data were collected from a total of 8 main guardians including 1 father, 1 mother and 6 relatives. For focus group discussions, data were collected from a total of 12 teachers including 4 males and 8 females with ages ranging from 25 to 44 years old. The mean duration of teaching experience was 4 years (range from 1 to 10 years).

3.2.1 Knowledge and Perception of ADHD in Teachers and Guardians

All parents did not know that their children had ADHD. In addition, they did not know ADHD as a mental health problem. They just perceived that these children had negative behaviors such as being stubborn, naughty, overactive, forgetful, agitated, often lost, slow to process information, having difficulty in waiting, and exhibiting roles of martyrs, thieves and ringleaders. A mother of an ADHD child said,

"He is obstinate and never ever stays still and climbs up tree after tree. He is just going right away after we tell him not to."

Teachers did not exactly know whether these children had negative behaviors or disease. However, they noticed that these students had problems concentrating in class, working in groups, succeeding in their assignments and showing ignorance. In addition, these children also exhibited emotional problems such as aggressiveness and uncontrolled mood. As a teacher said,

"To do nothing is not successful, to motivate them to work at all."

Most guardians did not know the causes of the negative behaviors expressed by these children. They guessed that it could be the result of alcohol consumption during pregnancy, lack of antenatal care, parental drug abuse, child abuse, parental child care etc. However, they noticed that some of these children's relatives also showed these

negative behaviors. The teachers gave possible causes including genetics, poor family and community environment, imitative behavior, hormonal or chemical disturbance, alcohol consumption during pregnancy, abnormal eating behaviors etc. Genetics and poor family and community environment were strongly suggested as causes of the negative behaviors by these teachers.

The perceptions toward these children differed among their guardians. The majority of guardians perceived that these children exhibited negative behaviors without knowing whether they had a disease. Some misunderstood these children had other mental disorders such as autism and mental retardation. However, some guardians thought that these children were normal as they said that,

"He thinks like a child, just not restless. Actually it is not only him, the other kids are like this."

Most teachers believed that the children with these negative behaviors should be treated. Similar to the guardian group, some considered these children as normal.

3.2.2 Effects on ADHD Children

Most guardians thought that these children could not pay attention in class and eventually could not read or write. Some guardians said that,

"A grandmother complained that her grandchild only read and wrote only for a short while and could not finish the homework properly. He also did the same thing at school."

Teachers pointed that these children could not perform well in studying and lacked logical thinking skills. These children were also irresponsible and unable to be disciplined causing problems in their daily life activities. These children were easily influenced by others and became negative. The teachers thought that they were unable to control themselves, properly communicate and express themselves to other people. For example, a teacher said,

"The performance of these children was poor at school. I do not want to send them to the Ordinary National Education Test (O-NET), because it will make a lower school assessment result.

3.2.3 Effects on the Family

The negative behaviors of these children such as aggressiveness caused difficulty in taking care of these children. The situation resulted in disharmony in the family and even broken homes. Because rural communities in Thailand usually comprise extended families, the children from unsettled homes may have lived with their relatives.

"Her mom left her because she was so difficult." "Her dad took her but could not stand her."

"So grandma now takes care of her"

"Living with the family, he always quarrels with father, mother and sister." "He was very aggressive for example using a knife on them. However, he was very calm with his aunt; that's why he was living with his aunt."

These children often blamed other family members, even their parents. The teachers also shared that these children felt inferior and were viewed as a burden to the family. This was often seen when these children caused troubles or when they misbehaved. The problems led their parents to family conflicts and unfortunately caused broken families in some situations.

3.2.4 Effects on Community

Some behaviors of these children might be imitated by their friends at school. Some guardians said that these children behaved aggressively with their teachers. Teachers said that they did not pay the attention to their work, were exploitative and unable to work with their friends. Some were hated and annoyed by their friends. Sometimes they brought their friends into trouble. Both guardians and teachers shared the same opinion that these children would cause social problems such as stealing, fighting, vandalism, drug addiction and were rejected by society.

3.2.5 Expectations of Teachers and Guardians

Guardians expected that their children could grow up better, learn as much as they could, get an appropriate job and live a better life. For example, one parent said,

"I don't want anything else. I just want my son to grow up and be able to take care of himself." Teachers expected these children to perform well in class like other students and to be able to adapt to society. For example, one teacher said,

"I want them to improve their learning skills."

3.2.6 Diagnosis and Treatment of ADHD Children

The local health care unit in this community could not diagnose and treat this condition. No screening for ADHD was conducted among these children until this study. Both guardians and teachers did not know any specific treatments. Some assumed that the way to improve these children might include medication, behavioral adaptation and meditation. Some guardians were uncertain in seeking diagnosis and treatment because of economic problems. To obtain diagnosis and treatment, they had to access a higher level of health care institute where pediatric psychiatrists are available. Although they were covered by the Universal Coverage Health Scheme, they had to spend some money for travelling.

Table 1. Univariate logistic regression analysis for factors associated ADHD in a rural community, Thailand

	Total	ADHD	Crude ORs	95% CI	*p*-value
	n (%)	n (%)			
Age (years)	mean (SD) = 9.54 (1.75), min-max= 6-13				
≥ 10	254 (51.3)	5 (2.0)	1		
6-9	241 (48.7)	6 (2.5)	1.3	0.4-4.2	0.695
Gender					
Female	254 (51.3)	3 (1.2)	1		
Male	241 (48.7)	8 (3.3)	2.9	0.7-10.9	0.122
Grade					
4^{th}-6^{th}	248 (50.1)	3 (1.2)	1		
1^{st}-3^{rd}	247 (49.9)	8 (3.2)	2.7	0.7-10.4	0.141
School					
No.2	339 (68.5)	2 (0.6)	1		
No.1	156 (31.5)	9 (5.8)	10.3	2.2-48.3	0.003
History of Head Injury					
No	443 (89.5)	7 (1.6)	1		
Yes	52 (10.5)	4 (7.7)	5.2	1.5-18.4	0.011
School factors					
Repeatedly in Class					
No	480 (96.7)	6 (1.3)	1		
Yes	15 (3.3)	5 (33.3)	39.5	10.3-151.1	<0.001
Suspension from School					
No	484 (97.8)	8 (1.7)	1		
Yes	11 (2.2)	3 (27.3)	22.3	5.0-100.0	<0.001
Changing School					
No	342 (69.1)	1 (0.3)	1		
Yes	153 (30.9)	10 (6.5)	23.8	3.0-188.0	0.003
History of bullying					
No	434 (87.7)	4 (0.9)	1		
Yes	61 (12.4)	7 (11.5)	13.9	4.0-49.2	<0.001

Family factors					
Family status					
Family (both parents)	311 (64.5)	6 (1.9)	1		
One of the parents	171 (35.5)	5 (2.9)	1.5	0.5-5.1	0.487
Main guardian					
Father/mother	302 (61.6)	2 (0.7)	1		
Relative	188 (38.4)	9 (4.8)	7.5	1.6-35.3	0.01
Siblings					
One or more sibling	396 (82.7)	7 (1.8)	1		
No sibling	83 (17.3)	3 (3.6)	2.1	0.5-8.2	0.295
Education (main guardian)					
Primary or above	463 (94.9)	8 (1.7)	1		
Uneducated	25 (5.1)	3 (12.0)	7.8	1.9-31.3	0.004
Disharmony between parents					
No	427 (86.3)	8 (1.9)	1		
Yes	68 (13.7)	3 (4.4)	2.4	0.6-9.3	0.201
Maternal factors					
Lie as a habit					
No	448 (95.3)	9 (2.0)	1		
Yes	22 (4.7)	2 (9.1)	5.5	1.0-24.0	0.052
Alcohol consumption during pregnancy					
No	477 (96.4)	9 (1.9)	1		
Yes	18 (3.6)	2 (11.1)	6.5	1.3-32.6	0.023
Smoking during pregnancy					
No	485 (98.0)	10 (2.1)	1		
Yes	10 (2.0)	1 (10.0)	5.3	0.6-45.7	0.131
Paternal factors					
Lie as a habit					
No	443 (92.9)	8 (1.8)	1		
Yes	34 (7.1)	3 (8.8)	5.3	1.3-20.8	0.018

Table 2. Multivariate logistic regression analysis for factors associated ADHD in a rural community, Thailand

	Total	ADHD	Adjusted ORs	95% CI	*p*-value
	n (%)	n (%)			
Repeatedly in Class					
No	480 (96.7)	6 (1.3)	1		
Yes	15 (3.3)	5 (33.3)	20.7	1.9-226.1	0.013
Suspension from School					
No	484 (97.8)	8 (1.7)	1		
Yes	11 (2.2)	3 (27.3)	49.5	4.0-615.5	0.002
Changing School					
No	342 (69.1)	1 (0.3)	1		
Yes	153 (30.9)	10 (6.5)	31.4	2.1-463.8	0.012
History of bullying					
No	434 (87.7)	4 (0.9)	1		
Yes	61 (12.4)	7 (11.5)	22.8	3.3-156.0	0.001
Main guardian					
Father/mother	302 (61.6)	2 (0.7)	1		
Relative	188 (38.4)	9 (4.8)	8.3	1.1-60.7	0.038

Backward Wald: Adjusted for school, grade, gender, history of bullying, changing school, suspension from school, repeatedly in class, main guardians, education and incomes of the main guardian, having a father or mother who tells a lie as a habit, smoking or alcoholic pregnancy, disharmony between parents, and history of head injuries.

4. Discussion

The prevalence of ADHD in the present study was 2.2%, which is relatively low compared with the related studies in Thailand (Visanuyothin et al., 2013; Benjasuwantep, Ruangdaraganon, & Visudhiphan, 2002). A recent study (Visanuyothin et al., 2013) conducted among 7,188 school children to determine the situation of ADHD in Thailand used a three-stage stratified cluster sampling (provinces, schools and classrooms) and showed an overall prevalence of 8.1%. The prevalence in Thailand was similar to that reported from another Southeast Asian country, Vietnam (Pham, Nguyen, & Tran, 2015). The prevalence of ADHD differed according to the part of Thailand, i.e., 5.1% in the north, 6.5% in Bangkok, 6.7% in the central regions, 9.4% in the northeast and 11.7% in the south. Another study in Bangkok (Benjasuwantep, Ruangdaraganon, & Visudhiphan, 2002) showed a prevalence of 6.5% in one school. The relatively low prevalence of ADHD in the present study might be the result of the limited population in a remote rural area. A recent study from Vietnam also showed that the prevalence of ADHD among children living in rural areas was 2.2 times lower than those who lived in urban areas (Pham, Nguyen, & Tran, 2015). This might have indicated that a few risk factors for ADHD such as environmental exposure, complications of pregnancy and delivery and psychosocial adversity may vary in different settings (Benjasuwantep, Ruangdaraganon, & Visudhiphan, 2002). Most studies found that ADHD was more common among males (Thapar & Cooper, 2016). In the present study, the prevalence of ADHD among boys tended to be higher but not statistically significant, which could have been due to the small sample size.

The children with ADHD in this community were associated with problems in school including educational and social aspects. They were significantly associated with repeating classes, suspension from school and changing schools. Our qualitative data indicated that ADHD children could not pay attention in class and eventually could not read or write. ADHD children lacked logical thinking skills, concentration, responsibility and discipline, which consequently led to failures in studying, working or problem solving in daily life activities. In addition to their study ability, bullying behavior of some children with ADHD might be associated with their suspension from school. These children were easily influenced by others, unable to control themselves and became negative leading to bullying behaviors. Some children exhibited aggressive, mischievous behaviors until the teachers had to meet their parents.

A related study (Hurtig et al., 2007) indicated that children with ADHD commonly lived in nonintact families. Our finding showed that the children with ADHD in this rural community were also associated with living with relative(s), and not having parents as their main guardians. From the qualitative information, children with ADHD might be the cause of family problems. In Thailand, rural communities usually comprise extended families in which the relatives are living together or in the same areas. Some children were neglected by their parents. Thus, their relatives were commonly responsible for these children.

Although most interviewed guardians and teachers were experienced with ADHD children, they did not exactly know their conditions especially in the guardian group. Some teachers might know about ADHD from some training courses, but they did not know how to differentiate ADHD from normal child behaviors of these age groups. In addition, no screening or diagnostic system was available in these schools and local healthcare center of this community. Thus, these ADHD children lacked proper diagnosis, referrals and specific treatment. Knowledge of ADHD such as symptoms, screening tests and specific treatments should be provided to the community. This condition should also be emphasized among teachers who might be one of the first to notice ADHD symptoms. The chance for receiving proper diagnosis and treatment will be increased and the consequences of ADHD will be reduced.

To date, a few screening tests (Alda & Serrano-Troncoso, 2012) for ADHD are available and suitable for using at the community level. From our experience of SNAP-IV for screening ADHD in this community, the test was easy to use and understand by both guardians and teachers. Using this screening test should be the principle intervention for identifying ADHD at the community level, which could lead the suspected children to the proper healthcare system. In addition, ADHD is considered a chronic condition for which continuous care is needed. Local healthcare centers should not only prepare a detection and referral system but also use the chronic care model for these children. In Thailand, pediatric psychiatrists are limited to only tertiary healthcare centers, so follow-up care and treatment adherence should also be enhanced by the local healthcare center.

The limitation in this study was that only school children were included. From the qualitative information, ADHD children in this community were unknown or considered to have a disease. Some might have been suspended or expelled from school. This could have caused the relatively low prevalence of ADHD among children in this remote rural community compared with schools in urban communities where ADHD is more familiar and supported.

In conclusion, we presented here the situation of ADHD in a remote rural community, Thailand. ADHD in this community was associated with educational problems and mischievous behaviors. The main guardians of these children were usually not their parents. Knowledge of ADHD was limited causing misperceptions towards these children. In addition, no screening or diagnostic system was available in this community. Our information is crucial for the healthcare system to improve screening and referral systems at the community level.

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Complete Interests Statement

The authors declare they have no competing or potential conflicts of interest.

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Knowledge, Attitude and Practice of Biomedical Waste Management among Health Care Personnel in a Secondary Care Hospital of Al Buraimi Governorate, Sultanate of Oman

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Abstract

Background: Due to existence of highly infectious materials, the biomedical waste can be a probable source for transmission of diseases as well as occupational hazards among health care workers if not adequately managed. **Objective:** To assess the knowledge, attitude and practices of biomedical waste management among health care personnel in a secondary hospital of Al Buraimi Governorate, Sultanate Oman.

Methodology: A Cross sectional descriptive self-administered questionnaire based study was conducted among 207 subjects from 30th September 2015 to 30th March 2016 in Al-Buraimi hospital, Oman. Stratified random sampling comprised of four strata (100 nurses, 65 doctors, 22 housekeeping staff and 20 laboratory technicians).Chi-Square test was applied using SPSS version 21 with significance level ≤ 0.05. Confidentiality was maintained with ethical approval from research committee and informed formal consent was taken from the participants.

Result: Overall response rate was 125 (60.3%) from total 207, mean age 36.14±8.9 and age ranges from 20 to 58 years with mean age (doctors 42.5, nurses 29.8, laboratory technician 29.2 and housekeeping staff 36). Female proportion of 82 (65.6%) was higher as compare to males 43 (34.4%). The study was analyzed on the basis of "satisfactory" and "unsatisfactory" scores using "cut-off point" tools. Nurses had better satisfactory knowledge (90.9%), attitude (94.5%) and practice (80%) scores as compare to other participants. The overall "satisfactory" knowledge, attitude and practice scores were found to be statistically insignificant (P=0.100, P=0.346, P=0.364 respectively). No significant relationship established between dichotomized variables of knowledge and practice (P = 0.264) as well as attitude and practice (P = 0.147).

Conclusion: The "satisfactory" scores of knowledge, attitude and practice were found to be higher among nurses as compared to other participants, which may be due to intensive patient care and more involvement in biomedical waste management as well as greater responsibility allocated by hospital administration.

Keywords: biomedical waste management, health care personnel, knowledge, attitude and practice

1. Introduction

Globally, there was a constant increase and expansion in the number of health care institutions and hospitals to meet the health care facilities required of the alarming population expansion (Tesfahun, Kumie, & Beyene, 2016). An increase and expansion in the number of hospitals and health care facilities, causes an increase in the utilization of disposable medical materials, which further contributed in production of a large amount of biomedical wastes in

these health care facilities (WHO, 2002; Karamouz, Zahraie, Kerachian, Jaafarzadeh, & Mahjouri, 2007).

The introduction of more complicated equipments and overall medical advancement causes an increase in waste production per patient in health care facilities globally (Radha, Kalaivan, & Lavanya, 2009). The increased production rate of biomedical waste was combined by mishandling and poor disposal methods (Hassan, Ahmed, & Rahman, 2008). The risk of disease transmission was raised among the health care workers and other environmental issues such as pollution (Awad, Obeidat, & Shareef, 2004). On the basis of these facts, incorporation of an integrated biomedical waste management system for hospitals and health care facilities was becoming a "cross cutting issue" (Nema, Pathak, & Bajaj, 2011).

In 2011, WHO stated that high developed countries produce an average up to 0.5 KG of hazardous waste per hospital bed per day while the figure for developing countries was only 0.2 KG per hospital bed per day. Biomedical waste was often not properly segregated in to hazardous or non hazardous wastes that made the actual amount of hazardous waste possibly much higher. 85% of generated waste from hospitals and other health care facilities were in fact non-hazardous while remaining 15% is considered to be hazardous materials that may be radioactive, toxic or infectious (WHO, 2011).

Like several other countries, Sultanate of Oman was putting great effort to improve its biomedical waste management practices. In this regard, Oman joined the Basel Convention on Controlling Trans-boundary movement of hazardous waste and their disposal in 1995 (The Basel Convention, 1989). The aim of the convention was to stop the spread of the waste business, which involved the transportation of waste from developing and industrial countries to underdeveloped countries for treatment (Tiemann, 1998). Also, several Gulf Cooperation Council (GCC) States singed or agreed on the convention, avoiding the waste transportation across its national boundaries (Al Shallash & Shereif, 2007).

Similar to other secondary hospitals within Sultanate of Oman, the location of incinerator is within the premises of the Buraimi hospital. It provides services to hospital itself and also to 8 governmental primary health care institutions, 1 polyclinic and up to 33 private health care facilities. The main common techniques of final waste management were autoclaving and incineration. Depending on the type of waste and its disposal method, both techniques are used in Buraimi hospital. It was observed that there was no previous study conducted in Oman to assess the knowledge, attitude and practices of health care workers regarding biomedical waste management. Therefore, the objectives of this study was to assess the knowledge, attitude and practices of biomedical waste management among the health care workers and to identify the gaps and steps needed to take necessary action for rectification at various levels in a secondary hospital of Al Buraimi Governorate.

2. Methodology

2.1 Study Design and Sample

Al Buraimi hospital provides secondary health services for all the residents of the governorate, with estimated Total Mid Population of (103,403) according to regional statistic MOH, annual report (2014). This 150 bedded hospital provides a range of in and outpatient medical services with 639 employees among them 444 health care workers providing their services in this hospital.

A cross-sectional descriptive self administered questionnaire based study was conducted among health care workers of Buraimi hospital in different categories from 30th September 2015 to 30th March 2016. Stratified random sampling was done to select the participants. The health care workers were grouped into four strata /subgroups such as: nurses, laboratory technician, doctors and housekeeping staff. The target population was 444 health care workers. The sample size included 207 subjects with confidence level of 95%. The participants included 100 nurses, 65 doctors, 22 housekeeping staff and 20 laboratory technicians. The research was conducted to assess the knowledge, attitude and practices of biomedical waste management among the health care workers and to identify the gaps and steps needed to take necessary action for rectification at various levels in a secondary hospital of Al Buraimi Governorate. Also the research with secondary objective to determine if there is any association between knowledge with practice and attitude with practice among the health care workers

The study subjects (Doctors, nurses, laboratory technician and housekeeping staff) who were working in Buraimi hospital for at least six months during the conduction of study were included in the study. This is due to some questions related to participant experience such as: did you sustain needle stick injury during past 6-12 months, did you receive post exposure prophylaxis, did you complete your hepatitis B vaccine course or did you report any incident related to biomedical hazard. Those who were not willing to participate in the study and those who were working in the administration, were excluded from the study. Approval from Research and Ethical Review Committee, Ministry of Health Oman was obtained to conduct the study. The Buraimi hospital administration was

informed and explained before the conduction of this study. Written formal informed consent which explained the objective and aims of study was obtained from all participants.

2.2 Data Collection

A pre-tested/ pilot study was carried out to identify potential practice, logistic constrains and problems before starting the actual field work. The pilot study included a pre-tested structured questionnaire, distributed among 20 participants by trained staff after taking formal permission. A modified questionnaire consisting of 37 questions were distributed to all participants. The questionnaires were divided into 4 parts. These questionnaires were developed after reviewing and evaluating similar published articles. The first part contained socio-demographic characteristic of participants (age, gender, job category, working experience, working section). The second part of questionnaire consisted of knowledge of health care workers which includes12 items, for example: color coding for waste disposal bags, constituents of biomedical waste, existence plan or strategy for biomedical waste in hospital. The attitude of health care workers were assessed by using 15 questions such as: Is safe management of biomedical waste an issue?, Is waste management a team works?, whether the safe management effort of biomedical waste increases the financial burden on hospital or not. While the practices part was assessed by 10 questions e.g. hand washing before and after procedure, using gloves, re-capping the used needle. The questionnaire was developed in English language. Since most of the housekeeping staff was Arabic speakers or had difficulty in reading and writing, it was decided to conduct an interview with them by author in order to fill the questionnaire.

2.3 Statistical Analysis

For data entry and analysis, SPSS version 21 was used. The overall scores for knowledge, attitude and practice were transformed into percentage score. Percentage knowledge, attitude & practice scores were analyzed on the basis of *"satisfactory/acceptable"* and *"unsatisfactory/unacceptable"* scores using *"cut-off point"* tools. This helped us to compare the responses of the participants and the results with other similar studies. The application of such tools are ideal for analysis of knowledge, attitude and practice questionnaires, this help the researchers to establish whether overall knowledge is *"satisfactory"* or not, overall attitude is positive or not and overall practices is acceptable or not (Barua A., Kademane K., Das B., Gubbiyappa K S., Verma R K. and Al Dubai S. AR. 2014). Responses to questions were scored as one (1 for correct/yes answers) and zero (0 for incorrect/no answers respectively). These scores were added to a single value out of a possible total score of 12 for knowledge, 15 for attitude and 10 for practices items. Participant who scored ≥ 60% were considered as "satisfactory" for knowledge, attitude and practices while scoring <60% measured as *"unsatisfactory"* for each variable. The chi square test was applied for knowledge, attitude and practice variables and to establish the associations between them. The P value was considered to be significant at ≤ 0.05.

3. Results

3.1 Response Rate and Characteristics of the Respondents

A total of 207 questionnaires were distributed to the target group. After multiple attempts through the staff development department of hospital for collection of questionnaire, only 125 were received, giving an overall response rate of 60.3 %. The overall response rate was considered to be *"satisfactory*", while Williams A. (2003) consider a response rate of 75% to be extremely good. The response rate of 125 health care workers among each category included doctors, 36 (29 %); nurses, 55 (44%); laboratory technician 14 (11%); and housekeeping staff, 20 (16%) with overall mean age 36.14±8.9 and age range from 20-58 years. Male comprised of 82(65.6%) and female 43 (34.4%). 85 (68%) of the respondents had Working experience of more than 5 years and 35 (28%) had working experience 1-5 years (See Table 1 and Figure 1).

Table 1. A response and characteristic of the respondents

Variables		Doctors (n=36)	Nurses (n=55)	Lab Technicians (n=14)	House Keeping staff (n=20)	Total (125)
Age	**Mean**	42.5	29.8	29.2	36	**36.14**
Mean±SD 36.14±8.9	**Range**	30-58	20-47	21-44	20-55	**20-58**
Gender	**Male**	31(24.8%)	5 (4%)	0 (0%)	7 (5.6%)	**43 (34.4%)**
no. (%)	**Female**	5 (4%)	50 (40%)	14 (11.2%)	13 (10.4%)	**82 (65.6%)**
Working experience	**6 M – 1yr**	0 (0%)	2 (3.6%)	1(7.1%)	2(10%)	**5 (4%)**
no.(%)	**1 – 5 yrs**	3 (8.3%)	13 (23.6%)	8 (57.1%)	11(55%)	**35 (28%)**
	>5yrs	33(91.6%)	40 (72.7%)	5(35.7%)	7(35%)	**85 (68%)**

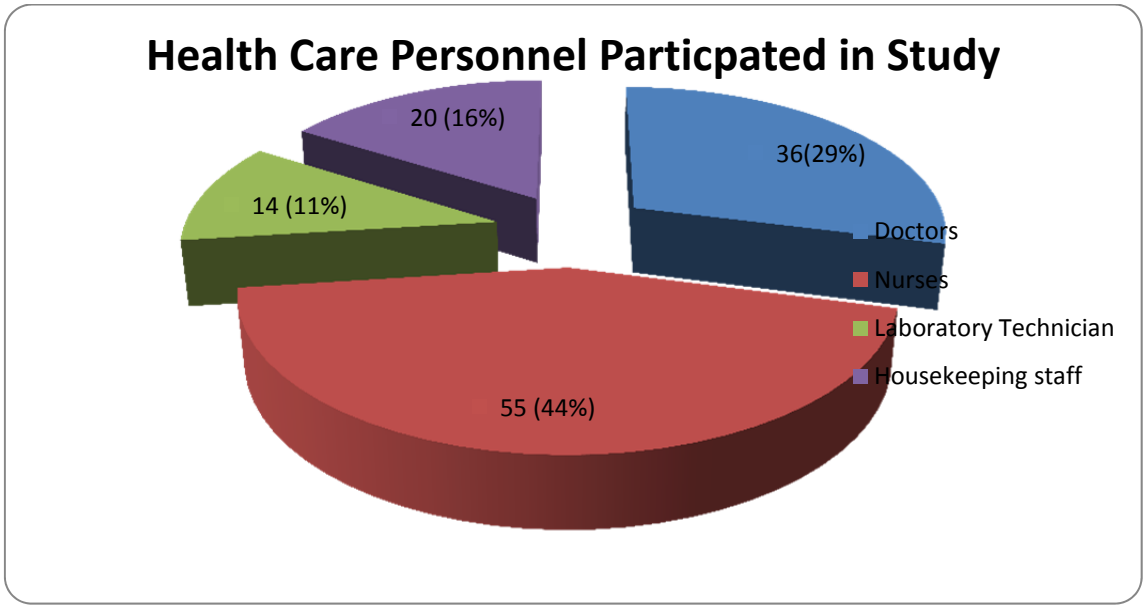

Figure 1. Health Care personnel participated in the Study

3.2 Knowledge Item

The knowledge of the participants was assessed by using Chi-Square test with p-value significance at ≤ 0.05. The percentage of Nurses knowledge regarding the biomedical waste documents and legislation implemented in hospital (61.8%) was significantly higher than other 3 category doctors (30.5%), laboratory technician (28.5%) and housekeeping staff (20%) (P=0.000). Regarding the knowledge of health care workers about different types of wastes, it was found that 98.2% of nurses, 92.2% of laboratory technicians, 90% of housekeeping staff and 88.9% of doctor's staff knew that infectious waste belong to the biomedical waste, statistically it was insignificant among the respondent (P=0.333). Health care workers who responded correctly about diseases which are transmitted through mishandling of biomedical waste management, like Hepatitis B, Hepatitis C and CCHF (Crimean-Congo hemorrhagic Fever) were found to be statistically significant with P-value (0.004, 0.000 and 0.025 respectively). About the color coding segregation of biomedical waste the knowledge of housekeeping staff (100%) and nurses (94.5%) were significantly better than doctors (58.3%) and laboratory technician (64.2%) (P=0.000).

Furthermore, regarding the knowledge of usage the personal protective precaution while dealing with patients known to be positive with infectious diseases it was found to be "statistically insignificant" (P=0.124), but the knowledge of laboratory technician (92.8%) was better than nurses (80%), doctors (75%) and housekeeping staff (60%). Although all health care workers in 4 category nurses (100%), laboratory technician (100%), housekeeping (100%) and doctors (97.2%) answered that the sharp container is the correct place for the sharp objects to be disposed but "statistically" it was found to be "insignificant" (P=0.474). The knowledge about the correct statement of Sealing the Hazardous waste containers (yellow bin) was considered to be highly significant (P=0.000)

with high percentage among nurses 90.9%. It was observed that housekeeping staff (90%) significantly had better knowledge than doctors (58.3%), nurses (58.1%), and laboratory technician (28.5%) regarding the post exposure prophylaxis management protocol (P=0.011). By evaluating, overall participants "satisfactory" knowledge score, it was found to be (81.6%) with higher knowledge score in nurses (90.9%) followed by laboratory technicians (78.6%), housekeeping staff (75%) and doctors (72.2%) but overall satisfactory knowledge scores of the participants was "statistically insignificant" (P= 0.100), (see Table 2).

Table 2. Knowledge of health care workers about Biomedical Waste Management in Buraimi hospital

Knowledge	**Doctors (n=36)**		**Nurses (n=55)**		**Lab. Technician (n=14)**		**Housekeeping staff (n=20)**		**Total (n=125)**	**P-Value**
Item correctly answered	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	
1- Knowledge about biomedical waste documentation and legislation implemented in Buraimi hospital										
	11	30.5%	34	61.8%	4	28.5%	4	20%	53 (42.4%)	**0.000**
2- Which of the following wastes belong to Biomedical Wastes:										
Pharmaceutical waste?	26	72.2%	41	74.5%	6	42.9%	10	50%	83 (66.4%)	0.062
Radioactive waste?	29	80.6%	35	63.6%	8	57.1%	13	65%	85 (68%)	0.181
Pathological waste?	32	88.9%	51	92.7%	14	100%	17	85%	114 (91.2%)	0.214
Sharps?	31	86.1%	54	98.2%	12	85.7%	19	95.%	116 (92.8%)	0.223
Infectious waste?	32	88.9%	54	98.2%	13	92.9%	18	90%	117 (93.6%)	0.333
3- Which of following constitutes belong medical waste										
Pharmaceutical waste?	25	69.4%	41	74.5%	7	50%	12	60%	85 (68%)	0.292
Chemicals?	20	55.6%	35	63.6%	9	64.3%	13	65%	77 (61.1%)	0.846
Body fluid?	29	80.6%	53	96.4%	14	100%	17	85%	113 (90.4)	**0.030**
Pathological Material?	31	86.1%	52	94.5%	14	100%	12	60%	109 (87.2%)	**0.006**
Unused medicine?	20	55.6%	31	56.4%	3	21.4%	10	50%	64 (51.2%)	0.105
Radioactive materials?	28	77.8%	29	52.7%	8	57.1%	14	70%	79 (63.2%)	0.331
Pressurized containers?	16	44.4%	18	32.7%	3	21.4%	16	80%	53 (42.2%)	**0.005**
4- Which of diseases can be transmitted while mishandling of infectious waste:										
Hepatitis B?	34	94.4%	55	100%	14	100%	15	75%	118 (94.4%)	**0.004**
HIV?	36	100%	52	94.5%	13	92.2%	17	85%	118 (94.4%)	0.205
Hepatitis C?	36	100%	53	96.4%	12	85.7%	12	60%	113 (90.4%)	**0.000**
CCHF?	28	77.8%	47	85.5%	13	92.2%	10	50%	98 (78.4%)	**0.025**
5- Knowledge about color coding segregation (separation) of biomedical waste?										
	21	58.3%	52	94.5%	9	64.2%	20	100%	102 (81.6%)	**0.000**
6- Universal precaution should be used only while dealing with patients known to be positive with infectious diseases?										
	27	75%	44	80%	13	92.8%	12	60%	96 (76.8%)	0.124
7- Reasons for putting the wastes in a wrong bin (most important, 2nd option, 3rd option and 4th option)										
Lack of knowledge	16	44.4%	26	47.3%	9	64.3%	6	30%	57 (45.6%)	0.705
Waste being full	5	13.9%	7	12.7%	1	7.1%	2	10%	15 (12%)	0.293
In-appropriate location of bin	8	22.2%	10	18.2%	4	28.6%	3	15%	25 (20%)	**0.030**
Lack of description or symbol	2	5.6%	10	18.2%	1	7.1%	4	20%	17 (13.6%)	**0.027**

8- How the sharp objects (exposed to blood or body fluids) to be disposed?										
	35	97.2%	55	100%	14	100%	20	100%	124 (99.2%)	0.474
9- Correct statements about hazardous waste containers:										
Containers must be closed?	23	63.9%	47	85.5%	14	100%	14	70%	98 (78.4%)	**0.004**
Containers must be clean?	25	69.4%	52	94.5%	14	100%	17	85%	108 (86.4%)	**0.002**
Containers must be compatible?	26	72.2%	47	85.5%	13	92.9%	16	80%	102 (81.6%)	0.203
10-When hazardous waste containers (yellow bin) should be sealed?										
	18	50%	50	90.9%	11	78.6%	7	35%	86 (68.8%)	**0.000**
11- Once a person vaccinated for hepatitis B, is it not necessary to confirm the immunity?										
	26	72.2%	48	87.2%	11	78.5%	9	45%	94 (75.2%)	**0.029**
12- Do you know about post exposure prophylaxis management protocol?										
	21	58.3%	32	58.1%	4	28.5%	18	90%	75 (60%)	**0.011**
Satisfactory knowledge score (≥ 60% item correct)										
	26	72.2%	50	90.9%	11	78.6%	15	75%	102 (81.6%)	0.100

3.3 Attitude Item

The majority of health care workers 84.8% including laboratory technician (92.7%), nurses (87.3%), doctors (80.5%) and housekeeping staff (80%) strongly disagreed that the safe management of biomedical waste is not an issue at all but *"statistically"* was not found to be *"significant"* (P=0.639). Regarding the statement that 'waste management effort is a team work and no single class of people is responsible for its safe management', the attitude of nurses (92.7%) was significantly greater as compared to doctors (83.2%), laboratory technician (64.3%) and housekeeping staff (60%) (P=0.024). The study participants also disagreed regarding efforts on safe management of biomedical waste which cause an increase in the financial burden on management (P=0.063, *"statically insignificant")*. The percentage of laboratory technician (78.5%) who did not agree about safe management of biomedical waste as an extra burden on work, was higher than nurses (76.3%), doctors (63.8%) and housekeeping staff (60%) was found to be *statistically* not *significant* (P=0.088). Consequently it was found that the percentage of laboratory technician (100%) who agreed that voluntary programs are important for upgrading the knowledge about the biomedical waste was higher verses doctors (94.4%), nurses (92.8%) and housekeeping staff (80%) but *statistically* was *insignificant* (p=0.455). The attitude of staff regarding importance of washing their hands before and after contact with each patient was found to be *statistically* highly *significant* (p=0.000) with high proportion among nurses (100%) and laboratory technicians (100%).

The health care workers who agreed that body fluids, pathological material, radioactive materials and pressurized containers are hazardous medical wastes were found to be statistically highly significant (p=0.000, p=0.000, p=0.000 and p=0.002 respectively). Also, it was found that the attitude of laboratory technicians (100%) towards further strict implementation of biomedical waste was highly *"significant"* comparing to doctors (86.1%), nurses (72.7%) and housekeeping staff (65%) (P= 0.040). Meanwhile, 80% of all respondent i.e. housekeeping staff, doctors, nurses and laboratory technician stated that they will inform waste collection team in case if they putted the waste in a wrong bin which was *statistically significant* (P= 0.055). It was noted that *"significantly"* more laboratory technicians (100%) than nurses (96.4%), doctors (94.4%) and housekeeping staff (40%) agreed that needle stick injury is a concern (P= 0.000). The perception about the risk of infection and taking precautions among health care workers after receiving the vaccination was *statistically insignificant* (P=0.371. The proportion of laboratory technicians (100%) was more as compared to doctors (94.5%), nurses (91%) and housekeeping staff (85%). Furthermore, among staff about 90.9 % of nurses considered that every patient should be treated as if they are carrying blood borne pathogen which was considered statistically highly significant (p=0.000). The overall "satisfactory" attitude scores was 91.2% with higher attitude score in nurses (94.5%) compared to laboratory technicians (92.9%), doctors (91.7%) and housekeeping staff (80%), but attitude of satisfactory score was found to be "statistically insignificant" (P = 0.346) (Table 3).

Table 3. Attitude of health care workers towards the biomedical waste management in Buraimi hospital

Attitude **Items answered correctly on basis of 5 points likert scale.**	**Doctors (n=36)**		**Nurses (n=55)**		**Lab. Technician (n=14)**		**Housekeeping (n=20)**		**Total (n=125)**	**P-Value**
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**		
1- Safe management of biomedical waste is not an issue at all.	29	80.5%	48	87.3%	13	92.7%	16	80%	106 (84.8%)	0.639
2- Waste management is a team work	30	83.2%	51	92.7%	9	64.3%	12	60%	102 (81.6%)	**0.024**
3- Safe management efforts of biomedical waste increase the financial burden on management	7	22.1%	33	60%	5	35.7%	11	55%	57 (45.6%)	0.063
4- Safe management of biomedical waste is an extra burden on work	13	63.8%	42	76.3%	11	78.5%	12	60%	88 (70.4%)	**0.088**
5- importance of voluntary programs for upgrading the knowledge of biomedical waste	34	94.4%	51	92.8%	14	100%	16	80%	115 (92%)	0.455
6- Importance of washing the hands before and after contact with each patient	33	91.6%	55	100%	14	100%	16	80%	118 (94.4%)	**0.000**
7- Clinical significance of labeling the containers	34	94.5%	47	85.5%	13	92.9%	11	55%	105 (84%)	**0.008**
8- Hazardous medical waste:										
- Body fluid	30	83.3%	54	98.2%	14	100%	8	40%	106 (84.4%)	**0.000**
- Pathological materials	27	75%	46	83.6%	11	78.6%	4	20%	88 (70.4%)	**0.000**
- Radioactive materials	26	72.2%	36	65.5%	5	35.7%	4	20%	71 (56.8%)	**0.000**
- Pressurized containers	5	13.9%	25	45.9%	4	28.6%	11	55%	45 (36%)	**0.002**
9- Further strict implementation of biomedical waste management rules	31	86.1%	40	72.7%	14	100%	13	65%	98 (78.4%)	**0.040**
10 Consideration of whole waste after the medical waste in general waste	36	100%	52	94.5%	13	92.9%	18	90%	119 (95.2%)	0.199
11- Consideration of whole waste after the general waste in medical waste	34	94.4%	53	96.4%	14	100%	17	85%	118 (94.4%)	0.220
12- Informing the waste collection team after putting wastes in a wrong bin	30	83.3%	43	78.2%	9	64.3%	18	90%	100 (80%)	**0.055**
13- Is needle stick injury a concern	34	94.4%	53	96.4%	14	100%	8	40%	109 (87.2%)	**0.000**
14- Perception about risk of infection and taking precaution after receiving the vaccination.	34	94.5%	50	91%	14	100%	17	85%	115 (92%)	0.371
15- Every patient should be treated as if they are carrying blood borne pathogen	31	86.2%	50	90.9%	12	85.7%	7	35%	100 (80%)	**0.000**
Satisfactory attitude score (≥ 60% items corrected)	33	91.7%	52	94.5%	13	92.9%	16	80%	114 (91.2%)	0.346

3.4 Practice Item

Most of the participants (89.6%) stated that they do practice all *"universal precautions"* while caring patients and dealing with biomedical waste. In this regard, practices of nurses (98.2%) were significantly better than housekeeping staff (95%), laboratory technician (85.7%) and doctors (75%) (P= 0.004). It was found that the percentage of housekeeping staff (100%) had better practices than nurses (92.7%), doctors (86.1%) and laboratory technician (85.7%) about the following of color coding segregation of biomedical waste, but statistically it was found as insignificant (P= 0.075). Also, it was observed that doctors (72.2%) had "significantly" better practices for not putting the waste in the wrong bin as compared to housekeeping staff (65%), laboratory technician (57.1%) and nurses (54.5%) (P= 0.000). Regarding the "re-capping" of used needles, 81.1% of nurses confirmed that they do not re-cap the used needles which was "significantly" better in contrast to practices of laboratory technicians (64.3%), doctors (61.4%) and housekeeping staff (30%) (P=0. 000).

The number of nurses (96.4%) who discard the used needle, sharps and slides immediately was found to be slightly higher than housekeeping staff (95%), laboratory technician (92.9%) and doctors (88.9%) while statistically was not found to be significant (P= 0.486). It was observed that the number of nurses (90.9%) stated that they did not sustain any needle stick injuries during the past 12 months, which was "significantly" higher than laboratory technicians (85.7%), doctors (80.6%) and housekeeping staff (75%) (P= 0.014). However, only 16% of health care workers confirmed that they had reported incidents related to biomedical hazard and injuries. Among them the percentage of housekeeping staff (50%) was more significant in contrast to laboratory technician (21.4), doctors (13.9%) and nurses (3.6%) (P= 0.000). Moreover, it was observed that 79.2% of study population did complete their vaccination course against Hepatitis B. The vaccination coverage was found to be higher among doctors (91.7%) than laboratory technicians (78.6%), nurses (78.2%) and housekeeping staff (60%) but it was statistically not significant (P= 0.126). It was also observed that the number of housekeeping staff (70%) attending the voluntary programs regarding the biomedical waste was "significantly" greater than nurses (9.1%), laboratory technicians (7.1%) and doctors (5.6%) (P=0.000). In addition, the overall practice "satisfactory" scores was 74.4%, with higher satisfactory score in nurses (80%) followed by housekeeping staff (75%), doctors (72.2%) laboratory technician (57.1%) but overall practice satisfactory score of the participants was found to be statistically insignificant (P = 0.346) (Table 4).

Table 4. Practice of health care workers regarding biomedical waste management in Buraimi hospital

Practice Item correctly performed	**Doctors (n=36)**		**Nurses (n=55)**		**Lab. Technician (n=14)**		**Housekeeper (n=20)**		**Total (n=125)**	**P-Value**
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**		
1- Universal precaution while caring patients and dealing biomedical wastes										
	27	75%	54	98.2%	12	85.7%	19	95%	112 (89.6%)	**0.004**
2- Color coding segregation (separation) for biomedical waste										
	31	86.1%	51	92.7%	12	85.7%	20	100%	114 (91.2%)	0.075
3- Putting wastes in wrong bins										
	26	72.2%	30	54.5%	8	57.1%	13	65%	77 (61.1%)	**0.000**
4- Re-capping of used needles										
	22	61.1%	45	81.1%	9	64.3%	6	30%	82 (65.6%)	**0.000**
5- Immediately discarding the used needle, sharps and slides immediately										
	32	88.9%	53	96.4%	13	92.9%	19	95%	117 (93.6%)	0.486
6- Sustained needle stick injury during the last 12 months										
	29	80.6%	50	90.9%	12	85.7%	15	75%	106 (84.8%)	**0.014**
7- Post exposure prophylaxis management.										
	0	0%	2	3.7%	1	7.1%	7	35%	10 (8.2%)	**0.000**
8- Reporting any incident related to biomedical hazard or injury										
	5	13.9%	2	3.6%	3	21.4%	10	50%	20 (16%)	**0.000**

9- Completing vaccination course for Hepatitis B									
	33	91.7%	43	78.2%	11	78.6%	12	60%	99 (79.2%)	0.126
10- Attending training program regarding biomedical waste management in the past 1 year									
	2	5.6%	5	9.1%	1	7.1%	14	70%	22 (17.6%)	**0.000**
Satisfactory practice score (≥ 60% item correct)									
	26	72.2%	44	80%	8	57.1%	15	75%	93 (74.4%)	0.364

3.5 Association between Knowledge, Attitude and Practice

One of the objectives of this study was to establish if there is any relation between knowledge with practice, and attitude with practice among the health care workers of a secondary hospital in Buraimi governorate towards the biomedical waste management. The knowledge, attitude and practice scores are *"dichotomized"* in to "satisfactory" and "unsatisfactory" data to measure associations and chi-square test (P-value) was applied to determine the "statistical significance" of any association between the three variables. Statistically there was no significant "association" found between dichotomized variables of knowledge and practice (P=0.264), and attitude and practice (P=0.147), (Table 5).

Table 5. Association of knowledge with practice and attitude with practice

		Practice		**P-value**
		Satisfactory≥60%	Unsatisfactory<60%	
Knowledge	Satisfactory≥60%	78 (76.5%)	24 (23.5%)	0.264
	Unsatisfactory<60%	15 (65.2%)	8 (34.8%)	
Attitude	Satisfactory≥60%	87 (76.3%)	27 (23.7%)	0.147
	Unsatisfactory<60%	6 (54.5%)	5 (45.5%)	

4. Discussion

This Cross sectional descriptive study was a unique opportunity to provide information about a topic which is considered as global issue by many researchers (McDougall, White, Franke, & Hundle, 2001). This study also can be useful to recognize the gaps and necessary action needed in future for modification of biomedical waste management at different levels in hospital.

The study observed that knowledge about the biomedical waste documents and legislation in the hospital was significantly higher among nurses than doctors, laboratory technicians and housekeeping staff. In contrast to a study conducted in Middle East, Cairo Egypt, it was found that housekeeping staff was significantly better knowledge than nurses and physicians about the existence of departmental plans and a hospital system for waste disposal (Hakim, Mohsen, & Baker, 2014). In a similar study conducted in India, it was observed that knowledge regarding existence of biomedical waste management rules was better among doctors than nurses or paramedical staff (Mathew, Benjamin, & Sengupta, 2011).

Furthermore, in the current study it was observed that knowledge of color coding segregation of biomedical waste was significantly higher among housekeeping staffs than nurses, laboratory technicians and doctors. On the other hand, a study conducted in 12 private hospitals in 5 different governorate in Sana'a, Yemen showed that waste collectors (housekeeping staff) has poor awareness regarding the biomedical waste handling and also poor awareness about differentiation between biomedical waste and domestic waste management (Al-Emad, 2011).

The overall "satisfactory" knowledge score among nurses (90.9%) was significantly higher than laboratory technicians (78.6%), housekeeping staff (75%) and doctors (72.2%). The result of current study agrees with the result of a study from Bangalore in India, which observed highest percentage of correct knowledge among nurses (61.3%) than doctors (46.6%), non teaching staff (37.7%) and laboratory technicians (27.9%) regarding the proper biomedical waste management.In contrast to another cross-sectional study conducted in Middle East, at Ain Shams University hospital in Cairo Egypt showed that the percentage of doctors (63.3%) with overall "satisfactory" knowledge score was significantly better than that nurses (60.9%) and housekeeping staff (40.4%) (Hakim, Mohsen, & Baker, 2014). Also in contrast to present study, a similar study performed at Al Mansoura University

Hospital in Egypt, it was found that knowledge related to the waste management was better among doctors (36.8%) than housekeeping staff (31.1%) and nurse (27.4%) (Mostafa, Shazly, & Sharief, 2009).

In the current study regarding the attitude of health care workers towards the safe management of biomedical waste, majority of laboratory technicians (92.7%) considered it (BMW) as an issue as compared to nurses (87.3%), doctors (80.5%) and housekeeping staff (80%) but statistically insignificant (P=0.639). Moreover, significantly higher percentage of nurses (92.7%) than doctor's (83.2%), laboratory technicians (64.3%), and housekeeping staff (60%) agreed that the waste management is a team work and no single class of people is responsible for its safe management (P=0.024). Whereas in another study conducted in a tertiary care rural hospital in India, high proportion of housekeeping staff felt that the safe disposal of biomedical waste was an extra burden at work and is entirely the responsibility of the hospital not an individual responsibility. They also felt that the safe management of biomedical waste is not an issue at all (Radha, 2012).

Furthermore, during this study it was found that the attitude of laboratory technicians (100%) towards further strict implementation of biomedical rules was significantly greater than doctors (86.1%) and followed by nurses (72.2%) and housekeeping staff (65%) and was found statistically significant (P=0.040). Compared to a study in India, at a tertiary level health care institution, where doctors (100%) were found more positive towards the need for actions for safe biomedical waste management than nurses (60%) and other health care workers (Sachan, Patel, & Nischal, 2012). Whereas, in another study conducted in India, it was observed that nurses had better attitude regarding implementation of rules, proper separation and disposal of waste than did housekeeping staff and technicians (Shafee, Kasturwar, & Nirupama, 2010).

"Statistically" the overall satisfactory attitude score (91.2%) was statistically insignificant (P=0.346) among the study group, but the overall satisfactory attitude score of nurses (94.5%) was higher than laboratory technicians (92.9%), doctors (91.7%) and housekeeping staff (80%). This may be due to intensive patient care and more involvement of nurses in biomedical waste management, as well as greater responsibilities of nurses allocated by hospital administration towards the biomedical waste management. While comparing with the findings of similar study conducted in Ain- Al Shams hospital University, it showed that overall "satisfactory" attitude score of housekeeping staff (61.9%) was more than nurses (49%) and doctors (56.4%) (Hakim, Mohsen, & Baker, 2014).

The present study revealed that the overall "satisfactory" practice score of nurses (80%) was much higher verses housekeeping staff (75%), doctors (72.2%) and laboratory technicians (57.1%). The result of current study matched with the study of Ain Al shams university hospital which shows that nurses (84.8%) had significantly better practice score than doctors (67.3%) and other health care workers, this might be due to lack of training, lack of interest in participating in training programs and patient overload in Ain Shams university hospital (Hakim et al., 2014). Further, similar study findings were observed in a study of Bangalore India, where nurse's practices towards the biomedical waste disposal were significantly higher than the housekeeping and technical staff (Madhukumar & Ramesh, 2012). Moreover, another study conducted in India it was found that only 25.8% of technical staff verses 45.4% nurses were practicing and following the biomedical waste disposal rules (Shafee, Kasturwar, & Nirupama, 2010).

This current study also tried to explore the association between knowledge with practice and attitude with practice but it was found to be statistically insignificant. Although, it was found that overall nurses satisfactory scores of knowledge, attitude and practices were higher verses other three categories, this can be attributed to their commitment, accountability, intensive patient care and greater role in biomedical waste management allocated by hospital administration. In contrast to an Indian study, nursing professional had low depth of knowledge towards the biomedical waste management but their attitude and practices were much better than physicians (Ajai & Nath, 2013).

Hebel-Ulrich Maja (2005), during a study found that various responses about the knowledge showed that the awareness regarding hygiene persists, but was not practiced. While the study of Saini S, Nagarajan, and Sharma (2005), found that health care workers with advanced education and knowledge have better attitude toward the subjects. Also, Grodzinska-Jurczak, and Friedlein, (2002), found an association among the level of students' knowledge and their activities towards the waste management exist. According to Hakim, Mohsen, and Baker, (2014), importance of orientation programmes and training courses on awareness regarding waste management cannot be ignored.

Another study from Egypt found that the only statistically significant independent predictor of participant knowledge was the presence of health care workers at orientation programs on biomedical waste management but no such association was found with real practices (Mostafa, Shazly, & Sharief, 2009), cited in Hakim, Mohsen and Baker (2014). They also recommended that the majority of awareness programs and training courses should

highlight "theoretical aspects" with several lectures but less practical training. Furthermore, they stated that educational level of housekeeping staff should be taken into consideration before orientation and training programs, because a significant percentage of them are illiterate in developing countries.

The current study may contain *"volunteer bias",* where some participants who had higher knowledge, attitude and practices may have greater response in contrast to those who have lower knowledge, attitude and practices. Due to *"social desirability bias",* probably the participants may not tell the fact particularly towards the questions on attitude and practice. To minimize the *"social desirability bias"* and as well as *"non response"* all participants are assured for their anonymity and confidentiality of reports. Also the study may have *"recall bias"* which the participants had to recall past knowledge to response the questions. Furthermore, to reduce the "recall bias" a stratified random sampling was selected to conduct the study. It was also noticed that the long questionnaire and busy schedules could be source of bias for study.

5. Conclusion

It was concluded from the study that the staff knew about documentation related to rules and regulation of biomedical waste management which needed further strict implementation. Higher percentage of health care workers knew about diseases that are transmitted through mishandling of biomedical waste management. Also it was considered that biomedical waste management is a team work and majority of them followed universal precautions while handling biomedical waste.

It was found during the study that nurses had better "satisfactory knowledge" (90.9%), attitude (94.5%) and practice (80%) scores toward the biomedical waste management in health care institutions as compared to other participants. This may be due to intensive patient care and more involvement in biomedical waste management as well as greater responsibility allocated by hospital administration toward the biomedical waste management. On the other hand, the overall satisfactory scores for knowledge (81.6%), attitude (91.2%) and practice (74.5%) were found to be statically insignificant (P=0.100, P=0.346, P=0.364 respectively). Also, there was no statistically significant association found between knowledge with practice (P=0.264) and attitude with practice (P=0.147). This further identifies the gap between awareness and practice and also positive attitude is needed to be translated into better practices at various levels in a secondary hospital of Al Buraimi Governorate.

Recommendations

Intensive awareness and advance training programs for all health care workers according to their awareness level should be carried out at regular time interval who are directly involved in the management of BMW in order to improve the skills. Development and implementation of new updated national policies and guidelines should be considered regarding biomedical waste management. In addition, it is recommended to allocate the tasks and responsibilities to focal persons in order to properly monitor the biomedical waste management on the basis of guidelines.

During literature review, it was found that there was no such previous studies were conducted within county so wide based observational studies are needed to carry out in other regional secondary and tertiary hospitals in Sultanate of Oman to compare as well as to generalize the results.

Study Limitation

The overall response rate was 60% because of busy work schedule, time factor and annual leaves. The research may influenced by *"social desirability bias"* which the participant may not tell the truth due to surrounding social pressure. Due to tight schedules and time factors majority of participants completed the questionnaire at home and return back it after one week.

There is possibility that participants may complete the questionnaire with assistance either from their colleagues or other sources for example internet. Also, some subjects among the target population would not be interested to participate due to less knowledge thus increase the *"non response bias"*. The long questionnaire could be one of the reasons for low response rate and might be contributed to insignificant associations between knowledge with practice and attitude with practice. Since, the study is limited to one hospital so the study findings cannot be generalized to other hospitals or region of country.

Authors Contribution

AYMDAB composed the manuscript and planned the study; MMU worked on methodology and did the final revision with critical review; AAAM, FSAA & MK did the data collection and management; and HMAG accomplished the interpretation of results and statistical analysis.

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Competing Interests Declaration

There is no conflict of interest among authors and authors have no actual or potential competing financial interest and research was approved by National Research and Ethical Review & Approve Committee, Ministry of Health, Sultanate of Oman.

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In-Vitro Antimicrobial Activity of Herbal Extracts From Tabuk Region (Kingdom of Saudi Arabia) Against Nosomial Pathogens: A Preliminary Study

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Abstract

Aim: The study aims to investigate the antimicrobial activity of herbal extracts from Tabuk region against nosocomial pathogens.

Material and Methods: The plants included in this study were collected according to United States Department of Agriculture (USDA). The plants were grinded into fine powder using electric grinder, and the powder was transferred into air tight containers. Extracts of this powder was prepared in form of stock solution that was further used for preparing solutions of different concentrations. Antibacterial tests including minimum inhibitory concentration and maximum bactericidal concentration, broth dilution method, and well-diffusion method were performed.

Results: The current study has determined the herbs that possess antimicrobial activity against the most common nosocomial pathogens. The sample extracts including Achinella fragrantissima, Artemisia judaica, Caralluma quadrangular, Cleome droserifera, Rhyza stricta, Moringa, and Ochradenus baccatus were tested for organisms including; Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus, and Candida albicans. The results have depicted positive anti-microbial activity of herbal shrubs.

Conclusion: The results have demonstrated positive and promising anti-microbial activities against the nosocomial pathogens.

Keywords: anti-bacterial tests, anti-microbial activity, bacteria, fungi, herbal extracts, nosocomial pathogens

1. Introduction

The occurrence of infections can be widely viewed through myriad fungi or bacteria, which becomes a cause of severe illness. In Saudi Arabia; the studies related to nosocomial infections are limited. Studies have reported around 48% nosocomial infections among the Saudi patients (Abdel-Fattah, 2005; Sabra & Abdel-Fattah, 2012). The most important bacteria and fungi causing systemic infections reported by CDC included Escherishia coli, Klebsiella Sps, Pseudomonas aeruginosa, Salmonella Sps., Staphylococcus aureus, and Candida in United States (Centres for Disease Control and Prevention, 2013). The nosocomial infections include fungal and bacterial infections, and are aggravated by the reduced antibiotic susceptibility of the microbe. The acceleration of drug resident pathogens is emerged increasingly, leading to challenge the efficacy of essential antimicrobial treatment. Thereby, the development and replacement of new drugs are outpaced through the speed with which these drugs are lost. Certainly, the implications of these pathogens surpassed a renaissance of severe infections, threatening number of life-prolonging and life-saving interventions, including organ transplantations, cancer treatments, and sophisticated surgical operations. According to Scott (2009), the hospitals have instigated hotbeds to control the accelerating extent of severe infections and to restructure the existing procedures.

World Health Organization (WHO) has taken a positive step to combat drug resistance by setting out measures for governments and their national partners. The development of new tools and foster innovation are important measures in the policy of WHO. The instigation of these schemes was appropriate to encourage the drug industry for developing new antimicrobial drugs for future illnesses. Conversely, pharmaceutical companies have

immensely used herbal medicine for drug preparation. Herbalism is a traditional practice of medicine, which is relied on the plants' usage and their extracts. There are a number of herbal medicines used by physicians; such as quinine, opium, digitalis and aspirin. In its report, WHO has reported that physicians in United States are using 25% of modern drugs extracted from plants (Llewellyn et al., 2010). Plant extracts are the most promising source of such compounds and Arab world has been known for its medicinal herbs.

Tabuk province has rich habitats for plant growth owing to favorable climate of the North western region of Saudi Arabia. The database search on world-wide-web showed Tabuk region of Saudi Arabia to be rich in diverse flora (Llewellyn et al., 2010). Its floral diversity extends over a number of regions including; the Jabal Lauz of Hijaz Mountains, the Great Nafud and Ar'ar regions, Deesa, and Harrat-ar-Raha nature reserve, which are distributed as wadis, hills, and plains. According to Llewellyn et al. (2010), pharmaceutical companies have launched an important plant area (IPA) in the Arabian Peninsula. The vegetation of Tabuk region is mainly composed of chinopods along with other xerophytic vegetation. Significant literature is available for the plants, which possess potential medicinal benefits.

2. Materials and Methods

2.1 Plant Identification and Collection

The plants were collected according to the guidelines of United States Department of Agriculture (USDA). The samples of collected plants were submitted to the department of Biology (Botany), Faculty of Science, University of Tabuk, for their identification. Table 1 has discussed 7 plants that are selected and perceived in the current study.

Table 1. Details about seven selected plants

Plant name	Effect/ traditional use	Reference
Cleome droserifera	For treatment of wounds.	7
Rhazya stricta	Antimicrobial against ESBL producing pathogens.	8
Ochradenus baccatus	Antimicrobial action studied limits only to fish pathogens.	10
Artemisia judaica	Antihelmenthic action stated, but antimicrobial remains unexplored.	11
Achillea fragrantissima	Used as traditional anti-helmenthic medicine. Antimicrobial action unexplored.	13
Caralluma quadrangula	Invitro cytotoxic action studied, antimicrobial activity unexplored.	14
Moringa leaves	Minimum studies available.	-

2.2 Preparation of Extracts

The dirt and unwanted substances were removed from the collected plants by washing them gently with distilled water. The plants were dried in shade at room temperature. Care was taken to retain the activity of heat labile components of the plants during drying. The air-dried plants were crushed in the mortar and pestle. Electric grinder was used for further grinding of plants into fine powder. The obtained powder was transferred to air-tight containers, labelled, and stored in the laboratory away from sunlight.

The plant extracts were prepared by following the method described by Pinelo et al. (2009) with few modifications. The sample powder weighed 250-300 g and was soaked in 2 liters of 80% methanol in a conical flask. The conical flasks were placed in the water bath at 40 ºC for 24 hours with constant shaking. The extract mixture was strained using double layer cheese cloth. The obtained filtrate was further filtered using double layered Whitman filter paper. The filtrate was concentrated under reduced pressure at 35 ºC using the Bucchi system. Further, the concentrated extracts were subjected to vacuum at -30 ºC for 3 to 4 days to yield a solid or thick paste like product, which was refrigerated until used. The paste was dissolved in DMSO to prepare the stock solution of 1000 mg/ml concentration. The stock solution was used to prepare the different concentration solutions (500 mg/ml, 250 mg/ml, 125 mg/ml) for antimicrobial assays.

2.3 Antimicrobial Assays

Crude methanol extracts of the collected herbs were used as test material. American Type Culture Collection

(ATCC) strains of Escherichia coli, Pseudomonas aeroginosa, Staphylococcus aureus and Candida albicans were used. All microbial work was conducted in accordance with guidelines of the NCCLS.

2.4 Antibacterial Tests

2.4.1 Minimum Inhibitory Concentration and Maximum Bactericidal Concentration

Minimum inhibitory concentration (MIC) of each herbal extract was determined with strains grown in cation adjusted Muellor-Hinton broth by Macrobroth dilution method according to NCCLS guidelines. The crude extracts tested were between 10000 mg/ml to 100 mg/ml.

2.4.2 Broth Dilution Method

Broth macro dilution is one of the most basic antimicrobial susceptibility testing methods. The procedure involves preparing dilutions of the antimicrobial agent in a liquid growth medium dispensed in tubes containing a minimum volume of 2 ml. Each tube is inoculated with a microbial inoculum prepared in the same medium after dilution of standardized microbial suspension adjusted to 0.5 McFarland scale. The inoculated tubes were incubated at 37 ^{o}C for 24 hours after well-mixing.

According to Balouiri et al. (2016), the growth of the organism is inhibited through the lowest concentration of antimicrobial agent MIC as reported by unassisted eye. The most common estimation of fungicidal activity or bactericidal activity is the minimum lethal concentration (MLC). The MLC is also determined as a minimum fungicidal concentration (MFC) or minimum bactericidal concentration (MBC). The lowest concentration of antimicrobial agent is considered as MBC, which is used for killing 99.9% of the final inoculum under a standardized set of conditions after 24 hours incubation. The number of surviving cells is determined after incubation of 24 hour as negative microbial growth is yielded through the MBC.

2.4.3 Well-Diffusion Method

According to Balouiri et al., (2016), the antimicrobial activity of plants extracts is evaluated through this widely used method. A volume of the microbial inoculum over the entire agar surface is spread to inoculate the agar plate surface, likely to the procedure included in disk-diffusion method. A sterile cork borer or a tip is aseptically punched with a volume of the extract solution and a hole of a 6 to 8 mm diameter (at 1000 mg/ml, 500 mg/ml, 250 mg/ml, 125 mg/l concentration) was dissolved in DMSO. The agar plates were incubated at 37 ^{o} C for 24-48 hours. The growth of the tested microbial strain was inhibited through no growth showing zone. The zone showing no growth of the tested microorganism was measured and noted as zone of inhibition. 50 µl of DMSO was used as negative control; while, ceftriaxone was used as positive control.

3. Results

The selection of plants for this study was dependent on available literature of herbs with antimicrobial properties. The anti-bacterial mechanism has been studied to determine active ingredients that are responsible bacterial cell death. A total of 5 extracts including Achinella fragrantissima, Artemisia judaica, Caralluma quadrangular, Rhyza stricta, and Moringa were prepared. These sample extractions were tested for organisms including; Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus, and Candida albicans. The other herbal extracts that were tested and showed either had no or less antimicrobial activity against the tested organisms. Table 1 depicts the literature available for the tested herbs.

Table 2 has depicted overall anti-microbial activity of the herbal shrubs and mentioned the organisms that have been tested in the study. The table has also mentioned the quantity of extraction in ml. Table 3 has clearly indicated the herbs, their concentration, and results in the form of inhibitory zones shown by the organisms that were tested in this study.

Table 2. Antimicrobial activity of herbal extracts

Extract	Organism tested	MIC	MBC
Achinella fragrantissima	Escherichia coli	250 mg/ml	125 mg/ml
	Pseudomonas aeruginosa	250 mg/ml	125 mg/ml
	Staphylococcus aureus	1000 mg/ml	500 mg/ml
	Candida albicans	500 mg/ml	250 mg/ml
Artemisia judaica	Escherichia coli	250 mg/ml	125 mg/ml
	Pseudomonas aeruginosa	500 mg/ml	250 mg/ml
	Staphylococcus aureus	1000 mg/ml	500 mg/ml
	Candida albicans	1000 mg/ml	500 mg/ml
Caralluma quadrangula	Escherichia coli	500 mg/ml	250 mg/ml
	Pseudomonas aeruginosa	500 mg/ml	250 mg/ml
	Staphylococcus aureus	1000 mg/ml	500 mg/ml
	Candida albicans	1000 mg/ml	500 mg/ml
Rhyza stricta	Escherichia coli	500 mg/ml	500 mg/ml
	Pseudomonas aeruginosa	500 mg/ml	250 mg/ml
	Staphylococcus aureus	1000 mg/ml	500 mg/ml
	Candida albicans	1000 mg/ml	500 mg/ml
Moringa	Escherichia coli	1000 mg/ml	500 mg/ml
	Pseudomonas aeruginosa	1000 mg/ml	500 mg/ml
	Staphylococcus aureus	1000 mg/ml	500 mg/ml
	Candida albicans	1000 mg/ml	500 mg/ml

Table 3. Zones of inhibition obtained from the tested herbal extracts by agar well diffusion method

Herb	Concentration of the extract	Microorganisms tested			
		Escherichia coli	Pseudomonas aeruginosa	Staphylococcus aureus	Candida albicans
Achinella fragrantissima	1000 mg/ml	16.33+/-0.81	9.5+/-0.54	28.33+/-0.81	26.83+/-0.72
	500 mg/ml	15.33+/-0.51	9+/-0	26.5+/-0.54	24.83+/-0.40
	250 mg/ml	4.83+/-0.40	7.5+/-0.54	23+/-0.63	20.5+/-0.54
	125 mg/ml	R	R	21.5+/-0.83	18.5+/-0.54
Artemisia judaica	1000 mg/ml	16.33+/-0.51	26.16+/-0.40	36+/-0.63	33.16+/-0.75
	500 mg/ml	14.16+/-0.40	25.16+/-0.75	34.33+/-0.81	32.16+/-0.40
	250 mg/ml	10.83+/-0.40	23.83+/-0.40	32.16+/-0.75	29.5+/-0.54
	125 mg/ml	9+/-0	21.5+/-0.54	32.66+/-0.51	27.66+/-0.51
Caralluma quadrangula	1000 mg/ml	22.16+/-0.40	23.33+/-0.51	32.83+/-0.40	33.83+/-0.40
	500 mg/ml	20.16+/-0.40	21.16+/-0.40	30+/-0	28.33+/-0.51
	250 mg/ml	16.66+/-0.51	18.5+/-0.83	27.16+/-0.40	24.16+/-0.40
	125 mg/ml	13.16+/-0.40	15.33+/-1.1	24.33+/-0.51	19.83+/-0.40
Rhyza stricta	1000 mg/ml	14.66+/-0.51	20.5+/-0.54	27.5+/-0.54	31.83+/-0.75
	500 mg/ml	12.16+/-0.40	18.83+/-0.40	22.66+/-0.51	29.16+/-0.40
	250 mg/ml	11.16+/-0.40	17.16+/-0.40	19.83+/-0.40	25.83+/-0.40
	125 mg/ml	8+/-0	8+/-0	15.83+/-0.40	23+/-0.63

Moringa	1000 mg/ml	19.83+/-0.40	23.16+/-0.40	35.33+/-0.51	33.66+/-0.51
	500 mg/ml	17.16+/-0.40	21.33+/-0.51	31.33+/-0.51	27.83+/-0.75
	250 mg/ml	14.83+/-0.16	18.66+/-0.51	28.83+/-0.40	23.83+/-040
	125 mg/ml	10.5+/-0.54	16.16+/-0.40	24.5+/-0.54	20.5+/-0.21

4. Discussion

The antimicrobial activities of these extracts have been determined through MIC and disk diffusion methods. A study conducted by Su, et al. (2015) revealed that ethyl ether extraction from Polygonum cuspidatum tends to provide a promising and capable agent for therapeutic applications against nosocomial pathogens. The drug resistant gene transfer occurs due to the spread of drug resistant bacteria among different hosts. A study clearly stated that Staphylococcus aureus, Acinetobacter baumannii, and Pseudomonas aeruginosa are the most common drug resistance and nosocomial infection strains. The infection rate of these organisms is as high as 50% (Edelsberg et al., 2014).

A study conducted by Hayat et al. (2009) stated Artemisia judaica as diverse and important genus of family Asteracea. It tends to display increased diversity within the temperate areas of northern and southern hemisphere. A study presented results that supported future research on Artemisia judaica including its synergistic and antimicrobial properties. These herbs are extensively applied in the field of medicine, food industry, and agriculture (Janackovic et al., 2015).

Muhaidat, et al. (2015) represented the antibacterial activities and phytochemical composition of important oils, extracted from two jordanian cleome species Cleome species, C. *droserifolia* and C. *trinervia*. The report has duly indicated that a number of defense substances are developed through Cleome species while pathogenic microbes are defended through these Cleome species. Thereby, it is recommended that the development of tools against both nosocomial and drug-resistant microbial pathogens is clearly worthy from the discovery of Cleome specie.

Khan, et al. (2016) have examined the organic, non-alkaloid and crude extracts impact on the methicillin-resistant Staphylococcus aureus (MRSA) pathogens as extracted from Rhazya stricta leaves. The antimicrobial activities have been proven through the leaves of medicinal plant R. stricta alongside MRSA clinical isolates. This extraction was entirely based on the 1% agarose well-diffusion method and TEM. Thereby, it is recommended that MRSA infections might be potentially treated through R. stricta leaves as new antimicrobial compounds.

Abdel-Rahman, et al. (2015) has explored the efficacy of existing medicinal claims with respect to Egyptian folk medicine. An anti-inflammatory activity is exhibited through A. *fragrantissima* in a carrageenan-induced paw edema of a rat model. The study has shown the efficacy of writhing tests and hot plate tests for exhibiting the analgesic activity of extracts. The study has revealed protective effects of the extracts alongside rat gastric ulcer and ulcerative colitis. In addition, peripheral analgesic and central activities are possessed through A. *fragrantissima* to ward off gastric and colonic tissues.

In the context of anticancer drug candidate, Jung (2014) has focused on entirely on the potential of water-soluble MOL extracts. Compounds with the highest anticancer activities often possess bulky hydrophobic clusters throughout their chemical structures, which render water insoluble in the field of development process and anticancer drug discovery (Sidduraju & Becker, 2003). It is identified that severe therapeutic challenges and formulation issues are led by low water solubility. Due to the precipitation of the drug, serious complications are resulted through inappropriate soluble drug administration, which include respiratory system failure and embolism. New water-soluble MOL extracts were focused and examined as an anticancer drug candidate under the study. The increase in resistance among the strains leads to outbreak, if severe nosocomial infections occur. Therefore, the present study has targeted common drug-resistant strains of nosocomial infections for exploring their antimicrobial activity.

In the developing countries, the control of infectious diseases in communities and hospitals is acquired by multi-drug resistant gram-positive and gram-negative bacteria. There is an increase in the implication of different nosocomial infection, which include; urinary tract infections, bacteremia, and nosocomial pneumonia (Radj et al., 2013). Cross-resistance among these bacteria makes the treatment of certain infections difficult along with a large group of activities. Therefore, the exploration of new sources of natural compounds has become easy with anti-bacterial activity against them.

The basis of natural products and traditional medicine system has provided excellent leads for the development of new drug. The anti-microbial activity tends to provide main basis for the therapy of different fungal and bacterial

infections. The discovery of anti-microbial agents eventually leads to eradication of the infectious diseases. The overuse of these drugs results in the emergence and dissemination of multi-drug resistant strains belonging to different groups of micro-organisms (Harbottle et al., 2006). The results of the current study showed that the tested herbal extracts increased zone of inhibition in the gram-positive organisms like Staphylococcus aureus and Candida albicans (Table 3). This could be in favour of the study conducted by Walsh, et al. (2003), which stated that the impact of antimicrobial activity is associated with the inhibition of various cellular processes. These processes are followed by increase in the permeability of plasma membrane, which might result in the leakage of ions from the cells.

Similar to the present study, Khan, et al. (2009) showed that majority of MIC (Minimum Inhibitory Concentration) values of the extracts were decreased as compared to MFC (Minimum Fungicidal Concentration) values. These results clearly stated that the extracts were responsible for inhibiting the growth of test micro-organisms, when the bacteria and fungi are present at higher concentrations. It is believed that plants are an alternate to battle the spread of multidrug resistant micro-organisms after the emergence of antibiotic resistant pathogens in hospitals as well as homes. These herbal extracts may be applicable and work, efficiently where the modern antibiotic therapy fails. Moreover, appropriate activity of the crude plant extracts has been observed against the multidrug resistant strains.

5. Conclusion

The infection caused by nosocomial pathogens results in mild to severe life-threatening illnesses. The study has assessed antimicrobial activities of five plant extracts against the multidrug resistant (MDR) strains. The failure of essential microbial treatment has failed as a result of emergence and spread of drug resistant pathogens. The results have demonstrated promising antimicrobial activities against the most predominant nosocomial pathogens. The use of these plants for treating various diseases has been supported by the gathered results. The plant extracts can also be used for obtaining new and effective herbal medicines for treating infections caused by multidrug resistant strains of certain micro-organisms. Moreover, the results have presented significant positive anti-microbial activity of the herbal shrubs against nosocomial pathogens. The active components of the extracts may be identified and tested separately to focus on the active compound with antimicrobial activity, which could be used as a sole antimicrobial compound or as an additive to the currently used antimicrobials.

Declaration

The authors declare no conflict of interest. The authors alone are responsible for the content and writing of this manuscript.

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Community-Based Maternal and Neonatal Health Services in Kolda and Sedhiou Districts of Senegal

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Abstract

Introduction: A recent assessment of the Millennium Development Goals has shown significant gaps in most developing countries, particularly with regard to the decline in maternal and infant mortality. Unaccess to health services is a major obstacle to reducing maternal and infant mortality. To support the Ministry of Health and Social Action in the implementation of its Strategic Plan for Reproductive Health (2012-2015), the NGO Micronutriment Initiative has developed a project based on Community-based Maternal and Neonatal Health services (CBMNH), which will be implemented at the level of the Kolda region. The general objective of this study is to carry out a situational analysis of maternal and neonatal health in the health districts of Kolda and Sedhiou to help the implementation and the evaluation of the project.

Method: It was a descriptive and analytical cross-sectional survey. The study included women who gave birth between February 2013 and January 2014. The sampling was random at two degrees. The sample size was 471 women for each of the two health districts. The data collected during an individual interview focused on prenatal consultation (PNC), delivery, postnatal consultation (PONC) and exclusive breastfeeding (EBF). The quantitative analysis of the data consisted of the estimation of the main indicators, the comparison of the indicators between the health district of Sedhiou and the health intervention district of Kolda. Multivariate analysis identified factors associated with PNC, delivery, and EBF.

Results: In total, 965 women were interviewed. The results of the study show that the average duration of PNC1 ranged from 3.41 months in Sedhiou to 3.82 months in Kolda. The proportion of women with full PNC was 38.8% and 54.9% respectively in Kolda and Sedhiou. The proportion of women who took iron-folic acid for at least 90 days ranged from 78.8% (Sédhiou) to 71.7% (Kolda). The delivery was carried out by trained staff in 61.0% and 57.4% respectively in Kolda and Sedhiou. The EBF was initiated in the first hour in 47.0% (Kolda) and 52.6% (Sédhiou).

The results of the multivariate analysis showed that the early use of PNC services was related to low household income (0.65 [0.50-0.86]), proximity to the health facility (1.93 [1.34-2.78]) and multiparity (1.4 [1.05-1.87]). Completion of all PNC was associated with household income and early PNC1 (3.65 [2.58-5.18]). With regard to iron-folic acid intake, it was more common in women who achieved early PNC1 (2.19 [1.58-3.04]) and all PNC (3.58 [2.22- 5.77]). The delivery by trained personnel was related to the proximity of the structure (2.43 [1.75-3.37]), but also to the preparation of the delivery. Women who knew the period of the MBF (1.37 [1.04-1.81]) and the protective role of the EBF (1.71 [1.28-2.27]) started their children early at the EBF.

Conclusion: The results of the study show that the use of reproductive health services was linked to environmental, economic, cultural and structural factors. Improving the accessibility of these services requires joint action by the government, NGOs, community actors and the involvement of the population. This will be done through the construction, equipping and rehabilitation of health facilities, strengthening the knowledge of providers, community actors, women and support groups.

Keywords: maternal and neonatal health, community-based services, health districts, Senegal

1. Introduction

The maternal and child health is a major concern in developing countries. This interest is justified by the importance of maternal and infant mortality. Among the indicators monitored by WHO, it is at the level of these two targets that we note the greatest difference between the high et low resource countries. According to the WHO, most maternal and infant deaths (99%) occur in developing countries, more than half of them in sub-Saharan Africa (WHO, 2012). A recent assessment of the Millennium Development Goals (MDG) has shown significant gaps in most developing countries [UN 2013]. In Senegal, the maternal mortality rate is 392 deaths per 100,000 live births and the neonatal mortality rate is 29 deaths per 1,000 live births (National Agency of Statistics and Demography, 2012).

The factors related to maternal and infant mortality are well documented because they have been the subject of several studies (Khan et al., 2006). It is noted that deliveries sometimes occur in bad conditions of asepsis, complications are diagnosed late and evacuation to health facilities for better care is often very difficult. In Senegal, 26.8% of deliveries take place at home and the situation is more worrying in rural areas (39.2%) (Ministry of Health, Public Hygiene and Prevention, 2012). Under these conditions, newborns often benefit from precarious care. To all these factors is added the geographical and financial inaccessibility. Even when care is available, it is difficult to access because of the precarious economic situation of the populations. Households have few resources because almost half live below the poverty line. And when these resources are available, they are directed to other areas deemed to be priorities. The policy of the State of Senegal is to provide quality care as close as possible to the population through health structures and community-based services. According to WHO, about 80% of maternal deaths are due to severe bleeding, infections, high blood pressure and abortions (WHO, 2012); these deaths could be avoided through the implementation of key interventions offered as part of a continuum of care linking families and communities to health systems.

To accelerate progress in reproductive health, the Ministry of Health and Social Action of Senegal (MHSAS) has developed its Strategic Plan for Reproductive Health 2012-2015, whose objectives are focused on strengthening the community component of interventions to improve access to maternal and neonatal health (Ministry of Health, Public Hygiene and Prevention, 2012). It is within this framework that the Micronutriment Initiative (MI) is providing support to the MHSAS to help operationalize the implementation of this approach through a process that includes conducting a situational analysis at the national level.

The general objective of this study is to make a situational analysis of maternal and neonatal health in the districts of Kolda and Sedhiou before the implementation of the intervention.

2. Methodology

2.1 Quotation

In this study, the goal is to perform baseline measurements and compare indicators and baseline characteristics between intervention and control areas. The study was carried out in the Kolda district selected as an intervention zone. The control district was chosen in the region of Sedhiou. According to the characteristics of the three districts of this region, that of Sedhiou seems the most appropriate because of its geographical location, socio-cultural similarities, the situation of health indicators, and the isolation of certain areas. Thus, the intervention district was compared to the control district during the baseline measurement and secondarily to assess the effectiveness of the intervention.

In this present study, the aim is to do the situational analysis, that is to say the pre-test through a descriptive and analytical transversal study.

2.2 Study Population

It is represented by all women of reproductive age in health districts of Kolda and Sedhiou.

2.3 Sampling

A two-stage random survey was conducted. The first degree consisted of the census districts (CD) of villages or neighborhoods and the second degree by women who had a newborn in the 11 months preceding the survey.

a. The Statistical Unit

Women who gave birth during the 11 months preceding the survey.

b. Inclusion Criteria

Was included in the study, any woman who gave birth:

• A live or lifeless child at birth following a delivery in the health districts of Kolda and Sedhiou;

• During the 11 months preceding the survey.

c. The Criteria of Non-Inclusion

Was not included any woman:

• Absent during two passes;

• Or refusing to give consent and / or assent to the interview.

d. The Size of the Sample

It was estimated on the basis of a 95% confidence interval (α= 0.05 and 1-β = 0.9), calculated according to the method of Casagrande and Pike- [Casagrande JT, Pike MC, Smith PG. 1978], and a non-response rate estimated at 5%.

e. The Sampling Method

For the recruitment of statistical units, a two-stage random survey was conducted.

• First-degree sampling

This sampling consists of selecting the census districts (CD) to be included in the study.

It was necessary to randomly draw the number of CDs for each SD from the updated list of all DRs in the districts of Kolda and Sedhiou.

The random selection of the DRs was done using the Emergency Nutrition Assessment (ENA) software for each district.

• Second degree sampling

This sampling concerns the selection of women in the CDs. The selection of the statistical units was made by a draw of the villages or districts composing each CD. Thus, at the level of each selected neighborhood or village, all the women fulfilling the selection criteria were chosen until the necessary number was reached.

2.4 Key Variables of the CBMNH Project of Kolda

at. Key variables

The data collection focused on the key variables of the CBMNH project of Kolda project.

• The prenatal consultation

She was appreciated on the number and the period of the first PNC (PNC1). This information is collected during the individual interview with the woman and the exploitation of the pregnancy logbook. NPC knowledge and practices were appreciated.

• Iron and folic acid

The use of iron and folic acid was appreciated by the individual interview and the exploitation of the pregnancy logbook.

• Childbirth performed by trained staff

Delivery by trained staff was appreciated during the individual interview with the woman, the collection of the place of delivery and the person who assisted the woman.

• Exclusive Breastfeeding (EBF)

Breastfeeding should be exclusive for up to six months. It must also be initiated just in the first hour of birth. These aspects were sought during the individual interview with the woman. Knowledge about breastfeeding has also been sought.

2.5 Data Analysis

The data was analyzed with the R Software Survey package or the Stata software. This was done for univariate, bivariate and multivariate analysis. The data analysis consisted of two parts: a descriptive part and an analytical part.

Descriptive part

Qualitative variables were described with 95% frequency and confidence interval and quantitative variables by the average, confidence interval, and standard deviation.

Analytical part

It allowed the comparison of the main indicators between the intervention district and the control district.

• The bivariate analysis was done using the following statistical tests: the Khi² for the comparison of the proportions, the Student or the ANOVA for the comparison of the averages. When distributions were not normal, Mann Withney and Kruskall Wallis non-parametric tests and Fisher's exact test were used.

This bivariate analysis also identified the factors associated with the key variables.

• A multivariate analysis was used to account for confounders.

This multivariate analysis allowed to model the key variables of the study that constituted the dependent variables. The explanatory variables related to personal characteristics, knowledge and practices in sexual and reproductive health.

The model was developed using the approach described by Hosmer and Lemeshow (Hosmer & Lemeshow, 1989). All explanatory variables whose p are less than 0.25 were considered for the final model. The variables that were not selected (except those whose p are greater than 0.8) were introduced one by one and the model comparison was made by the likelihood ratio. Then, by a descending procedure, the least significant variables were removed one by one, and the comparison was made by the likelihood ratio test. Confusion was sought by a decrease of more than 10% in the beta coefficient (Greenland, 1989).

2.6 Ethical Considerations

Newsletters were sent to the various administrative authorities. At each district level, the administrative and local authorities have been informed. Informed consent was sought from all persons 18 years of age and older participating in the study. For persons under the age of 18, the consent of the parents or guardian has been requested, together with their consent.

They have been informed beforehand of the personal health questions that will be asked.

The identity of the individuals who consent to participate was noted on a specific card and kept in secret. In all subsequent uses of the results, anonymity will be respected, no information to find a participant will be included. The approval of the National Ethics Committee for Health Research in Senegal was obtained before the start of field activities.

3. Results

3.1 Descriptive Parts

Table 1. Distribution of women by health districts

Health District	**N**	**%**
Kolda	484	50,2
Sedhiou	481	49,8
Total	965	100,0

A total of 965 women were interviewed.

Characteristics of mothers

Table 2. Main characteristics of the mothers of the 2 health districts

	KOLDA		SEDHIOU	
	%(IC95%)	N	% (IC95%)	N
Mother's logbook				
Logbook available	80,5[76,7-83,9]	389	76,0[71,9-79,7]	364
Notebook not available	14,5[11,5-18,0]	70	20,0[16,6-24,0]	96
No logbook	05,0[03,3-07,4]	24	04,0[02,5-06,2]	19
Child birth logbook				
Logbook available	78,4[74,4-81,9]	377	77,8[73,7-81,4]	371
Logbook not available	09,6[07,2-12,6]	46	15,7[12,6-19,4]	75
No logbook	12,1[09,4-15,4]	58	06,5[04,5-09,2]	31
Schooling				
None	59,5[55,0-63,9]	287	64,7[60,2-69,0]	310
Primary	25,7[21,9-29,9]	124	20,0[16,6-24,0]	96
Secondary	14,3[11,4-17,8]	69	14,6[11,6-18,2]	70
Higher	00,4[00,1-01,7]	2	00,6[00,2-02,0]	3
Income generating activities				
Yes	40,0[35,6-44,5]	193	50,7[46,0-55,3]	232
The Head of household income				
Inferior to 50000	51,8[47,2-56,3]	250	63,3[58,7-67,7]	288
50000-100000	32,8[28,7-37,3]	158	26,1[22,1-30,6]	111
100000-200000	13,1[10,3-16,5]	63	11,3[08,5-14,8]	48
Superior to 200000	02,9[01,7-05,0]	14	02,9[01,6-05,1]	12

Property owned by the household

Table 3. Main household possessions in the 2 health districts

Socio-economic characteristics	KOLDA		SEDHIOU	
	%(IC95%)	N	% (IC95%)	N
Energy consumed by the household				
Electricity	01,7[0,8-03,4]	8	10,2[07,7-13,4]	49
Bottle gas	00,6[2,2-02,0]	3	01,0[00,4-02,6]	5
Coal	15,7[12,7-19,4]	76	21,7[18,1-25,7]	104
Firewood	81,6[77,8-84,9]	394	59,8[55,2-64,2]	287
Main source of drinking water				
Tap water	06,6[04,6-09,3]	32	08,5[06,3-11,5]	41
Pump well	02,1[01,1-03,9]	10	04,2[02,6-06,5]	20
Well dug	89,9[86,7-92,3]	434	84,2[80,5-87,3]	404
Rainwater	01,2[00,5-02,8]	6	03,1[01,8-05,2]	15
Toilet type				
Flush valve	06,4[04,5-09,1]	31	04,2[02,6-06,5]	20
Latrines	84,1[80,4-87,1]	406	75,1[70,9-78,8]	361
No toilet-bush	09,1[06,8-12,1]	44	15,2[12,2-18,8]	73

Knowledge and advice received by women

Table 4. Distribution of women according to the knowledge and advice received in the 2 health districts

	KOLDA		SEDHIOU	
	%(IC95%)	N	% (IC95%)	N
Interest of EBF				
Ensure healthy food for the child	47,9[43,4-52,5]	232	55,3[50,7-59,8]	266
Protect the child against infections	54,3[49,8-58,8]	263	51,4[46,8-55,9]	247
Protect the mother against close pregnancies	16,5[13,4-20,2]	80	15,6[12,5-19,2]	75
PNC performed during pregnancy				
Number of PNCs to be performed during pregnancy (4)	74,2[70,0-78,0]	359	73,4[69,2-77,2]	353
Medication used to fight anemia				
Folic Acid Iron Association	97,3[95,3-98,5]	471	92,5[89,7-94,6]	445
Medication used to fight bleeding				
Misoprostol	02,1[01,1-03,9]	10	04,0[02,5-06,2]	19
Health program				
Attendance at an awareness session	77,1[73,0-80,7]	373	50,3[45,8-54,9]	242
Aspect addressed awareness				
Theme on the health of mother and child	47,5[43,0-52,1]	230	25,4[21,6-29,5]	122
The preparation of the birth				
Choice of the person who will attend the delivery	23,6[19,9-27,6]	114	22,2[18,7-26,3]	107
Choice of place of delivery	34,5[30,3-39,0]	167	40,1[35,7-44,7]	193
Purchase and storage of soap	52,5[47,9-57,0]	254	47,4[42,9-52,0]	228
Money for emergency	53,9[49,4-58,4]	261	51,8[47,2-56,3]	249
Preparation of clean linen	71,9[67,6-75,8]	348	61,1[56,6-65,5]	294
At least 4 PNC				
Advice implementation 4 CPN	78,7[74,7-82,2]	381	69,4[65,1-73,5]	334
Advice				
Advice on importance taking iron	96,1[93,8-97,6]	465	86,1[82,6-89,0]	414

Main indicators of the CBMNH project

Table 5. Main indicators of the CBMNH project

	KOLDA		SEDHIOU	
	%(IC95%)	N	% (IC95%)	N
		484		481
Pregnant women recognize the importance of PNC and the use of health services for PNC, childbirth and PoNC				
% of women who received iron-folic acid supplementation during their last pregnancy (logbook)	74,2[70,0-78,0]	359	79,6[75,7-83,1]	389
% of women who received iron-folic acid supplementation during their last pregnancy (mother)	96,3[94,1-97,7]	466	94,2[91,6-96,0]	453
Average duration of the PNC 1	3,81[3,59-4,20]	267	3,41 [3,20-3,61	217
% of women who achieved PNC 1 at most at 3 months	51,7[45,5-57,8]	138	61,8[54,9-68,2]	134
% of women who took iron-folic acid supplementation for at least 90 days during their last pregnancy as recommended (logbook)	71,7[67,4-75,0]	347	78,8[74,8-82,3]	379
% of women who achieved at least 4 PNC during their last pregnancy (woman)	38,8[34,5-43,4]	188	54,9[50,3-59,4]	264
% of women who achieved at least 4 CPNs during their last pregnancy (logbook)	18,0[14,7-21,8]	87	30,4[26,3-34,7]	146
% of women whose delivery was performed by trained staff.	61,0[56,4-65,3]	295	57,4[52,8-61,8]	276
% of newborns who received postnatal care by a health professional	61,7[57,4-66,0]	299	77,9[74,2-81,6]	375
% of women or newborns who received post natal care by a health professional	64,0[59,6-68,3]	310	82,1[78,3-85,4]	395
% of newborns who received postnatal care by a community worker	10,7[7,9-13,4]	52	9,7[7,0-12,3]	47
% of women who received postnatal care by a community worker	14,7[11,7-18,2]	71	13,7[10,8-17,2]	66
% of newborns who received postnatal care by a professional or community worker	70,2[66,1-74,3]	340	80,9[77,4-84,4]	389
% of women receiving postnatal care by a professional or a community agent	72,1[67,8-76,0]	349	83,8[80,1-86,9]	403

Table 6. Main indicators of the CBMNH project

	KOLDA		**SEDHIOU**	
	%(IC95%)	N	% (IC95%)	N
		484		**481**
Community health staff provide quality care for PNC and childbirth				
% of newborns who received PoNC by trained community-level staff	10,7[7,9-13,4]	52	9,7[7,0-12,3]	47
% of parturient who received PoNCs by trained community-level staff	14,7[11,7-18,2]	71	13,7[10,8-17,2]	66
% of women who received Misoprostol at the time of delivery at the community level	4,2[00,1-21,1]	1	0	00
% of pregnant women who planned the delivery	20,9[17,4-24,8]	101	22,1[18,5-26,1]	106
% of pregnant women who planned the delivery with a Bajenu Gox (**BG)**	1,2[0,5-2,8]	6	2,5[1,4-4,4]	12
% of pregnant women who plan a delivery with a Bajenu Gox (choose who will attend the birth)	2,5[1,3-4,4]	12	3,1[1,8-5,2]	15
% of pregnant women who plan to give birth with a Bajenu Gox (choose place of birth)	4,1[2,6-6,4]	20	4,2[2,6-6,5]	20
% of pregnant women who plan to give birth with a Bajenu Gox (buy and keep a bar of soap)	4,8[3,1-7,2]	23	5,0[3,3-7,4]	24
% of pregnant women who plan to give birth with a Bajenu Gox (put a little money aside for emergencies)	5,0[3,3-7,4]	24	4,6[3,0-7,0]	22
% of pregnant women who plan to give birth with a Bajenu Gox (prepare clean linen)	6,0[4,1-8,6]	29	5,2[3,5-7,7]	25
% of parturient who initiated breastfeeding within one hour of birth	47,0[42,6-51,7]	228	52,6[48,0-57,1]	253
% of parturient who practice exclusive breastfeeding at 6 months	64,7[57,9-71,0]	139	60,4[53,9-66,6]	145
% of women who received advice on early initiation of EBF during pregnancy with BG	6,6[4,6-9,3]	32	11,2[8,6-14,5]	54
% of women who received advice on the importance of EBF during pregnancy with BGs	6,4[4,5-9,1]	31	11,2[8,6-14,5]	54

3.2 Bivariate Analysis

3.2.1 Factors Determining Early PNC

Table 7. Factors associated with early PNC

	Early PNC (%)	P
Personal characteristics		
Level of education		0.001
None	941 (19.8)	
Primary or more	499 (28.6)	
Household income		0.001
Inferior 50 000	713 (17.2)	
50 000 or more	686 (28.1)	
Revenue Generating Activity		0.28
Yes	747 (23.9)	
No	686 (21.6)	
Nearest health facility		0.001
Less than 5 km	783 (28.6)	
5 km or more	661 (16.0)	
Time to go to the nearest health facility		0.001
Less than 15 mn	561 (27.0)	
15 mn or more	883 (19.8)	
Parity		0.001
0-3	766 (19.8)	
More than 3	678 (30.3)	
Attend an awareness program		0.04
Yes	759 (25.0)	
No	681 (20.5)	
Knowledge		
Period PNC1		0.001
Yes	1117 (26.5)	
No	327 (10.4)	
Number of CPN during pregnancy		0.001
Yes	909 (26.6)	
No	474 (15.4)	
Important advice PNC		0.005
Yes	912 (28.5)	
No	521 (13.3)	

3.2.2 Factors Determining Complete Prenatal Consultation

Table 8. Factors associated with complete PNC

	complete PNC (%)	P
Personal characteristics		
Level of education		0.001
None	941 (10.4)	
Primary or more	499 (20.8)	
Household income		0.001
Inferior 50 000	713 (09.0)	
50 000 or plus	686 (18.5)	
Revenue Generating Activity		0.676
Yes	747 (14.3)	
No	686 (13.5)	
Nearest health facility		0.001
Less than 5 km	783 (18.5)	
5 km or more	661 (08.6)	
Time to go to the nearest health facility		0.001
Less than 15 mn	561 (21.0)	
15 mn or more	883 (09.5)	
Parity		0.001
0-3	766 (16.4)	
More than 3	678 (11.2)	
Attend an awareness program		0.001
Yes	759 (17.2)	
No	681 (10.4)	
Knowledge		
Period PNC1		0.001
Yes	1117 (16.2)	
No	327 (07.3)	
Number PNC during pregnancy		0.001
Yes	909 (19.4)	
No	474 (04.6)	
Importance advice PNC		0.001
Yes	912 (18.5)	
No	521 (05.6)	
Early CPN1Realization		0.001
Yes	330 (31.5)	
No	1114 (08.9)	

3.2.3 Determinants Iron Consumption within 90 Days

Table 9. Factors associated with iron consumption within 90 days

	Consumption of iron for 90 days (%)	P
Personal characteristics		
Level of education		0.001
None	890 (50.9)	
Primary or more	475 (64.4)	
Household income		0.001
Inferior 50 000	665 (50.9)	
50 000 or plus	662 (63.1)	
Revenue Generating Activity		0.051
Yes	707 (53.4)	
No	653 (58.6)	
Nearest health facility		0.001
Less than 5 km	750 (60.6)	
5 km or more	617 (49.4)	
Time to go to the nearest health facility		0.001
Less than 15 mn	541 (64.1)	
15 mn or more	826 (50.50)	
Parity		0.007
0-3	734 (58.9)	
More than 3	633 (51.6)	
Attend an awareness program		0.001
Yes	738 (62.3)	
No	628 (47.6)	
Knowledge		
Period PNC1		0.001
Yes	1088 (58.2)	
No	279 (45.5)	
Number of PNC during pregnancy		0.001
Yes	891 (61.5)	
No	431 (47.5)	
Role of the iron		0.24
Yes	1298 (55.8)	
No	66 (48.4)	
Importance advice PNC		0.001
Yes	896 (61.4)	
No	454 (44.3)	
Important advice about iron consumption for 90 days		0.001
Yes	1181 (58.7)	
No	183 (36.1)	
Early PNC1achievement		0.001
Yes	327 (71.8)	
No	1040 (50.5)	

Full PNC achievement		0.001
Yes	201 (83.6)	
No	1166 (50.8)	

3.2.4 Delivery by a Trained Staff

Table 10. Factors associated with performing delivery by trained staff

	Delivery by a trained staff Yes (%)	P
Personal characteristics		
Level of education		0.001
None	933 (51.5)	
Primary or more	498 (64.3)	
Household income		0.001
Inferior 50 000	707 (49.6)	
50 000 or plus	683 (62.4)	
Revenue Generating Activity		0.51
Yes	741(54.9)	
No	683 (56.6)	
Nearest health facility		0.001
Less than 5 km	779 (70.0)	
5 km or more	683 (39.1)	
Time to go to the nearest health facility		0.001
Less than 15 mn	560 (73.0)	
15 mn or more	873 (44.9)	
Parity		0.001
0-3	762 (61.4)	
More than 3	671 (49.6)	
Attend an awareness program		0.003
Yes	753 (59.6)	
No	678 (51.8)	
Knowledge		
Period PNC1		0.001
Yes	1110 (60.1)	
No	323 (41.5)	
Number of PNC during pregnancy		0.001
Yes	907 (60.5)	
No	469 (49.9)	
Role of the iron		0.001
Yes	1327 (58.1)	
No	96 (27.1)	
Importance advice PNC		0.001
Yes	906 (63.0)	
No	508 (43.5)	

	Delivery by a trained staff Yes (%)	P
Importance advice about iron consumption for 90 days		0.001
Yes	1194 (60.5)	
No	234 (33.3)	
Childbirth preparation advice		0.001
0	432 (42.8)	
1-3	704 (56.2)	
4-5	287 (76.3)	
Early PNC1achievement		0.001
Yes	329 (71.4)	
No	1104 (51.2)	
Full PNC achievement		0.001
Yes	202 (84.6)	
No	1231 (51.2)	
Complete intake of iron for 90 days		0.001
Yes	755 (66.5)	
No	603 (47.6)	
Childbirth preparation		0.001
0	262 (37.0)	
1-3	752 (53.3)	
4-5	414 (72.9)	

3.3 Multivariate Analysis

3.3.1 Factors Determining Early Prenatal Consultation

Table 11. Factors determining early prenatal consultation

	OR [95%CI]	P
Personal characteristics		
Level of education		0,06
None	1	
Primary or more	1.32 [0.99-1.76]	
Household income		0.003
Inferior 50 000	1	
50 000 or plus	0.65 [0.50-0.86]	
Revenue Generating Activity		0.14
Yes	1	
No	1.23 [0.93-1.61]	
Nearest health facility		0.001
Less than 5 km	1	
5 km or more	1.93 [1.34-2.78]	
Time to go to the nearest health facility		0.56
Less than 15 mn	1	
15 mn or more	0.90 [0.63-1.28]	
Parity		0.023
0-3	1	
More than 3	1.4 [1.05-1.87]	
Attend an awareness program		0,24
No	1	
Yes	0.84[0.63-1.12]	
Knowledge		
Period PNC1		0.001
No	1	
Yes	2.19 [1.44-3.34]	
Number of PNC during pregnancy		0.043
No	1	
Yes	1.38 [1.01-1.88]	
Importance advice about PNC		0.001
No	1	
Yes	1.95 [1.40-2.70]	

3.3.2 Factors Determining Full Prenatal Consultation

Table 12. Factors determining full prenatal consultation

	OR [95%CI]	P
Personal characteristics		
Level of education		0,036
None	1	
Primary or more	1.47 [1.07-2.11]	
Household income		0.014
Inferior 50 000	1	
50 000 or plus	0.64 [0.45-0.95]	
Revenue Generating Activity		0.474
Yes	1	
No	1.14 [0.80-1.61]	
Nearest health facility		0.105
Less than 5 km	1	
5 km or more	1.49 [0.92-2.42]	
Time to go to the nearest health facility		0.05
Less than 15 mn	1	
15 mn or more	1.56 [0.99-2.44]	
Parity		0.3
0-3	1	
More than 3	1.21 [0.84-1.75]	
Attend an awareness program		0,045
No	1	
Yes	0.69 [0.47-1.0]	
Knowledge		
Period PNC1		0.85
No	1	
Yes	1.05 [0.62-1.79]	
Number of PNC during pregnancy		0.001
No	1	
Yes	3.73 [2.27-6.14]	
Importance advice about PNC		0.001
No	1	
Yes	2.2 [1.39-3.48]	
Practice		
Early PNC achievement		0.001
No	1	
Yes	3.65 [2.58-5.18]	

3.3.3 Factors Determining Iron-Folic Acid Intake for at Least 90 Days During Pregnancy

Table 13. Factors determining iron-folic acid intake for at least 90 days during pregnancy

	OR [95%CI]	P
Personal characteristics		
Level of education		0,014
None	1	
Primary or more	1.41 [1.07-1.86]	
Household income		0.018
Inferior 50 000	1	
50 000 or plus	0.74 [0.58-0.95]	
Revenue Generating Activity		0.086
Yes	1	
No	0.81 [0.63-1.03]	
Nearest health facility		0.344
Less than 5 km	1	
5 km or more	1.17 [0.84-1.63]	
Time to go to the nearest health facility		0.309
Less than 15 mn	1	
15 mn or more	1.19 [0.85-1.68]	
Parity		0.06
0-3	1	
More than 3	1.28 [0.99-1.65]	
Attend an awareness program		0,004
No	1	
Yes	0.68 [0.53-0.89]	
Knowledge		
Period PNC1		0.264
No	1	
Yes	1.19 [0.88-1.62]	
Number of PNC during pregnancy		0.058
No	1	
Yes	1.29 [0.99-6.14]	
Importance advice about PNC		0.047
No	1	
Yes	1.32 [1.1-1.72]	
Advice importance of taking iron for 90 days		0.001
No	1	
Yes	2.06 [1.38-3.06]	
Practice		
Early PNC achievement		0.001
No	1	
Yes	2.19 [1.58-3.04]	
Full PNC achievement		0.001
No	1	
Yes	3.58 [2.22-5.77]	

3.3.4 Factors Determining Delivery by Trained Staff

Table 14. Factors determining delivery by trained staff

	OR [95%CI]	P
Personal characteristics		
Level of education		0,171
None	1	
Primary or more	1.22[0.92-1.62]	
Household income		0.051
Inferior 50 000	1	
50 000 or plus	0.78 [0.6-0.1]	
Revenue Generating Activity		0.134
Yes	1	
No	1.22 [0.94-1.57]	
Nearest health facility		0.001
Less than 5 km	1	
5 km or more	2.43 [1.75-3.37]	
Time to go to the nearest health facility		0.014
Less than 15 mn	1	
15 mn or more	1.54 [1.09-2.17]	
Parity		0.002
0-3	1	
More than 3	1.5 [1.15-1.95]	
Attend an awareness program		0,602
Yes	1	
No	1.08 [0.82-1.41]	
Knowledge		
Period of PNC1		0.067
No	1	
Yes	1.34 [0.98-1.83]	
Number of PNC during pregnancy		0.787
Yes	1	
No	0.96 [0.73-1.27]	
Role of the iron		0.277
No	1	
Yes	1.36 [0.78-2.38]	
Advice on importance PNC		0.207
No	1	
Yes	1.2 [0.9-1.59]	
Advice importance taking iron for 90 days		0.028
No	1	
Yes	1.55 [1.07-2.28]	

Childbirth preparation advice		0.003
0	1	
1-3	1.02 [0.7-1.48]	
4-5	2.13 [1.28-3.55]	
Practice		
Early PNC achievement		0.61
No	1	
Yes	1.09 [0.78-1.52]	
Full PNC achievement		0.001
No	1	
Yes	2.52 [1.59-4.0]	
Consumption of iron for 90 days		0.006
No	1	
Yes	1.46 [1.11-1.91]	
Childbirth preparation		0.003
0	1	
1-3	1.59 [1.02-2.47]	
4-5	2.27 [1.35-3.81]	

4. Discussion

This study allowed us to measure the main basic indicators of the SCSMN project, to compare them and finally to model the factors determining the PNC, the delivery and the early initiation to the EBF at Kolda district level. At first, factors influencing PNC, childbirth and then those influencing EBF were analyzed.

4.1 Prenatal Consultation

The PNC is a special moment of contact between the provider and the pregnant woman. It allows the detection of health problems and their follow-up in the mother and the fetus. It also allows the prevention of childhood diseases by vaccinating the mother (VAT for example). It should be an opportunity to give many tips for the implementation of health programs and should allow to retain the patient in relation to health facilities, including the place of delivery. In Senegal, four PNCs are proposed, the first of which in the first trimester of pregnancy. In this study we focused on early PNC, complete PNC, and iron-folic acid consumption during pregnancy.

The results of our study show that 51.7% of women achieved PNC in the first three months in Kolda against 61.8% in Sédhiou. The average duration of the PNC is lower in Sédhiou than in Kolda. The results of the multivariate analysis show that early PNC is related to personal characteristics, PNC knowledge, and advice received about the importance of PNC.

Several studies have shown the role of the economic level in the use of health services for prenatal care (Magadi et al., 2000; Koné-Péfoyo & Rivard, 2006; Faye, Manga et al., 2011). It allows the satisfaction of needs and access to structures in case of suffering. Wilkinson and Marmot in the report on the social determinants of health have shown the role of income on the health status of populations. This situation is found both among the poor and the rich. Solving health problems involves reducing inequalities. This requires the involvement of all actors, including political ones. The inaccessibility of structures is not only financial, but also geographical (Faye, Manga et al., 2011]. In rural areas, women are often obliged to travel more than five kilometers to reach the nearest health facility due to poor road infrastructure and inadequate transportation.

The achievement of early PNC is linked to the knowledge of the period and the number of PNCs needed during pregnancy. Particular emphasis should be placed on sensitizing women in health facilities for a better knowledge of PNC but also at home by Bajenu Gox and Relays, particularly in primigravida who do not yet have a great experience of pregnancy. Indeed, there are still some buildings surrounding pregnancy (Ndiaye et al., 2005). This makes the statement late to avoid evil spirits (Niang, 2003).

To be effective the PNC must be early but also complete. The proportion of women who completed the complete PNC in Kolda is 38.8% in our study. This proportion is even lower if we rely on the mother's health record (18%). This difference can be explained by under-reporting of providers. The results of our study are similar to those found in EDS IV with a national average of 40% (Ndiaye, Salif, & Mohamed Ayad, 2006) but are lower than the national average in EDS V (50%) [Ministry of Health (Senegal)]. However, this proportion was 41% in rural areas. Faye A in a study conducted in Gossas found that 35% of women had achieved 4 PNC (A. Faye, M. Faye, et al., 2010). It should also be noted that, of the women who have done a PNC1, most do not perform the four PNCs. Similar results have been found in EDS IV and V. This raises the problem of continuity of services. A special effort should be directed towards interventions aimed at getting women to continue PNCs at the level of structures but also at community level through greater involvement of support groups. Bajenu Gox too can play a big role at this level by accompanying women in this process. The results show that women who had received information about PNC were more likely to complete four PNCs hence, the importance of emphasizing women's awareness and information in order to improve their knowledge. In fact, knowledge improves as well PNC1, PNC coverage and iron-folic acid intake for at least 90 days.

Iron-acid consumption for 90 days is a recommendation of the Reproductive Health Directorate. The results of the multivariate analysis show that accessibility is a major determinant in the consumption of iron-folic acid during pregnancy. Community actors can play an important role in reducing these difficulties by facilitating access at the community level. However, the results of the study show that they are very weakly involved in the distribution of iron.

4.2 Delivery

Home birth by unskilled people in poor asepsis conditions is one of the leading causes of maternal death, unlike in developed countries where delivery is done by trained staff. Home delivery ranged from 39% in Kolda while in Sedhiou this proportion was 41.3%. In the EDS-MICS 2010-2011, 56% of deliveries took place at home in Kolda. The national average, which was 38% in 2005, decreased to 28.8% in 2010-2011 (National Agency for Statistics and Demography, 2012).

Unlike developed countries where it is well planned with the presence of qualified personnel, home delivery in Africa is very problematic. The results of our study show that it is mainly related to the preparation of childbirth. Similar results were found by Faye and al in a study conducted in five regions of Senegal (Faye et al., 2010). The preparation of childbirth helps to better involve women in the management of pregnancy. Indeed, the identification of the health facility where the childbirth is to take place and the person who must perform it, allows the woman to have more information about the pregnancy especially during the delivery period. The surprise effect of childbirth is often responsible for home delivery (Bolam et al., 1998). Often, women do not know the time of delivery. Particular emphasis should be placed on the preparation of delivery during PNCs. But this assumes that health care providers are equipped enough to do so, which is not often the case. These aspects should be taken into account during their training. The involvement of Bajenu Gox can be an alternative. However, the results of the study show a low involvement of the latter. In this project, special emphasis should be placed on greater involvement of the Bajenu Gox.

The preparation for childbirth can be hindered by the woman's position in society. Her limited decision-making power in the household does not give her the ability to negotiate and make certain decisions (Nikièma, Haddad, & Potvin, 2008). She is also often very badly seen in these societies because considered as an interference with the divine will. It is clear that to get around these cultural barriers, it is important to involve husbands, religious and customary leaders.

The situation is all the more alarming that the government has implemented a policy of free of charge cesarean delivery (Witter, Armar-Klemesu, & Dieng, 2008). The Free of charge responds to logic of social justice that aims to prevent the poorest from being marginalized and falling into permanent exclusion (De La Rocque, 1996). In most countries where these policies have been put in place, they have promoted access to care for the poor (Ensor & Ronoh, 2005), thereby reducing social inequalities in health (Nabyonga, Desmet, & Karamagi, 2005). However, some writings show that they do not always benefit the poorest (Asante et al., 2007). In some contexts, they would have even benefited the non-poor more than the poor (Leighton & Diop, 1995). Indeed, In order to benefit from this free service, you must have access to health services.

In our study, distance is the main factor of geographic accessibility (Pison, 2000). Similar results have been found in Burkina Faso (Haddad, Noutgara, & Ridde, 2004), Kenya, Rwanda, Sudan (Pearson & Shoo, 2005) and Uganda (Mbonye, 2001). The accessibility of health facilities poses real problems in developing countries, particularly in Africa. In rural areas, one in three women must travel more than five kilometers to reach the

nearest health service, 80% for the nearest hospital due to faulty road infrastructure and inadequate means of transport.

Competing Interests Statement

The authors declare that they have no competing or potential conflicts of interest.

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The Effectiveness of Mindfulness Based Stress Reduction Intervention on Emotion Regulation Problems and Blood Sugar Control in Patients With Diabetes Type II

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Abstract

Aim and Background: Diabetes is one of the most prevalent and costly chronic diseases that imposes many limitations on the activities of the patient. Stress reduction treatment based on mindfulness is an intervention which is used in mind-body medicine in order to reduce mental and physical disorders in patients with chronic diseases. So, this study aims to investigate the effectiveness of stress reduction treatment based on mindfulness on emotion regulation problems and glycemic control in patients with type 2 diabetes.

Methods and Materials: The paper is an experimental study based on control and treatment groups with pre-test and post-test. 34 male and female patients with type 2 diabetes having at least high education, from Molasadra Clinic of Isfahan, were selected and were placed randomly in two groups of control (N=17) and treatment(N=17). Pre-test stage was done for both two groups by cognitive emotion regulation questionnaire (CERQ) and also by means of Glucometer to measure glycemic of patients. The treatment group for 8 sessions of 2 hours (once a week) was placed under the training of mindfulness-based stress reduction intervention. Afterwards, the post-test was done for both groups. The obtained data using SPSS software version 20 and multivariate analysis of covariance were analyzed.

Findings: The findings showed that MBSR had effect on emotion regulation problems, and glycemic control of patients with type 2 diabetes.

Conclusions: On the basis of results, MBSR can have positive impact on emotion regulation problems, and glycemic control of patients.

Keywords: diabetes, mindfulness-based stress reduction, emotion regulation, glycemic control

1. Introduction

1.1 Introduction to the Problem

Diabetes is a complex metabolic disorder which is characterized by hyperglycemia (high blood sugar). Hyperglycemia is a result of impaired secretion or functioning of insulin or both. Diabetes is a disabling chronic disease (Barnard, Lioyd, & Holt, 2012). Because of physical problems like retinopathy, nephropathy, neuropathy, cardiovascular diseases and psychological effects, diabetes significantly affects patients' quality of life (Longo et al., 2012).

Physical and mental stresses stimulate neuro-hormonal pathways, specifically hypothalamic-pituitary-adrenal axis. Catecholamine and glucocorticoid axes affect structure and function of specific tissues, resulting in cytokine secretion. All these increase glucagon production and reduce reabsorption or breaking down of sugar in peripheral muscles. Cytokinin basically causes stress oxidative and inflammation processes through interleukin 6, which results in insulin resistance and cardiovascular complications. Relaxation is a process which can regulate cortisol and other stress hormones. Structured meditations, such as stress-based mindfulness, teach how to evoke such a response by focusing on diaphragmatic breathing (Dinardo, 2009).

1.2 Importance of the Problem

Previous studies on psychological problems of diabetes mellitus patients have shown that 40% of the population had psychological problems. Major complaints have mostly been about prevalence of the disease, depression, obsession-obligation, physical problems, and anxiety and distress. A review study on studies conducted in years 2006 to 2011 in United States and Europe showed widespread comorbidity between depression and diabetes (Roy & Lioyd, 2012). Depression in diabetes patients is accompanied by self-care behaviors that are lower than the desired level and less compliance to the required medications and diet (Karan, Tanveer, Jaskanwal, & Jayadave, 2012). Poor emotional health leads to other undesirable outcomes, such as reduced quality of life, undesirable metabolic control, and increased mortality rate (Fisher et al., 2008). There are at least three reasons that justify psychological interventions for diabetes patients: improved disease and situation acceptance by the patient, behavior changes for better self-care, and eliminations of the psychological barriers to disease control (Feifer & Tansman, 1999).

The relationship between quality of life and psychological health and the prevalence of psychological problems in patients with diabetes necessitate effective interventions to improve psychological health and quality of life for these patients. In this study, MBSR interventions are employed to deal with emotion regulation problems and blood sugar control. When it comes to emotion regulation, it is a cognitive coping strategy that persons use after experiencing negative situations that cause reduce, maintain or increase an emotion. These coping strategies include self-blame, acceptance, rumination, positive refocusing, refocus on planning, positive reappraisal, putting into perspective, catastrophizing and other-blame (Gross, 1998).

Mindfulness is a type of meditation that focuses on conscious presence in the moment in a purposeful and nonjudgmental manner. In the past 30 years, there has been a growing interest in using mindfulness for therapeutic purposes; a review of literature shows more than 70 published papers by 2007 (Ludwig & Kabat-Zinn, 2008). Stress reduction-based mindfulness is a structured group program with the aim of reducing pain and stress and improving psychological health for patients. Studies have shown that MBSR does not have any negative effects on fibroma, chronic pain, rheumatoid arthritis, diabetes, chronic fatigue syndrome, cancer, blood pressure, aids, skin diseases, multiple chemical sensitivity and cardiovascular diseases. In fact, it has long-term positive therapeutic outcomes in distress reduction in various chronic diseases (Hartmann et al., 2012). Treatment of diabetes, as a worldwide chronic disease, requires constant and effective blood sugar control. Blood sugar control is closely related to stress, since stress causes sugar to be released into blood. Previous studies have investigated the relationship between stress and weak blood sugar control in those with diabetes. They have also investigated the effect of different stress management strategies on blood sugar levels (T. Morris, Moore, & F. Morris, 2011).

Compared with the general population, patients with diabetes are twice as likely to develop anxiety and depression. This results in less compliance with treatment and therefore weak blood sugar control. Evidence shows that treating psychological issues in those with diabetes can improve their health. Psychological distress is related to impaired blood sugar control in people with diabetes (Karan et al., 2012).

The core of MBSR is to teach mindfulness meditation and its applications in daily life and in coping with stress, pain, and illness (Rosenzweig et al., 2010). Mindfulness-based stress reduction is a behavioral intervention that relies on concentrating on self. MBSR exercises center around focusing on thoughts, emotions, and perceptions. These skills are acquired through focusing on breathing to focusing on every other living activity. MBSR helps by changing people's understanding of stressful events and enhancing their ability to control their life. It has been shown that MBSR has positive effects on physical and psychological symptoms and can be an effective auxiliary treatment for physical illnesses. MBSR results in significant improvements in general aspects of welfare, including quality of life, approaches of dealing with chronic diseases, anxiety, and depression (Grossman, Tiefenthaler-Gilmer, Raysz, & Kesper, 2007).

Despite the above-mentioned generally-approved positive effects of MBSR, few studies have so far been conducted on the effectiveness of such approaches on chronic diseases like diabetes in Iran. There is no doubt that MBSR is an effective help in this regard. Therefore, the main goal in this study is to investigate the effectiveness of MBSR on emotion regulation and blood sugar control in patients with diabetes type II. To this aim, the study will first introduce this type of intervention, and then try to teach MBSR approach with respect to research variables. Accordingly, the main question is: "Does MBSR have positive effects on emotion regulation and blood sugar control?"

2. Materials and Methods

This study is an applied research in nature. Such studies are also called action research and emphasize providing

specific solutions in the course of real activities.

The study is quasi-experimental and uses control and experimental groups, as well as pre-test and post-test. The intervention was used for the experimental group. No interventions were used for the control group.

Research population consists of patients with diabetes type II who were referred to Mollasadra Diabetes Clinic in Isfahan, Iran. In this study 20 individuals were included in each of the experimental and control groups through directed sample selection (considering loss). At the end, 34 individuals remained that were assigned to two 17-member groups. Inclusion criteria were: absence of any severe psychiatric disease, lack of amputee or maims, being on no psychiatric medications, no experience of diabetic coma, high school diploma or higher, 18 years of age or above, a member of Mollasadra Diabetes Clinic, and not following any other training program before and during MBSR intervention sessions.

Each group was given the Cognitive Emotion Regulation Questionnaire (CERQ) (Garnefski, Kraaij, & Spinhoven, 2001) and their blood glucose levels (glucometer device), were measured. This was the pretest stage. Afterwards, each group received MBSR in the course of eight sessions (two months, one two-hour session per week). At the post-test stage, the above questionnaire was again filled by the subjects, and their blood glucose levels were measured by researcher who had received the necessary training to measure blood glucose levels.

The CREQ is a self-report questionnaire consisting of 36 items. It is an easy-to-use tool which is applicable for all individuals of age 12 or above (in both normal and clinical populations). The results of Garnefski and Kraaij (2007) showed that the CERQ had good factorial validity and high reliabilities, with Cronbach's as ranging between 0.75 and 0.87 (Garnefski & Kraaij, 2007). The subscales evaluate nine cognitive approaches: self-blame, acceptance, rumination, positive refocusing, refocus on planning, positive reappraisal, putting into perspective, catastrophizing, and other-blame. Scores span from 1 (almost never) to 5 (almost always). Each subscale includes four items. The overall score for each subscale is calculated by adding up the scores of different items, which means that the score for each subscale will be between 4 and 20. A high score for a subscale means that the related approach is used in most of the cases by the person in the face of stressful and negative experiences.

The results showed that the measure consists of 9 factors, and distribution of test items was consistent with that of the original test. In addition, the correlation pattern observed among subscales of the questionnaire indicate that the questionnaire is multidimensional with every subscale benefitting from a relative independence. In this respect, results of factor analysis in different populations have shown that the 9-factor structure of the CERQ is unchangeable according to sex and age variables (Endler & Parker, 1993).

To measure blood glucose levels of diabetic patients we used a glucometer device. A glucometer can function using only a modicum of blood (1.5 µlit). Rheney and Kirk (2000) showed that there was minimum difference between the results achieved by this device and laboratory data (Rheney & Kirk, 2000). We used GO-based strips (Glucose Oxidase) in our glucometer device. According to Tang et al. (2001), increasing oxygen pressure in these strips results in decreased measured glucose. However, different pressures of oxygen have a negligible effect on measurements (Tang, Louie, Lee, Miller, & Kost, 2001).

Ethical considerations: to observe research ethics, MBSR was also applied for the control group in 4–5 sessions after the post-test stage.

Table 1. A brief description of intervention sessions based on Kabat-Zinn instractions

Sessions	Brief Description
Session 1	1. Introduction 2. Theory: physiology and symptoms of stress, anxiety, and distress, as well as definition of emotion regulation, self-regulation, blood sugar and blood sugar control. introducing MBSR and a summary of future activities. 3. Practice: assessment of symptoms of distress issues using Simons and Gaher's Distress Tolerance Scale (DTS), emotion regulation using CERQ-P, self-regulation using Miller and Brown's Self Regulation Questionnaire (SRQ), and measurement of blood sugar levels (fasting) by means of glucometer. 4. Technique: body scan. 5. Participants' feedback, after practicing – giving instructions for practicing at home.

Session 2	1. Follow-up: collecting reports of previous week's exercises. 2. Theory: effects of meditation on the brain and the grey matter – research evidence. 3. Technique: sitting meditation. 4. Participant's feedback, after practicing the technique – giving instructions for practicing at home.
Session 3	1. Follow-up: collecting reports of previous week's exercises. 2. Theory: living in the moment, here. What is Yoga? Why Yoga? 3. Technique: a few Yoga moves (in accordance with the physical conditions of each participant and the course's environmental conditions). 4. Participants' feedback, after practicing the technique – giving instructions for practicing at home.
Session 4	1. Follow-up: collecting reports of previous week's exercises. 2. Theory: expanding meditation to life. 3. Technique: grape (raisin, …) meditation. Mindfulness walking meditation. 4. Participants' feedback, after practicing the technique – giving instructions for practicing at home.
Session 5	1. Follow-up: collecting reports of previous week's exercises. 2. Theory: do you like yourself? 3. Technique: rain meditation. 4. Participants' feedback, after practicing the technique – giving instructions for practicing at home.
Session 6	1. Follow-up: collecting reports of previous week's exercises. 2. Theory: reconciliation with nature. 3. Technique: lake and mountain meditation. 4. Participants' feedback, after practicing the technique – giving instructions for practicing at home.
Session 7	1. Follow-up: collecting reports of previous week's exercises. 2. Theory: spreading the love. 3. Technique: forgiveness meditation. 4. Participants' feedback, after practicing the technique – giving instructions for practicing at home.
Session 8	1. Follow-up: collecting reports of previous week's exercises. 2. Theory: a conclusion of the lessons of the past two months. 3. Practice: write yourself down exercise; a method for consolidation of mindfulness.

3. Results

In this research, qualified individuals were randomly assigned to control (N=17) and experimental (N=17) groups, that this number was in both groups, including 9 women and 8 men. In terms of age category, 1 person in the control group and 2 person in the experimental group, were under the age of 26; 2 person in the control group and 3 person in the experimental group, were between 26–35 years old; 4 person in the control group and 3 person in the experimental group, were between 36–45 years old; 4 person in the control group and 4 person in the experimental group, were between 45–55 years old and 6 person in the control group and 5 person in the experimental group, were between 56–65 years old. Also, 6 person in the control group and 5 person in the experimental group, were single and others were married. In addition, in terms of educational level, in control group, 4 person had diploma, 2 person had Assistant, 6 person had BS, 4 person had MSc and 1 person had P.H.D, and in experimental group, 3 person had diploma, 9 person had BS and 5 person had MSc.

Descriptive results of this study include mean and standard deviation. In addition, we used MANCOVA to test research hypotheses. To check the normality of data, Kolmogorov- Smirnov test was used; to check the homogeneity of variances, Leven test was used; and to check the homogeneity of correlations among research variables, box's M test was used. Below are the research hypotheses and the related obtained results.

Using MANCOVA has a number requirements: 1) normality, 2) homogeneity of variances, 3) homogeneity of

regression slopes, and 4) multicollinearity. All the requirements were carefully analyzed (P> 0.05) in this study. Normality was checked and verified using Shapiro-Wilk test. Leven and Box's M tests (F=1.41) showed the equality of variances. Considering the significance level of the subscales, it turns out that 6 subscales of 9 subscales, do not have a prerequisite for the equation of variance, but according to the appropriate statistical sample size for the research project and interval scale of measurement tool, can be passed from this prerequisite. Therefore, MANCOVA could be used to analyze the data. Results of Leven test are shown in Table 2.

Table 2. Results of Leven test about the hypothesis of equality of variances of the two groups in the population

Variable	Leven Test			
	F	First degree of freedom	Second degree of freedom	Significance
Self-blame	2.82	1	32	0.1
Acceptance	21.90	1	32	0.000
Rumination	1.20	1	32	0.2
Positive refocusing	10.43	1	32	0.003
Refocus on planning	4.49	1	32	0.04
Positive reappraisal	4.22	1	32	0.04
Putting into perspective	4.14	1	32	0.01
Catastrophizing	0.01	1	32	0.9
Other-blame	0.001	1	32	0.9
Blood sugar control	6.35	1	32	0.01

Mean and standard deviation of pre-test and post-test scores of emotion regulation approaches and blood sugar control in intervention and control groups are shown in Table 3.

Table 3. Mean and Standard Deviation of pre-test and post-test scores of emotion regulation approaches and blood sugar control for each group

Approach	Group	Pre-test		Post-test	
		Mean	SD	Mean	SD
Self-blame	Intervention	13.35	3.51	9.82	2.27
	Control	13	3.39	13.17	3.18
Acceptance	Intervention	13.35	3.51	15.11	3.14
	Control	13	3.39	9.46	1.05
Rumination	Intervention	13.47		9.64	2.73
	Control	12.58	3.26	12.76	2.94
Positive refocusing	Intervention	7.23	1.39	14.11	2.47
	Control	7.58	1.41	7.82	1.42
Refocus on planning	Intervention	7.76	1.71	14.88	2.32
	Control	9.82	2.32	9.58	1.73
Positive reappraisal	Intervention	7.35	1.65	14.47	2.69
	Control	11.29	2.05	10.94	1.51
Putting into perspective	Intervention	8.29	2.17	15.35	2.93
	Control	11.41	2.18	11.05	1.95

Catastrophizing	Intervention	13	4.30	9.64	2.82
	Control	12.23	4.49	9.88	2.59
Blood sugar control	Intervention	144.58	40.78	131.41	36.92
	Control	140.41	23.81	141.41	24.50

Table 4 shows the results of MANCOVA for a comparison of emotion regulation approaches between the two groups. As is shown in Table 4, after normalizing the effect of synchronous variables (sex, education, age, and pre-test) on the dependent variable, a significant difference is observed between intervention and control groups for all emotion regulation subscales, except catastrophizing, ($P>0.05$). Therefore, the research hypothesis that MBSR affects different aspects of emotion regulation in patients with diabetes type II is confirmed, except catastrophizing.

Table 4. MANCOVA results for scores of emotion regulation subscales in each group

Subscale	Sum	Degree of freedom	Mean	F score	Significance	Eta	Power of test
Self-blame	49.08	1	49.08	22.23	0.000	0.49	0.99
Acceptance	88.29	1	88.29	15	0.001	0.39	0.96
Rumination	30.46	1	30.46	6.38	0.01	0.21	0.67
Positive refocusing	85.21	1	85.21	20.49	0.000	0.47	0.99
Refocus on planning	75.42	1	75.42	19.66	0.000	0.46	0.98
Positive reappraisal	58.68	1	58.68	14.55	0.001	0.38	0.95
Putting into perspective	72.65	1	72.65	13.80	0.001	0.37	0.94
Catastrophizing	10.99	1	10.99	2.73	0.1	0.10	0.35
Other-blame	9.23	1	9.23	5.11	0.03	0.18	0.58

Table 5 shows the results of MANCOVA for a comparison of blood sugar control between the two groups. As is shown in Table 5, after normalizing the effect of synchronous variables (sex, education, age, and pre-test) on the dependent variable, a significant difference is observed between intervention and control groups regarding blood sugar control ($P<0.05$). Therefore, the hypothesis that MBSR affects blood sugar control for patients with diabetes type II is confirmed.

Table 5. MANCOVA results for the effect of MBSR on blood sugar control

Variable	Sum of squares	Degree of freedom	Mean square	F score	Significance	Eta	Power of test
Blood sugar control	1402.24	1	1402.24	48.03	0.000	0.63	0.999

4. Discussion

According to data analysis results provided in the previous section, MBSR does affect emotion regulation in patients with diabetes type II. Here, "emotion regulation" is a term that specifies different cognitive coping strategies that people used after having experienced negative situations, resulting in reduction, maintenance, or intensification of an emotion. This means that, thoughts and cognition play an important role in a person's ability to manage, regulate, and control feelings and emotions after going through a stressful event. Such coping strategies include self-blame, rumination, acceptance, other-blame, catastrophizing, putting into perspective, positive reappraisal, positive refocusing, and refocus on planning. Each of these strategies have their own specific outcomes. Our results are in line with those of Opialla et al. (2015), Goldin, Ziv, Jazaieri, Hahn and Gross (2013), Vago and Silbersweig (2012), Vøllestad, Sivertsen and Nielsen (2011) and Philippe and Gross (2010). It seems that MBSR has been a good stimulating factor for emotion regulation in patients with diabetes type II.

An explanation for the above result could be that MBSR intervention encouraged patients to look at the negative experiences and events from a different perspective, go through negative emotions less intensely, modify their

emotional reactions, and therefore, experience less discomfort or stress. Diabetes can negatively affect a person's emotions, as was shown in the pre-test stage of this study. The reason might be sought in the effects of this disease on the psychological states of the patient. Among these problems are self-blame, rumination and other-blame, which are sometimes used in an obsessive manner. A decline in acceptance, focusing, and putting in perspective was also observed in these patients.

MBSR interventions offer a new way of confronting with distressful emotions and emotional strategies by emphasizing reflection on thoughts and changing awareness instead of challenging and changing the thoughts (Hartman et al., 2012). Since emotion regulation has several dimensions, mindfulness strategies were designed so that they could affect all of the aspects of the problem. MBSR exercises can affect the cognitive system and information processing through enhancing a person's awareness of the moment by a number of techniques, such as focusing on breathing and focusing on the body. In this way, this method can improve emotion regulation strategies. The three components of this method – moment-to-moment living, awareness, and nonjudgmental presence – increase a patient's acceptance and limits self-blame and rumination (Dinardo, 2009).

According to the results of the study, it seems that the body scan technique has had a good effect on patients' focusing. During the MBSR course, patients received clear instructions and exercises to help them understand the meaning of their thoughts, physical senses and internal emotions that together form a complete package. Emotions and thoughts are generally expressed through personal pronouns. For example, feelings are expressed as "my feelings".

MBSR is new method to follow thoughts and emotions by constantly focusing on the body, and analyzing how and where an emotion is manifested in a physical state. This method can be surprisingly beneficial. One way of achieving this is through the body scan technique. Another way is through yoga exercise that help regulate emotions and thoughts in addition to physical training. Techniques such as eating, listening, and watching meditations, etc. teach patients how to let go of their physical senses in every moment when alone. This will prevent them from thinking about themselves and their experiences. This will limit their referring to self-blame and rumination strategies.

Based on Kabat-zinn's findings (2005), it can be explained that Lake and mountain meditation also seems to have a positive effect on the emotion regulation strategies. This technique creates a sense of unification with both the natural and human world, enhancing flexibility of perspective and acceptance in patients. It can be said that, the forgiveness meditation technique, with the aim of loving and creating love, causes a patient to feel important, standing at the center of a love circle in which all loveable people are standing. The patients will learn to forgive and expand this circle little by little.

Also, according to the Kabat-zinn's finding (2005), it can be said that in this research, this techniques seems to have reduced "other-blame" in patients. "Write yourself down" is another helpful technique for regulating unpleasant emotions towards self and family. It motivates a person to accept himself or herself, and find a personal path in life. This in turn will reduce "self-blame". Moreover, this technique changes the focus from the past to the future, and thus, helps patients to set personal goals and identify personal preferences, enhancing "refocus on planning" and "positive reappraisal" in them.

Another major finding of the study is that MBSR has a positive effect on blood sugar control for patients with diabetes type II. Blood sugar control means awareness of blood glycogen levels and reduce of blood glucose levels, which was related to self-management behavior and psychological stress. The result was adherence to proper treatment, reduce of blood glucose levels and regular blood sugar monitoring. These results were in line with those of Van Son et al. (2013), Van Son, Nyklíček, Pop and Pouwer (2011), Morris, Moore and Morris (2011) and Rosenzweig et al. (2007).

According to the Bishop's finding (2002), it can be explained that Techniques of MBSR such as yoga and body-scan exercises not only enhance physical motion and help regulate emotions, but also reduce blood sugar levels (in cases even to normal levels). Daily yoga exercises for at least 30 minutes have shown to be effective in treating conditions such as asthma, diabetes, chronic obesity, cardiac illnesses, and various mental and psychological disorders. Alternating expansion and contraction of the abdominal viscera and increased abdominal pressure in this technique increases blood pressure and causes the liver, the pancreas and other internal organs to work better. Blood sugar level was dropped (to near-normal level) after lunch in most of the patients, resulting in a significant reduction in the required dosage of medicines like insulin. According to the findings of Whitebird, Kreitzer & O'Connor (2010) and nanda (n.d), it can be explained that it should be mentioned that before MBSR intervention, all of the patients were on diabetes medications and had diet limitations. Although no changes were made to their medications and diet, it seems that MBSR techniques such as yoga, had significant positive effects on

their life style. Some might argue that yoga is nothing but physical flexibility and mental peace; however, medical studies have shown that yoga can directly affect central nervous system, blood flow, and metabolism.

As a result, According to the research of Whitebird et al. (2010), it can be explained that an obvious improvement in reduce of blood glucose and diabetes and weight loss is observed after MBSR intervention. This does not necessarily mean that a patient can discontinue his or her medications or diet limitations.

5. Conclusion

In agreement with our hypothesis, we found that MBSR led to better emotion regulation and lower levels of blood glucose. MBSR interventions seek to establish and reinforce a nonreactive, nonjudgmental approach to thoughts and emotions and to cultivate acceptance through moment-to-moment awareness or "mindfulness." (Shapiro, Schwartz, & Bonner, 1998). However, in this research, although in both variables (emotion regulation and blood sugar control) the effect sizes were remarkable, in emotion regulation variable, no significant effect could be demonstrated for the catastrophizing subscale.

So, following this research and according to the results of the analysis of collected data, can be used from MBSR intervention to improve mental health and eliminate psychological problems in patients with diabetes type II. It should be noted that this research has been done in Molasadra Diabetes Clinic of Isfahan, therefore, caution should be exercised in generalizing its results to other similar diabetes clinics. Also, the reaction of some people to some of the techniques of MBSR, it is not only different in different societies, but also different from one group to another. Despite the limitations of the study, this study adds to the sparse literature on stress and late diabetes complications and emphasizes the potential of psychosocial interventions. The specific benefit of MBSR is its preventive nature and wide applicability for a variety of symptoms.

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Competing Interests Statement

The authors declare that they have no competing or potential conflicts of interest.

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Acute Bacterial Meningitis Complicated by Brain Herniation Shortly After Lumbar Puncture: A Case Report

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Abstract

Introduction: Brain herniation is a known complication of acute bacterial meningitis. Brain computed tomography (CT) is requested before the lumbar puncture (LP) to rule out increased intracranial pressure. Delay in antibiotic administration, secondary to brain CT, leads to a poor clinical outcome.

Case Profile: A 10-year-old boy, who had a history of skull fracture and pneumococcal meningitis, was presented to emergency room (ER) with a history of fever, headache and vomiting for 2 days. Clinically, he was fully conscious and his vital signs were stable, with positive meningeal signs. Other systemic examinations were normal. Brain CT was normal before LP. LP suggested meningitis in the form of leukocytosis with low glucose and high protein. Antibiotics were adminestered after LP. Two hours after LP, the patient had deteriorations in the level of consciousness; respiratory arrest was followed by a coma. Brain CT was repeated which showed cerebellar herniation and subarachnoid hemorrhage. Neuroprotective strategy was performed without improvements. Blood and CSF cultures showed pneumococcal growth. After one week, brain death was confirmed.

Conclusion: Brain herniation is a severe complication of bacterial meningitis. Clinical findings are the best indicators to delay LP and predict the risk of herniation. Normal brain CT does not necessarily mean LP is safe. Early antibiotic administration improves mortality and morbidity. Unnecessary CT before LP leads to a delay in antibiotic administration and poor outcome.

Keywords: meningitis, herniation, lumber puncture, brain, fulminant

1. Background

Acute bacterial meningitis is a serious infection with a significant risk of a CNS sequel or mortality (Joffe, 2007; Swanson, 2015). Brain herniation is a known complication of acute bacterial meningitis (Joffe, 2007; Swanson, 2015). The most severe type of bacterial meningitis is fulminant meningitis (FM) (Radetsky, 2014). Computed tomography (CT) is requested to rule out increased intracranial pressure before the lumbar puncture (LP) (Swanson, 2015). There is no clear guideline about the indications of CT before LP in pediatric; there are different protocols for adults varying in accordance with the conservation (April, Long, & Koyfman, 2017; Glimåker, Sjölin, Åkesson, & Naucler, 2017). There is clear evidence that CT scan before LP leads to a delay in antibiotic administration (Nagra, Wee, Short, & Banerjee, 2011; Glimaker, Johansson, Grindborg, Bottai, Lindquist, & Sjolin, 2015). The delaying of antibiotic administration by more than 3 hours leads to a poor clinical outcome (Glimaker et al., 2015; Auburtin et al., 2006).

We presented a case of acute bacterial meningitis that had a normal brain CT prior to LP, which complicated by brain herniation within 2 hours after LP.

2. Case Profile

A 10-year-old boy was not known to have chronic illness. He was presented to the emergency department (ER) at 00:15 with a complaint of fever, headache and neck stiffness and, recurrent vomiting for 2 days, which is associated with photophobia and phonophobia. He was seen in a private clinic a day before and administered oral antibiotics. No history of change in the level of consciousness and no history of seizure or abnormal posture was recoded. He had a history of a skull fracture more than a year earlier and a history of pneumococcal meningitis 4 months earlier, which was treated with a full course of IV antibiotics. He was fully vaccinated. No past history of other recurrent infections and no family history of immunodeficiency was observed. In ER, he presented walking,

fully conscious and oriented. Vital signs showed a temperature of 36.1^0C, heart rate of 111b/min, respiratory rate of 28breaths/min, and BP: 115/77 mmHg. Neurological examination showed GCS 15/15 with positive meningeal signs. He had normal cranial nerves, tone, power and reflexes. Fundoscopy was not conducted. ENT examination showed congested throat. Other systemic examinations were normal. The CT scan performed before the LP at 02:30 was normal (Figure 1). LP was carried out at 03:30, which showed leukocytosis (WBC level 906/mm^3 with 58% neutrophils), protein 1.17 g/l and glucose 1.3 mmol/l. Blood CBC showed WBC 35000 (77% neutrophils), hemoglobin 11.8 g/dl, and platelets 397000. Serum chemistries (including Na, K, Cl, BUN, creatinine and CO2) were normal. At 04:15, he received ceftrixon and vancomycin. At 05:20, he developed irregular respiration and showed a decrease in the level of consciousness without any response to stimulation. CNS examination showed GCS: 3/15 and bilateral fixed dilated pupils. He was intubated immediately and started on a neuroprotective strategy with hypertonic saline and mannitol infusions. No improvements were recorded. The CT scan was repeated after stabilization at 14:30 which showed cerebellar herniation and subarachnoid hemorrhage (Figure 2). Blood and CSF cultures were positive for Streptococcus pneumoniae. After one week, brain death was confirmed.

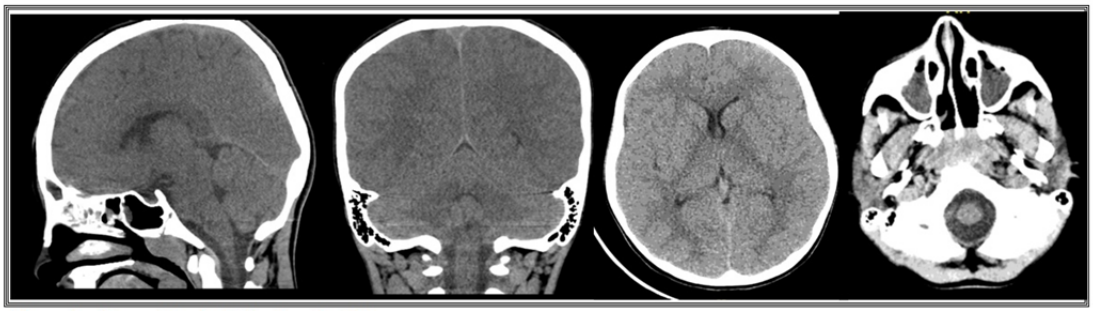

Figure 1. Normal brain CT before the LP

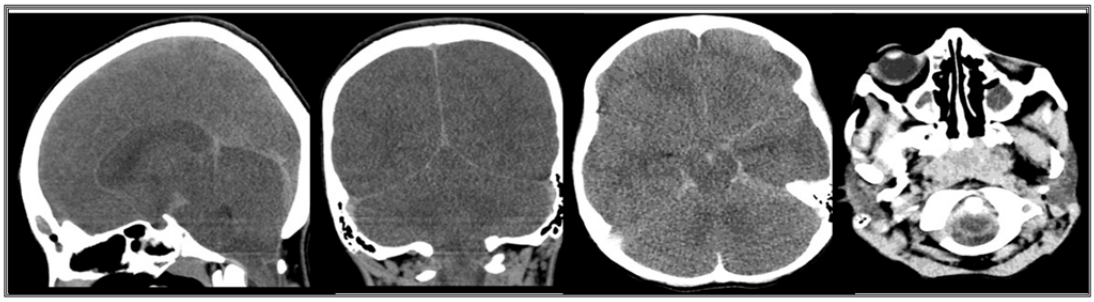

Figure 2. Cerebellar herniation with subarachnoid hemorrhage after the LP

4. Discussion

The child in the case suddenly deteriorated within 2 hours, from being fully conscious to falling into a coma. The causes of the deterioration will be discussed separately in detail. They could be either LP related, as the condition deteriorated shortly after LP, or a part of the meningitis process. The previous skull fracture is the cause of the recurrent pneumococcal meningitis (Ghosh, 2017).

Brain herniation affects around 5% of the cases of acute bacterial meningitis and accounted for 32% of its mortality (Joffe, 2007). Joffe found that there is a relation between the LP and brain herniation in his review, which showed brain herniation occurred within 3 hours from LP in 38%, 4 to 12 hours in 41% and more than 12 hours in 21%. Brain herniation occurred before LP in 11% of the cases which is against the risk of LP (Joffe, 2007). LP does not necessarily have to be the main cause, but may accelerate the process in the patient who ran the risk of herniation (Joffe, 2007; Swanson, 2015; Radetsky, 2014). Brain CT scan cannot totally rule out increased intracranial pressure (ICP). Rennick reported 5 out of 14 cases (36%) of brain herniation in children with meningitis had normal CT prior to LP (Rennick, Shann, & de Campo, 1993). Kastenbauer reported that 8 out of 10 cases (80%) of brain herniation in adults with meningitis had normal CT prior to LP (Kastenbauer, Winkler, & Pfister, 2002). Baker reported 6 out of 13 cases (46%) of high ICP measured by LP had normal CT (Baker et al., 1994). A normal

CT scan does not mean LP is totally safe. There is clear evidence that the brain CT scan before LP leads to a delay in antibiotic administration (Nagra, 2011; Glimaker et al., 2015). The delaying of antibiotic administration for more than 3 hours leads to a poor clinical outcome (Glimaker et al., 2015; Auburtin et al., 2006). Most of the case reports and case series of brain herniation secondary to meningitis showed change in the level of consciousness before LP (Joffe, 2007). The clinical contraindications of LP are changing levels of consciousness, fixed dilated pupils, fixed eye deviation, posturing, respiratory changes, papilledema, recent seizure or hypertension with bradycardia (Joffe, 2007; Swanson, 2015; Glimaker, 2015; Auburtin et al., 2006). We conclude that the clinical signs and symptoms are the most important indicators in identifying the risk of herniation and deciding when to delay LP. A cohort prospective study showed a more restricted guideline to perform brain CT before LP had less mortality and more favorable outcome due to earlier antibiotics administrations (Glimåker et al., 2017). The practice of brain CT before LP should be restricted to specific situations, where ICP is suspected clinically. The CSF culture will not be affected if the antibiotics are administered within 4 hours and before LP (Michael et al., 2010).

Bacterial meningitis is either acute, subacute or fulminant. Fulminant meningitis (FM) is the most severe type that causes abrupt developments of herniation or death within 48 hours from the onset of symptoms (Radetsky, 2014). A reported case of FM showed a sudden deterioration in ER within 2 hours to a coma and brain herniation without undergoing LP. The most common pathogen is pneumococcal infection. Most of the reported cases had normal brain CT before LP and diagnosed as FM retrospectively (Radetsky, 2014). Herniation in FM is unresponsive to the interventions, but showed a response in acute condition (Joffe, 2007; Radetsky, 2014). Mortality occurred among more than 50% (Radetsky, 2014).

In our case, it is still a challenge to determine the exact cause of the deterioration. No one can totally detemine the cause of this deterioration. The patient did not have any clinical contraindications of LP with the normal brain CT, which made LP less likely to be the cause. The sudden deterioration was in favor of acute or fulminant meningitis processes, especially since the case was associated with a delaying of antibiotic administration secondary to performing CT and LP.

5. Conclusion

Brain herniation is a severe complication of bacterial meningitis. Clinical findings are the best indicators of delaying LP and predicting the risk of herniation. Normal brain CT does not necessarily mean LP is safe. Early antibiotic administration improves mortality and morbidity. Unnecessary CT before LP leads to a delay in antibiotics administration and poor outcome.

Competing Interests Statement

The authors declare that they has no competing or potential conflicts of interest.

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Environmental Health Risk Assessment Due to Exposure to Mercury in Artisanal and Small-Scale Gold Mining Area of Lebak District

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Abstract

In Indonesia it is estimated that there are around 250,000 artisanal and small-scale gold mining (ASGM) and generally use mercury for amalgamation process and then release it to the environment during gold refining process. This study aims to analyze mercury levels in the environment around ASGM in Lebaksitu Sub-District, Lebak District, Banten Province and identify hazardous exposure that may occur. The study design used was descriptive observational with Environmental Health Risk Assessment (EHRA) method. Environmental data taken include water and food samples. Social-demographic and dietary interviews were conducted. The study population was 72 residents of Lebaksitu Sub-District obtained through sample size formula and selected by simple random sampling. The study was conducted from April to May 2017. Exposure assessment is an important part of risk assessment. Exposure is a process that causes contact with environmental hazards such as risk agents, as a bridge connecting 'hazards' to 'risks'. Exposure analysis needs to consider all routes (inhalation, ingestion, absorption) and media (air, water, soil, food, drinking water) so that the total intake can be calculated. Exposure route analysis usually generate a critical pathway, the dominant exposure path. This pathway concerns which environmental media is the vehicle of risk agent and how it enters the body. Once a critical pathway is found, other possibility pathways contribution may be small and can be ignored. Mercury is a toxic pollutant that bioaccumulated and biomagnetic continuously through the food chain. The levels of mercury at the research sites on rice, fish, and vegetables have average of 0.027 mg/kg; 0.283 mg/kg; and 0.410 mg/kg. The calculation of risk assessment obtained value of risk quotient (RQ) of 3.79 (RQ>1). The results of this calculation of risk assessment showed that mercury content in samples of rice, fish, and vegetables originating from Lebaksitu Sub-District potentially cause a health risk for the community surrounding the gold mining area who consume it.

Keywords: mercury, risk assessment, artisanal and small-scale gold mining

1. Introduction

In Indonesia it is estimated that there are around 250,000 artisanal and small-scale gold mining (ASGM) and generally use mercury for amalgamation process (Sembel, 2015). ASGM has many associated environmental and occupational health issues. The health and well-being of miners, their family members, and also nearby communities is often adversely affected (WHO, 2016).

Mercury is a natural element found in air, water, and soil, that has silvery white color, liquid, and volatile (Widowati, Sastiono, & Jusuf, 2008; United Nations Environment Programme, 2008). Mercury is commonly found at very low concentrations in the environment (Gohari, 2016). Although only be found in low concentrations in the earth's crust, this metal is heavily buried in mining areas (Agustina, 2010). ASGM usually use mercury in ore processing. Gold ore mining results are processed by amalgamation method, that is the process of binding of gold metal from ore by using mercury (Widodo, 2011).

Amalgam (a combination of gold/silver metal with mercury) is heated, vaporizes mercury from the mixture, and leaves the gold (Widodo, 2011; WHO, 2013). The use of this method of amalgamation results in the emergence of problems, namely the release of mercury is high enough to pollute the river water (Widodo, 2008). In addition, mercury wastes and other heavy metal waste are toxic and persistent and hazardous to humans and the environment (Kementerian Lingkungan Hidup, 2013).

The proposed route for mercury to enter the human body is only an indirect way through the food web of the inhabitants (Arifin, Sakakibara, & Sera, 2015).Diet hold an important role in individual exposure to environmental chemicals. Mercury contamination from the human food chain is a significant problem for human health and well-being. Methyl-mercury exposure is a clear example that the general population is exposed to this metal through the consumption of fish and other products of the aquatic environment (Schoeman, Bend, Hill, Nash, & Koren, 2009; Dewailly et al., 2012).

One of ASGM in Indonesia that is still active today is ASGM in Lebaksitu Sub-district, Lebak District, Banten. According to research that has been done in Lebaksitu Sub-district known mercury levels in water, soil, and fish taken from the area around ASGM of Lebaksitu Sub-district each of 0.00392 ppm, 5.709 ppm, and 0.5175 ppm. The results of these measurements indicate mercury levels that have exceeded the threshold and indicate that environmental pollution has occurred due to mercury (Agung & Hutamadi, 2012). This study aims to analyze mercury levels in the environment around ASGM in Lebaksitu Sub-District, Lebak District, Banten Province and identify hazardous exposure that may occur.

2. Materials and Methods

The study design used in this study is the Environmental Health Risk Assessment (EHRA) which consists of several steps, that is: 1) hazard identification, 2) dose-response analysis, 3) exposure assessment, and 4) risk characterization (Rahman, 2007). Environmental data taken include water and food samples (rice, fish, and cassava leaves). The population in the study were residents residing in Lebaksitu Sub-district with inclusion criteria: 1) residing around the location of small scale gold mining in Lebaksitu Sub-district; 2) men or women have equal opportunity in participating as respondents; 3) willing to be a respondent. The study population was 72 residents of Lebaksitu Sub-District obtained through sample size formula and selected by simple random sampling. The study was conducted from April to May 2017.

The calculation of mercury intake is obtained from the calculation of Intake (I), through the following equation (Rahman, 2007):

$$I = \frac{C \times R \times f_E \times D_t}{W_b \times t_{avg}}$$

Explanation:

I = Intake, mg/kg/day

C = Concentration of risk agent (mg/L for drinking water and mg/kg for food),

R = Rate of intake or consumption (L/dayfor drinking water and kg/dayfor food),

f_E = Frequencyof annual exposure (day/year),

D_t = Duration of exposure, year (real time or projection, 30 years for residential default value),

Wb = Weight (kg),

t_{avg} = Average time period (Dt x 365 days per year for non-carcinogenic substances, 70 years x 365 days per year for carcinogenic substances).

Estimation of the level of health risks derived from calculations using Risk Quotient (RQ) is calculated through the equation:

$$RQ = \frac{I}{RfD}$$

The interpretation of the RQ value obtained from the formula calculation is if RQ> 1 means having a health risk. RfD (Oral Reference Dose) is the amount of chemicals that can be consumed daily in a lifetime that is not anticipated to cause non-cancer health effects. The riskant contaminant studied, mercury, has a quantitative toxicity value (RfD) obtained from US EPA. Based on oral mercury inlet and non-carcinogenic character, the RfD value is 0.0001 mg/kg/day based on US EPA (US EPA, 2001).

3. Results

Based on Table 1, the frequency distribution of social, economic, and demographic characteristics of Lebaksitu residents, most of the respondents are women, namely 77.8%. Most of the respondents graduated from elementary school (38.9%). Most of the respondents are not miners / processors of gold that is equal to 77.8%.

Table 1. Frequency Distribution of Social, Economic, and Demographic Characteristics of Lebaksitu Sub-district, Lebak District, West Java 2017

Variable	Total	Percentage
Sex		
Male	16	22.2
Female	56	77.8
Education		
No school	24	33.3
Not completed in primary school	8	11.1
Finished primary school	28	38.9
Finished junior high school	12	16.7
Occupation		
Miners or gold processors	16	22.2
Not miners or gold processors	56	77.8
Total	**72**	**100.0**

Based on Table 2, the average age of respondents is 38.11 years old with a range of 20 years old to 80 years old. Average weight of respondents is 54.52 kg with a range of 39.20 kg to 81.00 kg. For height, the average height of respondents is 153,70 cm with range of 140 cm to 172 cm.

Table 2. Characteristics of Anthropometry, Activity Pattern, and Consumption Rate of Lebaksitu Sub-district Residents, Lebak Regency, West Java 2017

Variable	Mean ± SD	Median	Range	Distribution***
General anthropometry				
Age (year)	38.11 ± 15.12	33.50	20 - 80	Normal
Weight (kg)	54.52 ± 8.99	53.05	39.20 - 81.00	Normal
Height (cm)	153,70 ± 7,04	152,50	140 - 172	Normal
Activity pattern				
D_E (year)*	30	-	-	-
D_t (Real time) (year)**	20.11 ± 15.12	15.50	2 - 62	Normal
f_E (day/year)*	350	-	-	-
Consumption rate				
Drinking water (L/day)	1.23 ± 0.69	1.00	0.25 - 4.50	Abnormal
Beras (kg/hari)	0.26 ± 0.09	0.30	0.10 - 0.70	Abnormal
Ikan (kg/hari)	0.04 ± 0.01	0.03	0.00 - 0.18	Abnormal
Sayur (kg/hari)	0.03 ± 0.01	0.01	0.00 - 0.15	Abnormal

*use default value.

**Life span, calculated by the formula: current age - 18 years.

*** Normality (*Kolmogorov - Smirnov* ($n \geq 30$) and *Shapiro - Wilk* ($n < 30$)).

Based on the results contained in Table 3, the average mercury (Hg) value found in rice derived from Lebaksitu Sub-district was 0.027 mg/kg with minimum and maximum values of 0.020 mg/kg and 0.030 mg/kg. The mercury contained in fish from Lebaks Sub-district has an average of 0.283 mg/kg, minimum of 0.220 mg/kg and maximum of 0.360 mg/kg. Based on the results listed in Table 3, the average mercury value found in vegetables

(cassava leaves) consumed by Lebaksitu residents is 0.410 mg/kg, minimum 0.250 mg/kg and maximum 0.540 mg/kg.

Table 3. Concentration of Mercury on Three Types of Food Consumed by Lebaksitu Residents, Lebak District, West Java 2017

Parameter	Mean ± SD	Median	Range	Distribution*	Level of contamination**
Rice					
Hg (mg/kg)	0.027 ± 0.005	0.030	0.020 - 0.030	A	300
Fish					
Hg (mg/kg)	0.283 ± 0.063	0.270	0.220 - 0.360	N	2800
Vegetable					
Hg (mg/kg)	0.410 ± 0.132	0.440	0.250 - 0.540	N	4100

*A: Abnormal, N: Normal.

**Level of contamination calculated by:

Concentration of metal (Hg) ÷ RfD.

RfD *(*Reference Dose*)* Hg = 0,0001 mg/kg/day (US EPA).

Based on RQ calculations, estimates of health risks to mercury in rice, fish and vegetables (cassava leaves) in total show RQ>1 (RQ = 3.79) (Table 4). Estimation of health risk to mercury in rice with value RQ>1 that is equal to 1,58. For fish, estimate health risk to mercury with value RQ>1 that is equal to 1,49. While estimation of health risk to mercury in vegetable (cassava leaf) with value RQ<1 that is equal to 0, 72.

Table 4. Level of Risk of Mercury Exposure in Lebaksitu Village, Lebak Regency, West Java 2017

Source of Mercury	I* (mg/kg/day)	RfD (mg/kg/day)	RQ**
Hg			
Rice	0.0001583		1.58
Fish	0.0001493	0,0001	1.49
Vegetable	0.0000721		0.72
Total RQ			3.79

*I calculated by the formula: $I = \frac{C \times R \times f_E \times D_t}{W_b \times t_{avg}}$;

**RQ calculated by the formula: $RQ = \frac{I}{RfD}$.

4. Discussion

4.1 Mercury Contamination on Rice

Based on the results contained in Table 3, the average mercury (Hg) value found in rice derived from Lebaksitu Village was 0.027 mg/kg. From some available sources, there is no mercury content threshold value in rice. However, based on the Indonesian Food and Drug Supervisory Agency (BPOM RI) Regulation on the Determination of Maximum Limit of Microbial and Chemical Feeding in Food, maximum limit of mercury contamination in the permitted flour is maximum of 0.05 mg/kg (BPOM RI, 2009). Flour can be made from various types of vegetable materials such as whole grains so that the threshold value can be used as a reference. This means that the mercury content in rice that has been tested by the laboratory at the study site is still below the permissible level based on the BPOM RI regulation is seen from the average concentration, as well as the minimum (0.020 mg/kg) and the maximum (0.030 mg/kg) of mercury in the sample rice tested.

Bioaccumulation of mercury in the terrestrial food chain gets little attention and is considered unimportant. However, recent research has shown that rice can be an important route of methyl mercury exposure to residents in

the Hg mining area in China. This study, for the first time, shows that rice is an intensive bioacumulator of MeHg, but not of IHg, which may be trapped by roots (Zhang, Feng, Larssen, Shang, & Li, 2010).

4.2 Mercury Contamination on Fish

The mercury contained in fish from Lebaksitu Sub-district has an average of 0.283 mg/kg. Based on the Indonesian Food and Drug Supervisory Agency Regulation (BPOM RI) on the Determination of Maximum Limit of Microbial and Chemical Feeding in Food, maximum limit of mercury contamination in fish is allowed maximum of 0.5 mg/kg (BPOM RI, 2009). This means that the mercury contents of fish that have been tested by the laboratory at the study sites are still below the permissible levels based on the BPOM RI regulation is seen from the average concentration, as well as the minimum (0.220 mg/kg) and the maximum (0.360 mg/kg) of mercury in the sample fish tested.

Methyl-mercury can be formed in water and soil by small organisms. The stockpiling of mercury by fish occurs because these animals consume planktonic organisms containing mercury ions in contaminated water. Methyl-mercury is formed in fish tissue. Bigger and older fish tend to have the highest mercury levels (Herman, 2006; ATSDR, 2010) As fish size increases and increases the residence time, their mercury levels rise roughly (Langeland, Hardin, & Neitzel, 2017).

4.3 Mercury Contamination on Vegetable (Cassava Leaves)

Based on the results listed in Table 3, the average mercury value found in vegetables (cassava leaves) consumed by Lebaksitu residents is 0.410 mg/kg. Like rice, there is no mercury threshold value found in cassava leaves. However, based on the Indonesian Food and Drug Supervisory Agency (BPOM RI) Regulation on the Determination of Maximum Limit of Microbial and Chemical Feeding in Food, maximum limit of mercury contamination in tomatoes is allowed maximum of 0.03 mg/kg (BPOM RI, 2009). Tomatoes are categorized as one type of vegetable so that the threshold value can be used as a reference. This means that the mercury content of cassava leaves that have been laboratory tested at the study sites exceeds the permissible levels based on the BPOM RI regulation is seen from the average concentration, as well as minimun (0.250 mg/kg) and the maximum (0.540 mg/kg) of mercury in the sample cassava leaves are tested.

Numerous studies have shown that vegetables and grains grown near various sources of mercury can be contaminated (R. Li, Wu, Ding, Fu, Gan, & Y. Li, 2017). Studies that examine the ratio of heavy metal accumulation to vegetables using irrigation with wastewater, clean water and river water have found that mercury concentrations are relatively high in leafy vegetables. The study also revealed that wastewater causes more accumulation to soil and vegetables than river water and tube well water (Hassan et al., 2016).

4.4 Mercury Contamination on Water

Water samples from Lebaksitu Village have been taken and laboratory tests are conducted. The results of laboratory tests show that no mercury contamination is detected in clean water samples. This indicates that the clean water used by the people of Lebaksitu Sub-district is within safe limits. Results of interviews with stakeholders and local residents, obtained information that clean water used by residents for everyday purposes such as drinking, cooking, bathing, and so forth comes from hilly water. The water is flowed to people's homes using hoses and water pipes. It can be concluded that the water source is far from the location of ASGM so it is not contaminated by mercury waste from the gold mining.

4.5 Estimated Risk Level

Based on RQ calculations, estimates of health risks to mercury in rice, fish and vegetables (cassava leaves) in total show RQ>1 (RQ = 3.79) (Table 4). Estimation of health risk to mercury in rice with value RQ>1 that is equal to 1,58. For fish, estimate health risk to mercury with value RQ>1 that is equal to 1,49. While estimation of health risk to mercury in vegetable (cassava leaf) with value RQ<1 that is equal to 0, 72. RQ value <1 this mean that intake mercury per day from vegetables still safe. However, after combined with rice and fish intake, there was a RQ>1 value, which means that the daily mercury intake of rice, fish, and vegetables is at risk of health problems to the people of Lebaksitu Sub-district who consume them.

Research conducted by Castilhos et al. (2015) calculate the value of hazard quotient. The hazard quotient (HQ) is a risk indicator which defines the ratio of the exposure level and the toxicological reference dose and was applied to determine the threat of MeHg exposure. For all sampling sites, HQ resulted from 1.5 to 28.5, except for the reference area. In Creporizinho, the values of HQ are close to 2 for most sites, whereas in São Chico, there is a hot spot of MeHg contamination in fish with the highest risk level (HQ = 28) associated with its human consumption (Castilhos et al., 2015).

5. Conclucions

The mercury content of rice and fish that has been tested by the laboratory is still below the permissible level based on BPOM RI Regulation (0.05 mg/kg). However, the mercury content in vegetable (cassava leaves) that have been laboratory tested exceeds the permissible levels based on BPOM RI Regulation (0.03 mg/kg). Estimation of health risk estimation to mercury in rice, fish and vegetables (cassava leaves) in total shows RQ>1 (RQ = 3.79). The value of RQ>1 indicates that the daily mercury intake of rice, fish, and vegetables is at risk of health problems to the people of Lebaksitu Sub-district.

Competing Interests Statement

The authors declare that theyhave no competing or potential conflicts of interest.

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Health-Risk Factors and 8-Year Incidence of Kidney Disease in Transitional Thailand: Prospective Findings From a Large National Cohort Study

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Abstract

Objective: Kidney disease (KD) is increasing its burden in Thailand but prospective observational KD studies are few. So we analysed 8-year nationwide Thai Cohort Study (TCS) data on KD incidence, distribution and risk association among Thais.

Design and Method: TCS is a longitudinal study of the Thai health-risk transition among Open University student residing nationwide. At baseline (2005) the cohort members analysed here were aged 15-88 years and did not have KD. At the follow up in 2013 (n=41638) incident KD was reported based on doctor diagnosis. We analysed the 8-year cumulative incidence of KD and its association with risk factors by using multivariable logistic regression.

Results: The incidence of KD (2005 to 2013) was 4.0%; the rate in men (5.9) was significantly higher than in women (2.5). KD increased significantly for both increasing age and body mass index (BMI) (p trend <0.001 for both). Its incidence was strongly associated with concurrent diseases including hypertension, diabetes and high blood lipids and moderately associated with increased frequency of cigarette smoking, instant food, roast or smoked food and soft drink consumption. KD decreased with increases in personal income, household assets, walking and physical activity.

Conclusion: Physical activity, high income and household assets prevented KD. Lifestyle changes such as smoking and high consumption of instant, roast or smoked food and soft drink increased risk of KD. Government should encourage more physical activity and less smoking, salt and sugar.

Keywords: kidney disease, socioeconomic status, body mass index, physical activity, Thailand, cohort

1. Introduction

Kidney disease (KD) is a worldwide public health burden that leads to end-stage renal disease (ESRD) and cardiovascular disease (CVD), with a large cumulative loss of disability-adjusted life years (DALYs). The prevalence of KD is increasing and estimated to range from 9% to 16% around the globe. Estimates have been reported from many countries such as Malaysia (Hooi et al., 2013), Norway (Hallan et al., 2006), China (Zhang et al., 2012), Taiwan (Wen et al., 2008), Japan (Imai et al., 2009), the US (Coresh et al., 2007) and Turkey (Suleymanlar et al., 2011). In addition, decreased glomerular filtration rate (GFR) in KD increases risk of CVD and decreases life expectancy (Gansevoort et al., 2013; Go, Chertow, Fan, McCulloch, & Hsu, 2004; Keith, Nichols, Gullion, Brown, & Smith, 2004). This is important because CVD is the dominant cause of mortality

around the globe (Roth et al., 2015) particularly in those with KD (Drey, Roderick, Mullee, & Rogerson, 2003). In the 2010 US Global Burden of Disease Study, KD was ranked as the 9th and17th cause of death and disability-adjusted life years, respectively (Murray & Lopez, 2013).

In Thailand, KD prevalence is increasing rapidly (9% in 2003 and 17.5% in 2008) (Chittinandana, Chailimpamontree, & Chaloeiphap, 2006; Ingsathit et al., 2010). This may be a result of increased risks for KD in the Thai population due to ageing (Sasat & Bowers, 2013), increasing obesity (Aekplakorn et al., 2014), diabetes (Papier et al., 2016) and hypertension (Thawornchaisit et al., 2013b). Thailand's rapid socio-economic development in the last 4 decades leads to urbanization (Lim, Kjellstrom, et al., 2009), and sedentary work. People consume more calories and more fat, sugar and salt (Aekplakorn et al., 2011; Lim et al., 2014; Pitayatienanan et al., 2014). Urbanization altered lifestyle with more alcohol consumption and a higher incidence of non-communicable diseases such as hypertension, high cholesterol and obesity (Wakabayashi et al., 2015).

Our 8-year prospective cohort analysis aims to identify the risk factors of KD operating in Thailand such as age, demography, socio-economy, physical activity, cigarette smoking, alcohol drinking, soft drink intake, food and vegetable consumption, concurrent diseases particularly hypertension, diabetes and high blood lipids. Finding the current risk factors of KD will help to develop the national policy for prevention of further burden from ESRD in the Thai population such as screening for early detection and appropriate interventions for controlling risk factors.

2. Methods

2.1 Data and Study Population

The Thai Cohort Study (TCS) is an on-going prospective study of the health-risk transition among distance learning Open University students. It investigates effects on population health of rapid socioeconomic development and modernization underway in Thailand (Sleigh, Seubsman, & Bain, 2008). A 20-page baseline questionnaire was mailed to all 200 000 students enrolled at Sukothai Thammathirat Open University in 2005. Overall 44% (87151) responded and follow up mail-out questionnaires were completed in 2009 and 2013. Across those 8 years 42785 persons responded to all three surveys and constitute the cohort analysed here. These cohort members live in their communities nationwide and represent well the STOU student body and the general Thai adult population, with similar median age, median income, country-wide residence distribution and ethnic diversity (Seubsman, Yiengprugsawan, Sleigh, & the Thai Cohort Study, 2012). However, they were also younger and better educated than most Thai adults and were expected to experience the health-risk transition ahead of their fellow Thais. Details on study methodology and cohort characteristics have been reported (Seubsman et al., 2012; Sleigh et al., 2008). Investigated risk factors included demographic, socioeconomic, cultural and lifestyle characteristics, health-risk behaviours, diet, body mass index and self-reported health outcomes including kidney disease, diabetes, high blood lipid, hypertension, various cancers, goiter, epilepsy, asthma, arthritis, chronic bronchitis, and depression/anxiety. As well there were questions on hearing, vision or dental impairment, occupation, home environment, health services, social networks, personal well-being and family background.

2.2 Variables and Categories

Analyses were carried out with kidney disease (KD) as the dependent outcome variable. Independent explanatory variables examined included demographic factors (age, marital status, urbanization) and SES (income, household assets, and education), body mass index (BMI), underlying disease (diabetes, high blood lipid and hypertension), and lifestyle factors (physical exercise, food preferences and intake, cigarette smoking and alcohol consumption) were independent variables.

Participants were grouped into three age categories. Marital status was defined as married/living with a partner or single. Urbanization status was classified based on rural (R) or urban (U) residence when aged 10-12 years old and in 2005 thus producing 4 groups: lifelong ruralites (RR), urbanizers (RU), de-urbanizers (UR) and urbanites (UU).

Personal monthly income was divided into four categories. In 2005, one US dollar was equivalent to 42 baht so most participants had quite low incomes. Household assets were classified into three categories.

Body mass index (BMI) was calculated and Asian cut-offs points for different body sizes were used, in accordance to guidelines of the International Obesity Task Force (Kanazawa et al., 2005). BMI classification was as follows: underweight (BMI < 18.5), normal (18.5 ≤ BMI < 23), overweight (23 ≤ BMI < 25), or obese (BMI ≥ 25).

Screen time (hours/day spent before TV or computer) and sitting time (hours/day spent sitting for any purpose) were assessed as proxies for sedentariness. Incidental exercise (frequency of housework or gardening), was categorised into 4 groups: ≤3 times per month; 1-2 times per week; 3-4 times per week; most days. Various forms of physical activity (at least 20 minutes of mild, moderate or strenuous exercise, 10 minutes or more walking

sessions) were also included and recorded using 4-item ordinal categories ranging from never to ≥5 times per week.

We measured planned total physical activity based on cohort members reporting the number of sessions per week of strenuous and moderate exercise for at least 20 minutes, and of walking for at least 10 minutes. We weighted the measures as follows: (2 × strenuous + 1 × moderate + 1 × walking) sessions per week. This weighting system is based on the recommendation of the International Physical Activity Questionnaire and the Active Australia Survey as used in other analyses of cohort data (Australian Institute of Health and Welfare, 2003; Banks, Lim, Seubsman, Bain, & Sleigh, 2011). Finally, for each individual, the 'overall measures' of weekly exercise for 2005 and 2013 were added and then averaged by dividing by 2, creating a longitudinal measure of planned physical activity (LPPA).

Smoking was self-reported and grouped into never, ex-smoker or current smoker. Alcohol consumption had four categories: never, ex-drinker, occasional drinker or current-drinker. Foods that could potentially influence KD (deep fried, instant, roast or smoked, soybean products and soft drinks) were assessed for consumption frequency based on a five-point Likert scale ranging from less than once a month to once or more a day. Western-style fast food exposure was noted on a three-point scale from less than once to more than 3 times per month. Fruit and vegetable consumption were recorded as standard serves eaten per day.

2.3 Statistical Analyses

All analyses were performed using SPSS software. The 8-year KD risks were calculated for each explanatory variable. For statistical inference, 95% confidence intervals (CI) are presented as well as two tailed p-values with significance at 5 percent (one asterisk) or one percent (two asterisks).

Relative risks (RRs) in a large study of an uncommon disease (incidence less than 10%) can be accurately estimated as odds ratios (ORs) (Webb & Bain, 2011). For each risk variable, the RR and 95% CI were estimated using logistic regression to calculate the bivariate OR for KD. Adjusted RRs (ARRs) were estimated by calculating multivariate logistic regression ORs. ARRs were controlled for confounding by age, sex, marital status, socioeconomic status (SES), BMI, underlying diseases and personal behaviours (cigarette smoking and alcohol drinking). A variable was included in a multivariate model if bivariate analysis had indicated a statistically significant association with incidence of KD. Some variables were included because earlier analyses reported elsewhere had shown a significant or substantial association with KD.

3. Results

3.1 Baseline Characteristic of Participants

TCS participants without KD at baseline in 2005 and responding in 2013 were analysed. The remaining cohort participants at risk were 41638 (Table 1). The mean age of participants at baseline was 32.5 years old and there were more females than males (55%vs 45%). The highest proportion of participants resided in the Central regions and North-eastern and the lowest proportion lived in the East. Sixty three percent of the participants lived in urban areas. More than half of participants had a higher education attainment than high school and their monthly incomes were lower than 10000 baht. The distribution of household assets of participants was quite similar to Thai population with a slightly higher proportion of participants in the low category. Overall, 1958 participants reported in 2013 being diagnosed with KD by a doctor (Table 2).

3.2 Incidence and Risk Factors of KD

The overall KD cumulative incidence between 2005 and 2013 was 4.0% (1556/38754); the rate in males (5.9%) was significantly higher than that of females (2.5%, Table 2). The incidence directly rose with age and an increased BMI. However, the risk of KD decreased with the increased personal income and household assets. Marital status, urbanization and educational attainment had no influence on the risk of KD.

Walking and planned physical activity, averaged across the 8-year follow-up, were protective factors. The higher frequency of walking (≥4 times/week) and LPPA (≥15 sessions/week) were associated with lower incidence of KD. The risk of KD increased in participants who had diabetes mellitus, high blood lipids and hypertension. Current smokers and ex-smokers had a higher risk of developing KD than non-smokers. However alcohol drinking had no influence on the risk of incident KD. The risk of KD had a direct association with the frequency of instant and roast or smoked food consumption and drinking soft drinks while fruit and vegetable intake had no influence on KD.

Table 1. Attributes of 41638 Thai Cohort Study members who did not have kidney disease at study baseline in 2005

Factor	Participants	
	n	percent
Demographic data		
Participants	41638	
Age (y) mean	32.5	
(SD)	(8.5)	
Age group		
≤30 y	19694	47.3
31-40 y	14517	34.9
>40 y	7427	17.8
Sex		
Male	18798	45.1
Female	22840	54.9
Married/partnered		
No	19098	53
Yes	21499	47
Regions		
Bangkok	6821	16.5
Central	9969	24.1
North	8333	20.1
North-east	8695	21.0
East	2409	5.8
South	5186	12.5
Urbanization status[a]		
Rural–rural (RR)	2553	18.9
Rural–urban (RU)	3846	28.5
Urban–rural (UR)	2402	17.8
Urban–urban (UU)	4678	34.7
Socioeconomic status		
Education level		
High school	18361	44.2
Diploma	11090	26.7
University	12086	29.1
Personal monthly income (baht) [b]		
≤7000	14740	36.1
7001–10000	9324	22.8
10001–20000	11559	28.3
>20000	5213	12.8
Household assets[e] **(baht)** [d]		
Low	15340	36.8
Medium	13192	31.7
High	12937	31.1

[a]Location of residence (rural, R, or urban, U) before and in 2005. The values showed only participants who moved their residences within 5 years.

[b]At the time of the survey in 2009, US$1 = 31 Thai baht.

[e]Replacement value in Thai baht, categorized into three groups: low ≤30,000, medium 30,001-60,000 and high >60,000.

Table 2. Eight-year incidence of kidney disease and association with baseline risk factors among Thai Cohort Study participants, 2005-2013

	KD[a](n)	I %(95% CI) [b]	aRR (95% CI)
Participants	1958	4.0 (3.8-4.2)	
Demography			
Age group			
≤30 y	530	2.8 (2.6-3.0)	1
31-40 y	602	4.5 (4.1-4.9)	1.59 (1.36-1.86)
>40 y	424	6.4 (5.8-7.0)	2.18 (1.77-2.67)
P-trend			<0.0001
Sex			
Female	529	2.5 (2.3-2.7)	1
Male	1027	5.9 (5.5-6.3)	1.62 (1.38-1.9)
Socio-economic status			
Education level			
University	770	4.6 (4.2-5.0)	1
Diploma	360	3.5 (3.1-3.9)	1.07 (0.91-1.26)
High school	423	3.7 (5.2-5.9)	1.17 (0.83-1.12)
P-trend			0.381
Personal monthly income (baht)			
≤7000	486	3.6 (3.2-4.1)	1
7001–10000	333	3.8 (3.4-4.2)	0.88 (0.74-1.03)
10001–20000	469	4.3 (3.9-4.7)	0.73 (0.61-0.87)
>20000	238	4.9 (4.3-5.5)	0.71 (0.56-0.89)
P-trend			<0.004
Household asset			
Low	548	3.9 (6.6-7.5)	1
Medium	494	4.0 (4.6-5.3)	0.93 (0.81-1.08)
High	508	4.2 (3.3-3.9)	0.86 (0.73-1.0)
P-trend			0.208
BMI classification[d]			
Underweight (BMI <18.5)	109	2.2 (1.8-2.6)	0.78 (0.61-0.99)
Normal (18.5 ≤ BMI < 23)	634	3.1 (2.9-3.3)	1
Overweight (23 ≤ BMI < 25)	296	4.7 (4.1-5.3)	1.31 (1.12-1.56)
Obese (BMI ≥25)	490	7.6 (7.0-8.2)	1.9 (1.64-2.2)
P-trend			<0.0001

Physical activities			
Walking per week			
Never	249	3.8 (3.4-4.2)	1
1-3 times	375	4.0 (3.6-4.4)	0.9 (0.75-1.08)
4-6 times	398	4.2 (3.8-4.6)	0.79 (0.65-0.95)
≥7times	484	4.1 (3.7-4.5)	0.82 (0.68-0.99)
P-trend			.068
0-7 ses/w[e]	552	5.2 (4.8-5.7)	1
8-14 ses/w	653	5.0 (4.6-5.3)	0.94 (0.81-1.09)
≥15 ses/w	495	4.9 (4.5 -5.3)	0.89 (0.75-1.0)
P-trend			0.582

Table 2. (continued...)

	KD[a](n)	I %(95% CI) [b]	aRR (95% CI) [c]
Underlying diseases			
Diabetes mellitus (type1&2)			
No	1474	3.8 (3.6-4.0)	1
Yes	82	19.1 (19.0-19.14)	2.59 (1.9-3.53)
High lipids			
No	1247	3.6 (3.4-3.8)	1
Yes	309	7.4 (6.6-8.2)	1.43 (1.21-1.68)
Hypertension			
No	1355	3.7 (3.5-3.9)	1
Yes	201	10.8 (9.4-12.2)	1.86 (1.54-2.26)
Personal behaviours			
Smoking status			
Never	847	3.0 (2.8-3.2)	1
Ex-smoker	444	6.6 (6.0-7.2)	1.277 (1.09-1.5)
Smoker[f]	230	7.4 (6.4-8.5)	1.49 (1.23-1.8)
P-trend			<0.0001
Drinking status			
Never	272	2.6 (2.2-3.0)	1
Ex-drinker	169	5.3 (4.5-6.1)	1.35 (1.07-1.7)
Occ- drinker[g]	926	4.1 (3.9-4.3)	1.07 (0.91-1.27)
Reg- drinker[h]	174	9.3 (7.9-10.7)	1.52 (1.18-1.97)
P-trend			<0.001
Food consumption habit			
Instant food			
<1 time/m	330	4.0 (3.6-4.4)	1
1-3 times/m	591	3.8 (3.4-4.2)	1.03 (0.88-1.22)
1-2 times/wk	361	3.8 (3.4-4.2)	1.03 (0.86-1.24)

3-6 times/wk	211	4.6 (4.0-5.2)	1.3 (1.04-1.62)
≥1 times/d	45	5.4 (3.8-7.0)	1.43 (0.97-2.12)
P-trend			.066
Roast or smoked food			
<1 time/m	218	3.5 (3.1-3.9)	1
1-3 times/m	512	3.6 (3.2-4.0)	1.11 (0.91-1.34)
1-2 times/wk	462	4.0 (3.6-4.4)	1.2 (0.97-1.47)
3-6 times/wk	296	5.3 (4.7-5.9)	1.39 (1.10-1.76)
≥1 times/d	49	5.9 (4.3-7.5)	1.62 (1.1-2.39)
P-trend			<0.025
Soft drink			
<1 time/m	335	3.2 (2.8-3.6)	1
1-3 times/m	453	4.0 (3.6-4.4)	1.15 (0.97-1.35)
1-2 times/wk	344	4.0 (3.6-4.4)	1.08 (0.9-1.29)
3-6 times/wk	282	4.8 (4.2-5.4)	1.29 (1.06-1.57)
≥1 times/d	123	5.3 (4.3-6.3)	1.4 (1.07-1.81)
P-trend			0.04

[a]Kidney disease. [b]Incidence of kidney disease and 95% confidence intervals (CIs). [c]Adjusted relative risks and 95% CIs calculated from multi-variable logistic regression models of kidney disease adjusted for age, sex, marital status, socioeconomic status (exclude type of house), BMI classification, sedentariness, physical activities, underlying diseases and personal behaviours. [d]Asian standard BMI classification. [e]Sessions/week. [f]Current smoker. [g]Occasional drinker. [h]Regular drinker

4. Discussion

Our large national cohort study of the Thai health-risk transition produce data on the incidence of kidney disease and its risks in young and middle-aged Thai adults. The 8-year follow up from 2005 to 2013 of participating cohort members who were initially free of KD detected a cumulative incidence of KD over this period of 4%. Risk factors that were strongly associated with higher incidence of KD were male sex, ageing, obesity, concurrent diseases (particularly diabetes, high blood lipids and hypertension). Factors inversely related to the incidence of KD were personal income and household assets. Cigarette smoking, instant food, roast or smoked food and soft drinks consumption had a moderate effect on KD incidence but walking 4 or more times per week inversely affected incident KD. Planned physical activity averaging 15 or more sessions per week over the 8-year period reduced the incidence of KD. Urbanization, marital or partner status and education attainment had no influence on KD. As well alcohol drinking, fruit and vegetable consumption were not related to KD. The incidence of KD in this cohort was much lower than those in other studies (Ingsathit et al., 2010) since the TCS participants were younger than general Thai adults.

In our cohort study, ageing was a strong risk of KD incidence which was consistent with previous cross-sectional studies in China (Du et al., 2017; C. Xue et al., 2013; Zhang et al., 2012), Korea (Kim et al., 2009; Park, Baek, & Jung, 2016), Thailand (Thawornchaisit et al., 2015), Malaysia (Hooi et al., 2013), Singapore (Ramirez, McClellan, Port, & Hsu, 2002), India (Anupama & Uma, 2014), Turkey (Suleymanlar et al., 2011) and the US (White et al., 2008). Age was independently associated with a reduced renal function (W. Chen et al., 2009; Zhang et al., 2008; Zhang et al., 2007) and albuminuria (W. Chen et al., 2009). One study showed that an increase in 1 year in age carries 4% chance of getting KD (Anupama & Uma, 2014). In conclusion, age is an independent risk factor for KD. Sex is also an important factor. This Thai cohort found that males had a significantly higher risk of KD compared to females. Similar results were reported from China (Zhang et al., 2012), India (Anupama & Uma, 2014) and the US (Coresh, Astor, Greene, Eknoyan, & Levey, 2003; Coresh et al., 2005). A study in Japan showed males had a higher risk for low estimated glomerular filtration rate (eGFR) (Takamatsu et al., 2009). A study in China found females also had a high risk of reduced eGFR (L. Xue et al., 2014). Many cross-sectional studies in China (J. Chen et al., 2005; Du et al., 2017; L. Xue et al., 2014), Thailand (Ingsathit et al., 2010), Turkey (Suleymanlar et al., 2011),

Australia (White et al., 2008) and the US (Brown et al., 2003) found being female was an independent risk factor for KD.

Socio-economic status (SES), particularly personal monthly income and household assets, had an inverse effect on risk of KD. Similar results emerged from cross-sectional studies in China (Du et al., 2017), Taiwan (Wen et al., 2008), Thailand (Perkovic et al., 2008) and the US (Martins et al., 2006; Vart, Gansevoort, Coresh, Reijneveld, & Bultmann, 2013; White et al., 2008). One of these studies in the US revealed that poverty associated with increase risk of microalbuminuria (Martins et al., 2006). Low SES people tend to have increased risk of obesity and hypertension (Vart et al., 2013) as well as more infection, more interstitial and glomerulonephritis, poor diet and environment and low opportunity to access health care due to lack of health insurance (White et al., 2008). The progress of the health risk transition in Thailand is revealing that KD and SES already associate inversely as in rich countries.

We also found that increasing BMI was directly associated with increasing incident KD. Similar results were revealed in previous cross-sectional studies in Korea (Kim et al., 2009; Park et al., 2016), China (Du et al., 2017), Singapore (Ramirez et al., 2002) and Australia (White et al., 2008) and in follow up studies of 10 to 12 years in the US (Grubbs et al., 2014; Stengel, Tarver-Carr, Powe, Eberhardt, & Brancati, 2003) and 25 years in Israeli (Vivante et al., 2012). The US study of Grubbs et al (2014) found that increasing BMI was significantly associated with lower kidney function. In Singapore a higher BMI associated with rising proteinuria (Ramirez et al., 2002). In a prospective cohort of Israeli soldiers obesity was significantly associated with an increased risk of incident ESRD (Vivante et al., 2012). A British cohort study revealed that obesity when young (less than 40 years) was significantly associated with a higher risk of KD incidence (Silverwood et al., 2013). Multiple studies have shown obesity is a risk for KD which then becomes part of the enormous national cost of excess weight (W. Chen et al., 2009; Du et al., 2017; Pitayatienanan et al., 2014; L. Xue et al., 2014).

Our cohort found that higher frequency of walking and LPPA was associated with a reduction of KD incidence. Our previous cross-sectional study of baseline TCS data also revealed a similar result of LPPA (Thawornchaisit et al., 2015). It is consistent with previous study revealing that physical inactivity related to an increase risk of KD incidence (Stengel et al., 2003). In addition, a study in KD patients reported that regular water-based exercise (30 minutes, twice a week) associated with decrease of proteinuria and increase of glomerular filtration rate (Pechter et al., 2003).

We found that diabetes mellitus was a strong risk factor for KD as noted in cross-sectional studies in China (C. Xue et al., 2013; Zhang et al., 2012), Korea (Kim et al., 2009; Park et al., 2016), Malaysia (Hooi et al., 2013), Singapore (Ramirez et al., 2002), Thailand (Ingsathit et al., 2010; Thawornchaisit et al., 2015), India (Anupama & Uma, 2014), the US, Australia and Thailand (White et al., 2008). In China, a population based cross-sectional study indicated that diabetes was the strongest risk factor for KD (W. Chen et al., 2009; L. Xue et al., 2014). A study in Singapore revealed that diabetes associated with increase of proteinuria (Ramirez et al., 2002). The most common cause of KD was glomerulonephritis and the second was diabetic nephropathy (Xie & Chen, 2008). The study revealed that blood sugar (HbA1c) in diabetes patients was associated with an increase of albuminuria, predictor of microvascular lesions for kidney disease including ESRD (Parving et al., 2006). In addition, population-based studies in China confirmed that diabetes associated with an increase of albuminuria (W. Chen et al., 2009; L. Xue et al., 2014) while one study reported that diabetes associated with reduction of eGFR (L. Xue et al., 2014).

We found that high blood lipids strongly associated with increased KD incidence. Cross-sectional evidence from Thailand (Thawornchaisit et al., 2015) and China (W. Chen et al., 2009; W. Chen et al., 2011; C. Xue et al., 2013; L. Xue et al., 2014; Zhang et al., 2007) and prospective evidence from the US (Muntner, Coresh, Smith, Eckfeldt, & Klag, 2000) revealed similar results. High blood cholesterol and triglyceride associated with a reduced renal fuction (Zhang et al., 2007). High triglyceride (W. Chen et al., 2009) and lipid (L. Xue et al., 2014) associated with increase of albuminuria. One of these studies revealed that high lipid and cholesterol associated with reduction of eGFR and high risk of KD (L. Xue et al., 2014). High triglycerides and lower high-density lipoprotein (HDL) cholesterol related to increased KD incidence (Muntner et al., 2000). Hyperlipidaemia may have a major role in increased risk of glomerulosclerosis and tubule-interstitial fibrosis (Schaeffner et al., 2003).

In the Thai Cohort Study, hypertension was strongly associated with a higher incident KD and similar findings were reported from cross-sectional studies in China (Du et al., 2017; C. Xue et al., 2013; L. Xue et al., 2014; Zhang et al., 2012), Korea (Kim et al., 2009; Park et al., 2016), Malaysia (Hooi et al., 2013), Singapore (Ramirez et al., 2002), Thailand (Ingsathit et al., 2010; Thawornchaisit et al., 2015), India (Anupama & Uma, 2014), the US, Australia and Thailand (White et al., 2008). High blood pressure associated with reduced renal fuction (W. Chen et al., 2009; Zhang et al., 2008; Zhang et al., 2007). A study in Singapore revealed that hypertension associated with

increase of proteinuria and the risk for proteinuria according to systolic and diastolic blood pressure were significantly increased beginning at levels of 110 and 90 mmHg, respectively (Ramirez et al., 2002). Hypertensive nephrosclerosis was the third most common causes of KD (Xie & Chen, 2008). High blood pressure (L. Xue et al., 2014) and hypertension (W. Chen et al., 2009; W. Chen et al., 2011) were independent risk of increased albuminuria. As well hypertension associated with a reduction of eGFR (W. Chen et al., 2011). In addition, blood pressure in diabetes patients was associated with an increase of albuminuria which was an independent predictor of microvascular lesions for kidney disease including ESRD (Parving et al., 2006). Elevated systolic blood pressure in KD patients was a significantly risk factor associated with KD progression to ESRD (Inaguma et al., 2017). The population-based studies in China found that hypertension independently associated with KD occurrence (W. Chen et al., 2009; W. Chen et al., 2011).

In our cohort, cigarette smoking is moderately associated with an increased risk of KD incidence. Cross-sectional studies in China (W. Chen et al., 2009; C. Xue et al., 2013; L. Xue et al., 2014), Thailand (Thawornchaisit et al., 2015), The Netherlands (Pinto-Sietsma et al., 2000) and a longitudinal study in the US (Stengel et al., 2003) showed a similar result. The population-based studies in China found that cigarette smoking independently associated with increase albuminuria (L. Xue et al., 2014) and reduced renal function with the occurrence of KD (W. Chen et al., 2009). The study showed that smoking more than 20 cigarettes a day significantly related to two times risk of incidence of KD compared to non-smoker (Stengel et al., 2003). In addition, the Netherlands study revealed that smoking was associated with increase of albuminuria and reduction of GFR in a dose-response manner (Pinto-Sietsma et al., 2000). In sum, cigarette smoking was directly related with increased risk of KD incidence.

In our study, higher frequency of instant foods, high sodium intake and carbohydrate consumption were associated with a higher risk of incident KD. High salt consumption associated with increased risk of KD is reported in many studies such as in the US (Lin, Hu, & Curhan, 2010), and Iran (Khaledifar, Gharipour, Bahonar, Sarrafzadegan, & Khosravi, 2013). In women study, high sodium consumption associated with reduction of eGFR (Lin et al., 2010). High sodium intake may related with high blood pressure which also plays a major role in reduction of eGFR (Lin et al., 2010). A positive correlation between 24 hour urinary sodium secretion and the level of albuminuria was reported in an Iranian study (Khaledifar et al., 2013). Our study provides additional evidence that higher instant food consumption is associated with an increased KD incidence.

In our cohort, consumption of roast or smoked food, contained high protein associated with an increased incidence of KD which was consistent with several other studies (Jacobsen, Christensen, Mogensen, Andreasen, & Heilskov, 1979; Jha et al., 2013) (Friedman, 2004). However, the Mediterranean diet associated with reducing the risk of development of KD (Chrysohoou et al., 2010). High protein consumption associated with glomerular hyperfiltration, increase of proteinuria and accelerated risk of KD (Friedman, 2004). In addition, a study of women with mild kidney insufficiency showed high protein intake related with reduction of kidney function (Knight, Stampfer, Hankinson, Spiegelman, & Curhan, 2003). Furthermore, high consumption of red meat may increase risk for albuminuria (Lin et al., 2010). As well, in non-dialysis KD patients, low protein diet consumption was able to improve serum creatinine and increased eGFR (Rizzetto, Leal, Bastos, Fouque, & Mafra, 2017). Many reports and our findings support that high protein consumption associated with increased risk of KD incidence.

We found that higher frequency of soft drink drinking directly increased risk of KD incidence. Our finding is consistent with previous reports such as cross-sectional studies in the US (Bomback et al., 2010; Saldana, Basso, Darden, & Sandler, 2007; Shoham et al., 2008). The studies reported a significant association between two or more sugar-sweetened soft drinks per day intake and the increase of albuminuria (Shoham et al., 2008) and decline of eGFR (Lin & Curhan, 2011). Furthermore, 2 or more cola carbonated beverages drinking per day was associated with increased risk of kidney disease (Saldana et al., 2007). As well, sugar-sweetened soda consumption one or more per day was associated with prevalent hyperuricemia and renal injury (Bomback et al., 2010). High serum uric acid level is an independent risk factor for incident kidney disease (Tsai, Lin, Kuo, & Huang, 2017; Weiner et al., 2008). We found that frequent sugar-sweetened beverage intake related to increase risk of KD incidence.

Our cohort study is based on a very large and long-time prospective study of Thais. The results are adjusted for confounding factors so independent risk factors for KD for Thais can be identified. Although the participants are younger and well-educated than Thai people, they represent the population well in socio-demography, socio-economy and geography (Seubsman et al., 2012; Sleigh et al., 2008). Therefore, results from our studies will represent the future trends for renal health in the Thai population.

Self-report is a limitation of our cohort study since it may relate to recall error. We do know that these open university student populations accurately self-reported weight and height (Lim, Seubsman, & Sleigh, 2009).

Furthermore, cohort members accurately reported diabetes, heat exposure at work and hypertension (Papier et al., 2017; Tawatsupa et al., 2013; Thawornchaisit et al., 2013a). These validation studies show that self-report of health and disease by STOU participants is generally reliable for evaluating the health risk transition and the future trend of chronic diseases in Thailand. Indeed, the cohort study was conducted among Open University students to increase the reliability of self-reported measurement and each time we investigate a specific variable we find the report to be accurate.

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Ethical Considerations

Ethical approval was obtained from Sukhothai Thammathirat Open University Research and Development Institute (protocol 0522/10) and the Australian National University Human Research Ethics Committee (protocol 2004344 and 2009570). Informed, written consent was obtained from all participants.

Competing Interests Statement

The authors declare that there are no competing or potential conflicts of interest.

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The Influence of Conversational Content on College Students' Safe Sex Intentions: A Mixed Method Approach

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Abstract

Even though health campaign designers are advised to specifically focus on triggering conversations between people about health issues, there is still a lot unknown about what aspects of a conversation may contribute to safe sex behavior and intentions. Empirical research in this field so far has mainly focused on conversational occurrence rather than conversational content, and where content is taken into account, this mostly concerns self-reports. In this mixed method study, we looked into the quantitative effects of real-life conversations about safe sex, triggered by a safe sex message, on college students' intentions related to safe sex. We then used a qualitative analysis to try and identify content-related aspects that may be related to the quantitative effects. Two weeks after filling in a questionnaire on their safe sex-related intentions, participants (N = 24) were instructed to watch and talk about a safe sex video with a conversation partner of choice, followed by filling in a questionnaire. The conversational data were analyzed qualitatively. The results suggest that the conversations increased safe sex-related intentions compared to pretest scores, and that content-related aspects such as conversational valence, type of communication behavior and behavioral determinants were related to these effects. Thus, our findings provide enhanced insight into the social norms and behavioral patterns related to safe sex, and indicate that it is important to look at conversational content in detail rather than to focus on mere conversational occurrence or quantitative effects.

Keywords: college students, conversational content, interpersonal communication, mixed-method, safe sex

1. Introduction

1.1The role of Interpersonal Health Communication in the Persuasion Process

In the past decades, researchers in the field of health communication have increasingly focused on the role of face-to-face interpersonal communication in the effectiveness of health campaigns. With this development, the field moves away from the assumption that in mass communication, the health campaign itself is exclusively responsible for effects on health behavior, acknowledging that "media messages are not consumed in a vacuum, and the personal experiences of many (if not most) individuals would support the statement that media stimulates conversation and social interaction" (Helme et al, 2011, p. 367). Conversations elicited by health campaigns may influence health behavior, for instance because they spread the message further to a larger audience (Dunlop, Kashima, & Wakefield, 2010), because they may lead to the discovery of social norms (Hornik & Yanovitzky, 2003; Frank et al., 2012), provide social support (Duggan, 2006), increase feelings of self-efficacy (Frank et al., 2012), or because they may help break taboos concerning sensitive topics such as HIV/AIDS (Pettifor et al., 2004).

Several empirical studies have indeed found evidence for the important role of interpersonal communication in health campaign effects (e.g., Chatterjee, Bhanot, Frank, Murphy, & Power, 2009; Van den Putte, Yzer, Southwell, De Bruijn, & Willemsen, 2011; Frank et al., 2012). Seen in this light, triggering interpersonal communication may be a fruitful strategy in order to maximize the effectiveness of health campaigns.

1.2 Ambiguous Effects of Interpersonal Health Communication

Most of the research on the topic of interpersonal communication about health issues has so far relied on

questionnaire studies in which conversations on health issues are studied indirectly, for instance by asking participants to report on past conversation behavior (e.g., Chatterjee et al., 2009; Frank et al., 2012; Helme et al., 2011; Van den Putte et al., 2011; Hendriks & De Bruijn, 2015), or on their intention to engage in conversations on a certain topic (e.g., Jansen & Janssen, 2010; Lubinga, Schulze, Jansen, & Maes, 2010; Lubinga, Jansen, & Maes, 2014). Thus, these studies mainly focused on whether or not conversations took place, i.e., conversational *occurrence*. In order to establish effects of conversations on health behavior determinants, it is essential that we also look at the *content* of these conversations (as recommended by Southwell & Yzer, 2007; Frank et al., 2012).

Focusing on the mechanism underlying the effectiveness of interpersonal communication seems especially important as conversations that are stimulated by a health campaign will not always be in agreement with the aims of the campaign (Hafstad & Aaro, 1997; Dunlop, 2011). Indeed, several studies have found unintended - and undesirable- effects of conversations about health messages (David, Capella, and Fishbein, 2006; Van den Putte et al., 2011; Hendriks, Van den Putte, De Bruijn, & De Vreese, 2014; Lubinga, Maes, & Jansen, 2016). Lubinga et al. (2016), for instance, found that young South African adolescents' conversations about cryptic HIV/AIDS messages decreased the level of understanding of these health messages in a considerable number of cases. Interpersonal communication about health messages that are not understood correctly may thus increase the reach and frequency of misinterpretations of the messages, which may have dangerous consequences (Lubinga et al., 2010). It therefore seems a good idea to learn more about the content and effects of health-related conversations.

1.3 Aspects of Conversational Content

So what aspects of conversational content could be involved in persuasion? An early study by Weinstein (1993) looked at persuasive conversations between friends about self-protective health behavior, such as exercising three times a week, or flossing regularly. One of the goals was to determine what ingredients of a conversation may make a conversation persuasive. Weinstein did not identify any particular ingredients in the conversations that appeared to have special persuasive power. Rather, the fact *that* a peer had recommended something seemed more persuasive than any specific argument in the conversation (Weinstein, 1993).

Later studies, however, did suggest content-related aspects that may influence the persuasion process. For instance, a number of studies found that 'conversation valence' or the favorability of the conversation, that is, whether conversation partners talk positively or negatively about the health topic, may be an important factor in the effects of interpersonal health communication on health behavior (Morgan, 2009; Dunlop et al., 2010; Frank et al., 2012; Hendriks, De Bruijn,& Van den Putte, 2012; Brennan, Durkin, Wakefield, & Kashima, 2016). However, conversational valence is unlikely to be the only factor involved. Donné, Jansen, and Hoeks (2017a), for instance, conducted an interview study, asking people how and with whom they communicated about various kinds of health behavior (using sunscreen, eating healthy, safe sex, etc.). They found four general types of health-related conversation: admonishing ("urging [the conversation partner] to adapt health behavior, to prevent damage to his or her own health and/or that of others"), casual talk ("talking about a health theme in a social situation"), educating ("providing the conversation partner with information on a health issue to prevent him or her from performing unhealthy behavior"), and negotiating ("attempting to reach agreement with each other on performing healthy behavior for the benefit of both the self and the conversation partner") (p. 4). Donné et al. (2017a) suggested that the effect on health behavior and intentions may be different for each of these conversation types.

So how can changes in intention actually be brought about? According to the Reasoned Action Approach (Fishbein & Ajzen, 2010), the likelihood that one will actually perform a certain behavior is ultimately determined by his or her set of beliefs regarding this behavior. These beliefs can pertain to the attitude towards the behavior, to the perceived social norm, and to the person's perceived control over successfully performing the behavior. For a graphical depiction of the model (Fishbein & Ajzen, 2010), see Figure 1.

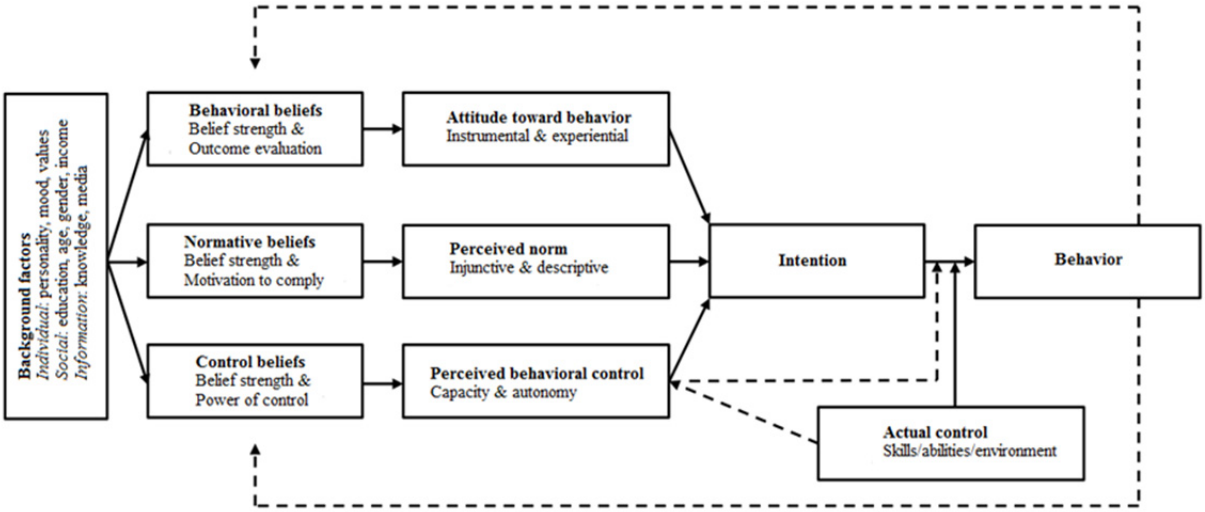

Figure 1. Reasoned action approach (Fishbein & Ajzen, 2010)

According to this model, messages, or conversations for that matter, can affect intention by bringing about a change in attitude, perceived norm or perceived behavioral control. This can be done in basically four ways: 1) by adding *new* beliefs, 2) by changing the *strength* of beliefs, 3) by changing the *evaluation* of these beliefs, or 4) by changing the *saliency* of beliefs.

In our current study, we will look further than mere conversational occurrence, and we will attempt to find out how the content of conversations might determine the persuasive effects produced by these conversations. We will focus on three content-related aspects: conversational valence, types of communication behavior, and behavioral determinants. In the next section, we will zoom in on the specific health theme that will be central to this study: safe sex.

1.4 Safe Sex Communication among College Students

Although college students generally know how to prevent a sexually transmitted infection (STI), condom use is not a normative behavior among this group (Troth & Peterson, 2000). Safe sex communication (SSC in the rest of this article), that is, communication about birth control and preventing STIs (cf. Cleary, Bahrman, MacCormack, & Herold, 2002), seems to be crucial in order to change health behavior and intentions. SSC has been found to be an important predictor of, for instance, condom use (Widman, Noar, Choukas-Bradley, & Francis, 2014).

A meta-analysis by Noar, Carlyle, and Cole (2006) found that SSC, specifically with a sexual partner, may be an important determinant of safe sexual behavior. SSC can also take place between parents and children (Troth & Peterson, 2000; Eisenberg, Sieving, Bearinger, Swain, & Resnick, 2006), and between friends (Lefkowitz, Boone, & Shearer, 2004; Busse, Fishbein, Bleakley, & Hennessy, 2010; Helme et al., 2011). For college students, friends are an important source of sex-related information (Kallen, Stephenson, & Doughty, 1983), and once students have more experience in talking about safe sex with friends, they may also find it easier to talk about safe sex with a sexual partner (Lefkowitz et al., 2004). Consistently, in the field of sexual health promotion for young people, peer education is a popular strategy (e.g., Tolli, 2012). In peer education, members of similar age or status are trained to share or teach health-related information or values to their peers. While we recognize the possibly important role of peers skilled in sexual health promotion, in the present study we were interested in finding out more about the effectiveness of conversations between peers who are not specifically trained in talking about health information.

Helme et al. (2011) found that safe sex mass media campaigns are often viewed in the presence of others, for instance friends or partners, and that viewing those messages often results in conversations about the message. In the present study, we focus on conversations triggered by a safe sex intervention developed by Donné, Hoeks, and Jansen (2017b). Following recommendations made by Yzer, Siero, and Buunk (2001), the main focus of the present study is on college students *without* a steady sexual partner, since they face a relatively high risk for STI infection compared to college students with a steady sexual partner, and SSC is thus expected to be more relevant for this group.

1.5 The Present Study

In the present study, we use both quantitative and qualitative methods to investigate the effects and content of SSC triggered by a safe sex message. We aim to answer the following research questions:

RQ1: What is the effect of conversations about safe sex triggered by a safe sex message on college students' intentions related to safe sex?

RQ2: Which content-related aspects with regard to conversational valence, types of communication behavior, and behavioral determinants can be identified in conversations about safe sex triggered by a safe sex message?

RQ3: How do the content-related aspects identified in RQ2 relate to the effects found in RQ1?

2. Method

2.1 Design, Participants and Procedure

The study was set in a quasi-experimental pretest-posttest design and consisted of three waves of data collection. Table 1 shows information on when the three waves of data collection (referred to as W1, W2 and W3 in the rest of this article) took place. A total of N = 24 participants took part in the data collection (68.8% women; mean age: 20.4 years). All participants received a financial compensation of €10 for their participation.

At W1, participants were recruited either in class or online through email or social media networks. Based on their answers in an online questionnaire (W1-Q) we assessed their eligibility for participating in the experiment, that is, whether they were college students without a steady sexual partner, since SSC was thought to be more relevant for this group than for college students with a steady sexual partner. In order to prevent a possible priming effect, we concealed the goal of the experiment by not only including questions in W1-Q regarding safe sex but also regarding other topics that may be relevant to college students: alcohol and XTC.

The first author contacted the participants through email, and asked them to find a conversation partner with whom they were comfortable talking about issues raised in W1-Q (i.e., alcohol, XTC and safe sex). Once participants indicated that they had found a conversation partner, they received more detailed instructions through email about the procedure to be followed in W2.

After two weeks, W2 took place in the private environment of one of each dyad of participants and their conversation partner, in the absence of experimenters. W2 consisted of a series of actions described in an online protocol, followed by an online questionnaire. Before being exposed to the video clip on SSC, participants first viewed a short anti-substance abuse PSA, after which they were instructed to talk about the topic 'alcohol' for five minutes. This task was included to get participants used to talking about a health topic in the self-selected dyad, and to recording the conversation. Participants were then instructed to watch a video clip on safe sex (see section 2.2) which they could find through a URL, after which they were instructed to talk about the topic "safe sex" for five minutes, and to record these conversations. They were asked to stay on topic as much as possible, and to only make one take of recording. Finally, the participants were asked to individually fill out the online questionnaire (W2-Q) including questions regarding, among other things, intentions with regard to safe sex and SSC. All 24 recordings of the conversations between the participants were transcribed verbatim. Any information linking to the identification of participants, e.g., names, was not included in the transcripts.

Two weeks later, W3 took place. All participants and their conversation partners were asked to complete an online questionnaire (W3-Q) including questions regarding their actual safe sex behavior in the past two weeks. However, most participants indicated that they had not been sexually active in the limited time span between W2 and W3. We were therefore unfortunately not able to analyze the resulting behavioral data in a meaningful way. Consequently, the data on this variable are not taken into account in section 3. After filling out W3-Q, all participants and their conversation partners received a financial compensation of €10.

Table 1. The three waves of data collection

	When	What
Wave 1 (W1)	A0	Questionnaire 1 (W1-Q)
Wave 2 (W2)	A0 + 2 weeks	- Watching video - Conversation - Questionnaire 2 (W2-Q)
Wave 3 (W3)	A0 + 4 weeks	Questionnaire 3 (W3-Q)

2.2 Stimulus Material

The stimulus material consisted of a video clip on SSC (Donné et al., 2017b). In this 2-minute video clip, two male students are depicted in their dormitory, drinking beer, and talking – through text balloons - about their experiences with SSC with a sexual partner. Each friend shares a recent anecdote in which the topic of safe sex (i.e., condom use) was brought up before having sex with a girl. In both anecdotes, SSC with a sexual partner leads to actual condom use without any problems.

2.3 Measures

Questions were asked on actual behavior and intentions regarding safe sex and intentions for SSC with both sexual partner and friends (all based on Donné et al., 2017b). Behavior was measured using semantic differential items followed by a 5-point scale; intentions were measured using Likert items followed by a 7-point scale. Furthermore, questions were asked regarding participants' age, gender, sexual preference (open ended question), sexual activity, and status of having a steady sexual partner. Moreover, in an open-ended question in the posttest, we asked what the relationship was with the conversation partner (e.g., friends or family). A full description of the items can be found in Appendix A.

2.4 Data Analysis

2.4.1 Quantitative Data Analysis

We conducted a 2 x 3 Repeated Measures ANOVA with *wave* (W1 versus W2) and *intention type* (safe sex versus SSC partner versus SSC friends) as within-participants factors.

2.4.2 Qualitative Data Analysis

We qualitatively analyzed the transcripts of the 24 conversations that were recorded by the participants with regard to (1) conversational valence, (2) types of communication behavior, and (3) behavioral determinants.

In order to assess conversational valence, the transcripts were first divided into codable information units, consisting of any meaningful utterance about one topic (Lubinga et al., 2016). An information unit did not necessarily coincide with one clause: A clause could consist of multiple information units, or one information unit could extend over multiple clauses. An example of an information unit is "And I know, for example, well, for example, I have someone in my group of friends from home. I know that she quite regularly eh.. shares the bed with someone else and that she then regularly.. eh.. for example.. eh.. doesn't do it safely.", see also example (3). This first step of analysis resulted in N = 616 information units. Following Hendriks, Van den Putte, and De Bruijn (2015), in order to assess conversational valence, every information unit related to safe sex or safe sex communication in the conversation was coded. We coded an information unit as positive when it would most likely increase the chance that the participant would have safe sex, and as negative when it would most likely decrease the change that the participant would have safe sex. Subsequently, in order to determine the valence per conversation, we subtracted the number or negative information units from the number of positive information units. For every information unit, coder 1 (the first author of this article) determined the valence. Next, coder 2 (a well-trained research assistant) thoroughly reviewed coder 1's conversational valence codes, resulting in an agreement of 78% (note 1). Codes that both coders did not agree on were discussed until full agreement was reached.

In order to identify types of communication behavior, we adopted definitions of the four types of communication behavior: admonishing, casual talk, educating and negotiating, from Donné et al. (2017a; see section 1.3). Coder 1 analyzed all 24 conversations according to the pre-established definitions of the four types of communication behavior. Subsequently, coder 3 (the third author of this article) thoroughly reviewed coder 1's analyses, and checked whether there were codes of types of communication behavior he did not agree on with coder 1, resulting

in an agreement of 93%. Any disagreements were resolved by discussion.

Finally, we identified behavioral determinants in the conversations. In this step of data analysis, the information units we generated in order to assess conversational valence were labeled according to definitions of the reasoned action approach provided by Fishbein & Ajzen (2010). For every information unit, coder 2 established to which concept within the reasoned action approach the information unit was related. The concepts within the reasoned action approach were operationalized based on Fishbein and Ajzen (2010), and in discussion between coder 1, coder 2, coder 3, and coder 4 (the second author of this article). The definitions can be found in Appendix B. Coder 1 subsequently thoroughly reviewed coder 2's analyses of the 616 information units in terms of the reasoned action approach-concepts, resulting in an agreement of 81%. Codes that both coders did not agree on were discussed until full agreement was reached. The final codes were checked by coder 3 and coder 4.

3. Results

Below, in section 3.1, we first discuss the quantitative results with regard to participants' questionnaire W1-Q and W2-Q answers in order to answer RQ1. Subsequently, in section 3.2, we discuss the qualitative results, i.e., the content of the conversation transcripts with regard to (1) conversational valence; (2) types of communication behavior; and (3) behavioral determinants in order to answer RQ2. Finally, in order to answer RQ3, in section 3.3, we relate the quantitative results to the qualitative results.

3.1 Quantitative Results

Table 2 shows the means and standard deviations of the variables measured in W1 and W2.

Table 2. Means (and SD) of variables measured in W1 and W2. 1 = low; 7 = high

	W1	**W2**
Safe sex intention	5.09 (1.43)	5.39 (1.51)
SSC partner intention	5.52 (1.28)	5.76 (1.40)
SSC friends intention	4.72 (1.65)	5.33 (1.49)

We found a main effect of *wave* ($F(1,22) = 4.59$; $p<.05$), reflecting that mean scores on intention were significantly higher on W2 (M = 5.49; SE = 0.19) than on W1 (M = 5.11; SE = 0.23).

3.2 Qualitative Results

Our findings will be illustrated by excerpts taken from each conversation consisting of conversational turns, which were translated from Dutch into English for the purpose of this article. In this section, we refer to "person A" as the target participants of this study, and "person B" as their conversation partners. Table 3 in Appendix C indicates for each individual conversation the following data: sex of the conversation partners, their relationship, the overall valence of the conversation, the types of communication behavior we identified, and safe sex intention scores for person A at times W1 and W2.

3.2.1 Conversational Valence

As described in section 2.4.2, we established the conversational valence of each individual conversation. In most conversations (N = 19) participants talked predominantly positively about safe sex, as in the following example (conversation 2):

(1) B: Yeah. No, I would just do it safe and also, just be honest with yourself, that you don't want an STI or something yourself either. At least, it seems to me that no one would want that.

A: Yeah.

B: And should you have one, then you should definitely not be proud of it.

In the 5 remaining conversations, participants talked about safe sex in a more negative way, as in the following example, which indicates a lack of perceived risk or perceived vulnerability for contracting an STI (conversation 20):

(2) B: Aren't you afraid that eh.. well you contract something through unsafe sex?

A: Well actually no. I feel like it's a very far-off thing, but eh no actually.. not.

3.2.2 Types of Communication Behavior

As described in section 2.4.2, we also looked at the types of communication behavior that could be identified in the conversation.

In 21 of the 24 conversations we identified casual talk. In some cases, casual talk revolved around the exchange of anecdotes or experiences, as in the following example (conversation 21):

(3) A: And I know, for example, well, for example, I have someone in my group of friends from home. I know that she quite regularly eh.. shares the bed with someone else and that she then regularly.. eh.. for example.. eh.. doesn't do it safely. It even happened once that we got a message in our WhatsApp group like.. it's a girl, by the way, like eh yeah, eh, how can I get the morning after pill, as a matter of eh.. I laughed really hard about that.

In other cases, as in the following example (conversation 10), casual talk revolved around participants' attitude toward sexuality or safe sex:

(4) A: That's ridiculous, right? It's just.. I think that yeah, when a guy won't take care of it [a condom], then I will. And if he then doesn't want to anymore, well, he can beat it (laughs).

B: Yeah, that's true.

A: That's how I feel.

B: Yeah, that's your opinion, a lot of girls are not resilient enough against that, right?

Furthermore, in 8 cases we found examples of educating behavior, in which explicit information on safe sex was exchanged, as in the following example (conversation 12):

(5) A: And why would you eh.. choose to use protection or not to use protection?

B: Eh.. yeah, you don't want to deal with the consequences, like, STI or worst case scenario a baby, if you don't want one. Yeah, those are the main reasons why you would use that to have safe sex.

Finally, in 4 cases, one of the conversation partners admonished the other on his or her sexual behavior. In some cases, the admonishment occurred directly, as in the following example (conversation 3):

(6) A: With X, I did it without [a condom] once too.

B: Oooooh..

A: Terrible, huh?

B: Were you on the pill?

A: I did.. no.

B: You nitwit!

In other cases, the admonishment occurred more indirectly, as in the following example (conversation 20):

(7) A: Would you do it [safe] next time?

B: Yes.

A: Yes?

B: Yes.

A: Okay. Clever.

Since none of the conversations took place between sexual partners, we did not identify any cases of negotiating behavior. However, in 17 conversations, participants talked *about* negotiating about safe sex. Since participants often referred to personal experiences or anecdotes, talking about negotiating can also be seen as a form of casual talk, as in the following example (conversation 8):

(8) A: I can imagine eh what they mean with that it may kill the mood a little bit when you ask that question. But I actually kind of like it and especially when a guy talks about this first eh.. that he just, that shows responsibility and stuff. I think that is eh.. that is really cool actually.

3.2.3 Behavioral Determinants

Finally, for every conversation, the content was analyzed with regard to behavioral determinants of safe sex in terms of the reasoned action approach (Fishbein & Ajzen, 2010). We found that participants most often talked about their attitudes (N = 177), as in the following example (conversation 17):

(9) B: That [Intra-Uterine Device] is kind of handy, because then you don't have to think about it any further and I don't want kids or something in the next couple of years anyway so then. Well.

Furthermore, participants often talked about their intention (N = 49) or their behavior (N = 41) with regard to safe sex, as in the following example (conversation 21):

(10) A: (…) Eh yeah about myself, about myself I have a bit more to talk about: I pretty much always do it safe.

Moreover, in 49 cases, participants talked about their past behavior, as in the following example (conversation 5):

(11) B: I can't even recall that we ever used a condom (…)

In 52 information units we identified an injunctive norm, as in the following example (conversation 24):

(12) B: (…) I find it pretty difficult to find where you can do an STI test, how you can do that easily and there is a little bit of a taboo there and you don't want people to find out. Does it cost money, does it not cost anything?

In 39 information units we identified a descriptive norm, as in the following example (conversation 10):

(13) A: You hear a lot of stories of eh (…) well in Groningen in any case, yeah I think that only few students actually do it safe.

With regard to perceived behavioral control, we mostly uncovered information on perceived capacity (N = 47), as in the following example (conversation 17):

(14) B: And I don't think that I would forget [to have safe sex] or something.

A: No.

B: Or that I would be scared to ask.

3.3 Comparing Quantitative and Qualitative Results

We compared individual scores of W1 to W2. As can be seen in Table 3 in Appendix C, we found that in 7 dyads, person A's intention to have safe sex decreased *numerically* (ranging from a decrease of 0.5 to 3.5 on the 7-point rating scale). In 3 dyads, person A's intention to have safe sex did not change. In 13 dyads, person A's intention to have safe sex increased (ranging from an increase of 0.5 to 2.5).

It should be noted that for most dyads (N = 21), person A's safe sex intention scores were already above midpoint "4" of the 7-point rating scale at W1, and also at W2 (N = 20). Furthermore, for most dyads (N = 17), changes in person A's safe sex intentions did not exceed 1 on the 7-point rating scale that was used. Below, we zoom in on the dyads that show either a decrease or an increase of more than 1 scale point in person A's safe sex intentions compared to W1 scores. For these conversations, we will look in more detail at what comprised the content of the conversations with regard to conversational valence, type of communication behavior, and behavioral determinants, and explore how this relates to the quantitative effects we found. The criterium used here (of more than one scale point) is of course rather arbitrary, but it is used heuristically to allow us to focus on the clearest cases of change in intention.

3.3.1 Quantitative *Decrease* in Safe Sex Intentions

In two conversations (number 12 and 22, see Appendix C), person A's safe sex intention decreased (resp. from 5.5 to 2 and from 5.5 to 3.5). Both conversations were coded as having an overall positive valence (see section 3.2.1), indicating a discrepancy between questionnaire scores and the valence that we coded. In both conversations, casual talk was the dominant type of communication behavior. Whereas in the first conversation partners mainly exchanged experiences and anecdotes with regard to safe sex, in the second conversation, the dyad mainly talked about their general attitude towards sexuality and safe sex. Furthermore, they exchanged knowledge on safe sex.

Both conversations predominantly revealed information units exposing behavioral determinants with a positive valence. For the conversation 12, both person A and person B expressed their intention to have safe sex. Person A furthermore indicated as an injunctive norm that having an STI is not cool. Moreover, person B expressed that it may ruin the mood a little bit to talk about condoms, but that this does not outweigh the benefits, which indicates an instrumental attitude. All of these utterances emphasize the importance of having safe sex. It is therefore rather difficult to account for the quantitative decrease in person A's safe sex intentions.

In conversation 22 a number of information units exposing behavioral determinants with a negative valence were identified: With regard to safe sex behavior and intention, person A indicated she rarely has safe sex, and that she does not intend to bring a condom when going out. Furthermore, person A and B both revealed the experiential attitude that using a condom is a hassle and that past experiences with a condom went wrong. Finally, person B (female) mentioned as an injunctive norm that having sex with a condom is less pleasurable for a man. However,

quite a few information units in this conversation revolve around anecdotes in which a condom *was* actually used or in which past sexual education in school is discussed, accounting for more information units with a positive valence.

3.3.2 Quantitative *Increase* in Safe Sex Intentions

In 4 conversations (number 4, 14 17 and 24, see Appendix C), person A's safe sex intention increased by >1 compared to W1 scores (resp. from 5 to 7, from 5 to 6.5, from 4 to 6 and from 2.5 to 5). All 4 conversations were coded as having a positive valence. In these conversations, we identified casual talk and educating as the dominant types of communication behavior. The casual talk mostly revolved around the exchange of anecdotes, around a general attitude regarding sexuality and safe sex, or around talking about negotiating with a sexual partner. In conversation 24, person B indirectly admonished person A when she indicated not always having safe sex, e.g., by saying: "But with a steady boyfriend you would, right?". In this conversation, the admonishment and anecdotes shared by person B may have contributed to the increase in person A's safe sex intentions, even when person A indicated in the conversation she does not always have safe sex.

A number of information units exposing behavioral determinants with a positive valence could be identified: some participants indicated they generally have, and also intend to have, safe sex, and always keep condoms in their house. Furthermore, several experiential and instrumental attitudes were expressed: it is not strange to talk about condoms, it is a good idea to have safe sex and to take an STI test, especially with varying sexual partners. Some participants indicated they do not want to get pregnant at their age, and that having unsafe sex is not worth the risk. Additionally, the descriptive social norm was expressed that people in the social environment talk a lot about safe sex. Moreover, some participants expressed perceived behavioral control, e.g., by indicating that they would not hesitate to bring up the topic of safe sex, and that a sexual partner had better be fine with using a condom because otherwise the participant would not have sex. Finally, participants talked about the importance and effectiveness of using condoms and other safe sex methods such as the pill. The overall positive valence of the behavioral determinants identified in these conversations may account for the quantitative increase in person A's safe sex intentions.

4. Discussion

With this study, we attempted to unravel the effects of conversations on determinants of college students' safe sex intentions. Earlier studies on interpersonal health communication have found that, in some cases, conversations have a positive effect on the advocated health behavior, but they have also found instances where the effects are detrimental. To find out more about how conversations can give rise to these contrasting outcomes, we looked at the content of actual conversations, instead of focusing on indirect, self-reported measures of conversations as was done in previous work. In the present study, we recorded and analyzed actual conversations about safe sex, triggered by a safe sex message, in order to find out whether and how such a conversation would have an effect on safe sex intentions.

We found that watching a safe sex message followed by a conversation on safe sex significantly improved intentions to have safe sex and to discuss safe sex with a sexual partner and with friends. This result was significant despite the fact that scores on safe sex intention were already quite high at W1, and despite the limited number of participants due to strict inclusion criteria for participants and our choice for including in-depth qualitative analysis of the conversations.

Furthermore, we were interested in *what happened* in these conversations triggered by the safe sex message, with regard to conversational valence, types of communication behavior, and behavioral determinants. We found that participants often talked casually about the topic "safe sex" by exchanging anecdotes (both personal anecdotes and anecdotes about other people) or by talking about their attitude towards safe sex or sexuality in general. This casual talk may be a main influential element of the conversation. The examples we found of talking *about* negotiating with a sexual partner, can also be categorized under casual talk, since they often refer to personal experiences or anecdotes. First-hand experiences conveyed by peers may be more persuasive than abstract numbers or statistics (Weinstein, 1993). Furthermore, conversations between peers appear to be a rich source of information for both conversation partners. For a number of conversations that indicated an increase in safe sex intentions, we identified elements of educating behavior. This result coincides with the idea of peer education as a potentially effective tool for improving sexual health among young people (e.g., Tolli, 2012). Moreover, not only are conversation partners provided with information on, for instance, the injunctive and descriptive norms of their conversation partners; expressing their own behavior with regard to safe sex may make them more aware of their own behavior patterns and the underlying attitudes and beliefs. Apparently, it is not necessary to admonish someone on their health behavior in order to influence their behavioral intentions. Rather, the conversations appear to be an opportunity to

(critically) reflect on one's safe sex behavior, attitudes and beliefs in the "safe" presence of someone one is comfortable with.

We furthermore found that a majority of conversations displayed a positive conversational valence. In other words, in most cases, conversation partners talked positively about safe sex. This was reflected in the number of conversations in which safe sex intentions of person A either stayed the same or increased after the conversation. When comparing our quantitative results with our qualitative results for each individual conversation, we found that most conversations that indicate an increase in safe sex intentions predominantly displayed behavioral determinants with a positive valence. This suggests that in order to understand the effects of health-related conversations on behavioral intentions, it is important to look at *what* is said in these conversations and *how* this is said, and not only focus on the quantitative questionnaire scores.

Hendriks et al. (2012) found that a negative conversational valence, in the context of binge drinking, was associated with healthier behavioral intentions, i.e., higher intentions to refrain from binge drinking. In our study, however, when we compared quantitative and qualitative analyses, we found some discrepancies between conversational valence and scores on behavioral intentions. According to the reasoned action approach (Fishbein & Ajzen, 2010), changes in behavioral intention stem from a change in beliefs regarding attitudes, social norms, or perceived behavioral control. In the conversations, a discrepancy between, e.g., one's own attitude and own behavior, or social norms and one's own behavior, may have become visible; it appeared to be difficult for participants to 'stick with', for instance, past unsafe sex behavior when a social norm in favor of safe sex was discussed in the conversation. This inconsistency in beliefs and behavior may lead to a state of cognitive dissonance (see e.g., Harmon-Jones & Mills, 1999), which can be solved in two ways: (1) by changing behavioral intentions to be consistent with beliefs, e.g., by 'promising' safer sex behavior in the future, or (2) by changing beliefs to be consistent with behavioral intentions, for instance, by emphasizing the hassle of using a condom. This mechanism of cognitive dissonance in conversations may be explored further in future research.

Previous studies on the persuasive effects of conversations have either relied solely on questionnaire-based measures of conversational behavior, or focused on the rather general measure of conversational valence. The present study is one of the first empirical studies that relates the effects with the content of *actual* safe sex conversations, triggered by a safe sex message. In order to maximize external validity we provided participants with the freedom to choose their own conversation partner. Furthermore, participants recorded the conversations in their private environment, which may have increased their feelings of comfort compared to a laboratory study setting. Nevertheless, there are some methodological issues that need to be addressed in future research.

First of all, it should be taken into account that safe sex is generally seen as a sensitive topic (e.g., Moyer-Gusé, Chung, & Jain, 2011). In order to maintain a good relationship, avoiding such sensitive topics may be an unspoken relational norm (Allen, Emmers-Sommer, & Crowell, 2002). Not everyone may talk about sensitive topics equally openly; sometimes, people may be more reluctant to talk about e.g., safe sex. Perhaps, for this topic and for other sensitive topics, people may not be truthful about their own beliefs when these beliefs conflict with the perceived social norm. In such cases where there may be a discrepancy between social norms and one's own beliefs, a (positive) conversational valence score should be treated with caution.

Furthermore, it should be taken into account between whom the conversations take place. In our study, most of the dyads consisted of two female conversation partners. It may be interesting for future studies to include male-male and mixed-sex dyads. Moreover, in the present study, we mainly focused on sexually active college students without a steady sexual partner. In addition, in our study, the target participants were completely free to choose whom to talk to; we did not place constraints on whether "person B" did have a steady sexual partners, or whether this person was sexually active or not. These factors may affect the conversations regarding the extent to which anecdotes and experiences with respect to safe sex are shared. Future research could specifically select dyads differing in sex, sexual activity and relationship status, but should in any event take those factors into account.

5. Conclusion

In this study, we looked into the quantitative effects and into the content of actual conversations about safe sex, triggered by a safe sex message, on college students' safe sex related intentions. We found that watching a safe sex message followed by a conversation on this issue increased intentions related to safe sex. Participants appeared to seize conversations as an opportunity to exchange information, and to share experiences and attitudes with regard to safe sex, thus exposing behavioral patterns and social norms. Our results show that it is not sufficient to look only at quantitative effects of conversations, but that content-related aspects, such as conversational valence, type of communication behavior and behavioral determinants brought up in conversations should also be considered in order to understand the how and why of conversational effectiveness. Future research may extend our findings to

other contexts and other types of dyads, and may also focus on the cognitive dissonance and sensitivity that may be associated with talking about safe sex.

Competing Interests Statement

The authors declare that they have no competing or potential conflicts of interest.

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Notes

Note 1. Since the coders did not independently analyze the dataset we only report percentages of agreement in this section and the following sections, instead of a Cohen's kappa.

Appendix A: Measures

Safe sex behavior (W1-Q and W3-Q)

Safe sex behavior was measured using a five-point semantic differential item: "When I have sex, I have safe sex" (1 = never, 5 = always; 9 = n.a.). In W3-Q, safe sex behavior was assessed again using three five-point semantic differential items: "In the past two weeks, when I had sex, I had safe sex" (1 = never, 5 = always; 9 = n.a.).

Safe sex and SSC intentions (W1-Q and W2-Q)

The intention to engage in safe sex was measured using two seven-point Likert items (Cronbach's $\alpha = .97$; $r = .94$): "I plan on only having safe sex", and "I will only have safe sex" (1 = I completely disagree, 7 = I completely agree). The intention to engage in SSC with a sexual partner and with friends was measured using four seven-point Likert items (Cronbach's $\alpha = .97$; $r = .95$ for sexual partner and Cronbach's $\alpha = .94$; $r = .88$ for friends): "I plan on talking with a sexual partner [friends] about using condoms [safe sex]" and "I will talk with a sexual partner [friends] about using condoms [safe sex]" (1 = I completely disagree, 7 = I completely agree).

Other (W1-Q and W2-Q)

Finally, questions were asked regarding participants' age, gender, sexual preference (open ended question), sexual activity ("Have you been sexually active in the past year? Yes/No"), and status of having a steady sexual partner ("Do you have a steady sexual partner? Yes/No"). Furthermore, in an open-ended question in the posttest, we asked what the relationship was with the person with whom participants participated in W2 and W3 (e.g., friends or family).

Appendix B: Definitions of behavioral determinants (based on Fishbein & Ajzen, 2010)

Intention: A person's estimate of the likelihood or perceived probability of performing a given behavior.

Attitude: A latent disposition or tendency to respond with some degree of favorableness or unfavorableness to a psychological object. Attitudes may consist of two aspects:

Instrumental aspect: Anticipated positive or negative consequences.

Experiential aspect: Positive or negative experiences perceived to be associated with performing the behavior.

Perceived norm: Perceived social pressure to perform or not to perform a given behavior. Two types of norms can be distinguished:

Injunctive norm: Perceptions concerning what should or ought to be done.

Descriptive norm: Perceptions that others are or are not performing the behavior in question.

Perceived behavioral control: People's perceptions of the degree to which they are capable of (perceived capacity), or have control over (perceived autonomy), performing a given behavior.

Appendix C: Analyses per conversation

Table 3. Information per conversation on (1) sex of conversation partners; (2) relationship between conversation partners; (3) types of communication behavior identified (dominant type of behavior in bold); (4) conversational valence; and (5) person A's scores on safe sex intention at W1 and W2. 1 = low; 7 = high

Conv.	Sex		Relation	Type of communication behavior				Valence	Safe sex intention (person A)		
	A	B		Casual	Adm.	Edu	Negot		W1	W2	Δ
1	F	F	Friends	**X**				+	6.0	6.5	+.5
2	F	F	Friends	**X**				+	7.0	Missing	-
3	F	F	Friends	**X**	X			+	2.0	2.0	0.0
4	F	F	Friends	**X**				+	5.0	7.0	+2.0
5	F	F	Friends/roommates	**X**	X	X		-	4.0	5.0	+1.0
6	F	F	Roommates	**X**				-	4.0	5.0	+1.0
7	F	M	Partners (not sexually active)					+	7.0	7.0	0.0
8	F	F	Friends					+	3.0	4.0	+1.0
9	F	F	Friends	X	**X**	X		-	4.0	5.0	+1.0
10	F	F	Family	**X**				-	7.0	7.0	0.0
11	F	F	Family	**X**	X			+	5.0	4.0	-1.0
12	M	M	Friends	**X**		X		+	5.5	2.0	-3.5
13	F	F	Friends	**X**		X		+	5.0	6.0	+1.0
14	F	F	Friends	**X**		X		+	5.0	6.5	+1.5
15	F	F	Friends	**X**		X		+	7.0	6.5	-.5
16	F	F	Friends					+	6.0	7.0	+1.0
17	F	F	Friends	**X**		X		+	4.0	6.0	+2.0
18	M	M	Friends	**X**				+	6.5	6.0	-.5
19	F	M	Partners (not sexually active)	**X**		X		+	7.0	6.0	-1.0
20	F	F	Friends	**X**	X	X		-	5.0	5.5	+.5
21	M	M	Friends	**X**		X		+	5.0	4.5	-.5
22	F	F	Friends	**X**				+	5.5	3.5	-2.0
23	M	F	Friends	**X**		X		+	6.0	7.0	+1.0
24	F	F	Friends	**X**	X	X		+	2.5	5.0	+2.5

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Screening of Prediabetes and Type 2 Diabetes Mellitus in Rabigh, Saudi Arabia

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Abstract

Introduction: Identifying people with an increasing risk of diabetes provides a chance to change some factors before the occurrence of serious sequelae and permits the expectation of diabetes tendencies and the necessitated means to manage emerging diabetes. This current research aimed to screen students versus employees in Rabigh campus, King Abdulaziz University for the incidence of prediabetes and diabetes mellitus Type 2.

Methods: A sample of 279 was proportionally taken from student and employee study groups. Structured Modified Diabetic Risk Test (MDRT) questionnaire was adapted to be filled by each participant. Impaired glucose tolerance, body mass index, waist circumference and blood pressure of all participants were quantified. This study was done from January 2017 to March 2017.

Results: Higher pre-diabetic and diabetic risks were observed in employee as compared to students ($OR_{Pre\text{-}Dia}$=4.07 with 95% CI =1.518-10.95; OR_{Dia}=2.913 with 95% CI 0.815-10.41). Waist circumference and body mass index of students showed significant association with glucose level with p values 0.003 and 0.002 respectively.

Conclusion: There are an alarming number of individuals with the risk of being affected by diabetes in both students and employees among this study population. These findings emphasize on the need for a primary healthcare clinic role in the screening, management, follow up and promoting community awareness of Diabetes Mellitus.

Keywords: Body Mass Index, diabetes, prediabetes, risk factors, waist circumference

1. Introduction

Diabetes and prediabetes are becoming more prevalent worldwide. Globally, during the past 20 years, the percentage of individuals with diabetes had increased more than twofold with rapid increase in type 2 diabetes (Zimmet, Magliano, Herman, & Shaw, 2014). Diabetes is considered as one of the main health challenges of the 21stcentury with life-changing complications among people living with this condition. It is expected that worldwide, nearly 5,100,000 deaths and more than eight percent of all death causes were regarded as being triggered by diabetes in 20-80-year-old patients. Around 415,000,000 persons are currently expected to develop diabetes with half of them unaware of it. In addition, there is 318,000,000 individuals show impaired glucose tolerance with an amplified diabetes development risk in the upcoming years, adding considerable burden to developing and less developed countries (IDF-Atlas, 2015). The International Diabetes Federation (IDF) considered Saudi Arabia among the countries with high diabetes prevalence of around 17.6%. More than 30

million in the region are likely to experience impaired glucose tolerance and the number of diabetic patients will probably reach 72,100,000 by 2040. Diabetes was attributable to three hundred and forty-two thousand demises in the region in 2015. More than half of these deaths happened in patients under the age of 60 (IDF-Atlas, 2015). El Bcheraoui et al., reported that 14.8% of males and 11.7% of females were diabetic in 2013(El Bcheraoui et al., 2014). These figures increased with age, accounting for 7.8% among those aged 25-34 and 50.4% among those aged 65 and older. Furthermore, prediabetes (borderline diabetes) was present in 15.2% of the Saudi population with similar age group. The disturbing rising tendency of diabetes incidence in a Saudi population of thirty million, constitutes a main medical and community health problem and a real challenge for health strategic planning (Alqurashi, Aljabri, & Bokhari, 2011; Elhadd, Al-Amoudi, & Alzahrani, 2007).

Quantifying the sum of population affected by diabetes, prediabetes and having the risk to develop diabetes is essential to permit balanced planning and distribution of funds and activation of prevention programs for this general health problem (Alqurashi et al., 2011). The risk factors related to type2 diabetes (hereafter "diabetes") could be classified into two groups. First, modifiable risk factors that comprise overweight, abdominal obesity, fatty sugary diets, impaired glucose tolerance, elevated blood pressure(≥140/90mmHg), and decreased level of physical activity (Alberti, Zimmet, & Shaw, 2007). In addition, there is accumulated evidence that indicates smoking as a risk factor (Yeh, Duncan, Schmidt, Wang, & Brancati, 2010). The diabetes risk was observed higher, around 74% in females smoking >40 cigarettes daily, while this risk was around 45% in male smokers (Will, Galuska, Ford, Mokdad, & Calle, 2001). Second, the non-modifiable risk factors are individuals who are more than 45 years of age, diabetes in first degree relatives, ethnicity, and history of diabetes in a preceding pregnancy (Alberti et al., 2007). Therefore, an idyllic risk evaluation or estimation model for diabetes should include both groups of risk factors (Bang et al., 2009).

The most serious complications associated with diabetes result from micro and/or macro-vascular pathology, and poor quality of health (Badran & Laher, 2012). Therefore, great attention has been given to diabetes to prevent its critical consequences, starting from recognizing individuals at risk in earlier stages before diagnosis. This process has led to the term of prediabetes as an intermediary type of dysglycemia, i.e. prediabetes is a condition of high glucose level that has not yet reached a diabetic level. Individuals with impaired glucose tolerance (140 - 200 mg/dl), glycated hemoglobin (HbA1c) levels between 5.5–6.4%, or fasting glucose (100–126 mg/dl) were defined as prediabetic who are at increased risk of developing diabetes and later its lethal complications (Association, 2014; Selvin et al., 2010). An individual may be prediabetic for years without knowing it. Prediabetes threatens a higher diabetes risk, cardiovascular disorders, especially in females and stroke mortality especially in the presence of obesity (IDF-Atlas, 2015; Levitzky et al., 2008; Seshasai, 2011). Prediabetic subjects are at an amplified diabetes risk as much as 3-10 times more than healthy individuals and up to 70% of them may develop type 2 diabetes during their lifetime (Control & Prevention, 2013). Therefore, detection of prediabetes is crucial, considering the possibility of diabetes development. Recognizing prediabetic individuals increases the chance to control certain modifiable risk factors before the occurrence of significant consequences. Despite acknowledgment of increasing burden of Type 2 Diabetes Mellitus (DM), relevant data is limited from Saudi Arabia (Alotaibi, Perry, Gholizadeh, & Al-Ganmi, 2017). This current research aimed to screen students and employees in Rabigh campus, King Abdulaziz University for the incidence of prediabetes and diabetes mellitus Type 2.

2. Material and Methods

In total, 279 subjects, from Rabigh campus of King Abdulaziz University, Saudi Arabia were involved in a preliminary screening program for prediabetes and diabetes. This study was done from January 2017 to March 2017.Announcement of the forthcoming research project was distributed by print posters and information sessions on campus. Interested participants were first screened in person to decide primary eligibility criteria. The early assessment assured that all participants were males, ≥18 years of age, without previously detected diabetes and treatment affecting glucose level. All subjects who fulfilled the eligibility criteria and were interested in participating in the study were scheduled to join an in-person, onsite screening. A sample size of 279 was proportionally allocated to student and employee study groups to detect the difference of 4% in prevalence with 80% power of the test and 95% confidence level.

For this cross-sectional study, questionnaire was adapted and modified from well reputed validated diabetes risk tests (ADA, 2017; Makrilakis et al., 2011; Poltavskiy, Kim, & Bang, 2016; Rydén et al., 2014; Yang, Hall, Piccolo, Maserejian, & McKinlay, 2015). The first two added questions are modifications taken from the test designed by Professor Jaakko Tuomilehto and named Finnish Diabetes Risk Score (FINDRISC) (Tuomilehto et al., 2010). The possibility of developing diabetes was calculated depending on the total score of Modified Diabetic Risk Test (MDRT). Provisional scored survey, with 7 questions, was adapted from Poltavskiy &Bang et al. (Bang et al., 2009;

Poltavskiy et al., 2016). Some modifications were done including exclusion of gender, gestational diabetes and age-related questions since all participants were males and more than 95% of them were less than 40 years (score: 0). These questions were replaced by questions about waist circumference, types of meals, and smoking which are type 2 diabetes known risk factors. Six questions; 1, 2, 3, 5, 6 & 7- of this MDRT were about behavioral modifiable risk factors; physical activity, meal type, blood pressure, smoking, BMI, and waist circumference respectively. Question number 4 was related to diabetic status of family members. The score of MDRT ranged from 0-10 and any participant who scored 5 or higher was presumed to have an elevated risk of diabetes according to Diabetes Risk Test adapted from Bang et al. (Bang et al., 2009; Poltavskiy et al., 2016) (see Appendix A).

All participants underwent measurement of waist circumference (WC), body mass index (BMI), as well as pressure of blood. We followed WHO criteria for those measurements (WHO, 2000, 2011; Zhou et al., 2017). Glucose-tolerance was tested using fast gluco-test (Bayer contour instrument with blood glucose test strips). Data was collected after acquiring written informed consent. King Abdulaziz University granted this study ethical approval in accordance with Helsinki declaration of 1975 and its latest amendments.

At the end of investigations, all individuals were persuaded to go on a self-monitored; diet, physical activity and weight control. Subjects who were at increased risk of being diabetic or prediabetic were advised to visit their family physician for confirmation, follow up and required treatment.

2.1 Data Analysis

The results were analyzed using IBM SPSS 21 version. Fisher's exact, Linear by Linear Association and chi-square tests has been applied to investigate the association of blood glucose levels with various risk factors and p-values <0.05 considered significant. Multinomial logistic regression was applied to model the association between blood glucose values and Modified Diabetic Risk Test adjusted for group/s.

3. Results

The salient measurements of the study populations' general characteristics are presented in Table 1; the mean age, BMI and WC were 22.94 years, 26.18 Kg/m^2, and 88.53cm respectively. Table 2 shows blood glucose values classification and characteristics of studied population (students and employees); 209 (92.5%) of students had normal blood glucose levels (without self-reported diabetes and not prediabetic), 10 (4.4%) were prediabetic and 7 (3.1%) were diabetic. Of the fifty-three employees, 41 (77.4%), 8 (15.1%), and 4 (7.5%) were normal, prediabetic and diabetic. Higher pre-diabetic and diabetic risks were observed in employee as compared to students ($OR_{Pre\text{-}Dia}$=4.07 with 95% CI =1.518-10.95; OR_{Dia}=2.913 with 95% CI 0.815-10.41). Overall 3.9% (n-11) of the subjects were presumed to be diabetics as shown in Table 2. Body mass index measurements of students were as follow: 122 (54%) were less than 25, 41 (18.1%) were between 25 and <30 and 63 (27.9%) were ≥30. Measurements of students' waist circumference showed that 151 (66.8%) were <94 cm, 48 (21.2%) recorded more than 102, and the rest were found to be in between the previous values. A clear majority (92.5%) of the recruited students did not consume a healthy diet. 69.5% were physically inactive, 39.4% had a family history of diabetes, 38% were smokers and 14.1% had elevated blood pressure.

Recorded measurements of prediabetic students showed that over 80% had a BMI score >25; 60% had WC > 94; and 30% had diabetes family history. In addition, 70% were smokers, 80% reported low levels of exercise, and 100% had a diet rich in fat, salt, and sugar (Table 2). While the measured values of diabetic students revealed that 71% had a BMI score ≥ 30, WC score > 102 and had diabetic first-degree relatives with 85.7% reported low levels of exercise and consumed a daily fatty, salty, and sugary diet.

Table 1. General characteristics of the study groups

Participant Groups	Number of Participants	Age (years)	BMI (kg/m^2)	Waist Circumference (cm)
Students	226	20.55 ± 1.85	26.37 ± 6.95	88.09 ± 16.19
Employees	53	33.15 ± 10.45	25.43 ± 4.54	90.39 ± 11.71
Total	279	22.94 ± 6.9	26.18 ± 6.56	88.53 ± 15.45

Body mass index measurements of employees were as follow: 24 (45.3%) were less than 25, 20 (37.7%) were between 25 and <30 and 9 (17%) were ≥30. Measurements of their waist circumference showed that 32 (60.4%) were <94 cm, 7 (13.2%) recorded more than 102, with the remaining measuring between the previous values. The majority (73.6%) of the recruited employees group did not eat a healthy diet. 62.3% were physically inactive, 45.3%

had a family history of diabetes, 35.8% were smokers and 17% had elevated blood pressure (Table 2).

Measurements of prediabetic employees showed that 37.5% had a BMI score > 25; and only 12.5% measured WC score > 94. More than 62.5% had a positive diabetes family history, and reported decreased physical activity, in addition to a rich fatty, salty and sugary diet (Table 2). The measured values of diabetic employees revealed that 75% had a BMI score ≥ 25, 50% with a WC score ≥ 94, 75% had diabetic first-degree relatives and 100% reported low levels of exercise and consumed a daily fatty, salty, and sugary diet.

Significant associations were seen in linear by linear association test among students with prediabetes and diabetes. BMI was significantly associated with glucose level with p-value equal to 0.003. There are 7.358 more chances of developing prediabetes or diabetes status for those with high BMI/obese students (OR 7.358; 95% CI: 1.386 - 39.057). Waist circumference is also significantly associated with blood glucose level in the students group with p-value equal to 0.002; there is 10.244 times more risk of developing prediabetes or diabetes status for the students with a waist circumference larger than 102cm (OR 10.244; 95% CI: 1.919 – 54.689). Smoking, daily physical activity, diet and family history did not show statistically remarkable correlation with glucose level.

Table 2. Blood glucose levels by different characteristics of study sample

		Students Blood Glucose Level			**P-value**	**Employees Blood Glucose Level**			**P-value**
		Normal (209)	**Prediabetic (10)**	**Diabetic (7)**		**Normal (41)**	**Prediabetic (8)**	**Diabetic (4)**	
BMI	**<25**	118	2	2	**0.003**[a]	18	5	1	0.885[a]
	25-29.9	38	3	0		15	3	2	
	≥30	53	5	5		8	0	1	
WC	**<94 cm**	145	4	2	**0.002**[a]	23	7	2	0.276[a]
	94-102 cm	23	4	0		11	1	2	
	>102	41	2	5		7	0	0	
Elevated BP	**No**	179	9	6	0.999[b]	33	8	3	0.409[b]
	Yes	30	1	1		8	0	1	
Daily Physical Activity	**Yes**	66	2	1	0.588[b]	18	2	0	0.162[b]
	No	143	8	6		23	6	4	
Daily Meal	**Vegetables and fruits**	16	0	1	0.572[b]	12	2	0	0.643[b]
	Fatty, salty and sugary	193	10	6		29	6	4	
Family History	**No**	137	128	7	0.210[b]	29	25	3	0.252[b]
	Yes	89	81	3		24	16	5	
Smoking	**No**	140	132	3	0.104[b]	34	24	6	0.281[b]
	Yes	86	77	7		19	17	2	

BMI: body mass index; WC: waist circumference; BP: blood pressure; a Linear by Linear Association Test is applied; b Fishers Exact Test is applied.

The diabetes risk was calculated depending on the total score of Modified Diabetic Risk Test (MDRT) of all participants. There were 212 participants with modified diabetic risk test score less than 5, of which 15 were prediabetic and 4 were diabetic based on blood glucose level. On the other hand, 57 participants scored 5 or more, of which 3 were prediabetic and 7 were diabetic (Table 3). The measurements of blood glucose level and MDRT scores were significantly associated since the p-value is 0.008.

Multinomial Logistic Regression was applied to test the significance of MDRT to classify blood glucose categories (Normal, Prediabetic and Diabetic). Table 4 summarizes the results of Multinomial Logistic Regression, p-value of

MDRT is 0.005 in diabetic group, so the MDRT is a significant predictor to classify diabetic group. Also, the adjusted odds ratio for MDRT in diabetic group is 6.367, i.e. there are 6.367 times more chances of being in diabetic group as compared to normal if MDRT score is ≥5 adjusted for group (Students/Employees).

Table 3. Association of Blood Glucose with Modified Diabetic Risk Test Score

		Modified Diabetic Risk Test Score		Odds Ratio (95% CI)	Chi-Square	P-Value
		<5	>=5			
Blood Glucose Level	**Normal**	193	57			
	Prediabetic	15	3	0.677 (0.189 – 2.422)	10.198	**0.008**
	Diabetic	4	7	5.925 (1.675 – 20.963)		

Table 4. Multinomial Logistic Regression model to classify Blood Glucose level

Blood Glucose Level [a]		β	Std. Error	Wald	P-Value	Odds Ratio	95% CI for Odds Ratio	
							Lower Bound	Upper Bound
Prediabetic	**MDRT**	-0.303	0.659	0.212	0.645	0.738[b]	0.203	2.685
	Group (Students/ Employees)	1.391	0.505	7.58	0.006	4.018	1.493	10.814
Diabetic	**MDRT**	1.851	0.653	8.025	**0.005**	6.367[b]	1.769	22.919
	Group (Students/ Employees)	1.205	0.673	3.207	0.073	3.335	0.892	12.466

[a]The reference category is: Normal, [b] Odds Ratio adjusted for Group.

4. Discussion

Proper usage of screening is a key factor in avoiding and controlling diabetes (Badran & Laher, 2012). Several diabetic risk scores were used to recognize subjects with increased diabetes risk (ADA, 2017; Al-Lawati & Tuomilehto, 2007; Bang et al., 2009; Makrilakis et al., 2011; Poltavskiy et al., 2016; Rydén et al., 2014; Yang et al., 2015). At present, risk score test for diabetes is internationally standardized and existing ones need to be tested among diverse groups in real-world settings (Bang et al., 2009). This study used questions from diabetic risk test of American Diabetes Association and Finnish Diabetes Risk Score with little modification ensuring its suitability for the participants of the present study (ADA, 2017; Bang et al., 2009; Makrilakis et al., 2011).

The outcomes of the current research revealed that 3.9% of the subjects are presumed to be undiagnosed diabetics and in need of further follow up and investigations for confirmation. This result is similar to El Bcheraoui et al. results and other relevant studies (Alqurashi et al., 2011; El Bcheraoui et al., 2014; Elhadd et al., 2007; IDF-Atlas, 2015). In addition, results revealed that 4.4% of students and 15.1% of employees were found to be suggestive of being prediabetic, which is also in harmony with the findings of Bcheraoui et al (2014) for similar age group of employees but not for students. Furthermore, the analysis of the study showed that commonly known diabetes behavioral risk factors (namely; blood pressure, smoking and family history) are poor predictors of prediabetes and diabetes, which presents contradiction with other studies (Grossman & Messerli, 2008; Willi, Bodenmann, Ghali, Faris, & Cornuz, 2007).

Higher BMI and large WC increased the probability of prediabetes or diabetes more than seven folds and ten folds respectively. These significant findings indicate that BMI and WC are key indicators of prediabetes as well as diabetes. The strength of waist circumference results is backed up by a study that tested the inter-relationships among demographic factors, physical activity and poor diet on prediabetes and concluded that a large WC had the greatest effect on prediabetes (Bardenheier et al., 2013). In addition, findings from the National Health and Nutrition Examination Survey (NHANES)2009-2010 has reported that the significance of sleep disorders on diabetes is attenuated when body mass index is included in the model, where the odds ratio for diabetes drops from 2.04 (1.40, 2.95) to 1.38 (0.95, 2.00). They conclude that the subject's obesity status plays a central role in the

effect of sleep disorders on diabetes (Liu, Hay, & Faught, 2013). Other studies have shown that BMI adjustment attenuates the association amongst the quality of diet and diabetes (Harding et al., 2004; Villegas et al., 2006), which supports our findings of BMI being a significant predictor of prediabetes and diabetes. The outcomes of the current study are in harmony with several other studies which have shown relation between diet and the risk of diabetes and prediabetes (Carter, Gray, Troughton, Khunti, & Davies, 2010; Esposito & Giugliano, 2011; McNaughton, Dunstan, Ball, Shaw, & Crawford, 2009).However ,they also contradict a few other studies which have shown no association between diet quality, specifically total fat intake and red meat, and diabetic risk (Aune, Ursin, & Veierød, 2009; Salmeron et al., 2001). The significant relation between increased BMI and WC with both prediabetes and diabetes may help guide future primary and secondary prevention programs where in addition to socioeconomic factors, BMI and large WC may need to be considered more important for better outcomes. Bardenheier and colleagues (Bardenheier et al., 2013) concluded that a large WC had the greatest effect on prediabetes, which is corresponding to our findings.

This study showed no association between few known diabetic risk factors and prediabetes. This may be explained by the fact that prediabetes is considered an early precursor state indicating likely eventual development of diabetes, and not the eventual established diabetes state itself in which the associated risk factors are more evident and strongly associated. Moreover, while the majority of prediabetic cases may end up being diagnosed with diabetes, not all cases will be; therefore, the expected relationship of known diabetes risk factors with prediabetes is diluted.

Besides BMI and WC, our study findings showed a considerable number of participants are at risk of being diabetic, according to Modified Diabetic Risk Test score based on the contributing factors including low level of physical activity, and bad eating habits. These results are in harmony with the outcomes of many studies which reported that obesity, sedentary lifestyle, physical inactivity and bad eating habits are the foremost reasons for diabetic prevalence increase in Saudi Arabia (Al-Lawati & Tuomilehto, 2007; Al-Nozha et al., 2007; Al Hazzaa, 2004; Alqurashi et al., 2011).

Physical direct measures such as BMI and waist circumference may serve as a lifetime proxy for diet quality and level of physical activity compared to self-reported measures of health behaviors, taken at a single time point. While the reliability of self-reports of health conditions may be questioned, there is evidence that they are generally well correlated with medical record review (Okura, Urban, Mahoney, Jacobsen, & Rodeheffer, 2004; Sauver et al., 2005).

Some limitations exist in this study. Fasting glucose was only measured once and may be subject to measurement error. The fact that measures are obtained at a single time point may reduce the likelihood of finding significant differences as research has shown that repeated measures of health behaviors may increase the significance and the effect size of such modifiable behaviors (Stringhini et al., 2010). The questionnaire was adapted and modified from two validated questionnaires, but this modified questionnaire used in this study needs to be tested and validated in further studies on larger population in similar or diverse settings. This study was planned in Rabigh campus, King Abdulaziz University, considering feasible conduction of study procedures including required measurements for screening and access to students representing local community (mostly Rabigh residents) as compared to conduction in community. The composition of the sample which covers only young to middle aged males is another limitation of the study. Countervailing strengths of this study include consideration of recognized behavioral risk factors, allowing assessment of their independent and joint influences on prediabetic and diabetic status. Additionally, further exploration among similar and other diverse community settings may also assist in better generalization of the findings.

5. Conclusion

In conclusion, the Modified Diabetic Risk Test of the present study can be a suitable tool for use as a preliminary tool in a screening program to predict the risk of developing prediabetes and diabetes but needs further exploration on larger population. Our results showed that BMI and WC were consistent predictors of prediabetes outcomes. The study findings have both clinical and public health impact: many different risk factors (including body mass index and waist circumference) are variably related to diabetes, prediabetes, and offer variably effective opportunities for primary and secondary prevention. By identifying the salient risk factors, future primary and secondary prevention initiatives can be more precisely targeted, resulting in more effective and cost-efficient outcomes.

Competing Interests Statement

The authors declare that there are no conflicts of interest.

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Appendix A

Screening of prediabetes and Type 2 Diabetes Mellitus in Rabigh, Saudi Arabia

- **Weight** **Height** **Body mass index**
- **Waste circumference**
- **Blood pressure**
- **Glucose in blood:** **Fasting** **Random**

Modified Diabetic Risk Test (MDRT)

Write your score

1. Do you usually have daily at least 30 M physical activity?

a) Yes (0 point)

b) No (1 point)

2. What is your main meal?

a) Daily vegetables and fruits (0 point)

b) Daily fatty, salty, sugary food (1 point)

3. Have you ever been diagnosed with high blood pressure?

a) Yes (1 point)

b) No (0 point)

4. Do you have mother, father, sister or brother with diabetes?

a) Yes (1 point)

b) No (0 point)

5. Do you smoke nowadays?

a) Yes (1 point)

b) No (0 points)

6. Body mass index?

a) Lower than 25Kg/m2 (0 points)

b) 25-30 Kg/m2 (1 points)

c) Higher than 30 Kg/m2 (2 points)

d) Higher than 40 Kg/m2 (3 points)

7. Waist circumference below the ribs?

a) Less than 94 cm (0 points)

b) 94-102 cm (1 points)

c) More than 102 (2 points)

Total Score:

If you scored 5 or higher:

You are at increased risk for having type 2 diabetes. However, only your doctor can tell for sure if you do have type 2 diabetes or prediabetes (a condition that precedes type 2 diabetes in which blood glucose levels are higher than normal). Talk to your doctor to see if additional testing is needed.

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Adolescent School-Based Sexual Health Education and Training: A Literature Review on Teaching and Learning Strategies

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Abstract

Objectives: The objective of this review is to gain an understanding of the teaching approaches used and their effectiveness in imparting sexual health literacy amongst school adolescents. The intention is to design interventions for effective sexual health education in our study setting.

Methods: We reviewed various literature related to adolescent sexual health education studies that have been conducted by prior researchers. We also provide an overview of the teaching and learning methods used.

Results: Through this literature review, we learned that GBL and gamification were carried out primarily in developed countries, outside of Africa. It has been observed that both GBL and Gamification are effective and efficient in the transformation of knowledge, as they influence students' learning processes through engagement, enjoyment, excitement, attractiveness, and participation. They also foster critical thinking skills, improve confidence, increase motivation, and stimulate a habit of self-regulatory learning among students.

Conclusions: Ensuring the impartation of sexual health knowledge can also be achieved by designing and applying effective innovation teaching methods that appeal to today's youth, such as GBL and Gamification. We will design GBL and Gamification methods and evaluate their effectiveness amongst Africans students, specifically among Tanzanian school adolescents.

Keywords: sexual health, school adolescents, sexual health literacy, sexual health education, literature review

1. Introduction

Adolescence, or puberty, is a period of great opportunity and hope. It is the period between childhood and adulthood when young people undergo physical, mental, and emotional changes. This period can be confusing for some adolescents because most become sexually active without having the knowledge required to manage their sexual behaviour (Mlyakado, 2013b), due to biological factors caused by hormone changes (Walcott, Meyers, & Landau, 2008). When a growing person enters puberty (adolescence) he or she becomes interested in sex, but is emotionally immature and frequently ignorant. While others manage to make the transition to adulthood without getting involved in risky sexual behaviours, others fail to overcome the challenges of this critical stage and eventually miss the opportunity to realize their full potential in life. The main reason is that most of them are sexual health illiterate.

Adolescents who fail to manage their biological changes are driven by emotions that are associated with the increase of hormones during adolescence. Most of them are susceptible to risky sexual behaviours, such as underage sexual intercourse, having sexual intercourse with many partners, and participating in unprotected sexual activities (Mlyakado, 2013a). These adversely affect their future health outcomes through such things as increasing their chances of getting sexually transmitted infections (STIs) including HIV/AIDS, and becoming school dropouts because of pregnancy (Walcott et al., 2008). One of the most significant commitments a country can make to its economic, social, and political progress, and to its stability, is to invest in the growth and development needs of its adolescents, which includes educating them about sexual health.

Sexual health education programmes in many countries aim to impart adolescents with the information they need to make informed decisions related to sexual issues during adolescence (Mueller, Gavin, & Kulkarni, 2008). Sexual health education is improving and is reducing cases associated with irresponsible sexual behaviour within

the adolescent age group. Adolescents who are sexual health illiterate are more likely to participate in underage sexual intercourse, unsafe sex, and sexual assault (Che, 2005; Peter, 2013; Shegesha, 2015). Cervical cancer, unplanned pregnancies, and dropping out of school (Eggers et al., 2016; Mathews et al., 2012; Sommer, Likindikoki, & Kaaya, 2015; Kirby, 2002; K. Mkumbo et al., 2009; Smith & Harrison, 2013; Speizer et al., 2003) are more common among those who have underage sexual intercourse. These adverse effects may not only affect their childhood but could also prove detrimental to their adult life—socially, culturally and economically (Shemsanga, 2013; Ubora wa Afya kwa Familia Duniani, 2001).

Sexual health education teaches adolescents how to make right decisions about their sexual behaviour and improve their health status (Buston, Wight, Hart, & Scott, 2002; Daniel Wight, Plummer, & Ross, 2012). These initiatives have been jointly implemented by international and local organisations. Various national and international movements support adolescents' rights to sexual health-related information. In order to determine the most effective approach to establishing sexual health literacy, we conducted a literature review pertinent to the adolescent sexual health education approaches currently being used globally, and in Africa and Tanzania respectively. The results of this literature review analysis will inform researchers and designers involved in sexual and reproductive health education the best and most effective innovations in teaching methods which can appeal to school adolescents.

2. Adolescent Sexual Health Education

2.1 Global

Risky sexual behaviour amongst adolescents owing to a lack of sexual education has become a global concern. Sexual health education initiatives have been integrated into secondary school curricula in many countries throughout the world to educate young people on how to make informed choices, and to increase awareness of the consequences of risky sexual behaviour.

Thus, adolescents need to be provided with a comprehensive package programme for effectively transforming their sexual knowledge. Just teaching them abstinence alone or giving them no sex education knowledge may make them more prone to unexpected teenage pregnancy or to being infected with STIs (Kohler, Manhart, & Lafferty, 2008) due to practicing unprotected sex, having limited access to contraceptive facilities and services, and engaging in unsafe abortions after having unwanted pregnancies. Hence, when providing sexual educational programmes, sensitive issues like confidentiality, privacy, compassion, and individual rights as young adolescents should be taken into consideration (Shaw, 2009), which may facilitate the development of sexual education programmes that better suit their requirements and ensure effective knowledge transformation. The most successful and comprehensive sexual education programme is grounded on an established educational theory supporting voluntary thinking, emotional and behavioural change (Ponzetti, 2016).

The significance of sexual education among the younger generations is widely acknowledged. Mellanby, Newcombe, Rees, & Tripp (2001), for instance, stress health and education organisations working jointly to develop strategies for supporting sexual education among young generations both at home and in schools. To date, various strategies have been employed: many countries have integrated sexual education programmes within school curricula for students aged 12 to 16 (Chu et al., 2015; Mellanby et al., 2001), and in some instances parents or guardians have been encouraged to educate their children on these matters while at home (Wight & Fullerton, 2012).

Even if all initiatives taken so far advocate sex education among school teenagers, this approach seems to be ineffective and has ultimately proven to fail (Che, 2005). Reasons put forth for this failure include: 1. Current sex education programmes in schools are limited by scant government emphasis, 2. Restricted time and space, 3. Inadequate teaching and learning materials, 4. Ineffective traditional teaching methods, 5. Lack of policy, 6. Insufficient skilled expertise (Hong Kong Department of Health, 2014), and 7. Taboos against socio-cultural values like speaking about sex in public in some countries (Okazaki, 2002).

2.2 Africa

Before the HIV/AIDS pandemic in Africa, sexual health education for adolescents consisted of discussions that were private due to social and cultural reasons. At the time, the focus was to impart knowledge so as to protect them from STIs such as syphilis and gonorrhoea. Also, they were taught how to behave during adolescence. Adult males would talk with adolescent boys and adult females did the same with the girls (Shemsanga, 2013). In schools, teachers would teach them about the mammal reproductive system, whereby topics such as the human reproductive system and sexual health behaviour were taught in the classroom, but with great care and respect for sensitive cultural issues.

The number of adolescents with HIV/AIDs, STIs, underage pregnancies, rape experiences, and those who have dropped out of school has been increasing (Tiendrebéogo, Meijer, & Engleberg, 2003). The statistics provided by (UNAIDS, 2016; WHO, 2016) indicate that in Sub-Saharan African (SSA) the issues related to HIV/AIDS are very serious. For example, recent data from 2015 indicate that globally there are 36.7 million people living with HIV/AIDS, of which 2.5 million are new infections. UNAIDS and WHO further report that the most affected area is Sub-Saharan Africa, with approximately 25.6 million people living with HIV/AIDS, accounting for two-thirds of the world's total. More specifically, there were about 1.8 million adolescents under 15 living with HIV/AIDS globally in 2015, of which 1.6 million are from Sub-Saharan Africa. Furthermore, globally, there are about 150,000 adolescents under 15 years old who were newly infected with HIV/AIDS in 2015, 120,000 of which are from Sub-Saharan Africa. About 110,000 adolescents under 15 years old are dying of AIDS globally, of which 91,000 are from Sub-Saharan Africa. In addition, the report showed that the four countries with the highest rates of infected adolescents aged 10 to 19 years in Sub-Saharan Africa are South Africa, Nigeria, Kenya, and Tanzania.

This situation calls for African governments, in collaboration with various international and local development partners, to develop ways to curb this situation. UNESCO (2013) stipulated that such initiatives as sexual education programmes be developed, during the International Conference on Population and Development (ICPD) in 1994, and in the Transparent and Participatory Accountability Strategies for Monitoring and Implementing Sexual Education Programmes. Other initiatives include the 45th Session of the Declaration on Youth and Adolescents for Sexual Education (The Commission on Population and Development, 2012), the 2003 Maseru Declaration for Combating HIV/AIDS, and the African Commission held in Maputo in 2006, during which sexual education among adolescents was also taken into consideration.

The initiative most widely adopted in Africa is the inclusion of sexual education in primary and secondary schools. East and Southern African (ESA) countries have jointly developed a sexual health education curriculum. The goal was to increase adolescent knowledge regarding protective behaviours, including rejecting unwanted sex, delaying involvement in sexual intercourse, and practicing safe sex (Population Council, 2012). Sexual education in ESA countries covers: (a) self-awareness, self and others' relationships and power in relationships; (b) human development, puberty, the body, and reproduction; (c) sexuality and sexual behaviour (d) sexual health: STIs/HIV/AIDS/STDs, and their prevention using condoms, treatment, care; (e) sexual health: such as pregnancy, contraception, and abortion; and (f) communication, negotiation, and decision-making skills. Delivery of this sex education programme to students in ESA countries mainly uses the traditional teaching methods.

Despite the remarkable efforts made so far through many years of investment in developing these programmes, their implementation has several limitations: (a) There exist misconceptions regarding the concept of sex education, which is still vague and sometimes mysterious to most implementers; (b) Sexual education is not a stand-alone programme, but rather is included within other subjects; (c) Teachers have limited ability to use participatory teaching methods; and (d) Teachers lack a background in health education and reproductive health knowledge (Tiendrebéogo et al., 2003). African governments rely heavily on international development organizations for initiatives and money (F. Okonofua, 2014). There is little initiative by or support from local African governments, and there is an acute shortage of people trained in sexual health education. Consequently, the implementation of sexual education programmes in most African countries is insufficient.

Cultural factors also limit the teaching of sexual education in schools. Those who teach are often challenged by colleagues and community members for contradicting African norms, morals, and beliefs (Hsu, 2010). In addition, a lack of systematic training, limited support from relevant authority, limited content and resources, little time allocated, and traditional methods of teaching have also been noted among other factors contributing to ineffective sexual health education programmes for adolescent African students (Ahmed, Flisher, Mathews, Mukoma, & Jansen, 2009; Arnab et al., 2013). Naidoo (2006), for instance, after conducting a qualitative study which intended to examine the effectiveness of sexual education programmes in schools in South Africa, discovered that students were more interested in other exciting interactive teaching methods than only lecturing.

2.3 Tanzania

The United Republic of Tanzania is the largest country in East Africa, covering 940,000 square kilometres, 60,000 of which are inland water ways (The United Republic of Tanzania, 2013). In Tanzania, young people aged 10 to 24 years old constitute 32% of the population. A third are these are adolescents (10 to 19 years old) (National Adolescent Reproductive Health Strategy 2011-2015). Their large numbers make it inevitable that programmes would be developed to address adolescent health and development. For this reason, Tanzania, apart from being a signatory to various international and regional conventions that promote adolescent sexual and reproductive health, has developed policy documents in which young people's needs are addressed. These were all products of

collaboration between stakeholders drawn from various government departments, civil society, and multilateral agencies.

From an education point of view, the Ministry of Health (in collaboration with the Ministry of Education and Vocational Training) promotes sexual health education through the National School Health Programme. Through this latter programme, young people are provided with a number of health care services that provide information on their sexual and reproductive health, as well as counselling support. The Ministry of Education and Vocational Training has also brought HIV education into national school curriculum.

Despite these initiatives, there are still obstacles to adolescents accessing quality sexual and reproductive health information and services. This accounts for the fact that adolescent pregnancy is still a major challenge in this country. For instance, two-thirds of women in Tanzania are married before their 20th birthday, and about a quarter (23%) of girls aged 15 to 19 in Tanzania have already begun childbearing. This reflects their limited access to sexual and reproductive health information, among other things (2004-2005 Tanzania Demographic and Health Survey). Adolescent pregnancies have a major negative effect on the education of young girls in Tanzania, not to mention complications arising from early childbearing, unsafe abortions, and the spread of HIV and other STIs. Such problems are exacerbated by the existence of socio-cultural factors such as gender norms, encouragement of early and forced marriage, and female genital mutilation (FGM) (United Republic of Tanzania, Ministry of Health and Social Welfare, Reproductive and Child Health Section, 2011).

Adolescent sexual activity is a real threat to Tanzania. The majority of adolescents engaged in sexual activity below 15 years of age have little knowledge on sexual health issues, and less than half of adolescents have even adequate knowledge about sexual health (AVERT, 2016). For instance, 9.7% of adolescent girls and 10.2% of boys had experienced sexual intercourse before age 18 (The United Republic of Tanzania, 2013). Every year, almost 130,000 people are infected with HIV/AIDS and STDs due to sexual activity (MoEVT, 2014). Moreover, it is noted that Tanzania has the highest rate of adolescent pregnancy in the world (Makoye, 2015). According to Makoye, approximately 8,000 unwanted pregnancies occur among adolescent women in Tanzania, and account for one in six students attending school. Some scholars (Sommer et al., 2015) suggest that imparting knowledge of responsible sexual behaviour among adolescents should be done before puberty, or else it will then be difficult to change adolescent behaviour through later sexual education. This is why, according to Bilinga (2016) and Klepp, Flisher, & Kaaya (2008), most secondary school students in Tanzania have limited understanding of (1) healthy sexual behaviour, (2) contraception, and (3) reproductive health.

In partnership with others, in 2015 the Tanzanian government launched various sexual health education programmes that have aimed to curb the negative effects of underage sex (Makoye, 2015). Such initiatives target boys and girls who had never been taught anything about sex before. These initiatives in Tanzania include establishing sex education clubs in schools; providing sexual health education training to school teachers, and integrating sexual education into curricula (M. Bilinga & Mabula, 2014; Makoye, 2015; Mkumbo, 2009; Shegesha, 2015).

In consequence, sexual education programmes now are widely integrated into school curricula in Tanzania. However, sex education in Tanzania is mostly covered within the subjects of social studies, civics, science, and biology (Mkumbo, 2009). It is not detached from the other subjects. Sexual education sub-topics include 1. Family issues; 2. The human body and cleanliness; 3. HIV/AIDS, STIs, and STDs; 4. Life skills; 5. Dating and marriage; 6. The rights and responsibilities of family members; 7. Proper behaviour and good manners; 8. Decision making; 9. Gender issues; 10. Customs; 11. Diseases and infections; 12. Family planning; 13. Sexuality, sexual health, and good manners; 14. Sexual behaviour; and 15. Maternal and child care. In addition, they were taught adolescence, adolescent reproductive development, contraception, abortion, human sexuality, gender, love and relationships, violence, STIs, HIV/AIDS, and life skills (Ubora wa Afya kwa Familia Duniani, 2001).A large number of sexuality-related curricula for adolescents have been developed in Tanzania by the government and both local and international-stakeholders.

3. Overview of Teaching and Learning Approaches in Sexual Health Education

3.1 Traditional Teaching Method

The traditional teaching method holds that the teacher has the power and responsibility for constructing the lectures and making the decisions regarding the content and specific outcomes. In other words, *"the traditional method gives teachers the impression that they cause learning to occur"* (Jack, 2015, p. 8). In that teaching approach, teachers believe that the student's head is empty and needs to be filled with information. The teacher has the power over students' knowledge transfer through preparation, teaching, and assessment. The main strength of

the traditional teaching approach is that it has some potential merits regarding the development of student IQ and EQ (Liu & Long, 2014, p. 8). It is commonly held limitation is that it inhibits and controls students' ability to express their own thoughts.

The traditional teaching approach has been used for centuries. However, due to the development of technology, is has been more recently regarded as ineffective for imparting knowledge today. Schwerdt & Wuppermann (2011, p. 1) argues that the traditional teaching approach has been characterised by three major issues. First, it suffers from constraints in providing feedback to instructors about their learners, and assumes that all students can learn at the same pace. Second, learners are not active listeners under traditional teaching. Third, gives the impression that learners can only learn by listening.

Despite its weaknesses, the traditional teaching method is still widely used in many developing countries where technology is limited. Akkus, Gunel, & Hand (2007, p. 1749) contends that the traditional approach holds teachers to be the only knowledge transmitters, whereas students are just receivers of the knowledge imparted by their instructors. As highlighted by Akkus et al. such means of perceiving the process of knowledge transmission disempowers students and authorizes only teachers to influence the nature of classroom interaction, including the initiation of questions and the exchange of thoughts among students.

Within sexual health education, reasons that teachers tend to employ the lecture method include the avoidance of too many questions from the students, fewer potential complications compared to participatory teaching methods, greater levels of attention payed by the students, frequent lack of confidence in the topic due to socio-cultural issues, lack of skills related to the subject, lack of teaching facilities for doing demonstrations, and large numbers of students in the class which makes it difficult for teachers to handle if they were to apply other teaching approaches.

3.2 Game-Based Learning

Before defining GBL, it is important to understand the term 'Game'. According to Kapp, (2012 p. 7), a 'game' is an interactive activity in which certain players, who are supposed to adhere to certain rules and guidelines take part in order to achieve certain results or outcomes. Thus, when people are engaged in games which are purposefully designed to achieve a certain outcome, it could be said that they are directly or indirectly able to learn something which is meaningful and not just for entertainment (Blunt, 2006). As such, GBL is effective and efficient at transferring knowledge, as it influences students' learning process through engagement, enjoyment, excitement, attractiveness, and participation (Admiraal, Huizenga, Akkerman, & Dam, 2011). GBL fosters critical thinking skills and improves confidence in students (Cicchino, 2013). GBL has been reported to motivate students (Harrold, 2015) and to stimulate a habit of self-regulatory learning among students (Xu, 2012). GBL offers attractive and unlimited opportunities to students to learn at their own pace.

Other effectiveness characteristics of GBL have been identified by numerous scholars. For example, according to Blunt (2006), GBL is an effective learning tool for facilitating students to apply, practice, and develop higher order thinking skills and gain understanding more quickly than with traditional teaching. Nevertheless, Perry (2016) argues that the most efficient GBL should be designed in a way that supports students' participation by integrating player capabilities with relevant game features and course content. This can enable easy implementation on the part of stakeholders because the games are acceptable, usable, and employed by students to acquire a certain field of knowledge (Chu et al., 2015).

A high-quality serious game with all the required features and navigability can attract students to play it, with knowledge gain being a resulting by-product. For example, any game encourages students to compete for higher scores than opponents. Contrary to traditional methods of teaching, the GBL process is considered most likely to be more fun and comforting during teaching and learning (Xu, 2012). Learners in this current century require learning approaches which enable them to learn in a way which can motivate and encourage their learning. Teaching methods that bore learners can never be given high priority in this era in which technology seems so attractive and promising. Learners are interested in collective and competitive reasoning in the sense that it can enable them to focus on their learning objective while competing for higher scores (Jimenez-gomez, 2015).

3.3 Gamification

There is a connection between game-based learning and gamification, as both involve game mechanics. Gamification is *"using game-based mechanics, aesthetics, and game thinking to engage people, motivate action, promote learning, and solve problems" (Karl M. Kapp, 2012, pp. 9–10)*. Gamification is a wider concept which can be divided into two main areas, structural gamification and content gamification:

- Structural gamification "is the application of game elements to propel a learner through content with no

alteration or changes to the content." In the educational context, this kind of gamification can be implemented by adopting score elements, such as point scoring, badges, leaderboards, and achievements (K. M. Kapp, Blair, & Mesch, 2013, p. 224).

- Content Gamification *"is the application of game elements, game mechanics, and game thinking to alter content to make it more game-like"* (Kapp et al. (2013: 237). Through this kind of gamification certain game elements, such as a storyline, characters and mystery, are added to learning content in order to engage students.

Gamification emerged from the business field, where "game mechanics techniques" from video games were applied to non-game situations with the purpose of increased engagement and motivation, and the encouragement of particular learner behaviours (Simõesa, Redondob, & Vilasb, 2013). According to Hanus & Fox (2015), gamification evolved from advertising. However, it originally arose, its potential was recognized after it was applied to health and education. Within education, gamification is still a relatively new idea.

A previous systematic mapping study (Dicheva, Dichev, Agre, & Angelova, 2015) divided game elements into two parts, mechanics and design principles.

3.3.1 Game Mechanics

According to Dicheva et al. (2015) game mechanics consists of point systems, badges, levels, a leaderboard, virtual goods, and avatars. Bunchball Inc. (2010) asserts that the mechanism employed to gamify a task or an activity is known as game mechanics. The following are commonly known and used game mechanics: (i) points, (ii) levels, (iii) trophies, (iv) badges, (v) achievements, (vi) virtual goods, (vii) leader boards, and (viii) virtual gifts.

3.3.2 Design Principles

Design principles consists of a goal or challenge, personalization, rapid feedback, visible status, unlockable content, freedom of choice, freedom to fail, a storyline or new identities, onboarding, time restriction, and social engagement.

3.3.3 Game Dynamics

Game-dynamics are the needs, aspirations and motivations geared toward engaging the player's emotions. These include: (a) rewards, (b) status, achievement, (c) self-expression, (d) competition, and (e) altruism. Also, according to Hanus and Fox (2015), gamification can be applied using different forms of learning, such as: 1. The application of narratives to amend the setting of a typical task; 2. The design of social competition; and 3. Provision of incentives like rewards and badges in order to motivate behavioural change. This approach encourages engagement and participation in learning for the purpose of gaining knowledge for behavioural change among individuals. In education transformation, some researchers (Behnke, 2015; Landers & Callan, 2011) address the potential of gamification in increasing student engagement and fun. In their opinion, through gamification students can be encouraged to transform their knowledge by playing a game in order to perform academic activities while enjoying playing the game in question.

Hence, since gamification has already been employed in education (Filsecker & Hickey, 2014; Garcia et al., 2014), it may also be used in adolescent sexual education. This could be an effective way to promote and impart knowledge about sexuality among secondary school adolescents, encouraging them to abstain from engaging or participating in various irresponsible behaviours. This has been acknowledged by other scholars (Hew, Huang, Chu, & Chiu, 2016) who view game mechanics as an innovative teaching tool which is effective in motivating, engaging, interacting and amusing young adolescents during learning.

4. The Role of GBL in Adolescent Sexual Health Education

GBL is among the most technologically innovative ways of promoting sexual health education, and seems to be promising and attractive to the present generation. Delivering sexual education through GBL is more likely to be harmless, comforting and supportive in cultures where talking about sex in public is taboo (Okazaki, 2002). This teaching and learning technique may promote skill transformation, such as problem solving and collaboration, which can be emphasized through GBL to promote sexual education among adolescents.

GBL sometimes called Serious Games (SG) are games whose main purpose is something more serious than just entertainment. One such serious purpose is education. Such games transform learners' lives while they are having fun (McGonigal, 2011). According to (Arnab & Clarke, 2015), GBL can foster cognitive knowledge, create awareness, and facilitate behavioural change. Research has been conducted to develop games that have these effects in sexual health education. For example, a study conducted by Arnab et al. (2013) involving a

multi-disciplinary team of researchers from the UK, created SG for adolescent relationships and sexual education. The GBL developed was tested using a cluster randomized controlled trial. A total of 505 students aged between 13 and 14 from local schools were invited to participate in the study. The GBL approach was reported as having positive learning outcomes. Authors suggested blending interactive GBL with traditional learning to motivate discussions among teachers and students within their communities.

Their study (Arnab et al., 2013) came up with an evaluation and analysis approach which focused on one part of the game, gameplay, rather than the full game activity, as being capable of augmenting sexual education. Perhaps this should be considered one of the major limitations of this study. In addition, although this research attests to the effectiveness of GBL in promoting sexual education among adolescents, it does not point out ways to address any challenge encountered during implementation. Furthermore, the research does not specify which technological tool was used to play the game. This missing information could help other researchers repeat a similar study.

A study by Bowen et al. (2014) developed GBL for adolescents to raise awareness of and encourage behavioural change related to dating violence. The scholars used focus group interviews to collect data from thirteen adolescents aged between nine and ten. They also used a thematic analysis technique to analyse the data. The results proved that GBL is a positive pedagogy in terms of instructional principles and for delivering training content. Bowen and colleagues reported technical problems associated with GBL, particularly in relation to functionality, such as technological shortages and insufficient participant instructions. The technical problems pointed out are really important for other researchers to take into consideration in their studies. The number of participants involved in the study was limited, which makes the findings questionable. In order to make the obtained findings more valid, a large number of respondents should be involved. Furthermore, just one research approach was employed rather than enriching their findings by applying a combination of multiple data collection approaches.

Games can be used for both behavioural change and entertainment, and GBL can contain informative messages for promoting health-related behavioural change (Baranowski, Buday, Thompson, & Baranowski, 2008). In their study, Baranowski et al. (2008) reviewed 25 video game articles related to promoting health-related behavioural change which included sex education messages for adolescents. They revealed that most of the reviewed articles demonstrated positive impacts on health-related behaviour change through game playing. Games can lead to moral and attitudinal change. Further research is needed to promote sex-related behavioural change through GBL in various socio-cultural contexts globally, particularly among young people.

In the same vein, the assessment by DeSmet A et al. (2014) of the efficacy of GBL in modifying sexual health-related behaviour using both systematic literature review and a meta-analysis found that since digital games are confidential in nature, they may encourage learners to discuss sexual topics regarded as confidential in some cultural backgrounds. Literature was obtained from various health-related databases dating from before July 2013. Seven GBL health-related articles were identified and included in the study. The studies showed significant sexual behavioural change through GBL. However, it was reported that these GBL studies did not employ many game features.

Finally, a study conducted in Hong Kong by Chu et al. (2015) developed a game application known as "Making Smart Choices" that addressed challenges encountered by adolescents in seeking access to sexual health education. Popular networking platforms such as Facebook and other web-based services, and smart devices such as iPads and smart phones are used to play the games. A total of 1,176 adolescents between 12-16 years old participated in playing the game. Qualitative and quantitative data were collected to evaluate the effectiveness of the intervention. They found that the students' knowledge of sexual health improved after playing the game. The game was described as interesting, interactive, informative, and real-to-life. It produced behavioural and attitudinal changes related to sex and relationships in school adolescents. This made GBL intervention appear promising for teaching adolescent sexual health education in Hong Kong.

5. The Role of Gamification in Adolescent Sexual Health Education

In the sexual health education context, gamification has also been used for both teaching and learning. For example, previous scholars (Arnab & Clarke, 2015) have employed game mechanics such as scoring systems, to maximize engagement while investigating pressure and coercion in adolescent relationships. According to Shawaqfeh (2015), game elements are very important in improving knowledge gain and comprehension, as well as in increasing confidence levels among learners. Although, Shawaqfeh's study is not related to adolescent sexual health education, it is related to health education in general, as it focuses on pharmaceutical education.

Schoech et al. (2013) applied game mechanics to the evaluation of behavioural changes in regard to sexual and

relationship violence control among adolescents. They used game elements such as challenges, a point system, bonuses, penalties, awards such as virtual money, feedback and scoring. The intention was to encourage, motivate, and engage students during learning. Furthermore, game elements enhanced self-disclosure, co-learning, and the comprehensive delivery of the lesson to the intended students. Thus, game elements are important in teaching and learning, and in facilitating adolescents to gain the information they need to curb irresponsible sexual behaviours that prohibit them from reaching their future goals.

6. Conclusion and Way Forward

The above-reviewed literature indicates that sexual health education has been conducted differently from country to country due to the different socio-cultural backgrounds of younger school students. Studies on GBL and gamification have been carried out primarily in developed countries, outside of Africa. Thus, they lacked experience in a local African context, as there is no literature from the continent which identifies this topic. In spite of the large amount of school curricula adopted in Tanzania to teach sexual health literacy to adolescents, the majority of these curricula vary in terms of quality, completeness, coverage of content, scope and consistency, making them questionable and giving rise to the need for the present study.

This study is also in response to the call by Mkumbo (2008) for new research into the effectiveness of instructional methods used by teachers in promoting sexual health education to adolescents in Tanzania. Additionally, although sexual education has been part of the curriculum for a couple of decades in most schools in Tanzania, irresponsible adolescent sexual behaviour has been increasing sharply. This is because traditional instructional methods, which are more widely used to teach sexual health education nationally than any other method, seem ineffective. Our hope is to increase Tanzanian adolescents' knowledge of sexual and reproductive health using empirically proven and innovative teaching tools, namely game-based learning and gamification, and suggest appropriate strategies for evaluating learning outcomes. Through this review, we have gained an understanding of the study area, and have thus sought to comprehend what are the foundations of the field and what should be the focus of this study, which is to design innovative GBL and Gamification with emphasis on African settings and on Tanzania in particular.

Author's Contribution

All authors participated equally to the development of this manuscript. All authors read and approved the final manuscript.

Conflict of Interest

The authors declare that there are no conflicts of interest present in this study.

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