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# Frequency of Use of Skin-Lightening Products, Levels of Self-Esteem and Colorism Attitudes in University Students of Karachi: A Cross Sectional Study

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## Abstract

The objective of our study was to determine the frequency of use of skin lightening/whitening products, level of self-esteem among university students, and any association between them. A cross-sectional study was conducted at Jinnah Medical and Dental College and the University of Karachi over a period of 12 months on a convenient sample of 499 students of both genders. Self-esteem was measured using Rosenberg Self Esteem Scale, and the use of skin whitening products and attitude towards skin color was determined using a structured questionnaire. Data were analyzed using SPSS 21.0. Out of n = 499 participants, 30.9% (n = 155) responded that they had used skin lightening products during their life. Of those who said yes, 15.1% (n = 76) responded that they are currently using such products. 63.8% (n = 321) classified their complexion as medium, 29.8% (n = 150) classified it as fair and 5.2% (n = 26) classified themselves as having dark complexion. 73% (n = 367) of people were completely satisfied with their complexion, while 20.1% (n = 101) wished for a lighter shade. Self-esteem scores were calculated, and it was found that 89.9% (n = 452) participants had scores above 15, and only 9.3% (n = 47) participants had low self-esteem, having scores below 15. Only 1% (n = 5) having dark complexion, 5.4% (n = 27) having medium complexion and 2.8% (n = 14) fair suffered from low self-esteem score. The frequency of use of skin lightening products was found to be low in university students from the sample population. The majority had good self-esteem and were satisfied with their complexion. There was no relationship between complexion and self-esteem in the study sample.

**Keywords:** self-esteem, complexion, skin whitening, lightening products, colorism, fairness

## 1. Introduction

Skin color is a physical trait dependent on several variables, including race, geographical location, genetics, diet, etc. Skin color is primarily determined by melanin, a pigment present in the epidermis. Over centuries, there has been a preference for a lighter complexion, especially for women. Implications of such classist colorism are observed all over Pakistan, leading to an increased usage of harmful chemicals in skin whitening creams and cosmetics to achieve a lighter tone (Gio, 2010). The desire to look fairer has convinced thousands of individuals to invest a remarkable amount of money in fairness products, as seen in a dramatic increase over the last few decades (Hoskins, 2014).

Pharmaceutical and advertisement industries depict fair complexion as a driver to excelling in professional and personal life, such as job and marital prospects. This has led individuals to splurge on such products without adequate knowledge about their results and effects (Global Industry Analysts Inc., 2017). Most manufacturers of such products are aware that people with darker or tanned skin are willing to try out every possible skin lightening treatment regardless of the expense, effectiveness, or hazards associated with them, thus causing the industry to flourish further (Hoskins, 2014). However, a study conducted by Jayakrishnan (2021) discusses the change in the marketing techniques of certain popular brands and companies in India. The age-old debate, which has now turned into a global movement against skin color bias and racism, has made big brands step back and reanalyze their marketing ways, which are majorly designed according to consumer demand. Consumer behavior and demand are

driven by social and cultural factors, among which skin-lightening products played a major role in South Asian markets. The recent conversation around skin lightening creams and criticism for promoting negative stereotypes for dark skin tones have led to change in how these brands and consumers view such products. A major brand like Fair and Lovely has renamed its skincare brand Glow and Lovely after social pressure and global debate about racial inequality. This is a breakthrough and led to other brands having the conversation about changing their marketing strategies as well.

Whitening products work by lowering the concentration of melanin in the skin. Skin whitening creams usually contain skin bleaching chemicals such as steroids, mercury salts, glutathione, and hydroquinone. Although banned in most European countries due to their harmful effects, they are still being used in Asian countries due to their high demand. While these products may give instant results, they damage the skin in the long run, causing wrinkles, rashes, diarrhea, headaches, itchiness, chills, and acne breakouts. Excessively reducing the concentration of melanin may also increase the risk of skin cancers as melanin acts to prevent sun damage to skin DNA.

Self-esteem is an understanding of one's self-worth, abilities, and potential. It includes accepting oneself with all personality and physical traits. Skin color plays an important role in developing self-esteem and may make some people vulnerable or insecure due to standards set by society.

It has been observed that young adults, such as university students, use these products to fit in with societal demands. Most published literature is conducted on African American populations that show no difference in self-esteem between dark and light-colored participants (Wade, 1996). Studies measuring self-esteem in university students and skin tone have been done separately and show a variable level of self-esteem among university students; however, there is limited evidence of a relation between them in the age group of university students, and none could be found from Pakistan (Fairness creams have nothing fair for skin, 2012).

## 2. Method

### 2.1 Participants and Sampling Procedure

A cross-sectional study was conducted at Jinnah Medical and Dental College and the University of Karachi for a period of 12 months. The sample size was set at 499, and a convenience sampling technique was used to interview students fulfilling the inclusion criteria and agreed to participate. The Research and Review Committee JMDC approved the study.

### 2.2 Inclusion Criteria

Students of both genders, aged 18 years and above, were included irrespective of their department within both universities. Participants in a good state of health and without any skin disease, not undergoing any surgical/cosmetic skin procedures or treatments, were considered eligible for the study. Implied consent was stated on the questionnaire.

### 2.3 Statistics Analysis

A 20-point structured questionnaire was constructed and pre-piloted to record background data and assess perceptions, experiences, and attitudes towards colorism. Rosenberg Self Esteem Scale (RSES) 10 item scale was used to measure self-esteem (Rosenberg, 1989). Data entered and analyzed using SPSS 21.0. Descriptive frequencies were obtained. The total RSES score was calculated using the Rosenberg scoring chart. RSES score was used to create normal, below, and above normal categories. Cross tabulation and chi-square tests were done to determine the relationship between self-esteem and usage of skin lightening/whitening products.

## 3. Results

A sample of 499 subjects was interviewed, of which, 53.7% (n = 270) were females and 45.5% (n = 229) were males, with a mean age of 21 years. Most of the students belonged to medicine, 54.9% (n = 276) and 21.1% (n = 106) students belonged to the field of business. The majority of the participants were unmarried, 79.1% (n = 398). Most of the candidates had a family income between PKR 1-3 lac per month, 31.6% (n = 159), while 22.7% (n = 114) candidates had more than three lacs per month.

Most of the participants, i.e. 63.8% (n = 321) identified themselves as having medium complexion, 29.8% (n = 150) identified as fair, and 5.2% (n = 26) participants identified as having dark complexion.

Figure 1 shows the frequency of usage of skin lightening products. Results showed that most participants have never used any skin lightening products, and only 15% are currently using them.

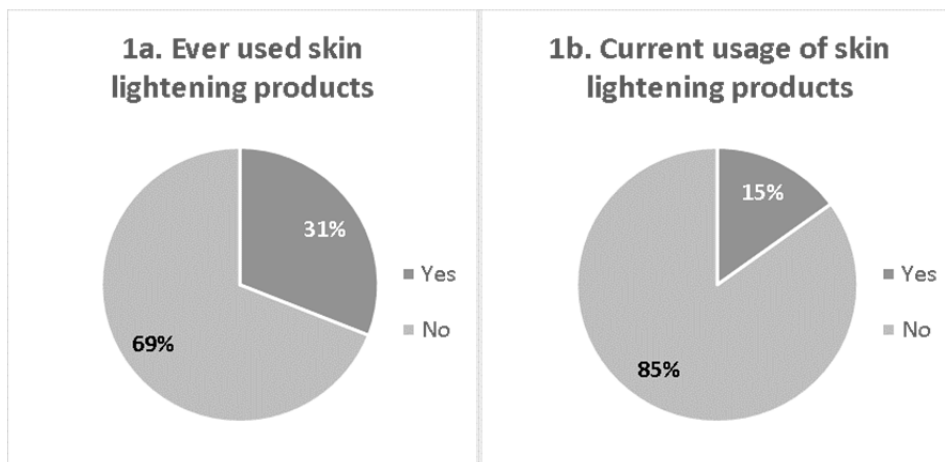


Figure 1. Frequency of use of skin lightening products

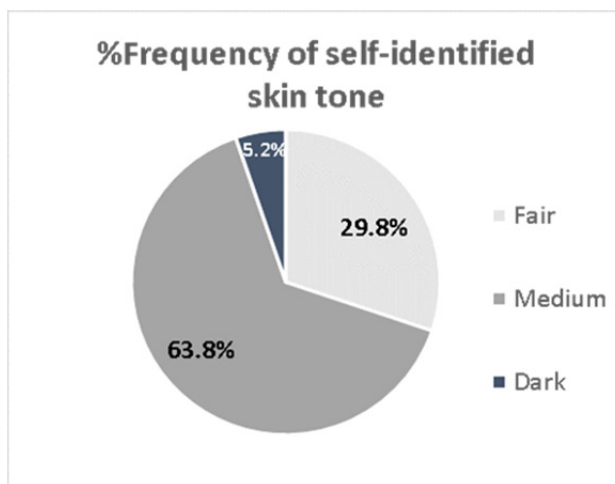


Figure 2. % frequency of self-identified skin tone

Self-esteem scores were calculated using Rosenberg Scale, and it was found that the mean self-esteem score was 20.99. 89.9% (n = 452) participants had scores above 15, which shows that they did not have low self-esteem; on the other hand, 9.3% (n = 47) participants had low self-esteem, having scores below 15, as illustrated in Figure 3. Of these only 1% (n=5) of dark-toned, 5.4% (n = 27) of medium-toned and 2.8% (n = 14) of fair toned had low scores.

Mean Score	• 20.99 ± 5.0
<15 Below Normal	• 9.3% (n=47)
15-25 Normal	• 69.4% (n=349)
26-30 Above Normal	• 20.5% (n=103)

Figure 3. Level of self-esteem and mean score

The level of self-esteem was cross-tabulated with self-classified current skin tone and with the use of skin whitening products. No association was found using chi-square tests between self-esteem and skin tone.

Additionally, data on attitudes and experiences regarding colorism was gathered. Descriptive frequencies for fully agreed responses are given in Table 1.

Table 1. Descriptive frequencies for colorism

<b>Personal Perceptions</b>	<b>Agree</b>	
	<b>n</b>	<b>%</b>
In your opinion		
People have negative attitude towards dark complexion	405	80.5
Media has important role in promoting colorism	434	86.3
Fairness product ads are major contributor to promoting colorism	215	42.7
Men and women perceive colorism differently	356	70.8
Complexion is important factor in marriage	394	78.3
For Men	86	17.1
For Women	202	40.2
Both	115	22.9
<b>Personal Experience</b>		
Have felt differently treated due to complexion	159	31.6
Negatively different	68	13.5
Positively different	89	17.7
Have received comments on complexion from peers/friends	294	58.4
Bothered by comments on complexion	170	34.1
<b>Personal Attitude</b>		
Prefer lighter skin tone for self	101	20.1
Prefer lighter skin tone for prospective spouse	84	16.7
Feel less confident due to own complexion	120	24.0
Feel unsatisfied with own complexion	132	26.4

The majority of students agreed that society has a negative attitude towards dark complexions, and media plays a major role in developing this construct. They also agree that there is a difference in perception of colorism between men and women; however, a fair complexion is a highly desired quality for a woman. The majority admitted receiving comments on their complexion, but such comments impacted a few.

Based on the data collected, we concluded that out of 499 participants who took the survey, about 73.0% (n = 367) subjects were completely satisfied with their current complexion; however, 20% (n = 101) people would have preferred a lighter skin tone for themselves.

Only 16.7% of participants admitted light skin to be a desirable trait in a prospective partner.

In contrast, several people rejected the role of their skin color in establishing their self-esteem. 75.3% (n = 379) of participants claimed that their skin tone has no bearing on their self-image or self-confidence. 51.7% (n = 260) of the participants explicitly revealed being completely satisfied with themselves.

#### 4. Discussion

This study was conducted to determine the prevalence of the use of whitening products, levels of self-esteem, and the association between them, if any, among university students of Karachi. According to the results, only 15% of the participants were found to currently use skin whitening products. The majority identified as having a medium complexion and had normal to high self-esteem scores. No relationship could be found between the two variables.

Skin lightening practices have escalated worldwide in an attempt to enhance skin tone. A study conducted in the

Northern Region of Saudi Arabia by Alrayyes, Alrayyes, & Farooq Dar (2020) highlights the increasing use of skin lightening products. Various reasons and beliefs were found behind these practices. The most prevalent being that the users believed that lighter skin tone played a role in self-esteem, perception of beauty, marriage, and social and financial opportunities. With women held to higher beauty standards than men, increasing skin-lightening practices and media sources contribute most to the normalization of colorism and social hierarchies, perceptions, and stigma.

A recent detailed study by Khan et al. (2021) in Pakistan found that over 50% of women use some type of skin-lightening product. However, the study did not determine the correlation between social strata, education, and age group, and it did not include men. Our study is the first to determine the frequency of use among university students in Karachi, including both sexes, middle-income groups, and educated past high school; factors that may contribute to less usage.

Studies show that the highest self-esteem was found amongst the participants in their early 20s, similar to the mean age of our study sample. A longitudinal study by Adams, Kurtz-Costes, Hoffman, Volpe, and Rowley (2020) found that low self-esteem in darker-toned adolescents outgrow it by their twenties and attain normal self-esteem.

According to an Afrocentric study conducted by Charles (2003), skin bleaching was not the result of low self-esteem. There were various reasons for skin bleaching because of various Black identities and because each person constructs his or her personality in a multicultural society. Another study by Marekia-Cleaveland (2019) commented on the effect of colorism on people in a society and the pressure to attain specific traits to adhere to beauty standards. A lighter complexion is celebrated widely due to the euro centricity of light skin, forcing people to try and look a certain way. However, it concluded that diversity must be celebrated, and it should not be restricted socially and culturally by constructed definition of beauty. Another research among the African population showed that only a few participants, significantly women, were using these products. However, they were mostly unaware of the after-effects and had low literacy (Chohan et al., 2014).

A study was conducted among women of South Asia aged 18-40. The purpose was to determine the interconnection between skin tone and self-esteem and if belonging to a generally less desired race and color plays any role. It was highlighted that regardless of women facing difficulties in foreign countries because they belong to a specific race or color, the women of South Asia did not negatively impact their skin color on their self-esteem (Bhayani-Larsen, 2020).

A study in Mumbai by Shroff, Diedrichs, & Craddock (2018) revealed that more than half of the population used skin fairness products at least once in their lifetime. In our study also, 31% admitted ever using such products. Since the mean age of our sample is 21 years, it can be assumed that such products were used during the formative teenage years. The main reason cited by this study was to look fairer and more attractive, just like what was being promoted in advertisements or in the media. Another study conducted by Lau and Idang (2022) in Malaysia among university students highlights the usage of beauty filters and selfie editing apps and their relationship with the individual's mental wellness. As the internet and social media usage have increased, more people started trying to take picture-perfect selfies, which has increased the usage of beauty filters and editing apps to hide or change their natural skin color, texture, or their real body shape. This study showed that the usage of these selfie editing apps was linked to lower self-esteem levels and greater social appearance anxiety. According to the research conducted by students of another university in Karachi, fairness product advertisements, societal pressure, and media were the main reasons for disliking dark skin tone and partiality toward lighter skin (Ismail, Loya, & Hussain, 2015). This opinion is similar to our participants, most of whom agreed that media has a major role in promoting usage through successful, attractive role models. A study performed on racism, colorism, and elitism in Bollywood points out the impact that the film industry has on the masses and the fact that these attitudes reinforce prejudices against dark-skinned people. The blatant partiality towards lighter skin and Eurocentric features is incongruent with the attitudes of several notable Bollywood voices raised in solidarity with the Black Lives Matter movement to battle racism in America. Bollywood needs to be less dismissive toward casting actors of all skin colors. It also needs to address the lack of positive representation of different regional and ethnic groups in India. Moreover, following the progressive views held by Bollywood celebrities and filmmakers, it is high time they realize that continually stereotyping darker-skinned actors as poverty-stricken, maleficent, or at a physical disadvantage is blatant hypocrisy and has lasting effects on the already prevalent colorism in its public (Peters, 2021).

As stated in a study conducted in Jamaica by Charles (2011), skin bleaching is in demand because they associate fair skin with high status, reputation, and sexual attractiveness. On the other hand, according to our research, complexion was not considered a contributing factor in receiving attention from the opposite gender by more than half of the respondents. That may be because both the studies targeted different groups of people from different



socioeconomic backgrounds and classes.

Another study was performed in Zanzibar, Tanzania, by Tekie (2020) to assess the effect that colorism has on women's identity and ethnic construction. Women were questioned about the impact that colorism has on their personal lives and its effect on their self-perception. It was established that colorism exists in society alongside the preconceived notion of relating lighter or medium skin to positivity while attaching stigmas to dark skin. That being said, women who were inhabitants of Zanzibar were less severely impacted by colorism than those raised in Tanzania's mainlands. It was also concluded that inclusion in the Zanzibar community was determined more directly by factors like religious, geographical, and historical similarities than skin color.

According to Indian research, more women believe that colorism has an important role in marriage (Verma, 2010). A study conducted by Sharda (2020) claims that colorism has been a constant dilemma for people in India. They think that skin tone biases has majorly disseminated by media, culture, and families. People living in India are fascinated by lighter skin tones. They think people with darker skin have low self-esteem and cannot be successful. They concluded that women in the young age group had the lowest self-esteem and had the most pressure to conform to lighter skin beauty ideals compared to the older generation. Also, they mentioned that skin tone has also been affecting people in the context of marriage. A similar study performed in India by Kukreja (2021) has revealed how colorism is treated as a marriage capital in certain areas of the country. The study acknowledges a form of gender-based oppression that takes roots in archaic, sexist ideals. The financial and social marginalization of certain communities in India makes it extremely difficult for darker-skinned women from these backgrounds in to get married. These women have entered cross-cultural marriages as a last resort, and their struggles do not end here. Their dark skin is routinely used as leverage against these brides. They are subjugated due to the implication that they have been saved from being perpetually unmarried due to their less-than-desired physicality.

Contrary to their findings, about half of our respondents stated that they do not have any preference regarding skin complexion when choosing their life partner. This shows that the women's excessive obsession is only the result of societal conditioning and that skin complexion is not as significant a factor in marriages as perceived by them. This, too, was because both the researchers had different social settings.

A study conducted by Jawad, Bhuiya, Faroque, and Gani (2022) discusses the role of a Bangladeshi superhero battling the social problems of colorism within the subcontinent. This study shows how South Asian countries still suffer from a colonial hangover by calling light-skinned people beautiful and prejudice against dark-skinned people, especially women. Young girls are told that having fair skin will determine the quality of their life; this distorts their sense of self and ingrains racism and colorism at a psychological level. This study focuses on introducing Ms. Shabash, a female superhero who fights against monsters and zombies at night, and society's expectations of ideal female beauty in daily life is a breath of fresh air for the young generation. For years young generation has been attracted to comics and graphic novels, and addressing an important issue through such medium has set a great example. It will inspire young minds in the future.

After all of the above discussion, it was concluded that most participants seemed to be completely satisfied with their complexion. They also had high to normal self-esteem. It cannot be determined whether self-esteem contributed to this satisfaction or vice versa.

#### *4.1 Limitations*

Our study's limitations are that the sample included educated, middle-class individuals, predominantly female gender. Majority of the students participating belonged to the same age group ranging from 18-25 years, South Asian race, similar mental and physical abilities, similar family income, and language skills. The representation of the dark-toned and male sex was small.

### **5. Conclusion**

We conclude that most participating university students were satisfied with their natural skin tone. The majority had high self-esteem, and there is no relation between complexion and self-esteem in the participating university students despite cultural norms and promotion of colorism in our society.

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## Competing Interests Statement

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

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# Exploring Healing Design Elements for Patient Room Design: Preferences of Adolescent Patients from Surgical Units

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## Abstract

Although the substantial influence of hospital environments on well-being has been widely recognized, research on the same topic for adolescent patients is limited. This study examined adolescent patients' preferences in hospital room designs to identify design elements that can potentially promote the healing process. Eight computer-simulated patient room images were developed through the combinations of three design elements: trim style (straight vs. arch), ceiling and floor details (plain vs. decorated), and window view (nature vs. city). Adolescent patients evaluated the images of patient room images using seven preference evaluation words on a Likert scale. Adolescent patients did not differ in preference for either straight or arch trim styles ( $p > 0.05$ ). Also, the different ceiling and floor details, such as plain vs. decorated, did not differ in the responses ( $p > 0.05$ ). However, the study results indicated that more adolescent patients strongly prefer the nature view than the city view ( $p < 0.01$ ), with higher peaceful, comfortable, pleasant, private, and enjoyable perceptions. Therefore, the window view was the most significant among the examined design elements, directing the value of relaxation and connection beyond the hospital environment. The results imply that 3D simulation of the patient room images adopting design elements can quantify adolescent patients' perceptions of room design in conjunction with the Likert scale. Based on the results of this study, adolescent patient rooms should be designed and developed considering natural stimulation aspects in connection with the outside environment.

**Keywords:** adolescent patient, patient room, preference, nature view, healing

## 1. Introduction

Depending on patients' characteristics and medical conditions, patients experience different degrees of stress while staying in a hospital. Research has evidenced that physical stimuli in hospital environments can influence patients' healing processes and health outcomes (Ghazali & Abbas, 2012; Ulrich, Zimring, Quan, Joseph, et al., 2004; Ulrich, 1984). Information about adolescent inpatients' feelings about hospital environments is insufficient. Adolescence is characterized by dramatic physical and emotional changes from childhood into individual maturity. The cognitive centers at this age are also in flux (Ramowski et al., 2007). Well-designed healthcare environments can support a patient's healing processes through physical and psychological benefits. Prior studies evidenced a meaningful relationship between physical healthcare environments and improved well-being (Ulrich, 1984; Karlin & Zeiss, 2006; Ampt & Maxwell, 2008; Salonen et al., 2013; Bukh et al., 2015). The importance of healthcare environments for adolescents should not be overlooked because of the transient nature of adolescence (Ullan et al., 2011). With an increasing number of adolescents with chronic health issues, healthcare professionals are confronting challenges in managing the complexity of adolescent health concerns (Sawyer et al., 2007).

Chronic pain occurring in adolescence may develop into more significant depressive symptoms and lower self-esteem than in other age groups (Varni, 1996). Adolescents also responded more sensitively to hospitalized environments where privacy was not sufficiently provided (Britto et al., 2010; Hutton, 2002). Adolescents' subclinical social anxiety also garnered attention as a potential health issue, and some studies acknowledged particular emotional fluctuations influenced by surroundings (Hutton, 2002; Valkenburg, 2006). Adolescent patients isolated from their peers experienced more significant anxiety than non-patient adolescents (Van Zalk & Van Zalk, 2015). However, empirical research findings are inadequate to support the necessity of hospital room planning for enhancing adolescent patients' psychological well-being. Some research evidenced that adolescents' preferences in hospital settings with interior colors and decoration (Tivorsak et al., 2004) have significant value in

terms of an emotional boost for healing. The transient nature of the adolescent development stage explains the distinct adolescent population’s preferences from adults and pediatrics. According to research results (Blumberg & Devlin, 2006), adolescent patients preferred hospital hallway and lobby designs with bright colors reflecting childhood but disliked decoration with emblems directly related to childhood. However, the research focused on the indoor design aspects of common areas, and the results could not be extended to the design of private spaces. Application of evidence-based hospital design plans for adolescents should consider their unique physical and mental status to enhance healing and psychological well-being (Craik & Feimer, 1991; Hartig & Staats, 2006). Since preference is a complex feeling based on experience, background, and knowledge, the analysis of the preferences should consider the environment and stimulus level (Imamoglu, 2000; Stamps & Mystery, 2004).

Although major national health institutes such as the U.S. Department of Health and Human Services and the American Academy of Pediatrics slightly differ in the age definition of the adolescent stage, for this study, adolescent participants ranged in age from 14 to 18. Holistic restoration of patients is the goal of healthcare providing facilities. Therefore, this study was designed to estimate how the design elements influence potential restoration of adolescent patients at hospital room environment by adopting computer-simulated room images containing interior design elements and Likert scale based perception keywords.

**2. Methods**

*2.1 Development of Patient Room Images*

The combinations of the three elements: trim styles (straight vs. arch) × ceiling and floor details (plain vs. decorated) × window views (nature vs. city), were implemented in the patient room images (Table 1).

Table 1. Combinations of three design elements applied to the computer-simulated room images

Design Element			Room Image No.
Trim Styles	Ceiling & Floor	Window View	
Straight trims with green and neutral colors	Plain	Nature	1
		City	2
	Decorated	Nature	3
		City	4
Arch trims with yellow and bright blue colors	Plain	Nature	5
		City	6
	Decorated	Nature	7
		City	8

The patient room designs and image constructions were developed according to the general guidelines of FGI 2014 Guidelines (FGI, 2014). A total of eight room images were generated according to Table 1 using 3D modeling, and rendering software, Google Sketchup, and Podium 2.4. Figure 1 presents the room images # 1 and 5 showing contrasts between the trim styles, ceiling and floor details, and window views.



Figure. 1. Computer-simulated room images developed by combining the three design elements such as trim styles × ceiling and floor details × window views). *Note:* Contrasts of styles for trim (straight with neutral color tone vs. arch with bright color tone), ceiling and floor (plain vs. decorated), and window view (nature vs. city) were applied to the eight room designs. Figures present only room # 1 and 5 to show the contrasts

## 2.2 Preference Evaluation Instrument

The evaluation instrument for the eight computer-simulated room images was developed along with Likert scale preference evaluations to quantify the responses to each room image. The adolescent inpatients evaluated each room image on a 5-point Likert scale from 1 (least likely) to 5 (most likely) for seven evaluation words: Peaceful, Comfortable, Pleasant, Roomy, Controllable, Private, and Enjoyable (Table 2). The evaluation words referred to Kasmar (1970) for the adolescents' environmental perceptions.

Table 2. Evaluation words and five-point Likert scale used for the room image evaluation.

Evaluation Word				
Peaceful, Comfortable, Pleasant, Roomy, Controllable, Private, Enjoyable				
Likert Scale				
1 (Least likely)	2	3	4	5 (Most likely)

## 2.3 Participants and Survey Procedure

This study was approved by the University of Louisville Institutional Review Board of Research Office. The participants were recruited at the surgical department in the Children's Hospital in Louisville, Kentucky, USA. The Norton Healthcare Research Office reviewed the researcher liability before the participant recruitment at the surgical department. After the deliberations of the study details, adolescent patients that signed the prepared consent form along with their guardians were included in the survey. The participating inpatients scored the room images presented by digital screen based on the perception keywords using the five-level Likert scale. A total of 47 adolescent patients completed the survey, ranging from 14 to 18 years old while waiting for their operations. The physical conditions of the participating patients varied depending on the types of surgical operations, therefore, the data collections were conducted only with the patient who were able to sit and communicate with the researcher regarding the survey.

## 2.4 Statistical Analysis of Data

Descriptive statistics and a Chi-square analysis were conducted with the subjects' demographic data to examine underlying discrepancies. First, the room design preference data were rearranged by the three design elements in a univariate model; then, the dataset was analyzed by ordinal logistic regression analysis of proc logistic of SAS (2010), considering the discrete nature of the five-point Likert scale. Finally, the three-room design elements (trim style, interior detail, and window view) were considered independent variables, and the responses for the seven evaluation words were regarded as dependent variables.

## 3. Results

### 3.1 Subject Demographics

The adolescent patients did not show significant differences in gender distribution. The percentage of female subjects was slightly higher than males, with females comprising 57.4% of the patient group. The probability of the chi-square test was not significant ( $p = 0.36$ ). The age distribution ranged from 14 to 18 years old, with a slightly higher proportion of 16 to 17-year-old subjects, but the frequency of the age group was also insignificant ( $p = 0.26$ ).

### 3.2 The Effect of Design Element on Preference

Table 3 presents the significance of the design element's effects on the subjects' responses to each evaluation word. Trim style and interior detail did not affect the adolescent patients' responses to the evaluation words ( $p > 0.05$ ). However, the window view was significant in most responses to the evaluation words except for 'roomy' and 'controllable.'

Table 3. *P*-value of the design element effects on adolescent patients' responses for seven evaluation words

Design Elements	Evaluation Words						
	Peaceful	Comfortable	Pleasant	Roomy	Controllable	Private	Enjoyable
Trim style	0.84	0.41	0.66	0.61	0.24	0.25	0.09
Ceiling & floor detail	0.19	0.14	0.25	0.94	0.78	0.06	0.92
Window view	< 0.0001	< 0.0001	< 0.001	0.17	0.35	< 0.0001	0.01

Table 4 presents the distributions of adolescent patients' responses to the window view element since the impacts of the other two design elements (trim style and interior detail) were not significant on the seven evaluation words. Also, percentages of the responses for the two evaluation words 'roomy' and 'controllable' were not provided in the table due to their insignificance in the window view element. More than 70% of the responses were presented in approval of the window view design element for the five evaluation words, while below 20% were distributed in disapproval.

Table 4. Percentage of the adolescent patients' Likert scaled responses showing the degree of approval of window view for the evaluation words.

Evaluation words	Window views	Least likely	Less likely	Neutral	Somewhat likely	Most likely
Peaceful	Nature	0.5	6.3	12.5	29.3	51.3
	City	0.8	10.5	18.3	32.9	37.5
Comfortable	Nature	0.0	1.9	8.2	27.5	62.4
	City	0.0	3.0	11.7	33.2	52.1
Pleasant	Nature	0.2	0.7	9.8	26.4	62.9
	City	0.4	1.1	13.4	31.2	54.0
Private	Nature	2.8	8.3	17.9	28.9	42.1
	City	4.6	12.9	23.4	29.0	30.1
Enjoyable	Nature	0.0	1.0	9.4	30.2	59.4
	City	0.0	1.4	12.2	34.5	51.9

There were more positive response percentages on the nature view (average 84%) than the city (average 77%) across the evaluation words. The combined portions of 'somewhat likely' and 'most likely' responses for the 'private' evaluation word were 71.0 and 59.1% on nature and city window views, respectively, which were lower approval compared to those of other evaluation words. The 'private' evaluation word received the highest disapproval responses in the percentages; the sum of 'less likely' and 'least likely' were 11.1 and 17.5% for nature and city views, respectively. The 'most likely' responses for 'enjoyable' demonstrated a 7.5% difference between nature and city window views, which was the least between nature and city views among the evaluated words.

#### 4. Discussion

More than half of the responses to the applied design elements placed between 'somewhat likely' and 'most likely,' indicated overall approval of the hospital room design by the adolescent patients. This study anticipated significant associations of roomy or controllable perceptions with trim styles or design details since visual effects of interior elements on interior spatial perceptions were substantial in the research (Jaglarz, 2011). The impact of interior settings, such as shapes and arrangement of interior features, should influence the interior space perceptions through visual illusions. However, the responses to other design elements for this study's evaluation words were not as significant as the window view element. This result may reflect the asynchrony of this age's physical, psychosocial, and cognitive abilities, as Sanders (2013) reported. Perhaps, the health status also affected the subjects' sensitivity to the delicate changes in the room simulations.

The consistently higher 'most likely' responses on the natural window view setting indicated a higher appreciation of the view than the city view. In addition, after surgery, patients who stayed in a room with a nature scenery

through a window had a shorter hospitalization, less stressful experience, and fewer analgesic doses than patients in a room without a window (Ulrich, 1984). Another study focusing on the effect of the natural environment also demonstrated a more significant recovery than in city settings (Kaplan 1995; Kaplan and Peterson, 1993). This advantage may have been due to the attraction to nature and color, which positively affected the health and well-being (Ulrich et al., 2008; Ulrich et al., 1991; Velarde et al., 2007). Hutton (2005) and Mazuch and Stephen (2005) positively valued large windows in a room, regardless of city or nature view, because the large window interior feature satiated teenagers' desire to connect to the outside beyond the hospital environment. Restoration is a significant part of the holistic healing process for hospital patients. There was empirical evidence for the benefit of the natural environment over the built (Hartig et al., 1991; Kaplan, 1995). Nature's ability to restore stress and attentional fatigue could make people prefer natural environments over built environments. Therefore, preference for nature supports restoration ability. Some empirical findings also evidenced restoration theory related to nature scenes (Adams et al., 2009; Tennessen & Cimprich, 1995; Ulrich et al., 2008).

Although the window view was the design element most influential on positive responses from the adolescent patients, substantial numbers of the subjects also felt less private from the interior aspect. The responses to disapproval for private perception remained at 11.1 and 17.5% on nature and city window view settings, respectively. Those proportions were the highest disapproval responses among the evaluation words. Hutton (2002) emphasized the importance of private space for adolescents, especially in hospitalization. Therefore, window views in a hospital room setting should be carefully considered to balance adolescent patients' confidentiality and other preferences. Meanwhile, the 'enjoyable' and 'pleasant' perceptions demonstrated the slightest difference between the nature and city views, reflecting adolescent patients' choice in some dynamic influence through the city view.

With the defined design elements (straight/arch trim style, plain/decorated interior detail, and nature/city window view) and Likert scale evaluations, this study was able to quantify adolescent patient room design preferences through the separated design element approaches. However, this study also has some limitations in interpreting the design impact on adolescent patients' design choices due to the possible gap in the responses to the concurring impression of color, hue, or other design characters and the verbally defined design elements. In addition, estimating preference even with well-designed survey instruments has been challenging due to the underlying process (Berkyne et al., 1970; Park et al., 2010). Finally, individual body condition would be another compound factor in the survey results.

The motivation for this study was to fill the gap between evidence-based design planning and the findings in literature for hospital room designs, particularly for adolescent patients. The developed hospital room rating, quantifying the room design preference on the applied design elements in this study, differentiated some interior design values through simulated room designs and a survey instrument.

### Competing Interests Statement

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

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# Mosquito-Borne Arboviruses in Brazil: Assessment of Apps Based on the Mobile Apps Rating Scale (MARS)

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## Abstract

**Background:** In Brazil, the prevalence of arboviral diseases, such as dengue, Zika, and Chikungunya, transmitted mainly by mosquitos, has increased alarmingly. In recent years, numerous free mobile apps tackling this issue have become available for various purposes and users.

**Objectives:** This study aimed to systematically survey and evaluate these apps using the Mobile App Rating Scale (MARS).

**Methods:** The survey was performed on Google Play Store and sought to identify these apps adopting the descriptors “Chikungunya”, “Dengue” and “Zika”. The MARS scale was used by two researchers to evaluate the apps following their translation to Portuguese and subsequent validation. Student's T-test, Kappa statistics, and Cronbach's alpha coefficient were employed to evaluate the interobserver agreement and the reliability of the scale.

**Results:** Most apps (20 out of 29 or ~70%) were created to disseminate basic information about arboviral diseases to the population or for entertainment. There was an agreement between the two researchers for all parameters of the MARS scale, except for the engagement ( $p=0.002$ ). The Cronbach's alpha coefficient indicated good reliability.

**Conclusions:** The use of the MARS scale has shown that most of the evaluated apps were developed to share information about arboviral diseases in an interactive way, but they do not necessarily have the purpose of influencing their users to change behaviours related to vector control or the prevention of arboviral diseases, which the authors feel would be a more appropriate aim for future app development.

**Keywords:** Mosquito-borne arboviruses, Mobile health (mhealth), mobile application, assessment

## 1. Introduction

In Brazil, the prevalence of diseases caused by arboviruses and transmitted by mosquitoes, such as dengue, Zika and Chikungunya, has increased alarmingly in recent years (Leta et al., 2018). Until September 2020, a total of 928,282 cases of dengue, with an incidence of 441.7 per 100,000 inhabitants, were registered by the Ministry of Health (Brazil, 2020; Santos et al., 2022). The traditional vector control programs, based on vertical methods to eliminate breeding sites with the use of insecticides, have failed due to the increase of resistant mosquito populations, the high level of adaptation of mosquitoes to urban environments and infrastructural problems in Brazilian cities (Lima-Camara, 2016; Donalisio et al., 2017; Lowe et al., 2018); (Donalisio et al., 2017).

One of the most effective control programs is community participation in monitoring mosquito breeding sites (Abel Mangueira et al., 2019; Costa et al., 2020; Santos et al., 2022). However, the existing programs do not effectively involve the population in the practices of elimination of these sites, leaving the community in the position of spectators (Abel Mangueira et al., 2019; Costa et al., 2020; Santos et al., 2022). Thus, health promotion and health education measures that transcend the dissemination of knowledge are necessary in order to boost the engagement of the population.

Recently, several studies have made efforts to elucidate the elaboration of educational materials for health promotion based on models of behaviour change, as well as the importance of using these theories for the involvement of the communities in health actions and for the adoption of individual protection behaviour (World Health Organization, 2012). One of the strategies that have been used to evaluate behaviour change involving communities and populations is the use of mobile learning and software applications (apps) for mobile devices (World Health Organization, 2012; McKay et al., 2018; Abel Manguiera et al., 2019). Available anywhere and at any time, these devices are very promising for the development of apps based on behaviour change theories to promote health education (Masterson Creber et al., 2016; Taj et al., 2019; Yang et al., 2015).

The rapid proliferation of smartphone apps has made it difficult - for their users as well as for health professionals and researchers - to define which ones have greater potential and quality (Stoyanov et al., 2015; Cummings et al., 2013). In 2014, there were more than 100,000 apps falling into the health, fitness, or medical categories, which doubled the market size of two and a half years previously (Xu & Liu, 2015). However, there is still a lack of evidence and methodological strategies to effectively evaluate the quality of the apps for health promotion, since the use of star ratings on Web pages is very subjective and based on unknown sources.

#### *The Mobile App Rating Scale (MARS)*

In 2015, Stoyanov and colleagues (2015) proposed a scale for the classification and the evaluation of the quality of these apps – the Mobile App Rating Scale (MARS) (Stoyanov et al., 2015). This scale has four sections, one of which is specific and modifiable to suit the application that is to be evaluated (Stoyanov et al., 2015). The items of the MARS scale are scored using a five-point Likert scale (1 inadequate, 2 poor, 3 acceptable, 4 good, and 5 excellent). The first section provides descriptive information about the apps. The second evaluates the objective quality of the application and it is organised into 19 items divided into four categories: engagement, functionality, aesthetics, and information quality. The third section contains four items that evaluate the overall subjective satisfaction of the user. The fourth section is an application-specific subscale that evaluates the perceived effect on knowledge, attitudes, the user's intentions regarding behaviour change, the search for help to promote change, and the likelihood of changing the identified target behaviours. The reliability of this scale was also examined, showing good results (Stoyanov et al., 2015). Recently, the MARS has been translated, validated, and adapted to be used in different countries and to be effective for rating apps built around health issues (Stoyanov et al., 2015; Terhorst et al., 2020; Martin Payo et al., 2019; Domnich et al., 2016; Messner et al., 2020).

## **2. Objectives**

This study aimed to use the Mobile App Rating Scale (MARS) to systematically survey and evaluate the apps related to the issue of arboviral diseases that are available for different purposes and users in Brazil. To achieve this goal, the MARS scale was translated into Portuguese and validated before being used to assess the quality of these mobile applications.

## **3. Methods**

The analysis of the apps for mobile devices was performed using the search terms “Chikungunya”, “Dengue” and “Zika”, referring to three of the main arboviral diseases transmitted by the *Aedes aegypti* mosquito. Preliminary screening was done based on the name and description of the app on Google Play Store, excluding apps that had fewer than 500 downloads, were duplicates (found using different search terms) or paid apps as well as those whose names were not associated with the search terms. After submitting the apps to the exclusion criteria, they were reviewed by team members and then downloaded for evaluation (Figure 1). The screening was based on the Android operating system and Google Play Store; since, in Brazil, more than 95% of the population uses the Android system. The screening was performed over the period of three months and a total of 29 Apps were selected to be evaluated.

After the screening phase, the MARS was translated from English into Portuguese and a pilot study was then performed to validate the tool. In this study, ten undergraduate biology students and four researchers (SS, RSM, VAA, IDF) performed the analysis of one of the apps identified in the screening phase using the translated scale. After addressing their critical comments regarding translation and other suggestions, the assessment was replicated with the final version of MARS. The Portuguese version of MARS can be obtained from the authors on request.

Before evaluating the 29 Apps, we followed the methodology suggested by Stoyanov and colleagues (2015). After watching training videos, three researchers used the Portuguese version of the scale to evaluate five apps not included in the final sample. Following this training phase, the 29 apps were

independently analyzed by two of them (researchers A and B). The compiled data were analyzed with the R program. Numerical variables representing the scores were analyzed using the normality test (Shapiro-Wilk) and, considering that most of them had a normal distribution, the Student's T-test was performed to compare the means obtained by the two researchers ( $p > 0.5$ ).

The Kappa test was used to evaluate the interobserver agreement for binary categorical variables and for variables using the Likert scale. To interpret the results, we used the Landis and Koch (1977) table, which establishes values above 0.81 as almost perfect agreement; between 0.61 and 0.80 as strong agreement; from 0.41 to 0.60 as moderate agreement; from 0.21 to 0.40 as reasonable agreement; between 0 and 0.20, the agreement is weak and if it is zero, it is insignificant (20). To perform the comparative evaluation of the reliability of the MARS scale between the two observers, Cronbach's alpha coefficient was used. It varies from 0 to 1. Values above 0.7 indicate good reliability of the evaluated score questionnaire.

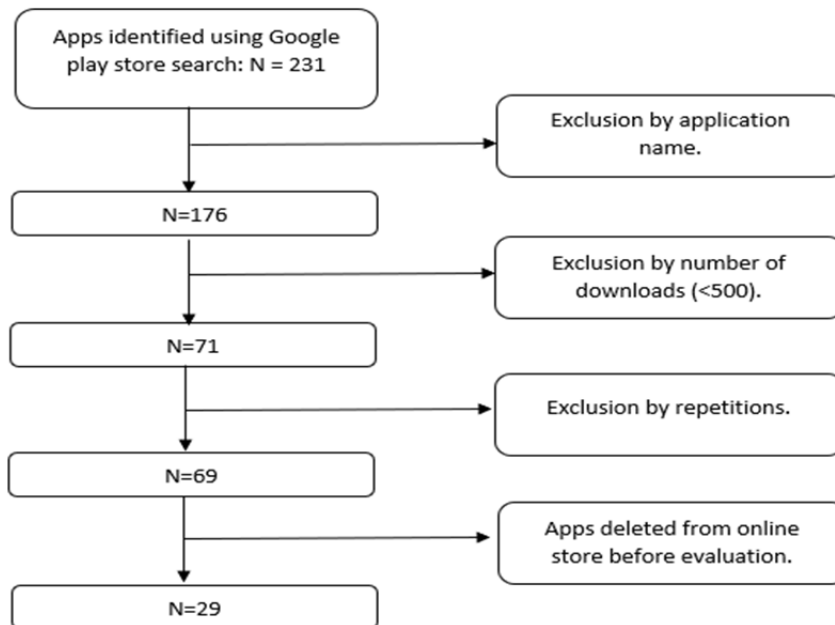


Figure 1. Flow chart of the selection of applications for mobile devices (apps) in Google Play Store

#### 4. Results

Table 1 presents a brief description of the 29 apps selected for analysis. It was verified that only four apps (14%) were developed by the state or federal government with the purpose of disseminating information to the population, facilitating the identification of mosquito breeding sites or individuals affected by arboviral diseases. One of these apps, “Zika Zero”, was widely disseminated by media outlets, such as television and radio. Four other apps were designed by university researchers or non-governmental organizations to collect epidemiological data or to facilitate the georeferencing of cases of arboviral diseases or breeding grounds. Furthermore, the dissemination of updated scientific information was the focus of the application created by the World Health Organization (WHO).

Most apps (20 out of 29 or ~70%) were created by individual or professional developers to disseminate basic information to the population or for entertainment; several “smash the button” games were developed. Interestingly, one of the apps offered a sound frequency that was supposed to be insect repellent. In all, 23 of the 29 apps had the general population as their target audience; four targeted health workers, one was for basic education teachers and the final one was aimed at children.

Table 2 shows the scores obtained by the 29 apps, in each of the parameters of the MARS scale, comparatively analyzing the evaluations of researchers A and B. It was observed that eight of the 10 apps with the highest average score were well evaluated by both researchers, showing strong agreement. Although the scores attributed by the different evaluators were not identical, the ranking of the apps tended to be considerably similar. Using the MARS scale, the two apps with the highest scores were “Dengue”, developed to assist health professionals in the management of epidemiological information; and the “SP X Dengue” app, an educational game developed by São Paulo state government. There was also an agreement between the evaluation of the researchers regarding the two apps with the lowest quality score (Mosquito Attack and Dengue x Chik x Zika).

Table 1. Description of the 29 Brazilian applications for mobile devices (apps), selected using the search terms “Chikungunya”, “Dengue” and “Zika”, which are the names of three of the main arboviral diseases transmitted by the *Aedes aegypti* mosquito

<b>Description of the applications</b>					
<b>Name</b>	<b>Developer</b>	<b>Funding</b>	<b>Aim</b>	<b>Target Audience</b>	<b>Brief Description</b>
01-Dengue	Medtouch Software	Professional App Developer	Clinical management	Health workers	Diagnostic information, treatment and hospitalization criteria for arboviral diseases
02-SP X Dengue	PRODESP - SP	State Government	Educative game	General Population	Game
03-Zika Virus	AES	Individual App Developer	Share information	General Population	Basic information about Zika virus
04-Dengue Fever Disease	DroidClinic	Individual App Developer	Share information	General Population	Basic information about arboviral diseases
05-Sem Dengue	Colab S.A.	Start-up and government	Entomological surveillance	General Population	Publication of photos of mosquito breeding sites for management of surveillance services.
06-Dengue SC	CIASC	State Government	Entomological surveillance	General Population and Health Workers	Georeferencing of mosquito breeding sites
07-RS Contra Aedes – Agentes	Telessaúde UFRGS	University	Entomological surveillance	Health Workers	Georeferencing of mosquito breeding sites and tool developed to help the health workers responsible for vector control
08-WHO ZIKA APP	WHO	World Health Organization	Science diffusion	Researchers and Health Workers	Scientific information of arboviral diseases.
09-Zika vírus 3D Animação	SfondiAnimati 3D	Professional App Developer	Images and animations of virus	General Population	Images and animations related to arboviruses
10-Zika@SG	HosayStudios	Professional App Developer	Share information	General Population	Basic information about Zika virus
11-Ariê e Yuki contra mosquitos	Krafthaus Designers	Professional App Developer	Educative game	Children	Game
12-Anti Mosquito Simulation Lite	Gonsai	Professional App Developer	Repellent tool	General Population	Sound frequency that supposedly repels mosquitoes
13-MOSQUITO Alert	Movement EcologyLab	Non-governmental organization and university researchers	Entomological surveillance	General Population	Notification and sharing of information by the population that can be used by researchers

14-Alerta Dengue	IMA Informática S/A	State Government	Locate at-risk areas	General Population	GPS localization of at-risk areas
15-Esmagar mosquitos	DevgamesApps	Professional App Developer	Entertainment	General Population	Game “smash the button”
16-Extermina Dengue	PlayO Studio	Individual App Developer	Entertainment	General Population	Game “smash the button”
17-Dr. Chikungunya	SPT TOLIMA	Professional App Developer	Diagnostic tool	Health Workers	Diagnostic information, treatment and hospitalization criteria for arboviruses
18-Mapa da Dengue	Web Fantástico	Professional App Developer	Monitoring map for surveillance	General Population	GPS localization of at-risk areas
19-Ataque a Dengue	TG Studio	Individual App Developer	Educative game	General Population	Game (teaching how to locate breeding sites)
20-Zika Virus and Microcephaly	Eric Brou	Individual App Developer	Notify about news	General Population	Daily news and information’s of Microcephalia and Zika virus
21-Kill Mosquito da Dengue	Dimar Luiz dos Santos	Individual App Developer	Entertainment	General Population	Game “smash the button”
22-Chikungunya 1	HUNT GAMES	Professional App Developer	Entertainment	General Population	Game “smash the button”
23-Zika vírus-Minha Vida	Webedia	Non-governmental organization of journalists	Notify about news	General Population	Daily news and information’s of arboviruses
24-Zika Zero	HiroTanima	Federal Government	Engage in preventive campaigns	School teachers	Engagement of schools in vector control of arboviruses
25-Todos Contra a Dengue	Mauricio Jezierski	Individual App Developer	Share information	General Population	Basic information of arboviral diseases
26-Zika Dilma	Edson Silva	Individual App Developer	Entertainment	General Population	Game “smash the button” (comedy and satirizing).
27-Fight Dengue	Access Devices Asia Sdn. Bhd.	Professional App Developer	Entertainment	General Population	Game “smash the button”
28-Mosquito Attack	MagicX	Professional App Developer	Entertainment	General Population	Game “smash the button”
29-DengueXChikXZika	DVG	Non-governmental organization and university researchers	identify symptoms of arboviruses	General Population	Questionnaire to evaluate the probability of being infected by arbovirus

Table 2. Averages obtained by two evaluators (A and B) after the analysis of applications related to arboviral diseases for each of the sections evaluated using the “Mobile App Rating Scale (MARS)”. (ENG – Engagement; FUN –Functionality; AES – Aesthetics; INF – Information; SCQ – Overall Score for Quality; SCS – Overall Score for Subjective Quality; BC – Score for Behavior Change section)

App	Researcher A								Researcher B							
	ENG	FUN	AES	INF	SCQ	SCS	BC	Mean	ENG	FUN	AES	INF	SCQ	SCS	BC	Mean
01-Dengue	3.00	4.50	3.33	4.00	3.71	3.25	4.16	<b>3.71</b>	4.40	4.75	5.00	4.60	4.69	3.75	4.66	<b>4.55</b>
02-SP X Dengue	3.80	4.25	3.33	3.66	3.76	3.25	4.16	<b>3.74</b>	3.80	4.25	4.33	4.00	4.10	3.75	5.00	<b>4.18</b>
03-Zika Vírus	1.40	3.00	1.00	1.75	1.79	1.00	1.00	<b>1.56</b>	3.00	4.50	4.66	4.50	4.17	3.50	4.00	<b>4.05</b>
04-Dengue Fever Disease	3.00	3.50	2.33	3.40	3.05	2.25	3.50	<b>3.00</b>	3.80	3.75	5.00	3.33	3.97	3.25	4.66	<b>3.97</b>
05-Sem Dengue	3.80	3.50	3.33	3.50	3.53	2.50	3.33	<b>3.36</b>	3.40	3.50	4.66	4.40	3.99	3.50	3.66	<b>3.87</b>
06-Dengue SC	3.20	4.25	3.66	3.80	3.73	3.00	4.00	<b>3.66</b>	2.80	4.25	4.33	4.40	3.95	3.50	3.50	<b>3.82</b>
07-RS Contra Aedes - Agentes	3.60	4.25	3.33	4.00	3.80	3.50	4.16	<b>3.81</b>	2.40	5.00	4.00	3.66	3.77	2.25	4.00	<b>3.58</b>
08-WHO ZIKA APP	2.00	3.20	2.66	4.40	3.07	2.75	3.16	<b>3.03</b>	3.00	4.25	4.00	3.00	3.56	2.25	3.66	<b>3.39</b>
09-Zika vírus 3D Animação	2.20	3.25	1.66	1.50	2.15	1.00	1.00	<b>1.82</b>	2.80	4.00	3.66	4.60	3.77	2.50	2.16	<b>3.36</b>
10-Zika@SG	2.60	3.75	2.66	3.33	3.09	3.25	4.00	<b>3.24</b>	2.60	4.25	3.33	3.50	3.42	1.75	3.83	<b>3.24</b>
11-Ariê e Yuki contra mosquitos	3.80	4.50	4.00	3.33	3.90	2.50	3.33	<b>3.62</b>	3.00	4.25	4.66	3.50	3.85	1.75	1.33	<b>3.19</b>
12-Anti Mosquito Simulation Lite	2.80	3.75	2.33	3.00	2.97	2.50	2.16	<b>2.79</b>	2.20	4.25	2.66	4.16	3.32	2.25	2.66	<b>3.07</b>
13-MOSQUITO Alert	3.20	2.25	2.00	2.50	2.48	1.25	2.16	<b>2.26</b>	3.75	3.50	3.00	3.00	3.31	1.25	1.00	<b>2.69</b>
14-Alerta Dengue	3.20	3.75	3.33	2.80	3.27	1.75	3.00	<b>3.01</b>	2.20	4.00	2.66	2.75	2.90	1.75	2.00	<b>2.61</b>
15-Esmagar mosquitos	3.00	3.50	2.66	2.50	2.91	1.50	2.00	<b>2.58</b>	1.40	3.50	3.33	4.00	3.06	1.50	1.00	<b>2.54</b>
16-Extermina Dengue	3.00	3.25	2.33	2.00	2.64	1.50	2.16	<b>2.41</b>	2.40	3.75	2.66	2.80	2.65	1.25	1.66	<b>2.45</b>
17-Dr. Chikungunya	3.60	4.00	2.66	3.66	3.48	2.25	3.66	<b>3.33</b>	1.80	4.25	2.33	3.00	2.85	1.25	1.00	<b>2.35</b>
18-Mapa da Dengue	2.80	2.50	1.66	1.50	2.11	1.00	2.16	<b>1.96</b>	1.40	3.75	2.33	2.75	2.56	1.25	2.00	<b>2.29</b>
19-Ataque a Dengue	2.60	2.75	2.66	3.00	2.75	1.75	2.50	<b>2.57</b>	1.80	4.25	2.33	2.50	2.72	1.25	1.00	<b>2.26</b>
20-Zika VirusandMicrocephaly	2.80	3.25	2.00	2.60	2.66	1.50	2.83	<b>2.52</b>	1.80	3.50	1.00	3.50	2.45	1.75	1.66	<b>2.24</b>
21-Kill Mosquito da Dengue	3.20	3.75	2.66	2.00	2.90	2.00	2.16	<b>2.67</b>	1.80	3.00	2.00	2.60	2.35	1.25	2.50	<b>2.21</b>
22-Chikungunya' 1	3.20	4.00	3.00	2.00	3.05	2.00	2.16	<b>2.77</b>	1.40	3.25	2.33	2.75	2.43	1.00	1.00	<b>2.02</b>
23-Zika vírus-Minha Vida	3.20	4.25	3.00	3.40	3.46	2.50	3.83	<b>3.38</b>	1.80	3.75	1.33	2.50	2.35	1.25	1.00	<b>2.00</b>



<b>24-Zika Zero</b>	2.40	3.50	2.66	2.50	2.77	1.75	2.16	<b>2.53</b>	1.20	3.00	1.00	2.60	1.95	1.00	2.16	<b>1.84</b>
<b>25-Todos Contra a Dengue</b>	3.00	3.75	2.33	2.60	2.92	2.25	3.00	<b>2.84</b>	1.80	4.00	1.00	1.60	2.10	1.25	1.00	<b>1.82</b>
<b>26-Zika Dilma</b>	3.40	4.25	3.00	3.00	3.41	3.00	1.83	<b>3.13</b>	1.00	3.50	1.33	2.00	1.96	1.00	1.16	<b>1.71</b>
<b>27-Fight Dengue</b>	2.80	3.00	2.33	2.20	2.58	1.50	2.50	<b>2.42</b>	1.40	1.75	2.00	2.66	1.95	1.00	1.00	<b>1.68</b>
<b>28-Mosquito Attack</b>	3.00	3.00	2.00	2.00	2.50	1.50	2.00	<b>2.29</b>	1.40	1.00	2.66	1.75	1.70	1.00	1.00	<b>1.50</b>
<b>29-DengueXChikXZika</b>	2.00	3.75	2.66	2.40	2.70	1.25	1.00	<b>2.25</b>	1.40	1.50	1.00	1.50	1.35	1.00	1.00	<b>1.25</b>

Table 3. Comparison of the general means obtained by the different evaluators for each of the sections of the scale “Mobile App Rating Scale” using T-student test. (\* p<0.05)

Section (Score)	Appraiser	n	Mean	SD	p-value
Engagement	A	29	2.95	0.57	*0.002
	B	29	2.31	0.92	
Functionality	A	29	3.59	0.59	0.73
	B	29	3.66	0.91	
Aesthetics	A	29	2.64	0.65	0.32
	B	29	2.92	1.31	
Quality of Information	A	29	2.84	0.79	0.15
	B	29	3.17	0.91	
Subjective Information	A	29	2.10	0.75	0.36
	B	29	1.90	0.96	
Average Quality of Information	A	29	3.00	0.54	0.99
	B	29	3.01	0.87	
Average Subjective Quality	A	29	2.10	0.75	0.36
	B	29	1.90	0.96	
Specific Medium - Change of Behavior	A	29	2.72	0.97	0.16
	B	29	2.28	1.36	

[Abbreviations: n – number; SD – Standard Deviation].

Table 3 shows the results of the t-student test comparing the mean scores attributed by the two researchers for each of the MARS parameters. It was found that there was an agreement between the evaluation of the researchers for all of these parameters, except for the engagement ( $p=0.002$ ).

Table 4. Kappa statistics results for the variables with significant p-value

	Variable	Kappa	p-value
<b>APPLICATION FOCUS</b>			
F1	Informative	0.65	0.00
F2	Entertainment	0.92	0.00
F3	Audio-visual	0.47	0.00
F4	Breeder's Denunciation	0.44	0.00
F5	Geolocation	0.90	0.00
3	AFFILIATIONS	0.40	0.00
<b>OBJECTIVE QUALITY</b>			
6	ENTERTAINMENT	0.24	0.01
7	INTEREST	0.27	0.00
8	CUSTOMIZATION	0.20	0.05
14	GESTURAL DESIGN	0.22	0.03
18	PRECISION DESCRIPTION	0.23	0.03
19	GOALS	0.28	0.07
23	CREDIBILITY	0.42	0.00

By using a Likert-type scale with five response options for each of the items assessed on the MARS scale, Kappa statistics indicated that nine parameters had no significant p-value. Table 4 shows the interobserver agreement values of the variables in which the Kappa p-value was significant ( $p<0.5$ ). It was verified that the Kappa values varied from 0.20 (customization) to 0.92 (application focus); three of 13 parameters had an almost perfect or strong agreement (above 0.61); three varied from 0.41 to 0.60, showing a moderate agreement; six varied from 0.21 to 0.40, being classified as reasonable agreement; and just one in thirteen had a Kappa value of 0.20, showing a weak agreement.

Finally, the internal consistency of the MARS was estimated using Cronbach's alpha coefficient and the results showed good reliability. A small difference between the results of the two evaluators was observed: 0.93 and 0.77 for researchers A and B, respectively (Table 5).

Table 5. Results of the reliability analysis of the MARS scale items, using the Cronbach's alpha coefficient. (Abbreviations: SD – standard deviation; CR – Correlation; CA1 – Cronbach Alfa if the it is deleted; Cr.Alpha – Cronbach Alfa)

Variables	Researcher A					Researcher B				
	Mean	SD	Correlation	CA1	Cr. Alpha	Mean	SD	Correlation	CA1	Cr. alpha
6. Entertainment	3.43	0.8	0.15	0.93	<b>0.93</b>	<b>3.2</b>	0.8	0.43	0.76	<b>0.77</b>
7. Interest	3.57	0.5	0.49	0.93		3.4	0.6	0.32	0.77	
8. Customization	2.71	0.8	0.09	0.94		1.4	0.9	0.87	0.73	
9. Interactivity	4	0.6	0.27	0.93		2	1	0.65	0.74	
10. Target Group	3.57	1.1	0.62	0.93		4.2	0.5	0.88	0.75	
11. Performance	3.71	0.8	0.87	0.92		4.4	0.6	-0.55	0.8	
12. Ease of use	3.71	0.8	0.87	0.92		4.6	0.6	-0.39	0.8	
13. Navigation	4.14	0.9	0.85	0.92		4.4	0.6	0.6	0.76	
14. Gestural Design	3	0.6	0.74	0.93		4	0.7	-0.24	0.8	
15. Layout	3.29	1	0.72	0.92		4	0.7	0.85	0.74	
16. Graphics	2.57	0.5	0.49	0.93		3.8	0.5	0.45	0.76	
17. Visual appeal	4	0.6	0.83	0.92		3.4	0.9	0.32	0.77	
18. Precision of description	2.57	0.8	0.82	0.92		4.4	0.6	-0.31	0.79	
19. Goals	3.57	0.5	0.35	0.93		3.8	0.8	0.28	0.77	
20. Quality of information	3.57	0.5	0.71	0.93		4.2	0.8	-0.09	0.79	
21. Quantity of information	3.86	0.9	0.84	0.92		3.4	1.5	0.05	0.81	
22. Visual information	3.57	0.8	0.52	0.93		3.4	1.3	0.25	0.78	
23. Credibility	2.71	1.1	0.77	0.92		3.6	0.9	0.95	0.72	
25. Would recommend the app	3.29	1.1	0.94	0.92		2.2	0.5	0.88	0.75	
26. How many times would you use	1.57	1	0.11	0.94		1.4	0.9	0.87	0.73	
27. Would you pay for this app	3.43	0.8	0.82	0.92		3.2	0.5	0.88	0.75	
28. Star rating	3.43	0.8	0.15	0.93		3.2	0.8	0.43	0.76	

## 5. Discussion

For the first time in Brazil, the MARS scale was translated and used to evaluate mobile apps. Most of the Brazilian apps were created by individual developers or companies, with little or no contribution from health professionals and organizations, and aimed to share information about arboviral diseases in an interactive way. However, they do not necessarily intend to influence their users to change behaviours related to vector control or the prevention of these diseases.

One of the issues identified in the present study was the screening process using search terms on the app store. Using the three selected descriptors (Dengue, Zika, and Chikungunya), the survey led to a great number of apps that had no direct connection to these arboviral diseases. In Brazil, the term “zika or zica” is used in common parlance to refer to bad luck and these words were extensively employed in this sense by developers on the app store.

Another issue was the durability or lifetime of the apps on the Google Play Store. Due to the challenges mentioned above, the screening of the apps was a lengthy process. In addition, many months were dedicated to the translation and validation of the Portuguese version of the MARS Scale as well as to the training of the researchers. During this process, several apps were excluded from Google Play Store. Given that most of the apps were developed by individual initiatives for entertainment purposes, this possibly occurred due to their financial limitations (Xu & Liu, 2015).

Most of the analysed apps were developed for the dissemination of information or entertainment purposes. A few excellent apps, such as the WHO ZIKA APP, fulfil their aim and manage to deliver high-quality information to health professionals and citizens. Some other apps, despite succeeding in providing information in an interactive way, do not necessarily intend to influence their users to change behaviours related to vector control or the prevention of arboviral diseases, which the authors feel could have huge benefits, especially amongst the more popular apps. Where this has been a specific aim of an app (or a project), the public health benefits are significant (Cummings et al., 2013). Moreover, the content made available on the apps was often not developed by health workers or organizations, meaning that conceptual mistakes, misconceptions or misunderstandings are possible or, indeed, inevitable (Cummings et al., 2013).

In the literature, many studies have addressed the contribution of behaviour change theories to the development of digital health technologies (Hartin et al., 2016; Wang et al., 2019; Glanz & Bishop, 2010). These theories, for example, have been successfully used to develop apps focusing on physical activities and weight loss (Yang et al., 2015). Despite this, the Brazilian apps analyzed in the present work did not adopt these theories to promote behaviour change in order to reduce the incidence of arboviral diseases.

This study corroborates previous findings demonstrating that the MARS scale is a reliable tool to identify high-quality apps (Stoyanov et al., 2015; Terhorst et al., 2020; Martin Payo et al., 2019; Domnich et al., 2016; Messner et al., 2020). For example, the “RS Contra Aedes - Agents” was classified as one of the five apps with the highest scores in the engagement section, general average score and subjective quality average. This app was developed by the Federal University of Rio Grande do Sul (UFRGS) in partnership with the State Department of Health. Targeting community health workers, endemic disease control agents and military officers, this app aims to help control and monitor home inspections for the elimination of mosquito breeding sites. The application is equipped with a geo-referencing system that provides real-time information to the health workers who are performing inspections and allows them to create reports, and record the date of the visit, address, type of property and location, that can feed the database of the Department of Health. The app also provides information about the diseases transmitted by the *Aedes aegypti* mosquito and its prevention, also offering advice for pregnant women to prevent congenital Zika syndrome. These features combine to make this app an exemplar of what the authors would like to see developers aim for: informative and instructive, but also adding to knowledge and supporting behavioural change.

This study also showed that most of the apps tackling public health issues available on the Google Play Store in Brazil were created by individual initiatives with little or no contribution and assistance from health services. Given the importance of the impact that these apps can have on public health by stimulating behaviour change, the authors support the creation of specific public policies to regulate, evaluate, and promote these apps. Additionally, efforts must be made to develop open-access repositories so that, over the years, a deeper analysis of the role of these apps in health promotion can be performed (Boulos et al., 2014). In the United Kingdom and in the United States, for example, there are already initiatives to create specific regulations and continuous assessment procedures for health-related apps. This kind of initiative needs to be globally discussed and better systematized in order to build common criteria for evaluating and regulating such apps (Iglezakis, 2020; Parker et al., 2017).

Carrillo et. al. (2021), in a literature review regarding the use of apps in the prevention of arboviruses, pointed out that few studies showed effective m-health interventions in terms of reducing vector density, either by changing population behaviour or as early warning indicators of outbreaks. The authors emphasize the need for the use of well-defined methodologies, such as randomized controlled trials or quasi-experimental designs, to assess the impact of using new technology. In the present work, it was not possible, with the use of the MARS scale, to evaluate the effectiveness of the use of the apps in relation to the purpose of reducing the prevalence of mosquito-borne arboviruses.

Regarding the reliability of the MARS scale, the findings of this study corroborate previous ones published by Stoyanov (Stoyanov et al., 2015; Taj et al., 2019; Terhorst et al., 2020). In terms of the limitations of the present study, although many researchers participated in the validation of the Portuguese version of the MARS scale, only two carried out the analysis of the 29 apps due to time restrictions and the need for training. In addition, it was not possible to replicate the study using the iOS operating system, because most of the apps analyzed in this work did not provide a version for this system.

## 6. Conclusions

The use of the internationally validated “Mobile Apps Rating Scale” can be effective to differentiate between mobile applications and place them on a continuum of usefulness. This study showed that most of the mobile apps investigated were developed to share information about arboviral diseases in an interactive way, but they do not necessarily intend to influence their users to change behaviours related to vector control or the prevention of these diseases. It is the authors’ contention that this should be addressed in the development of future applications, supported by a specific national public policy. Effective information leading to behavioural change has the potential to unlock significant public health benefits over and above those of applications designed merely to inform at a basic level.

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## Competing Interests Statement

The authors declare that they have no competing interests.

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# Religiosity and Spiritual/Religious Coping in Adults with Type 1 Diabetes Mellitus

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## Abstract

**Background:** Spirituality/Religiosity (S/R) plays an important role in chronic diseases coping, improvement of quality of life (QL) and adherence to treatment. There is a gap in studies regarding Type 1 Diabetes Mellitus (T1DM) coping and if S/R can help in metabolic control and complications decrease.

**Objective:** To evaluate the religiosity profile and relevance of spiritual/religious coping in adult patients with T1DM.

**Method:** This is a cross-sectional, descriptive study conducted in outpatient care in 56 T1DM patients in a tertiary service. Patients filled out questionnaires referring to demographic and clinical data, socioeconomic classification, the Index of Religiosity of the University of Duke - Duke scale (DUREL), and an adapted Spiritual-Religious Coping scale (SRCOPE).

**Results:** The analysis of the positive SRCOPE (PSRCOPE) showed a low / medium score ( $3.3 \pm 0.7$ ), whereas for the negative SRCOPE (NSRCOPE) it was low ( $2.0 \pm 0.7$ ), and the use of the total SRCOPE was considered high ( $3.7 \pm 0.4$ ), the NSRCOPE/ PSRCOPE ratio was  $0.7 \pm 0.2$ , demonstrating a predominance of PSRCOPE in relation to NSRCOPE. The organizational, non-organizational and intrinsic religiosities presented a correlation with PSRCOPE and total SRCOPE. Only intrinsic religiosity showed a significant correlation with anxiety and depression.

**Conclusion:** It was found that non-organizational and intrinsic religiosity had a high index. The obtained score for positive and negative SRCOPE showed a PSRCOPE predominance. There was significant correlation, between the scores of religiosity and coping. The next step is to evaluate the impact of these findings in clinical practice.

**Keywords:** Religiosity, type 1 diabetes mellitus, spiritual/religious coping

## 1. Introduction

Diabetes Mellitus (DM) is a metabolic disorder characterized by hyperglycemia, resulting from a deficiency in insulin production and/or its action, which can cause chronic micro and macrovascular complications (Sociedade Brasileira de Diabetes, 2019).

Actually 537 million adults (20–79 years) are living with diabetes - 1 in 10. This number is predicted to rise to 643 million by 2030 and 783 million by 2045. Diabetes is responsible for 6.7 million deaths in 2021 - 1 every 5 seconds (International Diabetes Federation, 2021).

When not well controlled, over the long term, can cause damage to many of the body's organs, leading to disabling and life-threatening health complications such as cardiovascular diseases (CVD), nerve damage (neuropathy), kidney damage (nephropathy), lower-limb amputation, and eye disease (mainly affecting the retina) resulting in visual loss and even blindness, complications considered chronic (Sousa, Zauszniewski, Musil, Price Lea, & Davis, 2005, International Diabetes Federation, 2021; Sociedade Brasileira de Diabetes, 2019).

According to the Diabetes Control and Complications Trial Research Group (DCCT), and the United Kingdom Prospective Diabetes Study Group (UKPDS), glycemic control reduces complications (Diabetes Control and



Complications Trial Research Group, 1993; UK Prospective Diabetes Study (UKPDS) Group, 1998; King, Peacock, & Donnelly, 1999). The International Diabetes Federation (IDF) carries out a series of actions around the world, seeking advances in treatment, services and education that improve the outcomes of patients with diabetes, as well as promote the prevention of diabetes and its complications.

As much as science and technology help to improve glycemic control, it is still difficult to define how the patient will face and adhere to the treatment of a chronic disease that will accompany him throughout the entire period of life, since Type 1 Diabetes Mellitus (T1DM) manifests itself abruptly, completely altering the patients' lifestyle, who present psychological reactions, including anger and depression that can make self-care practices difficult. With the help of family members and healthcare professionals, the course can change, and prevent or delay complications (Roy & Lloyd, 2012; Johnson, Eiser, Young, Brierley, & Heller, 2013; Gilsanz et al., 2018).

It is time to accept that health care combined with increasingly advanced technologies used in the treatment of diabetes are not enough to reduce the prevalence and complications of the disease. Knowing that approximately 90% of the world's population is involved in some spiritual/religious practice and this dimension plays a relevant role in life (Moreira-Almeida, Lotufo Neto, & Koenig, 2006) we sought to assess the role of spirituality and religiosity (S/R) in glycemic control.

Thus, this study aims to assess the profile and relevance of the indices: religiosity, Spiritual-Religious coping and levels of depression, anxiety and stress in adult patients with T1DM, and the implications of these metabolic control variables. Some authors have reported that S/R are associated with improvements in coping skills (Spiritual-Religious Coping - SRCOPE). Increases health-related quality of life (even during terminal illnesses) and longevity. It decreases the rate of anxiety and depression, showing that the recognition and support of patients' spiritual needs would be a treatment path, especially for chronic diseases, which require long-term care (Mueller, Plevak, & Rummans, 2001; Rovner, Casten, & Harris, 2013).

Some forms of coping have been evaluated in patients with T1DM, but there are few studies on SRCOPE in these patients (Karlsen & Bru, 2002; Sultan, Epel, Sachon, Vaillant, & Hartemann-Heutier, 2008; Tercyak et al., 2010). Based on the fact that in SRCOPE, individuals use faith as a source of strength, comfort, hope and as positive strategies that lead to personal empowerment helping to overcome stress and depressive symptoms (Koenig, Pargament, & Nielsen, 1998), we will use this tool in our study. Considering the gaps in the literature regarding these strategies that could be used in patients with T1DM, this study aims to evaluate the SRCOPE of adult patients with T1DM.

## 2. Methods

This work was approved by the Ethics Committee of the Federal University of the Triângulo Mineiro (UFTM), protocol number 2048287.

The study sample consisted of 56 patients with T1DM, who regularly attend the outpatient clinic, two or three times a year.

Patients were selected according to the inclusion criteria that were:

Have been in T1DM treatment for at least 3 years, a period considered long enough to assimilate the experiences related to the treatment and control of the disease; be regularly monitored in the Diabetes outpatient clinics of the UFTM Endocrinology and Metabolic Department; be over 24 and under 67 years of age; have cognitive conditions to fill in the questionnaires.

### 2.1 Questionnaires and instruments

Patients completed the following instruments:

- 1). Regarding the collection of sociodemographic and general data, containing sex, age, and how long time they have had diabetes;
- 2). The Socioeconomic Classification Questionnaire was based on the criterion of Economic Classification of Brazil, which is constructed from the possession of goods and household utensils and schooling of the head of the family (Associação Brasileira de Empresas de Pesquisa, 2016);
- 3). The Index of Religiosity of the University of DUKE (DUREL); developed in 1997, translated into Portuguese in 2008, and validated in 2012 (Koenig, Parkerson Jr, & Meador, 1997; Moreira-Almeida, Peres, Aloe, Lotufo Neto, & Koenig, 2008; Koenig & Büssing, 2010; Lucchetti et al., 2012; Taunay, et al., 2012). It is a five-item scale, which measures three of the major dimensions of religious involvement related to health outcomes. Organizational Religiosity (ORA), item 1: attendance to private religious services (religious, cults, spiritist centers, study or

prayer groups, etc). Non-Organizational Religiosity (NORA), item 2: Praying, reading books, watching religious television programs. Intrinsic Religiosity (RI), item 3-5: full experience of religiosity, feeling of ultimate meaning of life, in which the person seeks to harmonize their needs and interests with their beliefs, striving to internalize and follow them completely.

4). The brief SRCOPE, which assesses how individuals use their faith to deal with stress in coping with adverse situations. The brief SRCOPE was based on the North American scale SRCOPE (Pargament, Koenig, & Perez, 2000). It was translated, adapted and validated for the Brazilian population by Panzini and Bandeira in 2005. The scale has 49 items, divided into four main indices, two dimensional: positive SRCOPE (PSRCOPE) and negative SRCOPE (NSRCOPE); and two general indices that integrate all the information provided by the scale, relating the first two measures, pointing to the interaction between the basic measures, showing a profile on the set of behaviors performed / evaluated. The two general indices are the total SRCOPE and NSRCOPE/PSRCOPE ratio.

The PSRCOPE consists of 34 items and 7 factors, while the NSRCOPE is composed of 15 items and 4 factors. The answers are in a Likert -like scale of 5 points: (1) not at all; (2) a little; (3) more or less; (4) enough; (5) very much. Since the two dimensions have an inverse direction, the simple average between positive and negative strategies could not be measure. Then, the calculation of the total SRCOPE was do with the inversion of the NSRCOPE, and the higher the total SRCOPE, the greater the total use of SRCOPE by the evaluated person. About the NSRCOPE/PSRCOPE ratio, where the lower the relation, the greater the positive confrontation. The scale also allows the evaluation of 7 PSRCOPE factors and 4 NSRCOPE factors. Factor P1: transformation of self and / or life; Factor P2: search for spiritual help; Factor P3: offer of help to the other; Factor P4: positive attitude in relation to God; Factor P5: search for the other institutional; Factor P6: distance through God / Religion / Spirituality; Factor P7: search for spiritual knowledge. Factor N1: negative reassessment of God; Factor N2: negative attitude towards God; Factor N3: dissatisfaction with the other institutional; Factor N4: negative reassessment of meaning.

The parameters for descriptive analysis of averages SRCOPE was: 1 to 1.5 very low; 1.5 to 2.5 low; 2.5 to 3.5 average; 3.5 to 4.5 high and 4.5 to 5.0 very high.

### *2.2 Analysis of Results and Statistics*

The data were organized and stored in spreadsheet in Excel® program, with double typing and validation. Statistical Package for Social Science (SPSS), version 23.0, was choose for statistical analysis.

A preliminary descriptive analysis of categorical variables was performed using absolute and relative frequency distributions and, for quantitative variables, measures of central (mean) trend and variability (amplitude and standard deviation). The Kolmogorov Smirnov test used verified the behavior of the variables regarding the distribution of normality. The association between the scales used was assessed by the Pearson correlation coefficient considered significant if  $p < 0.05$ .

### **3. Results**

The included participants characteristics was presented in Table 1. The median age was 38.5 years (minimum: 24; maximum 67 years), the majority were women (73.20%), aged below 35 years (39.3%). In relation to the profession, 42.9% the income was between 1.5 and 3 minimum salaries (46.4%). As for the Socioeconomic Class (SE), there was a class C (46.4%) predominance. More than half had 12 years or more of study (58.9%). With regard to religious belief, the vast majority referred to Christian (96.4%) The predominance of Catholic affiliation (64.3%), the spiritism and evangelical in the same proportion (16.1%). The time of diagnosis of diabetes was the majority in  $\leq 15$  years (57.1%).

Table 1. Sociodemographic characterization of adult patients with T1DM, attended at the UFTM diabetes outpatient clinic

Variables	n	%	
Sex	Male	15	26.80
	Female	41	73.20
Age	< de 35 years	22	39.3
	≥ 35 and < 50 years	18	32.1
	≥ 50 years	16	28.6
Job	Retired	6	10.7
	Liberal professionals	13	23.2
	Unemployed	11	19.6
	CLT	24	42.9
	Public Servant	2	3.6
Income	< 1.5 minimum salaries	5	8.9
	≥ 1.5 e < 3 minimum salaries	26	46.4
	≥ 3 minimum salaries	25	44.6
Schooling	< 12 years	23	41.1
	≥ 12 years	33	58.9
Belief	Christian	54	96.4
	Non Christian	2	3.6
Religion	Catholic	36	64.3
	Spiritism	9	16.1
	Evangelical	9	16.1
	Non Christian	2	3.6
SE class	A (1)	6	10.7
	B1+B2 (2)	21	37.5
	C1+C2 (3)	26	46.4
	D+E (4)	3	5.4
Diagnostic time	≤ 15 years	32	57.1
	> 15 years	24	42.9

SE: Socioeconomic.

Source: The author, 2019.

The data regarding ORA, NORA and IR were obtained through the evaluation of religiosity by the DUREL Scale and classified according to standardized parameters, considering low <4 and high ≥ 4, and IR, low <10 and high ≥ 10. The sample found a low OR (3.9 ± 1.5), high NOR rates (4.5 ± 1.5) and IR (13.2 ± 2.2), shown in Table 2.

Table 2. Results of the religiosity assessment (ORA / NORA / IR), through the means in adult patients with T1DM, attended at the UFTM diabetes outpatient clinic

Variables	Mean	SD	Minimum	Maximum
ORA	3.9	± 1.5	1	6
NORA	4.5	± 1.5	1	6
IR	13.2	± 2.2	6	15

SD: Standard deviation; ORA: Organizational religiosity; NORA: Non-organizational religiosity; IR: Intrinsic Religiosity.

Being that: ORA: < 4: Low; ≥ 4: High; NORA: < 4: Low; ≥ 4: High; IR: < 10: Low; ≥ 10: High.

Source: The author, 2019.

The SRCOPE was apply in all participants, and the data obtained were relate to PSRCOPE, NSRCOPE and total SRCOPE.

After evaluation of the scores, PSRCOPE was of  $3.3 \pm 0.7$ , considered average; NSRCOPE of  $2.0 \pm 0.7$ , considered low; total SRCOPE (PSRCOPE + NSRCOPEinv) of  $3.7 \pm 0.4$ , considered high. The NSRCOPE/PSRCOPE ratio was  $0.7 \pm 0.2$ , demonstrating a predominance of PSRCOPE in relation to NSRCOPE. These data are in Table 3. The PSRCOPE factor that presented high use by the patients was P4 - "Positive position against God" ( $4.4 \pm 0.7$ ). P7 factor - "Personal quest for spiritual knowledge" was the least used factor ( $2.2 \pm 1.0$ ). All negative factors had a low use score.

Table 3. Results of the evaluation of SRCOPE (PSRCOPE / NSRCOPE / total SRCOPE) and positive and negative factors, through means in adult patients with T1DM attended at the UFTM diabetes outpatient clinic

Variables	Mean	SD	Minimum	Maximum
Total SRCOPE	3.7	± 0.4	2.0	4.0
PSRCOPE	3.3	± 0.7	2.0	5.0
P1	3.5	± 0.9	1.3	5.0
P2	2.9	± 1.1	1.0	4.8
P3	3.2	± 0.9	1.0	4.8
P4	4.4	± 0.7	2.2	5.0
P5	2.9	± 1.0	1.0	4.7
P6	3.3	± 1.0	1.0	5.0
P7	2.2	± 1.0	1.0	5.0
NSRCOPE	2.0	± 0.7	5.0	3.0
N1	1.6	± 0.8	1.0	4.8
N2	2.4	± 1.0	1.0	4.3
N3	1.7	± 0.7	1.0	4.0
N4	2.3	± 1.1	1.0	4.7
NSRCOPE/PSRCOPE	0.7	± 0.2	0	1.0

SRCOPE: spiritual/religious coping; PSRCOPE: positive SRCOPE; NSRCOPE: negative SRCOPE; P: positive factor; N negative factor; SD: standard deviation; P1: transformation of self and / or life; P2: seeking spiritual help; P3: offer of help to the other; P4: Positive attitude towards God; P5: search of the other in institutions; P6: withdrawal through God, religion and / or spirituality; P7: personal quest for spiritual knowledge; N1: negative reassessment of God; N2: negative attitude against God; N3: dissatisfaction with the other in institutions; N4: negative reassessment of meaning.

Source: The author, 2019.

The SRCOPE scores were correlated with sociodemographic variables and with the time of diagnosis of T1DM,

and there was a significant inverse correlation between ORA and time of diagnosis, with inverse correlation; NSRCOPE, years of study and wage income; NSRCOPE/PSRCOPE and wage income. Positive Correlation between total SRCOPE and years of study and salary income. Data expressed in Table 4.

Table 4. Correlations between religiosity, SRCOPE and sociodemographic variables and time of diagnosis in adult patients with T1DM attended at the diabetes outpatient clinic, UFTM

Variables	Age		Years of schooling		Income		Diagnosis time	
	r	p	r	p	r	p	r	p
ORA	-0.100	0.463	0.132	0.333	0.035	0.796	0.380	<b>0.004*</b>
NORA	-0.020	0.881	0.037	0.789	0.077	0.575	0.062	0.641
IR	0.010	0.941	0.215	0.112	0.114	0.402	0.043	0.752
PSRCOPE	0.054	0.691	0.106	0.438	0.142	0.297	0.246	0.067
NSRCOPE	0.069	0.613	0.276	<b>0.039*</b>	0.377	<b>0.004*</b>	0.004	0.975
Total SRCOPE	-0.010	0.945	0.279	<b>0.037*</b>	0.380	<b>0.004*</b>	0.184	0.175
NSRCOPE/PSRCOPE	0.051	0.708	0.236	0.080	0.390	<b>0.003*</b>	0.136	0.318

Source: The author, 2019.

When the variables of religiosity correlated with each other, found that ORA and NORA showed a positive correlation with PSRCOPE and total SRCOPE, and inverse correlation with NSRCOPE/PSRCOPE ratio. The RI presented positive correlations with PSRCOPE and total SRCOPE and inverse with NSRCOPE and NSRCOPE/PSRCOPE ratio. Data represented in Table 5.

Table 5. Correlations between religiosity, Spiritual-Religious coping, in adult patients with T1DM in the diabetes outpatient clinic, UFTM

Variables	ORA		NORA		IR	
	r	p	r	P	r	p
PSRCOPE	0.448	<b>0.001*</b>	0.375	<b>0.004*</b>	0.482	<b>&lt;0.0001*</b>
NSRCOPE	-0.071	0.604	-0.090	0.509	-0.328	<b>0.014*</b>
Total SRCOPE	0.390	<b>0.003*</b>	0.349	<b>0.008*</b>	0.602	<b>&lt;0.0001*</b>
NSRCOPE/PSRCOPE	-0.292	<b>0.029*</b>	-0.295	<b>0.027*</b>	-0.632	<b>&lt;0.0001*</b>

Source: The author, 2019.

#### 4. Discussion

To our knowledge, this is an unprecedented study of religiosity and coping with the disease by a group of patients with T1DM using the DUREL scale and the short SRCOPE scale, respectively. Both validated for the Portuguese language.

Being able to prevent the evolution of complications is a challenge for the care team, family members and for T1DM patients themselves (Lucchetti, Lucchetti, & Puchalski, 2012; International Diabetes Federation, 2021) and as many studies have shown associations between S/R and physical, mental and social health (Lucchetti & Lucchetti, 2014), and systematic reviews showed that most studies indicated some positive association in which S/R was a protective factor, we decided to evaluate the impact of S/R on glycemic control in T1DM patients (Koenig, 2012).

In the analysis of the three dimensions of the DUREL scale, the sample found elevated NORA and IR index and ORA in the transition from medium to high, demonstrating that faith and the presence of the “divine” are fundamental. Participants have a preference for devoting themselves to religiosity at home, exercising it through prayer, which could be associated with the feeling of seeking to harmonize their needs and Personal interests to

their beliefs, striving to internalize and follow them completely. The utilization rate of the ORA dimension shows that the frequency of religious services (religious, cults, etc) is a less used option by this group (Table 2). Considering the characteristics of the sample studied, we can attribute this behavior as result of specific needs of these patients as more rigorous glycemic monitoring, fear of self-exposure, feelings of social rejection, risk of hypoglycemia during meetings, taking into consideration any testimonies about own life, or in the context of depression secondary to the disease.

Meneses et al., in 2013, evaluated two spiritual dimensions, defined as vertical, associated with the practice of religion (beliefs), and horizontal, existentialist (hope/optimism), in groups of patients with six chronic diseases (including T1DM and Type 2 diabetes mellitus (T2DM)). They found a positive and significant correlation between spirituality and vitality, and between hope/optimism and quality of life indicators. There was a negative correlation between beliefs and physical disposition. Their findings suggested that quality of life and spirituality vary according to the disease, proposing the inclusion of spiritual components in the care provided to individuals with T1DM (Meneses et al., 2013). In the evaluation of SRCOPE, mean use of PSRCOPE, low utilization of NSRCOPE and a high use of total SRCOPE, strategies for spiritual religious coping in this sample of patients, shows a relevant result (Table 3).

Evaluating the use of SRCOPE factors individually, it was found among the positive factors, a predominance of coping related to the transformation of oneself/and or of its life (Factor P1). This directed to personal transformation, obtained by reviewing their own attitudes and resulting in modifications associated with behaviors more appropriate to the spiritual-religious precepts of their religious affiliation. The acceptance of the new life proposal, which could result in adaptation to new rules and direction, and, modification of their lifestyle, which would be desirable in the treatment of T1DM. Another factor widely used by the research participants was the positive position facing God (factor 4), where he accepts the situation, deals with her doing his part, trusts in divine protection and seeks strength in her. One of the least used factors (factor P7) "Personal Search for spiritual knowledge" could be justified by the large amount of essential basic care needed to control the disease, which require time, attention, good will, disposition and spending Financial resources (Panzini, 2004).

When we evaluated the low use of the NSRCOPE, the negative reevaluation of God (negative factor 1 – Table 4), presented itself as the lowest score, demonstrating that despite the limitations, the challenges, the sorrows and difficulties, the majority of the research participants, Believe in God, trust in him, and do not blame him. This factor, very little used, usually happens accompanied by the expression of negative feelings, such as revolt, guilt, abandonment and sorrow. Negative factor 3 was also very little used, (factor dissatisfaction with the other institutional), suggesting that despite personal limitations, there was no predominance of feelings of dissatisfaction, disgust or sorrow with any institutional representative, either the frequenter, member, representative or leader of the religious institution. As for negative factors 2 (negative position against God) and 4 (negative reevaluation of meaning), both were poorly used, demonstrating that religion had no negative influence, causing no apathy and delivery of the situation, due to lack of collaboration, and/ or self-responsibility (Panzini, 2004).

Studies have shown that PSRCOPE strategies showed a positive correlation with improved mental health (fewer depressive symptoms and better quality of life), spiritual growth and cooperativity (Koenig, Pargament, & Nielsen, 1998; Panzini, Rocha, Bandeira, & Fleck, 2007). Sultan et al., in 2008, in a longitudinal study evaluated coping, anxiety and glycemic control in adult patients with T1DM, used the CISS scale (Coping Inventory of Stressful Situations) and the State-Trait Anxiety Inventory (STAI-Y). Found an inverse correlation between glycosylated hemoglobin (HbA1c) and the use of social fun coping and a positive correlation of HbA1c with a trait of anxiety. The greater the use of positive coping, the lower the anxiety traits and the decrease in the levels of HbA1c (Sultan et al., 2008).

Correlations between demographic data such as age, income, time of study, time of diabetes and religiosity showed that the ORA had an inverse correlation with the time of diagnosis. This may represent that a prolonged period of the disease may hinder the frequency of the religious community to which it belongs by limitations that were not defined by the present study. On the other hand, indexes of use of the total SRCOPE showed a significant positive correlation with income and time of study that are factors that may be related to less stress, depression and financial comfort to the patient with T1DM, who would have more time to Meditations and internal strengthening. The NSRCOPE had a significant inverse correlation with income and years of schooling, again raising the hypothesis that is the effect of the best quality of life provided by these findings. The inverse correlation of the NSRCOPE/PSRCOPE ratio in relation to income, leads us to understand that more study is necessary for conclusion and clarification (Table 4).

By correlating the variables ORA, NORA and IR with SRCOPE, it was demonstrated the significance of

religiosity in positive coping. There was a positive and significant correlation of religiosities, with the PSRCOPE, total SRCOPE and inverse with the NSRCOPE/PSRCOPE, showing that the highest rates of religiosity, provide greater utilization of SRCOPE in the dimensions considered positive (Table 5).

Despite the few studies with T1DM patients, Ahola et al. in 2010 showed a correlation between depression, metabolic syndrome and T1DM.

Some different approaches in the present study suggest that primary care physicians are aware of the influence of S/R, considering the inclusion of questions about religiosity in routine clinical interviews, in order to enrich their Dialogue with diabetic patients in an attempt to stimulate better adherence to care and self-monitoring (Ben-Aryea, Schiff, Karkabi, Keshet, & Lev, 2011).

## 5. Conclusion

Patients with T1DM have a high rate of intrinsic and non-organizational religiosity, and they use this religiosity in coping with the disease. This knowledge can empower the team, and especially seek a form of approach that encourages the best adaptation of patients, with greater discipline with self-care and glycemic monitoring, for who knows, we can achieve a more adequate control and especially with a reduced incidence of complications. Knowing that many professional organizations already recognize that spiritual care is an important component of health, such as the World Health Organization (WHO), and other researchers on the subject (Lucchetti, Lucchetti, & Puchalski, 2012) we recommended the inclusion of S/ R in clinical care and education. It is now up to the multiprofessional team that cares for patients with T1DM to pay attention to these results and, during their follow-up, to make a brief history of their spiritual life to familiarize patients with religious beliefs related to decisions about medical care, understand the role that religion plays in coping with the disease and identifying spiritual needs that may require assistance.

## 6. Limitations

One of the limitations of the study was the difficulty in selecting patients with T1DM in adulthood, due to the proposed objectives, which limited the sample size. Another limitation was the completion of several instruments, especially the CRE-Brief scale for its extension, requiring acceptance and patience on the part of the patient to spend time filling in forms, interfering with their life routines.

## Competing Interests Statement

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

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# Sexual Practices among Cobblestone Construction Workers in Addis Ababa, Ethiopia: Challenge to the Prevention of HIV Infection

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## Abstract

**Background:** HIV infection remains a public health challenge. This study assessed sexual practices among casual workers at the Cobblestone construction, Addis Ababa, Ethiopia.

**Methods:** This was a quantitative cross-sectional study carried out among the labourers at the Cobblestone construction sites between October – December 2018. Multi-stage sampling was used to estimate the sample size. Demographic and sexual practice information were collected using a structured questionnaire. Bivariate and multivariate analyses were used to determine associations between variables;  $P < 0.05$  was considered statistically significant.

**Results:** We recruited 627 labourers. Majority (82.2%) were aged between 18 and 38 years; average age at onset of sexual debut was  $17.9 \pm 2.67$  and  $19.14 \pm 2.18$  years among males and females respectively. Majority (68.5%) were married; exposure to pornography was 40.2% and 32% among male and female respectively. Lifetime multiple sexual practices were prevalent (59.9% and 50.0%) among males and females respectively; extramarital sex was prevalent (66.9%) among males but protected sex was relatively low (46.2%). Being employed significantly associated with likelihood of first exposure to alcohol ( $P = 0.029$ ), level of education, exposure to pornography and knowledge of symptoms of STIs significantly associated with multiple sexual practices.

**Conclusion:** Prevalence of risky sexual practices among the labourers were high which risks them to HIV infections. Innovative approaches to behavioural change are needed to reduce risks of HIV infection.

**Keywords:** Unprotected sex, extramarital sex, multiple partners, HIV, condom

## 1. Background

The world has in the past three decades experienced devastating impact of Human Immunodeficiency Virus (HIV) and global efforts to find a cure for the disease have not been successful (Brummer D.2002). The HIV pandemic remains a global major public health concern. According to the UNAIDS Global HIV & AIDS Statistics Facts Sheet (UNAIDS, 2020), 37.7 million people were living with HIV (PLHIV) globally, 1.5 million became newly infected and 680, 000 people died from AIDS-related illnesses. The report indicates that among PLHIV, 36.0 and 1.7 million were adults and children aged 0–14 years respectively; and 53% were women and girls. In the sub-Saharan Africa, six in seven new HIV infections among adolescents aged 15–19 years are among girls; and young women aged 15–24 years are twice as likely to be living with HIV than men. Around 4,200 adolescent girls and young women aged 15–24 years became infected with HIV every week (AVERT, 2018). Initiation into sexual activity is an important landmark of transition into adulthood (Lamers, Ireland, Resnick, & Blum, 2000; Baumgartner, Waszak, Tucker, & Wedderburn, 2009), and early adolescent sexual activity is a recurring problem with negative psychosocial and health outcomes. Early age at first sex (below 15 years) exposes adolescents to risk of unwanted pregnancy, sexually transmitted and HIV infections (Mchunu, Peltzer, Tushan & Seutlwadi, 2021; Makenzius & Larsson, 2013; Durowade et al., 2017). The risk factors for HIV infection include unprotected sex, multiple sexual partners, alcohol consumption, drug abuse, and risky sexual behaviour. Despite gains made in the level of awareness of preventing HIV transmission and scaling up treatment programmes, the number of people acquiring HIV has remained high (UNAIDS, 2020).

The Evidence for Contraceptive Options and HIV Outcomes study (ECHO, 2019) reported HIV incidence of 3.8% among young women in selected study sites. Although data has indicated slow but steady progress towards higher levels of condom use, countries in the sub-Saharan Africa have fallen short of global condom use targets due to inequities and condom use among young women declined in some countries (Smith, Mann, Jones, Miller, Longfield, & Gesuale, 2018). Trends of donor funding for condom programmes have also indicated that global investment in HIV prevention declined by 44% between 2012 and 2017 (Jones, Miller, Mann, Smith & Gesuale, 2018). Intensified efforts are urgently needed to increase investments in programmes to improve condom use in countries with moderate and high HIV prevalence.

Studies have shown that workers engaged in circular migration such as miners, construction, plantations, forestry and military personnel are at higher HIV risk exposure due to the long periods of being away from home, separation from the socio-cultural norms that guide behaviour in more stable communities, relatively high monthly income, and risk-taking behaviour (IOM, 2003). Therefore, higher HIV risk exposure has been associated with increased mobility (Herdt, 1997; Ruiz et al., 2014), and mobility has been associated with higher prevalence of HIV in southern Africa region (Hunt 1989; Wolffers, Fernandez, Verghis, & Vink, 2002; Zuma, Setswe, Ketye, Mzolo, Rehle, & Mbelle, 2010). Studies in India have also pointed out that cultures and beliefs of places of origin play roles in the prevention of HIV (Saggurti, Mahapatra, Sabarwal, Ghosh, & Johri, 2012).

According to the Ethiopia Federal HIV/AIDS Prevention and Control Office (FHAPCO, 2015), there were 741,478 people living with HIV in the country of which 60% were female and 21,216 were new infections. According to the most recent World Bank (2020) data, the situation has improved significantly; the prevalence of HIV/AIDS stands at 0.9% of the population aged 15–49 years and the prevalence of women's share of the population aged 15+ living with HIV/AIDS remains high (63%). There were about 600,000 casual labourers working in large development schemes like flower plantations, construction and mining industries in Addis Ababa, Ethiopia. Baseline assessment has indicated that 9-12% of the sexually transmitted diseases (STDs) occurred among casual labourers at the building and road construction sites (Ethiopia HIV/AIDS Strategic Plan, 2014).

The prevalence of risky sexual behaviours among construction workers was 44.9% (Kassa, Tesfay, & Alamrew, 2013), and multiple partners and lack of condom use were prevalent (Dias, Marques, Gama, & Martins, 2014). Another study in a rural town in Ethiopia reported that seasonal workers were practising non-marital sexual intercourse of which 74% were with commercial sex workers (CSWs), 69% had multiple sexual partners and 49% practised transactional sex. Condom use was uncommon and inconsistent and 57.6% of the respondents had never used condom during any sex episodes (Tiruneh, Wasie, & Gonzalez, 2015). Based on these findings, it is prudent that understanding the complex issues of construction casual labourers is necessary in an attempt to reduce HIV transmission among construction workers. This study aimed to assess the factors associated with sexual and condom use practices as risks to HIV infection among Cobblestone Construction labourers in Addis Ababa, Ethiopia.

## **2. Methods**

### *2.1 Study Setting*

According to the 2007 census, the population in Addis Ababa City was 3.65 million (1.89 million females and 1.76 million males). The study was carried out among Cobblestone construction employees in Addis Ababa, Ethiopia.

### *2.2 Study Design*

This was a quantitative cross-sectional carried out among the labourers at the Cobblestone construction sites between October – December 2018. The study gathered information on income and sexual behaviour among Cobblestone construction casual labourers.

### *2.3 Population*

The target population was construction labourers and the accessible population included all Addis Ababa Cobblestone construction casual labourers.

### *2.4 Sample Size*

Both willing adult male and female employees aged > 18 years, engaged in either quarrying or chiselling works for more than one month prior to the study were eligible to participate in the study. Casual labourers who worked at departments other than quarrying or chiselling were excluded from the study.

In calculating the sample size, the Kish Leslie (1965) formula of single population proportion was used. Based on previous studies on risky sexual behaviour among construction workers in Ethiopia of an estimated proportion  $p$

= 44.9% at 95% CI, margin of error (d) = 5% and z-value of 1.96 (Kassa, Tesfay, & Alamrew, 2013), the estimated sample size was 380 labourers. Adjusting for the non-response rate (10%) and multistage sampling design effect factor 1.5, the total sample size increased to 627 workers.

### *2.5 Sampling Procedures*

The Addis Ababa Cobblestone has seven construction sites including Glangora, Gewasa, Chefe, Katila, Bole Mele, Arabasa and Hanamariam. Simple random sampling was used to select the construction sites by assigning each site with a number from which two (Glangora and Katila) predominantly chiselling sites were randomly selected. Purposive sampling was used to select Hanamariam predominantly a quarrying site into the study. In selecting the study population, numbers were allocated to all eligible workers in the selected sites. Probability proportional to size sampling method was used to determine the number of participants from each site. Simple random sampling was used to select 122, 477 and 28 participants from Glangola, Hanamariam and Katila sites respectively.

### *2.6 Data Collection*

The first author assisted by three trained assistants recruited from the Addis Ababa Prevention and Control Office and one focal person from the Cobblestone Construction Company administered the questionnaire. The questionnaire was adapted from the HIV/AIDS Behavioural Surveillance Survey used by Brummer, (2002), and pre-tested on a group of 15 workers from sites other than the selected study sites. To prevent distortion of information due to language barrier, the questionnaire was translated to Ameharinga, the Ethiopian official language before administration. The interviews were conducted in isolated rooms at the sites offering enough confidentiality and lasted between 30 – 45 minutes. Collected data included demographic data, income, exposure to pornography (viewing of erotic pornographic video and movies), smoking habits and sexual practices. Data quality was ensured by regular meetings everyday between research assistants and the Principal Investigator for reviewing collected data and ensuring uniformity in the data collection process.

### *2.7 Data Management and Analysis*

At the end of each day, collected data was checked and entered through SPSS data capturing sheet. The analysis was done by IBM Statistical Package for the Social Science (SPSS) version 26. Frequencies and cross tabulation were used to characterise the data and multivariate logistic regression were performed to determine association between variables. The p-value <0.05 was considered statistically significant.

### *2.8 Validity and Consistency*

The validity of the data in this study was assured from the questionnaire development which was worded carefully to minimise ambiguity, carefully translated in order to make sure there was no distortion of information. In addition, the methods used were appropriate for the study. The consistency was established by ensuring that repetitive and inappropriate questions were avoided, and trained research assistants were used to collect the data.

## **3. Ethical Considerations**

The study received ethical clearance (Ref: HSHDC/829/2018) from the Department of Health Studies, University of South Africa and permission to carry out the study at the site was granted (Ref: CPC/395/09) by the Cobblestone Project Coordination Office in Addis Ababa.

## **4. Results**

The study recruited 627 Cobblestone casual construction workers of which 464 (74%) and 163 (26%) were male and female respectively. Majority (82.2%) were young adults and the mean age was 31 with  $\pm 0.96$  (SD) years. The dominant religion was Orthodox 315 (50.6%); majority (93.9%) were from rural areas and alcohol drinking was prevalent 58.5% and 65.2% among males and females respectively. Literacy was high (85.1%). (Table 1)

Table 1. Socio-demographic characteristics of the study participants

Variables	Total		Male		Female	
	Frequency	%	Frequency	%	Frequency	%
<b>Age</b>						
18 - 24	118	18.8	89	19.2	29	17.8
25 - 31	206	32.9	160	34.5	46	28.2
32 - 38	213	34.0	140	30.2	73	44.8
38+	90	14.4	75	16.2	15	9.2
<b>Total</b>	<b>627</b>	<b>100</b>	<b>464</b>	<b>100</b>	<b>163</b>	<b>100</b>
<b>Religion</b>						
Orthodox	315	50.6	224	48.6	91	56.2
Muslin	100	16.1	83	18.0	17	10.5
Protestant	208	33.4	154	33.4	54	33.3
<b>Total</b>	<b>623</b>	<b>100</b>	<b>461</b>	<b>100</b>	<b>162</b>	<b>100</b>
<b>Ethnicity</b>						
Amhara	254	44.0	178	42.5	76	48.1
Oromo	196	34.0	126	30.1	70	44.3
Debube	127	22.0	115	27.4	12	7.6
<b>Total</b>	<b>577</b>	<b>100</b>	<b>419</b>	<b>100</b>	<b>158</b>	<b>100</b>
<b>Place of origin</b>						
Rural	584	93.9	427	93.0	157	96.3
Urban	38	6.1	32	7.0	6	3.6
<b>Total</b>	<b>622</b>	<b>100</b>	<b>459</b>	<b>100</b>	<b>163</b>	<b>100.0</b>
<b>Education status</b>						
Illiterate	93	14.9	78	16.9	15	9.2
Literate	532	85.1	384	83.1	148	90.8
<b>Total</b>	<b>625</b>	<b>100</b>	<b>462</b>	<b>100</b>	<b>163</b>	<b>100.0</b>
<b>Exposure to alcohol before and after employment at Cobblestone</b>						
Before	329	89.6	242	91.7	87	84.5
After	38	10.4	22	8.3	16	15.5
<b>Total</b>	<b>367</b>	<b>100</b>	<b>264</b>	<b>100</b>	<b>103</b>	<b>100</b>
<b>Current drinking habit</b>						
Not drinking	242	39.7	187	41.5	55	34.8
Drinking	367	60.3	264	58.5	103	65.2
<b>Total</b>	<b>609</b>	<b>100</b>	<b>451</b>	<b>100</b>	<b>158</b>	<b>100</b>
<b>Smoking/khat chewing habits</b>						
Yes	50	8.1	46	10.1	4	2.5
No	566	91.9	408	89.9	158	97.5
<b>Total</b>	<b>616</b>	<b>100</b>	<b>454</b>	<b>100</b>	<b>162</b>	<b>100</b>

#### 4.1 Sexual Practices

The sexual practices of the employees are shown in Table 2. Majority (80.5%) had sex and the age at first sexual

encounter among males was between 13–18 years. Majority of the females (68.0%) had first sexual encounter at > 18 years of age. While 10 participants were uncertain about exposure to pornography, exposure to pornography was 40.2% and 32% among males and female respectively and lifetime multiple sexual partners was almost identical (59.9% and 50%) among males and the females respectively. Having had multiple sex partners six months prior to the study was 49.8% and 46.4% among males and females respectively. However, about 4% were uncomfortable to respond to the question. Extramarital sex was more prevalent among males (66.9%) and protected sex was generally low (42.6%). The average condom use during extramarital sex was 73.4% while consistency protected sex was low (52%). (Table 2)

Table 2. Sexual behaviours and gender distribution among the study participants

Variables	Male		Female	
	Frequency	%	Frequency	%
<b>Have you ever had sex?</b>				
Yes	379	82.0	124	76.1
No	83	18.0	39	23.9
<b>Total</b>	<b>462</b>	<b>100</b>	<b>163</b>	<b>100</b>
<b>Age at first sex</b>				
13 - 18	226	62.4	39	32.0
≥ 18	136	37.6	83	68.0
<b>Total</b>	<b>362</b>	<b>100</b>	<b>122</b>	<b>100</b>
<b>Are you exposed to pornography?</b>				
Yes	185	40.2	54	34.4
No	275	59.8	103	65.6
<b>Total</b>	<b>460</b>	<b>100</b>	<b>157</b>	<b>100</b>
<b>Do you have lifetime multiple sexual partners?</b>				
Yes	185	59.9	234	57.2
No	124	40.1	175	42.8
<b>Total</b>	<b>309</b>	<b>100</b>	<b>409</b>	<b>100</b>
<b>Have you had multiple sexual partners six months prior to this study?</b>				
Yes	152	49.8	45	46.4
No	153	50.2	52	53.6
<b>Total</b>	<b>305</b>	<b>100</b>	<b>97</b>	<b>100</b>
<b>Have you had extramarital sex?</b>				
Yes	174	96.7	40	51.9
No	6	3.3	37	48.1
<b>Total</b>	<b>180</b>	<b>100</b>	<b>77</b>	<b>100</b>
<b>Do you use condom during extramarital sex?</b>				
Yes	65	75.6	17	68.0
No	21	24.4	8	32.0
<b>Total</b>	<b>86</b>	<b>100</b>	<b>25</b>	<b>100</b>
<b>Have you ever paid or received money for sex?</b>				
Yes	117	37.1	25	25.5
No	198	62.9	73	74.5
<b>Total</b>	<b>315</b>	<b>100</b>	<b>98</b>	<b>100</b>

<b>Do you practice protected sex?</b>				
Yes	125	40.6	51	48.6
No	183	59.4	54	51.4
<b>Total</b>	<b>308</b>	<b>100</b>	<b>105</b>	<b>100</b>
<b>How consistent are you in practicing protected sex?</b>				
Consistent	56	51.9	19	48.7
Inconsistent	52	48.1	20	51.3
<b>Total</b>	<b>108</b>	<b>100</b>	<b>39</b>	<b>100</b>

#### 4.2 Bivariate Analysis of Multiple Sex Partners

The bivariate analysis results of multiple sexual partners are presented in Table 3. Age, religion, marital status, education, alcohol exposure, cigarette smoking and khat chewing, average daily income, exposure to pornography significantly associated with multiple partners sex ( $P < 0.05$ ). Similarly, correct and consistence use of condom significantly associated with multiple partners sex ( $P < 0.05$ ). Among the males, average daily income  $< 100$  Birr when compared to daily income of  $\geq 100$  birr significantly associated with the likelihood of multiple sexual partners (COR=0.56,95% CI (0.33-0.97),  $P = 0.039$ ). Employment at the Cobblestone construction significantly associated with the likelihood of the first exposure to alcohol than before employment (COR=0.61,95% CI (0.39-0.95),  $P = 0.029$ ). In addition, education, cigarette smoking, khat chewing and symptoms of STIs increased the odds of the likelihood of having multiple sexual partners among males. Controlling for gender, Orthodox religion when compared to Protestant significantly associated with the likelihood of multiple sexual partners among female (COR=2.37,95% CI (1.03-5.46),  $P = 0.043$ ).

Table 3: Bivariate multiple sexual partner's sex among the study participants

Variables	All Cobblestone employees			Male			Female		
	COR	95% CI	p value	COR	95% CI	p value	COR	95% CI	p value
<b>Age</b>									
18-24	2.74	1.38 - 5.43	0.004*	2.29	1.33 - 6.57	0.008*	2.75	0.65 - 11.62	0.169
25-31	1.38	0.78 - 2.39	0.284	1.84	0.93 - 3.65	0.91	0.67	0.24 - 1.85	0.436
32-38	2.53	1.29 - 4.30	0.001*	3.58	1.87 - 6.85	0.003*	0.25	0.49 - 5.81	0.616
38+	RC								
<b>Religion</b>									
Orthodox	1.31	0.87 - 1.97	0.191	1.08	0.68 - 1.73	0.745	2.37	1.03-5.46	0.043*
Muslim	2.57	1.49 - 4.42	0.001*	2.66	1.44-4.93	0.002*	1.63	0.46-5.73	0.45
Protestant	RC								
<b>Education status</b>									
Illiterate	3.02	1.81-5.06	0.000*	2.87	1.64-5.03	0.000*	3.25	0.79-13.23	0.1
Literate	RC								
<b>First exposure to alcohol</b>									
Before Cobblestone	0.75	0.51-1.09	0.134	0.61	0.39-0.95	0.029*	1.51	0.68-3.35	0.31
After Cobblestone	2.33	1.06-5.15	0.036*	3.57	1.28-9.98	0.015*	0.96	0.2.0-4.61	0.959
Currently not drink	RC								
<b>Average daily income birr</b>									
$< 100$	0.51	0.28-94	0.030*	0.5	0.26-0.98	0.044*	4.96	1.29-19.08	0.020*
$\geq 100$	RC								

<b>Access to HIV testing at work</b>									
Yes	0.69	0.48-0.99	0.047*	0.64	0.42-0.97	0.033*	1.02	0.46-2.17	0.967
No	RC								
<b>Exposure to pornography</b>									
Yes	9.47	6.19-14.46	0.000*	10.5	6.38-17.23	0.000*	6.85	3.01-15.59	0.000*
No	RC								
<b>Knowledge of STIs symptoms</b>									
Yes	7.44	3.57-15.49	0.000*	8.89	3.67-21.53	0.000*	4.57	1.19-17.62	0.027*
No	RC								
<b>Knowledge that correct and consistent use of condom can prevent HIV transmission</b>									
Yes	0.64	0.45-0.92	0.016*	0.76	0.50-1.15	0.199	0.4	0.9-0.84	0.016*
No	RC								

*p* < 0.05 = significant, RC = reference category.

#### 4.3 Multivariate Analysis with Multiple Sexual Partners

Table 4 presents multivariate analyses results of multiple sexual partners practices. The level of education, exposure to pornography, income, paid for sex and symptoms of STIs significantly associated with multiple sexual practices. When all other variables remain constant, exposure to pornography, paid sex and symptoms of STIs significantly associated with multiple sexual partner practices for both males and females. Controlling for gender shows that among the males, average daily income, exposure to pornography, and symptoms of STIs significantly associated with multiple sex partners. The level of education significantly associated with the whole population. High odds ratio (2.66) of multiple sexual partners six months before the study was observed among females.

Table 4. Multivariate analyses of multiple sexual partner's sex among the study participants

Variables	All Cobblestone employees			Male			Female		
	AOR	95% CI	p value	AOR	95% CI	p value	AOR	95% CI	p value
<b>Education status</b>									
Illiterate	2.02	1.03 - 3.93	0.040*	NS			NS		
Literate	RC								
<b>Average daily income</b>									
< 100	0.4	0.19 - 0.83	0.014*	0.39	0.17 - 0.88	0.023*	NS		
≥ 100	RC								
<b>Exposure to pornography</b>									
Yes	8.16	5.06 - 13.17	0.000*	8.7	4.89 - 15.21	0.000*	6.15	2.53 - 14.98	0.000*
NO	RC								
<b>Paid for sex</b>									
Yes	2.73	1.64 - 4.54	0.000*	2.25	1.26 - 4.02	0.006*	7.25	2.47 - 21.22	0.000*
NO	RC								
<b>Symptoms of STIs</b>									
Yes	5.58	2.39 - 13.00	0.000*	6.14	2.23 - 16.86	0.000*	NS		
NO	RC								

\**P*<0.05; RC =Reference Category; NS= Nonsignificant.



#### 4.4 Condom Use

Table 5 shows that, level of education, family support, free condom access at workplace, exposure to pornography, extramarital sex, and correct and consistence use of condom can prevent HIV associated significantly with condom use ( $P < 0.05$ ). After controlling for gender, age, religion, family support, condom access and extramarital sex significantly associated with condom use among males ( $P < 0.05$ ). Other factors that significantly associated with condom use were the knowledge that HIV positive people cannot be recognised from their physical appearance and knowledge that HIV infected people cannot transmit the infection through having meals with infected persons. Among the female, knowledge that receiving HIV positive blood transfusion, sharing syringes with HIV infected people can transmit the infection; and correct and consistence use of condom can prevent HIV infection significantly associated with condom use [(COR=3.7,95% CI (1.10-12.71),  $P = 0.034$ )].

Table 5. Condom use among the study participants

Variable	All Cobblestone employees			Male employees			Female employees		
	COR	95% CI	p value	COR	95% CI	p value	COR	95% CI	p value
<b>Age</b>									
18-24	0.58	0.28 - 1.17	0.128	0.51	0.22 - 1.18	0.11	0.82	0.19 - 3.43	0.784
25-31	0.57	0.31 - 1.03	0.062	0.5	0.25 - 1.01	0.54	0.78	0.27 - 2.28	0.649
32-38	0.35	0.19 - 0.62	0	0.32	0.16 - 0.62	0.001	0.48	0.15 - 1.56	0.223
38+	RC								
<b>Religion</b>									
Orthodox	0.78	0.49 - 1.21	0.259	0.72	0.43 - 1.20	0.208	0.96	0.41 - 2.29	0.934
Muslim	0.47	0.36 - 0.85	0.012*	0.39	0.19 - 0.79	0.008*	0.96	0.26 - 3.47	0.956
Protestant	RC								
<b>Living with spouse/regular partner</b>									
Yes	1.49	0.92 - 2.42	0.109	1.88	1.08 - 3.28	0.026*	0.71	0.25 - 1.98	0.507
No	RC								
<b>Education status</b>									
Illiterate	0.51	0.29 - 0.88	0.017*	0.43	0.23 - 0.81	0.009*	1.46	0.37 - 5.78	0.591
Literate	RC								
<b>Family support</b>									
Yes	0.57	0.38 - 0.86	0.007*	0.47	0.29 - 0.76	0.002*	1.05	0.47 - 2.36	0.904
No	RC								
<b>Free condom access at work</b>									
Yes	2	1.31 - 3.05	0.001*	2.09	1.39 - 3.42	0.000*	1.63	0.69 - 3.73	0.265
No	RC								
<b>Exposure to pornography</b>									
Yes	0.62	0.41 - 0.93	0.022*	0.49	0.3 - 0.79	0.003*	1.34	0.59 - 2.98	0.5
No	RC								
<b>Extramarital sex</b>									
Yes	0.51	0.32 - 0.79	0.003	0.49	0.29 - 0.85	0.01	0.66	0.26 - 1.65	0.371
No	RC								
<b>Correct and consistence use of condom can prevent HIV</b>									
Yes	1.86	1.25 - 2.77	0.002*	1.56	0.98 - 2.45	0.06	3.12	1.32 - 7.08	0.007
No	RC								

<b>Can you recognise an HIV infected person by face?</b>									
Yes	1.79	117 - 2.74	0.008*	1.9	1.16 - 3.12	0.010*	0.69	0.29 - 1.64	0.407
No	RC								
<b>Can one be infected with HIV by sharing meals with infected persons?</b>									
Yes	0.52	0.24 - 1.12	0.095	0.38	0.15 - 0.98	0.046*	1.14	0.27 - 4.83	0.859
No	RC								
<b>Can HIV be transmitted by sharing syringes?</b>									
Yes	1.73	0.87 - 3.43	0.121	1.03	0.42 - 2.53	0.944	3.7	1.10 - 12.71	0.034*
No	RC								

\* $P < 0.05$ ; RC = Reference Category.

## 5. Discussion

The age at sexual debut varies between individuals and from place to place (Fatusi & Blum, 2008; Ekundayo, Dodson-Stallworth, Roofe, Aban, Bachmann, Kempf, Ehiri, & Jolly, 2007; Mott, Fondell, Hu, Kowaleski-Jones, & Menaghan, 1996). The mean age of sexual debut in this study was  $17.96 \pm 2.67$  years for males and  $19.14 \pm 2.18$  years for females, higher than those reported among seasonal workers in Metema, Ethiopia (Tiruneh, Wasie, & Gonzalez, 2015; Oljira, Berhane, & Worku, 2012). Compared to females, males have lower mean age at sexual debut. The finding of low mean age at first sexual encounter among males in this study is unexpected because since girls attain puberty earlier than boys, the expectation would be that females would have sexual debut earlier than males. This finding could be explained by some traditions and expectations in many African communities that a respectable woman should be passive with regards to sexuality and any proactivity would be associated with prostitution, a behaviour highly stigmatised. On the other hand, male dominance, exploring tendency and risk-taking behaviours would drive them to engage in sexuality at lower ages risking themselves to STIs and HIV infection. The prevalence of multiple sexual partners six months prior to this study were high (49.8% and 46.4%) among male and female respectively. This finding supports previous reports which found higher rates of multiple sexual partners among the males (Dias, Marques, Gama, & Martins, 2014; Ganczak, Czubińska, Korzen & Szych, 2017; Onoya, Zuma, Zungu, Shisana, & Mahlomakhulu, 2014; Saw, Saw, Chan, Cho & Jimba, 2018). In addition to the male dominance and societal expectations in sexuality, exposure to pornography, alcohol consumption and ability to pay for sex are likely to influence sexual behaviour and access to commercial sex workers which would explain the multiple sexual partner practices among the males seen in this study.

Education is a powerful tool for empowering communities to appreciate concepts and to make rational decisions. We however, found that the higher the level of education, the higher the likelihood of individuals engaging in multiple sexual partners. This could be explained by the association of education with likelihood of employment, regular and sustainable income which would provide especially among the males, the economic power to buy alcohol, pay for sex and own a television and DVD player for viewing erotic pornographic videos and movies. These findings, however, are contrary to the expectations that increased literacy would be associated with increased access to correct information on STIs and HIV transmission and prevention therefore, majority would take necessary precautions and prevent themselves from engaging in risky sexual practices.

We found in this study some positive attributes related to the knowledge about HIV and its transmission including knowledge that HIV positive people cannot be recognised from their physical appearance; HIV infected persons cannot transmit the infection to an uninfected person by eating together; receiving HIV positive blood transfusion; sharing syringes with HIV infected people can transmit HIV and that correct and consistent use of condom can prevent HIV infection indicate that the labourers' knowledge about transmission and prevention of HIV infection is high. However, their multiple sexual partner practices override the positive attributes.

Previous studies have reported that socio-ecological factors for condom-less sex occur at personal, social, and structural-level (Hughto, Reisner, & Pachankis, 2015; Sevelius, Reznick, Hart, & Schwarcz, 2009; Sweat, & Denison, 1995). At the personal level; dislike of condom, believing that condom use is not necessary, incorrect condom use and forgetting to use it during sexual encounters are some of the factors contributing to the risk of STIs and HIV infection. Previous reports have raised questions on how these challenges can be circumvented (Adia et al., 2018; Restar, Nguyen, Nguyen, Adia, Nazareno, Yoshika & Operario, 2018). We found in this study low rates of condom use during the most recent sexual encounters, (40.6% and 48.6%) among male and female

workers respectively. In addition, we found that among those who used condom, only small proportions (35.8% male and 48.7% female) used a condom during the recent multiple sexual intercourse. On average, about half, 51.9% and 48.7% male and female respectively used condom consistently during sexual intercourse. Similar findings were reported in the Sub-Saharan report (UNAIDS, 2016). In this study, some of the reasons given by the participants for using condom were to avoid STIs/HIV (85.5%), prevention of unwanted pregnancy (11.4%) and lack of trust in their sexual partner (2.1%). The reasons for not using condom on the other hand were preference of skin to skin (91.6%), non-availability of condoms, and a belief that use of a condom creates doubts on trust between sexual partners. While there is good knowledge on the advantages of using condom during sexual encounters, still a large proportion of the labourers preferred skin-to skin sex. Most of the reasons cited for not using condom can be addressed by reviewing the existing information dissemination strategies on STIs and HIV transmission and prevention and adopt innovative and motivating approaches for the young adults to adopt; provide age specific and targeted information about the advantages of condom use during sexual encounters. In addition, effort is needed to institute innovative programmes that will enhance behavioural change that would promote safe sex. The management of the Cobblestone construction sites should design implementable strategies including regularising training on aspects of STIs and HIV transmission and prevention and promote regular testing and treatment of employees who test for STIs and HIV.

## 6. Conclusion

The Cobblestone construction company employ young labourers that constitute the future generation of human capital for development of Ethiopia. Despite high knowledge of sexually transmitted infections and prevention among the labourers, multiple sexual partners and unsafe sex practices are prevalent. The study has shown that individual and socio-economic factors influencing unsafe sex practices. The Management of the Cobblestone Construction company should introduce measures that will stimulate positive behavioural change among its employees. Introducing regular training sessions on STIs and HIV risk factors, transmission and prevention are likely to promote behavioural changes that would enhance condom use, reduce multiple sexual partners and promote HIV testing and treatment of those testing positive.

### Availability of Data and Materials

All data and materials concerning this research article are available for sharing if needed.

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### Authors Contribution

WDM developed the project concept which was reviewed by YM and GT. WDM participated fully in the data collection under supervision of YM. All authors participated equally in data analysis, manuscript development and they all formatted and proofread the manuscript several times before submission.

### Competing Interests Statement

All authors have declared no conflict of interest on any part of this manuscript.

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# Obstructive Sleep Apnea Screening in Psoriasis Using the STOP-Bang Questionnaire: A Cross-Sectional Study

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## Abstract

**Introduction:** Psoriasis is a chronic, immune-mediated inflammatory disease characterized by sharply circumscribed erythematous plaques on the trunk and limbs. Reports are suggesting low sleep quality and increased risk of Obstructive Sleep Apnea Syndrome (OSAS) in psoriasis patients.

**Methods:** The present study aimed to investigate the array of OSAS in psoriasis based on the STOP-Bang questionnaire. The study was cross-sectional. The sample was sequential and for convenience. The association between categorical variables was verified with Pearson's chi-square and Fischer's exact tests, and Pearson and Spearman's correlations were used to evaluate the relationships between the continuous variables.  $P < 0.05$  values were considered significant.

**Results:** A total of 104 patients were selected, 53 (51%) males, with a mean age of  $51.7 \pm 14.8$  years. Body mass index was  $29.3 \pm 5$  kg/m<sup>2</sup>. Hypertension was present in 38 (36.5%) and diabetes in 19 (18.3%) patients. Psoriasis was controlled in 87 (83.7%) patients, determined by the PASI Score below 10 points. Regarding the risk for sleep apnea, 36 (34.6%) were at high risk, 28 (26.9%) were at intermediate risk, and 40 (38.5%) were at low risk. There was no significant correlation between the degree of severity of psoriasis and the risk of apnea by the STOP-Bang score ( $p = 0.6$ ).

**Conclusions:** The present study suggests an increased prevalence in high and intermediate-risk scores for OSA in the population with psoriasis. No association was observed between the degree of severity of psoriasis and apnea risk. Prospective controlled studies using the diagnosis of OSAS by polysomnography are necessary.

**Keywords:** sleep apnea, obstructive, psoriasis, cross-sectional Studies

## 1. Introduction

Psoriasis is a chronic, immune-mediated inflammatory disease characterized by sharply circumscribed erythematous plaques with silvery scales on the trunk and limbs. Its prevalence ranges from 0.5% to 11.4% in adults (Michalek, Loring, & John, 2017). Although it was formerly considered to be only a skin disease until a few decades ago, it is now considered a multisystemic disease (Kim, Jerome, & Yeung, 2017). One of the conditions associated with psoriasis is poor sleep quality, particularly obstructive sleep apnea (OSA) and snoring by triggering obesity and metabolic syndrome (Ger, Fu, & Chi, 2020).

Obstructive sleep apnea syndrome (OSAS) is considered a common sleep disorder that is observed with a prevalence of 2% - 4% in the general population (Kabeloglu Ilbay, Tas, Altuntas, Atakli, & Soysal, 2019) to even 20% of at least mild OSAS (Benjafield et al., 2019). It is characterized by episodes of recurrent upper airway

collapse, which leads to hypoxia, hypercapnia, and changes in the intrathoracic pressure (Ralls & Cutchen, 2019). It is associated with the increased nocturnal activity of the sympathetic nervous system, which results in elevated blood pressure and inflammatory and oxidative stress markers. In the clinical matter, OSAS is characterized by recurrent episodes of intermittent hypoxia, recurrent awakening, and excessive daytime sleepiness associated with recurrent partial or complete airway obstruction of the upper respiratory tract (Kabeloglu Ilbay et al., 2019).

The OSA plays a role in the pathogenesis of psoriasis. The sleep disorder causes changes in the microvascular structure through inflammatory activation. As a consequence, interactions between these two conditions may worsen the pathogenic course of each disease (Cohen, Jackson, Li, Wu, & Qureshi, 2015). The bidirectional relationship is demonstrated epidemiologically with an increased frequency of psoriasis in OSA patients and vice versa (Ger et al., 2020). One of the best pieces of evidence so far published consists of a meta-analysis of case-control and cross-sectional studies. It found 2.6-fold greater odds for prevalent OSA in relation to psoriasis and 13-fold increased odds for prevalent psoriasis about OSA (Ger et al., 2020).

Due to the growing number of patients suspected of having OSA being referred to sleep clinics, screening methods have become increasingly important. The gold standard for diagnosis of OSA is an overnight polysomnogram (PSG). However, PSG is time-consuming, labor-intensive, and costly. The PSG also requires the expertise of sleep medicine specialists, which may not be readily available at many centers. Therefore, a simple and reliable method of identifying patients at high risk of OSA and triaging them for prompt diagnosis and treatment is clinically relevant.

The STOP-Bang questionnaire was first developed in 2008 (Chung et al., 2008). It is a simple, easy to remember, and self-reportable screening tool, which includes four subjective (STOP: Snoring, Tiredness, Observed apnea and high blood Pressure) and four demographic items (Bang: BMI, age, neck circumference, gender) (Chung et al., 2008). The STOP-Bang questionnaire was validated initially to screen for OSA in the surgical population. The sensitivity for the STOP-Bang score  $\geq 3$  as the cut-off to predict any OSA (apnea-hypopnea index (AHI)  $>5$ ), moderate-to-severe OSA (AHI  $>15$ ) and severe OSA (AHI  $>30$ ) was 83.9%, 92.9% and 100% respectively (Chung et al., 2008).

Due to its ease of use and high sensitivity, the STOP-Bang questionnaire has been widely used in preoperative clinics (Chung et al., 2008; Nunes et al., 2015), sleep clinics (Boynton, Vahabzadeh, Hammoud, Ruzicka, & Chervin, 2013), the general population (Silva, Vana, Goodwin, Sherrill, & Quan, 2011) and other special populations (Nicholl et al., 2013) to detect patients at high risk of OSA.

In our psoriasis outpatient clinic, located in a tertiary public center of a teaching hospital in Brazil, the investigation of sleep disorders is lacking, mainly because of limited resources, particularly the absence of overnight PSG for investigation. The present study aimed to investigate the array of OSAS in psoriasis based on the STOP-Bang questionnaire.

## 2. Methods

### 2.1 Study Design

The design was a cross-sectional study. The local ethics committee gave its approval before the initiation of the study. The study was conducted according to the principles of the Declaration of Helsinki.

After obtaining written informed consent, 104 subjects (53 male and 51 female) with psoriasis were enrolled in our dermatology clinic between January and September of 2019.

The diagnosis of psoriasis was performed with both clinical and histopathological examinations. All subjects were at least 16 years old. Exclusion criteria included cognitive impairment, psychiatric and other dermatological disorders. Body weight was measured in kilograms (Kg), and height was measured in meters (m). The body mass index (BMI) was then calculated as follows: weight in kilograms divided by height in meters squared ( $\text{kg}/\text{m}^2$ ). Neck circumference was measured with a 150 cm tape measure, whose smallest markings were at 0.01 cm intervals, and was determined at the level of the cricothyroid membrane.

The severity of psoriasis was evaluated using the Psoriasis Area and Severity Index (PASI). Measurements for the PASI include mean redness, thickness, and desquamation of lesions (0–4°), weighted by the area of involvement, with the total score ranging from 0 (disease-free) to 72 (maximal disease). The patients also completed the STOP-Bang questionnaire. The four initial questions - those corresponding to the “STOP” portion of the questionnaire - were answered by the patients themselves. The responses to the questions corresponding to the “Bang” portion of the questionnaire were collected by the researcher on a standardized form. Factors that may cause sleep disorders were investigated. Neurological examinations were performed when considered necessary,

as per physician discretion.

### 2.2 Statistical Analysis

All statistical analyses were performed using the Statistical Package for Social Sciences 21.0 (IBM Corp.; Armonk, NY, USA) software package program. The Shapiro-Wilk test was used to confirm the normal distribution of all data in the present study. The continuous variables were expressed as means  $\pm$  SD, and Student's t-tests were used to compare the means between the two groups. The Chi-square test was used for categorical variables to test the differences between groups.

The Variance analysis, the ANOVA, and the Kruskal-Wallis tests were used to compare the measurements between the apnea risk categories. The association between categorical variables was verified with Pearson's chi-square and Fischer's exact tests. Pearson and Spearman's correlations were used to evaluate the relationships between the continuous variables. Unless otherwise stated,  $p < 0.05$  was set as the significance level.

### 3. Results

A total of 104 patients were included in the study. The mean age was  $51.7 \pm 14.8$  years, ranging from 18 to 82 years, with a slight majority of males (51%). The mean abdominal circumference was  $100.5 \pm 12.3$  cm, the mean weight was  $80 \pm 15.5$  kg, and the mean body mass index was  $29.3 \pm 5$ . Hypertension was presented in 38 (36.5%) patients, and diabetes mellitus (DM) in 19 (18.3%). Active smoking was reported by 29 (27.9%) patients, and smokers in abstinence were 38 (36.5%) patients. Regarding alcohol consumption, 94 (90.4%) patients stated that they did not use alcohol regularly.

Regarding the psoriasis, 87 (83.7%) patients presented PASI score below 10 points. Vulgar psoriasis was the most frequent subtype of the disease, corresponding to 84 cases (80.8%). The mean age of psoriasis diagnosis was  $38.6 \pm 16.8$  years, and the median disease time was 9.5 years (interquartile range of 5.0-19.5 years).

Table 1 presents the demographic, anthropometric, psoriasis characteristics, severity and lifestyle of the patients included in the study.

Table 1. Demographic, anthropometric, lifestyle and psoriasis characteristics in the sample of patients under consultation at the dermatology outpatient clinic of the University Hospital of *Santa Maria* from January to September 2019 (N=104)

Characteristics	FrequencyN (%)
<b>Demographic</b>	
Age in years	51.7 $\pm$ 14.8
<b>Gender</b>	
Male	53 (51)
Female	51 (49)
<b>Anthropometric</b>	
Weight (kg)	80 $\pm$ 15.5
Body Mass Index (kg/m <sup>2</sup> )	29.3 $\pm$ 5
Abdominal circumference (cm)	100.5 $\pm$ 12.3
Neck circumference (cm)	39.1 $\pm$ 4
<b>Lifestyle</b>	
Smoking	
No	37 (35.6)
Ex-smoker	38 (36.5)
Smoker	29 (27.9)
Alcoholism	10 (9.6)
<b>Psoriasis</b>	
PASI (median II)	5 (3-8.2)
PASI Classification	



<10	87 (83.7)
≥10	17 (16.3)
Age of diagnosis (years)	38.6±16.8
Time of diagnosis (years)	9.5 (5-19.5)
<b>Type of psoriasis</b>	
Skin	84 (80.8)
Cutaneous + arthritis	13 (12.5)
Cutaneous + nail	6 (5.8)
Psoriatic arthritis	-
Ungueal	-
Nail + Arthritis	-
Cutaneous + nail + arthritis	1 (1)
<b>Comorbidities</b>	
Hypertension	38 (36.5)
Central obesity	82 (78.8)
Systolic blood pressure (mmHg)	131.8±18.5
Diastolic blood pressure (mmHg)	82±11.9
Heart rate (beats/sec)	76.8±13.3
Diabetes	19 (18.3)
Asthma or chronic obstructive pulmonary disease	7 (6.7)
Chronic kidney disease	4 (3.8)
HIV-AIDS human immunodeficiency virus	2 (1.9)
Hypothyroidism	8 (7.7)
Hyperthyroidism	1 (1)

Data are mean ± SD; number (%) or interquartile range of patients. PASI = Psoriasis Area and Severity Index.

Regarding medical treatment, 80 patients (76.9%) used immunosuppressive medication. Among them, methotrexate was the most frequent, being used by 73 patients (70.2%), followed by immunobiological agents (adalimumab by seven patients and ustekinumab by four patients). The list of immunosuppressive drugs is described in Table 2.

Table 2. Medications in use by patients under consultation at the dermatology outpatient clinic of the University Hospital of *Santa Maria* from September to September 2019 (N=104)

Variables	Frequency N (%)
<b>Medications</b>	
Immunosuppressor	80 (76.9)
Methotrexate	73 (70.2)
Adalimumabe	7 (6.7)
Ustekinumab	4 (3.8)
Secukinumab	1 (1)
Cyclosporine	1 (1)

Data are number (%) of patients.

### 3.2 Sleep Apnea Trace by STOP-Bang Questionnaire

The application of the STOP-Bang questionnaire for sleep apnea screening revealed a median of 2.0 points

(interquartile range 2.0-4.0). The patients presented more frequently low risk for OSAS, evidenced in 40 cases (38.5%), followed by high risk in 36 cases (34.6%), and intermediate risk in 28 cases (26.9%) (Figure 1).

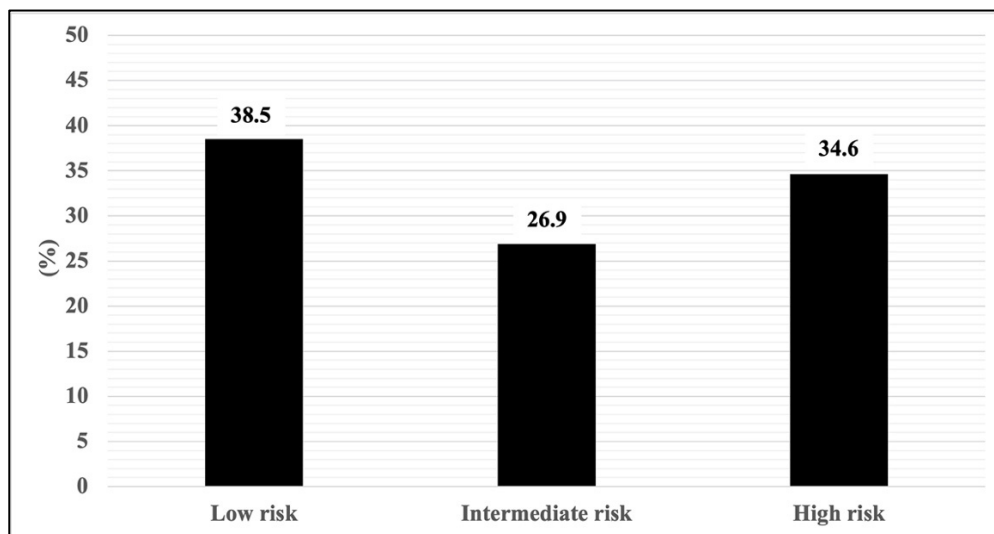


Figure 1. Frequency of risk categories defined from STOP-Bang Questionnaire in patients under consultation at the dermatology outpatient clinic of the University Hospital of Santa Maria, from January to September 2019 (N=104)

### 3.3 Association between Psoriasis and Sleep Apnea Risk

The *Mallampati* score revealed an average of  $2.7 \pm 1.0$  for patients at low risk for apnea, a mean of  $2.9 \pm 0.8$  for patients at intermediate risk, and a mean of  $2.8 \pm 0.9$  for patients at high risk ( $P = 0.484$ ).

The data evaluation according to the STOP-Bang questionnaire classification showed that patients at intermediate and high risk were older, with a mean age of  $58.7 \pm 10.9$  years and  $55.6 \pm 14.8$  years, respectively. On the other hand, low-risk patients had  $43.3 \pm 13.2$  years ( $P < 0.001$ ).

Men were more frequently at high risk for sleep apnea, corresponding to 27 patients (75% of the high-risk group sample), while women were more frequently at low risk of apnea, corresponding to 27 patients (67.5% of the low-risk group) ( $P = 0.001$ ).

The apnea risk was higher with weight gain ( $P < 0.001$ ). The measurements of body mass index, abdominal circumference, and neck circumference of individuals at intermediate and high risk were higher than those at low risk of apnea ( $P < 0.001$ ).

Regarding the severity of psoriasis, the median PASI score among patients at low risk for apnea was 4.9 (interquartile range of 2.7-9.1). Among patients at intermediate risk, the median was 4.7 (interquartile range of 2.5-7.3). In the high-risk group, the median PASI was 5.9 (interquartile range of 3.5-8.6). There was no statistical difference between the groups ( $P = 0.6$ ).

Patients at low risk for OSAS were diagnosed with psoriasis when younger, with a mean age of  $31.5 \pm 14.7$  years. Patients at intermediate and high risk were diagnosed with older age. The mean age of patients in the intermediate-risk group was 41.4 years  $\pm 16$  years, and the mean number of patients in the high-risk group was 44.2 years  $\pm 17.4$  years ( $P = 0.002$ ).

Individuals at intermediate or high risk of apnea had higher systolic blood pressure measurements, with an average of  $138.4 \pm 16.23$  mmHg for the intermediate-risk group and a mean of  $135.3 \pm 19.1$  mmHg for the high-risk group. Patients at low risk for apnea had a mean systolic blood pressure of  $124.3 \pm 17.3$  mmHg ( $P = 0.003$ ). Diastolic pressure also presented higher measurements in the intermediate-risk groups (mean of  $83.9 \pm 10.4$  mmHg) and high risk (mean of  $85.3 \pm 11.1$  mmHg) when compared to the low-risk group ( $77.8 \pm 12.5$  mmHg) ( $P=0.014$ ).

Patients at high risk of apnea had a higher prevalence of systemic arterial hypertension (SAH) ( $P < 0.001$ ). In the low-risk group, only one patient (2.5%) was hypertensive; in the high-risk group, 23 patients (63.9%) had SAH. Regarding the presence of DM, the prevalence was increased in the high-risk group: 12 patients (33.3%),

compared to only one patient (2.5%) in the low-risk group ( $P = 0.001$ ). Regarding the presence of central obesity, 34 patients (94.4%) in the high-risk group presented such comorbidity, compared to 23 patients (57.5%) in the low-risk group ( $P < 0.001$ ). The other variables evaluated were not associated with apnea risk (Table 3).

Table 3. Risk of obstructive sleep apnea according to the STOP-Bang Questionnaire associated with demographic, anthropometric, lifestyle characteristics and related to the presence of psoriasis in the sample of patients under consultation at the dermatology outpatient clinic of the University Hospital of *Santa Maria*, from January to September 2019 ( $N = 104$ )

Variables	Obstructive sleep apnea STOP-Bang score rating			P
	Low risk (N=40)	Intermediate risk (N=28)	High risk (N=36)	
<i>Mallampati</i> score	2.7±1.0	2.9±0.8	2.8±0.9	0.484*
<b>Demographics</b>				
Age in years	43.3 <sup>b</sup> ±13.2	58.7 <sup>a</sup> ±10.9	55.6 <sup>a</sup> ±14.8	<0.001*
<b>Gender</b>				
Male	13 (32.5)	13 (46.4)	27 (75.0)	0.001**
Female	27 (67.5)	15 (53.6)	9 (25.0)	
<b>Anthropometric</b>				
Weight (kg)	70.9 <sup>c</sup> ±13.9	80.7 <sup>b</sup> ±11.1	89.5 <sup>a</sup> ±14.4	<0.001*
Body Mass Index (kg/m <sup>2</sup> )	26.3 <sup>b</sup> ±4.1	29.7 <sup>a</sup> ±3.4	32.2 <sup>a</sup> ±5.2	<0.001*
Abdominal circumference (cm)	91.7 <sup>b</sup> ±10.5	102.8 <sup>a</sup> ±7.3	108.5 <sup>a</sup> ±11.2	<0.001*
Neck circumference (cm)	36.5 <sup>c</sup> ±3.5	39.3 <sup>b</sup> ±2.7	41.8 <sup>a</sup> ±3.6	<0.001*
<b>Physical Examination</b>				
Systolic blood pressure (mmHg)	124.3 <sup>b</sup> ±17.3	138.4 <sup>a</sup> ±16.2	135.3 <sup>a</sup> ±19.1	0.003*
Diastolic blood pressure (mmHg)	77.8 <sup>b</sup> ±12.5	83.9 <sup>a</sup> ±10.4	85.3 <sup>a</sup> ±11.1	0.014*
Heart rate (beats/sec)	75.6±13.7	78.0±13.0	77.1±13.2	0.753*

Data are mean ± SD or number (%) of patients.

\*ANOVA test where different letters represent significant statistical association - Bonferroni Post Hoc Test; \*\*Pearson Chi-square test; §Fischer's Exact Test; §§Kruskal-Wallis test; #Data does not allow analysis.

Note. The missing data were three for the *Mallampati* score.

The correlation between the STOP-Bang score and the parameters age, weight, BMI, abdominal circumference, and neck circumference was direct and moderate ( $0.5 > r < 0.7$ ;  $P < 0.001$ ). The correlation with systolic blood pressure, diastolic blood pressure, and the representative variable of the patient's age when the diagnosis of psoriasis was made were direct and low ( $0.3 > r < 0.5$ ;  $P < 0.001$ ). The other measurements were not correlated with the score evaluated (Mukaka, 2012) (Table 4).

Table 4. Correlation between STOP-Bang and demographic, anthropometric and psoriasis variables in the sample of patients under consultation at the dermatology outpatient clinic of the University Hospital of Santa Maria, from January to September 2019 (N=104)

Variables	Obstructive sleep apnea	
	STOP-Bang Score	
	r or s	P
Age	0.503	<0.001
Weight	0.578	<0.001
Body mass index	0.537	<0.001
Abdominal circumference	0.663	<0.001
Neck circumference	0.664	<0.001
Systolic blood pressure	0.415	<0.001
Diastolic blood pressure	0.367	<0.001
Heart rate	0.095	0.337
Age of diagnosis	0.396	<0.001
Diagnosis time	0.069	0.487*
PASI	0.064	0.517*

P: Pearson correlation; and \*Spearman correlation.

Note. The missing data are: five for body mass index; one for Systolic Blood Pressure and Diastolic Blood Pressure. PASI = Psoriasis Area and Severity Index.

#### 4. Discussion

It is well known that sleep disorders (including OSA) are considerably increased in patients with psoriasis (Nowowiejska et al., 2021; Saçmacı & Gürel, 2019). For predicting the presence of moderate to severe OSA, the STOP-Bang questionnaire has been found to have one of the highest sensitivity and specificity. It has good methodological validity, reasonable accuracy, and easy-to-use and remembers features. Additionally, it has been developed and validated as a Portuguese-screening tool for OSAS (Fonseca, Silveira, Lima, & Rabahi, 2016).

The present study classified the risk scores for OSAS according to the STOP-Bang questionnaire in ambulatory patients diagnosed with psoriasis. It was found that 34.6% of patients were at high risk, while 26.9% were at intermediate risk for OSAS. The results follow previous studies, including a systematic review that found a prevalence of sleep apnea from 36% to 81% in the psoriatic population (Gupta, Simpson, & Gupta, 2016). These numbers are considerably higher than the prevalence of OSA recorded in the general population (Michalek et al., 2017).

Regarding anthropometric parameters, the present study shows a population with a tendency towards central obesity (mean abdominal circumference of 100.5 cm) and overweight (mean BMI of 29.3 kg/m<sup>2</sup>). The presence of obesity or overweight and increased abdominal and cervical circumference were significantly more prevalent in the high-risk group for OSAS. It is known that obesity is common in patients with psoriasis and that an increased BMI is a trigger for inflammation (Cohen et al., 2015; Gabryelska, Sochal, Wasik, & Białasiewicz, 2018). Other studies also found that male gender, obesity, and neck circumference are associated with a higher risk of sleep apnea (Papadavid et al., 2017).

In the present study, the *Mallampati* classification showed no statistical difference between the three risk groups for OSAS, although this classification is usually considered an important factor in predicting moderate and severe sleep apnea (Amra et al., 2019). Among the possible mechanisms for the absence of such association, the small sample size of the study can be suggested as a potential cause. Regarding the time of the illness, patients classified as low risk for OSAHS were diagnosed with psoriasis when younger, and those at intermediate and high risk were diagnosed with older age. This result is controversial, diverging from some of the published studies. *Kabeloglu Ilbay et al.*, for example, found an association between a longer disease time and an increased risk for OSAHS (Kabeloglu Ilbay et al., 2019).

We did not find a relationship between the severity of psoriasis (defined by the PASI score) and the presence of a high risk for sleep apnea. Papadavid et al., when evaluating patients with the polysomnography method, also found no association between the severity of psoriasis and the presence of sleep apnea (Papadavid et al., 2013). Kabeloglu Ilbay et al., on the other hand, found a significant impact on the development of OSAS in patients with psoriasis according to PASI score (Kabeloglu Ilbay et al., 2019). Several factors could explain the divergence of findings reported so far. Among them, we mention the methodological differences in the design of the studies, the small study samples, and patients with different disease statuses.

There are some limitations of the present study. First, we were unable to perform polysomnography or to apply different and perhaps more accurate sleep questionnaires. Second, this is a cross-sectional study, a design with several potential biases. Considering the limitations observed, the present study corroborates the data published so far, suggesting an increased risk of OSAS in the population of patients with psoriasis. Given the findings, we believe that patients with psoriasis should be evaluated for sufficient sleep time and adequate sleep quality.

## 5. Conclusion

The present study demonstrated that patients with psoriasis followed in a specific outpatient clinic in Brazil have a high prevalence of intermediate and high OSA risk when evaluated through the STOP-Bang questionnaire. The study also found an association between the presence of central obesity with an increased risk for OSA. The findings support the screening for OSA in patients with psoriasis.

## Competing Interests Statement

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

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# The Effect of Feeding Patterns and History of Infectious Diseases on the Incidence of Stunting in Children Under Five in the Province of East Nusa Tenggara

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## Abstract

**Background:** The prevalence of stunting of children under five years old (toddlers) in East Nusa Tenggara (NTT) reached 40.3 percent, the highest when compared to other provinces in Indonesia. This figure is above the National stunting prevalence of 29.6 percent. The prevalence of stunting in NTT consists of infants with a very short category of 18 percent and a short category of 22.3 percent. The purpose of the study was to analyze the influence of feeding patterns and a history of infectious diseases on stunting.

**Method:** This type of research is quantitative with a case-control study design, located in Kupang Regency and South Central Timor Regency in 2020. The sample of this study was 150 children under five consisting of 75 children under five who were stunted and 75 children under five were not stunted as a control and a simple random sample development technique. The method of collecting data is through measuring the height and weight of children under five and conducting interviews with parents of toddlers using a questionnaire and analyzing it by Chi-Square.

**Results and Conclusion:** The results showed that there was an influence of food feeding patterns (pattern of menu preparation, food processing, food presentation, and how to feed) and a history of infectious diseases (Ari and diarrhea) on the incidence of Stunting in children under five in East Nusa Tenggara province.

**Keywords:** feeding, infectious diseases, stunting

## 1. Introduction

Stunting is a condition of failure to grow in children under five years old (for infants under five years old) due to chronic malnutrition so that children are too short for their age. Malnutrition occurs since the baby is in the womb and in the early days after the baby is born, however, the Stunting condition appears only after the baby is 2 years old. Stunting experienced by children can be caused by lack of attention in the first 1000 days of the baby's life, which determines the level of physical growth, intelligence, and productivity of a person in the future, it is emphasized that since the time of the conference pregnant women need to get supervision, especially related to nutrition where pregnant women need to get adequate nutrition so that the baby is not born stunted. During this period, the nutrients received by the baby while in the womb and receiving breast milk have a long-term impact on life as an adult. The incidence of stunting (short) toddlers is a major nutritional problem faced by Indonesia. Based on nutritional Status monitoring (PSG) data over the past three years, Short has the highest prevalence compared to other nutritional problems such as undernourished, underweight, and obesity. The prevalence of short toddlers increased from 2016, which was 27.5% to 29.6% in 2017.

The prevalence of short toddlers in Indonesia tends to be static. The results of Basic Health Research (Riskesdas) in 2007 showed the prevalence of short toddlers in Indonesia at 36.8%. In 2010, there was a slight decrease to 35.6%. However, the prevalence of short toddlers again increased in 2013 to 37.2%. The prevalence of short toddlers will then be obtained from the results of Riskesdas in 2018 which is also a measure of the success of programs that have been pursued by the Government (Ministry of Health, 2018)

East Nusa Tenggara province stunted children as many as 319,100 children (Riskesdas, 2013). Although the prevalence of stunting in NTT in 2018 (Basic Health Research) showed a decrease of 30.8 percent, NTT province (East Nusa Tenggara) too has a high percentage of stunting toddlers at 42.6 percent. The prevalence of stunting of

children under five years old (toddlers) in East Nusa Tenggara (NTT) reached 40.3 percent, the highest when compared to other provinces in Indonesia. This figure is above the National stunting prevalence of 29.6 percent. The prevalence of stunting in NTT consists of infants with a very short category (if less than minus 3 standard deviation) of 18 percent and short less than minus 2 to minus 3 standard deviation) of 22.3 percent.

The nutritional Status of toddlers is one of the indicators that describe the level of public welfare. One way of assessing the nutritional status of toddlers is by anthropometry using an age-based Weight Index (BB/U). The categories used were overweight (Z-score > +2 SD); Good nutrition (z-score-2 SD to +2 SD); Malnutrition (z-score < -2 SD to -3 SD); Malnutrition (z-score < -3 SD).

Kupang regency is one of the districts in East Nusa Tenggara province, the number of children who experience smallness is 4750 children from 31,000 ballista children spread across 83 villages. Efforts to monitor the growth of toddlers are carried out through weighing activities in Posyandu regularly every month. The report of Puskesmas in Kupang regency in 2014 shows that the coverage of toddlers weighed as many as 31,223 toddlers, toddlers with more nutrition as many as 238 toddlers, toddlers with good nutrition as many as 23,367 toddlers, toddlers with less nutrition as many as 1,739 toddlers and toddlers poor nutrition as many as 212 toddlers (Kupang Health Office, 2014). Data from January-August 2019 showed that from 4,750 children under five in Kupang regency the highest number of stunting was in Kupang Tengah district, Noelbaki village as many as 78 people, Oelpua village 55 people, east Penguin 41 people, Oelmasi 41 people, Tanah Merah 34 people, Oebelo village 10 people and Tarus 2 people. The problem of malnutrition in toddlers in South Central Timor Regency in 2015 was 35.5%, of which the highest coverage of malnutrition was in Oinlasi Health Center with as many as 70 cases, Nulle Health Center with as many as 66 cases, and City Health Center as many as 39 cases. Nutritional Status of toddlers from 2015.

Some of the factors that cause stunting can be described as follows: 1). Poor parenting practices, including the mother's lack of knowledge about health and nutrition before and during pregnancy, as well as after the mother gives birth. Some facts and Information show that 60% of children aged 0-6 months do not receive breast milk exclusively, and 2 out of 3 children aged 0-24 months do not receive complimentary foods breast milk (MP-ASI). MP-ASI is given/started to be introduced when the toddler is over 6 months old. In addition to serving to introduce new types of food to infants, solid foods can also meet the nutritional needs of the baby's body that can no longer be supported by breast milk, as well as forming the immune system and the development of the child's immunological system to food and drink. 2). There are still limited health services including ANC-ante Natal Care services (health services for mothers during pregnancy) Natal Care and quality early learning. Stunting is caused by multidimensional factors, including poor nutritional parenting practices, and a lack of maternal knowledge about health and nutrition before and during pregnancy and after childbirth (Ramayulis, 2018). In addition, stunting is also influenced by various other factors including infectious diseases such as respiratory tract infections, diarrhea, and intestinal worm infections in children.

The purpose of this study was to analyze the influence of feeding patterns and history of Infectious Diseases on the incidence of stunting in children under five in East Nusa Tenggara province.

## 2. Method

This type of research is with quantitative approach and *Case-control study design*. This study was conducted in two districts, namely the Kupang regency and South Central Timor Regency in 2020. This sample size uses the following formula:

$$n = \frac{\left\{ Z_{1-\alpha/2} \sqrt{2P_2^*(1-P_2^*)} + Z_1 - \beta \sqrt{P_1^*(1-P_1^*) + P_2^*(1-P_2^*)} \right\}^2}{(P_1^* - P_2^*)^2}$$

Description:

Level of significance ( $\alpha$ ) : 5%

Power of the test ( $1-\beta$ ) : 90%

Odds Rasio: 4,643 (Khoirun, *et all*, 2015)

Anticipated probability of exposure given disease ( $P_1$ ):0, 88 (Khoirun, *et all* 2015)

Anticipated probability of exposure given no disease ( $P_2$ ): 0,61 (Khoirun, *et all* 2015)

Sample Size (n): 74

So n needed: 75



The large sample of this study 150 children under five consisted of 75 case samples and 75 control children under five and how to take samples with a simple random sampling technique. The independent variables of this study were the pattern of feeding (menu preparation, food processing, food presentation, and how to feed) and the history of infectious diseases, and the dependent variable was the incidence of stunting. The method of data collection was carried out by weight and height measurement, stunting determination, and interviews with parents of toddlers about feeding patterns and infectious disease history using questionnaires and analyzed using Chi-Square.

### 2.1 Research Ethics

Informed Consent is a form of approval sheet between the researcher and the research respondent (parents of toddlers) by providing an approval sheet, without a name (Anonymity) is a guarantee in the use of the research subject by not giving or including the name of the respondent on the observation sheet/questionnaire and only writing the code on the data collection sheet or the Confidentiality is an ethical issue by providing a guarantee of confidentiality of research results, both information, and other issues.

## 3. Results

### 3.1 The Effect of Feeding Patterns on Stunting There are Children Under Five

#### 3.1.1 Effect of Menu Arrangement Patterns

Table 1. Effect of food menu delivery pattern

	Menu Delivery Stunting Status Amount		P Value	OR	95% CI		
	Stunting	Normal			Low	Upper	
Not Good	52(69,3%)	40(53,3%)	92(61,3%)	0,044	1,978	1,014	3,860
Good	23(30,7%)	35(46,7%)	58(38,7%)				
Total	75(100%)	75(100,%)	150(100%)				

Table 1 above shows the influence of the pattern of preparation of food menu to children on stunting, statistical test results show p value  $0.044 < \alpha 0.05$  then there is a pattern of preparation of food menu on stunting in children under five. The value of OR 1.978 indicates the pattern of preparation of the food menu is less good and will risk children to be stunting 1.978 times compared to children who obtain a pattern of preparation of a good food menu.

#### 3.1.2 Influence of Food Processing Patterns

Table 2. Effect of food processing patterns

Processing	Stunting Status		Amount	P Value	OR	95% CI	
	Stunting	Normal				Low	Upper
Not good	53(70,7%)	41(54,7%)	94(62,7%)	0,043	1,998	1,019	3,918
Good	22(29,3%)	34(45,3%)	56(37,3%)				
Total	75(100%)	75(100,%)	150(100%)				

Table 2 above shows the influence of food processing patterns on the incidence of stunting in children under five, the results of the statistical test p value  $0.043 < \alpha 0.05$  then there is the influence of food processing patterns on the incidence of stunting significantly on the incidence of stunting in children under five. The or value of 1.998 indicates that poor food processing patterns will risk children being stunted 1.998 times compared with good food processing patterns.

### 3.1.3 Influence of Food Presentation Patterns

Table 3. Effect of food serving patterns

Presentation	Stunting Status		Amount	P Value	OR	95% CI	
	Stunting	Normal				Low	Upper
Not good	44(58,7%)	28(37,3%)	72(48,0%)				
Good	22(29,3%)	34(45,3%)	56(37,3%)	0,009	2,382	1,237	4,591
Total	75(100%)	75(100,%)	150(100%)				

Table 3 above shows the influence of food presentation patterns on children, the results of statistical tests p value  $0.009 < 0.05$ , there is an influence of food presentation patterns significantly on the incidence of stunting in children under five. The value of OR 2.382 indicates that if the pattern of food presentation to children is not good, the risk of children becoming stunted as 2.382 times compared to the pattern of good food presentation.

### 3.1.4 Effect of Feeding Pattern

Table 4. Effect of feeding patterns

Giving	Stunting Status		Amount	P Value	OR	95% CI	
	Stunting	Normal				Low	Upper
Not good	48(64,0%)	35(46,7%)	83(55,3%)				
Good	27(36,0%)	40(53,3%)	67(44,7%)	0,033	2,032	1,056	3,909
Total	75(100%)	75(100,%)	150(100%)				

Table 4 above shows the effect of the pattern of feeding children, the results of the statistical test p value  $0.033 < 0.05$ , there is a significant influence of the pattern of feeding children on the incidence of stunting in children under five. The OR value of 2.032 indicates that if the pattern of feeding children is not good, the child will be at risk of becoming stunted 2,032 times compared to the pattern of giving good food to children.

## 3.2 Influence of Infectious Disease History on Stunting in Children Under Five

### 3.2.1 Influence of History of Acute Respiratory Infections (Ari)

Table 5. Risk history of Ari disease

ARI history	Stunting Status		Amount	P Value	OR	95% CI	
	Stunting	Normal				Low	Upper
Yes	62(82,7%)	47(62,7%)	109(72,7%)				
No	13(17,3%)	28(37,3%)	41(27,3%)	0,006	2,841	1,330	6,071
Total	75(100%)	75(100,%)	150(100%)				

Table 5 above shows the influence of the history of ARI on the incidence of stunting in children under five p value  $0.006 < 0.05$  then there is a significant influence of Ari on the incidence of stunting in children under five. An OR value of 2,841 indicates that children with a history of ARI disease will be stunted 2,841 times compared to children who do not have a history of ARI disease

### 3.2.2 Effect of Diarrheal Disease History

Table 6. Effect of diarrheal disease history

	History of Diarrhea Stunting Status		Amount	P Value	OR	95% CI	
	Stunting	Normal				Low	Upper
Yes	41(54,7%)	23(30,7%)	64(42,7%)				
No	34(45,3%)	52(69,3%)	86(57,3%)	0,003	2,726	1,396	5,323
Total	75(100%)	75(100,%)	150(100%)				

Table 6 above shows the effect of diarrheal disease history on stunting incidence in children under five, the results of the statistical test  $p$  value  $0.003 < UTC$   $0.05$  then there is a significant effect of diarrheal disease history on stunting incidence in children under five. The value of OR 2.726 indicates that if there is a history of diarrheal disease, the child will experience stunting 2.726 times compared to children who do not have a history of diarrheal disease.

## 4. Discussion

Stunting is a condition of failure to grow in children under five years old (for infants under five years old) due to chronic malnutrition so that children are too short for their age. Malnutrition occurs since the baby is in the womb and in the early days after the baby is born, however, the Stunting condition appears only after the baby is 2 years old. The incidence of stunting (short) toddlers is a major nutritional problem faced by Indonesia. Based on nutritional Status monitoring (PSG) data over the past three years, Short has the highest prevalence compared to other nutritional problems such as undernourished, underweight, and obesity. The prevalence of short toddlers increased from 2016, which was 27.5% to 29.6% in 2017.

Stunting is a height that is less according to age ( $< -2SD$ ), characterized by the slow growth of children failing to achieve a normal and healthy height according to the age of the child. Stunting is chronic malnutrition or growth failure in the past and is used as a long-term indicator of malnutrition in children. Stunting can be diagnosed through an anthropometric index of height according to age that reflects the linear growth achieved in pre-and post-natal with indications of long-term malnutrition, resulting from inadequate nutrition and or health. Stunting is linear growth that fails to reach its genetic potential as a result of poor diet and disease. Stunting that occurs in childhood is a risk factor for increased mortality, cognitive abilities and low motor development, and unbalanced body functions.

Three main factors cause Stunting, namely unbalanced food intake (related to the content of nutrients in food, namely carbohydrates, proteins, fats, minerals, vitamins, and water), a history of low birth weight (lbw), a history of illness, poor parenting practices, including lack of maternal knowledge about health and nutrition before and during pregnancy, as well as after the mother gave birth. giving breast milk (ASI) exclusively, not receiving complementary foods breast milk (MP-ASI). In addition, it should pay attention to the pattern of feeding including the pattern of menu preparation, processing, presentation, and how to give. Preparation of balanced menu according to Rizqie Auliana (1999: 64). it is necessary to observe the following principles: quality and quantity of necessary nutrients are sufficient in the menu. In terms of quality, the menu must meet 4 healthy 5 perfect. Meanwhile, in terms of quantity, the menu must be appropriate for the age, gender, and activity of family members. b dishes should be able to be enjoyed and satisfy the tastes of all family members. c can give a feeling of satiety. d must be affordable by the financial circumstances of the family. e does not contradict socio-cultural requirements. 34 f adapted to local food availability. In addition to the things mentioned above, the principle of preparing the menu should also pay attention to the availability of the necessary tools and also human ability to process food. Menu planning is a series of plans to achieve the objectives of the organization of food to be served by taking into account various aspects, such as nutritional needs, Planning material needs, availability of materials to be used, ordering materials, processing of food ingredients, distribution of food to consumers, and estimated consumer acceptance of the composition of the menu to be presented.

Food processing is the process of processing food and beverages derived from plant or animal raw materials into products that can be consumed. The changed raw materials can be grains, meat, and milk. The process of food processing is different, depending on what the final purpose of the food will be. Such as vegetables that are frozen, wheat that is ground to produce flour, potatoes that are fried to serve as chips, and animals that are slaughtered for

meat. (Winarsi, 2016) to produce delicious food, required stages and processes to process raw materials to be ready for consumption. The stage starts with the process of preparation of raw materials, processing, then serving. After processing, the food is served in such a way as to cause appetite to eat. The presentation of food is tailored to the wishes and needs. The most common food processing technique is processing by utilizing heat. The technique has existed since 1830. The person who introduced the technique was named Nicholas Appert. In the past, Nicholas Appert faced a challenge in a food preservation competition during the war between France and England. French troops took more casualties, due to a lack of food. Nicholas also experimented with how to heat canned food, which led him to victory in the race. The technique developed until it became a technology in the development of packaged food preservation. Based on his theory, microbes like wet foods such as chicken, meat, eggs, and milk. In point of fact, the food is high in nutrition. Nicholas found a loophole, that microbes can not live in an extreme environment. With high temperatures, heating is considered effective for preserving such food. (Rezkisari Indira, 2017)

The presentation of food should be carried out according to the type of food. Hot food should be placed in a container suitable for hot food, as well as for cold food. Food that is processed immediately, should also be served immediately after processing, especially for foods that must be served hot. Food that is ready to be cooked must be placed in a food heater so that the heat remains durable until served. Serve food covered for hot food.

While cold food should be stored in a refrigerated chamber before D. present. Cold food also does not need to be covered around the serving place not far from the place of processing. Food presentation techniques are how to make the food served to appear uniform and look attractive. Food arrangement can be done by adjusting the composition of the shape, texture, and color. Hygiene and the way of controlling food before serving can affect the health of the person who will consume it. Food contaminated by bacteria or harmful ingredients can cause poisoning and disease. Hazards caused by errors in food control there are three types biological hazards, chemical hazards, and physical hazards. Biological hazards include bacterial and parasitic contamination that can cause disease. This pollution can be caused by air, soil, and water or small animals in a dirty environment. How to provide healthy food for children from childhood is very good for growth and development. Not only makes optimal growth, but the risk of children developing chronic diseases when adults can also decrease.

The results showed that there was an influence of feeding patterns on the incidence of stunting in children under five in East Nusa Tenggara province. Feeding patterns include patterns of menu preparation, food processing patterns, food presentation patterns, and patterns of how to give food to children under five. The effect of the pattern of preparation of food menu to children on stunting, the results of statistical tests show  $p$  value  $0.044 < \alpha 0.05$  then there is a pattern of preparation of food menu on stunting in children under five. Value or 1.978 shows the pattern of preparation poor diet will risk children stunting 1,978 times. The effect of food processing patterns on the incidence of stunting in children under five, the results of the statistical test  $p$  value  $0.043 < \alpha 0.05$  then there is the influence of food processing patterns on the incidence of stunting significantly on the incidence of stunting in children under five. The  $OR$  value of 1.998 indicates that poor food processing patterns will risk children becoming stunted 1.998 times. effect of food presentation patterns to children, the results of statistical tests  $p$  value  $0.009 < \alpha 0.05$  then there is the influence of food presentation patterns significantly to the incidence of stunting in children under five. The value of  $OR$  2.382 indicates if the pattern of food presentation to children is not good, it will risk the child being stunted 2.382 times. The effect of the pattern of feeding to children, the results of the statistical test  $p$  value  $0.033 < \alpha 0.05$  then there is an influence of the pattern of feeding to children significantly on the incidence of stunting in children under five. The value of  $OR$  2.032 indicates that if the pattern of feeding children is not good, the risk of children becoming stunted is 2.032 times compared to the pattern of feeding children. The results of this study are not much different from the research of Dayuningsi et al where the risk of stunting in toddlers is the most dominant parenting pattern of feeding ( $p$  value= 0.000; odds ratio= 6.496; 95% CI= 2.486-16.974) (Dayuningsi, 2020).

History of infectious diseases affects the incidence of stunting under five, the results showed the influence of the history of Ari disease on the incidence of stunting in children under five  $p$  value  $0.006 < \alpha 0.05$  then there is a significant influence of Ari disease history on the incidence of stunting in children under five. The value of  $OR$  2,841 indicates that if there is a history of Ari disease, the child will experience stunting 2,841 times. The results of the study are not much different from the study Subroto Tiro, where the incidence of infection in children aged 12-59 was as many as 65 respondents (31.9%) not as many as 139 respondents (68.1%). In the incidence of stunting, as many as 102 respondents (50%) did not stunt as many as 102 respondents (50%).  $P$ -Value = 0.000 so that the  $P$ -Value is  $< \alpha (0.000 < 0.05)$ , so that there is a relationship between the history of infectious diseases and the incidence of stunting in children aged 12-59 months in the Working Area of the Rama Indra Health Center (Subroto Tiro et al., 2021). Research by Nabuasa et al., (2013) shows that there is a relationship between infectious

diseases with the incidence of stunting.

The effect of diarrheal disease history on stunting incidence in children under five, the results of statistical test  $p$  value  $0.003 < UTC 0.05$  then there is a significant effect of diarrheal disease history on stunting incidence in children under five. The value of OR 2.726 indicates that if there is a history of diarrheal disease, the child will experience stunting 2.726 times. The results of this study are not much different from the study by Desyanti et al., (2017), where most of the children in the stunting group often have diarrhea (72.7%). There is a history of diarrheal disease relationship ( $p=0.025$ ,  $or=3.619$ ) that has a significant association with the incidence of stunting. History of other infectious diseases such as dental caries, based on research results by Rahman *et All* (2014) that there is a relationship between short nutritional status (stunting) with the level of dental caries ( $p = 0.000$ ) in kindergarten students in Kertak Hanyar District, Banjar Regency.

## 5. Conclusion

- 1) There is an influence of feeding patterns (menu preparation patterns, food processing patterns, food presentation patterns, and feeding patterns) on the incidence of stunting in children under five in East Nusa Tenggara province
- 2) There is an influence of a history of infectious diseases (Ari and diarrhea) on the incidence of stunting in children under five in East Nusa Tenggara province

## 6. Recommendations

- 1) The government through the Health Office and Puskesmas should periodically conduct preventive effort campaigns to prevent the occurrence of acute respiratory infections
- 2) The government through related agencies (health and social) provides training to the community regarding the processing of local food that is rich in nutrients as an additional food source to overcome the problem of stunting
- 3) Families (parents) try to change adequate feeding patterns so that children get sufficient food intake to prevent stunting in children under five.

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## Competing Interests Statement

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

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