

ORIGINAL RESEARCH

Knowledge of sexually transmitted infection among adults living in Saudi Arabia: a national cross-sectional study

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Abstract

Sexually transmitted infections (STIs) are a major global health, occurring in different worldwide nations. Discussing STIs in Saudi society is considered taboo, due to social and ethical constraints. Sexual health is a serious issue in Saudi Arabia due to conservative religious values make sexual health among youth a significant concern, as young people face heightened vulnerability to STIs due to increased sexual experimentation, limited awareness, and difficulty accessing treatment. The study purpose is to evaluate the knowledge of STIs among adults in Saudi Arabia. This cross-sectional study involves adult men and women from various regions of Saudi Arabia. Sexually transmitted diseases (STD) knowledge scores were calculated using a validated 27-item Arabic questionnaire adapted from existing tools. Survey data were analyzed using IBM SPSS version 20.0. Results are presented as frequencies and percentages. Chi-squared or Fisher's exact tests were used for comparisons, with statistical significance set at $p < 0.05$. In a study with 1706 participants (94.7% response rate), the gender distribution was 825 males (48%) and 881 females (52%). Most respondents were aged 18–23 (43%), followed by 24–31 (27%) and 32–39 (14%) years. Geographically, 71% were from the central region, with significant gender differences in regional distribution ($p < 0.0001$). The estimated overall mean of knowledge scores (STDs-KS) was 6.65 ± 3.1 . The STD-KS showed no significant association with age. However, gender had a significant association ($p < 0.0001$), with males having slightly lower scores (6.5 ± 3.0) than females (6.8 ± 3.2). Marital status showed marginal significance ($p = 0.042$), and educational status had a significant association ($p < 0.0001$) with STD-KS. In conclusion, this study highlights the significance of demographic factors in STD knowledge. It emphasizes the need for targeted interventions considering age, gender, marital status, education and geography to enhance STI awareness and prevention.

Keywords

Sexually transmitted diseases; Sexually transmitted infection; Saudi Arabia; Knowledge

1. Introduction

Sexually transmitted infections (STIs), previously known as sexually transmitted diseases (STDs) continue to be one of the biggest health issues in both high-income and low- and middle-income countries. As a result of societal issues and ethical concerns, talking about STIs in Saudi society is frowned upon.

In traditional cultures, where sexual activity is considered taboo and sexual interaction before marriage is neither acceptable nor permitted, societal pressure hinders young people from getting the necessary information [1]. Some STI preventive strategies advertised and applied in non-Islamic

countries are inappropriate in Islamic countries. For example, the concept of "Safe Sex" to avoid STIs, which urges the use of condoms for all sexual interactions regardless of marital status, is completely prohibited in Islam [2].

A comprehensive study of the literature on the awareness and knowledge of sexually transmitted infections (STIs) among European school-age youth showed that awareness of Human papillomavirus (HPV) was often lower than that of Human Immunodeficiency Virus (HIV)/Acquired immunodeficiency syndrome (AIDS) [3]. An examination of adolescents in Berlin's knowledge about STI was the goal of a cross-sectional study. Although other STIs were less well

known, human immunodeficiency virus (HIV) was widely known. For instance, only 2.2% were aware that there is no cure for HPV infection, whereas 10.8% knew about the HPV vaccination and 46.2% had never heard of chlamydia [4]. The knowledge, attitudes, risky behaviors, and preventative practices of Malaysian university students in the health and non-health disciplines as future healthcare workers with regard to STIs were examined in a separate study. The majority of the students had heard of STIs, and half of them were aware that they could manifest without any symptoms. HIV continues to be the most well-known STI among students, while chlamydia and trichomoniasis are only sometimes mentioned [5].

Another investigation was done into the sexual behavior and understanding of STIs among Italian teenagers. 2867 secondary school students, ages 14 to 21, were given questionnaires, parents and teachers were the primary sources of sex education for 37% of the respondents, and 95% agreed that schools should be the main venue for sex education. Only 9% said their school's sex education was effective, though [6]. Southwest Ethiopian polytechnic college students participated in a cross-sectional survey on their knowledge of sexually transmitted illnesses and the risk factors that go along with them. They discovered that a number of factors, such as being male, having more years of education, just having one sexual partner or no partners, and getting information from the media, boost one's knowledge of sexually transmitted illnesses [7]. A cross-sectional survey was carried out on 536 people in Jeddah, Saudi Arabia, who were between the ages of 18 and 25 to determine the awareness of STIs among adolescents. Between the ages of 18 and 25, 536 volunteers, both medical and non-medical, were chosen at random. Rather than formal schooling, the mass media was the most frequent source of information [8].

Another survey was conducted to evaluate general public attitudes and understanding of HIV/AIDS in Jeddah, Saudi Arabia during a series of public HIV/AIDS awareness initiatives from 2013 to 2015, a survey with 3841 participants was carried out. Higher ratings were obtained by respondents who were in the 19–25 age group, had college degrees, and knew HIV/AIDS patients. Overall, attitudes toward people living with HIV/AIDS were negative; more than 40% thought they should be kept apart, and less than 20% were in favor of marriage to someone who has the disease [9]. At Albaha University in Saudi Arabia, a cross-sectional study including 1900 individuals was carried out in 2020, showed that young adults lack knowledge of STIs [10].

Young men and women between the ages of 18 and 25 were asked to reply to questions and statements on STIs posted on social media in a different cross-sectional survey conducted in 2016. Surprisingly, only 55% of the 5040 responses claimed to be able to prevent STIs. 95.8% of participants agreed that STIs should be covered in schools, with only 4.2% disagreeing [11]. A descriptive study involved adult women who went to the dermatology clinic at King Saud University Medical City in Riyadh, Saudi Arabia, for reasons other than STIs. Out of the 1150 Saudi adult women who were contacted and asked to respond, 843 did so. HIV had the highest incidence of STI knowledge (84.9%) while genital warts had the lowest (17%) [11]. Knowledge of STI transmission mechanisms and

symptoms was substantially correlated with age, educational attainment, and monthly income [2].

In Saudi Arabia, an Islamic nation with a strong respect for personal privacy and confidentiality, young people's sexual health is undeniably a major worry, and the youth population is one of the most vulnerable groups to STD infection [8, 12]. This vulnerability to STD infection is most likely linked to the developmental phase of early adulthood, when sexual experimentation increases [13], as well as a variety of barriers, such as a lack of understanding about STDs and difficulty receiving treatment [14].

There is a lack of published data from authorities, research on incidence rate, and data on the prevalence of STIs among Saudis, answering such a question remains problematic. The rising frequency of STIs may be attributed to a lack of awareness and education about their prevention. It is possible to avoid STIs, the primary prevention is important since it can lower morbidity and serious consequences.

Yet, no reported data from different regions in Saudi Arabia, and this study aims to evaluate the knowledge of STIs among adults enrolled in different regions in Saudi Arabia.

2. Material and methods

2.1 Participants and settings

This cross-sectional study was conducted between 01 March 2023 and 01 May 2023, utilizing social media platforms (WhatsApp Messenger (Meta Platforms, Inc., Menlo Park, CA, USA)) as the primary data collection method across different parts of Saudi Arabia. A sample size was determined by using the Raosoft® website, with an error margin of 5% and a 95% confidence interval. The population in Saudi Arabia was 36,947,025 million in 2023, the estimated sample size was revealed to be around 385. To obtain the relevant data, a convenience sampling strategy was employed, and an online survey was developed after conducting a pilot study involving 20 respondents. The survey was implemented using the Google Forms (Google LLC, Mountain View, CA, USA) platform, distributed through social media channels such as WhatsApp. Participants were contacted through a WhatsApp message, which provided a comprehensive explanation of the study's objectives and included a participation request along with a survey link. A cover page was displayed upon clicking the survey link, outlining the study's title, purpose and estimated time required to complete the questionnaire. The survey was disseminated to a total of 1800 individuals.

We did not gather respondents' contact information, such as email addresses, or demand registration for the purpose of secrecy. It was entirely voluntary, and complete anonymity was guaranteed. The target sample comprised adults aged 18 and above, and the questionnaire focused on assessing their knowledge of STIs.

2.2 Sexually transmitted disease knowledge questionnaire

To evaluate participants' knowledge of STIs, the STDs-KQ (STDs Knowledge Questionnaire) was employed. Jaworski and Carey originally designed and implemented the sexually

transmitted disease knowledge questionnaire (STDs-KQ) in 2007 [15]. Permission to use this scale had been obtained, and the Arabic version of the STDs-KQ was utilized to cater to the language needs of the target sample [9]. The Arabic version of the STDs-KQ had been previously validated and proven reliable for measuring STDs knowledge among Arabic speakers. The STDs-KQ consisted of 27 items, and the response options were as follows: 1—True, 2—False, 3—Don't know. The STDs-KQ served as a tool to assess knowledge and awareness of STIs. The 27 items of the Arabic version of the STDs-KQ had an estimated standardized Cronbach's alpha of 0.74, which showed an acceptable level of internal consistency and reliability.

2.3 Statistical analysis

For the quantitative data collected through the survey, statistical analysis was conducted using Statistical Package for Social Sciences (SPSS version 20.0, IBM Inc., Armonk, NY, USA). The results were presented in terms of frequencies and percentages. In cases where comparisons between survey variables were necessary, the Chi-squared test or Fisher's exact test was employed. The significance threshold was set at $p \leq 0.05$ to determine statistical significance.

3. Result

3.1 Assessment of sociodemographic variables of the study participants

A total sample of 1706 individuals, with response rate (94.7%), consisting of 825 males (48%) and 881 females (52%), comprised this study (Table 1). Examining age groups, the largest proportion of respondents was in the 8–23 years old category, comprising 738 individuals (43% of the total sample). Among them, 388 individuals (47% of males and 40% of females) fell into this age range. The distribution of respondents gradually declined with increasing age, as observed in the subsequent age groups. For instance, the 24–31 years old category accounted for 466 individuals (27%), with 243 males (29%) and 223 females (25%). Similarly, the 32–39 years old group consisted of 241 individuals (14%), including 94 males (11%) and 147 females (17%). The distribution continued to decrease for the older age categories: 40–47 years old (143 individuals, 8%), 48–55 years old (84 individuals, 5%), and 56 years and older (34 individuals, 2%). Notably, the p -value analysis revealed a highly significant association between age groups and gender ($p < 0.0001$), indicating that age distribution varied significantly between males and females.

In terms of marital status, the majority of respondents were classified as single, with 1145 individuals (67% of the total sample). This category comprised 644 males (78%) and 501 females (57%). The second most prevalent category was married individuals, accounting for 487 respondents (29%),

TABLE 1. Assessment of sociodemographic variables of the study participants (n = 1706).

Variable analysed	Total respondents n = 1706		Male n = 824 (48%)		Female n = 882 (52%)		p -value
Age groups (in years)							
8–23 years old	738	43%	388	47%	350	40%	<0.0001
24–31 years old	466	27%	243	29%	223	25%	
32–39 years old	241	14%	94	11%	147	17%	
40–47 years old	143	8%	38	5%	105	12%	
48–55 years old	84	5%	33	4%	51	6%	
56 years and older	34	2%	28	3%	6	1%	
Marital status							
Single	1145	67%	644	78%	501	57%	<0.0001
Married	487	29%	157	19%	330	37%	
Divorced	61	4%	20	2%	41	5%	
Widow	13	1%	3	0%	10	1%	
Educational status							
General education	498	29%	275	33%	223	25%	<0.0001
Bachelor	1062	62%	474	58%	588	67%	
Master's and PhD	146	9%	75	10%	71	8%	
Region analysed							
Central	1207	71%	631	76%	576	65%	<0.0001
Western	199	12%	69	8%	130	15%	
Eastern	142	8%	62	8%	80	9%	
Southern	76	4%	25	3%	51	6%	
Northern	82	5%	37	4%	45	5%	

including 157 males (19%) and 330 females (37%). A smaller proportion of the sample identified as divorced (61 individuals, 4%) or widowed (13 individuals, 1%). The *p*-value analysis showed a highly significant association between marital status and gender ($p < 0.0001$), indicating substantial differences in marital status distribution between males and females.

Regarding educational status, the majority of respondents held a bachelor's degree, with 1062 individuals (62% of the total sample). This group consisted of 474 males (58%) and 588 females (67%). Additionally, 498 respondents (29%) had a general education background, including 275 males (33%) and 223 females (25%). The *p*-value analysis demonstrated a highly significant association between educational status and gender ($p < 0.0001$), indicating notable disparities in educational attainment between males and females.

The geographic distribution of respondents was analyzed across different regions. The central region had the highest representation, with 1207 individuals (71% of the total sample).

Among them, 631 were males (76%) and 576 were females (65%). The western region accounted for 199 individuals (12%), including 69 males (8%) and 130 females (15%). The eastern region had 142 respondents (8%), with 62 males (8%) and 80 females (9%). The southern region comprised 76 individuals (4%), including 25 males (3%) and 51 females (6%). Lastly, the northern region had 82 respondents (5%), with 37 males (4%) and 45 females (5%). The *p*-value analysis indicated a highly significant association between region and gender ($p < 0.0001$), highlighting notable differences in regional distribution between males and females.

3.2 Correlation between sociodemographic variables and STD knowledge scores of the study participants

Table 2 presents the results of an analysis of STD-KS in relation to various variables. The mean \pm standard deviation (SD) values are reported for each variable, along with *p*-

TABLE 2. Correlation between sociodemographic variables and STD knowledge scores of the study participants (n = 1706).

Variable analysed	Mean \pm SD	<i>p</i> -value	STDs-KS		Chi-square	<i>p</i> -value
			Low	High		
Age groups (in years)						
8–23	7.5 \pm 3.5	0.6120	423 (57%)	315 (43%)	0.491	0.6330
24–31	6.8 \pm 3.2		189 (41%)	277 (59%)		
32–39	6.2 \pm 2.9		94 (39%)	147 (61%)		
40–47	5.9 \pm 2.7		62 (43%)	81 (57%)		
48–55	5.5 \pm 2.5		39 (46%)	45 (54%)		
56 and older	4.7 \pm 2.3	15 (44%)	29 (56%)			
Gender						
Male	6.5 \pm 3.0	<0.0001	435 (53%)	389 (47%)	27.353	<0.0001
Female	6.8 \pm 3.2		390 (45%)	492 (55%)		
Marital status						
Single	7.2 \pm 3.4	0.0420	632 (55%)	513 (45%)	4.223	0.0680
Married	6.0 \pm 2.8		193 (40%)	294 (60%)		
Divorced	5.5 \pm 2.6		31 (48%)	32 (52%)		
Widow	4.8 \pm 2.2		6 (47%)	7 (53%)		
Educational status						
General education	5.8 \pm 2.7	<0.0001	286 (58%)	212 (42%)	14.355	<0.0001
Bachelor	6.5 \pm 3.0		471 (44%)	591 (56%)		
Masters	7.0 \pm 3.3		47 (50%)	47 (50%)		
PhD	7.5 \pm 3.5		22 (42%)	30 (58%)		
Region analysed						
Central	6.3 \pm 2.9	0.8420	678 (56%)	529 (44%)	7.362	0.3370
Western	5.5 \pm 2.6		97 (49%)	102 (51%)		
Eastern	5.8 \pm 2.7		67 (47%)	75 (53%)		
Southern	5.2 \pm 2.3		41 (54%)	35 (46%)		
Northern	4.9 \pm 2.2		45 (55%)	37 (45%)		

SD: standard deviation; STDs: sexually transmitted diseases; KS: knowledge scores.

values indicating statistical significance. The overall mean and standard deviation of STDs-KS was 6.65 ± 3.1 . The age groups were divided into six categories, ranging from 8–23 years to 56 years and older. The mean STD-KS scores for each age group range from 7.5 ± 3.5 to 4.7 ± 2.3 . However, the p -values for the Chi-square test show that there is no significant association between age groups and STD-KS scores.

In terms of gender, the mean STD-KS scores are 6.5 ± 3.0 for males and 6.8 ± 3.2 for females. The p -value for gender indicates a highly significant association with STD-KS scores ($p < 0.0001$) also shown in Fig. 1. Among males, 53% have low STD-KS scores, while 47% have high scores. Conversely, among females, 45% have low scores and 55% have high scores. The marital status variable shows that single individuals have a higher mean STD-KS score (7.2 ± 3.4) compared to married (6.0 ± 2.8), divorced (5.5 ± 2.6), and widowed (4.8 ± 2.2) individuals. However, the association between marital status and STD-KS scores is only marginally significant ($p = 0.042$). The distribution of low and high scores varies across marital status categories. Educational status demonstrates a strong association with STD-KS scores ($p < 0.0001$) also represented in Fig. 2. Individuals with a general

education background have a mean score of 5.8 ± 2.7 , while those with a bachelor's degree have a mean score of 6.5 ± 3.0 . The mean scores increase for individuals with master's (7.0 ± 3.3) and doctoral (7.5 ± 3.5) degrees. The distribution of low and high scores differs significantly among the educational status groups. Lastly, the analysis includes different regions, including Central, Western, Eastern, Southern and Northern regions. The mean STD-KS scores range from 6.3 ± 2.9 to 4.9 ± 2.2 across these regions. However, the Chi-square test does not indicate a significant association between the region and STD-KS scores ($p = 0.842$).

4. Discussion

The significance of this study lies in its contribution to the existing literature on the demographic distribution and knowledge levels related to STIs among a large sample population. The study showed that 43% of respondents were aged 18–23, with fewer respondents in older age groups. It also found significant variations in age distribution between males and females. Our study found that female participants had higher STDs-KS than males, which is consistent with previous re-

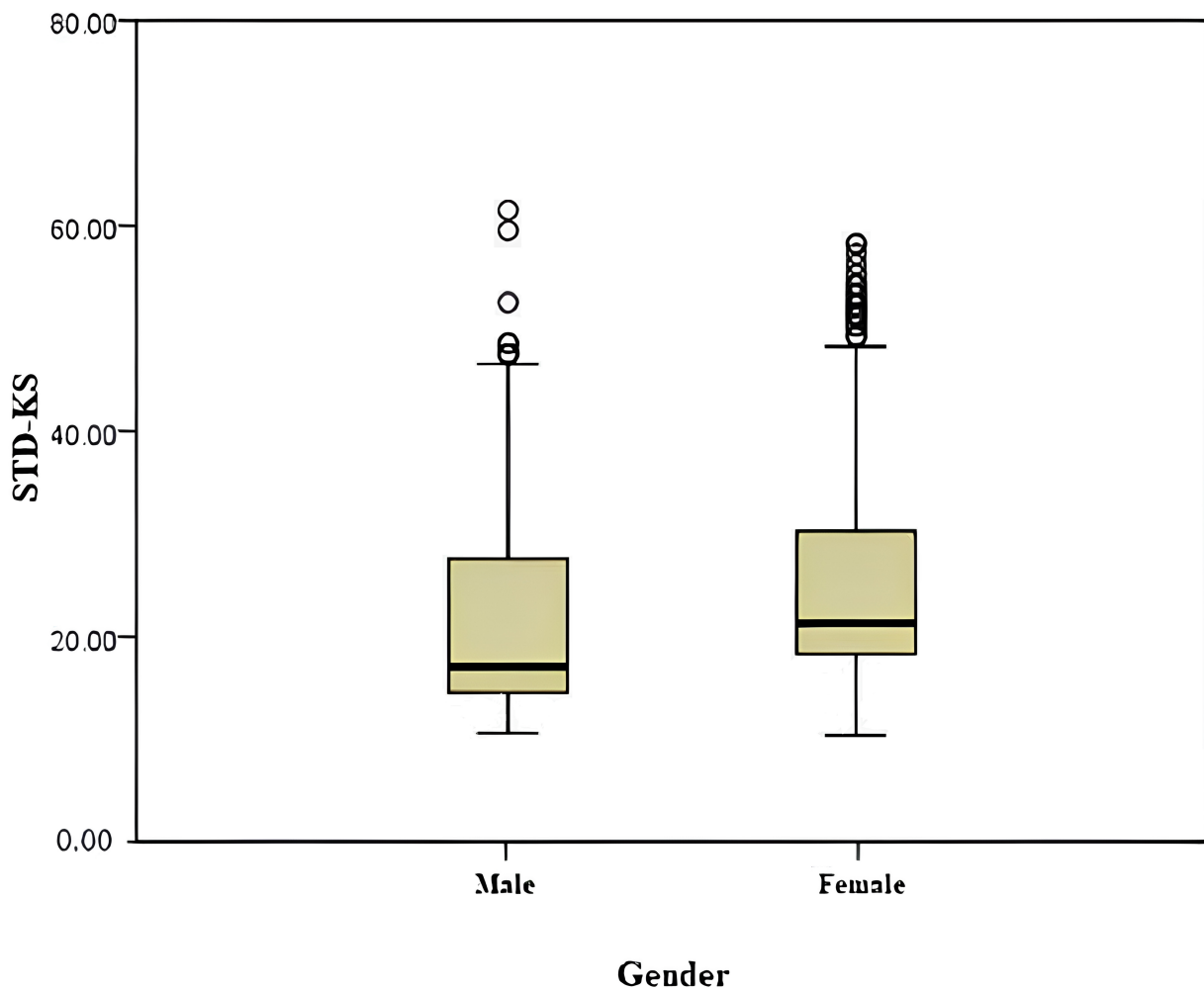


FIGURE 1. Boxplot representing the correlation between STD-KS scores and gender of the study participants. STD: sexually transmitted diseases; KS: knowledge scores.

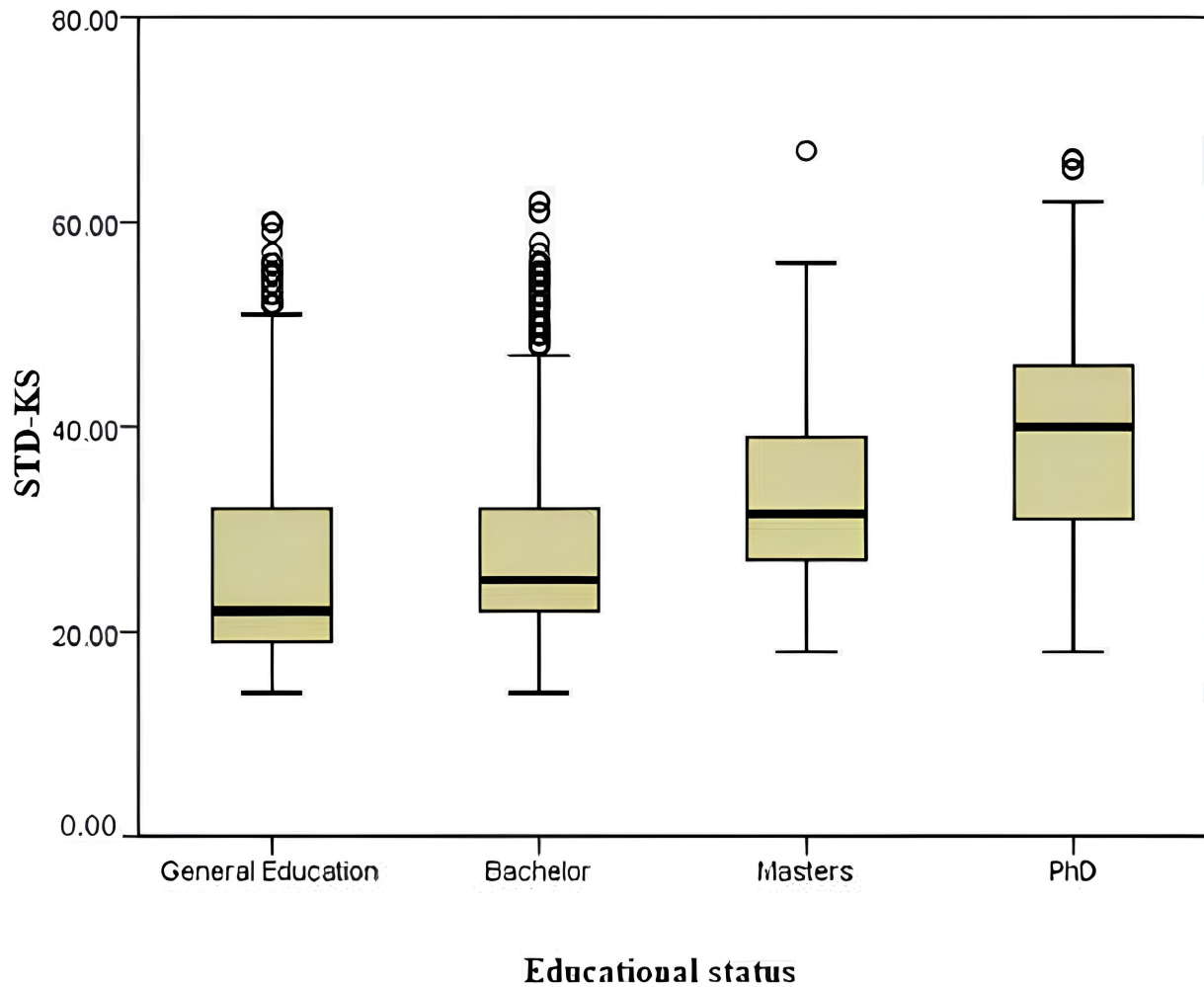


FIGURE 2. Boxplot representing the correlation between STD-KS scores and the educational status of the study participants. STD: sexually transmitted diseases; KS: knowledge scores.

search [10, 15]. The estimated mean of knowledge scores (STDs-KS) was 6.65 ± 3.1 , lower than the earlier publication by Albanghali *et al.* [9] (7.95 ± 4.29). Thus, this study supports the need for increased efforts and sexual education programs to enhance STD knowledge among young adults in various populations. This finding highlights the need for tailored approaches when designing educational interventions and preventive strategies targeting specific age groups and genders.

The significant association between marital status and gender suggests substantial differences in marital status distribution between males and females. The marital status variable indicates that single individuals had a higher mean STD-KS score compared to married, divorced and widowed. However, the link between married status and the STD-KS scores is only marginally significant ($p = 0.042$). This finding is important for understanding the demographic characteristics of the population and considering marital status as a potential factor influencing STI knowledge and behaviors. The Central region had the highest representation, followed by the Western, Eastern, Southern, and Northern regions. The significant association between region and gender emphasizes the need to

consider regional differences when developing public health initiatives and interventions to address STI knowledge and prevention. The finding prompted a further investigation to determine the real cause of the improvement in knowledge levels shown in singles as compared to those in current or past partnerships. Due to cultural and religious influences on behavior in Saudi Arabia, future research should investigate the link between knowledge, practices and STI risk. Fear of judgment and legal repercussions may lead to underreporting and reluctance to seek medical help, affecting the estimated prevalence of STIs [9].

There have been several studies conducted on STI knowledge in Saudi Arabia in this same regard. One study published in 2006 aimed to assess the knowledge and awareness of STIs among university students in Saudi Arabia [2]. The study found that there were gaps in knowledge regarding STIs, with misconceptions and low awareness of prevention strategies.

Another study [10] investigated the knowledge and attitudes of Saudi and non-Saudi female college students towards STIs. The study highlighted a lack of knowledge regarding STIs and revealed misconceptions and stigmatizing attitudes toward those affected by these infections. A cross-sectional study [9]

further assessed the knowledge of STDs among young adult students using a validated questionnaire. Female participants were found to exhibit a significantly higher mean STDs-KS compared to males. Additionally, students in health sciences programs demonstrated higher STDs-KS compared to those in arts and sciences programs. These findings indicate a lack of STIs knowledge among young adults, highlighting the need for comprehensive health education programs, particularly in the later stages of secondary education, to enhance STIs awareness in this population. Furthermore, a study [16] published in 2014 titled examined the awareness and knowledge of STIs among male adolescents in Saudi Arabia. The study found that the participants had limited knowledge about STIs, with low awareness of the transmission modes and symptoms of various infections.

The results of this investigation agreed with data found in earlier literature [5, 10, 11, 17]. In line with earlier studies [9, 10] female participants had higher STDs-KS than their male counterparts in this study. While data points to a low incidence rate of STIs among Saudis [10, 18, 19], multiple studies have emphasised the lack of knowledge and awareness among various populations living in Saudi Arabia, independent of gender [9, 11, 17, 18]. Currently, Saudi Arabia lacks a youth- or adolescent-focused evidence-based health education programme that focuses on men's and women's health. The application of educational programmes for promoting healthy behaviour for minimising STI transition, however, appears to have a significant positive influence [20–22]. A modified knowledge assessment questionnaire, the usage of which was first mentioned in a 2007 study [23] for the goal of measuring STI knowledge, has been used in numerous studies [9, 10, 15, 23]. Several studies in the literature created various types of questionnaires to gauge people's knowledge and awareness of STIs, but the validity of the evidence from these studies may be compromised due to the inherent limitations that arise due to the utilisation of a questionnaire-based methodology [23–26].

5. Limitations

This study has several limitations that should be considered when interpreting the results. Firstly, the sample used in this study may not be fully representative of the general population, as it was based on a convenience sampling method. This sampling approach introduces the possibility of selection bias and limits the generalizability of the findings to broader populations. Additionally, the study relied on self-reported data, which may be subject to recall bias or social desirability bias. Participants may have provided responses that they perceived as more socially acceptable, leading to potential inaccuracies in the reported STI knowledge scores. Lastly, the study's focus on demographic variables and their association with STI knowledge scores may overlook other important factors that contribute to STI prevention and sexual health outcomes. Finally, the results are limited to the population and gender of men and women. As a result, this might have had an impact on our findings, which might have varied if the study had been done in groups without cultural constraints.

6. Conclusions

Although demographic factors like being female or single are associated with higher STI knowledge scores compared to males and those with current or past partnerships, overall STI knowledge remains significantly low. Health education programs targeting both men's and women's health, especially for youth subgroups, can help promote STI awareness, knowledge and prevention among this population.

Future research should focus on evaluating the effectiveness of tailored interventions and exploring additional factors that may influence STI knowledge and behaviors, ultimately leading to improved sexual health outcomes.

AVAILABILITY OF DATA AND MATERIALS

All data generated or analyzed during this study are included in this published article.

AUTHOR CONTRIBUTIONS

MAA—conceptualization, funding acquisition, project administration and supervision. MAA, SA, MaA and MSA—data curation and formal analysis; validation and visualization; writing-review and editing. MAA, AAb, MoA, AAla, RA, AAlh, AAS and ABA—investigation; writing-original draft. MAA, SA—methodology. MAA, MSA—resources and software.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study has ethical approval from the Deanship of Scientific Research at Majmaah University with Institutional Review Board approval number (MUREC- Feb.5/COM-2022/6-4). All responders provided written informed consent.

ACKNOWLEDGMENT

The author extends the appreciation to the Deanship of Postgraduate Studies and Scientific Research at Majmaah University for funding this research work through the project number (R-2024-1220).

FUNDING

This research work was supported by the Deanship of Postgraduate Studies and Scientific Research at Majmaah University through project number R-2024-1220.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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How to cite this article: Meshari A. Alzahrani, Abdullah Abahussain, Mohammed Alharbi, Abdulrahman Alanazi, Rakan Almjlad, Abdullah Alharbi, *et al*. Knowledge of sexually transmitted infection among adults living in Saudi Arabia: a national cross-sectional study. *Journal of Men's Health*. 2024; 20(11): 88-95. doi: 10.22514/jomh.2024.188.