

ORIGINAL ARTICLE

Knowledge and attitudes of sexually transmitted infections among medical students in Riyadh, Saudi Arabia

Abdulaziz Abuabat^{1,3*}, Abdulrahman Alfarhan^{1,3}, Raed Alahmari^{1,3},
Waleed Alanazi^{1,3}, Abdulaziz AlJaafary^{1,3}, Sajida Agha^{2,3}, Amir Omair^{2,3},
Nazish Masud^{2,3}

ABSTRACT

Background: Sexually transmitted infections (STIs) are among the most common diseases worldwide, putting great pressure on healthcare systems with health, financial, and social implications. However, they are a class of diseases that are preventable due to them having limited routes of transmission. The control of STIs is effectively done through the promotion of preventive and safe sexual practices. This prevention began by assessing the current state of knowledge of undergraduate medical students. This study was conducted to assess the knowledge and attitudes of future educators, i.e., medical students, toward STIs.

Methods: A questionnaire-based, cross-sectional study was conducted among male, undergraduate, medical students of three major universities in Riyadh, Saudi Arabia, namely King Saud University, King Saud Bin Abdulaziz University for Health Sciences, and Alfaisal University.

Results: The total number of participants in this study was 387 students. Out of them, 22% were from Alfaisal University, 36% were from King Saud University, and 41% were from King Saud bin Abdulaziz University for Health Sciences. There were no significant differences between the different variables and attitudes toward STIs. However, there was a statistically significant relationship between the level of knowledge and academic year, phase, university, and type of school.

Conclusion: This study clearly indicates gaps in the knowledge of medical students in the three designated universities, with Alfaisal scoring the highest in knowledge among them. Further research should investigate the reason behind this gap and the best method to address it. Moreover, additional emphasis on the knowledge of STIs and prevention should be implemented into the curriculums.

Keywords: Cross-sectional, knowledge, attitude, STI, medical students.

Introduction

Sexually transmitted infections represent a global health problem, putting pressure on healthcare systems worldwide [1–3]. Sexually transmitted infections are defined as infections that are transmitted through sexual contact [4]. A large number of infection transmissions are attributed to the lack of awareness of the infections [5–7]. Poor levels of knowledge are usually found among people with less formal education and younglings [5–7]. Despite having poor knowledge, these groups and others still participate in sexual practices [6,7]. Sexually transmitted diseases are a wide term that encompasses a lot of diseases. However, they share a lot of symptoms, presentations, and modes of transmission. For example, the symptoms include painful urination, genital

discharge, and genital pumps or lesions [7,8]. Some STIs do not show symptoms in their initial stages, which make their transmissions easier and make them harder to avoid [7,9,10]. Infections like HIV, which require lifelong treatment, make it even more important to prevent the

Correspondence to: Abdulaziz Abuabat

*College of Medicine, King Saud Bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia.

Email: AbdulazizAbuabat@gmail.com

Full list of author information is available at the end of the article.

Received: 04 May 2020 | **Accepted:** 10 June 2020

occurrence of the disease “AIDS”, rather than just treat it [9].

Previous research studies, focusing on assessing the awareness of STIs, have provided results that are varied, which is understandable because of the diverse methods, tests, and targets used in the research [6,11–14]. Most of the previous research studies in Saudi Arabia have focused on different age groups, which differ from what this research targets [11,15–17]. A major limitation of the researches carried out in Saudi Arabia is that they focus on the female population and omit the male population [11,15,17,18]. This research focuses on assessing the awareness of STIs and investigating the behavioral risk factors among undergraduate, male medical students. This study will be the first to provide fundamental information concerning Saudi Arabian male university students, regarding the knowledge of STIs and risk factors.

Many governmental bodies and educational institutions have implemented programs to increase awareness [5,7,9]. The ultimate goal of these programs is to prevent the transmission of STIs through safe sexual practices. An important step in understanding the needs of the recipients of these programs is to assess their level of understanding and awareness of the diseases and to better design the programs [6]. This assessment needs to be carried out for all groups that the program is directed at, which will help in showing any deficiencies in the educational process [5]. For example, university and higher education students are supposed to be more informed on this subject; however, poor awareness and knowledge indicates a problem in the educational efforts for these diseases. In addition to that, university students are mostly considered to be in the younger age group, which is particularly vulnerable to STIs and consequent health problems [5,15].

The aim is to assess the knowledge and attitudes regarding STIs. The targets of this research were male medical students in Riyadh, Saudi Arabia. The rationale behind this choice is that in the conservative Saudi society, discussing STIs is prohibited based on social factors. Due to that, information and knowledge and other risk factors regarding STIs in Saudi society are remarkably limited. Therefore, in this research, we tried to evaluate the limitation in knowledge about STIs among Saudi male medical students. Moreover, medical students are future physicians who are perceived to be knowledgeable, skillful, and expected to encounter all kinds of pathologies in their medical practice, including STIs [19].

Methods

This is a cross-sectional, survey-based study that was conducted in three universities in Riyadh, Saudi Arabia: King Saud Bin Abdulaziz University for Health Sciences (KSAU-HS), King Saud University (KSU), and Alfaisal University. King Saud University is the oldest university

in the kingdom founded in 1957. In addition to being the first in the kingdom, it has the largest number of enrollments, which exceeds 55,000 students across all disciplines. The participants in this study are majors from the medical specialties. More than 6,000 students attend King Saud Bin Abdulaziz University for Health Sciences and 734 of those students are in medical specialties. Alfaisal University has approximately 4,000 students in different colleges and specialties. These universities follow the same educational guidelines provided by the Ministry of Education.

The sample size was estimated using an online tool with a confidence interval of 95%, and a 5% margin of error. A total of 387 medical students enrolled in this study. All students from different academic years were approached and encouraged to participate in this study. Female students were excluded from the study because of the difficulty to approach them, due to the cultural and social norms. Distribution of the questionnaire took place in May 2018. Consecutive sampling was utilized to collect the data.

A validated, self-administered questionnaire was adapted from the International AIDS questionnaire–English version and other relevant KAP studies [20–22]. The first section included the demographic profile, followed by a section about the knowledge of STIs. The second section consisted of attitude-related questions and the third section had nine items regarding attitudes.

Data collection and entry were carried out using Microsoft Excel. Extraction and analysis of data were carried out by SPSS version 22. Categorical variables, such as year and university name, were presented as frequencies and percentages. Continuous variables were presented as mean and standard deviation. The data are summarized as tables. The overall knowledge scores were computed for all the correct answers: the maximum score was 7, whereas the minimum score was 0. The maximum score for the attitude items was 27 and the minimum score was 9. Based on the sample’s mean scores, the cut-off points for those having sufficient knowledge were above the mean score, while those having insufficient knowledge were below the mean score. The same procedure was applied for the attitude scores. Chi-squared test was carried out to assess the association of the profile of participants with the knowledge and attitude levels. A p -value < 0.05 was considered significant for all the tests conducted. Ethical approval for this study was obtained from King Abdullah International Research Center (KAIMRC), reference number SP18/080/R.

Results

Profile of participants

Table 1 shows that a total of 387 students completed the survey. Students in their third academic year had the highest number of participants, 97 students (25%). Students in their basic science phase had a total of 193

Table 1. Demographic data of the participants.

Variables	Category	N	%
Academic Year	First year	71	18%
	Second year	61	16%
	Third year	97	25%
	Fourth year	96	25%
	Fifth year	33	9%
	Sixth year	29	8%
Academic Phase	Phase 1 (Preparatory year)	132	34%
	Phase 2 (Basic Sciences)	193	50%
	Phase 3 (Clinical)	62	16%
University	King Saud University	142	37%
	King Saud bin Abdulaziz University for Health Sciences	159	41%
	Al Faisal University	86	22%
Type of School	Public	301	78%
	Private	86	22%

(50%) students participating in this study, followed by 132 preparatory year students (34%). The highest number of participating students was 159 (41%), who belonged to King Saud Bin Abdulaziz University for Health Sciences. The majority of the students, 301 students (78%), were enrolled in public universities, while the remaining 86 (22%) belonged to a private university.

Knowledge about STIs

As Table 2 shows, 374 (97%) participating students reported that they have heard of STIs. HIV/AIDS was the most correctly identified STI by 383 (99%) students, followed by syphilis, which was identified by 370 (96%) students. When asked about causative organisms, 382 correctly identified viruses (99%) and 349 identified bacteria (90%) as possible organisms. However, only 193 students identified fungi (50%) and 152 failed to identify parasites (39%) as a causative organism. Unprotected sex was the most identified mode of transmission by 382 students (99%). Regarding the symptoms, ulcers (96%) and discharge (96%) were the most identified symptoms by 371 participants. Infertility (76%) and cervical cancer (76%) were the most correctly identified complications by 295 and 294 participants, respectively. However, 183 participants failed to identify ectopic pregnancy (47%) and 177 failed to identify stillbirth (46%) as possible complications. When asked about the factors that influence contracting STIs, 361 correctly identified condoms (93%) and 358 correctly identified multiple sexual partners (93%). In addition, 227 students picked monogamy (59%) and 217 picked IV drug abuse (56%) as possible factors. However, 128 participants failed to correctly answer sexual abstinence (33%).

Attitudes about STIs

As shown in Table 3, the majority of the students, 376 (97%) and 371 (96%), agreed that condoms protect people against STIs. In addition, 358 participants agreed that screening for STIs is good (93%), especially 381 agreed to screening before marriage (99%). Interestingly, only 228 (59%) agreed that exposure to pornographic materials can contribute to risky sexual practices. When asked about concerns of contracting STIs, 214 disagreed (56%) to having concerns. In addition, 226 (59%) agreed that STIs are problems they have given much thought to. However, 369 (96%) agreed that if they notice symptoms of STIs in their partners, they will advise them to seek treatment immediately.

Association of the demographic profile with the knowledge and attitude

Table 4 shows the association of knowledge and attitude with the demographic data. Several variables, like class, phase, name of university, and type of school, were significantly associated with the level of knowledge ($p < 0.001$). Third-year students had the lowest level of sufficient knowledge compared to their peers from other classes. Additionally, Phase 2 students also had a low level of knowledge compared to students from Phases 1 and 3. Moreover, students from King Saud Bin Abdulaziz University of Health Sciences had a higher level of knowledge compared to students from King Saud University. With regard to the type of school, private schools were significantly associated with having a higher level of knowledge compared to public schools. No significant associations were found between demographics and attitudes.

Table 2. Description of the knowledge questions.

Items	Incorrect Answer n (%)		Correct Answer n (%)	
Have you ever heard of STDs?	13	3%	374	97%
Which of the following is an STD?				
Syphilis	17	4%	370	96%
Genital herpes	40	10%	347	90%
Trichomoniasis	195	50%	192	50%
Chlamydia	99	26%	288	74%
HIV/AIDS	4	1%	383	99%
Hepatitis B	124	32%	263	68%
Hepatitis C	154	40%	233	60%
What are the causative organisms of STDs?				
Bacteria	38	10%	349	90%
Virus	5	1%	382	99%
Fungi	194	50%	193	50%
Parasite	235	61%	152	39%
What are the routes of transmission of STDs?				
Needles and syringes	61	16%	326	84%
Blood products	50	13%	337	87%
Unprotected sexual	5	1%	382	99%
Mother to child	50	13%	337	87%
What are the symptoms of STDs?				
Weight loss	191	49%	196	51%
Ulcers	16	4%	371	96%
Burning	183	47%	204	53%
Discharge	16	4%	371	96%
Wound/sore	58	15%	329	85%
Body rash	116	30%	271	70%
Swelling	95	25%	292	76%
Sore throat	216	56%	171	44%
Gland fever	132	34%	255	66%
No symptoms	233	60%	154	40%
What are the complications of STDs?				
Infertility	92	24%	295	76%
Cervical cancer	93	24%	294	76%
Body weakness	105	27%	282	73%
Ectopic pregnancy	204	53%	183	47%
Still birth	210	54%	177	46%
What factors can increase or decrease the chances of STDs?				
Condoms	26	7%	361	93%
Monogamy	160	41%	227	59%
IV drugs abuse	170	44%	217	56%
Multiple sexual partners	29	8%	358	93%
Sexual abstinence	259	67%	128	33%

Discussion

This study aimed to assess the knowledge and attitude of medical students through a survey at a point in time.

This provides some insight into the level of knowledge about STIs, their modes of transmission, symptoms, and practices relating to them in male medical students at different years of study in medical schools. The data

Table 3. Attitudes of the participants about sexually transmitted infections.

Items	*Strongly disagree		*Strongly agree	
	n (%)		n (%)	
I feel condoms protect people against STDs	11	3%	376	97%
I feel condoms play an important role in preventing STDs	15	4%	371	96%
I feel screening for STDs is good	28	7%	358	93%
I feel screening for STDs before marriage is important	5	1%	381	99%
I think watching/reading pornographic materials can contribute to risky sexual practices	158	41%	228	59%
In my opinion, I feel STDs can cause death if left untreated	40	10%	345	90%
I am worried about contracting STDs	214	56%	171	44%
The STD problem is something that I have not given much thought to	160	41%	226	59%
If I notice symptoms of STDs in my partner, I will advise him/her to seek treatment immediately	17	4%	369	96%

Table 4. Associations between university students' knowledge level and their sociodemographic characteristics.

Variables	Knowledge level					Attitude level				
	Good (%)		Poor (%)		p-value	Positive attitude (%)		Negative attitude (%)		p-value
Academic year										
First year	37	(52)	34	(48)	<0.001	44	(62)	27	(38)	0.166
Second year	43	(71)	18	(30)		32	(53)	29	(48)	
Third year	32	(31)	65	(67)		52	(54)	45	(46)	
Fourth year	59	(62)	37	(39)		45	(47)	51	(53)	
Fifth year	22	(67)	11	(33)		19	(58)	14	(42)	
Sixth year	24	(83)	5	(17)		21	(72)	8	(28)	
Phase										
Phase 1 (Preparatory)	80	61%	52	39%	<0.001	76	58%	56	42%	0.112
Phase 2 (Basic Sciences)	91	47%	102	53%		97	50%	96	50%	
Phase 3 (Clinical)	46	74%	16	26%		40	65%	22	36%	
KSU	66	(47)	76	(54)	<0.001	77	(54)	65	(46)	0.66
KSAUHS	88	(55)	71	(45)		85	(54)	74	(47)	
Alfaisal University	63	(73)	23	(27)		51	(59)	35	(41)	
Public	154	51%	147	49%	<0.001	162	54%	139	46%	0.367
Private	63	73%	23	27%		51	59%	35	41%	
Chi-squared test used.										

gathered during this research revealed that there are disparities in participants' knowledge on different STIs and the causative agents of these STIs. The findings of knowledge gaps echoed the results from similar studies on the knowledge of STIs among the Saudi population [23,24]. These disparities were noted as expected, as different STIs received varying amounts of attention [23,24]. They extended even into university years, as the attention during university-mandated lectures and seminars was not equal for different types of STIs as shown by other studies which focused on university-level students [24]. For example, the participants scored high scores when asked if syphilis, genital herpes, and HIV were STIs, with 370 (96%), 347 (90%), and 383 (99%) participants correctly answering the question, respectively. On the contrary, only 192 (50%) of the participants were able to correctly identify trichomoniasis

as an STI, which is in-line with previous studies [25]. In addition, Hepatitis B and C and chlamydia were correctly identified as STIs by 263 (68%), 233 (60%), and 288 (74%) participants, respectively. Nationwide awareness campaigns launched on the dangers and nature of HIV could explain its near-perfect answers [26,27]. High scores on syphilis and genital herpes questions could be caused by several factors, including the mention of syphilis in the medical curriculum, in its relation to neuropathy, as well as the presence of the word genital in genital herpes. With regard to the organisms causing STIs, bacteria and viruses were identified by 349 (90%) and 382 (99%) participants, respectively. However, fungi and parasites were identified by only 193 (50%) and 152 (39%) participants, respectively. The low score on fungi being the causative agents in STIs could be explained by the rarity in which these infections occur

when compared to other organisms [28]. Infections, such as vaginal candidiasis, can occur as an STI as well as an overgrowth of the normal presence of candidiasis in the female genital tract [29]. Furthermore, when asked about trichomoniasis, 192 (50%) participants identified it as an STI. However, only 152 (39%) participants identified parasites as a causative organism, pointing to the fact that many participants did not know that trichomoniasis was actually a protozoa which made it a parasitic infection. Data on symptoms of STIs showed similar disparities between the commonly associated symptoms of STIs and symptoms that overlapped with other common infections. For example, ulcers and genital discharge were identified by most participants, as they are strongly linked to sexually transmitted infections due to their location and nature. On the other end of the spectrum, symptoms such as burning, sore throat, or having no symptoms at all were identified by a much smaller percentage of the participants, 204 (53%), 171 (44%), and 154 (40%), respectively, to be specific. The reasoning behind these low scores could be explained by the overlapping of these symptoms, or lack thereof, with other common conditions, such as the common cold and other common infections. Moreover, the false belief that STIs always cause symptomatic manifestations to occur and the lack of symptoms indicates the absence of such infections [23]. With regard to the routes of transmission, 326 (84%) participants correctly identified all the routes in which STIs disseminate in the survey. However, the factors that affect the risk of contracting STIs were not well identified by the participants. The use of protection in the form of condoms and having multiple sexual partners were identified as factors affecting the risk by 361 and 358 (93%) participants, respectively. On the contrary, IV drug abuse was identified by only 217 (56%) participants, indicating a lack of knowledge in the alternative routes in which these infections can be transmitted. As for the complications of STIs, the identification rates were below expectation. Specifically, the risk of having ectopic pregnancies and stillbirths was only identified by 183 (47%) and 177 (46%) participants, respectively. These numbers indicate a poor knowledge base of the long-term consequences for patients with STIs. Medical curriculums could have flaws when it comes to providing students with knowledge that goes beyond diagnostic skills and treatments. The data on the attitudes of the participants showed similar disparities to the ones found in the knowledge section. Virtually, all participants strongly agreed on the importance of condoms in the protection against STIs and their role in preventing transmission. This is not surprising, since condoms have received considerable attention in popular cultures, as well as in a lot of watched content either as movies or TV shows. This high-profile attention has provided decent knowledge on the basic form and function of condoms. The participants responded very positively to the importance of testing for STIs, whether it is regular screening, screening before marriage, or screening for STI symptoms in their partner. However,

this is expected since testing for STIs is a non-invasive process and is required by law in Saudi Arabia before marriage. This effect could be amplified in the study population, as they are medical students and have a higher understanding of these screening tests when compared to the general population. One problematic finding, however, was that 226 (59%) participants did not give much thought to STIs as a problem. This is problematic because this issue is one of the largest public health concerns worldwide and should be presented to medical students early in order to fully comprehend the extent of the problem, and it was the recommendation of a previous study carried out on non-medical university students [24]. The knowledge and attitude scores were different among the participants of various educational levels. The improvement in knowledge scores did not follow the expected linear improvement method. The participants in the second year scored significantly higher in having good knowledge, 43 (71%) students, compared to their colleagues in the third year, 32 (31%) students. This discrepancy in the distribution of scores can be explained by the placement of reproductive system-focused blocks. Hence, the students who took these blocks recently scored higher than their colleagues who were one level higher and had been taking other blocks. For example, 65 (67%) participants of the third year showed significant knowledge insufficiency compared to participants from other levels. All years, after the third year, showed linear improvement without any significant discrepancy. There was also a significant difference between the universities. Alfaisal University's participants scored significantly higher than their public university counterparts, KSU and KSAU-HS. This difference can be explained by the differing curriculums in the universities and the amount of focus each subject gets. Moreover, the number of participants from public universities was much higher and there was only one private university included which could have introduced a bias in the knowledge scores. In terms of attitude, participants showed an overall high level of negative attitude toward STIs, which comprised 45% of the overall answers in the survey. The data did not show any significant differences between the groups in terms of attitude. The data on attitude toward STI are similar to other studies carried out in the kingdom [23,27].

This study is an important initial step in gauging the knowledge and attitudes in the conservative population of Saudi Arabia. This study has several limitations. As a cross-sectional study, the data gathered are limited and cannot assess the cause and effect of associations. This study is also limited by its population, as only medical students from three universities were evaluated and there was no randomization in the sampling.

Conclusion

This study concludes that there are gaps in the knowledge of medical students about sexually transmitted infections in the specified universities in Riyadh, Saudi Arabia.

Third-year students had significantly insufficient knowledge compared to senior and junior students. The attitudes toward STIs were more positive and there were no significant differences between the three universities. More universities from different regions in the Kingdom of Saudi Arabia should be included in future researches to better assess the level of knowledge, attitudes, and behavior risk factors of STIs among male medical students.

List of Abbreviations

KSU King Saud University

KSAU-HS King Saud Bin Abdulaziz University for Health Sciences

STIs Sexually transmitted infections

Conflict of interest

The authors declare that they have no conflicts of interest.

Funding

None.

Consent for publication

Written consent was obtained from all the participants.

Ethical approval

This study was reviewed and approved by the Institutional Review Board (IRB) at King Abdullah International Medical Research Center (KAIMRC) (SP18/080/R).

Author details

Abdulaziz Abuabat^{1,3}, Abdulrahman Alfharhan^{1,3}, Raed Alahmari^{1,3}, Waleed Alanazi^{1,3}, Abdulaziz Aljaafary^{1,3}, Sajida Agha^{2,3}, Amir Omair^{2,3}, Nazish Masud^{2,3}

1. College of Medicine, King Saud Bin Abdulaziz University for Health Sciences Riyadh, Saudi Arabia
2. Department of Medical Education, College of Medicine, King Saud Bin Abdulaziz University for Health Sciences Riyadh, Saudi Arabia
3. King Abdullah International Medical Research Center Riyadh Saudi Arabia

References

1. Sexually transmitted infections (STIs). World Health Organization; 2019 [cited 2020 May 4]. Available from: [https://www.who.int/en/news-room/fact-sheets/detail/sexually-transmitted-infections-\(stis\)](https://www.who.int/en/news-room/fact-sheets/detail/sexually-transmitted-infections-(stis))
2. Kawado M, Hashimoto S, Ohta A, Oba M, Uehara R, Taniguchi K, et al. Estimating nationwide cases of sexually transmitted diseases in 2015 from sentinel surveillance data in Japan. *BMC Infect Dis*. 2020;20(1). <https://doi.org/10.1186/s12879-020-4801-x>
3. Shannon C, Klausner J. The growing epidemic of sexually transmitted infections in adolescents. *Curr Opin Pediatr*. 2018;30(1):137–43. <https://doi.org/10.1097/MOP.0000000000000578>
4. Definition of sexually transmitted disease [Internet]. Merriam-webster.com; 2020 [cited 4 May 2020]. Available from: <https://www.merriam-webster.com/dictionary/sexually%20transmitted%20disease>
5. Fageeh W. Awareness of sexually transmitted diseases among adolescents in Saudi Arabia. *J King Abdulaziz Univ Med Sci*. 2008;15(1):77–90. <https://doi.org/10.4197/Med.15-1.7>
6. Samkange-Zeeb F, Spallek L, Zeeb H. Awareness and knowledge of sexually transmitted diseases (STDs) among school-going adolescents in Europe: a systematic review of published literature. *BMC Public Health*. 2011;11(1). <https://doi.org/10.1186/1471-2458-11-727>
7. Wagenlehner F, Brockmeyer N, Discher T, Friese K, Wichelhaus T. The presentation, diagnosis, and treatment of sexually transmitted infections. *Deutsches Aerzteblatt Online*. 2016;113(1–2):11–22. <https://doi.org/10.3238/arztebl.2016.0011>
8. Guan J, Wu Z, Li L, Lin C, Rotheram-Borus M, Detels R, et al. Self-reported sexually transmitted disease symptoms and treatment-seeking behaviors in China. *AIDS Patient Care STDs*. 2009;23(6):443–8. <https://doi.org/10.1089/apc.2008.0204>
9. Jameson J, Kasper D, Fauci A, Hauser S, Longo D, Loscalzo J, et al. *Harrison's principles of internal medicine*. 18th ed. New York, NY: McGraw-Hill; 2012.
10. Genital herpes symptoms & treatment. Avert. 2019 [cited 2020 May 4]. Available from: <https://www.avert.org/sex-stis/sexually-transmitted-infections/herpes>
11. Filemban S, Yasein Y, Abdalla M, Al-Hakeem R, Al-Tawfiq J, Memish Z. Prevalence and behavioral risk factors for STIs/HIV among attendees of the Ministry of Health hospitals in Saudi Arabia. *J Infect Dev Ctries*. 2015;9(04):402–8. <https://doi.org/10.3855/jidc.5964>
12. Raheel H, Mahmood M, BinSaeed A. Sexual practices of young educated men: implications for further research and health education in Kingdom of Saudi Arabia (KSA). *J Public Health*. 2012;35(1):21–6. <https://doi.org/10.1093/pubmed/fds055>
13. Zin N, Ishak I, Manoharan K. Knowledge, attitude and practice towards sexually transmitted diseases amongst the inmates of women shelters homes at Klang Valley. *BMC Public Health*. 2019;19(S4). <https://doi.org/10.1186/s12889-019-6863-5>
14. Cutti S, Zaramella M, Pavesi L, Uglietti A, Malfitano A, Martinelli V, et al. Increasing awareness on HIV and STDs: a four-year program on high school in the Province of Pavia. *Eur J Public Health*. 2015;25(suppl_3). <https://doi.org/10.1093/eurpub/ckv175.179>
15. Farih M, Khan K, Freeth D, Meads C. Protocol study: sexual and reproductive health knowledge, information-seeking behaviour and attitudes among Saudi women: a questionnaire survey of university students. *Reprod Health*. 2014;11(1). <https://doi.org/10.1186/1742-4755-11-34>
16. AlQuaiz A, Kazi A, Al Muneef M. Determinants of sexual health knowledge in adolescent girls in schools of Riyadh-Saudi Arabia: a cross sectional study. *BMC Women's Health*. 2013;13(1). <https://doi.org/10.1186/1472-6874-13-19>
17. Al-Batanony M. Knowledge, attitude and practices about sexually transmitted infections/sexually transmitted

- diseases (STIs/STDs) among married employee ladies in Qassim Province, KSA. *Int STD Res Rev*. 2016;4(1):1–10. <https://doi.org/10.9734/ISRR/2016/26067>
18. Tork H, Al hosis K. Effects of reproductive health education on knowledge and attitudes among female adolescents in Saudi Arabia. *J Nurs Res*. 2015;23(3):236–42. <https://doi.org/10.1097/jnr.000000000000105>
19. Chew B, Cheong A. Assessing HIV/AIDS knowledge and stigmatizing attitudes among medical students in University Putra Malaysia. *Med J Malaysia*. 2013 [cited 2020 May 4];68(1):24–9. Available from: <https://europepmc.org/article/med/23466762>
20. Davis C, Sloan M, Macmaster S, Hughes L. The International AIDS Questionnaire-English Version (IAQ-E). *J HIV/AIDS Prev Children Youth*. 2007;7(2):29–42. https://doi.org/10.1300/J499v07n02_03
21. Sexual risk behaviors and academic achievement. Cdc.gov; 2009 [cited 2020 May 4]. Available from: https://www.cdc.gov/healthyyouth/health_and_academics/pdf/sexual_risk_behaviors.pdf
22. Drago F, Ciccarese G, Zangrillo F, Gasparini G, Cogorno L, Riva S, et al. A survey of current knowledge on sexually transmitted diseases and sexual behaviour in Italian adolescents. *Int J Environ Res Public Health*. 2016;13(4):422. <https://doi.org/10.3390/ijerph13040422>
23. Al-Afraa T, El-Tholoth H, Alqahtani F, Aljabri A, Alfaryan K, Alharbi F, et al. Knowledge and attitude about sexually transmitted diseases among youth in Saudi Arabia. *Urol Ann*. 2018;10(2):198. https://doi.org/10.4103/UA.UA_14_17
24. ALMalki B. Knowledge and awareness of sexually transmitted disease among male university students in Taif, Saudi Arabia. *Int J Med Sci Public Health*. 2014;3(3):342. <https://doi.org/10.5455/ijmsph.2014.070120141>
25. Sekirime W, Tamale J, Lule J, Wabwire-Mangen F. Knowledge, attitude and practice about sexually transmitted diseases among University students in Kampala. *Afr Health Sci*. 2001 [cited 2020 May 4];1(1). Available from: <http://www.bioline.org.br/pdf?hs01007>
26. Subbarao N, Akhilesh A. Knowledge and attitude about sexually transmitted infections other than HIV among college students. *Indian J Sex Transm Dis AIDS*. 2017;38(1):10. <https://doi.org/10.4103/0253-7184.196888>
27. Alwafi H, Meer A, Shabkah A, Mehdawi F, El-haddad H, Bahabri N et al. Knowledge and attitudes toward HIV/AIDS among the general population of Jeddah, Saudi Arabia. *J Infect Public Health*. 2018;11(1):80–4. <https://doi.org/10.1016/j.jiph.2017.04.005>
28. Report on global sexually transmitted infection surveillance. Apps.who.int; 2018 [cited 4 May 2020]. Available from: <https://apps.who.int/iris/bitstream/handle/10665/277258/9789241565691-eng.pdf?ua=1>
29. Willems H, Ahmed S, Liu J, Xu Z, Peters B. Vulvovaginal candidiasis: a current understanding and burning questions. *J Fungi*. 2020;6(1):27. <https://doi.org/10.3390/jof6010027>