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Knowledge, attitudes, and perception toward human papillomavirus among health profession students: A cross-sectional study in King Saud Bin Abdulaziz University for Health Sciences

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Abstract:

BACKGROUND: Human papillomavirus (HPV) infection is the major risk factor for cervical cancer (CC) in women of reproductive age. Despite advances in treatment and prevention of CC by HPV vaccination, very few women utilize them because of a lack of awareness about HPV.

MATERIALS AND METHODS: We conducted this cross-sectional study among Health Professions Students (HPS) at King Saud Bin Abdul Aziz University for Health Sciences, Jeddah. Data were collected using a predesigned and validated study questionnaire to assess the knowledge, attitude, and perception of HPS toward HPV.

RESULTS: A total of 580 HPS responded to the survey; 128 (22.1%) were male, while 452 (77.9%) were female with the mean age ± standard deviation 20.36 ± 1.74 years. There was no significant difference between males and females related to screening of HPV and CC (82.8%; 82.3%). A minority (30.3%) of participants thought that HPV infection leads to CC, while 38.3% did not know about it. Furthermore, knowledge about HPV screening and vaccination was poor.

CONCLUSIONS: Students from the college of medicine had more knowledge and awareness about HPV (34.9%, $P < 0.001$). Thus, it is important to implement effective education programs, curricular activities, and awareness campaigns for health professions to augment the learning process effectively.

Keywords:

Cancers, cervical, college of medicine, health professions, human papillomavirus, students

Introduction

Human papillomavirus (HPV) is one of the common sexually transmitted viral infections affecting the reproductive tracts in humans.[1,2] HPV infections are associated with about 99% of cervical cancer (CC) and other organ cancers such as vulva, anus, vagina, penis, oropharyngeal, and head and neck.[3-5] Out of the more than 150 strains described for HPV, around 40 types infect the human reproductive system and transmit sexually during skin-to-skin contact.[1,2] Infections with almost 14 different types of HPV result in various types of cancers. HPV types 16 and 18 associate with 70% of the CC, making them the high-risk types; however, some

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low-risk types– 6 and 11– cause genital warts and cervical lesions.[1,2,6,7]

The burden of HPV infections varies worldwide and depends on countries' geographic location and is modulated by various risk factors such as sexual behaviors, societal norms, and religious inclinations.[4,6,8] The secondary pivotal risk factors include smoking, drinking, multiple sexual partners, education level and system, nutrition, long-term oral contraceptive use, and immune system suppression.[8]

Worldwide CC ranks fourth common cancer in women after breast cancer (2·1 million cases), colorectal cancer (0·8 million), and lung cancer (0·7 million) in both incidence and mortality; and for the age group of 15-44, it ranks third common malignancy.[9,10] In 2018, the age-standardized incidence of CC was 13.1 per 100 000 women worldwide. The incidence, however, varied widely among countries, with the lowest incidence burden in Western Asia (Age-Specific Incidence Rate-ASIR <6 per 100,000), modest in Australia, New Zealand, Northern America, Western Europe, Northern Africa, Southern Europe, and Northern Europe (ASIR <10 per 100,000) and highest in Africa, Melanesia, Micronesia, Southeastern Asia, Eastern Europe, the Caribbean, and South America (ASIR ≥11–15 per 100 000).[9] CC is the leading cause of death in women in about 42 lower-resource countries, amounting to approximately 84% of all CCs cases and 88% of all deaths.[9-11] In the Kingdom of Saudi Arabia (KSA), the incidence of CC is very low, and it ranks 20th among other cancers with only 316 new cases and 158 deaths reported in 2018,[12] making it the sixth leading cause of cancer-related death in women aged 15–44 years.[11]

Furthermore, without any intervention, the ASIR of CC in the kingdom will increase by 100% to 120% by the end of 2025.[11] Since CC is one of the preventable gynecological cancers with an identifiable major risk factor of HPV infection. It is curable provided that the infection by high-risk HPV type is detected and established early. Thus, the knowledge and awareness about the various risk factors, infection by HPV, early warning signs and symptoms are crucial for early diagnosis. Many researchers have reported that the poor knowledge on the HPV and its link to CC, lack of awareness of the HPV vaccine as well as the perception of HPV being a sensitive topic are some of the important identifiable barriers for the early detection, diagnosis, and treatment of disease.[13,14] Furthermore, there is a huge gap in the knowledge and practice for HPV and CC screening programs among the general masses within the Gulf States and the Kingdom.[6,15-20] There is also a lack of structured national screening programs, which adds to the insult.[8,11,21] Numerous factors determine the worldwide acceptance and uptake of the vaccine, most importantly including the knowledge, social factors, religious beliefs, cultural practices, and attitudes.[11,14,19,20]

Health profession education is one of the best and trustworthy mediums to raise the general masses' awareness about the CC and its various risk factors, particularly HPV infection.[6,14,19] The future of health professional education is to invest sufficiently in the medical students and train them in concomitance with the culture and religious beliefs they are expected to serve to increase the effectiveness of the medical education program. Therefore, it becomes important for the educators to assess the awareness and knowledge of students to develop certain education and awareness policies in such a manner to effectively enhance their role as mediators between the healthcare system and the society they are serving. Such assessment enables the dispensation of education and awareness to the public and effectively can lead to better reception of screening programs and reduce the morbidity and mortality due to CC. As numerous studies carried in various regions across the KSA have reported poor awareness and knowledge regarding CC, its risk factors, HPV infection, and the availability of screening testing and vaccines.[6,8,11,14,19,20-23]

The objectives of this study were to assess the knowledge, awareness, and attitude of health professions students (HPS) in the King Saud Bin Abdul Aziz University for Health Sciences (KSAUHS), Jeddah, regarding the HPV, its infection, the screening methods available for the early detection of infection, and the vaccination for preventing its infection.

Materials and Methods

Study design and setting

This study is a descriptive type of research using a survey approach. The study was carried in between February and March 2020.

Study participants and sampling

The participants in this study were HPS. All students were indiscriminately selected, and a convenience sampling method was used for the selection. The sample size was calculated by using the Raosoft® software (website link: Www.raosoft.com/samplesize.html). The required sample size was calculated at the 90% confidence level with an estimated 50.0% prevalence of awareness regarding euthanasia and a margin of error ± 5%. With a total student population at College of Medicine (COM) =780, College of Nursing (CON) = 290, College of Science and Health Professions (COSHP) = 1100, and College of Applied Medical Sciences (CAMS) = 400). The total number of students in KSAU-HS, Jeddah

Campus being 2570. The necessary determined sample size was calculated to be 245; however, the final sample size of 350 was deemed the best representation of the study population (for 95% confidence levels) to account for the 10% nonresponse rate.

Ethical considerations

The study was approved by the Institutional Ethic and Research Board of KSAU-HS and King Abdullah International Medical Research Center (KAIMRC).

Data collection tool and technique

The data from the students were collected through an online survey using the Google Forms platform. The questionnaire was sent to all HPS via their official E-mail by the Students Affairs Departments of each College located within Jeddah campus. The questionnaire comprised three sections: Section A contained questions about the demographics, section B contained 09 statements regarding HPV, and section C contained 17 statements about screening for HPV and CC and HPV testing and vaccination [questionnaire is available on request]. Each survey question had three choices: "Yes" (True), "No" (False), and "Do Not Know."

Informed consent from all the participants was duly taken before participation, and participants were assured that all responses would remain confidential. The study involved a pre-designed questionnaire containing questions about HPV infections, their screening, and vaccination. The survey used was carefully developed after extensive literature.[3,6,17,24-26] Before its dispensation, a survey pilot test was conducted among a focal group of students for its validity, and changes were made according to the feedback received.

Statistical analysis

The data collected were tabulated, and analysis was performed using IBM SPSS Statistics for Windows, Version 20.0 (Armonk, NY: IBM Corp). Descriptive analyses were conducted for frequencies and percentages, and mean values were obtained for continuous data. The Chi-square test was used to compare categorical variables in the questionnaire (gender, level of education, college). $P < 0.05$ was accepted as statistically significant.

Results

Sociodemographic characteristics

A total of 580 students responded positively to the dispensed survey; of them, 128 (22.1%) were male, while 452 (77.9%) were female with a ratio of 1:0.28. The mean age of the respondents was 20.36 (standard deviation = 1.74). The demographic characteristics of the participants are presented in Table 1.

Table 1: Demographic data of the health profession students who took part in study

Variables	*n* (%)
Age	580
Mean±SD	20.36±1.74
Gender	
Male	128 (22.1)
Female	452 (77.9)
Marital status	
Single	556 (95.9)
Married	14 (2.4)
Divorced	8 (1.4)
Widow (er)	2 (0.3)
College	
COM	126 (21.7)
COSHP	154 (26.6)
CAMS	100 (17.2)
CON	200 (34.5)
Academic level	
First year	130 (22.4)
Second year	154 (26.6)
Third year	176 (30.3)
Fourth year	64 (11.0)
Fifth year	46 (7.9)
Sixth year	10 (1.7)
Total	580 (100.0)

SD=Standard deviation, COM=College of medicine, COSHP=College of Science and Health Professions, CAMS=College of Applied Medical Sciences, CON=College of nursing

Furthermore, 130 (22.4%) of the respondents were from the first year, 154 (26.6%) were from the 2nd year, 176 (30.3%) from the 3rd year, 64 (11.0%) from the 4th year, and 46 (7.9%) were from the 5th year, and 10 (1.7%) were from the 6th year of their academic level. In addition, 126 (21.7%) of the respondents represented COM, 154 (26.6%) were from COSHP, 100 (17.2%) from CAMS, and 200 (34.5%) from CON [Table 1].

Knowledge and awareness about human papillomavirus

Table 2 shows the reported knowledge and awareness of the participants regarding HPV. Statistical analysis revealed that approximately half of the participants (54.8%) knew that viruses are causal agents of cancers, and 46.9% of participants had heard of HPV. Moreover, around 52.4% believed that HPV infection affects both men and women, while 35.9% did not think it did so. Most of the participants did not think that HPV causes herpes or genital warts. 46.2% of respondents did not know that HPV can cause cancers; however, only a minority agreed to the statement that "HPV does not cause cancer." Only a minority (30.3%) of participants thought that HPV infection could cause CC, while 38.3% did not know about it. Most of the participants (45.2%) were not aware of the vaccination for HPV infection [Tables 3 and 4].

Table 2: Knowledge about human papillomavirus infections and relation to cancer

	n=580, *n* (%)
Viruses can cause cancer?	
Yes	318 (54.8)
No	118 (20.3)
Don't know	144 (24.8)
Ever heard of HPV	
Yes	272 (46.9)
No	206 (35.5)
Don't know	102 (17.6)
HPV infection can affect both women and men?	
Yes	304 (52.4)
No	68 (11.7)
Don't know	208 (35.9)
HPV is the virus that causes herpes?	
Yes	152 (26.2)
No	104 (17.9)
Don't know	324 (55.9)
HPV can cause genital warts?	
Yes	194 (33.4)
No	38 (6.6)
Don't know	348 (60.0)
HPV doesn't cause cancer?	
Yes	68 (11.7)
No	244 (42.1)
Don't know	268 (46.2)
Cervical cancer is caused by HPV infection?	
Yes	176 (30.3)
No	182 (31.4)
Don't know	222 (38.3)
HPV vaccination?	
Yes	198 (34.1)
No	262 (45.2)
Don't know	120 (20.7)
Have you ever heard of a gynaecological examination?	
Yes	262 (45.2)
No	230 (39.7)
Don't know	88 (15.2)
All married women aged 20-65 years should undergo screening	
Yes	392 (67.6)
No	68 (11.7)
Don't know	120 (20.7)
Screening helps in prevention of cervical cancer?	
Yes	442 (76.2)
No	42 (7.2)
Don't know	96 (16.6)
Screening causes no harm to the patient/client	
Yes	288 (49.7)
No	130 (22.4)
Don't know	162 (27.9)
Screening can help in early detection and better treatment	
Yes	478 (82.4)
No	24 (4.1)
Don't know	78 (13.4)

Contd...

Table 2: Contd...

	n=580, *n* (%)
Screening for cervical cancer is not expensive?	
Yes	134 (23.1)
No	76 (13.1)
Don't know	370 (63.8)
If screening is free and causes no harm, will you screen yourself?	
Yes	396 (68.3)
No	76 (13.1)
Don't know	108 (18.6)
Have you ever heard of Pap smear test?	
Yes	132 (22.8)
No	292 (50.3)
Don't know	156 (26.9)
Best time for doing pap smear test	
A week after period	170 (29.3)
During breastfeeding	2 (0.3)
During menstrual flow	30 (5.2)
During pregnancy	12 (2.1)
Not sure	366 (63.1)
What interval should pap smear test be done	
After menopause	28 (4.8)
6 monthly	80 (13.8)
Yearly	472 (81.4)
At what age do you think women should start to do pap smear test regularly?	
<20	96 (16.6)
20-35	224 (38.6)
36-50	212 (36.6)
51-65	48 (8.3)
Pap smear test should be done by	
Doctor	250 (43.1)
Trained nurse	58 (10.0)
Trained technician	272 (46.9)
In case of abnormality in Pap smear test, what should be done?	
Consult medical advice	262 (45.2)
Consult medical advice and leave it god	2 (0.3)
Do other co-tests	120 (20.7)
Leave it to god and pray	16 (2.8)
May be combination of all	2 (0.3)
Not sure	178 (30.7)
If the vaccine were to work at any age, would you accept the HPV vaccine for yourself?	
Yes	340 (58.6)
No	60 (10.3)
Don't know	180 (31.0)
If you are the decision maker, would you consent for your household women to receive the vaccine?	
Yes	338 (58.3)
No	48 (8.3)
Don't know	194 (33.4)
Pap smears are not necessary after vaccination with HPV vaccine	
Yes	66 (11.4)
No	146 (25.2)
Don't know	368 (63.4)

Contd...

Table 2: Contd...

	n=580, *n* (%)
Is it possible to prevent cervical cancer by HPV vaccine?	
Yes	348 (60.0)
No	38 (6.6)
Don't know	194 (33.4)

HPV=Human papillomavirus, Pap=Papanicolaou

Further analysis of the data revealed a significant difference in the knowledge and awareness among students at various colleges and levels for the same questions [Tables 4 and 5]. For many of the questions of the HPV section, COM students were able to answer the questions correctly, and as expected, the higher the level of education (year) higher was the probability of the students answering correctly. For example, the majority (60.3%) of COM students correctly answered no to the question "HPV does not cause cancer" as well the majority of them were aware that HPV causes CC, among them higher-level students being in the majority (up to 80%). Similarly, for the question "HPV can cause genital warts?" most COM students answered in affirmation and with 100% of 6th year students answering correctly. Furthermore, the majority (54.0%) of the COM students were aware of the HPV vaccination, with 80% of the 6th-year students being aware of it. Furthermore, about 62% of the COM students knew that HPV was a causal agent of CC, and this awareness was highest among 6th years' students as well (80%). Regarding the sources of knowledge of HPV, the majority of the participants answered self-learning, internet, and curriculum as the top three repositories of information [Figure 1].

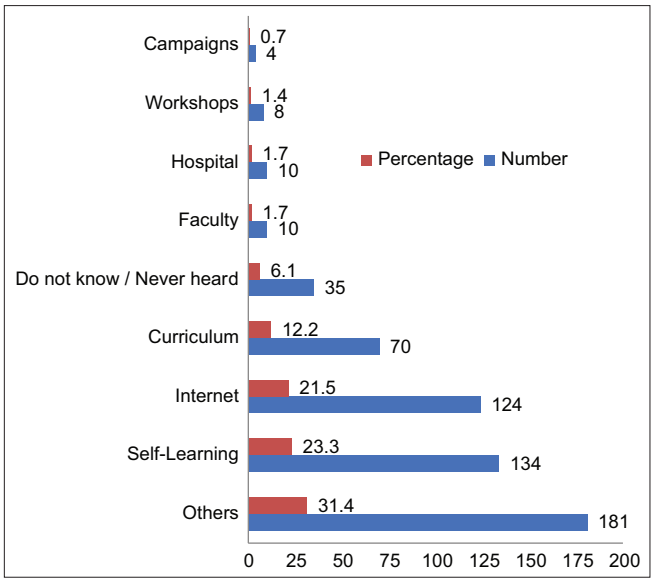

Figure 1: Source of Knowledge Regarding Human papillomavirus

Attitude toward human papillomavirus

Table 3 summarizes the participant's attitude and awareness regarding the Screening of HPV and CC and the availability of tests for screening HPV infection. Among the participants, only 45.2% had heard of gynecological screening, 67.6% agreed that all married women (20–65 years) should get screened for infection and CC. The majority (82.4%) of participants indicated that screening could help early detection and better treatment, but only half were sure that screening does not cause any harm to patients. Furthermore, the majority (76.2%) agreed that screening would help prevent CC; however, 63.8% did not know whether CC screening was expensive or not. Almost 70% of participants believed they would screen themselves provided the screening is free of cost and incur no harm.

Further analysis of the data revealed a significant difference among students at various colleges and levels for the attitude regarding screening of HPV and CC [Tables 4-6]. The majority (655%–96%) of COM students were aware of the gynecological examination, screening of married women, screening preventing CC, causing no harm, and being helpful in early detection and agreed to screen themselves. However, 61.9% of COM students did not know whether CC screening was expensive or not. Furthermore, the agreement and awareness showed an upward trend as the level of education increased, with most of the higher-level students possessing adequate knowledge about screening and its beneficial usage.

About the awareness and attitude about the HPV test and its availability, the majority of the participants were not at all aware of it, which is reflected in the responses to the questions "heard about Pap smear test," "best time to do Pap smear test," and "interval for Pap test." The majority of the participants (63.1%) were not sure about the timing of the Pap smear test, and only 29.3% were able to identify the correct option [A week after period; Figure 2]. Furthermore, only 22.8% of the participants had heard about the Pap smear test, and only 4.8% of participants had done the test. Most respondents thought that Pap smear tests should be done at yearly intervals. Almost 47% of participants said that trained technicians should ideally do a Pap smear. Forty-five percent of the participants said that medical consultation is needed if the test comes out positive, and only 20.7% opted to have co-test done as follow-up while 30.7% were not sure what to do in that scenario [Figure 3].In addition, only 12.4% of the female participants had undergone a Pap smear test, and only 6.2% had their Pap smear test results as abnormal [Figure 4]. Surprisingly, 58.6% of respondents agreed to have HPV vaccination done for themselves, and 58.3% agreed to provide consent for their household women to receive the vaccine, as 60.0% of the participants thought that CC is preventable. The

Table 3: Knowledge about human papillomavirus infections and relation to cancer as per gender and college of education

	Gender		*P*	College				*P*
	Male (%)	Female (%)		COM (%)	COSHP (%)	CAMS (%)	CON (%)	
Viruses can cause cancer?								
Yes	68.8	50.9	<0.001*	69.8	49.4	50.0	52.0	<0.001*
No	9.4	23.5		7.9	18.2	12.0	34.0	
Don't know	21.9	25.7		22.2	32.5	38.0	14.0	
Ever heard of HPV								
Yes	57.8	43.8	0.001*	73.0	31.2	38.0	47.0	<0.001*
No	34.4	35.8		23.8	54.5	48.0	22.0	
Don't know	7.8	20.4		3.2	14.3	14.0	31.0	
HPV infection can affect both women and men?								
Yes	57.8	50.9	0.206*	61.9	42.9	52.0	54.0	0.002*
No	7.8	12.8		6.3	19.5	6.0	12.0	
Don't know	34.4	36.3		31.7	37.7	42.0	34.0	
HPV is the virus that causes herpes?								
Yes	25.0	26.5	0.014*	19.0	31.2	12.0	34.0	<0.001*
No	26.6	15.5		39.7	3.9	12.0	18.0	
Don't know	48.4	58.0		41.3	64.9	76.0	48.0	
HPV can cause genital warts?								
Yes	40.6	31.4	0.087*	50.8	23.4	26.0	34.0	<0.001*
No	7.8	6.2		1.6	3.9	10.0	10.0	
Don't know	51.6	62.4		47.6	72.7	64.0	56.0	
HPV doesn't cause cancer?								
Yes	7.8	12.8	0.001*	9.5	11.7	10.0	14.0	0.001*
No	56.3	38.1		60.3	37.7	36.0	37.0	
Don't know	35.9	49.1		30.2	50.6	54.0	49.0	
Cervical cancer is caused by HPV infection?								
Yes	43.8	26.5	<0.001*	61.9	15.6	22.0	26.0	<0.001*
No	34.4	30.5		22.2	44.2	30.0	28.0	
Don't know	21.9	42.9		15.9	40.3	48.0	46.0	
HPV vaccination?								
Yes	39.1	32.7	0.331*	54.0	19.5	30.0	35.0	<0.001*
No	43.8	45.6		36.5	58.4	40.0	43.0	
Don't know	17.2	21.7		9.5	22.1	30.0	22.0	
Source of knowledge regarding HPV								
Self-learning	15.9	25.3	<0.001**	11.1	27.3	22.4	28.3	<0.001**
Curriculum	22.2	9.3		19.0	5.2	12.2	13.1	
Faculty	0.0	2.2		0.0	2.6	2.0	2.0	
Hospital	0.0	2.2		0.0	0.0	0.0	5.1	
Internet	15.9	23.1		22.2	27.3	26.5	14.1	
Workshops	1.6	1.3		0.0	2.6	0.0	2.0	
Campaigns	0.0	0.9		1.6	0.0	2.0	0.0	
Do not know/never heard	7.1	5.8		4.8	8.4	10.2	3.0	
Others	37.3	29.8		41.3	26.6	24.5	32.3	

*Chi-square test, **Fisher's-exact test. HPV=Human papillomavirus, COM=College of medicine, COSHP=College of Science and Health Professions, CAMS=College of Applied Medical Sciences, CON=College of nursing

attitude for these questions also followed the same trend, with most COM students agreeing to the statements. However, the majority of students (63.4%) did not know whether to have a Pap smear test after vaccination or not.

Discussion

This prospective cross-sectional study aimed to measure the levels of knowledge, awareness, and attitudes of Saudi HPS HPV, CC, screening, and the HPV vaccination. The results of our cross-sectional study found an average level of knowledge about HPV infections and their connection with CC.

Our study found that 318 (54.8%) had the knowledge that HPV infection leads to cancers. These results were much better than the ones reported from the KSA.[17,19,27] As infection by high-risk HPV type is one of the prime

risk factors for causing gynecological cancers, especially CC, 42.1% of the participants were aware of the association between HPV and cancers. However, only 30.3% of students answered in affirmation that HPV infection causes CC, which is much above what has been reported by similar studies earlier.[11,18,28] This established that KSAUHS students have moderate knowledge about HPV; however, HPV link to other noncancerous diseases like warts was unknown to them (33.4%). These observations were compared to the study by Holcomb *et al*.,[29] which demonstrated that 33.8% of the respondents were aware that HPV caused genital warts but lower than what Rajiah *et al*.,[30] had reported in his Malaysian study were 63.7% of respondents had correctly answered that HPV causes genital warts and higher than Al-Dubai *et al*., who reported that only 12.7% of participants correctly answered the question.[31]

The lack of awareness is not common only in the GCC region, but many studies worldwide have reported poor participants' knowledge about HPV role in CC carcinogenesis. A study from Poland by Kamzol *et al*. reported a dismal awareness about HPV and CC among 17–26-year-old students. They reported that students could not identify HPV as the etiological factor for CC.[32] Similarly, Notara *et al*.[33] reported that health caregivers in Greece had a significant gap in knowledge about HPV infection and its concomitant role in CC carcinogenesis. Kietpeerakool *et al*.[34] found very low knowledge of HPV among participants of Thailand. Furthermore, Kahn *et al*., in their study on Norway which found that 15% of the participants knew about HPV relationship to CC.[35] Furthermore, Rajiah *et al*., in their study among healthcare students, reported that around 80% of them identified HPV as a causal agent of CC and about 54.6% agreed that HPV infects both men and women equally, but only 37% of them considered HPV as a frequently occurring illness.[30]

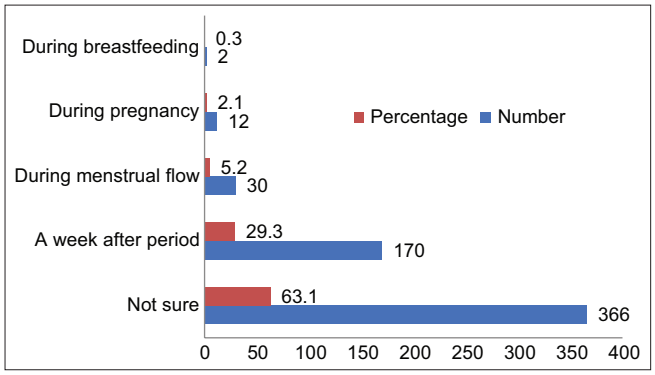

Figure 2: Best time for doing Pap smear test

Furthermore, 134 (23.3%), 124 (21.5), and 70 (12.2%) of participants stated that their source of knowledge was self-learning, the internet, and curriculum, respectively. These findings were relatively similar to results as reported by Al Shaman *et al*., Alnafisah *et al*., and Rajiah *et al*., in all of which the respondents had identified the mass media and the internet as their prime source of knowledge.[19,23,30] In contrast, a study from Bahrain[15] reported gynecologists as the primary source of information by respondents, and a study from Al-Ahsa, KSA reported that self-learning, curriculum, and internet be the first, second, and third top sources of information, respectively.[6] Hence, it becomes pertinent for medical educators to incorporate the curricular amendments to improve the knowledge and awareness of the students, about cancers and viral infection, early on in their health profession education. Health programs targeting the community have recently increased in KSA, targeting various sections of society, especially health professional

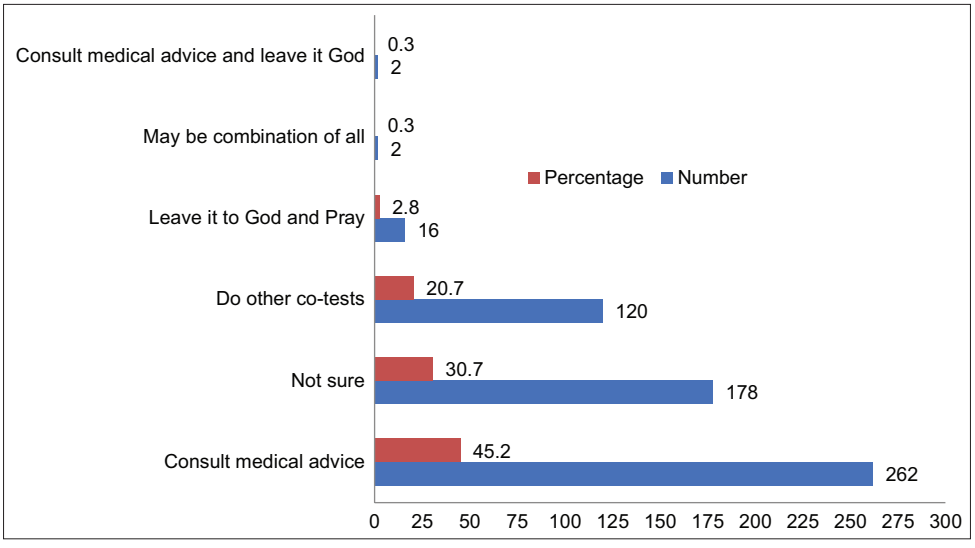

Figure 3: In case of abnormality in Pap smear test, what should be done?

Table 4: Knowledge about human papillomavirus infections and relation to cancer as per level of education

	Academic level						*P*
	First year (%)	Second year (%)	Third year (%)	Fourth year (%)	Fifth year (%)	Sixth year (%)	
Viruses can cause cancer?							
Yes	52.3	41.6	53.4	81.3	69.6	80.0	<0.001*
No	15.4	16.9	30.7	6.3	26.1	20.0	
Don't know	32.3	41.6	15.9	12.5	4.3	0.0	
Ever heard of HPV							
Yes	33.8	31.2	52.3	78.1	60.9	100.0	<0.001*
No	41.5	55.8	28.4	18.8	8.7	0.0	
Don't know	24.6	13.0	19.3	3.1	30.4	0.0	
HPV infection can affect both women and men?							
Yes	40.0	49.4	54.5	59.4	69.6	100.0	<0.001*
No	32.3	1.3	8.0	6.3	13.0	0.0	
Don't know	27.7	49.4	37.5	34.4	17.4	0.0	
HPV is the virus that causes herpes?							
Yes	24.6	16.9	29.5	28.1	39.1	60.0	<0.001*
No	15.4	6.5	19.3	34.4	30.4	40.0	
Don't know	60.0	76.6	51.1	37.5	30.4	0.0	
HPV can cause genital warts?							
Yes	23.1	20.8	37.5	50.0	52.2	100.0	<0.001*
No	9.2	5.2	5.7	6.3	8.7	0.0	
Don't know	67.7	74.0	56.8	43.8	39.1	0.0	
HPV doesn't cause cancer?							
Yes	7.7	13.0	13.6	3.1	21.7	20.0	<0.001*
No	50.8	23.4	38.6	65.6	52.2	80.0	
Don't know	41.5	63.6	47.7	31.3	26.1	0.0	
Cervical cancer is caused by HPV infection?							
Yes	15.4	19.5	33.0	56.3	52.2	80.0	<0.001*
No	33.8	44.2	27.3	15.6	21.7	20.0	
Don't know	50.8	36.4	39.8	28.1	26.1	0.0	
HPV vaccination?							
Yes	32.3	19.5	37.5	43.8	52.2	80.0	<0.001*
No	47.7	55.8	42.0	34.4	34.8	20.0	
Don't know	20.0	24.7	20.5	21.9	13.0	0.0	
Source of knowledge regarding HPV							
Self learning	37.5	19.5	21.8	6.3	26.1	20.0	<0.001**
Curriculum	4.7	1.3	18.4	21.9	30.4	20.0	
Faculty	0.0	3.9	2.3	0.0	0.0	0.0	
Hospital	3.1	0.0	2.3	0.0	4.3	0.0	
Internet	20.3	39.0	13.8	15.6	8.7	0.0	
Workshops	1.6	1.3	2.3	0.0	0.0	0.0	
Campaigns	0.0	0.0	1.1	3.1	0.0	0.0	
Do not know/never heard	2.3	14.3	3.4	6.3	0.0	0.0	
Others	30.5	20.8	34.5	46.9	30.4	60.0	

HPV=Human papillomavirus

students, but it has been mostly directed to diabetes, obesity, cardiovascular diseases, and breast cancer. Such activities mostly ignore CC and the role of HPV infection and its screening.[6,14,36]

Furthermore, in this study, we found that the level of education and the college of health profession were significantly related to the participants' knowledge about HPV infection, vaccination, the Pap smear test, and their attitudes toward screening for HPV infection and CC. Similar results were demonstrated by numerous studies in and around Saudi Arabia[28,37,38] but contrasted with a study from Bahrain.[15]

In the present study, the value of the screening in general and the significance of Pap smear as a screening tool for HPV infection and early detection of CC was recognized very well. About 45.2% of students had heard about a gynecological examination, 67.65% agreed that women should undergo screening, 76.2% believed that screening

Table 5: Knowledge, awareness and perception about human papillomavirus screening, tests, and vaccination as per gender and college of education

	Gender		*P*	College				*P*
	Male (%)	Female (%)		COM (%)	COSHP (%)	CAMS (%)	CON (%)	
Have you ever heard of a gynaecological examination?								
Yes	59.4	41.2	0.001*	69.8	45.5	38.0	33.0	<0.001*
No	29.7	42.5		22.2	39.0	46.0	48.0	
Don't know	10.9	16.4		7.9	15.6	16.0	19.0	
All married women aged 20-65 years should undergo screening								
Yes	56.3	70.8	0.002*	76.2	70.1	68.0	60.0	0.005*
No	12.5	11.5		6.3	7.8	10.0	19.0	
Don't know	31.3	17.7		17.5	22.1	22.0	21.0	
Screening helps in prevention of cervical cancer?								
Yes	75.0	76.5	0.930*	87.3	74.0	78.0	70.0	0.004*
No	7.8	7.1		3.2	6.5	4.0	12.0	
Don't know	17.2	16.4		9.5	19.5	18.0	18.0	
Screening causes no harm to the patient/client								
Yes	50.0	49.6	0.775*	65.1	51.9	40.0	43.0	<0.001*
No	20.3	23.0		15.9	20.8	18.0	30.0	
Don't know	29.7	27.4		19.0	27.3	42.0	27.0	
Screening can help in early detection and better treatment								
Yes	82.8	82.3	0.796*	96.8	80.5	86.0	73.0	<0.001*
No	3.1	4.4		0.0	3.9	0.0	9.0	
Don't know	14.1	13.3		3.2	15.6	14.0	18.0	
Screening for cervical cancer is not expensive?								
Yes	29.7	21.2	0.124*	31.7	20.8	12.0	25.0	0.006*
No	10.9	13.7		6.3	15.6	14.0	15.0	
Don't know	59.4	65.0		61.9	63.6	74.0	60.0	
If screening is free and causes no harm, will you screen yourself?								
Yes	53.1	72.6	<0.001*	74.6	74.0	64.0	62.0	0.005*
No	26.6	9.3		15.9	7.8	18.0	13.0	
Don't know	20.3	18.1		9.5	18.2	18.0	25.0	
Have you ever heard of Pap smear test?								
Yes	29.7	20.8	0.101*	34.9	22.1	16.0	19.0	<0.001*
No	46.9	51.3		55.6	53.2	52.0	44.0	
Don't know	23.4	27.9		9.5	24.7	32.0	37.0	
Best time for doing Pap smear test								
A week after period	12.5	34.1	<0.001**	22.2	20.8	34.0	38.0	<0.001**
During breastfeeding	0.0	0.4		0.0	0.0	0.0	1.0	
During menstrual flow	3.1	5.8		1.6	3.9	2.0	10.0	
During pregnancy	1.6	2.2		0.0	1.3	0.0	5.0	
Not sure	82.8	57.5		76.2	74.0	64.0	46.0	
What interval should Pap smear test be done								
After menopause	4.7	4.9	0.253*	0.0	3.9	4.0	9.0	<0.001*
6 monthly	9.4	15.0		7.9	10.4	6.0	24.0	
Yearly	85.9	80.1		92.1	85.7	90.0	67.0	
At what age do you think women should start to do Pap smear test regularly?								
<20	10.9	18.1	0.081*	6.3	20.8	12.0	22.0	<0.001*
20-35	39.1	38.5		47.6	35.1	44.0	33.0	
36-50	37.5	36.3		36.5	33.8	44.0	35.0	
-	12.5	7.1		9.5	10.4	0.0	10.0	
Pap smear test should be done by								
Doctor	39.1	44.2	0.251*	47.6	51.9	32.0	39.0	<0.001*

Contd...

Table 5: Contd...

	Gender		*P*	College				*P*
	Male (%)	Female (%)		COM (%)	COSHP (%)	CAMS (%)	CON (%)	
Trained nurse	7.8	10.6		7.9	6.5	4.0	17.0	
Trained technician	53.1	45.1		44.4	41.6	64.0	44.0	
In case of abnormality in Pap smear test, what should be done?								
Consult medical advice	37.5	47.3	0.032**	46.0	49.4	52.0	38.0	<0.001**
Consult medical advice and leave it	1.6	0.0		0.0	1.3	0.0	0.0	
Do other co-tests	26.6	19.0		31.7	15.6	24.0	16.0	
Leave it to God and pray	1.6	3.1		0.0	3.9	0.0	5.0	
May be combination of all	0.0	0.4		1.6	0.0	0.0	0.0	
Not sure	32.8	30.1		20.6	29.9	24.0	41.0	
If the vaccine were to work at any age, would you accept the HPV vaccine for yourself?								
Yes	57.8	58.8	0.443*	73.0	57.1	60.0	50.0	<0.001*
No	7.8	11.1		1.6	9.1	4.0	20.0	
Don't know	34.4	30.1		25.4	33.8	36.0	30.0	
If you are the decision maker, would you consent for your household women to receive the vaccine?								
Yes	67.2	55.8	0.017*	74.6	61.0	60.0	45.0	<0.001*
No	3.1	9.7		0.0	10.4	2.0	15.0	
Don't know	29.7	34.5		25.4	28.6	38.0	40.0	
Pap smears are not necessary after vaccination with HPV vaccine								
Yes	6.3	12.8	0.044*	3.2	10.4	4.0	21.0	<0.001*
No	31.3	23.5		28.6	28.6	24.0	21.0	
Don't know	62.5	63.7		68.3	61.0	72.0	58.0	
Is it possible to prevent cervical cancer by HPV vaccine?								
Yes	67.2	58.0	0.080*	73.0	66.2	62.0	46.0	<0.001*
No	3.1	7.5		1.6	7.8	2.0	11.0	
Don't know	29.7	34.5		25.4	26.0	36.0	43.0	

*Chi-square test, **Fisher's-exact test. HPV=Human papillomavirus, COM=College of medicine, COSHP=College of Science and Health Professions, CAMS=College of Applied Medical Sciences, CON=College of nursing, Pap=Papanicolaou

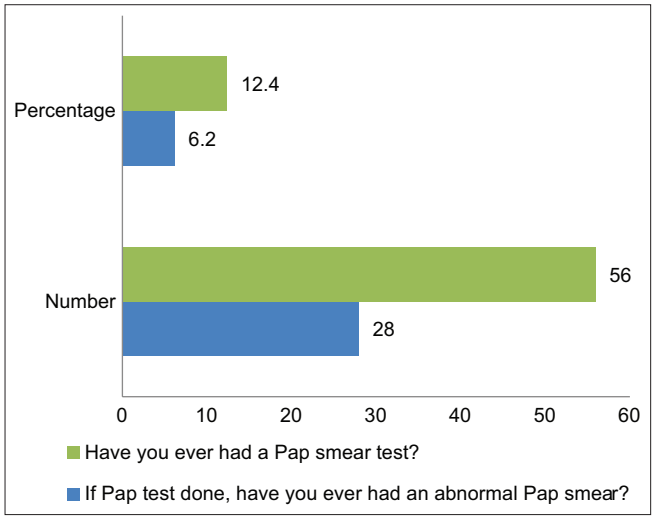

Figure 4: Responses in affirmation for the Pap Smear Test

helps in the prevention of CC, 82.4% believed screening helps in early detection and better treatment, and 68.3% agreed to undergo screening provided it is free and harmless. These findings were in sharp contrast to many similar studies carried out across Saudi Arabia, which reported a poor attitude toward screening[18] but were in tune with the study from Al Qassim.[19] In addition, in the current study, contritely, most of the students had not heard about the Pap smear test for HPV infections and were unsure when to do it as only 29.3% identified a correct test timing (a week after the period), and 38.6% said that testing should be started at 20–35 age period, although most of them identified that trained technicians should do the test. These observations were like the results reported by Jassim *et al*., and Jradi and Bawazir,[15,18] in which both reported low awareness of participants about the Pap smear test, in contrast to the awareness that Sait[14] had reported among the women participants in his study to be 67.6%.

Furthermore, in this study, the majority of the students displayed a willingness to receive HPV vaccination, expressed their decision to get their household women also vaccinated if they were the decision-makers,

Table 6: Knowledge, awareness and perception about human papillomavirus screening, tests, and vaccination as per level of education

	Academic level						*P*
	First year (%)	Second year (%)	Third year (%)	Fourth year (%)	Fifth year (%)	Sixth year (%)	
Have you ever heard of a gynaecological examination?							
Yes	35.4	45.5	43.2	53.1	56.5	100.0	<0.001*
No	40.0	44.2	38.6	37.5	39.1	0.0	
Don't know	24.6	10.4	18.2	9.4	4.3	0.0	
All married women aged 20â€“65 years should undergo screening							
Yes	66.2	75.3	63.6	65.6	56.5	100.0	0.029*
No	13.8	5.2	14.8	9.4	21.7	0.0	
Don't know	20.0	19.5	21.6	25.0	21.7	0.0	
Screening helps in prevention of cervical cancer?							
Yes	69.2	80.5	77.3	78.1	73.9	80.0	0.015*
No	10.8	2.6	5.7	6.3	17.4	20.0	
Don't know	20.0	16.9	17.0	15.6	8.7	0.0	
Screening causes no harm to the patient/client							
Yes	40.0	46.8	51.1	53.1	65.2	100.0	<0.001*
No	30.8	13.0	23.9	25.0	26.1	0.0	
Don't know	29.2	40.3	25.0	21.9	8.7	0.0	
Screening can help in early detection and better treatment							
Yes	75.4	85.7	85.2	81.3	78.3	100.0	0.001*
No	10.8	0.0	3.4	0.0	8.7	0.0	
Don't know	13.8	14.3	11.4	18.8	13.0	0.0	
Screening for cervical cancer is not expensive?							
Yes	20.0	11.7	21.6	34.4	47.8	80.0	<0.001*
No	18.5	11.7	13.6	6.3	8.7	20.0	
Don't know	61.5	76.6	64.8	59.4	43.5	0.0	
If screening is free and causes no harm, will you screen yourself?							
Yes	64.6	74.0	69.3	59.4	65.2	80.0	0.314*
No	12.3	11.7	13.6	12.5	17.4	20.0	
Don't know	23.1	14.3	17.0	28.1	17.4	0.0	
Have you ever heard of Pap smear test?							
Yes	20.0	18.2	13.6	37.5	43.5	100.0	<0.001*
No	49.2	57.1	54.5	46.9	30.4	0.0	
Don't know	30.8	24.7	31.8	15.6	26.1	0.0	
Best time for doing Pap smear test							
A week after period	24.6	24.7	36.4	18.8	39.1	60.0	0.001**
During breastfeeding	1.5	0.0	0.0	0.0	0.0	0.0	
During menstrual flow	7.7	2.6	5.7	3.1	8.7	0.0	
During pregnancy	4.6	0.0	1.1	6.3	0.0	0.0	
Not sure	61.5	72.7	56.8	71.9	52.2	40.0	
What interval should Pap smear test be done							
After menopause	3.1	2.6	8.0	6.3	0.0	20.0	0.002*
6 monthly	13.8	14.3	12.5	6.3	30.4	0.0	
Yearly	83.1	83.1	79.5	87.5	69.6	80.0	
At what age do you think women should start to do Pap smear test regularly?							
<20	33.8	13.0	10.2	12.5	8.7	20.0	<0.001*
20-35	40.0	37.7	33.0	43.8	47.8	60.0	
36-50	21.5	41.6	45.5	37.5	30.4	20.0	
51-65	4.6	7.8	11.4	6.3	13.0	0.0	
Pap smear test should be done by							
Doctor	47.7	42.9	36.4	34.4	60.9	80.0	<0.001*
Trained nurse	13.8	2.6	11.4	12.5	17.4	0.0	
Trained technician	38.5	54.5	52.3	53.1	21.7	20.0	
In case of abnormality in Pap smear test, what should be done?							

Contd...

Table 6: Contd...

	Academic level						*P*
	First year (%)	Second year (%)	Third year (%)	Fourth year (%)	Fifth year (%)	Sixth year (%)	
Consult medical advice	38.5	55.8	48.9	37.5	26.1	40.0	<0.001**
Consult medical advice and leave it	1.5	0.0	0.0	0.0	0.0	0.0	
Do other co-tests	10.8	23.4	13.6	34.4	43.5	40.0	
Leave it to God and pray	6.2	0.0	3.4	0.0	4.3	0.0	
May be combination of all	0.0	1.3	0.0	0.0	0.0	0.0	
Not sure	43.1	19.5	34.1	28.1	26.1	20.0	
If the vaccine were to work at any age, would you accept the HPV vaccine for yourself?							
Yes	50.8	64.9	59.1	62.5	52.2	60.0	<0.001*
No	10.8	3.9	14.8	0.0	26.1	20.0	
Don't know	38.5	31.2	26.1	37.5	21.7	20.0	
If you are the decision maker, would you consent for your household women to receive the vaccine?							
Yes	49.2	66.2	54.5	65.6	56.5	80.0	0.011*
No	15.4	5.2	6.8	3.1	13.0	0.0	
Don't know	35.4	28.6	38.6	31.3	30.4	20.0	
Pap smears are not necessary after vaccination with HPV vaccine							
Yes	10.8	6.5	14.8	3.1	26.1	20.0	<0.001*
No	32.3	19.5	25.0	21.9	21.7	60.0	
Don't know	56.9	74.0	60.2	75.0	52.2	20.0	
Is it possible to prevent cervical cancer by HPV vaccine?							
Yes	52.3	62.3	61.4	65.6	56.5	80.0	0.021*
No	7.7	7.8	4.5	0.0	17.4	0.0	
Don't know	40.0	29.9	34.1	34.4	26.1	20.0	

*Chi-square test, **Fisher's-exact test. Pap=Papanicolaou, HPV=Human papillomavirus

and agreed that it is possible to prevent CC by HPV vaccination (58.6%, 58.3%, and 60.0%, respectively). The positive attitude toward the vaccination was comparatively similar as reported by some studies across the world[11,19,30,39-44] but contritely higher than other western reports.[45,46] The high level of acceptability for vaccinations provides hope for the success of the screening and vaccination programs if implemented correctly, even in the predominantly conserved Islamic society, which is rife with cultural and religious taboos.[11,14,36,30,40]

However, this high level of acceptability does not guarantee equal translation into active vaccinations for HPV, as reported in various studies across diverse Muslim societies.[40,41,47,48] There are numerous perceived barriers to the vaccination process, and in a conserved society like Saudi Arabia, culture and taboos play a major role. Some of the important barriers are negative beliefs related to the screening itself, lack of knowledge and awareness about HPV infection and its role in CC, lack of information available for the vaccines, Islamic and cultural barriers in talking about gynecological or sexual diseases, personal inhibitions, financial issues.[11,19,40,41,43] Thus, it becomes necessary to design robust awareness campaigns and screening programs not only to promote knowledge and awareness about the disease – which helps in eliminating the negative perceptions, beliefs, and taboos – but also helps in the active participation by the society towards a better and successful health care system.[26,47,48]

Advances in Knowledge

1. Not many studies in Saudi Arabia have dwelled into the depth of HPV knowledge and awareness which this study has done
2. This study also identifies health profession education as a pivotal and trustworthy medium to raise the awareness of the general masses about the CC and its various risk factors particularly about HPV infection, as medicine students were more aware in this study
3. We also identify the need to implement effective education programs, curricular activities, and awareness campaigns for Health professions to augment the learning process effectively.

Application to patient care

1. Since CC is a preventable disease, early intervention and implementation of an adequate education program and curricular activities to increase the student's awareness would be a beneficial for patient care
2. Knowledge about the identifiable risk factors associated with HPV infections will allow early detection and reduce the disease burden

3. Awareness and practice for HPV and CC screening programs among the general masses will increase vaccination acceptance and augment the decrease in incidence
4. Awareness programs will also help eliminate the negative perceptions, beliefs, and taboos about CC and hence, a better and successful health care system.

Limitations

1. The sample population in this study were Health Profession students of Jeddah campus of KSAUHS, Saudi Arabia, and hence the results do not necessarily reflect that of the general population
2. Data collection questionnaire was an online self-administered one and hence had an inherent risk of recalling bias or contamination by the participating students.

Conclusion

The prevalence of HPV infection and hence CC is growing. Since KSA has a relatively young population, it has become imperative to implement an effective education program and curricular activities to increase the knowledge and awareness of the health profession students. In addition, it also becomes necessary to design robust awareness campaigns and screening programs to promote knowledge and awareness about the disease, which helps eliminate the negative perceptions, beliefs, and taboos and helps in active participation by society toward a better and successful health care system.

Ethical clearance

This study was approved by the Institutional Review Board of KAIMRC, a research wing of KSAU-HS, Jeddah (Reference No: RJ19/149/J; Dated: 22/12/2019).

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Nil.

Conflicts of interest

There are no conflicts of interest.

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