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Research Article

Human Papilloma Virus Knowledge and Acceptance of its National Immunization Program among Female University Students in Makkah Region

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Abstract

Background: Infection with Human Papilloma Virus (HPV) has been known as the primary cause of cervical cancer which is sexually transmitted disease. The association of cervical cancer with HPV infection is preventable by HPV vaccination. Despite the serious complications associated with HPV infection, the awareness and acceptance of HPV vaccination remain weak among the young female population.The aim of this study was to assess the knowledge gap regarding HPV infection and itsvaccination acceptance, and to investigate the barriers to accepting the HPV vaccination among female students in Makkah region.

Methods: This study was conducted using a self-administered cross-sectional closed-ended questionnaire from November 2022 to March 2023.A total 596 female students from various majors enrolled in universities in the Makkah region participated in this study. The collected data included knowledge of HPV infection and cervical cancer, acceptance of HPV vaccination, and demographic information. All data were analyzed using (SPSS) statistical software.

Results: Insufficient knowledge about HPV and its vaccination acceptance rate were observed among the female university students in Makkahregion (58% and 61%, respectively).The concerns about the vaccine's side effects and the fear of the injection were the main barriers to vaccination acceptance.

Conclusion: Raising awareness about HPV infection and cervical cancer by effective educational programs is extremely needed to increase the acceptance rate of HPV vaccination among female young population are highly recommended.

INTRODUCTION

Human Papillomavirus (HPV) is a double stranded DNA virus, found in humans are divided into five genera based on DNA sequence analysis (Bernard et al., 2010, Ekström et al., 2011). In recent years, it has become clear that many HPV types, including the majority of those contained within the Beta and Gamma genera, cause only asymptomatic infections in immunocompetent individuals and can be detected in skin swabs, and for some Gamma types, also in mucosal rinses (Ekström,et al., 2010). Twelve HPVs (16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, and 59) are defined by the World Health Organization (WHO) as being high-risk cancer-causing types with additional types (Licitra,et al., 2006, Bienkowska-Haba et al, 2009) Schiffman et al. 2009) being recognized as 'possibly' cancer-causing. Several other HPV types also belong to the high-risk clade based on evolutionary similarity to the known cancer-causing types (Muñoz et al., 2003, Schiffman et al. 2005).

Cervical cancer is ranked the fourth most common cancer among women worldwide. In 2021 , the number of newly diagnosed cases was estimated as 604,127 cases and 341,831 deaths were recorded as a result of cervical cancer worldwide (Bruni et al, 2023). Globally, the mortality rates of cervical cancer are substantially lower than the incidence, with a ratio of mortality to the incidence of 57 %, In Saudi Arabia, cervical cancer is considered the eighth most common cancer among the female population aged 15 to 44 years old (Bruni et al, 2023).

Cervical cancer is usually defined as an abnormal

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growth of cells in the cervix area, which is the lower, narrow uterine part that connects the uterus with the vagina. Most cases of cervical cancers begin in the transformation zone of the cervix. This particular area is composed of two types of cervical cells, glandular and squamous cells (American Cancer Society, 2020).

The transformation of normal cervical epithelium to malignant cells begins gradually and takes several years to turn into cancerous (Canavan & Doshi, 2000, Šarenac & Mikov , 2019) . During the early stage, most women remain asymptomatic without distinguishable signs. However, when cancer develops, several symptoms appear. For example, abnormal vaginal bleeding, abnormal vaginal secretions, or pain during sexual contact. Thus, cervical cancer progression can be prevented if pre - cancerous cells are detected early before they develop into cancerous cells by regular PAP smear screening tests (Canavan & Doshi, 2000, Mustafa, et al., 2023). The Pap smear screening test involves collecting cells from the surface of the cervix and examining them under a microscope (National Cancer Institute, 2022). If abnormal cells are detected, another test called the HPV test is performed on the same sample to detect the presence of the HPV, which is the major cause of cervical cancer (Ministry of Health, 2018; National Cancer Institute, 2022). If abnormal cells are detected, other histological and molecular tests are performed to confirm the presence of the HPV.

The severity of HPV is categorized into two types. The non-oncogenic or low-risk HPV (LR-HPVs), and the oncogenic or high-risk HPV type (HR-HPVs). LR-HPVs are associated with chronic anogenital warts (condyloma acuminate), oropharyngeal and conjunctival papilloma in infants and young children, recurrent respiratory papillomatoses, and mild dysplasia of the skin (Braaten & Laufer, 2008). While the HR-HPVs are more associated with high-grade dysplasia (HGD) and cervical cancer (Trottier & Burchell, 2009, Mustafa et al., 2023). The association of cervical cancer with HPV infection is preventable by the development of HPV vaccination (Braaten & Laufer, 2008, Sousa et al. 2018) and could be treated with neutron intracavitary brachytherapy (Wang, et al., 2024).

The HPV vaccine works as primary protection against several HPV genotypes. The known types of HPV vaccination are Gardasil, Gardasil 9, Cervarix, and Cecolin. They are all effective against high– risk HPV (16 and 18 genotypes), which is strongly related to cervical cancer (Gupta et al., 2017; Hirth, 2018). However, It has been demonstrated that the HPV vaccine Gardasil has a broad spectrum against HPV 6 and 11 genotypes, which cause genital warts and recurrent respiratory papillomatosis. About the age of the patient, HPV vaccination Cervarix and Gardasil are highly effective in females aged from 9 to 26 years who have never been exposed to HPV infection (World Health Organization, 2020b), whereas, Cecolin is recommended for women up to 45 years old (World Health Organization, 2020a).

HPV is a sexually transmitted infection. It is estimated that 40 % of HPV incidents are spread predominantly by direct sexual contact or skin-to-skin contact with an infected individual (Bosch et al., 2002) . In Western Asia, the prevalence of cervical HPV infection in the general population is estimated to be 2.5%, and HPVs are assumed to be responsible for 72% of invasive cervical cancer cases (Bruni et al, 2023). However, data on the HPV burden in the general population of Saudi Arabia is still scarce.

In Saudi Arabia, the Saudi Food and Drug Administration approved the HPV vaccines Cervarix and Gardasil for young women aged from 11 to 26 years in 2010. In addition, the HPV vaccine was incorporated into girls' routine vaccine schedule as it was published in the updated Saudi National Immunization Schedule in 2019. However, it remains optional for boys in the same age group (Farsi et al., 2021).

Despite the serious complications associated with HPV infection, college students globally have poor knowledge levels concerning HPV and it is related diseases (Charakorn et al., 2011; Chang et al., 2013, Almehmadi et al., 2019, Alhusayn et al. 2022, Easwaran et al. (2023)). Many studies including those conducted in Saudi Arabia , have highlighted the lack of awareness of HPV infection and cervical cancer among general populations, including students and health professionals (Al-Darwish et al., 2014; Almehmadi et al., 2019, Easwaran, et al., 2023). However, there are scarce studies on knowledge and awareness between females about HPV, its severity, protocols for the vaccination in different regions in KSA. Therefore, this study aims to assess the knowledge of HPV infection and the acceptance of HPV national immunization program among female university students in Makkah region and this is the first study to be designed for that goal.

MATERIALS AND METHODS

To evaluate University females'; attitudes towards and knowledge about HPV as well as vaccination against this infection in Makkah region, the following design of cross-sectional study was carried out .

Study design, population, and gathering of data

The current study used a self-administered cross-sectional closed-ended questionnaire. The population consisted of female students enrolled in Makkah region universities in Saudi Arabia. The survey was distributed in the form of interview questionnaire to all female students enrolled in Umm Al-Qura University, King Abdul Aziz University, Jeddah University, and Taif University. Being unwilling to participate of females and males were the exclusion criterion; participation was entirely voluntary. Female students who were at least 18 years old were given self-administered sur-

veys between November 2022 and March 2023. The questionnaires were completed by 596 students in total. The cluster sampling was used where random sampling to select just a proportion of the individuals within these chosen area . The surveys that were returned have all the answers. After explaining the study's aims to the students, written informed permission was obtained and information about respondents was kept completely private. The sample size was estimated at 596 students, given a confidence level of 85% and power test of 80% in line with the Kops et al. (2019).

The study questionnaire included three different sections. The first part was about demographic information such as age, nationality, marital status, university name, college type, and level of academic year. This was followed by a second section of 13 questions in total to assess participants' knowledge of HPV and its relationship with cervical cancer, knowledge about some possible signs, symptoms, and risk factors of HPV, knowledge of the Pap smear as a screening test, and knowledge of the HPV vaccine and its effectiveness. In addition, 5 questions to assess the participants' acceptance level of HPV vaccination and the possible barriers that prevent the students from obtaining the vaccine were included in the third section. All questions had three closed-ended answers: "yes", "no", and "I don't know". Correct responses received a score of one, while erroneous responses received a score of zero.

An interview questionnaire used in a prior study conducted in Riyadh was modified and altered for use in this investigation (Al-Shaikh et al., 2014) . The current questions were developed after a thorough examination of the literature (Tartaglia, et al, 2017, Sousa et al., 2018, Almehmadi et al., 2019, Palencia-Sánchez & Echeverry-Coral, 2020, Kops et al., 2021, Zuchelo , 2021, Alhusayn et al. 2022) and consultations with colleagues and professionals in the field of cervical cancer research. The validity of the survey was facilitated and guaranteed by this method. The authors of this study reviewed the document again to make sure the information gathered from the questionnaire was correct, credible, and suitable for the student population. Academic faculty from Umm Al-Qura University reviewed the items in the first phase for ambiguity and repetition. An impartial specialist translated the survey first into English and then back into Arabic to ensure its validity. In the second round, all questions were double-checked to ensure they covered topics including knowledge about HPV and its vaccination as well as, acceptance difficulties. To assess the readability of the questions and the clarity of the language, a pilot study with 30 female students was conducted. Using factorial analysis techniques, a factor analysis of the questions and answers was used to validate the questionnaire. The Cronbach's alpha coefficient was used to quantify consistency, and the κ technique was used to test intra-observer and inter-observer reliability.

Ethical Approval

This study was conducted in compliance with the Helsinki Declaration of 1975, as revised in 2000, and approved by the Biomedical Research Ethics Committee, at Umm Al-Qura University in March 2023, under approval number: HAPO-02-K-012-2023-03-1513. In addition, the study's aims were described to the students, and verbal informed consent was obtained from all participants.

Data analysis

All data were analyzed using IBM's Statistical Package for the Social Sciences (SPSS) version 22 software (IBM Corp., released in 2011). IBMSPSS Statistics for Windows, Version 22 (IBM Corp, Armonk, NY). Continuous variables were presented as mean ± standard deviation (SD), whereas categorical variables were expressed as frequencies (n) and percentages (%) and compared using the Chi-square test. The level of significance was fixed at 0.05 for all variables (P values 0.05). Participants were separated into groups based on demographic criteria such as age, nationality, participation, education, and age. The Chi-square test was used to test the demographic differences between participants who knew about HPV and its relationship with cervical cancer, and their acceptance of the HPV vaccine. Pearson correlation coefficient to test the relationship between variables (knowledge and acceptance).

The level of knowledge about HPV infection and cervical cancer was calculated by adding all item values; the total score varied from 0 to 13, with higher scores indicating a greater understanding of HPV and cervical cancer. Scores equal to or greater than 50% of the overall score were regarded as "good knowledge", while scores less than 50% were judged as "poor knowledge". The level of acceptance of HPV vaccination was also calculated by adding all item values; the total score varied from 0 to 4, with higher scores indicating a greater acceptance of HPV vaccine. When the respondents agreed on equal to or greater than 50% of the acceptance questions, scores were regarded "good acceptance", while when the respondents agree on less than 50% of the acceptance questions, scores were judged "poor acceptance".

RESULTS

A total of five hundred and ninety-six female students from different majors who studied at Makkah region universities consented to participate in this study. Table 1 presents the demographic characteristics of the participants.

The majority of students (91.9%, n=548) were between 18 and 23 years old, whereas 8.1% (n=48) of them were 24 years or above. Most of the participants (98%, n=584) were Saudi, while the rest (2%, n=12) were from other nationalities. Regarding their marital status, it showed that 92.6% (n=552) were single ,

and 5.2% (n=31) were married. Most of the study participants (91%, n=542) were recruited from Umm Al-Qura University. More than half of the students (61%, n=361) were enrolled in medical colleges, while 39.4% (n=235) were from non-medical specialties. The majority of the participants (64.8%, n=386) were in their first academic year, and 10.7% (n=64) were in their fourth year (Table 1).

Table 1: Demographic data of the respondents (n=596).

Variable	Groups	Number	%
1. Age	18-20	427	71.6
	21-23	121	20.3
	24-26	19	3.2
	Above 26	29	4.9
2. Nationality	Saudi	584	98
	Non Saudi	12	2
3. Marital Status	Single	552	92.6
	Engaged	9	1.5
	Married	31	5.2
	Divorced	3	0.5
	Widow	1	0.2
4. University	Umm Al-Qura	542	91
	King Abdul Aziz	30	5
	Jeddah	15	2.5
	Taif	9	1.5
5. College	Medical	361	60.6
	NonMedical	235	39.4
6. Academic Year	Year 1	386	64.8
	Year 2	49	8.2
	Year 3	36	6
	Year 4	64	10.7
	Year 5	26	4.4
	Year 6	35	5.9

Table. 2 revealed that in terms of knowledge about HPV, about half of the total respondents (50.4%, n=300) stated that they had heard of HPV. Students were more likely to have good awareness about the effects of HPV on female genitalia than its effects on male genitalia. About 64.6% (n=385) of respondents were unaware that sexual activity can transmit HPV. Furthermore, just 45% (n=268) of students knew that HPV could lead to genital warts. Moreover, more than half of respondents (55.9%, n=333) reported that HPV can cause cervical cancer (Table 2).

Regarding the relationship of HPV with chlamydia infection, the results of the current study showed that it was the least known risk factor by the students, where only 13.8% (n=82) answered yes. In addition, most of the students (71%, n=420) were not aware that smoking can increase the risk of HPV infection. Moreover, 63.2% (n=377) of participants did not know that HPV can go for extended periods without showing any symptoms.

Around half of students (47.6%, n=284) reported that they were aware that Pap smears can detect HPV, and 56.8% (n=339) knew that there is an available vaccine to prevent HPV. Half of the respondents (54, n=322) also knew that HPV vaccination is effective against cervical cancer (Table 2).

In terms of the acceptance level among female university students in Makkah region toward HPV vaccination, 47% (n=281) of students knew that the Saudi Ministry of Health (MOH) offers HPV vaccination for girls aged from 9 to26 years old. Most of the participants (74%, n=441) were willing to vaccinate their younger sisters or daughters. However, only 5.5% (n=33) of students revealed that they had received the vaccine for themselves (Table.3). Table. 3 illustrated that 73.1% (n=436) of the participants agreed with the national immunization program that applied to girls aged 9 to 14 years in school, while 26.9% (n=160) refused. Consequently, it appeared that 58% of the female university students in Makkah region have poor knowledge about HPV, and 61.2% have poor acceptance of HPV vaccination (Figure 1 and 2).

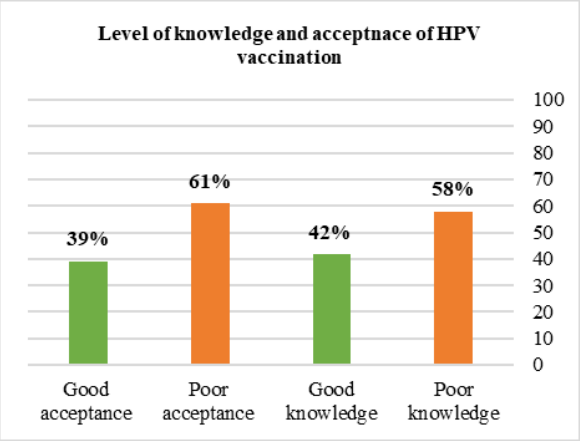

Figure 1: Level of knowledge about HPV infection and cervical cancer and acceptance of HPV vaccination among university students in Makkah region.

With regard to the barriers toward HPV vaccination that reported by the university students in Makkah region, it showed that 38% of the participants stated that they were concerned about the side effects of the vaccine. Twenty-three percent of the students agreed that the second most common reason for not receiving the vaccine was their fear of the needle itself, and 12% claimed that there is no time to obtain the vaccine. The figure also showed that 10% of the students believed that the vaccine was ineffective, and 9% of the participants cited family refusal as a reason for not receiving the vaccine. Other additional reasons were among the least barriers to HPV vaccination, which was reported by 8% of the students (Figure 2).

The statistical Chi-square test was used in both Tables 4 and 5 to compare the observed findings to the expected

Table 2: Respondents knowledge about HPV and cervical cancer (n=596)

N.	Question	I don't know		No		Yes		Mode	Median	Mean	Std Dev.
		Num	%	Num	%	Num	%				
1	Have you heard about HPV?	36	6.0	260	43.6	300	50.4	3	3	2.44	0.61
2	Do you know that HPV can infect the female genitalia?	213	35.7	13	2.2	370	62.1	3	3	2.26	0.95
3	Do you know that HPV can infect male genitalia?	338	56.7	89	14.9	169	28.4	1	1	1.72	0.88
4	Do you know that HPV can be transmitted via sexual intercourse?	326	54.7	59	9.9	211	35.4	1	1	1.81	0.93
5	Do you know that HPV can cause genital warts?	311	52.1	17	2.9	268	45.0	1	1	1.93	0.98
6	Do you know that HPV can cause herpes?	477	80.0	35	5.9	84	14.1	1	1	1.34	0.71
7	Do you know that HPV can cause cervical cancer?	242	40.6	21	3.5	333	55.9	3	3	2.15	0.97
8	Do you know that Smoking can increase the risk of HPV infection?	367	61.6	53	8.9	176	29.5	1	1	1.7	0.9
9	Do you know that person with chlamydia infection has a higher chance to be infected with HPV?	483	81.0	31	5.2	82	13.8	1	1	1.3	0.7
10	Do you know that individuals infected with HPV may remain asymptomatic for a long period?	319	53.5	58	9.7	219	36.7	1	1	1.8	0.94
11	Do you know that HPV can be detected by Pap Smear?	286	48.0	26	4.4	284	47.6	1	2	2.0	0.98
12	Do you know that there is an effective vaccination against HPV?	237	39.8	20	3.4	339	56.8	3	3	2.2	0.97
13	Do you know that HPV vaccination can prevent cervical cancer?	247	41.5	27	4.5	322	54.0	3	3	2.12	0.97

outcome. Table. 4 indicates that there was statistically significant difference in the knowledge scores for the following demographical variables: students age, marital status, and college (p=0.001, 0.04, and 0.001, re-

Table 3: Respondents' acceptance of HPV vaccination (n=596)

N.	Question	I don't know		No		Yes		Mode	Median	Mean	Std Dev.
		Num	%	Num	%	Num	%				
1.	Do you know that the Saudi Ministry Of Health offers free HPV vaccination for girls from 9 to 26 years old?	288	48.4	27	4.5	281	47.1	1	2	1.99	0.98
2.	Do you agree with the national immunization program which applied for girls aged 9 - 14 years in schools?	116	19.5	44	7.4	436	73.1	3	3	2.54	0.8
3.	Did you receive the HPV vaccine?	178	29.9	385	64.6	33	5.5	2	2	1.76	0.54
4.	Do you want to vaccinate your young sister or daughter?	0	0.0	155	26.0	441	74.0	3	3	2.74	0.5

spectively). However, there was no statistically significant difference in participants' knowledge scores when compared to university, academic year, and nationality (Table 4).

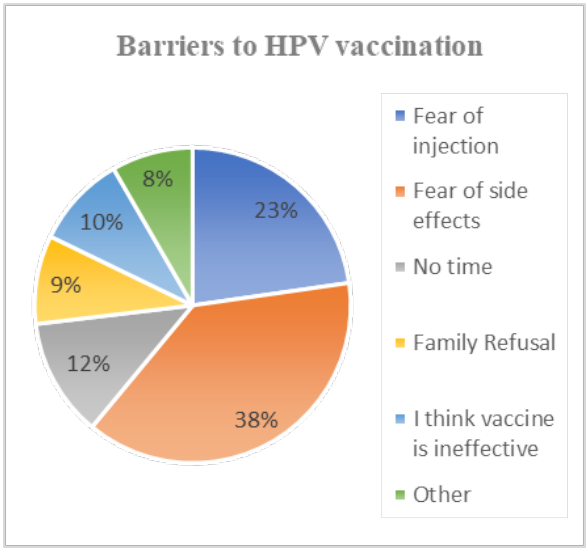

Figure 2: Barriers to HPV vaccination among university students in Makkah region.

Table 5 presents the comparison between students' acceptance of HPV with respect demographic variables using Chi -square test. It revealed a statistically significant difference in the acceptance scores by university and college, while age, nationality, marital status, and academic year were not found to differ in the acceptance scores in a statistically significant way (Table 5).

Accordingly, there is a positive relationship at the level of significant $p \leq 0.05$ between knowledge and acceptance when compared using the Person correlation coefficient (Table 6).

DISCUSSION

This study is the first to evaluate the knowledge about HPV and the acceptance of its vaccine at a time when the Saudi Food and Drug Administration authorized its plans for a vaccination campaign that was included in the Saudi national immunization program in 2019 for girls aged 9 to 26 years. The study's focus was therefore on female university students in Makkah region.

In the current study, the results revealed that students knew the least about the association between HPV and chlamydia infection (only 13.8%). Furthermore, most students (71%) were unaware that smoking raises the possibility of contracting HPV. Additionally, 63.2% of the participants, were unaware that HPV can persist for long time without exhibiting any symptoms. While there has been evidence in multiple research (Arnheim et al., 2011; Vriend et al., 2015; de Abreu et al., 2016) linking HPV and the development of cervical dysplasia to Chlamydia trachomatis, Neisseria gonorrhoeae, and Trichomonas vaginalis. It was reported that exposure to tobacco smoke has been strongly linked to several of infectious diseases (Kum-Nji et al., 2006). So it is very important to raise the awareness between females to the risk factors predisposing to the HPV in Saudi Arabia.

The findings of the current study showed a substantial correlation between the students' knowledge about HPV and their age. The observed outcome could potentially be attributed to the developmental stage of female students in the adolescent and adult age group, as

Table 4: Comparison in the knowledge about HPV between university females in relation to demographic variables (n=596)

Demographic variables		Knowledge group				Chi square test	Sig.
		Poor knowledge		Good knowledge			
		Number	%	Number	%		
Age	18-20	260	60.9	167	39.1	16.03**	0.001**
	21-23	71	58.7	50	41.3		
	24-26	9	47.4	10	52.6		
	Above 26	7	24.1	22	75.9		
	Total	347	58.2	249	41.8		
Nationality	Saudi	341	58.4	243	41.6	0.340	0.560
	Non Saudi	6	50.0	6	50.0		
	Total	347	58.2	249	41.8		
Marital Status	Single	328	59.4	224	40.6	9.545*	0.049*
	Engaged	6	66.7	3	33.3		
	Married	13	41.9	18	58.1		
	Divorced	0	0.0	3	100.0		
	Widow	0	0.0	1	100.0		
	Total	347	58.2	249	41.8		
University	Umm Al-Qura	317	58.5	225	41.5	0.722	0.868
	King Abdul Aziz	16	53.3	14	46.7		
	Jeddah	8	53.3	7	46.7		
	Taif	6	66.7	3	33.3		
	Total	347	58.2	249	41.8		
College	Medical	187	51.8	174	48.2	15.52**	0.001*
	Non medical	160	68.1	75	31.9		
	Total	347	58.2	249	41.8		
Academic Year	1	231	59.8	155	40.2	5.247	0.387
	2	31	63.3	18	36.7		
	3	23	63.9	13	36.1		
	4	32	50.0	32	50.0		
	5	13	50.0	13	50.0		
	6	17	48.6	18	51.4		
	Total	347	58.2	249	41.8		

they developed an interest in women's health awareness. Contradictory to our findings, Shakurnia et al. (2022) found no significant correlation between the age of the participants and their knowledge of or attitudes towards. That could be attributed to the accuracy of the answers in each survey, degree of education , customs, and traditions. In this study , it was found that the nationality of the participants didn't affect the degree of awareness of HPV infection, that could be attributed to the equality in the education services in Saudi Arabia.

The current study's findings showed a non-significant relationship between the academic year of students and their knowledge about HPV. While, in another study it was reported that there is a significant relationship between the academic year of nursing students and their attitudes and knowledge about HPV. This might be because some students in the lowest academic year are more knowledgeable than those in the highest; they might go to seminars and learn more about sexual illnesses at a younger age and receive health education (Abdelaliem et al., 2023) . In our study it was confirmed similarly that the college has significant effect on the participant knowledge about HPV, where the medical college students are more knowledgeable about the HPV than students studying in non-medical fields, similar findings were recorded before (Al-Darwish et al., 2014; Altamimi 2020).

Regarding symptoms of cervical cancer, this study highlighted the poor knowledge of female university students in Makkah region about the clinical signs of cervical cancer. Only 35% of the participants knew that individuals infected with HPV may remain asymptomatic for a long period. This result is in line with previous studies performed in Riyadh and Hail (Aldohaian et al., 2019; Altamimi, 2020) . Most cases of cervical cancer in Saudi Arabia are discovered late or at an advanced stage, where the treatment could require an aggressive intervention. Such poor knowledge of the young population about the clinical features of HPV infection and cervical cancer could be due to the absence of national screening programs and again public awareness campaigns (Manji., 2000) . This could be referred to that the problem hasn't received much attention in health college campaign, which leads to a paucity of community awareness efforts. It is advisable for health colleges to include in their curricula thorough knowl-

Table 5: Comparison in acceptance of participation in HPV cross survey between university females in relation to demographic variables (n=596).

Demographic variables		Knowledge group				Chi square test	Sig.
		Poor acceptance		Good acceptance			
		Number	%	Number	%		
Age	18-20	255	59.7	172	40.3	2.58	0.462
	21-23	79	65.3	42	34.7		
	24-26	14	73.7	5	26.3		
	Above 26	17	58.6	12	41.4		
	Total	365	61.2	231	38.8		
Nationality	Saudi	355	60.8	229	39.2	2.52	0.113
	Non Saudi	10	83.3	2	16.7		
	Total	365	61.2	231	38.8		
Marital Status	Single	340	61.6	212	38.4	1.9	0.75
	Engaged	5	55.6	4	44.4		
	Married	18	58.1	13	41.9		
	Divorced	2	66.7	1	33.3		
	Widow	0	0.0	1	100.0		
	Total	365	61.2	231	38.8		
University	Umm Al-Qura	325	60.0	217	40.0	8.54*	0.036*
	King Abdul Aziz	23	76.7	7	23.3		
	Jeddah	13	86.7	2	13.3		
	Taif	4	44.4	5	55.6		
	Total	365	61.2	231	38.8		
College	Medical	192	53.2	169	46.8	25.03**	0.001**
	Non medical	173	73.6	62	26.4		
	Total	365	61.2	231	38.8		
Academic Year	1	226	58.5	160	41.5	8.55	0.128
	2	33	67.3	16	32.7		
	3	29	80.6	7	19.4		
	4	39	60.9	25	39.1		
	5	18	69.2	8	30.8		
	6	20	57.1	15	42.9		
	Total	365	61.2	231	38.8		

edge of this pressing matter. Future health care workers may benefit from this in terms of health and knowledge promotion.

The present study also revealed a poor level of HPV vaccination acceptance among the university student's population in Makkah region, this was clearly shown in the survey section concerning the acceptability of HPV vaccination. It appeared that more than half of the participants knew that HPV had an effective vaccine. However, only few numbers knew that HPV vaccination could prevent cervical cancer. Although many participants declared that they are willing to vaccinate their young sisters or daughters, only a small portion of participants had received the HPV vaccine for themselves. These findings are in line with those reported before (Altamimi, 2020, Abdelaliem et al., 2023).

Several barriers to HPV vaccination were mentioned in this study. These could be attributed to the low acceptance rate of HPV vaccination among female university students in Makkah region. The first and main reason given by participants for not receiving the vaccine was their concern about its side effects. This was followed by the fear of needle injection, and the lack of time to reach the vaccination center. These findings are consistent with a previous study conducted in Hail (Altamimi, 2020, Abdelaliem et al., 2023). Other barrier such as parental refusal was also reported among the barriers to HPV vaccination in a study conducted by Aldohaian and his colleagues in 2019 (Aldohaian et al., 2019). Lack of information about HPV vaccine availability was also mentioned by the participants of this study as well as in a recent study conducted in Riyadh (Alhusayn et al., 2022), and worldwide in Ethiopia, Nigeria, and China (Liu et al., 2019; Biyazin et al., 2022; Rabiu & Yahuza, 2023). In summary, the current study reveals a lack of understanding regarding the availability of vaccines, risk factors, and signs and symptoms of cervical cancer. The future physicians who responded to the study are medical students, and they are a valuable resource for raising public awareness of cervical cancer's avoidable nature. Undergraduate medical students should be taught complete information in order to enhance their knowledge and awareness.

Overall, this study presented significant findings regarding one of the essential topics that impact community health. The low level of knowledge and ac-

ceptance of HPV vaccination could be mainly justified by the lack of or limited information on HPV, its associated factors to cervical cancer, and its vaccination among the university student population. Further efforts from the Saudi MOH and Ministry of Education are required to increase the knowledge and awareness about HPV infection and cervical cancer and to raise the willingness and acceptability of HPV vaccination as part of the Saudi National Immunization program. As far as we know this is the first study conducted on female university students enrolled in different universities in Makkah region. However, it might be limited by the absence of some other private universities and the exclusion of male students.

Table 6: Correlation between knowledge of HPV infection and cervical cancer and acceptance of HPV vaccination using Person correlation coefficient.

Item	Pearson correlation coefficient (r)	p-value
Knowledge of HPV infection and cervical cancer	0.673**	0.001**
Acceptance of HPV vaccination	0.535**	0.001**

CONCLUSION AND RECOMMENDATION

In conclusion, this study indicated a poor level of knowledge about HPV infection and poor acceptance of its vaccination program among female university students in Makkah region. Cultural and psychological reasons, such as (the fear of needle injection and HPV infection side effects) could be among the highest barriers to HPV vaccination acceptance. Thus , HPV effective awareness campaigns and university educational programs and curricula are highly recommended to impact public knowledge and understanding of HPV infection and cervical cancer prevention and vaccination.

AUTHOR CONTRIBUTION

The author is the only contributor to this study and I will act as and guarantor and will correspond with the journal from this point onward.

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