



Acceptance and Attitude Towards Human Papilloma Virus Vaccination Among Parents Attending Primary Health Care Centers, Riyadh, Saudi Arabia: A Cross-sectional Study

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Abstract

Introduction: Human Papillomavirus (HPV) is a significant cause of cancers, with vaccines like Gardasil and Cervarix offering prevention. This study explored the attitude of parents in Riyadh towards HPV vaccination for their daughters, focusing on the factors that influence vaccine acceptance.

Methods: The study employed a cross-sectional design, using a structured questionnaire. The collected demographic details, knowledge about HPV and its vaccine, attitudes towards vaccination, and the factors influencing vaccination decisions. Participants were selected through convenience sampling at Primary Health Care centers across Riyadh, targeting parents of daughters aged 9-13 years.

Results: Among 380 participants, awareness regarding the HPV vaccine was 71.3%. Results showed that 46.1% of parents intended to vaccinate their daughters, 31.3% were undecided, and 22.6% were against it. Hesitancy factors included a lack of information (47.8%), concerns about side effects (21.5%), and absence of medical advice (21.0%). Statistical analysis showed a statistically significant differences in vaccine awareness by age ($P < 0.001$), with the highest awareness among the 25-35 years age group (81.4%) and the lowest in those over 55 (38.6% aware). Gender also played a role, with 78.2% of females versus 60.3% of males being aware of the vaccine ($P = 0.001$). Employment status correlated significantly with awareness ($P < 0.001$); 77.3% of employed respondents were aware of the HPV vaccine compared to 65.5% of unemployed respondents. Knowledge scores varied significantly, with an average score of 3.62 ± 2.50 . Respondents with higher knowledge scores showed a stronger intention to vaccinate ($r = 0.513$, $P < 0.001$).

Conclusion: While a substantial proportion of parents in Riyadh are aware of the HPV vaccine, significant hesitancy exists, primarily due to informational deficits and safety concerns. The study underscores the need for targeted education campaigns to improve understanding of HPV vaccine benefits, addressing misconceptions and enhancing vaccine uptake to protect against HPV-related diseases.

Keywords: Human Papillomavirus (HPV); Saudi Arabia

Introduction

Human Papillomavirus (HPV) is the most common sexually transmitted infection globally and is the primary risk factor for cervical cancer. It's associated with a range of diseases, including cancers of the cervix, anus, and oropharynx, as well as benign epithelial lesions like genital warts and laryngeal papillomas [1]. Human Papillomavirus (HPV) presents significant health risks, particularly in the development of cervical intraepithelial neoplasia (CIN) and cervical cancer [2]. The risks of cervical intraepithelial neoplasia grade 3 or worse (CIN3+) associated with HPV infection slightly decline with age but remain elevated in older women, indicating the need for continued screening [3,4].

HPV infections are more prevalent among women and men with immunosuppression, particularly those with HIV, increasing the risk of HPV-related genital neoplasias [5]. Infection with high-risk HPV types, especially types 16 and 18, can cause precancerous lesions of the squamous epithelium. Most HPV infections are cleared by the immune system and do not result in clinical complications, but they can lead to significant morbidity and mortality if they progress [6]. HPV infection during pregnancy can lead to adverse health outcomes, and infants are also at risk of HPV infection through various transmission routes. Manifestations during childhood can range from common skin infections to severe complications like juvenile recurrent respiratory papillomatosis.

One of the first line of preventive methods of HPV, is HPV vaccination. HPV vaccination is associated with a significant reduction in the likelihood of invasive cervical cancer. HPV vaccination is recommended at age 11 or 12 years or even earlier at age of 9 years. In some cases, adults more than or 26 years of age can still take the vaccine [7,8]. There are two FDA-approved HPV vaccines, Gardasil and Cervarix [9]. The need for the vaccination is more in the developing countries since there is less pap testing and cervical cancer screening [10,11]. Effective vaccination against HPV can prevent cervical cancer, genital warts, and cytologic abnormalities, which significantly impacts public health and reduces the burden of HPV-associated diseases [12].

The Human Papillomavirus (HPV) vaccine has been extensively studied and found to be highly effective and safe. A comprehensive review focusing on the global status and impact of HPV vaccination highlighted its efficacy in preventing high-grade

precancerous lesions caused by vaccine-targeted HPV infections, with an effectiveness rate of 90% or higher in HPV naïve women. Additionally, it emphasized the excellent safety profile of the vaccine, with more than 280 million doses administered worldwide and no serious adverse events linked to it [13]. A study focusing on HPV vaccine efficacy and effectiveness against cancer observed that HPV vaccines are highly immunogenic and show remarkable efficacy among young women who were HPV seronegative before vaccination. The study also noted the potential for herd protection conferred by HPV vaccination [14].

Parental hesitancy and attitudes towards HPV vaccination vary significantly, influenced by factors like awareness, perceived susceptibility to HPV, and general attitudes towards vaccines. A substantial portion of parents remains hesitant about HPV vaccination, with a lack of knowledge and awareness being a significant issue [15,16]. A study found that 69% of parents had not heard of HPV vaccines, highlighting this gap in awareness [17]. Knowledge of HPV vaccination, perceived susceptibility to HPV, and lower levels of vaccination hesitancy were found to be crucial in determining parental readiness for adolescent HPV vaccination [18]. The current study aimed to assess the acceptance and attitude of parents attending primary healthcare centers in Riyadh, Saudi Arabia, towards HPV vaccination.

Methods

Study design

This research employed a cross-sectional survey design to evaluate the hesitancy of parents attending Primary Health Care centers (PHCs) in Riyadh, Saudi Arabia, towards Human Papillomavirus (HPV) vaccination. The study utilized a face to face structured questionnaire to collect data. The responses were collected using Google Forms over a predetermined period, ensuring ease of access and convenience for the participants.

Sample size

To determine the sample size, a statistical estimation was made considering an unlimited population size. The sample size calculation was based on a confidence level of 95%, a standard deviation of 0.5, and a margin of error of 5%. Based on these parameters, the required sample size was calculated to be 382 participants from the study population.

Inclusion and exclusion criteria

The study included parents who were attending various PHCs in Riyadh. The inclusion criteria were: parents of children, specifically focusing on those with daughters aged between 9-13 years, the eligible age group for HPV vaccination. Individuals who were willing to participate and provide informed consent for the study. The exclusion criteria involved parents who did not have children in the specified age group for HPV vaccination, individuals who were not willing or unable to provide consent to participate in the study.

Study questionnaire

The questionnaire included thirteen questions to capture a range of data relevant to the study objectives. These questions were designed to elicit comprehensive information regarding the participants' knowledge, attitudes, and practices related to HPV vaccination. It was divided into several sections, each aimed at gathering specific information. The first section collected the demographic information of the respondents, including age, gender, educational background, employment status, and marital status. The second section included questions related knowledge about HPV vaccination. Participants were asked about their awareness and knowledge of HPV vaccination. Questions in this section aimed to assess the level of familiarity with HPV vaccination, its introduction in the Saudi healthcare system, and beliefs regarding the vaccine's safety and efficacy. The final section included questions related to the attitude and acceptance. It included questions on whether the parents or their partners were vaccinated against HPV, if they planned to vaccinate their daughter against HPV, and reasons for hesitancy or refusal to vaccinate. The reasons explored included a lack of knowledge about the vaccine, absence of medical advice, concerns regarding the cost and side effects of the vaccine, and other specific reasons that the respondents could list.

Knowledge scoring

a knowledge scoring system was implemented to assess participants' awareness and understanding of the Human Papillomavirus (HPV) and its vaccine. Seven key questions were used for this purpose: 1) Ever heard of HPV vaccine, 2) Understanding that HPV infection is caused by a group of very common viruses worldwide, 3) Awareness that HPV often transmits through skin contact, 4) Knowledge that some variants of HPV can cause diseases such as genital warts or cervical cancer, 5) Awareness of the decision to implement HPV vaccination for girls aged 9 to 13 in Saudi Arabia, 6) Understanding that HPV infection complications can be prevented through the vaccine, and 7) Knowledge of the safety and efficacy of the HPV vaccine. Participants were awarded one point for each correct response, leading to a maximum possible score of seven points. This scoring system was designed to quantitatively evaluate the level of knowledge about HPV and its vaccine among the study participants, contributing to a better understanding of the public perception and acceptance of HPV vaccination.

Statistical analysis

Statistical analysis was performed using R v 4.3. Counts and percentages were used to summarize categorical variables and the mean ± standard deviation was used for continuous variables. Chi-square test of independence was used to assess the association between categorical variables and unpaired t-test was used to compare the average knowledge score between groups. Spearman's correlation was used to assess the association between ordinal variables. Linear regression analysis was used to assess factors associated with awareness regarding HPV. Hypothesis testing was performed at 5% level of significance.

Results

	[ALL]	No	Maybe	Yes	p. overall
	N = 380	N = 85	N = 24	N = 271	
Age:					< 0.001
<25 years	9 (2.37%)	1 (11.1%)	1 (11.1%)	7 (77.8%)	
25-35 years	59 (15.5%)	7 (11.9%)	4 (6.78%)	48 (81.4%)	
36-45 years	156 (41.1%)	31 (19.9%)	8 (5.13%)	117 (75.0%)	
46-55 years	112 (29.5%)	21 (18.8%)	9 (8.04%)	82 (73.2%)	
>55 years	44 (11.6%)	25 (56.8%)	2 (4.55%)	17 (38.6%)	
Gender:					0.001

Female	234 (61.6%)	39 (16.7%)	12 (5.13%)	183 (78.2%)	
Male	146 (38.4%)	46 (31.5%)	12 (8.22%)	88 (60.3%)	
Marital status:					0.569
Divorced	23 (6.13%)	8 (34.8%)	1 (4.35%)	14 (60.9%)	
Married	337 (89.9%)	74 (22.0%)	22 (6.53%)	241 (71.5%)	
Single	15 (4.00%)	2 (13.3%)	1 (6.67%)	12 (80.0%)	
Education:					0.055
Primary school	3 (0.79%)	2 (66.7%)	0 (0.00%)	1 (33.3%)	
Secondary school	7 (1.84%)	2 (28.6%)	1 (14.3%)	4 (57.1%)	
High school	38 (10.0%)	12 (31.6%)	5 (13.2%)	21 (55.3%)	
University degree	230 (60.5%)	43 (18.7%)	14 (6.09%)	173 (75.2%)	
Post-graduate	102 (26.8%)	26 (25.5%)	4 (3.92%)	72 (70.6%)	
Employment status:	Overall	No	Maybe	Yes	< 0.001
Employed	260 (68.4%)	46 (17.7%)	13 (5.00%)	201 (77.3%)	
Retired	54 (14.2%)	24 (44.4%)	6 (11.1%)	24 (44.4%)	
Student	11 (2.89%)	0 (0.00%)	1 (9.09%)	10 (90.9%)	
Unemployed	55 (14.5%)	15 (27.3%)	4 (7.27%)	36 (65.5%)	
Number of children:					0.5721
1	24 (6.32%)	5 (20.8%)	1 (4.17%)	18 (75.0%)	
2	58 (15.3%)	15 (25.9%)	2 (3.45%)	41 (70.7%)	
3	119 (31.3%)	20 (16.8%)	10 (8.40%)	89 (74.8%)	
>3	179 (47.1%)	45 (25.1%)	11 (6.15%)	123 (68.7%)	
Ever heard of HPV vaccine:					<0.001
No	85 (22.4%)	85 (100%)	0 (0.00%)	0 (0.00%)	
Maybe	24 (6.32%)	0 (0.00%)	24 (100%)	0 (0.00%)	
Yes	271 (71.3%)	0 (0.00%)	0 (0.00%)	271 (100%)	
Data were summarized using counts and percentages Analysis was performed using Chi-square test of independence					

Table 1: Descriptive statistics for the study sample.

A total of 671 participants were interviewed, only 380 had daughters aged 9-13 and were eligible to answer questions about the HPV vaccine. In the age breakdown, participants under 25 years predominantly acknowledged awareness at 77.8%. Interestingly, those over 55 showed a contrasting pattern, with 56.8% being unaware of the vaccine, and only 38.6% indicating awareness. The awareness was also high in the 25-35 year age group (81.4%).

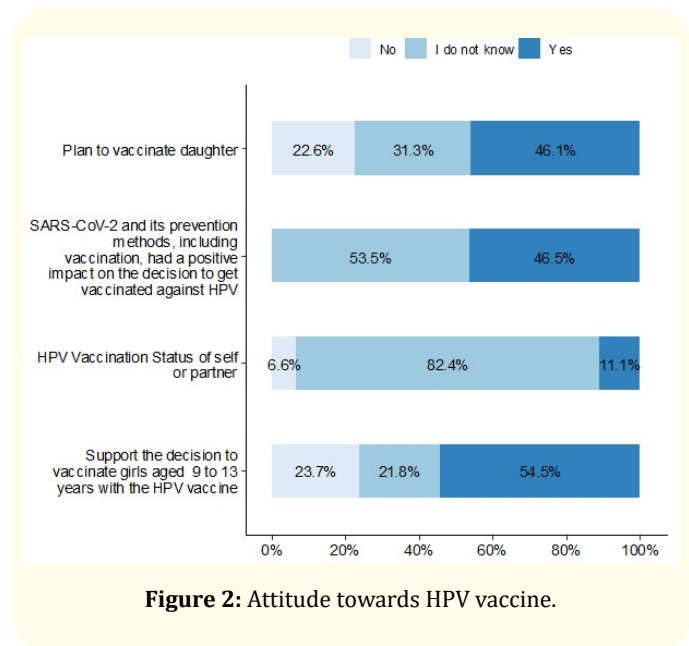
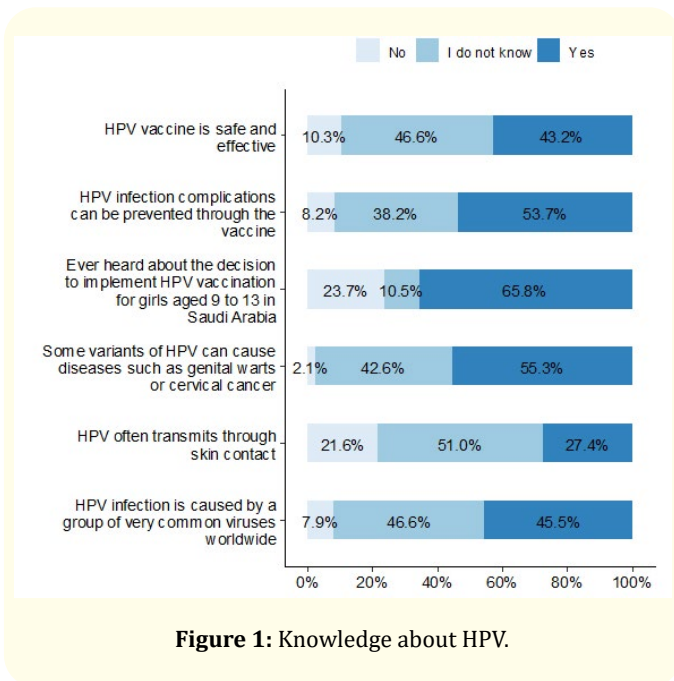
Similar trends of high awareness were observed in the 36-45 years (75%) and 46-55 years (73.2%) groups. A statistically significant association was observed between age and awareness regarding HPV vaccine ($P < 0.001$).

Gender was significantly associated with vaccine awareness. A significant majority of female respondents (78.2%) were aware,

compared to male respondents (60.3% , P = 0.001). Marital status was not significantly associated with vaccine awareness (P = 0.569), with married participants mostly aware (71.5%). Educational background correlated with varying levels of awareness (P < 0.001). Those with university degrees showed the highest awareness (75.2%), whereas primary school level respondents were least aware, with 66.7% being not aware. the number of children were not significantly associated with hearing about HPV vaccine. The responses regarding HPV vaccine awareness showed notable variations when segmented by employment status (P < 0.001). Employment status was significantly associated with awareness regarding HPV vaccine (P < 0.001). Among the 260 employed respondents, which constituted 68.4% of the total, a significant majority (77.3%) were aware of the vaccine, while 17.7% were not and 5% were uncertain. The retired participants, making up 14.2% of the total, displayed a more evenly split awareness, with 44.4% acknowledging awareness and an equal proportion unaware, alongside 11.1% who were uncertain. In contrast, among the 55 unemployed participants (14.5% of the total), 65.5% were aware of the vaccine, but a notable 27.3% were not, and 7.27% were uncertain.

Of the 380 respondents who completed the questionnaire, results indicated that 46.6% were unsure about the safety and efficacy of the HPV vaccine, while 43.2% believed it was safe and effective, and 10.3% did not. Regarding the prevention of HPV infection complications through the vaccine, 53.7% acknowledged this as possible, 38.2% were uncertain, and 8.2% did not believe it. When it came to awareness of the decision to implement HPV vaccination for girls aged 9 to 13, 65.8% were informed, 23.7% were not, and 10.5% were undecided. For the statement that some HPV variants can cause diseases such as genital warts or cervical cancer, 55.3% were aware, but 42.6% lacked this knowledge. The transmission of HPV through skin contact was a point of uncertainty for 51.0% of participants, with only 27.4% affirming it and 21.6% denying. Lastly, the survey showed that 45.5% understood HPV infection is caused by a common group of viruses worldwide, while a similar proportion of 46.6% did not have this information.

The knowledge score was calculated for each respondent. Results showed that the average number of correct answers was 3.62 ± 2.50 with 18.7% of the respondents not answerin any of the seven questions correct. A total of 156 (41%) respondents answers 5 or more questions correct and only 16.6% answers all questions correct. Half of the respondents correctly answered one to six questions.



When participants were asked if they plan to vaccinate their daughter against HPV, 46.1% indicated an intent to vaccinate. However, 31.3% were unsure, and 22.6% had no such plans. Concerning the impact of SARS-CoV-2 and its prevention methods on the decision to get vaccinated against HPV, nearly half of the respondents (46.5%) agreed there was a positive impact, while the remaining (53.5%) did not feel that the COVID-19 prevention measures influenced their decision to vaccinate against HPV. Regarding the HPV vaccination status of the respondents or their partners, a vast majority, 82.4%, reported not being vaccinated, while only a small fraction, 11.1%, were vaccinated, and 6.6% did not know their or their partner’s vaccination status. Regarding the decision to vaccinate girls aged 9 to 13 years with the HPV vaccine, 54.5% were in favor, while 23.7% did not support it, and 21.8% were undecided.

The most common reason given for refusing the HPV vaccine was the lack of information about the vaccine, as stated by 47.8% of the respondents. Concerns about potential side effects of the vaccine were the next most cited reason, accounting for 21.5%

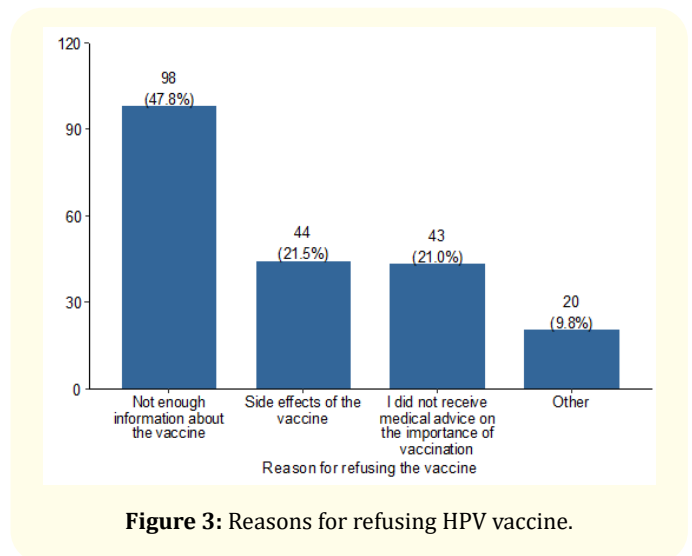


Figure 3: Reasons for refusing HPV vaccine.

of the refusals. A similar proportion, 21.0%, did not receive medical advice on the importance of vaccination, which influenced their decision against it. Lastly, 9.8% of respondents had other unspecified reasons for not getting the vaccine.

N		1	2	3	4	5
1	Knowledge score					
2	Supporting the decision to vaccinate girls aged 9 to 13 years with the HPV vaccine	0.477***				
3	HPV Vaccination Status of self or partner	0.162**	0.157**			
4	SARS-CoV-2 and its prevention methods, including vaccination, had a positive impact on the decision to get vaccinated against HPV	0.157**	0.187**	0.171**		
5	Plan to vaccinate daughter	0.513***	0.698***	0.176***	0.200***	
	Computed correlation used spearman-method with pairwise-deletion.					

Table 2: Correlation between knowledge and attitude towards HPV.

Supporting the decision to vaccinate girls aged 9 to 13 years with the HPV vaccine exhibited a very strong positive correlation with knowledge score ($r = 0.477, P < 0.001$), indicating that individuals with higher knowledge scores were more likely to have supported HPV vaccination for girls in this age group. HPV Vaccination Status

of self or partner showed moderate positive correlations with knowledge score ($r = 0.162, P < 0.001$) and supporting the decision to vaccinate girls aged 9 to 13 ($r = 0.157, P < 0.001$), suggesting that individuals with higher HPV vaccination statuses for themselves or their partners tended to be somewhat more supportive of

HPV vaccination. A positive attitude towards SARS-CoV-2 and its prevention methods, including vaccination demonstrated moderate positive correlations with knowledge score ($r = 0.157$, $P < 0.001$), supporting the decision to vaccinate girls aged 9 to 13 ($r = 0.187$, $P < 0.001$), and HPV vaccination status of self or partner ($r = 0.171$, $P < 0.001$). Lastly, "Plan to vaccinate daughter" showed

very strong positive correlations with knowledge score ($r = 0.513$, $P < 0.001$), HPV vaccination status of self or partner ($r = 0.176$, $P < 0.001$), SARS-CoV-2 and its prevention methods ($r = 0.200$, $P < 0.001$), and itself ($r = 0.200$, $P < 0.001$), and supporting the decision to vaccinate girls aged 9 to 13 years with the HPV vaccine ($r = 0.698$, $P < 0.001$).

	Female	Male	P	High school or less	University or higher	P
	N = 234	N = 146		N = 48	N = 332	
Ever heard of HPV vaccine:			0.001			0.012
No	39 (16.7%)	46 (31.5%)		16 (33.3%)	69 (20.8%)	
Maybe	12 (5.13%)	12 (8.22%)		6 (12.5%)	18 (5.42%)	
Yes	183 (78.2%)	88 (60.3%)		26 (54.2%)	245 (73.8%)	
HPV infection is caused by a group of very common viruses worldwide:			0.328			0.013
No	20 (8.55%)	10 (6.85%)		6 (12.5%)	24 (7.23%)	
I do not know	102 (43.6%)	75 (51.4%)		29 (60.4%)	148 (44.6%)	
Yes	112 (47.9%)	61 (41.8%)		13 (27.1%)	160 (48.2%)	
HPV often transmits through skin contact:			0.180			0.063
No	57 (24.4%)	25 (17.1%)		8 (16.7%)	74 (22.3%)	
I do not know	112 (47.9%)	82 (56.2%)		32 (66.7%)	162 (48.8%)	
Yes	65 (27.8%)	39 (26.7%)		8 (16.7%)	96 (28.9%)	
Some variants of HPV can cause diseases such as genital warts or cervical cancer:			0.021			0.142
No	5 (2.14%)	3 (2.05%)		2 (4.17%)	6 (1.81%)	
I do not know	87 (37.2%)	75 (51.4%)		25 (52.1%)	137 (41.3%)	
Yes	142 (60.7%)	68 (46.6%)		21 (43.8%)	189 (56.9%)	
Ever heard about the decision to implement HPV vaccination for girls aged 9 to 13 in Saudi Arabia:			<0.001			0.291
No	39 (16.7%)	51 (34.9%)		12 (25.0%)	78 (23.5%)	
I do not know	25 (10.7%)	15 (10.3%)		8 (16.7%)	32 (9.64%)	
Yes	170 (72.6%)	80 (54.8%)		28 (58.3%)	222 (66.9%)	
HPV infection complications can be prevented through the vaccine:			0.522			0.527
No	22 (9.40%)	9 (6.16%)		2 (4.17%)	29 (8.73%)	
I do not know	89 (38.0%)	56 (38.4%)		21 (43.8%)	124 (37.3%)	
Yes	123 (52.6%)	81 (55.5%)		25 (52.1%)	179 (53.9%)	
HPV vaccine is safe and effective:			0.375			0.151

No	28 (12.0%)	11 (7.53%)		2 (4.17%)	37 (11.1%)	
I do not know	106 (45.3%)	71 (48.6%)		28 (58.3%)	149 (44.9%)	
Yes	100 (42.7%)	64 (43.8%)		18 (37.5%)	146 (44.0%)	
Knowledge score	3.82 (2.32)	3.29 (2.74)	0.053	2.90 (2.39)	3.73 (2.50)	0.029
Data were summarized using counts and percentages for categorical variables and the mean (SD) for knowledge score Analysis was performed using Chi-square test of independence for categorical variables and unpaired t-test for knowledge score						

Table 3: Association between gender, education, and knowledge regarding HPV.

The analysis of the data reveals distinct differences and similarities in knowledge and perceptions about the HPV vaccine across gender and educational background. When comparing females to males, a significant difference is observed in the awareness of the HPV vaccine, with 78.2% of females versus 60.3% of males being aware ($P = 0.001$). Additionally, females show significantly higher knowledge about some variants of HPV causing diseases like genital warts or cervical cancer (60.7% females vs. 46.6% males, $P = 0.021$). Awareness of the decision to implement HPV vaccination for girls aged 9 to 13 in Saudi Arabia is also significantly higher among females compared to males (72.6% vs. 54.8%, respectively, $P < 0.001$). However, there were no significant gender differences in understanding that HPV is a common virus worldwide ($P = 0.328$), its transmission through skin contact ($P = 0.180$), the prevention of HPV infection complications through vaccination ($P = 0.522$), and the safety and efficacy of the HPV vaccine ($P = 0.375$).

Regarding educational background, those with a university or higher education show significantly higher awareness of the HPV vaccine compared to individuals with high school or less education (73.8% vs. 54.2%, $P = 0.012$). Similarly, there's a significant difference in the understanding that HPV is a common virus worldwide (48.2% in university/higher education vs. 27.1% in high school or less, $P = 0.013$). However, no significant differences were noted in terms of knowledge about the transmission of HPV through skin contact ($P = 0.063$), some variants causing diseases ($P = 0.142$), awareness of the vaccination implementation decision

in Saudi Arabia ($P = 0.291$), prevention of complications through vaccination ($P = 0.527$), or beliefs about the safety and efficacy of the vaccine ($P = 0.151$).

The mean knowledge score indicates a slightly higher score among females compared to males (3.82 vs. 3.29, $P = 0.05$). In terms of education, individuals with a higher educational background have a significantly higher mean knowledge score (3.73) compared to those with high school or less education (3.73 vs. 2.90, $P = 0.029$).

Predictors	K score		
	Estimates (B)	95% CI	p
(Intercept)	4.45	3.76 – 5.14	<0.001
Age			
< 35 years	Ref		
36-45 years	-0.29	-1.02 – 0.44	0.433
46-55 years	-0.36	-1.16 – 0.43	0.370
>55 years	-1.55	-2.68 – -0.42	0.007
Gender: Male vs. Female	-0.44	-1.00 – 0.11	0.118
Marital status			
Married	Ref		
Divorced	-1.26	-2.28 – -0.24	0.015
Single	-0.44	-1.76 – 0.87	0.507
Education			

University	Ref		
High school	-0.41	-1.19 – 0.37	0.298
Post-graduate	0.45	-0.13 – 1.02	0.128
Employment			
Employed	Ref		
Retired	-0.81	-1.69 – 0.06	0.069
Student	1.26	-0.31 – 2.84	0.116
Unemployed	-1.04	-1.80 – -0.28	0.007
B: Regression coefficient CI: Confidence interval			

Table 4: Sociodemographic characteristics associated with knowledge regarding HPV

The baseline knowledge score was found to be 4.45 (B = 4.45, p < 0.001), indicating the average score in the absence of other modifying factors. Age, marital status, and employment status were significant factors in the awareness and understanding of the HPV vaccine. Age showed a significant effect for individuals over 55 years, with a lower knowledge score compared to the reference group (B = -1.55, P = 0.007), suggesting less awareness or knowledge about the HPV vaccine in this age group. Gender differences were observed, with males having slightly lower scores than females, though this was not statistically significant (B = -0.44, P = 0.118). Marital status impacted knowledge scores; divorced individuals had significantly lower scores compared to married individuals (B = -1.26, P = 0.015). Interestingly, education level was not significantly associated with knowledge regarding HPV. Employment status showed that unemployed individuals had significantly lower knowledge scores (B = -1.04, P = 0.007) compared to employed individuals.

Discussion

Human Papilloma virus (HPV) is a viral infection that has been identified as the primary cause of cervical malignancy, abnormal cervical cells, and genital warts. Over 100 distinct kinds of Human papilloma virus can be identified. Types 16 and 18 account for 70% of cervical cancers. HPV is categorised as a sexually transmitted infection and is spread by direct contact between the skin of infected individuals [19,20]. Measures to prevent HPV and its sequelae including immunisation against the virus, cervical

cancer screening, and practicing monogamy or using condoms for individuals who are sexually active [21].

The current study assessed the acceptance and attitude of parents attending primary healthcare centers in Riyadh, Saudi Arabia, towards HPV vaccination. A significant portion of participants (71.3%) had heard of the HPV vaccine. A research was conducted with the specific objective of addressing the awareness of HPV and the vaccination among university students aged 18-25. The level of knowledge of HPV and its vaccination was reported as 83.3% and 69.9% respectively [22]. In another research conducted in Romania, it was shown that 62.3% of participants were aware of the HPV vaccination, whereas only 50.7% actually received it. The user’s text consists of the number [23]. Kudo., *et al.* (2021) in Japan showed that more than half of the surveyed Japanese girls had poor knowledge about cervical cancer screening, HPV, or HPV vaccines, highlighting the global challenge of educating young populations about HPV and its prevention [24].

In Saudi Arabia, a study found that only about 10% of participants had heard of HPV. Awareness and previous knowledge of the Pap smear as a screening tool were also variable, with low figures reported. The low proportion reported in the latter study could be explained by the inclusion criteria for the current study which included only parents of children aged 9 – 12 years who are more likely to have heard of HPV [25]. Alrajeh and Alshammari (2020) focused on women attending primary care clinics in Riyadh and found an overall low awareness of HPV and its vaccine, with only 32.8% knowing that HPV is sexually transmitted and 21% aware that it could cause cervical cancer. This study underscores the need for improved HPV-related education, particularly in regions like Riyadh [26].

In the current study, the average number of correct answers was 3.62 ± 2.50 with 18.7% of the respondents not answerin any of the seven questions correct and only 16.6% answers all questions correct. Results from various countries indicate a consistent pattern. A study from Birmingham showed poor knowledge of HPV and its links with cervical cancer, with 81% having a knowledge score of zero. However, the majority (88%) were in favor of vaccination [27]. A meta-analysis of studies conducted in China found that the pooled awareness and knowledge rates about HPV vaccination were only 15.95% and 17.55% respectively, indicating significantly lower awareness compared to other countries [28].

Regarding the association between demographic characteristics and HPV knowledge, a 2020 survey conducted in the United States revealed a decline in knowledge across some demographic groups. The lowest level of knowledge was associated with individuals aged 65 and older, males, and individuals with low levels of education and socioeconomic position which is similar to what was observed in the current study [29]. The association between age and HPV vaccine awareness was also similar to that observed in other research. Notably, López., *et al.* found that parental awareness of HPV and the vaccine, along with vaccine acceptability, were associated with the child's gender and age, suggesting a generational difference in health knowledge and attitudes. This aligns with the current study's findings, where younger age groups showed higher awareness compared to older groups. The significant association between age and awareness in the Riyadh study which reflects a broader trend of generational shifts in health knowledge [30].

Further evidence of age-related disparities in HPV awareness comes from Agénor, who assessed the relationship between sexual partners and HPV vaccine awareness among US. girls and women aged 15-25 years. They found a prevalence of HPV vaccine awareness at 84.4% and vaccine initiation at 28.5%, indicating a significant gap between awareness and action. This study highlights the need to target younger populations with appropriate messaging to bridge this gap [31].

Regarding the association between gender and HPV knowledge, a national study done in Saudi Arabia, which was published in 2021, showed that male medical students have low knowledge regarding the vaccine. Although the study included males with a medical background (medical students), the findings are inline with those observed in the current study and support the association between gender and knowledge regarding HPV [32]. Another study conducted among Australian women of diverse sexual orientations revealed differences in HPV knowledge and awareness, with White and female participants being significantly more likely to have heard of HPV [33].

The data underscores a predominantly positive inclination towards HPV vaccination for young girls, though it also reflects a substantial degree of uncertainty or lack of support from a combined total of over 45% of the respondents. The most common reason

given for refusing the HPV vaccine was the lack of information about the vaccine, as stated by 47.8% of the respondents. Concerns about potential side effects of the vaccine were the next most cited reason, accounting for 21.5% of the refusals.

These studies collectively indicate a need for age and culturally specific strategies in HPV vaccine awareness campaigns. The study's findings of higher vaccine awareness among younger parents and significant gaps in older age groups are consistent with global patterns. These insights suggest that public health messaging should be tailored to address the specific informational needs and preferences of different age groups and cultural backgrounds to effectively improve HPV vaccine awareness and uptake.

Conclusion

The study highlights the urgent necessity for improved public education and awareness of HPV and its vaccine, specifically targeting certain demographic groups such as older individuals, males, and those with lower levels of education or employment. The association between knowledge and intention to get vaccinated highlights the significance of informative initiatives in boosting vaccine acceptance.

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