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Knowledge, Attitudes, and Determinants of HPV Infection and Vaccination among Female University Students at Jazan University, Saudi Arabia

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Abstract
Background: Human papillomavirus (HPV) is a sexually transmitted infection that can result in many epithelial lesions and cancers. Worldwide, cervical cancer is the fourth most common type of cancer in women. Although HPV vaccines are readily available and have been shown to be effective, vaccination uptake remains insufficient.

Methods: A cross-sectional community-based study was carried out with 445 female students at Jazan University, Saudi Arabia, from April to September 2025, to assess knowledge, attitudes, practices, and factors influencing HPV vaccination. The Participants were selected through stratified and convenience sampling through an online questionnaire, and the data were analyzed by descriptive statistics and regression analyses.

Results: The study revealed that only 160 (43%) participants had previously heard of HPV. Knowledge of HPV transmission, related diseases, and vaccination rate was low. HPV vaccination uptake was limited (11%). Medical college students had significantly higher knowledge and more positive attitudes than non-medical students.
Vaccination uptake was significantly associated with college type, age, marital status, good knowledge, prior health education, and belief in vaccine effectiveness. Overall, knowledge was low, attitudes were negative, and HPV vaccination uptake was low among female university students.

Conclusion: HPV knowledge, attitudes, and vaccination were low; Health Belief Model strategies support Vision 2030 prevention goals.

Keywords: Human papillomavirus; Papillomavirus vaccines; Health knowledge, attitudes, and practice; Female students; Saudi Arabiad.

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1. Introduction

Human papillomavirus (HPV) is a sexually transmitted infection that can result in many epithelial lesions and cancers. Numerous genotypes have been found; the most prevalent ones are 6, 11, 16, and 18. Low-risk genotypes like 6 and 11 are linked to benign genital warts [1]. On the other hand, 16 and 18 are regarded as high-risk genotypes linked to genital tract cancers, particularly cervical cancer, and ovarian and endometrial cancers on occasion [1].

According to estimates, there were 36,068 new cases and 13,211 deaths from penile cancer and 604,000 new cases and 342 fatalities from cervical cancer globally in 2020. Worldwide, cervical cancer is the fourth most common type of cancer in women [2,3]. Saudi Arabia reported four new instances of penile cancer and two fatalities from the disease in 2020, along with 358 new cases of cervical cancer and 179 deaths from its consequences. In addition, penile cancer is the 35th most prevalent cancer in Saudi Arabia, and cervical cancer is ranked seventh [4].

The HPV vaccine could prevent more than 4 million female deaths in low- and middle-income countries over the following decade. Furthermore, WHO guidelines recommend a two-dose vaccination schedule for both girls and boys aged 9 to 14 years, while for older adolescents and any young adult who was not previously immunized, a three-dose catch-up series [5,6].

Multiple studies have demonstrated that HPV vaccination significantly reduces the infection caused by types 6,11, and 18, as well as the genital warts, by approximately 90% and reduces the rate of high-grade cervical lesions by up to 85% [5,7]. In Saudi Arabia, human papillomavirus vaccines have been incorporated into the national immunization program for females aged 11–26 years [8].

Although HPV vaccines are readily available and have been shown to be effective, the change of positive attitudes and knowledge into appropriate preventive measures remains less than its best. Adherence to suggested preventative behaviors, timely involvement in cervical cancer screening, and vaccination uptake are preventive measures associated with HPV. Studies show that actual HPV prevention measures are frequently insufficient even among groups with major awareness, especially among young adults and women [9]. In order to better understand obstacles to effective HPV prevention, it is essential to adopt a comprehensive Knowledge, Attitudes, and Practices (KAP) approach. Studies carried out in Saudi Arabia and other Arab countries have consistently reported gaps not only in knowledge and attitudes toward HPV infection and vaccination, but also in preventive practices [9,10,11,12].

The objective of this study was to assess the Knowledge, attitudes, and practices of female students at Jazan University towards human papillomavirus infection and its vaccine. The study hypothesized that female students have inadequate knowledge, attitudes, and practices regarding HPV infection and vaccination, and that HPV vaccine uptake varies by age, marital status, and source of information.

2. Materials and Methods

2.1 Study design and setting

A cross-sectional community-based descriptive study was conducted to assess the Knowledge, attitudes, and practices of female students regarding human papillomavirus infection and vaccination at Jazan University, from April to September 2025.

The target population includes all female undergraduate students enrolled at Jazan University during the 2024-2025 academic year.

2.2 Study participants and sampling

The study population consists of female students at Jazan University, Saudi Arabia, with the inclusion criteria of being registered students, agreeing to participate, and providing informed electronic consent. Both medical and non-medical college students were included to ensure adequate representation of different academic disciplines.

The sample size was calculated using Cochran's formula:

$$n0 = (Z^2 \times p \times (1-p)) / e^2$$

Where Z = 1.96 corresponds to a 95% confidence level, p = 0.5 represents the estimated population proportion, and e = 0.05 the margin of error. 384 participants. This was increased to 445 to account for an anticipated non-response rate.

An online self-administered questionnaire, distributed through university email, student leaders, and student social media platforms, was used to collect data. Most responses were from the Students' University email. A stratified sampling approach was used based on college type (medical and non-medical), and a convenience sampling technique was applied to recruit the participants.

Among survey respondents, female students who agreed to participate and completed the questionnaire were included in the study. In contrast, those who declined participation or submitted incomplete responses were excluded. Among participants, students who reported prior awareness of Human Papillomavirus (HPV) were included in the detailed analysis of knowledge-related items.

3. Method of data collection

A self-administered standardized questionnaire was built based on relevant literature, including previous KAP studies on HPV among Saudi university students and women [13.14,15]. The questionnaire was initially designed in English, then translated into Arabic, and subsequently back-translated into English by independent specialists to ensure the language and concept reliability. Content validity was assessed by three academic experts in public health, who reviewed the questionnaire for relevance, clarity, and comprehensiveness.

A pilot study was conducted among 20 participants to evaluate the clarity, accuracy and reliability of the questionnaire. Minor modifications included rephrasing unclear questions and improving the sequence of items for better comprehension. Internal consistency was assessed using Cronbach's alpha, which demonstrated acceptable reliability, with a value of 0.75.

3.1 The questionnaire consisted of five sections:

The first section aimed to inform participants about the study objectives, confidentiality, and voluntary participation, with electronic informed consent obtained. The second section collected demographic data, including age, marital status, and college type. The third section about the assess knowledge regarding HPV infection. HPV knowledge using a scoring system. Each correct answer was scored 1 point, with total scores ranging from 0–14, categorized as:

- Poor (0–6)
- Moderate (7–9)
- Good (10-14)

The fourth section aimed to evaluate the attitudes toward HPV vaccination, including perceptions of vaccine safety and efficacy, protection against HPV infection and cervical cancer, and willingness to receive or recommend the vaccine. Each correct answer was scored 1 point, with total scores ranging from 0–10), categorized as:

- Negative (0–5)
- Positive (6- 10)

The fifth section aimed to determine HPV vaccination uptake and the reasons influencing vaccination decisions. It included items on whether participants had received HPV vaccination or health education, reasons, and barriers to vaccination. This section was analyzed descriptively using frequencies and percentages.

3.2 Method of data analysis

Data were entered into Microsoft Excel and analyzed using the Statistical Package for Social Sciences (IBM SPSS Statistics version 29). Descriptive statistics, including frequencies and percentages, were computed and reported. Multiple linear regression was used to examine associations between students' sociodemographic characteristics and their knowledge, attitudes, and practices regarding HPV infection. In contrast, logistic regression was used to predict HPV vaccination status. A p-value < 0.05 was considered statistically significant.

4. Results

4.1 Knowledge about HPV infection and HPV Vaccination

Of 445 approached students, 384 completed the survey, resulting in a response rate of 86%. Only 160 (43%) had heard of Human Papillomavirus (HPV among them, the knowledge was limited. (41%) said the virus is transmitted sexually and (23%) linked it to cervical cancer. Regarding vaccination, only (20%) knew about the availability of the vaccine, and (14%) recommended HPV vaccination for those aged 9-25 years. 19% said the vaccine should be administered in multiple doses. Furthermore, 31% of respondents agreed that routine Pap screens are the best way to prevent HPV- related complications [Table 1].

Table 1: Knowledge about HPV infection and HPV Vaccination among Female University students who had ever heard of HPV (n = 160)

Items	n(%)
HPV is transmitted through sexual contact	66 (41%)
Diseases can cause Cervical cancer	37 (23%)
Diseases cause Genital warts	33 (21%)
Skin warts	28 (18%)
Penile cancer	22 (14%)
Both males & females can get infected with HPV	57 (36%)
HPV infection is not rare	110 (69%)
The highest incidence occurs during the 20s -30s	90 (56%)
People with genital HPV develop symptoms	70 (44%)
HPV is curable	83 (52%)
Availability of the HPV vaccination	32 (20%)
Recommended HPV vaccination aged (9-25 years)	24 (15%)
The vaccine is given in multiple doses	30 (19%)
Pap smears preventive	50 (31%)

4.2 Attitudes toward HPV Infection and Vaccination

Students showed limited positive attitudes toward HPV vaccination. Only 13% believed it was effective, and 15% considered it safe, while 21% thought screening was unnecessary after vaccination. However, 42% agreed to vaccinating males, and 77% were interested in learning more about HPV vaccination [Table 2].

Table 2: Attitudes toward HPV Infection and Vaccination among Female University Students (n = 160)

Item	n(%)
Cervical screening is unnecessary after receiving the vaccine	33 (21%)
HPV vaccination is effective in preventing cervical cancer	20 (13%)
The HPV vaccine is safe	24 (15%)
Should males/boys also be vaccinated	68 (42%)
Interest in learning more about HPV vaccination	123 (77%)

4.3 HPV Vaccination Status and Barriers

13% of participants reported having previously received health education about the HPV vaccine, with only 11% vaccinated, and the uptake was mainly due to perceived safety, effectiveness, and family history. Among the unvaccinated participants, the main barriers included lack of information, fear of side effects, perceived lack of necessity, and cultural reasons [Table 3].

Table 3: HPV Vaccination Status and Barriers among Female University Students(n = 160)

Item	%
Received HPV vaccine health education	21 (13%)
Received HPV vaccination	18 (11%)
Reasons for receiving HPV vaccination: safe and effective	8 (5%)
Reasons for receiving HPV vaccination: family history of cervical cancer	10 (6%)
Reasons for not receiving HPV vaccination: lack of information	86 (53%)
Reasons for not receiving HPV vaccination: fear of side effects	48 ()30%
Reasons for not receiving HPV vaccination: not necessary	6 (4%)
Reasons for not receiving HPV vaccination: cultural reasons	2 (1%)

4.4 Sociodemographic factors associated with the general score of knowledge of HPV infection and vaccination

Age and college type were significant predictors of general knowledge scores. Knowledge was positively associated with age, indicating higher scores among older students. A strong positive correlation was also found with college type, with medical students scoring significantly higher than non-medical students. Marital status showed no significant association with knowledge scores [Table 4].

Table 4: Linear Regression Analysis of sociodemographic factors associated with the general score of knowledge of HPV infection and vaccination

Sig.	T	Beta	Std. Error	B	Variables
.0000	4.986	-	0.139	0.691	(Constant)
<0.000	3.897	0.131	0.032	0.126	Age
0.000	22.914	0.769	0.033	0.748	College types
.7070	-.376	-.013	0.063	-.024	Marital status

4.5 Sociodemographic factors associated with the general Attitudes of HPV infection and vaccination

College type was a significant predictor of attitudes toward HPV infection and vaccination, with medical students showing more positive attitudes than non-medical students. However, no significant associations were found with age or marital status [Table 5].

Table 5: Linear Regression Analysis of sociodemographic factors associated with the general Attitudes of HPV infection and vaccination

p-value	T	Beta	Std. Error	B	Variables
0.000	11.704	-	0.149	1.743	(Constant)
0.937	-0.080	-0.004	0.035	-.0003	Age
0.000	6.532	0.322	0.035	0.229	College types
.0620	-1.871	-0.0092	0.068	-0.127	Marital status

4.6 Multivariate binary logistic regression analysis of factors associated with the HPV vaccination status

The study showed that HPV vaccination status was significantly associated with several factors. Non-medical students were less likely to be vaccinated compared to medical students. Younger students had lower odds of vaccination than those

aged ≥24 years. Married students were more likely to be vaccinated than single students. Higher knowledge, prior health education, and belief in vaccine effectiveness were associated with increased vaccination uptake. However, attitudes and social media as the main information source were not significantly associated with vaccination status [Table 6].

Table 6: Multivariate binary logistic regression analysis of factors associated with the HPV vaccination status among female university students

Variables	Category	OR	95% CI	P-value
College type	Medical college	-	-	-
	Non-medical college	0.41	0.22 - 0.77	0.005
Age (Years)	≥ 24	-	-	-
	18-20	0.18	0.19 - 0.90	0.027
	21-23	0.27	0.10 -0.69	0.001
Marital status	Single	-	-	-
	Married	3.22	1.81- 6.11	0.0001
Knowledge score	Poor	-	-	-
	Good	1.12	1.05 -1.20	0.001
Attitude	Negative	-	-	-
	Positive	1.05	0.98 -1.12	0.145
Received Health Education	No	-	-	-
	Yes	1.68	1.27 - 2.22	0.001
Belief in vaccine effectiveness	No	-	-	-
	Yes	1.84	1.32-2.57	0.001
Social media is a source of information	Health Care Provider	-	-	-
	From social media	0.64	0.29-1.42	0.273

5. Discussion

This study examined awareness, attitudes, and practices related to HPV infection and HPV vaccination among female students at Jazan University. Overall awareness was low, as less than half of the participants had previously heard of HPV. This result is consistent with studies conducted in other regions of Saudi Arabia, including Abha, Makkah, Qassim, and Riyadh, which have also reported low HPV knowledge among women in the general population [11,12, 13,16]. This low level of awareness might be the result of both a lack of ongoing awareness initiatives targeted at young women and limited integration of HPV- related content within the university curriculum

Even among those aware of HPV, understanding remained incomplete. Less than half correctly identified HPV as a sexually transmitted infection, and only a small proportion recognized its established role as the primary cause of cervical cancer [1,2]. Awareness of other HPV-related conditions, such as genital warts and penile cancer, and recognition that HPV affects both males and females, was also low. This misconception has been widely reported in Saudi studies [9,14,17]. These gaps suggest limited depth of health knowledge, where students may have heard about HPV but lack accurate understanding of its transmission and complications, indicating ineffective health communication strategies.

Although most participants correctly stated that HPV infection is common and most prevalent in individuals aged 20–30 years, more than half believed that the infection is curable. This misconception has been repeatedly reported in Saudi research and highlights ongoing gaps in accurate HPV-related knowledge [9,18]. Awareness of the recommended age for HPV vaccination and dosing schedules among female students was low, despite the vaccine being included in the Saudi Arabia national immunization program for eligible age groups [8]. Additionally, limited recognition of the preventive role of Pap smear screening indicates an inadequate understanding of comprehensive cervical cancer prevention strategies, consistent with previous Saudi findings [13]. This suggests weak dissemination of preventive health guidelines and limited integration of reproductive health education into student health programs.

Together, these gaps underscore the need for strengthened health education initiatives that align with Saudi Vision 2030 and the National Transformation Program (NTP), which emphasize improving preventive health services, promoting health education, and increasing vaccination uptake among youth and university populations [19].

The survey results show that only 11% of female students reported receiving the HPV vaccine, and the main reasons were confidence in its safety, effectiveness, and a family history of cervical cancer. This indicates that perceived risk and trust in the vaccine influence uptake. In contrast, for the unvaccinated students, lack of information was the most frequently reported barrier, followed by fear of side effects. Similar findings were reported in Saudi Arabia and neighboring countries [3,9,11,12]. These findings suggest that vaccine uptake is primarily driven by knowledge and perceived personal relevance rather than general attitudes, highlighting the importance of targeted awareness campaigns It is important that one-fifth of participants believed that cervical cancer screening is unnecessary after vaccination, revealing a serious misconception that threatens the long-term prevention efforts [18,7]. This indicates a critical misunderstanding of the complementary role of screening and vaccination, which could undermine cervical cancer prevention programs if not addressed. Despite these negative attitudes and practices, most students expressed interest in learning more about HPV and its vaccine, highlighting a valuable opportunity for targeted educational interventions within the university [11,12]. This reflects a positive readiness for behavioral change, suggesting that educational interventions are likely to be effective if properly implemented.

Linear regression analysis revealed that age and college type are significant predictors of general knowledge scores. Students enrolled in medical colleges demonstrated higher general and vaccine-specific knowledge than those from non-medical colleges, likely reflecting greater exposure to health-related curricula [20]. This suggests that academic exposure to health sciences plays a key role in shaping accurate HPV knowledge. Knowledge scores also increased with age, suggesting that cumulative educational experience contributes to improved understanding of HPV [12]. College type similarly influenced attitudes toward HPV vaccination, with medical students showing more positive attitudes than their non-medical peers, reinforcing the role of academic background in shaping vaccine perceptions [21,22,23]. This indicates that both maturity and field of study contribute to improved health awareness and more favorable preventive health attitudes.

Vaccination uptake was significantly associated with age, marital status, and knowledge level. Older students were more likely to be vaccinated than the younger students, possibly due to increased health awareness and perceived benefits from the vaccine [22,23]. Married students also showed higher vaccination uptake, indicating that life stage and associated health responsibilities may influence preventive health behaviors [24]. This suggests that personal life experience and perceived vulnerability increase engagement in preventive health actions. Furthermore, vaccination uptake was positively correlated with better knowledge levels, raising the significance of accurate information in converting awareness into action [23,15]. In contrast, attitudes toward HPV vaccination were not significantly associated with vaccination status, indicating that positive perceptions alone may not lead to actual vaccine uptake [25]. This highlights that knowledge is a stronger predictor of behavior than attitudes alone, emphasizing the importance of education over perception change only.

Health education, belief in vaccine effectiveness, and information sources were significant determinants of vaccination behavior. Students who had received structured health education were significantly more likely to be vaccinated, underscoring the role of formal educational interventions in raising awareness and promoting preventive health behaviors [25]. This confirms that structured educational programs have a direct and measurable impact on improving vaccination uptake Similarly, belief in the effectiveness of the HPV vaccine strongly predicted uptake, reflecting the importance of perceived benefits in health decision-making [23,244]. In contrast, reliance on social media as a primary information source was associated with lower vaccination uptake compared with information obtained from medical professionals, indicating that social media may increase awareness but also disseminate misinformation or insufficient information, which can have a detrimental impact on vaccine uptake [25,26].This suggests that credible healthcare providers remain the most influential and reliable source of health information, while unregulated online sources may adversely affect vaccination decisions

The study demonstrates several strengths, including addressing a significant public health issue and providing valuable insights into HPV knowledge, attitudes, and vaccination practices among university students. The inclusion of both medical and non-medical students enhances comparability, and the use of multivariate regression analyses strengthens the findings by allowing identification of independent predictors of HPV knowledge, attitudes, and vaccination behavior.

The study employed a cross-sectional design, which limits the ability to infer causal relationships between knowledge, attitudes, and practices regarding HPV. The research was conducted at a single university, which may limit the generalizability of the findings to other populations. Additionally, vaccination cards were not accessible for verification; the students' immunization status was determined only by self-report. The dependence on self-reporting could have resulted in recall and social desirability bias.

6. Conclusion

This study confirms the hypothesis that female students have suboptimal knowledge, attitudes, and practices regarding HPV infection and vaccination. It also

demonstrates that HPV vaccine uptake varies significantly according to age, marital status, and source of information.

HPV knowledge, attitudes, and vaccination uptake were higher among medical students, revealing disparities in preventive health awareness within the university. Vaccination uptake was significantly influenced by knowledge, health education, and belief in vaccine effectiveness, while reliance on informal information sources was linked to lower uptake. These findings align with Saudi Vision 2030 and the National Transformation Program (NTP), which emphasize enhancing health promotion and disease prevention

Consistent with the Health Belief Model, these factors play a key role in explaining vaccination behavior and supporting cervical cancer prevention efforts among university students.

7. Recommendations

- Organizations must enhance health education to boost awareness of HPV infections and vaccinations. Awareness initiatives, workshops, and incorporation into the curriculum can bridge gaps and foster positive attitudes, especially among non-medical students
- Future studies should use longitudinal or qualitative designs with probability sampling to examine causal relationships and changes over time. Multicenter studies and inclusion of male students would improve generalizability, and adding secondary and preparatory school students would enhance representativeness.
- Public health departments and university must work together on HPV awareness initiatives and effectively provide easily reachable on-campus vaccination services.

8. Ethical considerations

The local Research Ethics Committee at Jazan University (HAPO-10-Z-001) approved this study (Reference No: REC-44/06/463). In accordance with the Helsinki Declaration, informed consent was obtained electronically before participation. Data were collected anonymously without personal identifiers, stored securely, and used only for research purposes. All data will be retained for five years, and then permanently deleted.

1. Author contributions

- Single Author.

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4. Conflict of Interest Statement:

- The author declares that they have no competing interests.

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