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# Knowledge and Attitude toward Human Papillomavirus among Students at the University of Sulaimani/City Campus

**Khanda Mustafa Ahmed**

*University of Sulaimani/College of Nursing, Adult Nursing Department, Sulaymaniyah, Iraq*

## ABSTRACT

Human papillomavirus (HPV) is a sexually transmitted infection, which poses a significant global health concern. HPV affects sexually active individuals worldwide and is the primary cause of cancers in the cervix, anus, vagina, penis, and/or oropharynx. The aim of the study was to assess knowledge and attitude toward HPV among students at the University of Sulaimani City Campus. A cross-sectional study was conducted between December 08, 2024, and February 20, 2025, involving 210 students from the colleges of nursing, pharmacy, education, and Islamic science. Participants were predominantly aged 19–23 years. Female participants (55.7%) outnumbered male participants (44.3%). The most significant representation came from the pharmacy college (34.3%), followed by nursing (28.1%), education (21%), and Islamic science (16.7%). Most participants (86.7%) were in their fourth year of study. Rural residency was reported by 64.8%. Only 29.5% of students demonstrated good knowledge of HPV, and 24.8% showed positive attitudes. While 31% strongly agreed on the importance of vaccination, just 35.7% recognized its role in cancer prevention. Significant associations were found between knowledge levels and age, gender, and father's education ($P < 0.005$). Moreover, there was a significant association between age, gender, father's education, and level of knowledge ($P < 0.005$). Findings reveal substantial gaps in HPV awareness and vaccine attitudes among university students. Targeted educational interventions, particularly within nursing programs, are essential to equip future healthcare professionals with the knowledge needed to promote HPV prevention and reduce cervical cancer risk.

**Index Terms:** Human Papillomavirus, University Students, HPV Prevention, Vaccination, Knowledge, and Attitude

## 1. INTRODUCTION

Human papillomavirus (HPV) is a common infection that primarily affects the skin and mucous membranes [1], [2]. Its prevalence varies significantly across regions. Historically, the Middle East and North Africa (MENA) region has reported lower rates of HPV infection, largely attributed to more conservative sexual practices [3]. However, recent findings by Obeid *et al.* [4] indicate a rising trend in HPV infections among women in the region, particularly among individuals aged 10–24 years. Although comprehensive regional data remain limited, approximately 81% of people in the MENA region are considered to have HPV overall. Countries including Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, the United Arab Emirates, and Yemen are among the nations that make up the Gulf Cooperation Council.

Recent studies by Jensen *et al.* and Petca *et al.* [5], [6] confirmed that HPV is a prevalent genital virus. There are more than 100 types of HPV that are transmitted through skin-to-skin

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**Corresponding author's e-mail:** Khanda Mustafa Ahmed, University of Sulaimani/College of Nursing, Adult Nursing Department, Sulaymaniyah, Iraq. E-mail: khanda.mustafa@univsul.edu.iq

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contact, including sexual contact and other genital contact, such as touching an infected person's genitalia.

However, HPV cannot be transmitted through contact with inanimate objects, such as toilet seats. The Centers for Disease Control and Prevention [7] confirmed that the majority of HPV infections may resolve spontaneously; however, they can occasionally lead to genital warts, skin lesions, and malignancies, including cervical cancer.

A persistent HPV infection can lead to the development of abnormal cells on the cervix, which, if left untreated, may progress to cervical cancer [8]. While cervical cancer is the most common cancer caused by HPV, both men and women can also develop fewer common cancers, including anal, vulvar, vaginal, oral/throat, and penile cancers, as a result of a persistent infection [9]. The appearance of warts varies depending on the specific type of HPV infection [8]. A genital wart may present as a stem-like protrusion, a flat lesion, or small, cauliflower-shaped growths. Furthermore, multiple viruses or serotypes are associated with HPV, with high-risk HPV serotypes being strongly linked to cervical cancer [10]. High-risk serotypes, such as HPV 16 and HPV 18, are frequently detected and have the potential to cause cancer, as reported by Kombe *et al.* [11].

Furthermore, most sexually active men and women can become infected with HPV at some time in their lives, and some people may get infected again. Most people acquire the virus early in life, shortly after becoming sexually active [1], [12].

Cervical cancer is the fourth most common cancer in women and the fourth major cause of cancer-related mortality, according to Sung *et al.* and Bongaerts *et al.* [13], [14]. It is regarded as the third most prevalent malignancy in women under the age of 45 in almost 79% of nations. The estimated global incidence of cervical cancer in 2018 was 13.1 cases/10,000 women, with significant variations between countries, as reported by Arbyn *et al.* [15].

The World Health Organization (WHO) recommends HPV vaccination for girls aged 9–14 as a primary preventive measure against cervical cancer [16]. To achieve global elimination, the WHO aims to reduce incidence to fewer than 4 cases/100,000 women [16] through a life-course strategy encompassing primary, secondary, and tertiary prevention. Secondary interventions focus on screening women aged 30, while tertiary measures include palliative care and cancer treatment [17]. By 2030, the goal is for 90% of girls under 15 to be vaccinated, 70% of women aged 35–45 to be screened, and 90% of those with precancerous lesions to receive treatment [18].

Assessing knowledge and attitudes (KAs) about HPV among university students is crucial for several reasons. First, one of the main causes of cervical cancer and other conditions is HPV. Understanding students' knowledge can help identify gaps and guide the design of educational campaigns to promote awareness about HPV and its prevention. Second, attitudes toward HPV vaccination significantly influence its acceptance. By assessing these attitudes, health authorities can address misconceptions and encourage vaccination, which is essential in reducing HPV-related diseases.

Moreover, university students are forming lifelong health behaviors at a crucial moment. Assessing their attitudes and knowledge about HPV supports larger public health campaigns meant to lower the prevalence of diseases linked to HPV. As university students are at an age where they make independent health decisions, they can significantly benefit from education about HPV. This education encourages healthier lifestyle choices, promotes regular health check-ups, and empowers them to make informed decisions about their well-being, including vaccination, safe sex practices, and regular screenings.

This research provides a unique contribution to the literature by examining university students' attitudes toward HPV within the context of Sulaimani City, offering culturally specific insights that are currently underrepresented in global research. The central hypothesis is that students' attitudes toward HPV are influenced by their level of knowledge, cultural beliefs, and exposure to health education, which in turn affects their willingness to engage in preventive behaviors such as vaccination and screening.

These assessments not only help identify gaps in awareness but also inform the development of targeted educational programs and culturally sensitive materials focused on HPV prevention, transmission, and management. By understanding students' perceptions, the study aims to reduce stigma and misconceptions, ultimately fostering a more supportive environment for individuals affected by HPV.

## 2. MATERIALS AND METHODS

### 2.1. Study Design and Setting

This cross-sectional study was conducted between December 08, 2024, and February 20, 2025, involving 210 students from

the colleges of nursing, pharmacy, education, and Islamic science. A convenient sampling technique was used. Students in their last years of study (4th and 5th years) who expressed an interest to take part in the study were included in the inclusion criteria. As final-stage university students were intentionally selected for this study due to their advanced academic standing and increased exposure to health-related content. By the 4th or 5th year of study, students, particularly those enrolled in health disciplines, are more likely to have encountered formal education on infectious diseases, vaccination, and public health principles. Their maturity and critical thinking skills enhance the reliability of self-reported data, especially in studies assessing KAs. Moreover, as these students transition into professional roles, their perceptions and behaviors regarding HPV prevention carry practical implications for future healthcare delivery and peer education. This cohort's inclusion improves the significance of the results and assists in the creation of focused educational programs targeted to raise young adults' knowledge of HPV and encourage their vaccination uptake. On the other hand, 1st, 2nd, and 3rd-year students were not included.

The sample size was determined based on practical feasibility and methodological considerations. In the absence of prior local data on HPV-related KAs among university students in Sulaimani, a conservative estimate of 50% prevalence was assumed to maximize sample size requirements. Using a 95% confidence level and a 5% margin of error, the ideal sample size was calculated to be approximately 384 participants. However, due to logistical constraints and limited access to multiple institutions, the study was conducted at a single university, and a final sample of 210 students was recruited using convenience sampling. While this number falls below the statistically ideal threshold, it provides valuable preliminary insights and serves as a foundation for future multicenter studies with broader representation.

### 2.2. Ethical Approval

The University of Suleiman's College of Nursing's Ethical Committee provided its approval to the study. (Meeting number 24 on April 21, 2025). All study participants gave verbal consent. Furthermore, the confidentiality of all personal information was ensured throughout the study to provide the participants' anonymity.

### 2.3. Data Collection

Participants were randomly selected, and questionnaires were distributed to 20–30 students in the final stage of each of the aforementioned colleges. Before questionnaire administration, participants were verbally informed of the study's objectives and provided with assurances regarding the confidentiality and anonymity of their responses. A self-administered, anonymous questionnaire was provided to each participant, requiring approximately 15 min to complete.

Following a comprehensive examination of the literature, a questionnaire was developed for the study. It consisted of three parts – Part I: Includes information, including details such as age, gender, college, year of study, marital status, and the parents' educational attainment; Part II: Includes a knowledge assessment about HPV, containing thirteen questions evaluating participants' understanding of HPV infection, the HPV vaccine, and transmission; and Part III: Includes six statements measuring participants' attitudes regarding HPV.

### 2.4. Reliability

To evaluate the instrument's reliability, a pilot study was conducted involving a sample of 15 students. These participants were excluded from the main study to mitigate potential bias. A test-retest procedure was implemented over a 2-week interval, and the resulting scores were analyzed to calculate a reliability coefficient. Cronbach's alpha was employed to assess internal consistency, yielding a value of 0.84 for the full instrument, indicating excellent reliability. Data entry was performed on the same day as collection, allowing for immediate quality control and verification of completeness.

### 2.5. Pilot Study

A small trial study was conducted in the mentioned colleges at the University of Sulaimani. It took place from November 20 to November 27, 2024, involving 15 students as the sample for the pilot study. These students were excluded from the main study sample.

### 2.6. Validity

To ensure content validity, the questionnaire was reviewed by a panel of six experts representing diverse fields relevant to the study. Each expert received a preliminary version of the instrument and was asked to evaluate its clarity, relevance, and adequacy in capturing the intended constructs. The majority consensus affirmed that the questionnaire was appropriately designed and effectively structured to assess the phenomenon under investigation.

### 2.7. Statistical Analysis

The data preparation process involved data entry, coding of questions and variables, data cleaning to identify and correct illogical values, and data computation. The analysis

was conducted using the Statistical Package for the Social Sciences (SPSS) version 22. Descriptive statistics were used to analyze numerical data, providing useful summaries and facilitating the identification of average values, including the mean, median, and standard deviation. Frequency distribution represents categorical data. A $P < 0.05$ was considered statistically significant. Sociodemographic characteristics were presented as frequencies and percentages. Inferential statistical tests, including one-way analysis of variance and t-tests, were used where appropriate to compare the means of numeric variables. Upon identifying significant differences, students' KA scores were categorized into three groups according to their percentage of the maximum possible score: Poor (0–50%), fair (51–75%), and good (76–100%).

The level of HPV knowledge was assessed using a set of closed-ended and multiple-choice questions. Nine of these questions had "Yes" (3 points), "No" (2 points), and "Do not know" (1 point) as response options. The remaining questions were multiple-choice, allowing participants to select more than one answer from a list of provided options.

Attitudes toward HPV were assessed using a 5-point Likert scale: Strongly Agree (5 points), Agree (4 points), Neutral (3 points), Disagree (2 points), and Strongly Disagree (1 point). The attitude section comprised 6 statements, resulting in a total possible score ranging from 6 to 30 per respondent. To facilitate interpretation, total scores were converted into a standardized scale ranging from 1 to 5, where a score closer to 5 indicated a more positive attitude toward HPV. Based on the standardized score, participants' attitudes were classified as positive (≥4), neutral (3–3.9), or negative.

## 3. RESULTS

The study sample comprised university students with a mean age of 22.1 years (SD = 1.72), reflecting a relatively homogenous cohort typical of senior undergraduate populations. The majority (85.2%) were aged between 19 and 23 years, suggesting that the findings predominantly represent early adulthood, a developmental stage characterized by increased autonomy and evolving health-related decision-making. A smaller proportion (14.8%) was aged 24–28, indicating limited representation from older students who may have different life experiences or health priorities. Gender distribution showed a slightly higher proportion of female participants (55.7%) compared to males (44.3%). This may reflect enrollment trends in health-related disciplines and could be relevant given the gendered nature of HPV-related health risks and screening behaviors.

Participants were drawn from four academic colleges, with the largest representation from pharmacy (34.3%), followed by nursing (28.1%), education (21%), and Islamic science (16.7%). The predominance of students from health-related fields (pharmacy and nursing) may enhance the relevance of their responses, as these students are more likely to have received formal education on infectious diseases and preventive health measures. A substantial majority (86.7%) were in their 4$^{th}$ year of study, suggesting a cohort with advanced academic exposure and potential familiarity with public health concepts. This may contribute to more informed perspectives on HPV and related interventions.

Residency data indicated that 64.8% of participants lived in rural areas. This variable is particularly salient, as rural residency may be associated with reduced access to healthcare services and health education, potentially influencing KAs toward HPV prevention and vaccination. Regarding marital status, most participants were single (78.1%), while 21.9% were married. Marital status may intersect with sexual health behaviors and perceptions, which are relevant to HPV-related research, particularly in culturally sensitive contexts.

Finally, parental education levels were relatively high, with 71% of mothers and 82.9% of fathers reported as educated. Parental education is often linked to greater health literacy and may indirectly shape participants' attitudes and knowledge through familial influence and early exposure to health-promoting behaviors (Table 1).

The results indicate that over half of the participants (51.4%) were unaware of HPV. In addition, there is a lack of understanding about HPV, with the majority of participants (94.3%) unsure of what it is or incorrectly associating it with bacterial infections. The most common source of information regarding HPV among participants was health professionals (23.8%), followed by the Internet (18.6%), friends (13.8%), and television (4.8%). Regarding HPV transmission, the majority of participants (30.5%) reported that it can be transmitted through sexual contact. In comparison, 28.6% believed that it could be transmitted through skin contact, while 12.4% thought that it could be transmitted through sharing personal items.

Over half of the participants (52.4%) were unaware that HPV is a causative agent of cancer. However, 60% recognized its link to oral cancer, while 26% identified its association

**TABLE 1: Distribution of participants according to sociodemographic characteristics**

| Variables | Frequency (F) | Percentage |
|---|---|---|
| Age groups | | |
| 19–23 years | 179 | 85.2 |
| 24–28 years | 31 | 14.8 |
| Mean±SD 22.1±1.72 Median 22 | | |
| Gender | | |
| Female | 117 | 55.7 |
| Male | 93 | 44.3 |
| College | | |
| Nursing | 59 | 28.1 |
| Pharmacy | 72 | 34.3 |
| Education | 44 | 21 |
| Islamic science | 35 | 16.7 |
| Years of study | | |
| 4th years | 182 | 86.7 |
| 5th years | 28 | 13.3 |
| Residency | | |
| Urban | 74 | 35.2 |
| Rural | 136 | 64.8 |
| Marital status | | |
| Single | 164 | 78.1 |
| Married | 46 | 21.9 |
| Mother education | | |
| Educated | 149 | 71 |
| Non educated | 61 | 29 |
| Father education | | |
| Educated | 174 | 82.9 |
| Non educated | 36 | 17.1 |
| Total | 210 | 100 |

with anal cancer. In terms of vaccination awareness, 34.3% of respondents correctly indicated that the HPV vaccine is recommended for females and can be administered prior to the age of 12. However, only 29.5% knew that the vaccine can be administered after the age of 18 years old.

With respect to preventive knowledge, there is a lack of awareness about prevention methods. For example, 86.7% of participants demonstrated awareness of the Pap smear test as a preventive screening tool, and 83.3% knew that using condoms can help prevent HPV. Interestingly, the proportion of participants who believed that HPV infection could be asymptomatic was evenly split at 50%. More than two-thirds (68.6%) knew that HPV can affect both genders. Finally, 64.8% of participants expressed interest in receiving more information about HPV, indicating a strong demand for educational resources (Table 2).

The current survey shows that 37.1% of participants strongly agree that receiving an HPV vaccination is necessary, indicating a more positive viewpoint regarding HPV vaccination. Nonetheless, a notable proportion of participants (36.2%) expressed neutrality regarding the recommendation of the

**TABLE 2: General knowledge toward human papillomavirus of the study sample**

| Knowledge about human papillomavirus | Yes F (%) | No F (%) |
|---|---|---|
| 1-Have you heard of Human Papillomavirus (HPV)? | 102 (48.6) | 108 (51.4) |
| 2-What is HPV? | | |
| Virus that causes warts | 69 (32.9) | 141 (67.1) |
| A virus that can cause certain cancers | 37 (17.6) | 173 (82.4) |
| A bacterial infection | 12 (5.7) | 198 (94.3) |
| Not sure | 98 (46.7) | 112 (53.3) |
| 3-Where did you first hear about HPV? (Select all that apply) | | |
| Social media | 37 (17.6) | 173 (82.4) |
| Internet | 39 (18.6) | 171 (81.4) |
| Television | 10 (4.8) | 200 (95.2) |
| Health professionals | 50 (23.8) | 160 (76.2) |
| Friends or family | 29 (13.8) | 181 (86.2) |
| Others (please specify) | 49 (23.3) | 161 (76.7) |
| 4-How is HPV transmitted? (Select all that apply) | | |
| Skin-to-skin contact | 60 (28.6) | 150 (71.4) |
| Sexual contact | 64 (30.5) | 146 (69.5) |
| Sharing personal items | 26 (12.4) | 184 (87.6) |
| Airborne transmission | 20 (9.5) | 190 (90.5) |
| Not sure | 83 (39.5) | 127 (60.5) |
| 5-Can HPV cause cancer? | 110 (52.4) | 100 (47.6) |
| 6-Is there a vaccine available for HPV? | 133 (63.3) | 77 (36.7) |
| 7-Who should get the HPV vaccine? (Select all that apply) | | |
| Female only | 72 (34.3) | 138 (65.7) |
| Male only | 9 (4.3) | 201 (95.7) |
| Both | 62 (29.5) | 148 (70.5) |
| Do not know | 51 (24.3) | 159 (75.7) |
| 8-At what age is the HPV vaccine recommended? | | |
| Before age 12 | 72 (34.3) | 138 (65.7) |
| Between ages 12 and 18 | 9 (4.3) | 201 (95.7) |
| After age 18 | 62 (29.5) | 148 (70.5) |
| Do not know | 51 (24.3) | 159 (75.7) |
| 9-Which health conditions do you associate with HPV? (Select all that apply) | | |
| Cervical cancer | 47 (22.4) | 163 (77.6) |
| Genital warts | 60 (28.6) | 150 (71.4) |
| Oral cancer | 21 (10.0) | 189 (90) |
| Anal cancer | 26 (12.4) | 184 (87.6) |
| None | 13 (6.2) | 197 (93.8) |
| Not sure | 99 (47.1) | 111 (52.9) |
| 10-Do you think HPV infection can be asymptomatic? | 105 (50.0) | 105 (50.0) |
| 11-Are you aware that HPV can affect both men and women? | 144 (68.6) | 66 (31.4) |
| 12-Do you know how HPV can be prevented? | | |
| Vaccine | 72 (34.3) | 138 (65.7) |
| Pap-smear test | 28 (13.3) | 182 (86.7) |
| Using condom | 35 (16.7) | 175 (83.3) |
| Do not know | 92 (43.8) | 118 (56.2) |
| 13-Would you be interested in getting more information on HPV? | 136 (64.8) | 74 (35.2) |
| Total | 210 | 100 |

HPV: Human papillomavirus

HPV vaccine to friends and family. Regarding attitudes toward vaccination, 35.7% of participants believe that

getting vaccinated against HPV can prevent certain types of cancer, while a significant number of participants (37.6%) remain neutral. Nearly one-quarter (39.5%) of participants agree or strongly agree that it is crucial for students to be educated about HPV and its potential health risks, reflecting strong support for HPV education. In addition, 45.7% of participants believe that increased awareness of HPV could help reduce its spread. Furthermore, 32.4% of participants agree that discussing HPV openly among students might help reduce the stigma associated with sexually transmitted diseases (STIs), showing a positive attitude toward open communication and education (Table 3).

The findings reveal that less than half of the participants (45.7%) possessed minimal knowledge about HPV, while only 29.5% possess good knowledge. Furthermore, more than a third of the participants (36.7%) exhibit a poor attitude toward HPV, and 24.8% demonstrate a good attitude. In terms of encouraging positive attitudes toward HPV prevention and education, it shows that although attitudes are slightly better than knowledge levels, considerably more can be performed (Table 4).

The findings from Table 5 indicate that there is an association between certain sociodemographic. Factors such as age, gender, years of study, marital status, and father's education were statistically significant in relation to knowledge about HPV among the study participants ($P < 0.005$). Nevertheless, no statistically significant association between mother's education, residency, and college was found.

Table 6 reveals statistically significant associations between participants' attitudes toward HPV and the variables of age, gender, college affiliation, years of study, and father's educational level ($P < 0.005$). In contrast, no significant associations were observed with residency status, marital status, or mother's education.

## 4. DISCUSSION

The purpose of the current study was to evaluate university students' attitudes and knowledge regarding HPV.

These findings are consistent with those reported by Khan *et al.* [19] in Pakistan, where the majority of respondents were female (74.9%) and single (79%). The demographic parallels with Khan *et al.* [19] suggest that young, unmarried women across South Asia may share similar vulnerabilities and openness to HPV prevention. This regional consistency underscores the urgency of culturally sensitive, gender-focused interventions; this population should be a key target for public health efforts. Tailored awareness campaigns and vaccination outreach initiatives are essential to effectively promote HPV prevention within this group. In addition, while pharmacy students comprised the largest academic group in both studies (46.2% in Khan *et al.*'s study; 34.3% in the present study), the limited representation from non-health disciplines such as arts and humanities underscores a gap in HPV-related education across the broader university population. These findings highlight the need for interdisciplinary educational interventions that extend beyond health faculties, integrating HPV awareness into general curricula and student wellness programs. Such efforts could enhance vaccine uptake, reduce stigma, and promote informed decision-making among diverse student populations.

**TABLE 3: Level of Attitude toward human papillomavirus among study participants**

| Attitude toward human papillomavirus | Answer | | | | | |
|---|---|---|---|---|---|---|
| | Strongly agree F (%) | Agree F (%) | Neutral F (%) | Disagree F (%) | Strongly disagree F (%) | Mean |
| 1-Do you think that it is important to get vaccinated against HPV? | 65 (31) | 78 (37.1) | 50 (23.8) | 8 (3.8) | 9 (4.3) | 3.86 |
| 2-Would you recommend the HPV vaccine to your friends and family? | 67 (31.9) | 33 (15.7) | 76 (36.2) | 19 (9) | 15 (7.1) | 3.56 |
| 3-Do you believe that getting vaccinated against HPV can prevent certain types of cancer? | 75 (35.7) | 22 (10.5) | 79 (37.6) | 23 (11) | 11 (5.2) | 3.60 |
| 4-Do you think students need to be educated about HPV and its potential health risks? | 83 (39.5) | 83 (39.5) | 30 (14.3) | 8 (3.8) | 6 (2.9) | 4.09 |
| 5-Do you believe that increased awareness of HPV could help reduce its spread? | 76 (36.2) | 96 (45.7) | 25 (11.9) | 5 (2.4) | 8 (3.8) | 4.08 |
| 6-Do you think that discussing HPV openly among students might help reduce stigma associated with STIs? | 66 (31.4) | 68 (32.4) | 62 (29.5) | 10 (4.8) | 4 (1.9) | 3.86 |

Scores MD=24.0, Mean±SD 23.0±3.55, HPV: Human papillomavirus

**TABLE 4: Distribution of knowledge and attitude scores among study participants**

| Variables *n*=(210) | Scores | Frequency (F) | Percentage |
|---|---|---|---|
| Knowledge human papillomavirus | Poor | 96 | 45.7 |
| | Fair | 52 | 24.8 |
| | Good | 62 | 29.5 |
| Attitude to human papillomavirus | Poor | 77 | 36.7 |
| | Fair | 81 | 38.6 |
| | Good | 52 | 24.8 |

**TABLE 5: Association between knowledge of human papillomavirus and sociodemographic characteristics among study participants**

| Sociodemographic characteristics | *n* | Knowledge of human papillomavirus scores | Statistical analysis | |
|---|---|---|---|---|
| | | Mean SD | t/F | *P*-value |
| Age groups | | | | |
| 19–23 years | 179 | 7.89±2.45 | −11.131 | 0.000 |
| 24–28 years | 31 | 7.96±1.51 | | H. Sig |
| Gender | | | | |
| Female | 117 | 7.76±2.11 | −6.036 | 0.000 |
| Male | 93 | 8.08±1.89 | | H. Sig |
| College | | | | |
| Nursing | 59 | 8.11±2.00 | 4.217 | 0.912 |
| Pharmacy | 72 | 7.98±2.16 | | N. Sig |
| Education | 44 | 7.96±2.14 | | |
| Islamic science | 35 | 7.31±1.51 | | |
| Years of study | | | | |
| 4th year | 182 | 7.92±2.03 | −11.076 | 0.005 |
| 5th year | 28 | 7.75±1.97 | | Sig |
| Residency | | | | |
| Urban | 74 | 7.78±1.85 | −2.848 | 0.375 |
| Rural | 136 | 7.97±2.11 | | N. Sig |
| Marital status | | | | |
| Single | 164 | 8.04±2.12 | −9.228 | 0.000 |
| Married | 46 | 7.41±1.51 | | H. Sig |
| Mother education | | | | |
| Educated | 149 | 8.04±2.08 | −7.954 | 0.125 |
| Non-educated | 61 | 7.57±1.82 | | N. Sig |
| Father education | | | | |
| Educated | 174 | 8.03±2.11 | −9.959 | 0.000 |
| Non-educated | 36 | 7.27±1.34 | | H. Sig |

Another study by Liu *et al.* [20] conducted in Beijing, China, reported that 56.3% of participants were female and 43% were male. Similarly, Shetty *et al.* [21] in South India found that 72.3% of participants were female, while 27.7% were male. In Shetty's study, 50.8% of participants were between the ages of 20 and 22. The largest proportion of participants were enrolled in medical programs (43.5%), followed by those studying dentistry (27. 9%), nursing students (21.1%), and medical laboratory students (7.5%). Regarding marital status, 91% of the participants were single. Most participants were 1st-year students (32.2%). More than half of the students (55.8%) were from urban areas. In addition, the percentage

**TABLE 6: Association between attitude of human papillomavirus and sociodemographic characteristics among study participants**

| Sociodemographic characteristics | *n* | Attitude of human papillomavirus scores | Statistical analysis | |
|---|---|---|---|---|
| | | Mean±SD | t/F | *P*-value |
| Age groups | | | | |
| 19–23 years | 179 | 22.9±3.57 | −12.844 | 0.000 |
| 24–28 years | 31 | 23.8±3.40 | | H. Sig |
| Gender | | | | |
| Female | 117 | 23.1±3.23 | −6.885 | 0.000 |
| Male | 93 | 22.9±3.92 | | H. Sig |
| College | | | | |
| Nursing | 59 | 23.0±3.10 | 4.269 | 0.000 |
| Pharmacy | 72 | 23.0±3.89 | | H. Sig |
| Education | 44 | 23.2±3.77 | | |
| Islamic science | 35 | 22.8±3.37 | | |
| Years of study | | | | |
| 4th year | 182 | 22.8±3.64 | −13.549 | 0.029 |
| 5th year | 28 | 24.7±2.35 | | Sig |
| Residency | | | | |
| Urban | 74 | 22.7±3.73 | −3.822 | 0.335 |
| Rural | 136 | 23.2±3.45 | | N. Sig |
| Marital status | | | | |
| Single | 164 | 23.3±3.36 | −10.365 | 0.067 |
| Married | 46 | 22.5±4.16 | | N. Sig |
| Mother education | | | | |
| Educated | 149 | 23.0±3.46 | −9.817 | 0.304 |
| Non-educated | 61 | 23.1±3.80 | | N. Sig |
| Father education | | | | |
| Educated | 174 | 23.1±3.33 | −11.705 | 0.044 |
| Non-educated | 36 | 22.5±4.50 | | Sig |

of fathers' professions in various fields was higher compared to mothers' professions, which included healthcare providers, self-employed individuals, and retirees.

The findings of this study were consistent with those of a previous study conducted by Khan *et al.* [19], which also examined KAs toward HPV among university students in Pakistan. The study confirmed that 57% of students reported having heard about HPV. The participants' knowledge of HPV infection was 43.6%, whereas their knowledge of the HPV vaccine was 25.3%. Furthermore, almost the same percentage of students said that HPV infects both men and women, and 55% said that HPV causes cervical cancer. According to the vast majority of students (71%), HPV is not a rare disease in Pakistan. Nearly 68% of students, however, disagreed that HPV can cause no symptoms. About 47% of respondents said that HPV causes anal and penile malignancies, while 52% claimed that it causes external genital warts.

Regarding the mechanism of transmission, 40.51% of respondents answered that they were unsure, 34.10% stated

that body fluid exchange is the most common way, followed by skin-to-skin contact (44.87%), and coughing or sneezing (5.64%). Less than half (44.87%) of students said that vaccination is the best way to prevent HPV, followed by sexual abstinence (30%), condom use (21.54%), and antibiotic use (5.38%). Unlike prior studies conducted in South and East Asia, this research provides the first comparative insight into HPV knowledge among Iraqi university students. The persistence of misconceptions and low vaccine awareness highlights a critical gap in sexual health education, suggesting the need for national curriculum reform and targeted outreach.

Moreover, reports from previous studies by Khan *et al.*, [19]; Shetty *et al.*, [21]; Patel *et al.*, [22]; Khatiwada *et al.*, [23]; Mekonnen *et al.*, [24] confirmed that the sources of information were varied, including the Internet (37.8%), teachers (31.7%), television (22.1%), healthcare providers (21.9%), brochures (16.7%), posters (14.2%), family (9.4%), social media (67.3%), college education (48.0%), families or friends (41.7%), doctors or health-related workers (37.3%), friends (9.6%), radio (6%), media (49.12%), healthcare professionals (30.97%), and primary care physicians (2.9%). These findings suggest that social media campaigns are effective tools that hold contemporary relevance, indicating that social media campaigns may serve as effective tools for enhancing public knowledge about HPV. In addition, traditional media continues to have a significant impact, and healthcare providers continue to be reliable sources of information. This research highlights how important it is for medical professionals to be informed and initiative-taking in teaching people about HPV. Finally, family and community-based interventions can be very effective in raising awareness about HPV and fostering positive attitudes.

Regarding knowledge on HPV transmission, Chanprasertpinyo *et al.* [25] confirmed that approximately 65% of participants knew that HPV spreads through sexual contact and causes infection in both men and women. In addition, 52.4% of participants recognized that early sexual activity increases the risk of HPV infection, and 52.8% were aware of its role in causing cervical cancer. However, only 49.7% understood that condom use can help prevent HPV transmission. Notably, over half of the respondents (57%) were unaware that the HPV vaccine offers protection for both males and females In addition, Shetty *et al.* and Varer *et al.* [21], [26] found that a small percentage of participants (24.4%) stated that a woman who had previously been infected could receive the HPV vaccine; 21.8% were aware that the HPV vaccine could not cure a current infection. Nonetheless, 64.4% of respondents said that both males and females should have the vaccination, and 61% knew that cervical cancer screening was required for individuals who had already had the vaccination.

Likewise, Kim *et al.* [27] conducted a study in China assessing knowledge, attitudes, and perceptions associated with HPV vaccination among female Korean and Chinese university students. They found that 21.1% of Chinese female college students and 25.4% of Korean female students had heard of HPV. 15.8% of Korean students thought the immunization was unnecessary in the absence of infection signs, while 17.2% said that it should only be given to females. 52.7% of Chinese students said that HPV vaccinations should be given to both men and women, 31% answered that they were not required if there were no signs of infection, and 16.3% answered that only women should have them.

Furthermore, a study conducted by Shetty *et al.* [21] in South India revealed that most students (78%) knew the sexual route of HPV transmission, and 25.8% believed that HPV infection could be asymptomatic. While 62.6% of students demonstrated awareness that cervical cancer results from persistent infection with high-risk HPV strains and acknowledged that HPV can affect males, only 37.2% recognized its link to oropharyngeal cancer. In addition, 49.5% of participants reported that condom use offers protection against HPV transmission.

Moreover, Khatiwada *et al.* [23] in Indonesia confirmed that 90% of students reported that HPV is the leading cause of cervical cancer, and 86.3% agreed that sexual transmission is crucial for the spread of HPV infections among individuals. The participants' knowledge of the HPV vaccines was slightly greater than two-thirds. Regarding the administration of the HPV vaccine, 35% of students aged 15–20 years had received it. In contrast, 26% of students believed that 9–14 years was the optimal age range for receiving the vaccine, while 28% considered 21–26 years to be ideal.

Similarly, Cheema *et al.* [28] claimed that the majority (67.6%) of students knew that HPV can infect both males and females, and 58.3% stated that HPV can cause health effects in both men and women. Over half of the participants (53.8%) recognized that HPV is primarily transmitted through sexual intercourse, and 54% acknowledged that practicing safe sex – such as using condoms – can reduce the risk of transmission. In contrast, only 12.6% were aware that HPV infections often resolve spontaneously without medical intervention, and just 11.5% correctly identified the recommended vaccination age as between 11 and 12 years.

A significant portion of participants believed that HPV could be transmitted through skin contact or sharing items, which mirrors misconceptions reported in studies from India and China. However, the persistence of these myths in our Iraqi sample may be influenced by limited sexual health education and cultural sensitivities surrounding (STIs). Iraq lacks coordinated national efforts to address HPV knowledge gaps. This suggests a need for culturally tailored educational interventions that respect local norms while promoting accurate information.

Similarly, a study by Khan *et al.* [19] revealed that approximately 53% of students stated that there is no vaccine against HPV, and 64% disagreed that a vaccine can prevent HPV. In addition, Khatiwada *et al.* [22] reported that over 70% of participants perceived the HPV vaccine as both safe and highly effective. However, approximately 21% believed that vaccination is unnecessary for individuals who are otherwise healthy.

Furthermore, Cheema *et al.* [28] reported that 71.5% of students would accept HPV vaccination if recommended by a physician, while Patel *et al.* [22] found that 90% of participants believed that vaccines were safe and expressed willingness to receive and promote them. Despite this general receptiveness, vaccine hesitancy remains pronounced among nursing students, with 20% expressing safety concerns and fewer than 3% reporting prior vaccination. This discrepancy suggests that professional exposure to healthcare information does not uniformly translate into vaccine confidence, highlighting the need for targeted educational interventions within nursing curricula.

Regarding peer and family influence, Di Giuseppe *et al.* [29] and Cheema *et al.* [28] noted that 54.5% of students desired more information before recommending the vaccine to others. This underscores a broader issue: Negative perceptions often stem from misinformation, particularly through social media, and limited understanding of HPV risks and vaccine benefits. Despite robust evidence supporting vaccine safety, concerns about side effects persist, exacerbated by cultural stigma surrounding sexually transmitted infections. Myths such as claim that the vaccine causes infertility or promotes early sexual activity further deter uptake, especially in conservative societies

Significantly, because HPV is spread through sexual contact, conversations about the virus and its vaccine are sometimes frowned upon in some cultures, which causes stigma and discourages people from being vaccinated. Myths and misinformation such as claim that the vaccine causes infertility or encourages early sexual behavior. Apart from safety concerns, other reasons that contribute to vaccine hesitation include cultural beliefs, misinformation, and poor access to reliable health education.

In terms of KA, Chowdhury *et al.* [30] found that 56.71% of participants had poor HPV knowledge, while Abdelaliem *et al.* [31] reported moderate attitudes among 57% of nursing students. Cheema *et al.* [27] similarly observed low knowledge levels, with only 22.4% demonstrating good understanding. Voidazan *et al.* [32] revealed that 6$^{th}$-year medical students in Romania had significantly higher HPV knowledge (62%) compared to 1$^{st}$-year students (55.1% with minimal understanding), suggesting that academic progression correlates with awareness. These findings emphasize the importance of integrating HPV education early in university programs to address knowledge gaps and foster informed attitudes.

Sociodemographic factors also influence attitudes. Abdelaliem *et al.* [30] confirmed a significant association with marital status, while academic year showed a negative correlation with nursing students' attitudes toward vaccination. In contrast, age and marital status were positively linked to favorable perceptions. These trends suggest that maturity and life experience may enhance receptivity to preventive health measures.

This study has several limitations. First, its findings may not be generalizable beyond the sampled university in Sulaimani city. Future research should adopt multicenter designs to capture broader educational contexts. Second, the cross-sectional nature of the study limits causal inference; longitudinal or experimental approaches are needed to establish temporal relationships. Finally, due to the absence of a standardized global tool for assessing HPV KAs, the questionnaire was adapted from previously validated instruments, which may affect comparability across studies.

## 5. CONCLUSIONS

The results suggest a gap in KAs regarding HPV among university students. As future healthcare professionals, it is essential for students to possess a foundational understanding of HPV and its vaccine to effectively educate the public and promote preventive health behaviors. Therefore, it is crucial to develop community-based initiatives with a focus on integrating HPV education into school and university

health curricula, organizing peer-led workshops, and engaging local healthcare professionals to culturally deliver sensitive and evidence based information. In addition, media campaigns should be strategically designed to correct prevalent misconceptions, particularly the myth that HPV is transmitted through airborne routes or casual contact. Messaging should clearly communicate that since sexual contact is the main way that HPV spreads, it is important to highlight the vaccine's role in cancer prevention and foster open dialog to reduce stigma associated with sexually transmitted infections.

Moreover, practical outreach efforts could include setting up information booths in public spaces staffed by trained healthcare professionals, distributing educational brochures, and leveraging digital platforms to reach diverse audiences. These interventions should be inclusive and gender sensitive, ensuring that individuals of all backgrounds are equipped with accurate knowledge to make informed decisions about HPV prevention and risk management.

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## 7. CONFLICTS OF INTEREST

The author affirms that they have no conflicts of interest.

## REFERENCES

[1] World Health Organization. "*Human Papillomavirus and Cervical Cancer*". Available from: https://www.who.int/news-room/fact-sheets/detail/human-papilloma-virus-and-cancer [Last accessed on 2025 Nov 19].

[2] J. Wolf, L. F. Kist, S. B. Pereira, M. A. Quessada, H. Petek, A. Pille, J. G. Maccari, M. P. Mutlaq and L. A. Nasi. "Human papillomavirus infection: Epidemiology, biology, host interactions, cancer development, prevention, and therapeutics". *Reviews in Medical Virology*, vol. 34, no. 3, p. e2537, 2024.

[3] H. B. Baghi, B. Yousefi, M. A. Oskouee and M. Aghazadeh. "HPV vaccinations: A Middle Eastern and North African dilemma". *Lancet Infectious Dieases*, vol. 17, no.1, pp. 18-19, 2017.

[4] D. A. Obeid, S. A. Almatrrouk, M. B. Alfageeh, M. N. A. Al-Ahdal, F. S. Alhamlan. "Human papillomavirus epidemiology in populations with normal or abnormal cervical cytology or cervical cancer in the Middle East and North Africa: A systematic review and meta-analysis". *Journal of Infection and Public Health*, vol. 13, no. 9, pp. 1304-1313, 2020.

[5] J. E. Jensen, G. L. Becker, J. B. Jackson and M. B. Rysavy. "Human papillomavirus and associated cancers: A review". *Viruses*, vol. 16, no. 5, p. 680, 2024.

*[6]* A. Petca, A. Borislavschi, M. E. Zvanca, R. C. Petca, F. Sandru and M. C. Dumitrascu. "Non-sexual HPV transmission and role of vaccination for a better future". *Experimantal and Theraputic Medicine*, v*ol.* 20, no. 6, p. 1, 2020.

[7] Centers for Disease Control and Prevention. "*Genital HPV Infection: CDC Fact Sheet*". Atlanta GA, 2017. Available from: https://www.cdc.gov/std/hpv/stdfact-hpv.html [Last accessed on 2025 Nov 19].

[8] P. V. Chin-Hong, G. E. Reid and AST Infectious Diseases Community of Practice. "Human papillomavirus infection in solid organ transplant recipients: Guidelines from the American Society of transplantation infectious diseases community of practice". *Clinical Transplantation*, vol. 33, p. e13590, 2019.

[9] K. Tanaka, G. Kogure, M. Onuki, K. Matsumoto, T. Iwata, D. Aoki and I. Kukimoto. "Ancient evolutionary history of human papillomavirus type 16, 18 and 58 variants prevalent exclusively in Japan". *Viruses*, vol. 14, no. 3, p. 464, 2022.

[10] Y. Lu, J. Xue, T. Deng, X. Zhou, K. Yu, L. Deng, M. Huang, X. Yi, M. Liang, Y. Wang and H. Shen. "Safety and feasibility of CRISPR-edited T cells in patients with refractory non-small-cell lung cancer". *Nature Medicine*, vol. 26, no. 5, pp. 732-740, 2020.

[11] A. J. K. Kombe, B. Li, A. Zahid, H. M, Mengist, G. A Bounda, Y. Zhou and T. Jin. "Epidemiology and burden of human papillomavirus and related diseases, molecular pathogenesis, and vaccine evaluation". *Frontiers in Public Health*, vol. 8, p. 552028, 2021.

[12] A. Ardekani, M. Sepidarkish, A. Mollalo, P. Afradiasbagharani, S. Rouholamin, M. Rezaeinejad, M. Farid Mojtahedi, S. Mahjour, M. Almukhtar, M. Nourollahpour Shiadeh and A. Rostami. "Worldwide prevalence of human papillomavirus among pregnant women: A systematic review and meta-analysis". *Reviews in Medical Virology*, vol. 33, no. 1, p. e2374, 2023.

[13] H. Sung, J. Ferlay, R. Siegel, M. Laversanne, I. Soerjomataram, A. Jemal and F. Bray. "Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries". *A Cancer Journal for Clinicians*, vol. 71, no. 3, pp. 209-249, 2021.

[14] O. Bongaerts, C. Clevers, M. Debets, D. Paffen, L. Senden, K. Rijks, L. Ruiten, D. Sie-Go, P. J. Van Diest and M. Nap. "Conventional microscopical versus digital whole-slide imaging-based diagnosis of thin-layer cervical specimens: A validation study". *Journal of Pathology Informatics*, vol. 9, no. 1, p. 29, 2018.

[15] M. Arbyn, E. Weiderpass, L. Bruni, S. De Sanjosé, M. Saraiya, J. Ferlay and F. Bray. "Estimates of incidence and mortality of cervical cancer in 2018: A worldwide analysis". *The Lancet Global Health*, vol. 8, no. 2, pp. e191-e203, 2020.

[16] World Health Organization. "*Vaccines and Immunization: What is Vaccination*?" Geneva, 2021. Available from: https://www.who.int/news-room/questions-and-answers/item/vaccines-and-immunization-what-is-vaccination [Last accessed on 2025 Nov 19].

[17] World Health Organization. "*Global Strategy to Accelerate the Elimination of Cervical Cancer as a Public Health Problem*", 2020. Available from: https://www.who.int/publications/i/item/9789240014107 [Last accessed on 2025 Nov 19].

[18] Z. Q. Toh, F. Zhao, L. Zhang, L. Wei and H. Zou. "HPV natural history, immunological responses and vaccination strategies:

Challenges and opportunities". *Frontiers in Immunology*, vol. 14, p. 1349664, 2024.

[19] T. M. Khan, M. A. Buksh, I. U. Rehman and A. Saleem. "Knowledge, attitudes, and perception towards human papillomavirus among university students in Pakistan". *Papillomavirus Research*, vol. 2, pp. 122-127, 2016.

[20] Y. Liu, N. Di and X. Tao. "Knowledge, practice and attitude towards HPV vaccination among college students in Beijing, China". *Human Vaccines and Immunotherapeutics*, vol. 16, no. 1, pp. 116-123, 2020.

[21] S. Shetty, S. Prabhu, V. Shetty and A. K. Shetty. "Knowledge, attitudes and factors associated with acceptability of human papillomavirus vaccination among undergraduate medical, dental and nursing students in South India". *Human Vaccines and Immunotherapeutics*, vol. 15, no. 7-8, pp. 1656-1665, 2019.

[22] N. H. Patel, H. S. Parikh, M. R. Jasrai, P. J. Mewada and N. Raithatha. "The study of the prevalence of knowledge and vaccination status of HPV vaccine among healthcare students at a tertiary healthcare center in Western India". *The Journal of Obstetrics and Gynecology of India*, vol. 74, no. 4, pp. 326-333, 2024.

[23] M. Khatiwada, C. Kartasasmita, H. S. Mediani, C. Delprat, G. Van Hal and C. Dochez. "Knowledge, attitude and acceptability of the human papilloma virus vaccine and vaccination among university students in Indonesia". *Frontiers in Public Health*, vol. 9, p. 616456, 2021.

[24] B. A. Mekonnen, Y. K. Anagaw, B. A. Kassahun and M. C. Worku. "Evaluation of female university students knowledge, attitudes, and practices toward human papillomavirus infection and vaccination. Multicenter cross-sectional study". *BMC Womens Health*, vol. 24, no. 1, p. 437, 2024.

[25] W. Chanprasertpinyo and C. Rerkswattavorn. "Human papillomavirus (HPV) vaccine status and knowledge of students at a university in rural Thailand". *Heliyon*, 6, no. 8, p. e04625, 2020.

[26] C. Varer Akpinar and S. Alanya Tosun. "Knowledge and perceptions regarding human papillomavirus (HPV) and willingness to receive HPV vaccination among university students in a north-eastern city in Turkey". *BMC Womens Health*, vol. 23, no. 1, p. 299, 2023.

[27] H. W. Kim, E. J. Lee, Y. J. Lee, S. Y. Kim, Y. J. Jin, Y. Kim and J. L. Lee. "Knowledge, attitudes, and perceptions associated with HPV vaccination among female Korean and Chinese university students". *BMC Women's Health*, vol. 22, no. 1, p. 51, 2022.

[28] S. Cheema, A. Abraham, P. Maisonneuve, A. Jithesh, K. Chaabna, R. Al Janahi, S. Sarker, A. Hussain, S. Rao, A.B. Lowenfels and R. Mamtani. "HPV infection and vaccination: A cross-sectional study of knowledge, perception, and attitude to vaccine uptake among university students in Qatar". *BMC Public Health*, vol. 24, no. 1, p. 2316, 2024.

[29] G. Di Giuseppe, S. Angelillo, A. Bianco, F. Gallè, F. Licata, G. Liguori, F. Napolitano, C. G. A Nobile, M. Pavia, C. P. Pelullo and I. F. Angelillo. "Evaluating knowledge, attitudes, and behaviors toward HPV infection and vaccination among university students in Italy". *Vaccines (Basel)*, vol. 11, no. 10, p. 1517, 2023.

[30] S. Chowdhury, R. Ara, S. Roy, S. M. S. Tanvir, F. N. Eva, T. M. Neela, A. A. Moonmoon, S. Sifat, M. Zamila and M. D. H. Hawlader. "Knowledge, attitude, and practices regarding human papillomavirus and its' vaccination among the young medical professionals and students of Bangladesh". *Clinical and Experimental Vaccine Research*, vol. 11, no. 1, p. 63, 2022.

[31] S. M. F. Abdelaliem, A. M. Kuaia, A. A. Hadadi, A. K. Alhujayri, A. A. Al Anazi, A. A Hajar, R. S. AlShareda and S. M. Amri. "Knowledge and attitudes toward human papillomavirus and vaccination: A survey among nursing students in Saudi Arabia". *Healthcare*, vol. 11, no. 12, p. 1766, 2023.

[32] S. Voidazan, S. H. Morariu, M. Tarcea, H. Moldovan and M. Dobreanu. "Human papilloma virus (HPV) infection and HPV vaccination: Assessing the level of knowledge among students of the University of medicine and pharmacy of Tirgu Mures, Romania". *Acta Dermatovenerologica Croatica*, vol. 24, no. 3, p. 193, 2016.