



Assessing HPV awareness and Knowledge in Future Health Professionals: A Survey of Health Science Students in Iran

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Abstract

Human Papillomavirus (HPV) is among the most common sexually transmitted infections (STIs), with almost all sexually active individuals likely to encounter it during their lifetime. It is essential for health science students to have a comprehensive understanding of HPV, as their knowledge, attitudes, and behaviors can greatly impact patient education and decisions about vaccination or their current infection. This study aims to assess the level of awareness and knowledge about HPV among health science students and recognize the factors that influence these levels. We distributed paper questionnaires to 268 students (18–42 years) across different fields of study. Validity and reliability were assessed with 40 participants. After removing unreliable questions, a 36-item questionnaire was finalized. Awareness scores were calculated from responses, and statistical analysis was performed using IBM SPSS-27. This study examined 268 students aged 18 to 42 years, with an average age of 24.4 years (± 4.02). The median age was 24 years. Among the participants, 70.5% were female (189 subjects) and 29.5% were male (79 subjects). Students with PhD degrees in biological sciences had the highest awareness scores, averaging 16 (± 10.34). MSc students in biological sciences followed with awareness scores averaging 15.9 (± 5.83). BSc students in biological sciences had the lowest awareness scores, averaging 11.9 (± 6.43). Statistical analysis indicated that basic characteristics like sex, marital status, or having a partner did not significantly impact awareness levels among the subjects. However, the level of education was identified as a significant factor affecting awareness (p -value=0.043). The majority of the study participants demonstrated a moderate level of knowledge about HPV. In this study awareness levels vary significantly across educational levels. However, the demographic factors such as gender, marital status, and relationship status did not notably influence the participants' levels of awareness. These findings underscore the need for targeted educational interventions to address this knowledge gap and improve HPV awareness, especially among BSc students in biological sciences.

Keywords HPV · Stigma · Awareness · #questionnaire · Health science students · Knowledge

Introduction

Despite substantial advancements in medical research and public health programs, the stigma associated with human papillomavirus (HPV) continues to hinder effective prevention, education, and treatment initiatives [1, 2]. This issue is particularly perplexing within the context of biomedical science education, where future healthcare professionals are expected to be well-informed and objective. The HPV family consists of more than 200 unique types of non-enveloped, double-stranded DNA viruses. As one of the most common sexually transmitted infections (STIs), HPV affects both women and men, with many people contracting the virus

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at some point in their lives [3, 4]. Although the majority of HPV infections clear up over time, some can lead to health issues, including genital warts and various types of cancer. HPV genotypes are categorized into low-risk (LR-HPVs) and high-risk (HR-HPVs) types based on their potential to cause cancer. LR-HPVs mainly lead to cutaneous and anogenital warts, whereas HR-HPVs are associated with various cancers, including anogenital and oropharyngeal cancers such as anal, vulvar, vaginal, cervical, and penile cancers [5, 6]. To date, 15 HPV types have been identified as high-risk, with HR-HPV16 and HR-HPV18 accounting for approximately 70% of all cervical cancer cases, making them the most prevalent HPV types globally [7, 8]. HPV is mainly transmitted through skin-to-skin or skin-to-mucosa contact. While sexual transmission is the most commonly reported method, research has indicated the possibility of non-sexual transmission as well [9]. It is estimated that HPV infection is responsible for approximately 4.5% of all cancer cases worldwide, equating to around 630,000 new cases annually. The incidence is notably higher in women at 8.6% compared to 0.8% in men [10]. In 2018, cervical cancer caused 3.3% of cancer-related fatalities, totaling over 300,000 deaths, with the majority (more than 85%) transpiring in low- to middle-income nations. HR-HPVs are implicated in about 98% of these fatalities. Africa exhibits the highest incidence of CC linked to HR-HPV, with rates of 31.5 per 100,000 women annually, notably in sub-Saharan Africa (75.3 per 100,000 women annually), whereas Asia records the lowest incidence at 10.2 per 100,000 women annually [11].

Currently, three common HPV prophylactic vaccines are commercially available: Gardasil®4 (a quadrivalent vaccine targeting HPV 16, 18, 6, and 11, introduced in 2006), Cervarix™ (a bivalent vaccine against HPV 16 and 18, FDA approved in 2009), and Gardasil®9 (a nonavalent vaccine targeting HPV 6, 11, 16, 18, 31, 33, 45, 52, and 58, available from 2014). These vaccines, all developed based on L1 VLP, have demonstrated significant preventive effects against HPV infection in diverse populations across various regions, races, and age groups in clinical trials [12].

Knowledge of a disease can significantly influence patient behavior, prompting them to seek medical help, adhere to treatments, and better manage their condition [13]. Research suggests a negative correlation between HPV stigma and knowledge, meaning that as individuals become more informed about HPV, the associated stigma tends to decrease [14–16]. For example, awareness and knowledge about the high prevalence of HPV can provide a sense of reassurance to patients. Generally, diseases considered common are perceived as less stigmatizing than those seen as rare [17, 18]. A study examining HPV knowledge after cervical cancer screening revealed that women informed about

the condition's prevalence by their healthcare providers felt reassured and emotionally supported [18]. However, awareness can have negative effects in some aspects. For example, knowing that HPV is transmitted sexually can lead to increased stigma and shame, as women react similarly to HPV as they do to other STIs [19]. This negative feeling can be intensified in Islamic countries with traditional cultures, potentially leading to substantial psychological outcomes due to the sexually transmitted nature of the virus.

Therefore, assessing health sciences students' knowledge about HPV is necessary. The objective of this study is to evaluate the knowledge and awareness among health sciences students (Biomedical Sciences, Biological Sciences, Dentistry, and MD) regarding HPV.

Methods

Setting and Study Design

We visited universities in person and distributed paper questionnaires to students to complete. To assess the validity and reliability of the questionnaire, we first randomly selected a total of 40 participants who filled out the questionnaire. Two weeks later, the same participants completed the questionnaire again to examine its validity and reliability. After this assessment, we provided the questionnaires to the target students, who were aged between 18 and 42 years old, ensuring a supervisor was present to oversee the process. Additionally, we obtained consent from each participant, and the study was approved by the ethics committee with the code IR.TUMS.SPH.REC.1402.182 and grant id 64,903.

Participants and Procedure

A total of 268 students were selected, ranging in age from 18 to 42 years old. Among these students, 189 (70.5%) were female, and the remaining were male. These students were divided into four different groups based on their field of study, including Biomedical Sciences, Biological Sciences, MD, and Dentistry. In the Biomedical Sciences group, only BSc students were included, whereas the Biological Sciences group comprised students from BSc, MSc, and PhD levels.

The questionnaire items were evaluated for reliability. Out of the 44 questions in the questionnaire, one question (Question 44) had zero variance and was excluded from the reliability analysis. The split-half method was used to calculate reliability. The Guttman coefficient was found to be 0.611, and the Spearman-Brown coefficient was 0.628. Upon reviewing the questionnaire items, the questions that contributed to a decrease in reliability were identified and

Table 1 Subjects' characteristics

	Frequency	Percent
Sex		
Female	189	70.5
Male	79	29.5
Marital status		
Single	242	90.3
Married	24	9.0
Divorced	2	0.7
Having partner (n = 242)		
Has	53	21.9
Doesn't have	189	78.1

This table provides a detailed overview of the various attributes and demographics of the subjects who participated in the study. N = 268; Except for 'having partner' which only considered for single subjects

Table 2 Subjects' education characteristics

Major	Level	Frequency	Percent
Biomedical sciences	BSc	88	32.8
Biological sciences	BSc	63	23.5
	MSc	34	12.7
	PhD	5	1.9
MD		67	25
Dentistry		11	4.1

This table provides the number of students in each group: Biomedical Sciences, Biological Sciences, Dentistry, and MD

removed. The removed questions, in order, were: Question 37, Question 33, Question 42, Question 28, Question 2, Question 11, and Question 36.

For the remaining 36 questions in the questionnaire, the Guttman coefficient was 0.71, and the Spearman-Brown coefficient was also 0.71. Since the calculated coefficients are greater than 0.7, the 36-item questionnaire is considered to have acceptable reliability.

Data Analysis

In order to assess students' awareness about HPV virus, a questionnaire was designed by experts. The initial version of the questionnaire included 44 questions. All questions were true/false items. The correct answers received +1 score, and wrong answers received -1 score. In order not to force responders to choose true or false, a 'don't know' option was available for each question; and received 0 score. Split-half method was used for reliability analysis on a pilot sample. Reliability analysis showed that some questions reduced total reliability of questionnaire. After consulting with the expert group, those questions reduced reliability, were omitted from the final version of questionnaire. Our final questionnaire included 36 questions. Both Guttman Split-Half coefficient and Spearman-Brown coefficient of reliability were 0.71, which shows acceptable reliability.

The score of awareness for each subject calculated by summing up all his/her 36 responses.

Frequency, median, mean and standard deviation were used to describe data. Kolmogorov-Smirnov test by Lilliefors correction was applied to test normality. Since the awareness scores did not follow normal distribution, non-parametric tests such as Mann-Whitney U test and Kruskal-Wallis test were applied for two-group and multi-group tests, respectively. Statistical package IBM SPSS-27 was applied for analysis. 5% significant level was considered.

Results

Characteristics of the Participants

A total of 268 subjects were analyzed in this study. All subjects were students. The youngest and the oldest subjects were 18 and 42 years old, respectively; with the mean ($\pm$ std. deviation) equals 24.4 ($\pm$ 4.02) years. The median for age was 24 years. 189 (70.5%) of subjects were females, 79 (29.5%) were males. Other demographics were showed in Table 1. Subject were categorized into four groups based on their educational background: biomedical sciences, biological sciences, dentistry, and MD. The largest portion of the study population belongs to the biological sciences group, comprising 102 individuals (38.1%). This group is further divided into three subgroups: BSc, MSc, and PhD (Table 2). Following the Biological Sciences group, Biomedical Sciences is the second largest group with 88 participants (32.8%). Dentistry has the smallest number of participants, totaling 11 individuals (4.1%). Table 2 shows the major and education level of subjects in detail.

Descriptive Analysis of the Response Levels to the Questions

Based on the responses to the questions, three distinct response categories emerged: correct, incorrect, and uncertain. Question 1 and 9 received the highest number of correct responses, while Question 16 received the fewest. Conversely, Question 22 and 3 garnered the most incorrect responses, with Question 1 having the fewest. Question 34 and 20 had the highest incidence of uncertain responses. Figure 1 shows the percent of correct, wrong and don't know answers to each 36 items of questionnaire. Table 3 lists the survey questions that measured participants' knowledge and awareness regarding HPV.

The initial set of questions was designed to assess knowledge about cancers related to HPV. Participants' knowledge in this section was moderate. 53% of the study population were aware that the papillomavirus causes various types of

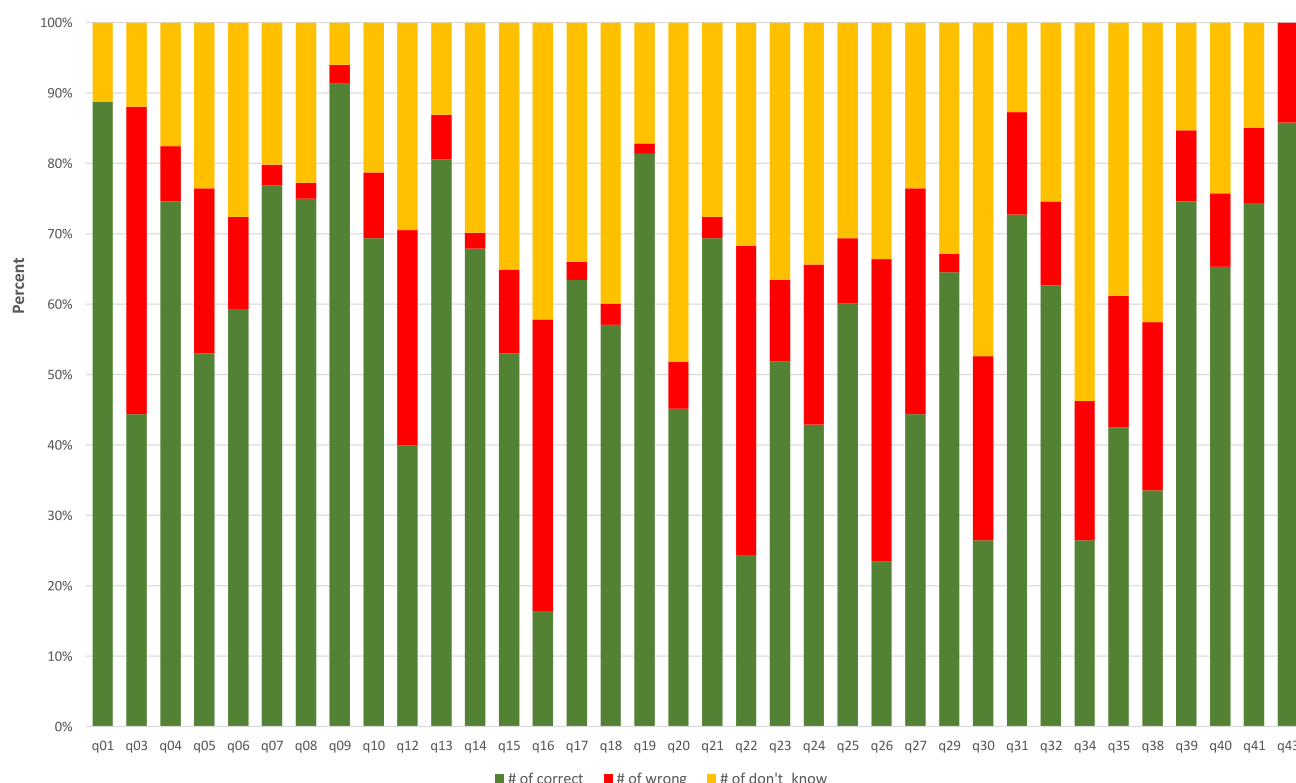


Fig. 1 Frequency of answers to each question. For each question, the figure displays the frequency of correct, incorrect, and “don’t know” responses

cancers (such as cervical, genital tract, and anal cancers) in women, while 59.3% knew it causes genital tract and anal cancers in men. Additionally, 74.6% of students understood that most cervical cancer cases are linked to the papillomavirus. In the second part, the students’ knowledge about the transmission routes of HPV was assessed. Overall knowledge about virus transmission was strong. 91.4% of students understood that the primary mode of papillomavirus transmission is through sexual contact. Additionally, 69.4% were aware that, besides sexual routes, other methods of papillomavirus transmission may exist among individuals. In the following section, knowledge about HPV genotypes was assessed. 74.3% of participants were aware that HPV types are classified into high-risk and low-risk groups based on their potential to cause complications. Additionally, 67.9% knew that the most significant high-risk types of this virus are 16 and 18. According to the results, the majority of participants are knowledgeable about the detection methods of HPV. For example, 81.3% of students understood that identifying the virus type is crucial for distinguishing between low-risk and high-risk HPV types. Additionally, 63.4% of students recognized that patients with an abnormal Pap smear history should undergo molecular testing to determine the presence of the HPV genotype.

Overall knowledge about the HPV vaccine was low among students. Only 26.5% knew that the HPV vaccine

should be given intramuscularly, as subcutaneous injection is ineffective. Just 42.5% of participants were aware of the proper timing for the vaccine doses. Additionally, only 33.6% understood that if someone is already infected with an HPV genotype covered by the vaccine, administering the vaccine after infection will not affect that specific genotype, though it will still be effective against other genotypes.

The results indicate that overall knowledge about HPV treatment options and preventive measures is moderate. 60.1% of participants are aware that there is no specific drug treatment for HPV infection, but the immune system typically clears the virus. Additionally, 23.5% know that current treatments for genital warts include freezing with liquid nitrogen, electrocautery (burning with electric current), and laser therapy. 44.4% of students are aware that maintaining a sexual relationship with an HPV-positive individual can be effectively managed by employing protective measures like condoms. However, 72.8% understand that condoms, whether used during heterosexual intercourse or in same-sex encounters, cannot offer complete protection against infection and disease. According to the survey findings, a significant majority of participants, accounting for 85.8%, reported that they have previously encountered the term ‘papillomavirus’ or have heard of it. This indicates a considerable level of awareness among the surveyed population

Table 3 Frequency of right/wrong/don't know answers to each question (N = 268)

Question code	Right answer (%)	Right answer (n)	Wrong answer (%)	Wrong answer (n)	Don't know (%)	Don't know (n)
Q01	88.8%	238	0.0%	0	11.2%	30
Q03	44.4%	119	43.7%	117	11.9%	32
Q04	74.6%	200	7.8%	21	17.5%	47
Q05	53.0%	142	23.5%	63	23.5%	63
Q06	59.3%	159	13.1%	35	27.6%	74
Q07	76.9%	206	3.0%	8	20.1%	54
Q08	75.0%	201	2.2%	6	22.8%	61
Q09	91.4%	245	2.6%	7	6.0%	16
Q10	69.4%	186	9.3%	25	21.3%	57
Q12	39.9%	107	30.6%	82	29.5%	79
Q13	80.6%	216	6.3%	17	13.1%	35
Q14	67.9%	182	2.2%	6	29.9%	80
Q15	53.0%	142	11.9%	32	35.1%	94
Q16	16.4%	44	41.4%	111	42.2%	113
Q17	63.4%	170	2.6%	7	34.0%	91
Q18	57.1%	153	3.0%	8	39.9%	107
Q19	81.3%	218	1.5%	4	17.2%	46
Q20	45.1%	121	6.7%	18	48.1%	129
Q21	69.4%	186	3.0%	8	27.6%	74
Q22	24.3%	65	44.0%	118	31.7%	85
Q23	51.9%	139	11.6%	31	36.6%	98
Q24	42.9%	115	22.8%	61	34.3%	92
Q25	60.1%	161	9.3%	25	30.6%	82
Q26	23.5%	63	42.9%	115	33.6%	90
Q27	44.4%	119	32.1%	86	23.5%	63
Q29	64.6%	173	2.6%	7	32.8%	88
Q30	26.5%	71	26.1%	70	47.4%	127
Q31	72.8%	195	14.6%	39	12.7%	34
Q32	62.7%	168	11.9%	32	25.4%	68
Q34	26.5%	71	19.8%	53	53.7%	144
Q35	42.5%	114	18.7%	50	38.8%	104
Q38	33.6%	90	23.9%	64	42.5%	114
Q39	74.6%	200	10.1%	27	15.3%	41
Q40	65.3%	175	10.4%	28	24.3%	65
Q41	74.3%	199	10.8%	29	14.9%	40
Q43	85.8%	230	14.2%	38	0.0%	0

regarding this particular virus. Other information's are detailed in Table 3.

Descriptive Awareness Regarding HPV Infection

The mean ($\pm$ std. deviation) of awareness score was 12.7 ($\pm$ 6.5) and its median was 13. The minimum observed score was -2 and the maximum was 30. Mean awareness is a little higher in females, however, according to the mann–whitney test, this difference was not statistically significant (p -value = 0.131). Since only 2 of the subjects were divorced, those subjects were excluded to test for differences in awareness between marital status groups. The mean awareness scores were closed in single and married subjects; therefore, two groups did not differ significantly (p -value = 0.982). Awareness score in single subjects who has partner was a little

higher, but the difference was not statistically significant (p -value = 0.161). At least one education level group had significantly different awareness score (p -value < 0.05). Subjects in biological sciences had the highest awareness score (Table 4). This group of subjects, included three educational levels, itself. In BSc biological sciences subgroup, the mean ($\pm$ std. deviation) of awareness was 12.7 ($\pm$ 6.33). The mean ($\pm$ std. deviation) score of awareness was 15.9 ($\pm$ 5.83) in MSc students in biological sciences. For PhD subgroup the mean ($\pm$ std. deviation) awareness score was 16 ($\pm$ 10.34). Kruskal–Wallis test statistic was 5.554 and p -value = 0.062, therefore, these subgroups did not differ significantly.

PhD students in biological sciences demonstrated the highest level of awareness, with an average score of 16 ($\pm$ 10.34), followed by MSc students with an average of 15.9

Table 4 Comparison of awareness between subgroups

	N	Mean $\pm$ SD	Mean rank	Mann–Whitney	Z	P-value
Sex						
Female	189	13 $\pm$ 6.08	139.1	6593	– 1.51	0.131
Male	79	11 $\pm$ 7.41	123.5			
Marital status [†]						
Single	242	12.7 $\pm$ 6.50	133.5	2896	– 0.22	0.982
Married	24	12.9 $\pm$ 6.13	133.8			
Having partner [†]						
Has	53	13.6 $\pm$ 6.59	133.4	4378.5	– 1.40	0.161
Doesn't have	189	12.5 $\pm$ 6.47	118.2			
Education level						
BSc	151	11.9 $\pm$ 6.43	126.4	9.829 ⁺⁺		0.043*
MSc	34	15.9 $\pm$ 5.83	170.2			
PhD	5	16 $\pm$ 10.32	166.2			
MD	67	12.5 $\pm$ 6.64	133.4			
Dentistry	11	12.2 $\pm$ 4.28	127.5			
Major						
Biomedical science	88	11.4 $\pm$ 6.47	121.5	5.289 ⁺⁺		0.152
Biological science	102	13.9 $\pm$ 6.51	147.1			
Dentistry	11	12.2 $\pm$ 4.29	127.5			
MD	67	12.5 $\pm$ 6.64	133.4			

[†]Divorced subgroup omitted, since only includes 2 subjects

[†]Only considered in single subjects

⁺⁺Kruskal–Wallis test statistic

*Significant at 5% level

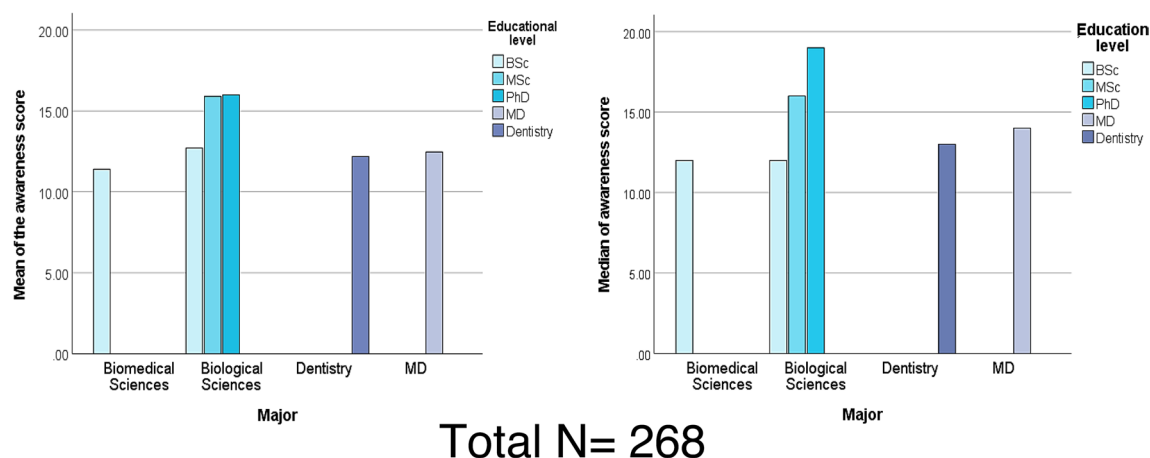


Fig. 2 The mean (left panel) and the median (right panel) of awareness scores according to major and education levels.

(± 5.83). Conversely, BSc students in biological sciences exhibited the lowest awareness, averaging 11.9 (± 6.43). Upon careful examination, the analysis uncovered intriguing insights. It was observed that demographic factors, including gender, marital status, and relationship status, did not exhibit a noticeable impact on individuals' levels of awareness. Nonetheless, educational attainment emerged as a pivotal determinant, with a calculated p-value of 0.043. This statistical measure underscores the significance of educational level in shaping individuals' levels of awareness regarding the subject matter. Figure 2 also shows the mean

(left panel) and the median (right panel) of awareness scores in the population under investigation, according to major and education levels. As the median plot shows, the highest average of awareness score belonged to PhD students in biological sciences. Furthermore, it is evident that there is no significant difference in awareness levels between BSc degrees in both the Biomedical Science and Biological Science groups.

Discussion

Health science students need to be thoroughly educated about HPV, as their understanding, actions, and attitudes can greatly impact patient outcomes. Being knowledgeable about HPV offers numerous advantages, such as greater participation in primary and secondary prevention measures like vaccination and screening. This study aimed to evaluate the awareness and understanding of HPV infection among health science students. Investigating this group is crucial because these students are key in educating their community about HPV infection and preventing cervical cancer. In this study, most participants demonstrated a moderate level of knowledge about HPV. Awareness levels varied significantly across educational levels, while demographic factors such as gender, marital status, and relationship status did not notably influence participants' awareness.

According to our observation, the Dentistry and MD groups demonstrate a moderate level of awareness compared to other groups. Consistent with our findings, a study by Hashemipour et al., which aimed to assess the knowledge of Iranian medical and dental students regarding HPV infection and vaccination, also found that the knowledge of students in these fields was moderate [20]. Additionally, in line with our results, the field of study can influence the level of awareness. However, they noted that demographic factors such as marital status and gender could have a statistically significant relationship with the mean score of knowledge ($p < 0.05$), which contrasts with our observations indicating that these factors have no significant impact ($p > 0.05$) [20]. Shakurnia et al. conducted a study on 181 medical, nursing, and midwifery students to evaluate their awareness and knowledge of HPV. Similar to our findings, female students had a higher mean (SD) of awareness/knowledge compared to male students, although this difference was not statistically significant. Similar to our observation, most of their participants had heard about HPV (92.3%). However, unlike our results, where PhD students in biological sciences had higher awareness levels, this study found that medical students had significantly greater awareness/knowledge compared to the other groups [21]. In a survey involving 669 students from Tabriz University of Medical Sciences, it was discovered that residents and postgraduate midwifery and nursing students exhibited greater knowledge compared to other groups. All participants were familiar with HPV. Educational level was identified as a factor influencing knowledge levels, consistent with our observations. However, their study also pinpointed two additional factors—age and smoking—that appeared to influence knowledge levels [14].

Based on a systematic review, the general understanding and awareness regarding HPV and HPV vaccination among the Iranian population (including parents, women, university students, medical students, nurses, and hospital staff) were found to be limited. Nevertheless, there was a positive and robust attitude towards this matter [22].

In general, Asian countries show limited awareness and knowledge of HPV infection. A study evaluating HPV knowledge among adult women in seven Asian countries—Hong Kong, Malaysia, China, India, Korea, Taiwan, and Thailand—revealed low levels of understanding about HPV and its associated conditions. Additionally, there was limited willingness to get vaccinated and low vaccine uptake rates [23]. According to the study by Alsous et al., which aimed to explore females' knowledge and acceptance of the HPV vaccine in four Arab countries (Jordan, Iraq, the UAE, and Qatar), 3658 individuals participated, but only 2804 responses were analyzed. The study found a lack of awareness and knowledge about HPV and its vaccine among participants from all four countries [24]. Aldawood et al. conducted a study examining HPV awareness among university students in Saudi Arabia, involving 403 health college students. Among them, 161 (40%) reported never hearing of HPV. The study found significantly lower HPV awareness among male students (57.1%) compared to females (62.7%) ($p\text{-value} = 0.003$). Their analysis also revealed associations between respondents' HPV knowledge levels, age, and college type. Interestingly, students who had received the HBV vaccine showed higher HPV knowledge levels [25]. Another study conducted on 824 students across 16 different faculties in Turkey aimed to evaluate their understanding and viewpoints regarding HPV, as well as their willingness to receive vaccination. The results showed that 43.6% of the students had never heard of HPV, while 50.6% were unaware of HPV screening tests or vaccination. Compared to our observations, the average HPV knowledge score was notably low [26]. Female students and individuals in health-related fields showed greater awareness of HPV and a stronger inclination towards receiving vaccination. In contrast to our observation, factors like being a senior student, intending to be vaccinated, being female, and having had sexual experience were associated with higher levels of knowledge [26]. Wang et al. conducted a study to evaluate the awareness and knowledge of HPV infection among students in China. Out of 2248 participants, only 45.3% were aware of cervical cancer, and merely 21.9% had heard about HPV. Additionally, 74.2% of the participants were unaware of the connection between HPV infection and cervical cancer. The majority of participants

demonstrated inadequate awareness and knowledge regarding HPV infection. The findings indicated that factors such as age, grade, major, and academic performance were associated with higher awareness levels of CC, HPV, and HPV infection ($p < 0.05$) [27]. According to a study conducted in Pakistan involving 500 respondents, with 390 responding to the survey, it was found that there is a lack of understanding among respondents regarding health issues associated with HPV, its prevention, modes of transmission, and the availability of HPV vaccines in Pakistan. The study identified gender and field of study as two primary factors influencing respondents' knowledge about HPV [28]. Another survey conducted in Pakistan assessed the general population's knowledge, attitudes, and practices regarding anal cancer screening and HPV. The survey included 1,620 participants and revealed that awareness of HPV and the causes, prevention, and screening of anal cancer was low, ranging from 11 to 24%. Additionally, there was significant stigma and embarrassment associated with screening, affecting 54% to 70% of respondents [29].

A cross-sectional study was carried out to assess Lebanese medical students' awareness of HPV and their attitudes towards the HPV vaccine, using a self-administered questionnaire. Out of approximately 3000 students, 1009 responses were gathered and analyzed. The study found that there was a significant deficiency in knowledge and awareness about HPV among these students, and the vaccination rate was notably low at 16.4%, hindered by various barriers including stigma [30]. When questioned about the notably low vaccination rates in Lebanon, 65.4% of respondents identified the main obstacle as the taboo and sexual stigma surrounding the vaccine. When asked specifically why they had not been vaccinated against HPV, 15.1% of female students and 11.3% of male students cited these same reasons [30]. However, research conducted in India revealed that medical students generally possessed good knowledge about HPV. For example, in the study by Gollu et al. involving 150 medical students, it was observed that 67 (95.7%) of male students and 79 (98.8%) of female students were knowledgeable about HPV as a causative agent for cervical cancer, with no statistically significant difference between the two groups [31].

The general lack of knowledge about HPV in Asian countries could be attributed to various factors, including the content of university curricula and the broader social and cultural context. For instance, educational materials and emphasis on HPV-related topics within academic programs might be insufficient, leading to gaps in understanding among students and healthcare professionals alike. Additionally, societal attitudes, cultural

beliefs, and taboos surrounding sexual health and related discussions in Islamic countries may hinder open discourse and knowledge dissemination about HPV and its implications.

There were some constraints in the current study. It's important to note that one of the limitations of our study is the relatively small sample size of our study population. While our findings provide valuable insights, future studies with larger and more diverse study populations are warranted to validate and generalize our results effectively. Additionally, another limitation of our study is that it does not encompass all healthcare groups. Including a broader range of healthcare professionals could offer a more comprehensive understanding of HPV knowledge across various specialties and disciplines.

Conclusion

HPV is a critical public health issue due to its high prevalence and association with various cancers. Knowledge about HPV among health science students is especially important as their knowledge can significantly improve health outcomes in patients in the future. Most participants in the study exhibited a moderate level of knowledge about HPV. This survey highlights that awareness levels about HPV significantly differ based on educational background. Similarly, factors such as gender, marital status, and having a partner do not significantly influence awareness levels. These findings underscore the necessity for targeted educational initiatives aimed at enhancing HPV awareness, particularly among BSc students. Furthermore, the results highlight the need for educational interventions tailored to specific disciplines to bolster awareness and knowledge concerning HPV. Health science students, as future healthcare professionals, must be well-informed about HPV. This knowledge will not only enhance their own health and understanding but also enable them to educate and guide other segments of society.

Author Contributions A.L, M.S, E.M: Methodology, Writing original draft, Investigation. A.N, S.S, Z.B: Investigation. N.Z, T.MH: Writing original draft. S.S: Statistical Analysis. A.A, S.J: Conceptualization, Supervision, Funding, Review and Editing.

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Availability of data and materials Data will be made available on reasonable request from corresponding author or first author.

Declarations

Competing interests The authors declare that they have no conflict of interest.

Ethics approval and consent to participate Approved by the Ethics Committee of Tehran University of Medical Sciences (IR.TUMS.SPH.REC.1402.182). In addition, consent forms were provided to all participants.

Consent for publication All participants provided their consent for the publication of the study findings.

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