folia medica

Folia Medica 68(1)
DOI: 10.3897/folmed.68.e160562

Research Article

Assessment of attitudes and practices regarding human papillomavirus vaccines among Medical University students: preliminary results

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Received: 29 May 2025 ♦ **Accepted:** 1 October 2025 ♦ **Published:** 30 January 2026

Citation: Hristamyan M. Assessment of attitudes and practices regarding human papillomavirus vaccines among Medical University students: preliminary results. Folia Med (Plovdiv) 2026;68(1):e160562. doi: 10.3897/folmed.68.e160562.

Abstract

Introduction: Human papillomavirus (HPV) infections are highly prevalent and are linked to a range of health conditions, from benign lesions to several oncological diseases. Safe and highly effective HPV vaccines have been developed; however, vaccination rates remain suboptimal in many countries, including Bulgaria. As future medical professionals, the attitudes and practices of healthcare students toward HPV vaccination are of extreme importance.

Aim: To evaluate the attitudes and practices of university healthcare students regarding HPV vaccines.

Materials and methods: An anonymous online survey was administered to a total of 245 medical, dental, and pharmacy students at the Medical University of Plovdiv, Bulgaria. Statistical analyses were performed using SPSS v. 24; $p<0.05$ was considered significant.

Results: The majority of participants (86.5%, n=212) had not been vaccinated against HPV, but more than half (n=121) expressed a willingness to be vaccinated. The proportion of vaccinated individuals increased with the number of sexual partners reported in the previous year ($\chi^2=10.44$, $p=0.033$). Approximately two-thirds of the individuals surveyed (n=157) would recommend vaccination, with a higher likelihood among women (U=1848.5, $p<0.001$). Vaccinated respondents tended to have greater distrust of the myth regarding reproductive consequences (U=1926.0, $p=0.002$). Embarrassment was not perceived as a major barrier, but 21.2% (n=52) stated that cost was. There was a consensus among all majors on the necessity for enhanced awareness, which is particularly pronounced among medical students (H=13.13, $p<0.001$). Unvaccinated respondents had a higher interest in gaining more knowledge (U=1971.0, $p=0.003$), just like first- to third-year students (H=9.37, $p=0.017$).

Conclusion: While overall vaccine confidence and attitudes are high, addressing specific concerns (such as safety, personal risk, and cost) could improve HPV vaccine uptake and acceptance.

Keywords

health behavior, healthcare students, human papillomavirus, prevention, vaccination

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PENSOFT.

Introduction

Human papillomavirus (HPV) is a non-enveloped, double-stranded DNA virus belonging to the *Papillomaviridae* family, which infects the basal cells of the epithelium and is responsible for the most common sexually transmitted diseases globally, associated with various health issues.[1,2] There are over 200 types of HPV, classified into low- and high-risk based on their oncogenic potential.[2] Noncancerous lesions are most often genital warts, while oncological diseases linked to HPV transmission include cervical cancers, as well as anogenital (vaginal, vulvar, penile, anal) and oropharyngeal cancers.[2]

HPV infections are highly prevalent among sexually active individuals, with most people having HPV at least once in their lifetime.[3] The virus is predominantly transmitted through sexual contact, including vaginal, anal, and oral sex, as well as skin-to-skin contact in the genital area.[4,5] Infections are typically asymptomatic and resolve spontaneously after one to two years. However, persistent infection with oncogenic types can lead to malignant outcomes.[6,7] Younger populations are more likely to clear the infection quickly and spontaneously, while persistence is more common in older individuals and/or those with weakened immune system.[8]

Several HPV vaccines have been developed to prevent infection by the most common high-risk types, as well as some low-risk HPV types. In the European region, the three licensed vaccines are the bivalent Cervarix, the quadrivalent Gardasil, and the nonavalent Gardasil 9 vaccines.[9] HPV vaccination is most effective during preadolescence and adolescence, before sexual debut, but it can also be administered later in life.[10]

HPV vaccines are safe and highly effective in preventing HPV infections and associated diseases.[11,12] Despite this, vaccination rates remain suboptimal in many regions of the world, mostly due to factors such as lack of awareness, vaccine hesitancy, and limited access.[13,14] In Bulgaria, vaccination coverage is notably low. In 2023, the Ministry of Health reported an uptake of less than 2% among girls aged 9 to 14.[15] On April 9 2025, the country expanded the national HPV vaccination and will now provide free 9-valent HPV vaccination for girls and boys, as well as to young adults at a later stage over a phased period to increase HPV vaccination coverage by 10% annually.[15]

Despite the efforts, HPV represents a significant public health challenge in Bulgaria, where HPV-associated diseases and cervical cancer rates remain alarmingly high compared to other European countries.[16,17] Studies reveal a high prevalence of high-risk HPV genotypes, particularly HPV 16 and 18, among various populations including women with normal and abnormal cytology, pregnant women, and vulnerable groups such as female sex workers.[18-21] Healthcare professionals in Bulgaria experience uncertainty and frustration due to rising cervical cancer mortality despite the introduction of HPV vaccination programs, highlighting the need for increased awareness and policy support.[22,23] The epidemiology of HPV also extends beyond the cervix, with studies documenting HPV presence in lung carcinomas and periodontitis, underlining the virus's broader oncogenic potential.[24,25] Encouragingly, immunotherapeutic interventions such as inosine pranobex have shown promise in enhancing HPV clearance post-cervical lesion treatment.[26] However, cervical cancer continues to impose a significant economic burden on Bulgarian healthcare and society, owing to high treatment costs and lost productivity.[27] Ongoing epidemiological surveillance reveals shifts in HPV genotype distribution and incidence trends, underscoring the urgent need for population-based screening and expanded vaccination coverage to reduce this preventable cancer's burden.[28,29]

Since HPV vaccines are a primary prevention method in the fight against the virus, the attitudes and practices of healthcare students toward HPV vaccination are very important since these future healthcare providers play a critical role in vaccine acceptance and uptake in the general population, influencing public health outcomes.[30] Therefore, understanding and improving students' attitudes and practices through education and awareness is essential to enhance HPV vaccine coverage and reduce HPV-related disease burden.

Aim

The aim of this study was to evaluate the attitudes and practices of university healthcare students regarding HPV vaccines.

Materials and methods

Study design

An anonymous survey of medical, dental, and pharmacy students at Bulgaria's Medical University of Plovdiv was conducted in May 2023. The survey aimed to evaluate knowledge, attitudes, and practices regarding HPV infection and vaccination, and was distributed online through the university's email and correspondence systems. A total of 245 students participated voluntarily. No personal data were collected. All participants gave informed consent, confirming their willingness to take part before beginning the questionnaire.

Questionnaire

The survey was created using Google Forms, included 52 questions, and was divided into three main sections: 1. Socio-demographic characteristics – collecting data on participants' age, sex, faculty, year of study, parental background in healthcare, sexual orientation, and number of sexual partners; 2. Knowledge and practices – containing

yes/no questions to evaluate students' understanding of HPV infections and HPV vaccines, as well as vaccination status); 3. Attitudes - a 5-point Likert scale (from strongly disagree to strongly agree) was used to measure students' perceptions and concerns regarding HPV vaccination and awareness. For this preliminary analysis, we focused on the attitudes assessment section.

Ethical considerations

This study was conducted following the ethical standards of the Declaration of Helsinki and was approved by the Ethics Committee of the Medical University of Plovdiv, Bulgaria (Protocol No. P-KHE-26/25.09.2025/). All participants gave informed consent prior to participation.

Sample size calculation

The sample size for this preliminary survey was determined using a convenience sampling approach. The survey was distributed online to all medical, dental, and pharmacy students of all years at the Medical University of Plovdiv. No formal sample size calculation was conducted prior to data collection; instead, the sample size was determined by the number of students who voluntarily completed the survey. A total of 245 students participated, which corresponds to about 10.2% of the estimated approximately 2400 students enrolled in these faculties and years combined. This sample size is considered adequate to provide preliminary insights into attitudes and practices regarding HPV vaccination, serving as a basis for future, more extensive studies. The flow chart showing the selection process of research participants for this preliminary survey is presented in **Fig. 1**.

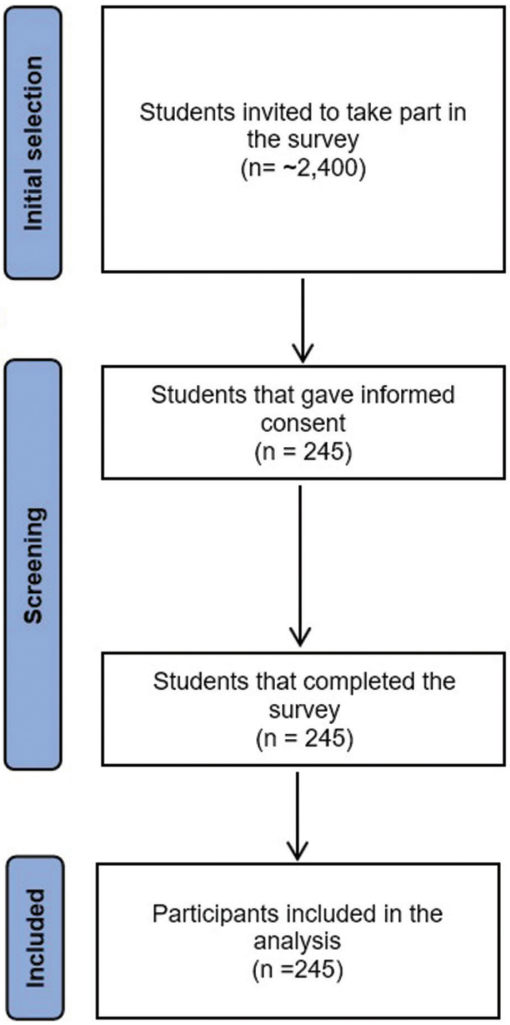

Figure 1. Flow chart showing the selection process of research participants.

Statistical analysis

All statistical analyses were conducted using IBM SPSS Statistics, Version 24 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize the data. Continuous variables were reported as means and standard deviations (mean ± SD) for normally distributed data and as medians with interquartile ranges (IQR) for non-normally distributed data. Categorical variables were presented as absolute frequencies and percentages (n, %). For between-group comparisons of the results, the Mann-Whitney U test, Kruskal-Wallis H test, and chi-square (χ^2) test of independence were used. A p-value <0.05 was considered statistically significant.

Results

A total of 245 medical, dental, and pharmacy students took part in the online survey; 71.8% were women (n=176), while 18.8% were men (n=68). One person identified as being of a different gender. Over two-thirds (n=175) of them had no parent that works in healthcare. The majority of respondents (225) identified as heterosexual, with nearly half (118) in a committed monogamous relationship. A detailed breakdown of the respondents' socio-demographic characteristics is presented in **Table 1**.

Of those surveyed, 33 (13.5%) reported being vaccinated against HPV, while the rest (86.5%, n=212) indicated that they were not. Among those unvaccinated, over half (n=121) expressed willingness to do so if given the opportunity. Only 9.4% (n=23) of respondents had a family member who had been vaccinated, and a similar small percentage (6.1%, n=15) had a family member affected by HPV or HPV-related cancer.

There was no statistically significant difference in the vaccination rate by year of study, sex, parent(s) with a medical profession, relationship status, or sexual orientation (p>0.05), but such a difference was found in relation to the number of sexual partners within the last year, and as the number increases, so does the proportion of vaccinated (χ^2=10.44, p=0.033).

The majority of respondents (75.1%, n=184) agree or strongly agree that vaccines in general are necessary and

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Table 1. Characteristics of the surveyed students

Question	N / Median	% / (IQR)
n	245	100.0
Sex		
Woman	176	71.8
Man	68	27.8
Other	1	0.4
Age (years)	21	2.00
Specialty		
Medicine	142	57.9
Dental medicine	45	18.4
Pharmacy	58	23.7
Course/year		
1	40	16.3
2	56	22.9
3	75	30.5
4	44	18.0
5	9	3.7
6	21	8.6
Parent working in healthcare		
Yes, one	41	16.7
Yes, both	29	11.8
No	175	71.5
Relationship status		
Single	93	38.0
Dating casually	34	13.9
Committed relationship/ married	118	48.1
Sexual orientation		
Heterosexual	225	91.9
Homosexual	14	5.7
Bisexual	5	2.0
Other	1	0.4
Number of sexual partners within the last year		
None	50	23.0
1	159	45.3
2-4	31	11.1
5 and more	5	2.0

IQR: interquartile range

beneficial, with only a small proportion (9.8%, n=24) disagreeing or strongly disagreeing. Support is slightly lower for HPV vaccines specifically. About 2/3 (n=157) would advise family, friends, or future patients to get vaccinated against HPV, while 16.4% (n=40) would not.

A statistically significant difference is found by sex and number of sexual partners in the last year, with women and students with more sexual partners being more likely to consider HPV vaccines necessary and useful (U=1848.5, $p<0.001$ and H=9.02, $p=0.021$, respectively), as well as being more likely to recommend them (U=2051.0, $p=0.007$ and H=9.48, $p=0.018$, respectively).

The vast majority disagreed with the statement that only females need HPV vaccination (71% disagree or strongly disagree, n=174), and that the vaccine was only targeted towards people with multiple sexual partners (76.7% disagree or strongly disagree, n=188). On the other hand, the results regarding the statements that the HPV vaccine could affect reproductive health and could cause neurological or other adverse events were more diverse, indicating some lingering concerns.

Medical students (H=10.28, $p=0.006$), those with both parents working as medical professionals (H=10.71, $p=0.009$), those who are homo- or bisexual (H=8.21, $p=0.021$), and those with multiple sexual partners (H=10.95, $p=0.009$) were more likely to disagree with the statement that the HPV vaccine is only for women, and for the latter two groups, this also applies to the use of the HPV vaccine only for promiscuous people (H=8.97, $p=0.016$ and H=8.13, $p=0.027$ respectively). In addition, vaccinated respondents more often do not believe in the myth about the reproductive consequences of the vaccine (U=1926.0, $p=0.002$).

Embarrassment was not a major barrier for HPV vaccination, while 21.2% (n=52) said cost would influence their decision, and 20.8% (n=51) would only get vaccinated if it was free.

Respondents who declared having no sexual relationships within the last year were more likely to be ashamed (H=7.85, $p=0.031$). Men were more likely to state that they would only get vaccinated if it was free of charge (U=2128.0, $p=0.019$).

There was overwhelming support (84.4%, n=208) for better awareness about HPV and its vaccines, and 81.2% (n=189) expressed a desire to gain more knowledge about it.

All majors agreed on the need for better awareness, but this is most noticeable among medical students (H=13.13, $p<0.001$), as well as among first- and second-year students (H=8.03, $p=0.027$). Interestingly, unvaccinated respondents had a higher interest in gaining more knowledge (U=1971.0, $p=0.003$), and the same was true for first- to third-year students (H=9.37, $p=0.017$). Children of medical specialists were also more likely to realize the need for better awareness (H=8.40, $p=0.019$) as well as advanced knowledge on the issue (H=8.92, $p=0.016$).

The full breakdown of the students' attitudes toward HPV vaccination is presented in **Table 2**.

Discussion

This is the first survey at the Medical University of Plovdiv to investigates HPV vaccine-related attitudes and practices across three types of future healthcare specialists (medical,

Table 2. Students' attitudes towards HPV vaccination

Statement	Strongly agree		Agree		Neutral		Disagree		Strongly disagree	
	N	%	N	%	N	%	N	%	N	%
Vaccines in general are necessary and beneficial	144	58.8	40	16.3	37	15.1	9	3.7	15	6.1
HPV vaccines are necessary and beneficial	110	44.9	64	26.1	45	18.4	13	5.3	13	5.3
I will advise my family members/friends/future patients to get vaccinated against HPV	106	43.3	51	20.8	48	19.9	21	8.6	19	7.8
Only females need to get vaccinated against HPV	18	7.3	10	4.1	43	17.6	38	15.5	136	55.5
The HPV vaccine is only for people with multiple sexual partners	14	5.7	16	6.5	27	11.0	39	15.9	149	60.8
The HPV vaccine could affect my reproductive health	47	19.2	23	9.4	79	32.2	39	15.9	57	23.3
The HPV vaccine could cause neurological and other adverse events	23	9.4	29	11.8	105	42.9	49	20.0	39	15.9
I am not at risk of HPV infection	41	16.7	39	15.9	66	26.9	45	18.4	54	22.0
I would be embarrassed to seek HPV vaccination	13	5.3	18	7.3	25	10.2	33	13.5	156	63.7
The cost of HPV vaccines would influence my decision to get vaccinated	24	9.8	28	11.4	57	23.3	44	18.0	92	37.6
I will only get vaccinated against HPV if it is free	29	11.8	22	9.0	58	23.7	44	18.0	92	37.6
There is a need for better awareness of HPV and HPV vaccines	178	72.2	30	12.2	18	7.3	9	3.7	10	4.1
There will be an increased trend of HPV-related diseases in the near future if vaccination rates are low	103	42.0	59	24.1	64	26.1	8	3.3	11	4.5
I wish to gain more knowledge about HPV and HPV vaccines	163	66.5	26	14.7	23	9.4	10	4.1	13	5.3

dental, and pharmacy students), offering broader insights than prior Bulgarian studies focused on individual groups, such as midwifery students.[17]

We found that only a small proportion of participants in the survey were vaccinated against HPV, with over half of the rest willing to be vaccinated in the future. A study in South India reports even lower rates of participants having received HPV vaccination prior to the survey. Interestingly, only 59.7% of the rest have heard of HPV vaccines before, but almost 2/3 intend to receive the vaccine.[30] In Jordan, despite low vaccination rates (3.6%) among female medical, dental, and pharmacy students, 75% are willing to receive the vaccine.[31] Only 6.5% of female pharmacy students in Zambia are vaccinated against HPV; however, 70% are open to.[32] These findings suggest a gap between intention and actual vaccine uptake.

In contrast, the overall HPV vaccination rates in female students in Japan are 55.6%, with higher rates observed in medical (73.8 %) and dental (63.0 %) students.[33] Moreover, 55.5% of medical students in an Italian cross-sectional study are vaccinated, with a marked sex disparity in favor of women (78.5% of female students compared to 16.5% of male students), and students in later years of medical education are more likely to be vaccinated.[24] Germany reports even higher vaccination rates than Italy, again with significant higher rates in females compared to males, but in this study older students were less likely to be vaccinated.[35] The higher percentages of vaccination among females are most likely due to the fact that the sex neural recommendations for HPV vaccinations were implemented in later years.[36]

The present study shows that individuals with more sexual partners within the last year are more likely to be vaccinated. Contrary to that finding, multiple studies in different countries found no significant association between HPV vaccination and an increased number of sexual partners among adolescents and young adults.[37-39]

In line with the findings of the current study, approximately two-thirds of medical students in South India are willing to recommend HPV vaccination.[30] A more positive attitude towards vaccination is also associated with medical students, which is linked to a similar higher intention to receive the HPV vaccine.[30] The majority of dental students in a U.S. study agree that recommending HPV vaccination falls within their professional role.[40]

A Bulgarian cross-sectional survey on adult women reports half of the participants approve of HPV vaccination, but about 60% express some distrust toward the vaccine.[41] In Japan, the main concerns among unvaccinated but interested people are adverse reactions (47.4%) and scheduling issues (29.1%)[33], whereas in Jordan, the most common reason for vaccine rejection is a perceived low risk, as

well as conspiracy beliefs.[31] Barriers for HPV vaccination among female pharmacy students in Zambia also include not being sexually active, as well as perceived high vaccine cost.[32] About 20% of our participants will get vaccinated on the condition that it is free, and in Jordan only 16.0% express willingness to pay for the vaccine.[31]

Our results did not suggest that embarrassment is a barrier for vaccination, but other studies highlight that stigma and shame can pose some challenges not only when disclosing vaccination status but also when receiving the HPV vaccine, indicating that embarrassment can reduce vaccine acceptance.[42,43]

The majority of participants in the present survey realize need for better awareness about HPV and its vaccines and express a desire to gain more knowledge. A Chinese study also indicates students' recognition of the importance of HPV-related knowledge in vaccination decisions.[44] An educational intervention study among female healthcare students demonstrates that a health education program significantly improves knowledge and awareness of HPV vaccines and increases willingness to get vaccinated.[45]

Compared to other Bulgarian studies on the topic, our findings somewhat align with previous research results by Petkova et al.[17], Todorova et al.[16] and Brunton et al.[18] which also identified gaps in HPV awareness, vaccination uptake, and vaccine uncertainty. Similar to Petkova et al.[17], our study shows increased knowledge with progression in health education, but persistent HPV vaccination hesitancy remains a challenge. These studies collectively underscore the need for enhanced educational interventions and public health measures.

Limitations of the study

This study has some limitations. The use of convenience sampling and voluntary online participation may introduce selection bias, limiting the generalizability of the findings to all students at the Medical University of Plovdiv. The self-reported nature of vaccination status and attitudes may be subject to social desirability bias. Finally, the cross-sectional design provides only a snapshot in time without assessing changes over time or causal relationships.

Conclusion

A small percentage of the university healthcare students are vaccinated against HPV, which correlates with the low vaccination rates in the country. This is particularly concerning given that these students, as future healthcare providers, play an important role in public health promotion and patient understanding regarding the issue. The students' attitude results suggest that while the general vaccine confidence is high, targeted education addressing specific concerns (such as safety, personal risk, and cost) could further improve HPV vaccine uptake and acceptance.

Ethical approval

The author declared that the study was conducted following the ethical standards of the Declaration of Helsinki. Approval for the study was granted by the Ethics Committee of the Medical University of Plovdiv, Bulgaria (protocol No. P-KHE-26/25.09.2025/).

Ethical statements

The author declared that no clinical trials were used in the present study.

The author declared that no experiments on humans or human tissues were performed for the present study.

The author declared that all participants gave written informed consent prior to participating.

The author declared that no experiments on animals were performed for the present study.

The author declared that no commercially available immortalized human and animal cell lines were used in the present study.

Conflict of interest

The author has declared that no competing interests exist.

Funding

No funding was reported.

Use of AI

No use of AI was reported.

Data availability

All data used are referenced or included in the article.

Author contributions

The author confirms sole responsibility for the conception of the study, data analysis, and manuscript preparation

Acknowledgements

The authors have no support to report.

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