

A Gender-Oriented Approach to Human Papillomavirus Vaccination: A Cross-Sectional Study Among Preclinical Medical Students

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Abstract

Objective: The first line of defense against cervical cancer is human papillomavirus (HPV) vaccination. The perception that HPV vaccination is primarily intended for women hinders progress in the fight against HPV. This study aimed to examine preclinical medical students' gender-based perspectives on the current HPV vaccination program and to assess the potential impact of gender-based approaches to cervical cancer prevention programs on their knowledge of HPV vaccination recommendations.

Materials and Methods: This descriptive cross-sectional study assessed preclinical medical students' awareness of HPV vaccination recommendations. The HPV Knowledge Scale was administered to eligible preclinical students. Incomplete questionnaires were excluded from the analysis.

Results: A total of 448 questionnaires were analyzed, corresponding to an 88.3% response rate. Regarding the recommendation of the HPV vaccine for males aged 11–26 years, only 34.8% of male students (n=46) and 31.0% of female students (n=98) correctly identified this indication. For females aged 11–26 years, the proportion of correct responses was higher, at 60.6% (n=80) among male students and 69.3% (n=219) among female students.

Conclusion: Improving medical students' knowledge of vaccination programs is an important step toward achieving primary prevention, a key objective of public health practice. Our findings demonstrate that preclinical medical students have lower awareness of HPV vaccination recommendations for males than for females, indicating an urgent need to strengthen gender-neutral HPV vaccination content in undergraduate medical education.

Keywords: Gender, HPV, vaccination

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INTRODUCTION

Beyond its fundamental role in cervical oncogenesis, human papillomavirus (HPV) infects a broad range of mucosal and cutaneous epithelial tissues. High-risk genotypes, particularly HPV-16 and HPV-18, play a role in the molecular pathogenesis of a wide range of malignancies, including oropharyngeal, anal, and penile cancers. The virus may integrate into the host genome, leading to overexpression of E6 and E7 oncoproteins (1). While global health discourse largely focuses on the burden of cervical cancer, the burden of HPV-associated oropharyngeal squamous cell carcinomas in men underscores the need for a gender-neutral approach to HPV prevention and vaccination. Effective HPV prevention requires recognition of its diverse oncogenic manifestations and should move beyond a female-centered clinical perspective (2).

Cervical cancer remains the fourth most common cancer globally among women after breast, colorectal, and lung cancers, according to the latest estimates from the World Health Organization (WHO) and the Global Cancer Observatory (GLOBOCAN), with the vast majority of cases attributed to persistent infection with high-risk HPV genotypes. Vaccination represents a primary prevention strategy and a highly cost-effective public health intervention for reducing the burden of HPV-related disease (3). However, due to systemic barriers to accessing vaccination and screening programs, approximately 90% of cervical cancer-related deaths occur in low- and middle-income countries.

In response to this global inequality, the WHO launched the Cervical Cancer Elimination Initiative in 2020 (4). This global strategy aims to achieve specific targets by 2030, including fully vaccinating 90% of girls by 15 years of age. As of 2021, more than 100 countries, including the United States, the United Kingdom, Germany, Australia, Belgium, Sweden, and New Zealand, had incorporated the HPV vaccine into their National Immunization Programs (NIPs) (5).

The Turkish Ministry of Health announced in November 2022 that the HPV vaccine would be included in the national program. However, as of 2026, the vaccine has still not been integrated into Türkiye's National Immunization Program for the entire target population and remains largely outside the scope of universal social security reimbursement, except for limited pilot applications. Regarding vaccine availability in Türkiye, the quadrivalent human papillomavirus vaccine (Gardasil®, Merck & Co., Rahway, NJ, USA) and the bivalent human papillomavirus vaccine (Cervarix®, GlaxoSmithKline, Brentford, UK) were launched in 2007 and 2008,

respectively, followed by the approval and launch of the nonavalent vaccine (Gardasil 9®) in 2019 (6). Beyond structural barriers, healthcare provider recommendations, individual knowledge, perceptions of vaccine effectiveness, and socioeconomic status remain important determinants of vaccination uptake (7). In this context, understanding gender-related differences in knowledge of HPV vaccination recommendations is important for developing equitable vaccination strategies.

The concept of 'feminization' in public health refers to the process by which a disease, risk factor, or preventive intervention becomes predominantly associated with women, potentially obscuring its relevance to men (8). In the context of HPV, this conceptual framing has historically emerged from the early emphasis on cervical cancer prevention, which may have contributed to a gendered perception of HPV and its prevention. Such a perception may affect awareness of HPV vaccination recommendations for males and females, including among future healthcare professionals.

Medical students are an important target population for assessing knowledge of HPV vaccination because their understanding of vaccination recommendations may influence their future counseling and preventive healthcare practices. Therefore, this study aimed to assess pre-clinical medical students' knowledge of HPV vaccination recommendations from a gender-sensitive perspective, with particular emphasis on differences in awareness of recommendations for males and females.

MATERIALS AND METHODS

Study Design and Setting

This descriptive cross-sectional study aimed to evaluate medical students' knowledge of the HPV vaccination program, focusing on gender-specific vaccination recommendations. The primary objective was to assess students' awareness and identify knowledge gaps regarding gender-neutral HPV vaccination.

Study Population and Sampling

The study population comprised students enrolled in the Faculty of Medicine of a foundation university in İstanbul, Türkiye, during the 2022–2023 academic year. Data were collected through face-to-face administration of questionnaires to students who voluntarily agreed to participate.

The inclusion criteria were enrollment as an active pre-clinical medical student (Period 1, 2, or 3) at the study university during the 2022–2023 academic year and provision of voluntary informed consent. Students who were absent on the days of data collection, declined to

participate, or were in the clinical phase of medical education were excluded. Participants were approached in person during scheduled lecture breaks and in common campus areas. The structured paper-based questionnaires were administered in quiet classroom settings to minimize distraction, and completion took approximately 5–7 minutes per participant.

To ensure anonymity and promote honest reporting, no personally identifiable information was collected, and participants were informed that their responses would not affect their academic standing. Surveys with missing data or incomplete responses in the core subdimensions were strictly excluded from the final analysis to maintain data integrity. A formal sample size calculation or power analysis was not performed *a priori*; instead, a census sampling approach was used to invite the entire accessible target population to participate.

Data Collection Tools

Data were collected using a structured questionnaire consisting of two main sections. The first section recorded demographic characteristics, including gender and academic year (Period). The second section employed the Human Papillomavirus (HPV) Knowledge Scale, originally developed by Waller et al. (2013) and validated in Turkish by Demir et al. (2019) (9,10).

The questionnaire consists of 33 items across four subdimensions:

- Subdimension 1: General knowledge about HPV (16 items)
- Subdimension 2: Knowledge regarding the HPV test (6 items)
- Subdimension 3: Knowledge regarding the HPV vaccine (5 items)
- Subdimension 4: Knowledge regarding the HPV vaccination program (6 items)

This study specifically focused on the fourth subdimension (knowledge regarding the HPV vaccination program) rather than the overall scale score. The targeted approach was selected because knowledge of vaccination program recommendations, including age-specific eligibility and recommendations for males and females, is directly relevant to equitable HPV vaccine counseling and implementation. Each correct response was assigned a score of 1, whereas incorrect or "don't know" responses were scored as 0, in accordance with the original scoring system.

Ethical Considerations

This study was approved by the Yeditepe University Faculty of Medicine Ethics Committee on April 17, 2023, with decision no. 2023/80-04. All participants provided

written informed consent prior to participation.

Literature Search Strategy

To contextualize the representation of gender-specific HPV vaccination research in the literature, a targeted literature search was conducted on the PubMed/MEDLINE database in April 2023. The search strings were "HPV vaccine AND women" and "HPV vaccine AND men", and the search was restricted to titles, abstracts, and keywords. The total number of publications retrieved from each search was recorded as a descriptive benchmark for the discussion.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were reported as frequencies (n) and percentages (%) for categorical variables. Because the primary study variables were categorical, categorical statistical methods were used. The Pearson chi-square test was used to evaluate differences in responses to HPV vaccination knowledge items between genders. Spearman's rho correlation coefficients were calculated to assess the association between the academic year (Period) and HPV vaccination program knowledge scores. Statistical significance was set at $p<0.05$.

RESULTS

The study population comprised 507 students, of whom 448 completed the questionnaire, yielding a response rate of 88.3%.

Most participants were female (n=316, 70.5%), while male students represented 29.5% (n=132) of the sample. By academic year, Period 3 students constituted the largest group (n=182, 40.6%), followed by Period 1 (n=137, 30.6%), and Period 2 (n=129, 28.8%) students (Table 1). The fourth subdimension of the scale assessed knowledge of the HPV vaccination program across six items, with

Table 1. Sociodemographic characteristics of the study participants.

	Group	n	%
Gender	Male	132	29.5
	Female	316	70.5
Academic Year	1	137	30.6
	2	129	28.8
	3	182	40.6

a maximum possible score of 6. The overall mean score for the study population was relatively low, indicating limited overall knowledge of HPV vaccination policies. Specifically, when analyzing individual item responses, a marked difference was observed between knowledge of HPV vaccination recommendations for women and those for men. For instance, most participants correctly identified that HPV vaccination is recommended for women aged 11–26 years.

No statistically significant difference was observed between male and female students regarding their knowledge of HPV vaccination recommendations for women. Most participants correctly identified that the HPV vaccine is recommended for women aged 11–26 years ($n=299$, 66.7%). Although the proportion of correct responses was higher among female students (69.3%) than among male students (60.6%), this difference did not reach statistical significance ($\chi^2=3.173$, $p=0.075$). In contrast, knowledge of HPV vaccination recommendations for men was substantially lower than knowledge of recommendations for females. Only 32.1% ($n=144$) of participants correctly identified that HPV vaccination is also recommended for men aged 11–26 years. Approximately 65.2% ($n=86$) of male students and 69.0% ($n=218$) of female students either gave incorrect answers or stated that they were unaware of this practice ($\chi^2=0.618$, $p=0.432$) (Table 2).

As students progressed through medical education, a statistically significant increase was observed in the proportion of correct responses regarding HPV vaccination recommendations. For indications related to women, the rate of correct responses increased from 55.9% in Period 1 to 74.9% in Period 3. Spearman's rho correlation analysis revealed a positive but weak correlation between academic year and knowledge of both male and female vaccination indications ($p<0.001$) (Table 3).

DISCUSSION

The findings of this study provide important insights into knowledge and gender-based gaps regarding the HPV vaccine among preclinical medical students. Despite the increasing global emphasis on gender-neutral vaccination, our results demonstrate lower awareness of

HPV vaccination recommendations for males than for females. Our data revealed that the proportion of students correctly identifying the HPV vaccine indication for women was higher than that for men. This finding aligns with the broader sociocultural phenomenon described as the 'feminization of HPV'. Rather than indicating an inherent individual gender bias among the participants, this knowledge gap is more accurately interpreted as a structural reflection of how HPV vaccination has historically been framed within public health policies and healthcare systems, which have heavily emphasized cervical cancer prevention (1,2).

In our study, female students had a higher proportion of correct responses regarding HPV vaccination recommendations for women than male students; however, this difference was not statistically significant. This finding is consistent with a study by Costa et al. in Brazil (11). This trend may be related to the greater clinical and public health visibility of cervical cancer compared with HPV-associated diseases affecting men. However, the misconception that the HPV vaccine is exclusive to women may also reflect the historical emphasis of vaccination campaigns on cervical cancer prevention. Global vaccination campaigns and visual materials have predominantly featured female subjects, potentially reinforcing the perception that HPV vaccination is primarily a women's health intervention.

The gender disparity observed in our study may also reflect broader patterns in the scientific and public health discourse surrounding HPV. Although preclinical students in our study are exposed to information on HPV transmission and molecular mechanisms in microbiology, infectious diseases, and reproductive health modules, their knowledge of the specific vaccination recommendations for males appeared to be limited. This disparity suggests that current medical education may benefit from more explicit, gender-neutral coverage of vaccination recommendations, rather than relying primarily on the cervical cancer prevention framework.

Consistent with the findings of Emre et al., our study observed that knowledge of HPV vaccination recommendations increased as students progressed through their academic years (12). To examine this trend in more detail,

Table 2. Comparison of knowledge levels on HPV vaccination indications by gender.

	Male n (%)	Female n (%)	Total n (%)	χ^2	p
Recommended for females	80 (60.6%)	219 (69.3%)	299 (66.7%)	3.173	0.075
Recommended for males	46 (34.8%)	98 (31.0%)	144 (32.1%)	0.618	0.432

Table 3. Spearman's rho correlation matrix of academic period and HPV vaccination knowledge levels.

	Academic Period	Knowledge (Males)	Knowledge (Females)
Academic Period	1.000	.160**	.170**
Knowledge (Males)	.160**	1.000	.396**
Knowledge (Females)	.170**	.396**	1.000

Note: ** Correlation is significant at the 0.01 level (two-tailed).

we used Spearman's rho correlation, which showed a statistically significant positive correlation between academic year and knowledge of both male ($p=0.001$) and female ($p<0.001$) vaccination recommendations. However, the weak magnitude of these correlations is also noteworthy. This suggests that knowledge acquisition occurs gradually, but the progression through the current curriculum may be insufficient to ensure comprehensive awareness of gender-neutral HPV vaccination recommendations. The moderate positive correlation ($p<0.001$) found between knowledge about protocols for men and for women suggests that students who are well-informed about one aspect of vaccination tend to be better-informed about another aspect as well, but the overall baseline level remains low.

One of the main reasons for the low level of knowledge and the reported low HPV vaccination rate (estimated as 3.9%) in Türkiye is the absence of the HPV vaccine in the national vaccination program (13,14). The literature consistently identifies "lack of knowledge" as the leading cause of inadequate vaccination rates worldwide (15,16). Since healthcare provider recommendations are an important determinant of vaccination uptake, identifying and addressing knowledge gaps among future physicians during their training should be considered a public health priority.

This study has several limitations. First, the research was conducted as a single-center study at a private university in İstanbul, which may limit the generalizability of the findings to medical students at other universities and different regions of Türkiye. Second, the cross-sectional design allows for the identification of associations but does not permit the establishment of definitive causal relationships. Additionally, a formal prior power analysis was not conducted, which may limit the statistical power

to detect very small effect sizes, although a high response rate from the eligible target population was achieved. Finally, although the response rate was high, self-reported data may lead to potential recall or social acceptability biases. To provide a more comprehensive understanding of gender-neutral HPV vaccination knowledge nationwide, future multicenter studies involving a more diverse sample of medical students are needed.

CONCLUSION

Increasing medical students' knowledge of vaccination programs is a fundamental step toward achieving primary prevention, which is a key objective of public health practice. As future physicians, medical students will play an important role in guiding the community regarding vaccination; therefore, it is essential that they possess comprehensive, evidence-based knowledge of targeted immunization strategies.

While HPV is often perceived as a pathogen primarily associated with women, HPV infection affects individuals of all genders, and men can both acquire and transmit the virus and develop HPV-associated diseases. Our study highlights that knowledge of HPV vaccination recommendations for males was lower than knowledge of recommendations for females among preclinical medical students. For HPV prevention strategies to be effective, vaccination should be approached as a gender-neutral public health intervention rather than solely as a component of women's health. Researchers and clinicians should therefore work to ensure that HPV vaccination is consistently presented as relevant to both sexes.

In conclusion, this study demonstrated that preclinical medical students had lower awareness of HPV vaccination recommendations for males than for females. These findings indicate the need to strengthen gender-neutral HPV vaccination education in undergraduate medical curricula. Future multicenter studies are needed to determine whether similar knowledge gaps exist among medical students in different educational and regional contexts. In the context of public health policies, shifting toward a gender-neutral vaccination discourse remains essential. Integrating the HPV vaccine into the National Immunization Program for both sexes in Türkiye represents a critical step toward achieving global HPV eradication strategies and comprehensive coverage in preventive medicine.

Ethical Approval: This study was approved by the Yeditepe University Faculty of Medicine Ethics Committee on April 17, 2023, with decision no. 2023/80-04.

Informed Consent: Informed consent was obtained from all participants.

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