

Original Research Article

Awareness and attitude regarding human papilloma virus, its vaccine and HPV vaccination acceptability among medical undergraduate students in Central India

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ABSTRACT

Background: India is a major contributor to the global burden of human papilloma virus infection. Cervical cancer is the leading cause of death globally as well as in India. Highest prevalence observed among adolescents and young adults. Vaccination against HPV is an important mode of primary prevention against cervical cancer. As future healthcare providers, medical students can significantly influence community perspectives and HPV vaccine adoption; thus, cultivating the right mindset in them is essential to expedite its implementation for societal benefit.

Methods: A cross-sectional study was conducted among 524 medical undergraduate students in government medical college. Data was collected using a pre-designed semi-structured self-administered questionnaire, entered into Microsoft Excel, and analysed.

Results: The study of 524 medical undergraduates in central India found that while most participants (75.95%) were aged 19-24 and predominantly female (58.78%), awareness of HPV and its vaccine was moderate. Although cervical cancer and genital warts were commonly recognized as HPV-related, knowledge of other associated cancers was limited. Nearly 29% were unaware of any HPV vaccine. High vaccine cost (50%) and limited awareness (20%) were key barriers to uptake, highlighting the need for improved education and affordable access.

Conclusions: This study found moderate but insufficient awareness of HPV and its vaccine among medical students in Central India. Many lacked knowledge of HPV-related cancers and vaccines like Gardasil-9, with cost and access as major vaccination barriers. Strengthening education is essential to improve vaccine uptake and reduce HPV-related disease burden.

Keywords: Cervical cancer, HPV vaccination, Human papilloma virus, Medical undergraduate

INTRODUCTION

Globally, cervical cancer is the fourth most common cancer among women and is responsible for 7.5% of all female cancer deaths. It is second leading cause of cancer deaths in women aged 15 to 44 years in India. Infection with specific high-risk strains of human papillomavirus (HPV) is the leading cause of cervical cancer.¹

Although over 140 types of human papillomavirus (HPV) have been identified, only about 40 types are sexually

transmitted, and notably, two high-risk HPV types, HPV 16 and HPV 18, are responsible for more than 80% of cervical cancer cases in India.² The virus infects epithelial cells of skin and mucosa, and has also been associated with cancer of the oropharynx, vulva, vagina, anus, and penis. In India, cervical cancer accounts for up to 43.8% of all female cancers, while the same HPV strains also cause a significant proportion of other cancers, including 92% of anal cancers, 89% of oropharyngeal cancers, and 63% of penile cancers in men, highlighting the importance of HPV vaccination for both genders before

sexual debut.³ In addition, cervical cancer risk is increased by a variety of clinic-epidemiological risk factors such as early marriage and multiple sexual partners. Multiple pregnancies and poor genital hygiene also contribute to the risk. Smoking further exacerbates the likelihood of developing cervical cancer. Women from low socioeconomic backgrounds are more vulnerable due to limited access to screening and treatment.⁴ Since cervical screening only detects precancerous and cancerous changes after they have occurred; HPV vaccination is primary prevention.⁵

Despite the recommendations by the World Health Organization (WHO) and the availability of highly effective and safe HPV vaccines in more than 100 countries, HPV vaccine is not currently included as part of the national immunization program (NIS) in India; however, the vaccine is available in the private sector since 2008, and in 2016, the State Government of Delhi and Punjab launched HPV vaccine implementation.⁶

The Indian Academy of Pediatrics Advisory Committee on Vaccination and Immunization Practices (IAP COVI) recommends HPV vaccination for females aged 9-26 years, particularly those who can afford it, categorizing it as a vaccine that can be considered based on individual circumstances and financial means. For girls aged 9-14 years, two intramuscular doses of either of the two HPV vaccines (HPV4 or HPV2) at 6-months interval is recommended. For girls aged 15 years and older, and for immunocompromised girls and women, three doses of the vaccine over a 6-month period are recommended.⁷ On the contrary, in western countries like USA and Europe, HPV vaccines are approved for mass scale use and included in the national immunization program for reducing the burden of cervical cancer.⁸

Barriers to HPV vaccination include the high cost of vaccines, societal and cultural concerns, religious objections, and fears about potential side effects that may occur after immunization. A major obstacle to HPV vaccination is the widespread lack of awareness and understanding about HPV, cervical cancer, and the vaccine itself, resulting in only small number of immunizations being carried out at private clinics. The uptake of HPV vaccine among adolescent girls in India seems to be higher in educated communities, underscoring the need for targeted awareness and education initiatives to reach a broader population.²

The effectiveness of cervical cancer control and prevention largely depend to a great extent on the level of awareness and knowledge about different aspects of the disease and the vaccine. It is therefore important to target immunizable young adult college-going girls and boys, as they are vulnerable to HPV infection due to their increasingly independent lifestyles. By vaccinating both males and females, we can help break the infection chain, given their role in the transmission of the virus. Since college students are typically within the ideal age range

for successful vaccination and can opt for vaccination with parental consent, targeting this group can yield significant benefits in HPV vaccination efforts.²

Knowledge of HPV and its vaccine is very important for the prevention of health hazards caused by HPV. The awareness and attitudes about HPV vaccine among undergraduate students have been reported, but data are limited regarding HPV vaccine acceptability and recommendation to others.⁹

Medical students are well-positioned to challenge misconceptions and raise awareness about cervical cancer. As future healthcare professionals, their influence can help shape public attitudes and behaviors toward cervical cancer prevention, ultimately improving health outcomes. By promoting vaccine acceptance and encouraging regular screening, they can play a key role in preventive healthcare. Staying informed about the latest developments allows them to educate and empower women to make informed health decisions.²

As future healthcare providers, medical students have a vital role in promoting cervical cancer awareness and prevention. Their awareness and attitudes significantly influence public understanding and acceptance of vaccination and screening practices. This study highlighted the importance of ensuring that medical students are well-informed about the etiology of cervical cancer, vaccine availability, target groups, potential side effects, efficacy, and dosage. Empowering them with accurate and up-to-date information is essential for enhancing community outreach and ultimately improving public health outcomes.⁵

METHODS

This cross-sectional study was conducted among 524 undergraduate MBBS students at Government Medical College, Nagpur, during the period from January to March 2025.

Inclusion criteria

Undergraduate medical students from Government Medical College, a tertiary care center, who provided informed consent were included in the study.

Ethical approval procedure

Approval was obtained from the institutional ethics committee (IEC). Informed written consent was taken from participants in their vernacular language after explaining the purpose of the study.

Sample size estimation

It is estimated based on the prevalence of acceptance of HPV vaccine in article by Pandey et al having title, "awareness and attitude towards human papillomavirus

(HPV) vaccine among medical students in a premier medical school in India.” published in PLoS One, 2012;7(7):e40619.

Following assumptions: prevalence of acceptance of HPV vaccine: 67.8%; absolute precision: 4%; desired confidence level: 95%; required sample size: 524.

Sampling method

Convenience sampling method was used.

Formula for sample size estimation

$$n = \frac{Z_{1-\alpha/2}^2 p(1-p)}{d^2}$$

Where, p - Expected proportion d - Absolute precision

1- α /2 - Desired confidence level

Data collection tool

A pre-designed, semi-structured, self-administered questionnaire was used to collect sociodemographic data of the students.

Data collection method

After obtaining clearance from the institutional ethics committee and permission to conduct the study, data collection was started. Undergraduate students from first year to final year, were considered for the study. Those who were willing to participate and gave informed written consent were included. The participants were provided with general instructions regarding how to fill out the questionnaire. A pre-designed, semi-structured, self-administered questionnaire was used to evaluate the sociodemographic data of the students.

Data management and analysis

The collected data were entered into Microsoft Excel and subsequently analyzed using Jamovi statistical software. Categorical variables were described using frequencies and percentages, while continuous variables were summarized as mean $\pm$ standard deviation (SD).

RESULTS

Table 1 represents distribution of participants according to socio-demographic characteristics. The study included a total of 524 participants. The majority of them (75.95%) were in the 19-24 years’ age group, followed by 17.94% in the 25-29 years’ group, and only 6.11% were older than 30 years. Regarding gender distribution, female participants constituted a larger proportion (58.78%) compared to males (41.22%). According to the data, 3rd and 4th year students made up the largest share of

participants (20.99% each), followed by 2nd years (19.66%), interns (19.27%), and 1st year students (19.08%). With respect to religion, the vast majority identified as Hindu (76.34%), while Buddhists made up 11.45%, Christians 5.73%, Muslims 3.82%, and 2.67% identified with other religions. As for family structure, most participants came from nuclear families (67.75%), followed by those from three-generation families (23.66%), and joint families (8.59%).

Table 1: Distribution of participants according to socio-demographic characteristics.

Variables	Total (N)	Percentage
Age (years)	19-24	398
	25-29	94
	>30	32
Gender	Male	216
	Female	308
Academic year	1 st year	100
	2 nd year	103
	3 rd year	110
	4 th year	110
	Intern	101
Religion	Hindu	400
	Christian	30
	Buddhist	60
	Muslim	20
	Other	14
Type of family	Nuclear	355
	Three generation	124
	Joint	45

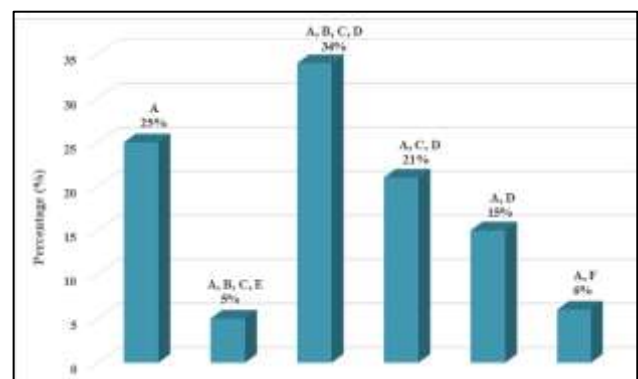


Figure 1: Evaluation of students' understanding of HPV-associated diseases.

*Based on Multiple responses. As per the responses given by study participants, A- Cervical Ca, B- Oropharyngeal Ca, C - Vulvar Ca, D- Genital Warts, E- Penile Ca, F- AIDS.

Figure 1 provides an overview of how well students recognize diseases associated with HPV. Based on the responses given by the study participants, the majority (34%) identified multiple HPV-associated conditions including A (cervical cancer), B (oropharyngeal cancer),

C (vulvar cancer), and D (genital warts). Individually, A (cervical cancer) was recognized by 25% of students. Other common combinations were A, C, and D (21%) and A and D (15%). A smaller group (5%) included E (penile cancer) along with A, B, and C, showing limited awareness of this condition. Notably, 6% of participants mistakenly linked F (AIDS) with HPV-related diseases, highlighting some confusion between HPV and HIV/AIDS infections.

Table 2: Awareness of HPV vaccines among study participants.

HPV vaccines	Number of subject (N)	Percentage
E	150	28.67
B	38	7.33
A	98	18.67
A, C	136	26.00
C	38	7.33
A, B, C	10	2.00
D	14	2.67
B, D	17	3.33
A, D	4	0.67
B, C, D	14	2.67

A. Cervavac, B. Cervarix, C. Gardasil, D. Gardasil-9, E. Do Not Know. *Based on Multiple Responses.

The Table 2 summarizes the level of awareness about HPV vaccines among the study group. The data show that a significant portion of participants, 28.67%, were unaware of any HPV vaccine (marked as “do not know”). Among those who were informed, the most frequently recognized vaccine combination was Cervavac and Gardasil (A, C), identified by 26% of participants.

Awareness of individual vaccines varied, with Cervavac alone (A) known by 18.67%, while both Cervarix (B) and Gardasil (C) alone were recognized by 7.33% each. Less commonly recognized vaccines included Gardasil-9 (D), noted by 2.67% of participants.

Awareness of multiple vaccine combinations was generally low: Cervavac, Cervarix, and Gardasil (A, B, C) were identified by 2%, Cervarix and Gardasil-9 (B, D) by 3.33%, Cervarix, Gardasil, and Gardasil-9 (B, C, D) by 2.67%, and Cervavac and Gardasil-9 (A, D) by 0.67%.

Figure 2 presents the factors contributing to participants not getting the HPV vaccination. The most common reason was high cost, cited by half of the participants (50%), indicating that financial barriers play a major role in vaccine uptake. Following this, lack of access and knowledge accounted for 20% of responses, highlighting issues related to availability and awareness. Doubts regarding the vaccine’s effectiveness were reported by 15%, reflecting some skepticism about the benefits of vaccination. Concerns about the fear of side effects were mentioned by 7% of participants, suggesting that safety worries also influence decisions. Lastly, 8% of

participants cited other reasons for not receiving the vaccine, which may include a variety of personal or contextual factors.

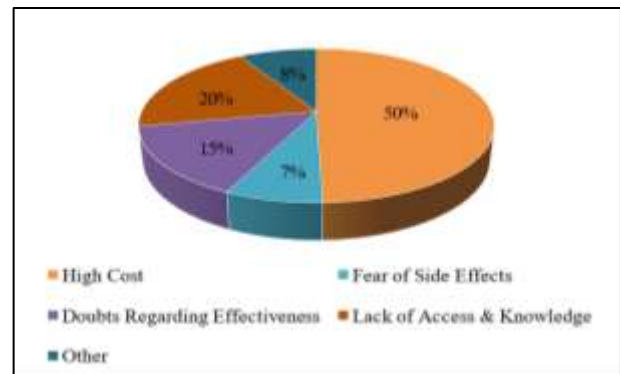


Figure 2: Factors contributing to participants not getting the HPV vaccination.

DISCUSSION

This cross-sectional study explored awareness, attitudes, and acceptability of HPV infection and vaccination among medical undergraduate students in central India. The majority of participants were young adults aged 19-24 years (75.95%) and predominantly female (58.78%), consistent with findings from studies by Pandey et al, Challa et al, and Kamini et al, which involved similar populations of Indian medical and paramedical students.^{1,5,10} This demographic group represents a critical window for HPV education and immunization, aligning with the optimal age for vaccine administration.

In terms of awareness, 34% of participants in our study identified multiple HPV-associated diseases, most commonly cervical cancer and genital warts. These findings mirror those reported by Pandey et al and Challa et al, where over 85% of students were aware of HPV’s role in cervical and other cancers.^{1,5} However, awareness of less commonly discussed HPV-related malignancies, such as penile cancer, was limited (5%), a gap similarly noted by Mehta et al.¹¹ Furthermore, 6% of respondents incorrectly associated AIDS with HPV, highlighting a significant misconception that was also observed in the study by Mehta et al.¹¹ This reinforces the need for better differentiation between HPV and other sexually transmitted infections in educational interventions.

Our findings revealed a moderate level of awareness regarding HPV vaccines. While 26% of participants correctly identified a combination of Cervavac and Gardasil, nearly 29% were unaware of any HPV vaccine. These figures are notably lower than those reported in the studies by Pandey et al and Challa et al, where awareness exceeded 75%.^{1,5} Similar trends of limited knowledge were noted by Swarnapriya et al, who found that less than half of their participants displayed good HPV-related awareness.¹² Recognition of newer vaccine formulations such as Gardasil-9 was especially low, consistent with the

limited understanding of vaccine cost and efficacy reported by Radhika et al.⁸ These observations underscore the need for enhanced, curriculum-based education on HPV vaccination, particularly covering updated vaccine options.

Cost was identified as the most significant barrier to vaccination in our cohort, cited by 50% of participants. Other common barriers included lack of access and information (20%) and doubts about vaccine efficacy (15%). These findings are in line with several Indian studies, including those by Padmanabha et al, Gupta et al, and Swarnapriya et al, which also highlighted economic and informational challenges as key obstacles to vaccine uptake.¹²⁻¹⁴ Concerns about vaccine safety and side effects were reported by 7% of our participants, a trend echoed in international studies by Rashwan et al and Cheung et al.^{15,16} These findings reflect the multifactorial nature of vaccine hesitancy and emphasize the need for comprehensive strategies that tackle financial, educational, and perceptual barriers.

Vaccine acceptance rates varied significantly across studies. Higher acceptance was observed by Pandey et al (67.8%) and Challa et al (80.3%), whereas lower uptake and willingness to vaccinate were reported by Swarnapriya et al and Padmanabha et al, largely due to safety concerns, misinformation, and financial constraints.^{1,5,12,13} Such variability suggests that demographic, educational, and cultural contexts strongly influence HPV vaccine acceptability and must be addressed through tailored interventions.

Finally, the misconception that links HPV with HIV/AIDS remains prevalent, as seen in our study and those by Mehta et al and Kamini et al.^{10,11} Even among medical students, these gaps in basic understanding indicate that current educational efforts may be insufficient. Therefore, there is a pressing need for targeted educational initiatives that not only increase awareness but also correct existing misconceptions and foster a more informed and positive attitude toward HPV prevention strategies.

The study employed a convenience sampling method, which may limit the generalizability of the results to the broader student population. The reliance on self-administered questionnaires introduces the potential for response bias, as participants might have provided socially desirable answers rather than accurately reporting their true perceptions. Moreover, the cross-sectional design offers only a snapshot of perceptions at a single point in time, failing to capture potential changes in attitudes or experiences over the duration of the academic program.

CONCLUSION

The present study reveals that awareness and attitude regarding HPV, its vaccine, and vaccination acceptability

among medical undergraduate students in central India remain moderate but insufficient. While a majority of participants identified cervical cancer and genital warts as HPV-associated conditions, significant gaps were evident in their knowledge of other HPV-related malignancies such as oropharyngeal and penile cancers. Additionally, misconceptions- such as confusing HPV with HIV/AIDS- highlight persistent misinformation, even among medically educated individuals. Awareness about HPV vaccination was similarly limited. Nearly one-third of participants were unaware of any HPV vaccine, and knowledge about newer vaccines such as Gardasil-9 was particularly low. This contrasts with higher awareness levels reported in other Indian medical institutions, suggesting a disparity potentially influenced by regional or institutional differences in health education exposure. Barriers to vaccine uptake reflected broader national trends, with high cost cited as the most significant obstacle, followed by limited access, lack of knowledge, and concerns about vaccine efficacy and safety. These challenges point to the need for a multifaceted strategy to enhance vaccine coverage and acceptance. Government-funded initiatives have already prioritized HPV vaccination for girls aged 9-14 years, and disparities in awareness and uptake among medical students suggest the importance of ongoing education and public health communication. Strengthening the understanding of HPV and its vaccine among future healthcare providers remains essential in addressing the burden of HPV-related diseases in India.

Recommendations

To improve HPV vaccine awareness and uptake among medical students, it is recommended to integrate HPV vaccination into the National Immunization Program to eliminate cost barriers and expand coverage. Strengthening the medical curriculum with comprehensive HPV education, addressing misconceptions through targeted awareness campaigns, and offering subsidized or free vaccination in educational institutions are essential steps. Empowering students as health advocates and regularly assessing their knowledge and attitudes will further support effective cervical cancer prevention efforts.

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