



RESEARCH ARTICLE

A study to improve knowledge and attitude regarding HPV infection, cervical cancer and its vaccination among undergraduate students in Government Medical College, Almora, Uttarakhand: An Educational intervention

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ABSTRACT

Background and Aim: Human papillomavirus (HPV) is the most common sexually transmitted infection and a primary cause of cervical cancer in women. Although incurable, HPV infection can be largely prevented through timely vaccination. This study aims to explore the basic understanding of medical students about cervical cancer, HPV and HPV vaccination.

Methods: This was a descriptive, questionnaire based cross-sectional study conducted among the undergraduate medical students from March 2025 to May 2025. A total of 380 respondents participated in the study and SPSS Version 29.0.2.0 was used to analyse the data.

Results : A total of 380 students attended four educational lectures on human papillomavirus (HPV), cervical cancer, and the HPV vaccine and completed pre- and post-tests. Most participants were younger than 21 years (56.6%), with nearly equal representation of males and females. Post-test results showed improved knowledge regarding HPV and cervical cancer, particularly about risk factors and preventive measures. Knowledge of the HPV vaccine also increased, especially regarding the recommended age of vaccination in India and required doses. Participants additionally demonstrated more positive attitudes toward HPV vaccination, including greater acceptance among sexually active females and increased recognition of HPV infection as a public health concern.

Conclusion: This study suggests that including material on HPV vaccination in the standard medical student curriculum could help increase physician recommendation for the HPV vaccine.

Keywords: Attitude, Awareness, Cervical cancer, HPV vaccine, medical students.

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INTRODUCTION

In India, cervical cancer (CC) is the second most prevalent gynaecological malignancy after breast cancer, accounting for approximately 14% of all female cancer cases. The age-adjusted incidence rate (AAIR) is 27.0 per 100,000 women, and the age-adjusted mortality rate (AAMR) is 12.4 per 10,000 population[1,2]. Cervical cancer is primarily caused by infection with high-risk human papillomavirus (HPV) types. While over 140 HPV types have been identified, only approximately 40 are sexually transmitted, with HPV-16 and HPV-18 responsible for more than 80% of cases in India[3-6]. Moreover, various clinical and epidemiological factors—including early age at marriage, multiple sexual partners, high parity, inadequate genital hygiene, and smoking—are frequently associated with an elevated risk of CC[7].

CC is a major public health concern in India, necessitating increased awareness of its risk factors and preventive measures among women. Despite the Pap smear being the standard screening method, its uptake remains low in rural areas, compounded by sociocultural stigma

that discourages discussion and screening[8]. CC can be both prevented and treated through a holistic strategy that includes preventive measures, early detection, the use of different screening techniques, and appropriate treatment interventions[9]. There are two HPV vaccines available in India: the bivalent vaccine (Cervarix, GSK Biologicals, Belgium, HPV2 targeting HPV types 16 and 18) and the quadrivalent vaccine (Gardasil, Merck, USA, HPV4 targeting HPV types 6,11,16, and 18)[10]. According to the Indian Academy of Pediatrics Advisory Committee on Vaccination and Immunization Practices (IAP COVI, 2020) “*all females aged 9–26 years who can afford the vaccine, must be offered HPV vaccine*” “*Category 2 of IAP categorization of vaccines*”[11].

For girls between 9 and 14 years old, it is recommended to receive two intramuscular doses of either HPV vaccine (HPV4 or HPV2) spaced six months apart. Girls aged 15 and older, as well as immunocompromised females, should receive three doses over a six-month period[12]. The quadrivalent vaccine is suitable for both males and females, while the bivalent vaccine is approved only for females. Although over 60 countries have incorporated

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the HPV vaccine into their national immunization schedules, vaccination coverage varies widely. In India, the implementation of a nationwide vaccination program is still under consideration.

The health care professionals (HCP) play a vital role in prevention and spreading awareness regarding CC and HPV vaccines. They can encourage the public to get vaccinated only if they themselves are well-informed about the benefits and risks of HPV vaccination. Therefore, evaluating their knowledge, attitudes, and willingness to accept and recommend the vaccine is essential.

This study aims to investigate the level of understanding and awareness of cervical cancer, human papillomavirus (HPV), and HPV vaccination among undergraduate medical students, in order to clarify uncertainties surrounding HPV vaccination.

METHODS

Study design

Descriptive cross-sectional study.

Study participants

All medical students studying at Government medical college Almora who were willing to participate in the study were included. The only exclusion criteria were

unwillingness to participate in the study. Informed consent was taken from the participants to ensure the right of the subject.

Study tool

An anonymous, self-administered structured questionnaire with a scoring scale was developed to assess students' knowledge and attitudes regarding CC and HPV vaccination by review of literature of different studies [13,16,17,19]. The tool included socio-demographic details and 26 questions assessing knowledge of cervical cancer, HPV infection, and HPV vaccination, along with items on attitudes and practices related to HPV vaccination. Knowledge was assessed using "Yes," "No," or "Do not know" responses, while attitude was measured using "Agree," "Disagree," or "Neutral." The questionnaire was pre-tested on ten randomly selected students to evaluate clarity, accuracy, language, and sensitivity, and necessary modifications were made.

Data collection

The survey was conducted in the department of Community medicine from March 2025 to May 2025. The pre-validated and pre-tested questionnaire was given to the participants by google drive link form shared on their official batch WhatsApp group. A total of 400 undergraduate students were approached. Of them, only 380 showed willingness to participate in the study. They were informed about the purpose of survey and that their participation was entirely voluntary. A written informed consent was taken from the participants before distributing them the consent forms.

Table 1: Socio - demographic profile of respondents (n= 380)

Variables		Frequency(No. %)
Age	≤ 21 years	215 (56.6)
	>21 years	165 (43.4)
	Mean ±SD = 21.2 ±1.60 yrs	
Gender	Female	188 (49.5)
	Male	192 (50.5)
Academic year	2021 (1 st Batch)	94 (24.7)
	2022 (2 nd Batch)	93 (24.4)
	2023 (3 rd Batch)	96 (25.3)
	2024 (4 th Batch)	97 (25.5)
Family H/o Cervical Cancer	Present	15 (3.9)
	Absent	365 (96.1)

Table 2: Association between Knowledge of Human Papilloma Virus and Cervical Cancer and time of test (N = 380)

<i>Knowledge Parameters responded positive</i>	<i>Pre test</i>	<i>Post test</i>	<i>% Change</i>
Have you heard about HPV infection	354 (93.2)	380 (100)	+ 07
Have you heard about Cervical cancer	370 (97.4)	380 (100)	+ 03
Is HPV infection related to Cervical cancer?	361 (95)	375 (98.6)	+ 3.8
What are the most common HPV types responsible for Cervical cancer?	333 (87.6)	370 (97.3)	+ 11.2
What are the Risk Factors for Cervical Cancer? (5 options given all 5 correct answer) (we have taken 4 & 5)	147 (38.6)	281 (73.9)	+ 47.7
What would be the mode of transmission of HPV infection	328 (86.3)	358 (94.2)	+ 8.4
Screening can be done for HPV infection?	353 (92.8)	374 (98.4)	+ 5.9
Methods of Screening for HPV infection?	309 (81.3)	359 (94.5)	+ 14.0
Is Cervical Cancer Preventable?	356 (93.7)	367 (96.5)	+ 3.0
What are the preventable measures of Cervical Cancer? (5 options given all 5 correct answer) (we have taken 4&5)	196 (51.6)	356 (93.7)	+ 44.9

They were given the instructions on how to fill out the questionnaire.

Between March and May 2025, the two authors (VSD and P) delivered eight presentations on HPV and the HPV vaccine to medical students at GMC Almora. The sessions covered HPV etiology, the incidence of HPV-associated cancers, and the safety, efficacy, and recommended use of the HPV vaccine. An introductory slide shown before the lecture informed students that the pre-test and post-test were part of a research study, that participation was voluntary, and that non-participation would not affect academic grades. The lecturers also verbally reiterated that completion of the surveys was optional. Submission of the questionnaire was

Table 3: Association between knowledge of human papillomavirus vaccine-related and time of test (N = 380)

<i>Knowledge Parameters responded positive</i>	<i>Pre test</i>	<i>Post test</i>	<i>% Change</i>
Are vaccines available in India?	369 (97.1)	378 (99.4)	+ 2.4
What are the type of vaccines available in India? (correct answer 2)	208 (54.7)	345 (90.7)	+ 39.7
At what age vaccine should be given (in years)?	112 (29.4)	354 (93.2)	+ 68.4
What is the no. of doses given to the recipient? (correct ans 1)	130 (34.2)	315 (82.9)	+ 58.7
Who can be Vaccinated? (correct ans 1)	157 (41.3)	358 (94.2)	+ 56.2
Can the vaccine be given to a sexually active female? (yes)	339 (89.2)	370 (97.4)	+ 8.2
Is screening required before vaccination? (No)	159 (41.8)	374 (98.4)	+ 56.6
Can vaccine be administered to those infected with HPV? (yes)	224 (58.9)	363 (95.5)	+ 36.6

considered as implied consent. Responses from the identical pre- and post-tests were matched using unique identification codes. Participants who failed to submit both surveys were excluded from the analysis. Each survey required approximately 10 minutes to complete.

Data analysis

Data was analysed using Statistical package for Social Sciences (SPSS) software version 21. Descriptive statistics were presented as frequencies (mean and standard deviation (SD)) for quantitative variables and as numbers and percentages for categorical variables. Continuous data was checked for normality of distribution. Z test for difference between the proportion of responses by males and females was used to compare the categorical data. Independent student t test was used to find the statistical significance in mean knowledge score of the two groups. A two-tailed *P* value less than 0.05 was considered as statistically significant.

Table 4: Frequency and percentage of attitudes changes about the HPV vaccine after lecture (n=380)

Attitudes	# of people who regressed their attitude (%)	# of people with same attitude (%)			# of people who improved their attitude (%)
		Disagree	Neutral	Agree	
I believe that the HPV vaccine provides more benefit than harm. (A*)	25 (6.5)	25 (6.5)	44 (11.6)	236 (62.2)	50 (13.2)
The HPV vaccine should not be offered to patients until they are sexually active. (D*)	06 (1.6)	194 (51.0)	65 (17.2)	56 (14.7)	59 (15.5)
I think that the HPV vaccine can cause serious side effects. (D)	18 (4.7)	63 (16.7)	173 (45.5)	70 (18.4)	56 (14.7)
The HPV vaccine saves lives. (A)	00 (00)	01 (0.03)	46 (12.1)	301 (79.3)	32 (8.5)
HPV is an	00 (00)	24 (6.3)	17 (4.5)	283 (74.5)	56 (14.7)

*A- AGREE

*D- DISAGREE

RESULT

A total of 380 students attended one of the 4 lectures

on HPV, Cervical cancer and the HPV vaccine and had completed both the pre and post-test. Approximately half of the participants were less than 21 years old (56.6%). Approximately half of the participants were male. Among 380, very few were having positive family history of cervical cancer (Table 1). Table 2 depicted knowledge of participants regarding Human papilloma virus and cervical cancer which was compared to the knowledge before the presentation. The greatest increase in knowledge among participants was regarding risk factors for cervical cancer followed by preventable measures for the same. Table 3 depicted knowledge of participants regarding Human papilloma virus vaccine which was compared to the knowledge before the presentation. The greatest increase in knowledge among participants was regarding the age at which vaccine should be given in India followed by the knowledge regarding doses of HPV vaccine to be given, it has been increased in approximately half of the participants. Table 4 depicted significant changes in attitudes related to the HPV vaccine. The largest increase in the attitude that sexually active female can also receive vaccine followed by side effects of vaccine and considering HPV infection as a major public health threat.

DISCUSSION

Cancer is an incurable illness, with CC being the most common gynaecological type that affects women between the ages of 15 and 44. Cancer can be treated in a variety of ways. Vaccines may be useful in preventing some types of cancer, according to research. However, Indian medical students have little understanding of HPV, how it is linked to CC, and how to prevent it[13].

This study, employing a pre-test/post-test design, suggests that even a short educational session may lead to more favourable perceptions of the HPV vaccine among medical students and increase their confidence when discussing vaccination with families. Incorporating medical students into targeted educational programs may therefore support broader efforts to strengthen provider-initiated vaccine recommendations, particularly as students transition into residency and begin assuming direct clinical responsibilities. Furthermore, enhancing confidence in vaccine counselling may contribute to more consistent and assertive recommendations throughout their professional practice, including among trainees who have not personally received the HPV vaccine. A recent meta-analysis concluded that strategies aimed at improving healthcare providers' attitudes might be more effective in

boosting HPV vaccination initiation than interventions targeting patients[14].

The average age of the participants in the present study was 21.2 years (Table 1). Before the implementation of the structured teaching program, the level of awareness among students about HPV infection and its association with CC was already very high, reported at 93.2% and 95%, respectively (Table 2). Similarly, Arunachalam et al. conducted a descriptive study among adolescent girls to assess their knowledge and attitudes regarding HPV, and the findings showed that most participants possessed adequate knowledge about the infection[13].

Similarly, the knowledge regarding risk factor for CC in pre-test was found to be inadequate among medical students. Only 38.6 % student's correctly respond to this question. However, in post-test after structured teaching programme score increase to 73.9% showing +47.7 % improvement in knowledge (Table 2). These finding were consistent with the result of study conducted by Ansari et al where pre-test score was 40% which after teaching intervention raised to 97%[16].

A positive development is highlighted during the study that 93.7% of medical students demonstrate excellent knowledge in post-test regarding preventable measure of CC which was 51.6 % in pre-test (Table 2). These findings were congruent with Ansari et al study[16]. Similar findings were addressed in the study conducted by Tripathy et al. (2015)[17].

The present study evaluated the association between knowledge regarding the human papillomavirus (HPV) vaccine and time of testing among participants. The post-test responses demonstrated a marked increase in correct knowledge regarding vaccine availability, type of vaccines, recommended age of vaccination, dosage schedule, eligibility for vaccination, and misconceptions related to vaccination among sexually active females and individuals infected with HPV. In the current study, awareness regarding the availability of HPV vaccines in India was already high during the pre-test (97.1%) and further increased to 99.4% in the post-test (Table 3). This suggests that baseline awareness of the existence of HPV vaccines among the study population was relatively good. Similar findings have been reported in recent studies among healthcare and university students, where approximately 95–97% of participants had heard about HPV vaccination, although detailed knowledge regarding its indications and schedule was often inadequate[18].

Knowledge regarding the type of HPV vaccines available in India improved significantly from 54.7% in the pre-test

to 90.7% in the post-test, reflecting a 39.7% increase (Table 3). This indicates that targeted educational interventions can effectively improve specific vaccine-related knowledge. Previous intervention studies have similarly reported significant improvements in HPV vaccine knowledge following educational sessions, demonstrating the effectiveness of structured awareness programs[19].

A particularly notable improvement was observed in knowledge regarding the recommended age for vaccination, which increased from 29.4% in the pre-test to 93.2% in the post-test (68.4% change) (Table 3). These finding highlights the substantial gap in baseline knowledge regarding optimal vaccination timing. According to global recommendations, HPV vaccination is most effective when administered before the onset of sexual activity, typically during early adolescence[20]. Lack of awareness about the recommended age for vaccination has been consistently reported in several studies across different populations[21].

Similarly, knowledge about the number of vaccine doses increased from 34.2% to 82.9%, representing a 58.7% improvement (Table 3). This indicates that many participants initially lacked correct information regarding vaccination schedules. Previous studies have also reported limited awareness regarding dosage schedules prior to educational interventions, emphasizing the need for systematic health education initiatives[19].

Knowledge regarding eligibility for vaccination improved substantially from 41.3% to 94.2% following the intervention (Table 3). This improvement suggests that participants gained a clearer understanding of the groups that can benefit from HPV vaccination. Educational interventions are known to enhance awareness regarding vaccine eligibility and play a critical role in improving vaccine acceptance and uptake[22].

Regarding misconceptions about vaccination, the present study demonstrated notable improvement in knowledge that HPV vaccination can be administered to sexually active females (increase from 89.2% to 97.4%). Although baseline knowledge was relatively high, the intervention further strengthened correct understanding. Similar findings have been reported in previous research, indicating that educational programs can effectively correct misconceptions about HPV vaccination and improve attitudes toward immunization.¹⁹ Another important finding was the marked improvement in knowledge that screening is not required prior to HPV vaccination, which increased from 41.8% to 98.4% (Table 3). This highlights that misconceptions regarding the need for prior screening are common and can act as barriers to vaccination. Educational

interventions can effectively address such misconceptions and facilitate better acceptance of preventive strategies[21]. Furthermore, knowledge regarding vaccination in individuals already infected with HPV increased from 58.9% to 95.5% (Table 3). This indicates that many participants initially lacked clarity regarding the benefits of vaccination even after HPV exposure. Various studies suggest that HPV vaccination can still provide protection against other HPV strains and therefore remains beneficial even for individuals who may already be infected with certain HPV types[20]. Similar improvements in knowledge scores between pre-test and post-test assessments have been consistently reported in various studies conducted among students and healthcare workers[19].

The present study also demonstrated a measurable positive shift in attitudes toward the human papillomavirus (HPV) vaccine following an educational lecture.

In the current study, the majority of participants showed improved attitudes toward the statement that the HPV vaccine provides more benefit than harm, with 62.2% agreeing and 13.2% demonstrating improvement after the lecture (Table 4). Only 6.5% showed regression in their attitudes. Similar results have been reported in previous studies, which found that targeted educational programs significantly improve awareness and acceptance of HPV vaccination among students and healthcare trainees[23,24].

Regarding the statement that the HPV vaccine should not be offered until individuals become sexually active, more than half of the participants (51.0 %) maintained their existing attitudes, while 15.5% demonstrated improved attitudes after the lecture (Table 4). This indicates persistent misconceptions about the optimal timing of HPV vaccination. Current global guidelines recommend HPV vaccination before sexual debut, typically between 9 and 14 years of age, to achieve maximal protective efficacy[25].

Concerns about vaccine safety remain an important barrier to vaccine uptake. In the present study, 45.5% of participants retained neutral attitudes regarding whether the HPV vaccine causes serious side effects, while 18.4% agreed with the statement and 14.7% showed improvement following the lecture (Table 4). Although some positive change was observed, the persistence of neutral or negative perceptions indicates that safety concerns remain a significant challenge. Previous studies have similarly reported that fear of adverse effects is a key factor contributing to vaccine hesitancy (4,5)[26,27]. Evidence from large population-based studies has consistently demonstrated that HPV vaccines have an excellent safety

profile, with serious adverse events being extremely rare[28].

Furthermore, the majority of participants recognized HPV as an important public health threat, with 74.5% agreeing and 14.7% demonstrating improved attitudes after the lecture (Table 4). This awareness is particularly important in low- and middle-income countries where cervical cancer remains a major cause of cancer-related morbidity and mortality among women[29].

CONCLUSION

The present study demonstrates that a substantial proportion of medical students have limited baseline knowledge regarding HPV vaccination. However, a brief educational intervention significantly improved their knowledge and attitudes. Therefore, we recommend to incorporate comprehensive education on HPV vaccination into the standard medical curriculum. Such educational initiatives are essential to ensure that future physicians are adequately prepared to recommend this effective cancer-preventive vaccine to all eligible individuals. Furthermore, policy measures similar to those implemented for the Hepatitis B vaccine could be considered, whereby HPV vaccination is made mandatory at the time of admission and provided free of cost to promote wider coverage and acceptance.

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