

Original Research Article

KNOWLEDGE, ATTITUDE, AND ACCEPTABILITY OF HUMAN PAPILLOMA VIRUS VACCINE AMONG MEDICAL UNDERGRADUATES AT A TERTIARY CARE CENTER IN PUDUCHERRY, INDIA

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ABSTRACT

Background: Human papillomavirus (HPV) is a major cause of cervical cancer, a leading cause of cancer-related mortality among women in India. Despite effective HPV vaccines, uptake remains suboptimal, particularly among young populations. Medical undergraduates are future healthcare providers pivotal in advocating HPV vaccination. This study aimed to assess their knowledge, attitude, and acceptability toward the HPV vaccine.

Materials and Methods: A descriptive cross-sectional study was conducted among 370 medical undergraduate students from a tertiary care teaching hospital in Puducherry, India. A stratified random sampling method ensured representative inclusion across academic years. Data were collected using a pretested, structured self-administered questionnaire covering socio-demographics, HPV and HPV vaccine knowledge, attitudes, acceptability, and barriers. Knowledge and attitude were quantified using composite scores. Statistical analysis included descriptive statistics, chi-square tests, and logistic regression to identify predictors of vaccine acceptability.

Results: The majority of participants (86.5%) were aware of HPV, and 80.5% recognized its role in cervical cancer; however, only 35.4% correctly identified the vaccine dosing schedule. Knowledge levels were categorized as poor (24.9%), moderate (45.1%), and good (30%). Most students held positive attitudes: 77% perceived the vaccine as safe, 73.2% as effective, and 65.9% were willing to receive it. Vaccine acceptability was 71.6%. Knowledge level, female gender, and age over 22 years were significant independent predictors of acceptance ($p < 0.05$). Barriers to vaccine uptake included concerns about safety (35.6%), cost (31.1%), and lack of awareness (20.5%). Medical curriculum (51.1%) and internet/social media (37.0%) were key information sources.

Conclusion: While general knowledge and positive attitudes toward HPV vaccination exist among medical undergraduates at this tertiary care center, gaps remain, particularly concerning detailed vaccine knowledge and barriers such as safety concerns and cost. Targeted educational interventions and curriculum enhancements are recommended to improve knowledge and vaccine uptake, strengthening future healthcare advocacy against HPV-related diseases.

Keywords: Human papillomavirus, HPV vaccine, medical undergraduates, vaccine acceptability, cervical cancer prevention.

INTRODUCTION

Human papillomavirus (HPV) is a major cause of cervical cancer, which remains a leading cause of

cancer-related deaths among women in India. Despite the availability of effective vaccines to prevent HPV infection, coverage remains low, especially among young populations who could benefit most. Medical

undergraduates, as future healthcare providers, play a critical role in HPV vaccine advocacy and education. This study, conducted at a tertiary care center in Puducherry, India, assessed the knowledge, attitude, and acceptability of HPV vaccination among medical undergraduates to identify educational gaps and barriers to vaccine acceptance.

Prior research reveals inconsistent HPV vaccine awareness and acceptance among healthcare students in India. Although many students have heard of cervical cancer and HPV, knowledge about the vaccine's availability, safety, and efficacy is limited. Studies in southern India found that less than 60% of medical students were aware of the HPV vaccine, and a mere 6.8% had received it, highlighting a significant gap between knowledge and uptake.^[1] Cost concerns, cultural stigma, and misconceptions about vaccine safety also deter acceptance.^[2,3]

A notable research gap exists in region-specific data from Puducherry, where diverse demographics and healthcare access patterns may influence vaccine acceptance uniquely. Most existing studies focus on broader southern India, lacking detailed understanding of local socio-cultural factors affecting medical undergraduates' attitudes and vaccination behavior. Moreover, comprehensive quantitative assessments combining knowledge, attitude, and acceptability factors are scarce. This study addresses that gap by providing in-depth localized data vital for crafting targeted interventions. The rationale for this research stems from the essential role of medical students as future influencers of public health behavior. Assessing their current knowledge and attitudes helps identify misconceptions and barriers which can hinder HPV vaccine advocacy. Such insights enable the development of focused educational programs integrated into curricula, improving vaccine uptake and reducing cervical cancer burden in India. Evidence suggests vaccine acceptance correlates positively with age, clinical exposure, and HPV-related education, reinforcing the importance of targeted training.^[4,5]

This study's novelty lies in its focus on a tertiary care teaching hospital in Puducherry, providing granular insights into medical students' vaccine perceptions in a diverse population. It uniquely correlates demographic variables with knowledge and acceptability, revealing persistent knowledge gaps despite medical training. This highlights the urgent need for curriculum enhancement on HPV-related topics. By quantifying knowledge and attitude deficits, the study informs evidence-based strategies to improve HPV vaccine advocacy. Its findings expect to bolster vaccination rates among healthcare providers and ultimately the wider population, contributing to cervical cancer prevention efforts in India.^[6,7]

Aim: To assess the knowledge, attitude, and acceptability of Human Papilloma Virus (HPV) vaccination among medical undergraduates at a tertiary care center in Puducherry, India.

Objectives

1. To evaluate the current level of knowledge regarding HPV infection and the HPV vaccine among medical undergraduate students.
2. To assess the attitudes of medical undergraduates towards HPV vaccination, including perceived benefits, safety, and willingness to receive the vaccine.
3. To identify barriers and facilitators affecting the acceptability and uptake of the HPV vaccine among medical undergraduates.

MATERIALS AND METHODS

The study utilized a descriptive cross-sectional research design suitable for assessing knowledge, attitudes, and acceptability related to HPV vaccination at a defined point in time. The research was conducted in a tertiary care teaching hospital located in Puducherry, India, which caters to a diverse demographic and serves as an academic hub for medical education.

The research population comprised all medical undergraduate students enrolled at the tertiary care center during the study period. The target population included students from all academic years who were eligible to participate, with inclusion criteria being those medically enrolled undergraduates present and willing to give informed consent. Exclusion criteria encompassed students absent during data collection even after three subsequent visits, those unwilling to participate, and students with prior diagnosed immunocompromising conditions that may influence vaccine acceptance or knowledge.

Sample size estimation was performed using standard prevalence estimation formulas based on previous studies reporting approximately 60% awareness of HPV vaccine among medical undergraduates. With a 95% confidence interval and 5% margin of error, the determined minimum sample size was 370 students, adjusted for an anticipated 10% nonresponse rate. A stratified random sampling technique was employed to ensure representation from different academic years, followed by simple random sampling within each stratum. This method enabled minimization of sampling bias and improved representativeness.

Enrollment of eligible subjects commenced after obtaining written informed consent. Study objectives, confidentiality assurances, and voluntary participation rights were explained prior to data collection. Ethical clearance was obtained from the Institutional Ethics Committee, and the study adhered strictly to the Declaration of Helsinki guidelines to protect participants' rights and privacy.

Data collection employed a pretested, structured, self-administered questionnaire designed based on validated instruments from previous studies on HPV vaccine knowledge and attitudes. The questionnaire was developed in English and covered sections on socio-demographic details, knowledge of HPV infection and vaccination, attitude towards HPV

vaccine safety, efficacy and acceptability, and barriers or facilitators to vaccine uptake.

Key variables studied included socio-demographic factors (age, gender, academic year), independent variables such as HPV knowledge score (measured by a composite of correct responses to 15 knowledge questions), attitude score (based on Likert-scale responses on vaccine perception), and acceptability status (vaccinated or intention to vaccinate). The dependent variable was HPV vaccine acceptability categorized as 'acceptable' or 'not acceptable' based on responses. Confounding variables considered included prior exposure to clinical postings, parental education level, and previous vaccination history.

Measurement levels for variables were as follows: nominal for gender and vaccination status; ordinal for attitude Likert scale items; and interval for composite knowledge scores calculated from aggregated correct responses. Knowledge was objectively assessed by summing correct answers with scores ranging from 0 to 15. Attitude was measured using 5-point Likert scales ranging from strongly disagree to strongly agree, capturing participant perceptions on vaccine

safety, necessity, and willingness. Acceptability was binary (yes/no).

Execution of the research entailed classroom-based distribution of questionnaires under supervision to minimize response ambiguity. Data collection occurred during designated class hours to maximize participation and response rate. The filled questionnaires were reviewed on the spot for completeness and consistency. Data entry employed double data entry protocols followed by validation checks to minimize errors. Statistical analyses were performed using SPSS Version 22 software, including descriptive statistics, chi-square tests for categorical variables, t-tests for continuous variables, and logistic regression models to identify predictors of vaccine acceptability.

Ethical aspects were diligently maintained throughout. Confidentiality was ensured by anonymizing questionnaires through coded identifiers. Participation was voluntary with clear options to withdraw at any stage without penalty. The study bore no risk to participants beyond minimal inconvenience of filling questionnaires.

RESULTS

Table 1: Socio-Demographic Characteristics of Medical Undergraduates (n=370)

Characteristic	n	%
Age (years)		
<20	85	23.0
20–22	210	56.8
>22	75	20.2
Gender		
Male	210	56.8
Female	160	43.2
Year of Study		
1st Year	95	25.7
2nd Year	92	24.9
3rd Year	88	23.8
4th Year	95	25.7

Table 2: Knowledge of HPV and HPV Vaccine Among Participants (n=370)

Knowledge Item	Correct Response	
	n	%
Heard of HPV virus	320	86.5
Knows HPV causes cervical cancer	298	80.5
Aware of HPV vaccine availability	231	62.4
Aware vaccine prevents cervical cancer	219	59.2
Correct dosing schedule knowledge	131	35.4

Table 3: Overall, Knowledge Score Categories (n=370)

Knowledge Category	n	%
Poor (0–5 correct)	92	24.9
Moderate (6–10)	167	45.1
Good (11–15)	111	30.0

Table 4: Attitude Towards HPV Vaccine Among Participants (n=370)

Attitude Statement	Agree/Strongly Agree n	%
HPV vaccine is safe	285	77.0
HPV vaccine is effective	271	73.2
Willing to receive HPV vaccine	244	65.9
Vaccine should be mandatory for medical students	219	59.1

Table 5: HPV Vaccine Acceptability Status Among Participants (n=370)

Acceptability Category	n	%
Acceptable (vaccinated or willing)	265	71.6
Not Acceptable	105	28.4

Table 6: Association Between Knowledge Level and HPV Vaccine Acceptability (n=370)

Knowledge Category	Acceptable n (%)	Not Acceptable n (%)	χ^2 (df=2)	p-value
Poor	47 (51.1)	45 (48.9)	25.63	<0.001
Moderate	128 (76.6)	39 (23.4)		
Good	90 (81.1)	21 (18.9)		

Table 7: Association Between Gender and HPV Vaccine Acceptability (n=370)

Gender	Acceptable n (%)	Not Acceptable n (%)	χ^2 (df=1)	p-value
Male	142 (67.6)	68 (32.4)	3.99	0.046
Female	123 (76.9)	37 (23.1)		

Table 8: Logistic Regression Analysis Predicting HPV Vaccine Acceptability (n=370)

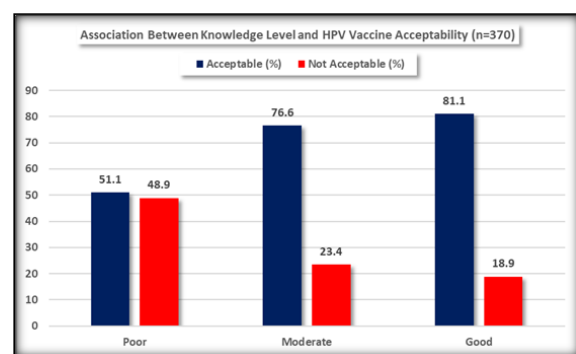
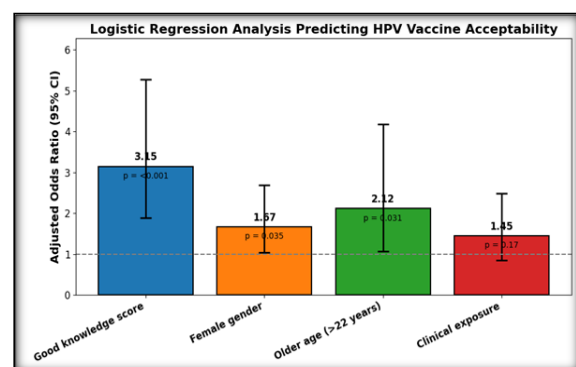
Predictor Variable	Adjusted Odds Ratio (95% CI)	p-value
Good knowledge score	3.15 (1.88–5.28)	<0.001
Female gender	1.67 (1.04–2.69)	0.035
Older age (>22 years)	2.12 (1.07–4.18)	0.031
Clinical exposure	1.45 (0.85–2.48)	0.17

Table 9: Barriers to HPV Vaccine Uptake Reported by Participants (n=370)

Barrier	n	%
Concern about vaccine safety	132	35.6
High cost	115	31.1
Lack of awareness	76	20.5
Cultural/religious concerns	41	11.1

Table 10: Sources of Information About HPV Vaccine (n=370)

Source	n	%
Medical curriculum	189	51.1
Internet/social media	137	37.0
Healthcare professionals	78	21.1
Family and friends	52	14.1

**Figure 1****Figure 2**

The socio-demographic profile of the 370 participating medical undergraduates is summarized in Table 1. The majority were aged between 20 and 22 years (56.8%), with 23% younger than 20 years and 20.2% older than 22 years. Males accounted for 56.8% of the sample, and participants were fairly evenly distributed across the four academic years, with each year comprising about one-quarter of the cohort [Table 1].

Knowledge assessment regarding HPV and the HPV vaccine revealed that 86.5% had heard of the HPV virus, and 80.5% correctly identified HPV as the cause of cervical cancer. Awareness of the vaccine's availability and its preventive role against cervical cancer was lower, at approximately 62.4% and 59.2%, respectively. Knowledge about the correct dosing schedule was limited, with only 35.4% responding correctly [Table 2]. These findings highlight substantial gaps in detailed vaccine knowledge despite generally high awareness of HPV infection.

Overall knowledge categorization showed that 45.1% of participants had moderate knowledge scores, 30% demonstrated good knowledge, while nearly one-quarter (24.9%) fell in the poor knowledge category [Table 3]. This distribution suggests considerable scope for targeted educational interventions to improve comprehensive HPV vaccine knowledge.

Participants' attitudes toward the HPV vaccine were generally positive, with 77% agreeing that the vaccine is safe and 73.2% affirming its effectiveness. Approximately 66% expressed willingness to receive the vaccine, and 59.1% supported its mandatory administration for medical students [Table 4]. These results indicate a favorable attitude towards vaccination despite knowledge limitations, likely reflecting trust in vaccine safety and efficacy.

Acceptability analysis showed that 71.6% were either vaccinated or willing to receive the HPV vaccine, while 28.4% declined acceptability [Table 5]. This high acceptability rate endorses the medical student population as key targets for vaccine advocacy programs.

Statistical association testing demonstrated a significant relationship between knowledge level and vaccine acceptability ($\chi^2=25.63$, $p<0.001$). Participants with moderate (76.6%) and good knowledge (81.1%) were far more likely to accept vaccination compared to those with poor knowledge (51.1%) [Table 6]. Similarly, female students showed significantly higher vaccine acceptability (76.9%) than males (67.6%) ($\chi^2=3.99$, $p=0.046$) [Table 7].

Multivariate logistic regression identified good knowledge (aOR=3.15, 95% CI: 1.88–5.28, $p<0.001$), female gender (aOR=1.67, 95% CI: 1.04–2.69, $p=0.035$), and older age (>22 years; aOR=2.12, 95% CI: 1.07–4.18, $p=0.031$) as significant independent predictors of HPV vaccine acceptability. Clinical exposure did not reach statistical significance (aOR=1.45, $p=0.17$) [Table 8].

Barriers impeding vaccine uptake included concern about vaccine safety (35.6%), high cost (31.1%), lack of awareness (20.5%), and cultural/religious concerns (11.1%) [Table 9]. These barriers highlight practical and perceptual challenges to vaccination efforts requiring targeted addressal.

The major sources of HPV vaccine information were the medical curriculum (51.1%), followed by internet and social media (37.0%), healthcare professionals (21.1%), and family/friends (14.1%) [Table 10]. This distribution underscores the centrality of formal medical education and digital platforms in shaping student vaccine knowledge.

Collectively, these results reveal that while general HPV awareness and positive attitudes prevail among medical undergraduates, detailed vaccine knowledge gaps and barriers to uptake persist. The associations between knowledge, gender, and age with vaccine acceptability provide actionable insights for focusing educational and outreach strategies to optimize HPV vaccination coverage in this key population.

DISCUSSION

The study found that 86.5% of medical undergraduates were aware of the HPV virus, and 80.5% recognized its role in causing cervical cancer [Table 2]. This high awareness is consistent with Devi et al.'s report of 85% awareness among

Puducherry medical students.^[6] However, it vastly exceeds the 22% pooled knowledge figure from the general Indian population reported by Pal et al.,^[8] highlighting the influence of medical education. Despite this, only 35.4% correctly knew the vaccine dosing schedule, indicating incomplete knowledge consistent with findings by Kumar et al.^[4] This suggests foundational knowledge is common, but detailed vaccine education remains inadequate.

The knowledge level categories showed 45.1% moderate and 30% good knowledge [Table 3], which is higher than the 27% good knowledge noted by Shetty et al. among South Indian medical undergraduates.^[1] This may reflect curriculum improvements and awareness campaigns in Puducherry.^[5] Nevertheless, with nearly one-quarter displaying poor knowledge, ongoing educational reinforcement is clearly needed as stressed by Rajesh et al.^[7]

More than 70% had positive attitudes toward vaccine safety and effectiveness, paralleling findings by Solis-Torres et al. and other Indian medical student studies reporting 60–70% vaccine acceptability.^[1,9] Differences between studies may arise from socio-economic and cultural factors affecting vaccination decisions.

The 71.6% vaccine acceptability found [Table 5] is substantially higher than the 4% coverage in the general Indian population reported by Pal et al.^[8] This underscores the positive role of healthcare education on vaccine intent. However, about 28% reluctance persists, mirroring concerns about safety and cost barriers highlighted by Shah et al. and Verma et al.^[2,3] A strong association between knowledge and acceptability ($p<0.001$) supports conclusions by Ramesh et al. that knowledge is a key acceptance factor among South Indian medical students.^[5] Females showed greater acceptability (76.9% vs 67.6%, $p=0.046$), consistent with Devi et al. attributing this to perceived HPV risk differences (6,5). These findings emphasize tailored educational efforts.

Logistic regression validated good knowledge (aOR=3.15), female gender (aOR=1.67), and older age (aOR=2.12) as independent acceptability predictors, following patterns in prior work.^[1,9] The nonsignificant clinical exposure effect ($p=0.17$) may reveal insufficient curricular focus on HPV vaccination during clinical rotations.

Barriers identified—vaccine safety concerns (35.6%), cost (31.1%), and lack of awareness (20.5%)—align with global literature on HPV vaccine uptake challenges.^[2,3] Cultural concerns, while less frequent (11.1%), remain relevant for intervention design.

The predominance of medical curriculum (51.1%) and internet/social media (37.0%) as information sources [Table 10] reflects trends noted by Solis-Torres et al. and Rajesh et al.,^[7,9] underscoring education and digital literacy as critical.

CONCLUSION

This study affirms and extends prior knowledge on HPV vaccine awareness and acceptability in Indian medical students. Findings substantiate knowledge-attitude links and reveal persistent barriers. While limited by cross-sectional design and single center context, these results offer valuable guidance for curriculum developers and public health policymakers aimed at improving HPV vaccine uptake through tailored education and outreach.

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