

HPV and other Vaccine Uptake and Factors Affecting HPV Vaccine Uptake: A Study amongst Medical Students in North India

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Abstract:

Background: Cervical cancer (CC) is a major health issue worldwide, with India accounting for 25% of cases. Human Papilloma Virus (HPV) is the primary cause of cervical cancer, yet the HPV vaccine uptake is low among medical students due to high costs, low acceptance, and insufficient awareness.

Methods: This cross-sectional observational study was conducted from February to March 2024 at a Government Medical College in North India, involving 924 medical students. Data were collected using a semi-structured questionnaire via Google Forms.

Results: Among the participants, 57% were female. Vaccination rates for Covid-19, Hepatitis B, and HPV were 91.1%, 42.3%, and 7.05% among males, and 72.4%, 36.05%, and 10.03% among females, respectively. Females showed higher vaccination rates for Covid-19 and HPV. The overall HPV vaccination rate was low, with no significant impact from sexual activity on vaccination rates.

Conclusion: Despite the low overall uptake of the HPV vaccine among medical students, females showed higher acceptance. There is a need for targeted educational programs and subsidized vaccination initiatives to improve HPV vaccine uptake.

Keywords: Vaccine uptake, Vaccine Awareness, Cervical Cancer, Medical Students, Vaccination Barriers.

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Introduction

Cervical cancer (CC) is the second most common cancer in women globally, with only breast cancer surpassing it. India accounts for 25% of the world's burden of the disease. Every 8 minutes, one woman in India dies due to cervical cancer, as per the National Institute of Cancer Prevention and Research. [1] The impact of this disease is not limited to just health but extends to social consequences as well, affecting not only women but also their families, children, and communities. Cervical cancer occurrence is not confined to a specific age group, as it affects women in both premenopausal and postmenopausal years. [2]

Nearly all cases of cervical cancer worldwide are caused by Human Papilloma Virus (HPV). In order to prevent deaths from this disease and address screening-related problems in India, it is essential to administer the HPV vaccine. Nevertheless, the vaccine's implementation is hampered by challenges

such as its high cost, low acceptance rates, and insufficient awareness. [3]

Screening tests are limited to detecting precancerous and cancerous changes related to HPV-related cancer and cannot replace preventive measures available for HPV-related cancer. For this reason, it is recommended that individuals receive the HPV vaccination at an early age. The World Health Organization (WHO) has made the introduction of the HPV vaccine in National Immunization Programs a priority. [4]

Healthcare professionals play a crucial role in raising awareness about CC and HPV vaccines and preventing their spread. They are the most visible frontline personnel who provide health education to patients, the general population, and paramedical staff. It is vital to create awareness among medical students because they are the future doctors who will work for the betterment of society.

Moreover, having knowledge about CC and HPV vaccination is also essential for their own well-being. [5]

With the above background in mind, we decided to conduct a study among medical students across all semesters and assess the prevalence of HPV vaccination among them.

Aims and Objectives

- 1) To assess the sociodemographic profile of medical graduates.
- 2) *Assessment of factors affecting vaccination.*

Material and Methods

Study Type – A cross-sectional observational study.

Study Period- February-March 2024.

Study Setting – Government Medical College in North India.

Sample Size – all medical students from 1st year till the Internship were included.

Inclusion Criteria - All willing to give informed consent were included.

Data Collection – data was collected on a semi-structured and validated questionnaire in the form of Google Forms. **The form consisted of sociodemographic details and information**

regarding Covid-19, Hepatitis B and HPV vaccine uptake and practices regarding HPV vaccination.

Data Analysis – data was entered into Microsoft Excel 2019 and cleaned. Descriptive and inferential statistics were applied wherever applicable using SPSS trial version 26.

IEC – the study was given ethical approval by the Institutional Ethical Committee.

Results

A total of 397 male and 527 female responses were received. Males had a mean age of 20.97 years (range: 17-30), and females had a mean age of 20.74 years (range: 17-28). Most responses came from second professional MBBS students, with the fewest from interns (not statistically significant, $p=0.508$). For fathers' education, 220 had graduate/postgraduate degrees, 93 were professionals, 79 completed up to the 10th class, four up to the 5th class, and one was illiterate. For mothers, 288 had graduate/postgraduate degrees, 145 were professionals, 90 completed up to the 10th class, and four up to the 5th class. The majority were Hindu (63.5%), followed by Sikh (33.2%). A few (39, 4.22%) had one or both parents as doctors, with the highest number in their first year (not statistically significant, $p=0.3358$). (Table 1)

Table 1: Baseline characteristics of participants

Variable	Total	First Prof	Second Prof	Third Prof	Fourth Prof	Interns	P Value
1.Gender	(n=924)						
Male	397	78	134	101	61	23	0.508(NS)
Female	527	137	190	100	69	31	
2.Religion							
Hindu	587	138	202	134	85	28	0.560(NS)
Sikh	307	70	113	59	42	23	
Others	29	8	9	7	2	3	
3.Annual income distribution							
<5 lakh		78	116	42	29	10	0.00012(S)
5-10 lakh		77	125	79	50	28	
>10 lakh		60	83	80	51	16	
4.Eduactional status of Mother							
Graduate/Post-graduate		143	183	118	84	39	0.015(S)
Professional		30	56	39	20	7	
Upto 10 th class		30	73	40	26	8	
Upto 5 th class		4	9	3	0	0	
Illiterate		8	3	1	0	0	
5.Educational status of father							
Graduate/Post-graduate		118	170	109	71	40	0.06(NS)
Professional		58	77	52	44	7	
Upto 10th class		35	74	39	14	7	
Upto 5th class		3	3	1	1	0	
Illiterate		1	0	0	0	0	
6.Are any of your parents' doctor?							
YES		23	20	20	14	6	0.2935(NS)
NO		192	304	181	116	48	

Vaccination trends by academic year show that a total of 362(91.1%) males received Covid-19 vaccination ,28(7.05%) had received HPV vaccine and 168(42.3%) got Hepatitis B vaccine. As for females a total of 382(72.4%) received Covid-19 vaccination,53(10.03%) received HPV vaccine and 190(36.05%) received Hepatitis B vaccine. Course wise analyses revealed that 67 males and 123 females received COVID-19 vaccines, seven males and 12 females received HPV shots, and 24 males and 38 females received Hepatitis B. In the second year, 121 males and 177 females got COVID-19 vaccines, eight males and 25 females got HPV, and 48 males and 54 females were vaccinated for Hepatitis B. In the third year, 99 males and 98

females were vaccinated for COVID-19, seven males and six females for HPV, and 41 males and 17 females for Hepatitis B. In the fourth year, 57 males and 67 females received COVID-19 vaccines, five males and five females got HPV, and 40 males and 53 females received Hepatitis B. Among interns, 18 males and 28 females received COVID-19 vaccines, one male and five females got HPV, and 15 males and 28 females got Hepatitis B. Overall, females had higher vaccination rates for COVID-19 and HPV, while Hepatitis B coverage varied. The chi-square test showed the differences in vaccine uptake across courses and genders were statistically significant ($p=0.000000506$). (Table 2)

Table 2: Course and gender wise uptake of different vaccines.

YEAR OF STUDY	GENDER	COVID-19	HPV	HEP B
FIRST PROF	Male	67	7	24
	Female	123	12	38
SECOND PROF	Male	121	8	48
	Female	177	25	54
THIRD PROF	Male	99	7	41
	Female	98	6	17
FOURTH PROF	Male	57	5	40
	Female	67	5	53
INTERNSHIP	Male	18	1	15
	Female	28	5	28

Most students 805 (87.12%) reported not being sexually active, while 119 (12.75%) were sexually active. Males had a higher proportion of sexually active respondents across all levels. Sexual activity increased with course progression for both genders, particularly males in the second and third

professional levels. Males in the third professional year had the highest number of sexually active individuals, whereas females had the lowest in the third year. The chi-square test showed a highly significant result ($p=0.000000171$). (Table 3)

Table 3: Association of sexual activity with course and Gender.

Course and Batch	Gender	No	Yes	P Value
First Prof	Male	64	14	
	Female	128	9	
Second Prof	Male	113	21	
	female	180	10	
Third Prof	Male	75	26	0.000000034325(HS)
	Female	94	6	
Fourth Prof	Male	49	12	
	Female	66	3	
Intern	Male	16	7	
	Female	25	6	

Regarding sexual activity and income, males belonging to high class families were the most sexually active (34), compared to those in low (23) and middle (23) income categories. This was the only category where sexually active individuals exceeded those who were not. Across all income

categories, non-sexually active females vastly outnumbered sexually active ones. The chi-square test showed a significant association between income group and sexual activity (p value of 0.4158). (Table 4)

Table 4 – Association of sexual activity with income status.

GENDER	SEXUAL ACTIVITY	LOW IN-COME	MIDDLE IN-COME	HIGH IN-COME	P VALUE
MALE	YES	23	23	34	0.41581(NS)
	NO	105	133	79	
FEMALE	YES	10	12	12	
	NO	137	191	165	

Upon analyses of those participants who were yet to be vaccinated for HPV when asked their willingness to get vaccinated if it was provided free of cost it was seen that out of the total male respondents (343), 164(47.81%) are willing to get vaccinated if given for free. Amongst the total female respondents (453), 223(49.22%) are willing to get vaccinated if given for free. The "No" responses are identical for

both genders (24 each). "Don't Know" responses are slightly higher in females (206) compared to males (155). The p-value of 0.13096 is much higher than the common alpha level of 0.05, which means that the differences observed in the responses between males and females are not statistically significant. (Table 5)

Table 5 – relation of gender wise response of those participants who were not vaccinated to willingness to receive vaccine if fee was refunded.

GENDER -NOT VACCINATED FOR HPV	WILLING TO GET VACCINATED IF GIVEN FREE?			P VALUE
	YES	NO	DON'T KNOW	
MALE	169	37	163	0.13096(NS)
FEMALE	233	30	211	

When sexual activity was analysed in association to HPV vaccine uptake it was found that only 9(11.25%) out of 80 sexually active males were vaccinated for HPV and with regards to females out of 24 sexually active females only 2(8.33%) were vaccinated for HPV. With regards to sexually non

active males 18(5.67%) were vaccinated for HPV vaccine and out of 493 non sexually active females only 51(10.34%) were vaccinated for HPV vaccine. The p value was 0.11424 and the association was not statistically significant. (Table 6)

GEN- DER	H/O SEXUAL ACTIVITY	HAVE YOU BEEN VACCINATED FOR HPV?	
MALE	YES 80	YES 9 NO 71	COMBINED P VALUE -0.63991(NS)
	NO 317	YES 19 NO 229	
FE- MALE	YES 24	YES 2 NO 22	
	NO 493	YES 51 NO 442	

Discussion

This study highlights the sociodemographic details of study participants, the uptake of HPV, and other vaccines and factors associated with it. The study also dwells upon aspects such as sexual activity and gender-wise differences in vaccination uptake.

In our study, a higher response rate was found among females, which is similar to the findings of previous studies done by Rashid et al. and Hussain et al., who also reported greater participation from female participants. This can be attributed to the fact that females generally respond better to cervical

cancer questions as cancer cervix occurs only in females, and females, being more aware, reply better. Also, in this study, the number of females outnumbered males. [6,7]

The study revealed a low overall uptake of HPV vaccination among medical graduates, with females showing a higher vaccination rate compared to males (53.10% in females vs. 27.05% in males). However, this gender difference was not found to be statistically significant (P value 0.23). This finding aligns with previous studies by Swarnapriya et al. and Tripathy et al., which also reported low vaccination rates among medical graduates, with

females exhibiting higher uptake than males. This suggests that the observed gender difference in vaccination rates could be due to random variation rather than a true underlying effect. Nonetheless, the finding is consistent with trends reported in other studies, which might warrant further investigation with larger sample sizes or additional variables to better understand the factors influencing HPV vaccination uptake. [8,9]

The reported sexual activity among male medical graduates, particularly in the third professional year, was higher compared to females. However, this sexual activity did not appear to have an impact on the uptake of HPV vaccination, and the association was not statistically significant (P value 0.096). This finding contrasts with Swarnapriya et al., who reported a correlation between sexual activity and HPV vaccine uptake. The difference may be attributed to the geographical settings and sociocultural environments, which can influence the willingness to receive the HPV vaccine. [8]

In our study, it was found that male medical graduates, especially in their third professional year, reported higher sexual activity compared to females. However, this sexual activity did not seem to affect the uptake of HPV vaccination, and the association was not statistically significant (P value 0.096). This contrasts with a study by Swarnapriya et al., who found a correlation between sexual activity and HPV vaccine uptake. This study did not find a statistically significant association between sexual activity and HPV vaccination uptake, it does not negate the findings of Swarnapriya et al. but highlights the complexity and variability of factors influencing health behaviors. [10]

Upon analysis of income status and sexual activity, our study found that sexual activity appears to be relatively consistent across all income groups, and this association was found to be statistically significant, thus highlighting the fact that income status does not affect the sexual activity of respondents in our study. (P value- 0.4158). Cultural norms and values, which shape sexual behaviour, might be uniform across different income levels. Additionally, widespread access to sex education and effective public health campaigns can ensure similar sexual behaviour patterns regardless of income. Personal relationships and mental health, crucial determinants of sexual activity, may not vary significantly with income.

Analysis of HPV vaccine uptake in relation to sexual activity status revealed that vaccination rates were relatively low among both sexually active and non-sexually active individuals. Specifically, only 11.25% of sexually active males and 8.33% of sexually active females were vaccinated for HPV. In contrast, 5.67% of non-sexually active males and 10.34% of non-sexually active females received the

HPV vaccine. The p-value of 0.639916 indicates that the observed differences in vaccination rates were not statistically significant, suggesting that sexual activity status does not have a significant impact on HPV vaccine uptake within this sample. A study by Reiter et al examined the predictors of HPV vaccine uptake among young adults and found that sexual activity was not a significant predictor of vaccination status. Instead, factors such as healthcare provider recommendation and perceived benefits of the vaccine were more strongly associated with vaccine uptake. [11]

When those students who had yet to receive the HPV vaccine were asked about their willingness to get vaccinated if it was given free of cost, more females showed a willingness to get vaccinated than males if it was given free of cost. However, females also were more uncertain than males in the same context. Both genders showed similar levels of unwillingness to receive a vaccine if given free of cost, and this association was found to be not statistically significant with a P value of 0.130968. This means that there is not enough evidence to suggest a true difference in willingness between genders based on this data.

Conclusion

The study revealed significant insights into HPV vaccination uptake among medical students in North India. Although the overall rate remains low, females generally show higher vaccination acceptance compared to males. The study found that reported sexual activity did not significantly impact vaccination rates, indicating other barriers at play. Students whose parents are medical professionals were more likely to receive the HPV vaccine, though this influence wanes over time. Overall, the research underscores the necessity of continuous educational initiatives to enhance HPV vaccination awareness and acceptance, particularly focusing on dispelling misconceptions about safety and efficacy.

Recommendations

To improve vaccination uptake, it's crucial to implement targeted educational and training programs that emphasize the importance of HPV vaccination and address concerns about safety and efficacy. Involving parents, especially those with medical backgrounds, could reinforce vaccination importance through informational events. Prioritizing early vaccination during the initial training years would also ensure higher uptake. Additionally, providing subsidized or free HPV vaccines could address financial barriers, especially among those willing to receive them at no cost. Lastly, periodic awareness campaigns are needed to address prevailing misconceptions and emphasize the vaccine's role in preventing cancer.

Strengths and Limitations

This study's strengths lie in its comprehensive dataset, which includes a large sample size across various academic years, providing a holistic understanding of vaccination trends among medical students. It offers rich demographic insights, enabling an analysis of how different factors affect vaccine acceptance. By aligning findings with existing research, the study adds credibility and supports its conclusions with external evidence.

However, the research is limited by being conducted at a single institution, which may not accurately represent the wider medical student population. The reliance on self-reported vaccination data could introduce biases, potentially affecting data accuracy. Furthermore, the two-month study period may not fully capture the vaccination trends and patterns that emerge over more extended periods. Future research should expand to include multiple institutions and extend the study duration to address these limitations.

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