

## INDIA COMING FORTH WITH FIRST INDIGENOUS HUMAN PAPILLOMAVIRUS VACCINE- ARE OUR MEDICAL UNDERGRADUATES AWARE ENOUGH?

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### Abstract

**Background:** India is introducing Cervavac, indigenous HPV vaccine. There has been poor uptake of immunizations among Indians. The public's approval of vaccination depends on the information and attitudes of the providers, medical students being one of the key groups. The objective is to determine knowledge of medical undergraduates about HPV infection and prevention strategies, and if their understanding has changed over the course of their training. **Materials and Methods:** The students from four professionals participated in a cross-sectional study. The final MBBS students (part I and II) were used as test group and the two earlier professionals as control group. Students were asked to respond to a questionnaire about HPV infection and prevention. The groups' scores were compared using 95% confidence interval. A score of  $\geq 25$  was considered as good while  $< 10$  as very poor out of a maximum 32. Internal consistency was evaluated (Cronbach's alpha was 1.00 for knowledge of infection; 0.62 for prevention). Gaps were identified, and students were provided infographic outlining the facts of infection and prevention. **Result:** Mean score for the attributes of knowledge about infection as well as prevention was very poor ( $< 10$ ). There was no significant ( $p$  value  $> 0.05$ ) difference of knowledge between male and female but statistically significant ( $p$  value  $< 0.05$ ) difference among the two groups where the test group performed better. **Conclusion:** The study participants, with a stake in the outcome, have limited awareness about HPV infection and prevention. Roll out of the indigenous vaccine calls out for intensive awareness campaigns for enhancing its uptake.

## INTRODUCTION

The most prevalent virus to infect the reproductive system is the human papillomavirus (HPV), which affects both sexes equally and can lead to precancerous lesions that can turn into cancer. Certain HPV strains (most commonly HPV-16 and HPV-18) when infecting females repeatedly, may lead to precancerous lesions (cervical intraepithelial neoplasia), if left untreated, these lesions can develop into invasive cancer.<sup>[1]</sup> Carcinoma cervix is the fourth most frequent disease in women globally with an anticipated 6 lakh new cases and 3.5 lakh fatalities in 2020. 90% of these mortalities are in low-middle income countries (LMICs).<sup>[2]</sup> India being one of them accounting for one-fourth of the global burden.<sup>[3]</sup> The primary risk factor for cervical intraepithelial neoplasia and invasive cervical cancer is sexually transmitted HPV infection.<sup>[4]</sup> India has 483.5 million females (older than 15) at risk of contracting HPV, with no primary prevention strategy in place till

recently, with an estimated incidence of 18.7 per lac females.<sup>[5]</sup>

One of the best public health measures against infectious diseases is vaccination. Adolescent immunisation against HPV is an effective primary prevention strategy as it can be given as early as 9 years of age.<sup>[1]</sup> The World Health Organization (WHO) advises all nations to include the HPV vaccine in their regular immunisation schedules. These vaccines are currently widely used throughout the world and are included in national vaccination programmes in 105 nations. Financial limitations, inadequate infrastructure for delivering adolescent vaccines, a lack of accurate information on the prevalence of the HPV disease, and cultural and religious sensitivities surrounding this subject are just a few of the factors that were contributing to the slow uptake of HPV vaccines around the world.<sup>[6-8]</sup>

India has recently introduced CERVAVAC, its first indigenous HPV vaccine.<sup>[9]</sup> In order to successfully integrate CERVAVAC into immunisation programmes, we must address sufficient provider

knowledge and awareness. Vaccine acceptability is aided by educational programmes aimed at healthcare personnel. Educational interventions among health care providers can have a positive impact on immunisation-related practices, as their knowledge is advantageous for their intent to vaccinate.<sup>[10,11]</sup> Thus, we aimed to assess the knowledge and awareness about HPV infection and its preventive measures among medical undergraduates of our institute. We also intend to compare the same among initial and final professionals of MBBS to explore the effect of Medical education and to raise awareness among them if any gaps identified.

## MATERIALS AND METHODS

**Study design and setting:** The present study is a cross-sectional survey conducted among all the undergraduates (MBBS batch 2018 to 2021) from August to October 2022 in a Government Medical College. Initial MBBS (I & II professionals) served as the control group for our study to evaluate the contribution of medical education, in issues like cervical cancer prevention against the test group of Final MBBS (Part I and II i.e. III and IV professionals).

**Sample size estimation:** From the existing literature in similar settings, among the study variables the lowest awareness proportion reported was knowledge about the availability of HPV vaccine that was 57% (12). With definite population correction and relative precision of 5%, the sample size was estimated to be 274 at a confidence level of 95% using the software Epi-info (Version 7.2.4.0). Adding the non-respondent rate of 10% final sample size estimated and rounded off to 310.

### Study Instrument and Variables

Data was collected using a close-ended questionnaire through Google form. The link to the survey was sent to the students, which was preceded by an introductory session about the purpose of the study. The introductory section of the questionnaire portrayed the aim and objectives of the study and the free willingness of participation with a consent statement. The final version of the questionnaire was composed of three sections.

The first section was designed to collect general demographic details of the participants.

The second section included 13 questions (18 responses, 1 mark for each) aimed to evaluate the participants' general knowledge and awareness about HPV like mode of transmission, most common strain, medical conditions associated with HPV, age group most commonly affected etc. The third section included 9 questions (14 responses, 1 mark for each) intended to assess the knowledge about preventive measures available, particularly vaccines against HPV like vaccines available in India, males as a potential recipient, indigenous HPV vaccine etc.

Participants who scored >25 out of maximum 32 were considered to have good knowledge, a score of 15-24 fair, 10-14 as poor and those who scored less than 10 were considered as having very poor level of knowledge/awareness.

After data collection an Infographic on HPV infection and prevention based on the questionnaire was circulated among the students (available as supplementary material).

**Statistical analysis:** Data was analysed using SPSS software version 24 (IBM Corp. Released 2016. IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp.). Descriptive data was expressed in frequencies and percentages. Chi square or Fisher's exact test was used to analyse significant differences between categorical variables. T test was used to compare the means between the groups. All p-values of less than 0.05 were considered statistically significant.

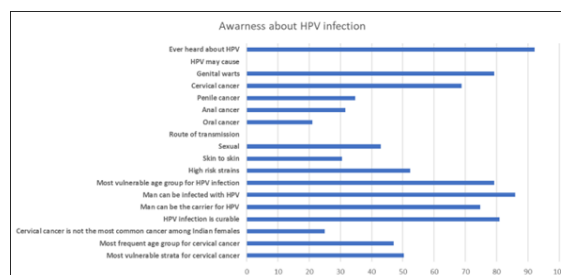
**Ethical Consideration:** Ethical approval was taken before commencing the study by the Institutional Ethical Committee. Informed consent was taken from all the participants after explaining the purpose of the study by the researcher.

## RESULTS

A total number of 509 students participated in the study. Mean (SD) age of the participants was 21.48 (1.82) years. Details of the participants is as shown in [Table 1].

### Knowledge About HPV Infection

Out of 509 respondents, four hundred and sixty-seven (92.1%) only, had heard about HPV. About 80% students had Knowledge regarding HPV as a causative agent for genital wart, 350(68.7%) students knew that it causes cervical cancer, 174 (34.1%) knows causation of penile cancer, 161(31.6%) knows that HPV may cause anal cancer while only 107 (21%) associated it with oral cancer. Proportion of the correct responses is as shown in [Figure 1].



**Figure 1: Percentage of correct responses regarding knowledge about infection**

Awareness regarding aetiology of different genital lesions and cancers is significantly improved with medical education as those in higher professionals have better knowledge as shown in [Table 2].

Route of transmission of HPV was correctly answered by 156 (30.6%) students. Ninety-four students from the test group, as compared to sixty-

two among the control group, had correct information and the difference is statistically significant. Only about half (52.2%) of the participants knew about the most common strains of HPV causing infection. On the contrary, awareness regarding the most vulnerable age group for HPV infection was 79.2% and men are also vulnerable for infection is known to the majority of the students (85.8%). However, the difference in the knowledge for any of these variables, between two groups is not statistically significant.

HPV lesions are curable is known to the majority of the participants (80.9%). It was answered correctly by 87.6% (213) among the test group, compared to 74.8% (199) among the control group with a high statistical significance.

Cervical cancer was incorrectly labelled as the most common cancer among Indian females by three fourth (75%) of the participants and no difference was found between two groups.

Only 47% of the participants knew the most vulnerable age group for cervical cancer and a higher number of students among the test group answered it correctly (54% vs 41%; p value =0.003). Similarly, only half of the participants (50.3%) were aware of the fact that females of lower socioeconomic strata carrying poor hygiene are most vulnerable for cervical cancer and no statistical difference was exhibited by the students of higher professionals (Final MBBS) compared to the lower ones.

A significant proportion of students (81.1% overall) were aware of the prevention of genital HPV infection through measures such as sexual abstinence and barrier contraception (condom use), but only 75% (n = 385) were aware of the availability of vaccines. Again, final MBBS students have a better understanding of preventive measures.

Only 63 (12.4%) students were vaccinated with the HPV vaccine, 27 among the test group and 36 among

the control group, all the recipients were females. Males can also be the recipient of the HPV vaccine, which is correctly answered by 405 (79.6%) students, surprisingly higher (81.5% vs 77.3%) among the control group.

65.2% of students responded that the recommended age for vaccination was 9-25 years, while knowledge about the availability of anti-HPV vaccines in the country, was quite low (50.29% Cervarix, 36.93% Gardasil, and 41.65% Cervavac). Moreover very few (34%) students knew that Cervavac is the indigenous HPV vaccine of India.

Only 98 students out of 509, were aware that HPV vaccination is soon going to be included in routine immunisation services in India for the age group of 9-16 years.

The mean score of knowledge about infection and prevention was poor (<10) among study participants. When stratified across gender, no statistical difference was seen. When the test and control groups were compared, the test group scored higher for both infection and prevention, with a high level of statistical significance.

### Prevention

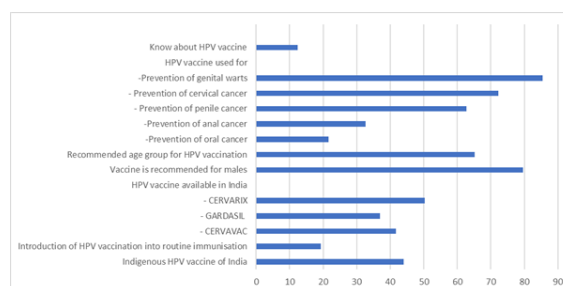


Figure 2: Percentage of correct responses regarding knowledge about prevention

Table 1: Socio- demographic details of the study participants

S.no.	Demographic variables	Frequency (n) N=509	Percentage (%)
1.	MBBS Professional		
	IV	91	8.4
	III	152	29.9
	II	147	28.9
	I	119	23.4
2.	AGE		
	18-20	159	31.23
	21-23	279	54.81
	≥24	71	13.9
3.	GENDER		
	Male	289	56.8
	Female	220	43.2

Table 2: Percentage distribution of correct responses across the two groups

S. No.	Variables	Test group (n=243)	Control group (n=266)	p value
1.	Ever heard about HPV	232 (49.5)	237 (50.5)	0.008
2.	HPV may cause*			
	Genital Warts	206 (51.1)	197 (48.9)	0.003
	Cervical cancer	195 (55.7)	155 (44.3)	<0.001
	Penile cancer	94 (54.0)	80 (46.0)	0.049
	Anal cancer	86 (53.4)	75 (46.6)	0.086
	Oral cancer	68 (63.6)	39 (36.4)	<0.001

3.	Primary route of transmission Sexual Skin to skin	94 (60.3) 45 (62.5)	62 (39.7) 27 (37.5)	<0.001 0.007
4.	Most common strains causing infection	127 (47.7)	139 (52.3)	1.000
5.	Most vulnerable age groups	187 (46.4)	216 (53.6)	0.275
6.	Men can be infected with HPV	216 (49.4)	221 (50.6)	0.074
7.	Men can be the carrier for HPV	178 (46.8)	202 (53.2)	0.541
8.	HPV lesions are curable	213 (51.6)	200 (48.4)	<0.001
9.	CC is second most common cancer among Indian female	65 (51.2)	62 (48.8)	0.412
10.	Most vulnerable age group for CC	131 (54.8)	108 (45.2)	0.003
11.	Most vulnerable strata among females for CC	126 (49.2)	130 (50.8)	0.535

**Table 3: Percentage distribution of correct responses across the two groups**

S. No.	Variables	Test group n(%) (n=243)	Control group n(%) (n=266)	p value
1.	Know about HPV vaccine	216 (88.89)	169 (63.53)	<0.001
2.	Vaccine offers prevention against Genital warts Cervical cancer Penile cancer Anal cancer Oropharyngeal cancer	170 (69.96) 198 (81.48) 167 (68.72) 91 (37.45) 62 (25.51)	149 (56.02) 170 (63.91) 152 (57.14) 75 (28.20) 48 (18.05)	0.001 <0.001 0.007 0.030 0.052
3.	HPV vaccines available in India Cervarix Gardasil Cervavac	150 (61.73) 117 (48.15) 95 (39.09)	106 (39.85) 71 (26.69) 117 (43.98)	<0.001 <0.001 0.281
4.	Recommended age group for HPV vaccination	168 (69.14)	164 (61.65)	0.078
5.	HPV vaccine is recommended for males	188 (77.37)	217 (81.58)	0.271
6.	Introduction of HPV vaccine into routine immunisation	49 (20.16)	49 (18.42)	0.653
7.	Indigenous vaccine of India	104 (42.80)	120 (45.11)	0.655

**Table 4: Mean score of knowledge about infection and prevention across the test and control groups and gender**

	Infection Mean (SD)	P value	Prevention Mean(SD)	P value
Test group	9.22 (2.27)	<0.001	7.74 (2.56)	<0.001
Control group	8.20 (2.22)		6.59 (2.55)	
Males (n=289)	8.72 (2.30)	0.714	6.98 (2.45)	0.131
Females (n=220)	8.64 (2.29)		7.34 (2.81)	
Total	8.68 (2.29)		7.14 (2.62)	

## DISCUSSION

**Awareness about HPV infection:** More than 200 related viruses, including some that transmit through vaginal, anal, or oral intercourse, are collectively referred to as HPV. It is the most common reproductive tract virus.<sup>[13]</sup> There are two categories of sexually transmitted HPV types: low risk and high risk. Most low-risk HPVs don't result in illness. Some low-risk HPV varieties, however, can result in warts on or around the genitalia, anus, mouth, or neck. Numerous cancers can be brought on by high-risk HPVs. About 14 HPV varieties are considered high-risk. Most HPV-related malignancies are caused by two of them, HPV16 and HPV18. Nearly all sexually active people contract HPV within months to a few years of engaging in sexual activity.<sup>[14]</sup> Although majority of the students have heard about HPV infection yet about 10% of the participants have never heard about the virus, all belong to control group i.e. the earlier professional students. However, only 52.3% of the students correctly responded about the high-risk HPV strains. Association of the virus with other forms of cancer like penile oral and anal was on very lower side (<40%) compared to genital warts or cervical cancer (70-80% respectively) while cervical cancers only form the tip of the iceberg among all HPV infections.

Knowledge about HPV infection among medical students from varied settings is reportedly low compared to other communicable infections of public health concern like Tuberculosis or Human Immunodeficiency virus (HIV). The reason may be comparatively low clinical exposure to the cases of HPV infection.<sup>[15-21]</sup>

In India, cervical cancer is the second most frequent malignancy among women between the ages of 15 and 44, accounting for one fifth of the Global burden. More than 75 percent of cases are detected at an advanced clinical stage with poor prognosis. Lack of awareness among our medical students shows the gravity, as these are the forthcoming mediators for public health education.<sup>[22]</sup>

**Awareness about preventive measures available:** A comprehensive strategy for cervical cancer prevention and control is advised by the World Health Assembly's Global strategy to eradicate cervical cancer as a public health concern, endorsed in 2020. Interventions over the life span are advised and vaccination is the primary mode of prevention among others. Screening and treatment of cervical pre-cancer lesions and management of invasive cancer being secondary and tertiary prevention respectively. (23) About 80% of the participants in the study were aware of the preventive measures available.



**Awareness about anti HPV vaccines:** Vaccination in particular was responded by 75% of them only, much similar to results of Pandey et al from Manipal, India.<sup>[24]</sup>

Till recently HPV vaccination was lacking the priority for the National Government associated with logistic and legislative issues.<sup>[25]</sup> But the recent release of cost effective CERVAVAC by Serum Institute of India in collaboration with the Department of Biotechnology, GoI is a welcoming advance for prevention of cervical cancer in India for our youngsters.

In this study only 12% of the participants had received the HPV vaccine. In a study from Manglore in similar settings with a smaller sample, 54 out of 263 (21%) were vaccinated. When the reasons of unacceptance was explored among non-recipients an important perception among the students was that the vaccine is not needed by their age group being sexually inactive. It shows the lack of understanding of primary prevention among medical students too.<sup>[26]</sup>

**Difference in the knowledge:** Medical education is shown to impart better knowledge as test group has scored higher than the control group. Alsous et al. from Jordan also found a significant difference among the four years of medical students with the higher batches showing better knowledge.<sup>[27]</sup> The reflection is suggesting the effect of not only medical education but the lower knowledge in the control group may be considered a proxy for general population.

Unlike most of the studies our findings did not exhibit any difference in the knowledge between girls and boys. In most of the earlier studies among students, medical or non-medical, female participants had higher knowledge whether for infection or prevention.<sup>[15,16,28]</sup> This may be due to the common perception that HPV is associated with Cervical cancer only, rather than with other illness, so females being the most vulnerable one.

#### **Limitations**

This study was conducted on only one medical school, lowering the generalizability of the results. Inclusion of other health care providers like post graduates, dental, paramedical and nursing students in future studies might increase the impact. Overall, we need all the health workers to be educated about HPV infection, cervical cancer and its prevention.

## **CONCLUSION**

HPV vaccine for primary prevention of cervical cancer is a good concept but awareness about HPV vaccine is still very low and has left many myths and misconceptions in the minds of people. This concept will be amalgamated only by its increased understanding of the provider and the recipient. Medical students, Health professional will be play a pivotal role in popularizing this strategy but this medical schools needs to focus more on such high

priority practical upcoming issues. A good understanding of preventive public health issues by health care professionals will lead to proper implementation of related government scheme in society.

To conclude, there exist gaps in knowledge regarding HPV infection, vaccination and we need more integrated teaching and encourage medical students in group discussions, interactive sessions and seminar where all the doubts aspects of HPV and its association with cervical cancer can be solved. We need well-designed HPV education programme for early identifying symptoms of the disease and to take proper action for preventive measures.

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