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Awareness And Attitude Towards Of Cervical Cancer And Human Papilloma Virus (HPV) Vaccine Among MBBS Students Of Medical College In Kolar. India

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Abstract:
Background: *Cervical cancer caused by Human papilloma virus remains a leading cause of morbidity and mortality among Indian women, despite the availability of preventive vaccines. Medical students, as future healthcare providers, play a pivotal role in promoting awareness and acceptance of HPV vaccination.* ***Objective:*** *This study aimed to assess awareness and attitudes towards cervical cancer and the human papillomavirus (HPV) vaccine among MBBS students in a medical college in Kolar, India, and to compare responses between preclinical and clinical cohorts.* ***Methods:*** *A cross-sectional survey was conducted among 419 MBBS students across all academic years between July and August 2023. A structured 30-item questionnaire, adapted from the THinK tool, was used to assess knowledge and attitudes regarding cervical cancer, HPV infection, vaccination, and preventive practices. Data were analysed using IBM SPSS version 25, with chi-square tests and ANOVA applied to assess differences across study years.*
Results: *Awareness of cervical cancer, HPV aetiology, and preventive strategies increased significantly with progression in medical education ($p < 0.001$). While only 26.9% of first-year students recognized HPV as the major cause of cervical cancer, the proportion rose to 98.1% by the third year. Knowledge of Pap smear screening, vaccine availability, and target populations followed similar trajectories. Despite these improvements, hesitancy persisted: concerns over side effects and insufficient information were the leading reasons for unwillingness to vaccinate. Willingness to receive HPV vaccination increased from 60.6% in first-year students to 82.5% among final-year students.*
Conclusion: *The findings highlight the critical role of medical education in shaping awareness and acceptance of HPV vaccination. Early integration of HPV-related modules into the MBBS curriculum, coupled with strategies to address misconceptions, may enhance vaccine advocacy and uptake. Strengthening student preparedness not only benefits their clinical competence but also positions them as key agents in reducing the burden of cervical cancer in India.*
Keywords: *Cervical cancer; Human papillomavirus; HPV vaccine; Medical students; Awareness; Attitude; India; Vaccine hesitancy; Preventive oncology; Public health education.*

INTRODUCTION

Infectious microorganisms induce various cancers and are known to be a major but modifiable risk factor. Infectious diseases are associated with the development of about 16.1% of cancers worldwide[1], viruses cause majority of cervical cancer, 80% of liver cancer, and 15-20% of other cancers[2]. Most of these carcinogenic infections are also potentially modifiable risk factors where effective preventive strategies already exists. The International Agency on Research on Cancer (IARC) has classified 11 infectious infections, category 1 carcinogens, of which Helicobacter pylori, human papillomavirus (HPV), hepatitis B virus (HBV) and hepatitis C virus (HCV) are the four most important[3,4].

Cervical cancer is the 3rd most common cancer in India with incidence of 18.3% (123,907 cases) and the second most common cause of death with a mortality of 9.1% as per GLOBOCAN 2020. Major risk factors of developing cervical cancer is low socioeconomic status, HPV infection and unsafe sexual practices. This is manifested by the fact that nearly 85% of all cervical cancer cases are reported in underdeveloped world[5]. In India, where 16-17 per cent of the global women live, 27 per cent of the entire global cervical cancer cases are found[6]. Of the 60,000 deaths in India each year, close to 33 per cent of all women worldwide dying of cervical cancer are felt to be in India, and 100,000 newly-diagnosed cervical cancer cases[7]. Globacon 2020 reported that 6,04,100 new cases were discovered globally in 2020 and cervical cancer caused 341,831 fatalities[8].

Human papillomavirus (HPV) is a member of Papilloma viridiae family of viruses. It is a common DNA virus that is most often transmitted sexually. Cervical cancer is associated with about 15 subtypes of human papillomavirus. The HPV 16 genotype is the causative organism in 70 per cent of the subtypes that cause cervical cancer. Having realised the causative mechanism of cervical cancer by virus HPV, preventive vaccinations against cervical cancer has been developed and HPV vaccinations have been introduced in recent years. These vaccines are widely used in most

developed countries with an aim of drastically reducing the number of people affected by cancer[9]. There are two classes of preventive HPV immunization vaccines developed and tested clinically. Gardasil (Merck and Co, USA) and Cervarix (Gladstone SmithKline, Belgium) have been licensed in many countries including the United States, Australia and European Union. They have been licensed as a female vaccine in India (primary vaccination 10-12 years, catch-up to 26 years) [11].

The growing possibilities of preventing cancer have been accompanied by a number of breakthroughs in our understanding of the connections between infections and cancer over the last 60 years. Prevention of cancer through the assistance of a vaccine is not a new idea. But knowledge and understanding of it is deficient in our society as well as medical fraternity [15,16]. The implication of the awareness and education will play a significant role in the implementation of this strategy and thus reducing the cancer burden in society [12]. A vaccination awareness programme must be carried out to highlight its importance. This will aid the successful implementation of HPV vaccination in our country [13,14]. Young medical professionals (age group: 17-25) are likely to emerge as the most accessabe source of information about cancer prevention strategies and can be influential in disseminating awareness to a large segment of the population.

Educational programs aimed at young health care providers play an undisputable role in increasing vaccine acceptance and coverage [17]. Educational interventions were shown to affect the practice pattern surrounding immunization in a positive way, in a study by Gonik et al[10]. Findings made in current research could also be applicable on the policy level to enact educative initiatives among health care practitioners on this critical societal health problem. The aim of this study was to determine the level of awareness and attitude towards cervical cancer and human papillomavirus (HPV) vaccine in MBBS students in prime college in Kolar.

OBJECTIVES

1. To assess awareness and attitude about of cervical cancer among MBBS students of a medical college in Kolar, India.
2. To assess awareness and attitude about of human papillomavirus (HPV) vaccine among MBBS students of a medical college in Kolar, India.
3. To compare the awareness and attitude among preclinical and clinical group of MBBS students

MATERIALS AND METHODS

After getting institutional Ethical committee clearance, a cross-sectional study using a questionnaire was carried out on MBBS students in all years of a medical college in Kolar. In the current study, a total of four hundred and nineteen MBBS students from 1st to 4th academic years were involved in the study after informed consent was obtained from each student. Their anonymity was assured and a questionnaire created in English about cervical cancer and human papilloma virus (HPV) vaccine was distributed to them. The research was carried out between July 2023 and August 2023 (2 months).

A questionnaire with thirty questions is developed to measure data on the awareness and attitude towards cervical cancer, human papillomavirus (HPV), HPV vaccine, level of acceptance and awareness and attitude towards vaccination among MBBS students, The questionnaire was based on the research of Matranga et al.,[18] and adjusted to our study. The study included all students of the both sex who were studying MBBS in a teaching hospital of a tertiary care. Data analysis was not done on incompletely answered questionnaires. The present study has been conducted with an objective of assessing the level of awareness of medical students with respect to HPV vaccine- 76% of whom were deemed aware of the vaccine in a prior reference article by Deeksha Pandey and other investigators. The study had to have a minimum size of 300. But 419 students were involved and included in the analysis.

DATA ANALYSIS

The data on awareness and attitude towards cervical cancer, human papillomavirus (HPV), HPV vaccine, the extent of acceptance and awareness and attitude towards vaccination among MBBS students were then entered in the Microsoft excel sheets. The IBM SPSS version 25 was used to analyse the data. Continuous and categorical data have been given as means and percentages respectively. Chi-square analysis was used to determine the association of various categorical variables with the year of study, and ANOVA, with Tukey post-hoc analysis, was used to compare various age variables over the four years. All analyses were regarded as significant when the p value was less than 0.05.

RESULTS

The number of students participating in our study was 419 which included 262 (62.5) females and 157 (37.5) males. The four batches of MBBS were evenly distributed with respect to male and female students and overall there were slightly more female students than male students and most of the participants (99%), are not married. MBBS second

and first year students taken as the control group. The 3rd and 4th year MBBS students are regarded as test group. There was no difference in terms of gender distribution over the years. Two hundred and one (48%) of the students were in the third and final year of medical school (test group). Two hundred and eighteen (52%) had just entered medical school, and were enrolled in preclinical courses with relatively less exposure to patients and clinical instruction. We used this group as control group to assess the role of medical education, in public health issues such as cervical cancer prevention.

We evaluated cervical cancer awareness of students enrolled in MBBS in various years in our study. The results showed that there were differences in awareness level over the four years. In I MBBS, 87/104 students (83.70%) knew about cervical cancer and 111/114 students (97.40%) knew about cervical cancer in II MBBS. This was followed by 103 of the 104 III MBBS (99.0%) students being aware, and all 97 IV MBBS students (100%) being aware. Chi-square test revealed statistically significant differences in awareness over the years ($P < 0.001$ in all comparisons), where the level of awareness increased with the progress of the student through their medical education. The table-1 shows the awareness of cervical cancer among the MBBS students in various years of study.

Table-1: Year-wise comparison of awareness about cervical cancer among MBBS students

Year	Awareness about cervical cancer		P value
	No	Yes	
I MBBS	17(16.3%)	87(83.7%)	<.001
II MBBS	3(2.6%)	111(97.4%)	
III MBBS	1(1.0%)	103(99.0%)	
IV MBBS	0	97	

We explored the consciousness of MBBS students with respect to the saying; cervical cancer can affect any woman. The results showed that there was a significant increase in awareness as students progressed towards their medical education. In particular, 56 of 104 students (53.8%) in I MBBS and 94 of 114 (82.5%) in II MBBS, respectively, said they knew this statement was correct. The same trend was reflected in 93 out of 104 students (89.4%) in III MBBS and 95 out of 97 students (97.9%) in IV MBBS who showed greater awareness. Chi-square analysis showed statistically significant changes in the level of awareness over the years ($P < 0.001$ in all comparisons), indicating the level of education development and exposure to clinical knowledge in students. The table-2 shows the awareness of MBBS students to the statement that cervical cancer is a disease that affects any woman in various years of MBBS.

Table 2: Year-wise comparison of awareness about 'cervical cancer affects any woman.

Year	Awareness		P value
	No	Yes	
I MBBS	48(46.2%)	56(53.8%)	<.001
II MBBS	20(17.5%)	94(82.5%)	
III MBBS	11(10.6%)	93(89.4%)	
IV MBBS	2(2.1%)	95(97.9%)	

We assessed the knowledge about cervical cancer in female MBBS students of various study years. The outcome showed that there was a significant change in awareness among the students as they underwent their medical education. In particular, 59/104 female students (56.7%), in I MBBS, and 100/114 students (87.7%), in II MBBS, were found to be aware of cervical cancer. The same pattern was followed with 97 and 89 students out of 104 (93.3 and 91.8) in III and IV MBBS showing student awareness respectively. Statistically significant changes in awareness between female students across the years ($P < 0.001$ on all comparisons) were statistically significant and supported the educational progression and exposure to clinical knowledge. The table-3 shows the data on awareness of cervical cancer among the female MBBS students with respect to various years of MBBS.

Table-3: Year-wise comparison of awareness on cervical cancer tops among women.			
Year	Awareness on cervical cancer		P value
	No	Yes	
I MBBS	45(43.3%)	59 (56.7%)	<.001
II MBBS	14(12.3%)	100(87.7%)	
III MBBS	7(6.7%)	97(93.3%)	
IV MBBS	8(8.2%)	89(91.8%)	

We analyzed the level of awareness of MBBS students about the most widespread etiology of cervical cancer in various years. The results showed that the level of awareness was significantly raised with the progress of the students in their medical education. Namely, in I MBBS, only 28 of 104 students (26.9%) were knowledgeable of the most common etiology, and 69 of 114 students (60.5%) in II MBBS. The same trend was reflected in 102/104 students (98.1%) in III MBBS and in 88/97 students (90.7%) in IV MBBS with awareness. The chi-square analysis showed statistically significant variation in the awareness over the years ($P < 0.001$ in all the comparisons), which is indicative of the improvement in education and exposure of students to clinical knowledge. The table-4 depicts the awareness of the MBBS students on the most widespread etiology (cause) of cervical cancer in the various years of MBBS.

Table-4: Year-wise comparison of awareness about most common aetiology of cervical cancer			
Year	Awareness		P value
	No	Yes	
I MBBS	76(73.1%)	28(26.9%)	<.001
II MBBS	45(39.5%)	69(60.5%)	
III MBBS	2(1.9%)	102(98.1%)	
IV MBBS	9(9.3%)	88(90.7%)	

We determined the level of awareness of MBBS students of symptoms of cervical cancer between the years of study. The results showed that the level of awareness increased greatly with progress of the students in their medical education. In particular, the number of students who noticed the symptoms of cervical cancer in I MBBS was 29 of 104 students (27.9%), whereas in II MBBS, this number was 71 of 114 students (62.3%). This was similar when 97 of 104 students (93.3) in III MBBS and 91 of 97 students (93.8) in IV MBBS expressed awareness. Chi-square analysis showed statistically significant differences in the level of awareness over the years ($P < 0.001$ in all the comparisons) indicating the trend of education, and the exposure of students to clinical knowledge. Table-5 shows the results about the awareness of MBBS students on the symptoms of cervical cancer.

Table 5: Year-wise comparison of awareness about most common symptoms of cervical cancer.			
Year	Awareness		P value
	No	Yes	
I MBBS	75(72.1%)	29(27.9%)	<.001
II MBBS	43(37.7%)	71(62.3%)	
III MBBS	7(6.7%)	97(93.3%)	
IV MBBS	6(6.2%)	91(93.8%)	

We assessed the level of awareness of MBBS students about human papilloma virus (HPV) in various years of study. The results showed that the students of all the years were highly aware. In I MBBS, 66/104 students (63.5%) were familiar with HPV and in II MBBS, 108/114 students (94.7%). The same pattern was followed in III MBBS with 103 of 104 students (99.0) and IV MBBS with 96 of 97 students (99.0) showing awareness. Chi-square analysis showed that there were statistically significant changes in awareness between years ($P < 0.001$ in all cases). The table-6 shows the data on the awareness of the MBBS students about HPV in various years of MBBS course.

Table-6: Year-wise comparison of awareness about human papilloma virus			
Year	Awareness		P value
	No	Yes	
I MBBS	38(36.5%)	66(63.5%)	<.001
II MBBS	6(5.3%)	108(94.7%)	
III MBBS	1(1.0%)	103(99.0%)	
IV MBBS	1(1.0%)	96(99.0%)	

we evaluated the change in awareness by the MBBS students on the high and low risk HPV strains by the various years of study. The results demonstrated that there was a dramatic rise in awareness with the progression of students in their medical programs. In particular, in I MBBS, the proportion of students who have knowledge on the topic of high- and low-risk HPV strains was 20 out of 104 students (19.2%), and 101 out of 104 students (97.1%), respectively in III MBBS. The same trend was followed in 86 of 97 students (88.7) in IV MBBS were aware. Chi-square analysis revealed statistically significant differences in awareness between the years ($P < 0.001$ in all comparisons), which reflect the educational process and greater exposure to clinical knowledge of the students regarding HPV strains. Data on the awareness of high and low-risk HPV strains among MBBS students in various years of MBBS is presented in the table-7.

Table-7: Year-wise comparison of awareness about 'high and low risk HPV strains			
Year	Awareness		P value
	No	Yes	
I MBBS	84(80.8%)	20(19.2%)	<.001
II MBBS	65(57.0%)	49(43.0%)	
III MBBS	3(2.9%)	101(97.1%)	
IV MBBS	11(11.3%)	86(88.7%)	

We analysed the knowledge of MBBS students about lesions caused by human papilloma virus (HPV) in various years of MBBS. The results showed that there was a dramatic change in awareness as the students went through the medical training. In particular, only 21 out of 104 students (20.2%) were familiar with HPV lesions in I MBBS, and 96 out of 104 students (92.3%) in III MBBS. The same was observed in 78 out of 97 students (80.4) in IV MBBS who were aware. Chi-square analysis also revealed statistically significant differences in the years of awareness ($P < 0.001$ in all comparisons), which defines the education process and progressive exposure of students to clinical knowledge in relation to HPV lesions. The table-8 uses the data on the awareness of the MBBS students about the lesions caused by HPV in the various years of MBBS.

Table-8: Year-wise comparison of awareness about 'lesions of HPV			
Year	Awareness		P value
	No	Yes	
I MBBS	83(79.8%)	21(20.2%)	<.001
II MBBS	54(47.4%)	60(52.6%)	
III MBBS	8(7.7%)	96(92.3%)	
IV MBBS	19(19.6%)	78(80.4%)	

We tested the level of awareness of MBBS students on the mode of contraction of human papilloma virus (HPV) in various years of MBBS. The results showed that there was a high gain in awareness as the students progressed in their medical education. In I MBBS, 45 out of 104 students (43.3) knew how HPV was contracted, and the figure was 98 out of 104 students (94.2) in III MBBS. This was followed by awareness in 85 of 97 students (87.6) in IV MBBS. The chi-square test showed that there was a statistically significant difference in the level of awareness over the years ($P < 0.001$ in all the comparisons), which reflects the education process and the growing exposure to information on HPV

transmission among students. The table-9 summarizes the data on student awareness in MBBS on the topic of how HPV is contracted in various years of MBBS.

Table-9: Year-wise comparison of awareness about how HPV infection is contracted			
Year	**Awareness**		**P value**
	No	**Yes**	
I MBBS	59(56.7%)	45(43.3%)	<.001
II MBBS	45(39.5%)	69(60.5%)	
III MBBS	6(5.8%)	98(94.2%)	
IV MBBS	12(12.4%)	85(87.6%)	

We rated the level of awareness of the MBBS students on HPV as an oncolytic virus at various years of MBBS. The results showed that the awareness of the students in all years is high. In particular, 49.0% of 104 students in I MBBS (51) indicated being aware that HPV was an oncogenic virus, and 98.1 of 104 students (102) in III MBBS. In the IV MBBS 94 out of 97 students (96.9) showed awareness. Chi-square test showed statistically significant awareness differences over the years ($P < 0.001$ in all comparisons), reflecting the educational process and higher exposure to clinical knowledge among the students on HPV as an oncogenic virus. The table-10 shows the information about the MBBS students awareness on HPV as an oncogenic virus by the various years of MBBS.

Table-10: Year-wise comparison of awareness about HPV as an oncogenic virus			
Year	**Awareness**		**P value**
	No	**Yes**	
I MBBS	53(51.0%)	51(49.0%)	<.001
II MBBS	9(7.9%)	105(92.1%)	
III MBBS	2(1.9%)	102(98.1%)	
IV MBBS	3(3.1%)	94(96.9%)	

We evaluated the level of awareness of MBBS students about the preventability of cervical cancer in the various years of MBBS. The results showed that awareness grew significantly with the progress in medical education of the students. Particularly, 32 students of 104 students (30.8% of the sample) in I MBBS knew that cervical cancer is preventable, and this figure rose to 92 students out of 104 students (88.5% of the sample) in III MBBS. This was followed by 87 of 97 students (89.7) in IV MBBS who were aware. The chi-square test revealed statistically significant differences among the years in respects of awareness ($P < 0.001$ in all comparisons) which highlights the education process and the exposure to more information regarding the preventable nature of cervical cancer among the students. The table-11 shows the data on awareness of MBBS students about the preventable nature of cervical cancer in various years of MBBS.

Table-11: Year-wise comparison of awareness about 'preventable nature of cervical cancer			
Year	**Awareness**		**P value**
	No	**Yes**	
I MBBS	72(69.2%)	32(30.8%)	<.001
II MBBS	52(45.6%)	62(54.4%)	
III MBBS	12(11.5%)	92(88.5%)	
IV MBBS	10(10.3%)	87(89.7%)	

We compared student awareness levels of MBBS students on the screening pap smear test to detect cervical cancer early across the years of MBBS. The results showed that there was good awareness of students in all years. In particular, 44 of 104 students (42.3) were familiar with the screening pap smear test in I MBBS, compared to 99 of 104 students (95.2) in III MBBS. The same was observed with 92/97 students (94.8) in IV MBBS who proved to be aware. The chi-square test showed statistically significant means of awareness had varied across the years ($P < 0.001$ among the all

comparisons). The table-12 shows the data on the awareness of MBBS students about screening pap smear test as an early-detective of cervical cancer in various years of MBBS study.

Table-12: Year-wise comparison of awareness about 'screening pap smear test for early detection of cervical cancer

Year	Awareness		P value
	No	Yes	
I MBBS	60(57.7%)	44(42.3%)	<.001
II MBBS	14(12.3%)	100(87.7%)	
III MBBS	5(4.8%)	99(95.2%)	
IV MBBS	5(5.2%)	92(94.8%)	

We tested the level of awareness of MBBS students about the pap smear test as a simple invasive test over the years of MBBS. The results showed that there was a high awareness of students in all the years. Particularly in I MBBS, 42.3 out of 104 students (44) were familiar with the fact that pap smear test is a simple invasive procedure, whereas in III MBBS this figure reached 92.3 out of 104 students (96). In IV MBBS, the percentage of students who showed awareness was 93.8 with 91 out of 97 students (91) showing awareness. The chi-square analysis showed statistically significant differences in the level of awareness between the years (P = 0.001 in all comparisons), which evidences the educational process and the greater level of knowledge about the essence of pap smear test of students. The table-13 shows the data on the awareness of the MBBS students about the awareness of the simple invasive procedure pap smear test.

Table-13: Year-wise comparison of awareness about 'pap smear test as a simple invasive procedure

Year	Awareness		P value
	No	Yes	
I MBBS	60(57.7%)	44(42.3%)	<.001
II MBBS	17(14.9%)	97(85.1%)	
III MBBS	8(7.7%)	96(92.3%)	
IV MBBS	6(6.2%)	91(93.8%)	

We assessed the level of awareness about prevention of cervical cancer by safe sexual practices in various years of MBBS. The results showed that students in every year had high awareness. In particular, 61 of 104 students (58.7%) in I MBBS knew that cervical cancer can be prevented by safe sex, and this rose to 101 of 104 students (97.1%) in III MBBS. As the clinical years (III MBBS and IV MBBS) went by, 97 (100%) of those who were surveyed were already aware. The chi-square test showed that the differences in awareness in the years were statistically significant (P < 0.001 in all the comparisons made). The table-14 contains the information about the awareness among MBBS students about whether safe sexual practices can prevent cervical cancer or not.

Table-14: Year-wise comparison of awareness about safe sexual practices prevent cervical cancer

Year	Awareness		P value
	No	Yes	
I MBBS	43(41.3%)	61(58.7%)	<.001
II MBBS	17(14.9%)	97(85.1%)	
III MBBS	3(2.9%)	101(97.1%)	
IV MBBS	0(0%)	97(100%)	

We measured the level of knowledge about the age of initiation of pap smear screening in various years of MBBS. The results revealed that the awareness grew tremendously after the students progressed in their medical studies. In particular, the proportion of students who knew the age at which pap smear screening was recommended was 16.3% in I MBBS and 92 of 104 students (88.5%) in III MBBS. This was repeated with 81 out 97 students (83.5) in IV MBBS who showed awareness. Chi-square showed that the differences in awareness in the years are statistically significant (P < 0.001 in all comparisons). The data regarding the awareness so far about the age when pap smear screening should be commenced among the years of MBBS is given in table-15.

Table-15: Year-wise comparison of awareness about age at which pap smear screening should be started.			
Year	Awareness		P value
	No	Yes	
I MBBS	87(83.7%)	17(16.3%)	<.001
II MBBS	56(49.1%)	58(50.9%)	
III MBBS	12(11.5%)	92(88.5%)	
IV MBBS	16(16.5%)	81(83.5%)	

We determined the level of awareness of MBBS students about the availability of vaccine to prevent cervical cancer. The results showed that students were very much aware in all years. In I MBBS, in particular, 43/104 students (41.3) were aware that there is a vaccine to prevent cervical cancer, and in III MBBS, this was 95/104 students (91.3). This was followed by 92/97 students (94.8) of IV MBBS who showed awareness. Chi-square analysis showed that the awareness differences between the years were statistically significant ($P < 0.001$ all the comparisons). Data on the awareness of the availability of vaccine to prevent cervical cancer at various years of MBBS are available in the table-16.

Table-16: Year-wise comparison of awareness about 'availability of vaccine for cervical cancer prevention			
Year	Awareness		P value
	No	Yes	
I MBBS	61(58.7%)	43(41.3%)	<.001
II MBBS	51(44.7%)	63(55.3%)	
III MBBS	9(8.7%)	95(91.3%)	
IV MBBS	5(5.2%)	92(94.8%)	

We assessed levels of awareness about the target population of HPV vaccination in various years of MBBS. The results showed that awareness increased significantly with the progression of the students through the stages of medical studies. In particular, 22 students out of 104 (21.2) students in I MBBS and 96 students out of 104 students (92.3) in III MBBS were knowledgeable about the target population to receive HPV vaccination. This pattern did not stop at 90 of 97 students (92.8) IV MBBS exhibiting awareness. Chi-square analysis revealed statistically significant differences in awareness by the years ($P < 0.001$ in all comparisons), which reflects an educational evolution and exposure to more knowledge on HPV vaccination guidelines by students. The table-17 displays the data on the awareness on the target population regarding HPV vaccination in various years of MBBS.

Table-17: Year-wise comparison of awareness about 'target population for HPV vaccination			
Year	Awareness		P value
	No	Yes	
I MBBS	82(78.8%)	22(21.2%)	<.001
II MBBS	45(39.5%)	69(60.5%)	
III MBBS	8(7.7%)	96(92.3%)	
IV MBBS	7(7.2%)	90(92.8%)	

We evaluated the level of awareness of MBBS students about the HPV vaccination schedule in various years of study. The result showed that the level of awareness increased significantly with the progress of the medical studies of the students. In I MBBS, 18/ 104 students (17.3) were informed about the HPV vaccination schedule; this rose to 85/ 104 students (81.7) in III MBBS. This was followed by 82 students of IV MBBS out of 97 (84.5) students who were showing awareness. The chi-square analysis indicated that there were statistically significant differences in awareness over the years ($P < 0.001$ in all the comparisons). The data on awareness of the HPV vaccination schedule by the year of MBBS is provided in the table-18.

Table-18: Year-wise comparison of awareness about HPV vaccination schedule			
Year	Awareness		P value
	No	Yes	
I MBBS	86(82.7%)	18(17.3%)	<.001
II MBBS	69(60.5%)	45(39.5%)	
III MBBS	19(18.3%)	85(81.7%)	
IV MBBS	15(15.5%)	82(84.5%)	

We assessed the knowledge between students in various years of MBBS on the catch-up program of HPV vaccination. The results indicated that there were different degrees of awareness between the students as they advanced their medical studies. Namely, among the I MBBS students 14 of the 104 (13.5) students knew about the catch-up program and among III MBBS students 77 of the 104 students (74.0) were aware of the catch-up program. In IV MBBS, 70 out of 97 students (72.2) were shown to be aware. Chi-square raised statistically significant differences in awareness between the years (P less than 0.001 in all comparisons) indicating the educational development and the exposure to information about HPV vaccination catch-up programs among students. The data in the table-19 present was on the awareness about the catch-up program on HPV vaccination on various years of MBBS.

Table-19: Year-wise comparison of awareness about 'catch up program			
Year	Awareness		P value
	No	Yes	
I MBBS	90(86.5%)	14(13.5%)	<.001
II MBBS	77(67.5%)	37(32.5%)	
III MBBS	27(26.0%)	77(74.0%)	
IV MBBS	27(27.8%)	70(72.2%)	

We evaluated the level of awareness concerning the protective efficacy of HPV vaccine in various years of MBBS. The results showed that there was a great improvement in the level of awareness as students progressed in their medical training. Particularly, a proportional number of 22 out of 104 students (21.2) in I MBBS and 85 out of 104 students (81.7) in III MBBS were aware of the protective efficacy of HPV vaccine. This was followed by the awareness shown by 77 out of 97 students (79.4%) of IV MBBS. The statistically significant differences in awareness were proved by chi-square analysis of the awareness across the years ($P < 0.001$ in all comparisons). The table-20 aims to provide the information about awareness on the protective efficacy of HPV vaccine by various years of MBBS.

Table-20: Year-wise comparison of awareness about 'protective efficacy of HPV vaccine			
Year	Awareness		P value
	No	Yes	
I MBBS	82(78.8%)	22(21.2%)	<.001
II MBBS	61(53.5%)	53(46.5%)	
III MBBS	19(18.3%)	85(81.7%)	
IV MBBS	20(20.6%)	77(79.4%)	

We examined the level of awareness of the side effects of HPV vaccine in various years of MBBS. The results showed a difference in how aware students were as they continued to advance in their medical training. In particular, 9 of 104 students (8.7) in I MBBS were aware of HPV vaccine side effects whereas 53 of 97 students (54.6) in IV MBBS were. Chi-square showed statistically significant differences in the awareness between the years ($P < 0.001$ in all comparisons). Table-21 shows the comparison of the awareness regarding the side effects of HPV vaccine in various years of MBBS.

Table-21: Year-wise comparison of awareness about 'side effects of HPV vaccine			
Year	Awareness		P value
	No	Yes	

I MBBS	95(91.3%)	9(8.7%)	<.001
II MBBS	77(67.5%)	37(32.5%)	
III MBBS	56(53.8%)	48(46.2%)	
IV MBBS	44(45.4%)	53(54.6%)	

We assessed the knowledge about the Indian HPV vaccine CERVAVAC at the various years of MBBS. The results showed that the level of awareness had significantly risen in accordance with the level of medical training that the students were in. In particular, 18 of 104 students (17.3) in I MBBS knew about the Indian HPV vaccine CERVAVAC and 90 of 104 students (86.5) students in III MBBS. This pattern was followed by 80/97 students (82.5%) in IV MBBS who were aware. The chi-square analysis with statistically significant differences in the level of awareness over the years ($P < 0.001$ in all comparisons). The data of the awareness about the Indian HPV vaccine CERVAVAC in various years of MBBS is found in the table-22.

Table-22: Year-wise comparison of awareness about Indian HPV vaccine CERVAVAC

Year	**Awareness**		**P value**
	No	**Yes**	
I MBBS	86(82.7%)	18(17.3%)	<.001
II MBBS	76(66.7%)	38(33.3%)	
III MBBS	14(13.5%)	90(86.5%)	
IV MBBS	17(17.5%)	80(82.5%)	

We analyzed the awareness of the effectiveness of HPV vaccine in the prevention of genital warts in various years of MBBS. The results showed that there was great improvement in awareness as the students progressed through their medical course. To be precise, the vaccine efficacy in the prevention of genital warts was known by 21 out of 104 students (20.2%) in I MBBS and by 74 out of 104 students (71.2) in III MBBS. This was followed by 73 out of 97 students (75.3) in IV MBBS who showed awareness. Chi-square testing revealed statistically significant differences in awareness over the years ($P < 0.001$ in all comparisons) that support the educational progression and exposure to more knowledge about the efficacy of the vaccine in reducing genital warts in students. The table-23 shows the data about the awareness concerning the efficacy of HPV vaccine in the prevention of genital warts in various years of MBBS.

Table-23: Year-wise comparison of awareness about 'vaccine efficacy in preventing genital warts

Year	**Awareness**		**P value**
	No	**Yes**	
I MBBS	83(79.8%)	21(20.2%)	<.001
II MBBS	60(52.6%)	54(47.4%)	
III MBBS	30(28.8%)	74(71.2%)	
IV MBBS	24(24.7%)	73(75.3%)	

We determined the vaccination status of HPV in various years of MBBS. The results showed that the percentage of students who received at least one dose of HPV vaccine has significantly increased with their duration of study in the medical field. In I MBBS in particular, 17/104 students (16.3) had been given at least one dose, and this rose to 45/104 students (43.3) in III MBBS. It was followed by 38 of 97 students (39.2% of IV MBBS who reported taking the vaccination. The Chi-square analysis was used to show statistically significant differences in vaccination status between the years ($P < 0.001$ in all comparisons). Data on the responses of their vaccination status of HPV in various years of MBBS is shown in the table-24.

Table-24: Year-wise comparison of responses to the question of receiving at least one dose of HPV vaccination.

Year	**HPV vaccine**		**P value**
	No	**Yes**	

I MBBS	87(83.7%)	17(16.3%)	<.001
II MBBS	78(68.4%)	36(31.6%)	
III MBBS	59(56.7%)	45(43.3%)	
IV MBBS	59(60.8%)	38(39.2%)	

We explored the questions regarding HPV vaccine among the MBBS students in various years. The results showed that the percentage of students who said they had inquiries about HPV vaccination also rose tremendously as they continued their medical training. Precisely, 20/104 students (19.2%) responded to direct questions in I MBBS, and 50/104 students (48.1) in III MBBS. This pattern was followed by 47 students out of 97 students (48.5) in IV MBBS who reported inquiries. Differences in responses regarding inquiries over the years were found to be statistically significant using chi-square analysis (P < 0.001 in all the comparisons). Table-25 shows the data on the responses of the MBBS students on the question of whether someone has asked about HPV vaccination by the various years of MBBS.

Table-25: Year-wise comparison of responses to the question of anyone enquiring about HPV vaccination.

Year	HPV vaccine		P value
	No	Yes	
I MBBS	84(80.8%)	20(19.2%)	<.001
II MBBS	90(78.9%)	24(21.1%)	
III MBBS	54(51.9%)	50(48.1%)	
IV MBBS	50(51.5%)	47(48.5%)	

We compared the HPV vaccination status of the MBBS students of varying years of study. The results indicated differences in HPV vaccination among the students at various levels of medical education. In particular, HPV vaccination has been taken by 17/104 (16.3) students in I MBBS and by 39/104 (37.5) students in III MBBS. Likewise, 35/97 students in IV MBBS (36.1% had been vaccinated against HPV. The chi-square analysis showed that the differences in the vaccination status among the years were statistically significant (P = 0.002). The table-26 shows the data on the responses about their HPV vaccination status among various years of MBBS.

Table-26: Year-wise comparison of responses to the question of having taken HPV vaccination

Year	HPV vaccine		P value
	No	Yes	
I MBBS	87(83.7%)	17(16.3%)	.002
II MBBS	85(74.6%)	29(25.4%)	
III MBBS	65(62.5%)	39(37.5%)	
IV MBBS	62(63.9%)	35(36.1%)	

We determined the level of awareness with regard to the cost of 3 doses of HPV vaccination among various years of MBBS. The results further indicated that the awareness of the cost of HPV vaccination among students increases significantly as they progress in their medical studies. In particular, 17 of 104 students (16.3) knew the cost in I MBBS, but this number rose to 57 of 97 students (58.8) in IV MBBS. The Chi-square test revealed that there were statistically significant differences in the awareness between the years (P less than 0.001 in all the comparisons). The table-27 shows information on the awareness of the cost of 3 doses of HPV vaccination in various years of MBBS.

Table-27: Year-wise comparison of responses to the question of having awareness about cost of 3 doses of HPV vaccination

Year	Awareness		P value
	No	Yes	
I MBBS	87(83.7%)	17(16.3%)	<.001
II MBBS	83(72.8%)	31(27.2%)	
III MBBS	62(59.6%)	42(40.4%)	

IV MBBS	40(41.2%)	57(58.8%)	

We studied willingness to receive HPV vaccination in various years of MBBS. The results showed that willingness to receive HPV vaccination had a positive trend among the students as they advanced their medical education. Namely, 63 students (60.6) out of 104 students (I MBBS) expressed readiness to receive vaccination, and 80 students (82.5) out of 97 students (IV MBBS). The chi-square analysis showed statistically significant differences in the willingness over the years (P = 0.002). The table-28 shows the information on the intention of receiving HPV vaccination in various years of MBBS.

Table-28: Year-wise comparison of responses to the question of willingness to get the HPV vaccination

Year	Awareness		P value
	No	Yes	
I MBBS	41(39.4%)	63(60.6%)	.002
II MBBS	32(28.1%)	82(71.9%)	
III MBBS	22(21.2%)	82(78.8%)	
IV MBBS	17(17.5%)	80(82.5%)	

We evaluated the intention to receive vaccination against HPV in case of non-vaccination in the past years of MBBS. The results showed that the intention to be vaccinated was strongly positively correlated among students and that a considerable majority of them indicated they were willing to be vaccinated despite not being vaccinated initially. In particular, in I MBBS, 65 out of 104 students (62.5%) would be ready to be vaccinated in this type of situation, and 78 out of 97 students (80.4%) were ready to do so in IV MBBS. Chi-square analysis revealed statistically significant variations in willingness over the years (P = 0.006), which highlights the strong willingness and acceptance to take into consideration HPV abortion among future medical practitioners. Table-29 finds out the willingness to receive HPV vaccination, in case it was not received previously, in different years of MBBS.

Table-29: Year-wise comparison of responses to the question of willingness to get the HPV vaccination in case of previous non-vaccination.

Year	Awareness		P value
	No	Yes	
I MBBS	39(37.5%)	65(62.5%)	.006
II MBBS	26(22.8%)	88(77.2%)	
III MBBS	20(19.2%)	84(80.8%)	
IV MBBS	19(19.6%)	78(80.4%)	

The causes of the lack of willingness to receive HPV vaccination among MBBS students were evaluated in various years. The results show that the most common causes students use are fear of side effects and lack of information. Particularly, 15 out of the 104 students (14.4) in I MBBS reported fear of side effects, whereas 74 students (71.2) believed that they lacked sufficient information. The same concerns were noted in the following years but at different proportions. The chi-square test showed that there were statistically significant differences in the reasons of non-willingness in the years (P < 0.001). Table-30 shows the data of the reasons mentioned by MBBS students as the reasons behind their unwillingness to receive HPV vaccination in different years.

Table-30: Year-wise comparison of responses to the question of reason for non-willingness to get the HPV vaccination.

Year	Non-willingness for vaccine		P value
	Afraid of side effects	No enough information	
I MBBS	15(14.4%)	74(71.2%)	<.001
II MBBS	21(18.4%)	30(26.3%)	

III MBBS	19(18.3%)	20(19.2%)	
IV MBBS	12(12.4%)	23(23.7%)	

Findings of the post-hoc test show that the reasons behind the non-willingness to receive the HPV vaccination among MBBS students differ significantly ($P < 0.001$) with respect to the year of study. The pairwise comparisons indicated that students in previous years (I MBBS and II MBBS), reported more concerns about side effects and information insufficiency than the students in later years (III MBBS and IV MBBS). This research has proven the significance of medical education and training on medical attitude towards vaccine acceptance and underlined the necessity of special educational actions to eradicate all the suspicions. This conclusion summarizes major findings of the post-hoc test and highlights the overall progressive change in attitudes of HPV vaccination among MBBS students over the course of their medical training. The post-hoc test in Table-31 tests the pair-wise comparisons of the differences in means between groups of variables on the basis of the significant results obtained above.

Table-31: Post-hoc test for the above significant results.

Group 1	Group 2	Mean difference	P value
I	II	-1.073	<.001
	III	-2.000	<.001
	IV	-3.019	<.001
II	III	-.927	<.001
	IV	-1.947	<.001
III	IV	-1.019	<.001

DISCUSSION

In this cohort of 419 MBBS students from Kolar, awareness rose consistently from preclinical to clinical years across core domains, HPV etiology, preventability of cervical cancer, Pap testing, vaccine availability, schedules, and target groups, indicating a strong curriculum effect. Comparable patterns were reported among Indian medical undergraduates in Manipal, where 89.2% recognized high-risk HPV as causal, 84.8% acknowledged preventability, and 75.6% knew a vaccine exists; females also showed higher awareness on key vaccine items and overall acceptance was 67.8%[19].

The gradient between future clinicians and the general student population remains stark. Among women in elite Kolkata colleges, only 11% had heard of the Pap test and 15% of HPV; recognition of behavioral risk factors was even lower, despite high vaccination intent (75%)[20]. This contrast underscores how structured medical teaching translates into literacy and intent, positioning MBBS students as credible disseminators of evidence-based guidance.

Our students' chief barriers are fear of adverse effects and "not enough information" mirror prior Indian findings. In Manipal, inadequate information was the most cited obstacle, ahead of cost and perceived complications[19]. Among practicing providers in Delhi-NCR, only 47% recommended HPV vaccination despite 81% awareness of vaccine existence; gaps clustered among paramedical staff and in public/rural settings, highlighting the need for targeted continuing education[21].

Knowledge that vaccination also prevents genital warts caused predominantly by HPV 6/11 improved with seniority in our sample, aligning with evidence summarized for Indian providers [21,22]. Strategically, integrating concise, assessment-linked HPV modules earlier in MBBS, coupled with counseling job-aids (cost, schedule, catch-up, adverse-event communication), can accelerate conversion from awareness to recommendation and uptake. Given the consistent female–male awareness gap in Indian cohorts [19,22], peer-led interventions anchored by female student champions may be particularly effective.

In sum, our findings corroborate Indian literature: medical education meaningfully elevates HPV/cervical cancer literacy and pro-vaccine attitudes, while persistent, information-related barriers demand earlier, practice-oriented training and structured outreach to close the recommendation and uptake gap across settings [19-22].

IMPLICATIONS

The present study carries both academic and practical significance. For medical education, the findings demonstrate that structured teaching substantially improves awareness and attitudes towards HPV and cervical cancer prevention, particularly during the clinical years. This progression supports the integration of HPV-focused modules earlier in the MBBS curriculum, ensuring students acquire foundational knowledge before patient interactions begin. From a public health standpoint, medical students emerge as effective multipliers of information within their families and communities. Strengthening their competence may enhance vaccine advocacy, counter misconceptions, and ultimately

improve uptake rates. These insights can inform policymakers and curriculum planners who aim to leverage future healthcare professionals as agents of change in addressing India's disproportionate burden of cervical cancer.

LIMITATIONS

The study has certain limitations that must be acknowledged. First, it was conducted in a single medical college in Kolar, which may restrict the generalisability of findings to other regions or institutions. Differences in teaching methods, community exposure, and institutional emphasis on preventive medicine could influence outcomes elsewhere. Second, the cross-sectional design captures awareness and attitudes at a single point in time, rather than following changes in the same cohort across successive years. Third, self-reported data through questionnaires may be influenced by recall or social desirability bias. Finally, the study did not explore in depth the socio-cultural and economic barriers such as parental influence, cost of vaccination, or healthcare access that may influence students' vaccination status and attitudes.

FUTURE SCOPE

Future research should adopt a longitudinal design to track the same cohort of medical students throughout their training, providing more precise insights into how medical education shapes awareness and vaccine acceptance. Expanding the study across multiple medical colleges and including diverse geographic regions would improve external validity. In addition, qualitative approaches such as focus group discussions or interviews may shed light on the nuanced reasons behind vaccine hesitancy, particularly regarding concerns over side effects or insufficient information. Linking student awareness with community outreach initiatives could also be evaluated to assess how well-trained medical students contribute to awareness and vaccine uptake beyond their academic environment.

CONCLUSION

The study underscores a clear trajectory: awareness, acceptance of HPV vaccination and cervical cancer prevention rise significantly with progression through medical education. Yet, persistent barriers rooted in fear and inadequate information highlight the need for structured, early, and practice-oriented education within the MBBS curriculum. Medical students represent a strategic cohort who can act as both learners and disseminators of accurate information, bridging the gap between scientific advances and public health practice. By reinforcing HPV-related training and addressing misconceptions, institutions and policymakers can help foster a generation of clinicians better equipped to reduce the cervical cancer burden in India.

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