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KNOWLEDGE, ATTITUDE AND PRACTICE (KAP) OF HUMAN PAPILLOMA VIRUS (HPV)— INFECTION AND ACCEPTABILITY OF HPV VACCINE AMONG MEDICAL STUDENTS IN A TERTIARY CARE CENTRE, KARUR, INDIA

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ABSTRACT: Background: Human Papilloma Virus (HPV) is a common sexually transmitted infection, and its persistence can lead to cervical cancer. It can be prevented by vaccines. **Objectives:** The study was conducted with the objective of analyzing knowledge, attitude, and practice towards HPV infection and the acceptability of vaccination among medical students. **Methodology:** Around 405 students in a tertiary care centre were randomly selected. Data were collected using a validated questionnaire and statistically analyzed using MS Excel and SPSS version 16. **Results:** Clinical students had significantly ($p < 0.01$) better knowledge than non-clinical students in areas like HPV and cervical cancer (99%, 91%), sexual transmission (98%, 86%), and HPV vaccine (92%, 74%). Non-clinical students significantly ($p < 0.01$) differ from clinical students by agreeing in areas related to vaccination, perceived as “sexually active” (32%, 22%), parent's decision (40%, 25%) and partner's opinion (81%, 56%). None of the students were ever screened for HPV infection or cervical cancer. No difference was seen between the phases related to HPV transmission through direct contact and non-curability. **Conclusions:** Clinical students had better knowledge than non-clinical students in core areas related to HPV. Integration of learning across subjects from the day of admission is inevitable.

INTRODUCTION: India is one of the overpopulated developing countries where the disease pattern differs significantly from that of developed countries. The country is undergoing a phenomenon called “epidemiological transition.”

With an increase in life expectancy, the main causes of death and disability are shifting gradually but steadily from communicable, maternal and perinatal causes to non-communicable diseases.

Among non-communicable diseases, cancers remain a nightmare for both treating doctors and health-related policymakers. In India, the most frequently encountered cancers in women are breast, cervix uteri, colorectal, ovary, lip, and oral cavity. Cervical cancer is closely associated with poor genital hygiene, early marriage, multiple

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pregnancies and contact with multiple sexual partners¹. Human Papilloma Virus (HPV) is a common sexually transmitted infection. Almost all sexually active people get infected at some point in their lives and usually present without symptoms. In most cases, the immune system clears HPV from the body. Persistent infection with high-risk HPV can lead to cervical cancer². As with other sexually transmitted diseases (STDs), men are implicated in the epidemiological chain of the infection. Acting both as "carriers" and "vectors" of oncogenic HPVs, male partners may significantly contribute to the risk of developing cervical cancer in their female partners³. Fortunately, vaccines are available to prevent cervical cancer by protecting against certain oncogenic types of HPV.

Available recombinant HPV vaccines are safe and effective for females aged 9 through 26 years. It has been recommended that all girls who are 11 or 12 years old get the HPV vaccine to be protected against cervical cancer⁴. The epidemiology of cervical cancer is a complex phenomenon. It starts as an infectious disease, and along with various personal, social, and environmental factors, it affects a sizable number of Indian women. Unfortunately, they enter the health system only at a later stage. Fortunately, it remains one of the most vaccine-preventable cancers. In such a scenario, while every Indian medical graduate is expected to play a crucial role as a clinician, he or she is also obligated to address social and other factors associated with HPV infection and cervical cancer. Thus, the study was conducted to assess and compare knowledge, attitude, and practice towards HPV infection and the acceptability of vaccination among students from non-clinical and clinical phases. Thus, the study aimed at finding the gaps, if any, and aiding them in a better understanding of the disease.

METHODOLOGY: A facility-based cross-sectional study was conducted among medical

students in a tertiary care centre in Karur, India. Based on a study titled "A Cross-Sectional Study on Knowledge, Attitude, and Practice Related to Human Papilloma Virus Vaccination for Cervical Cancer Prevention between Medical and Non-Medical Students in Hong Kong" at a 95% confidence interval with an allowable error of 5%, the power of the test at 95%, and the dropout rate at 10%, the size of the sample was derived as 405⁵. Students were randomly selected from all professional years. Clearance was obtained from the institutional ethics committee. After obtaining informed consent, the study was conducted from June to July 2024. A pretested, semi-structured questionnaire was administered by the investigator.

It was comprised of four sections, dealing with socio-demographic details, knowledge, attitude, and practice. Data were entered in MS Excel, exported to SPSS version 16, and analyzed statistically. Appropriate descriptive statistics (qualitative data as percentages) were used. Inferential statistics, the Chi-square test, and Fischer's exact test for categorical variables and Independent's t test for continuous variables were applied to compare students of phases 1 and 2 (1st and 2nd professional years) who were studying pre- and para-clinical subjects predominantly with phase 3 (3rd and 4th professional years) students who were studying clinical subjects principally in terms of knowledge, attitude, and practice related to HPV infection and vaccination.

RESULTS:

Socio-Demographic Profile: A total of 405 responses were collected. Among the respondents, about 67.1% were females and 32.9% were males. All participants who took part in our study were undergraduate medical students and were unmarried. Among 405 students, 305 belonged to the 1st and 2nd professional years (phases 1 and 2), and the rest were from the 3rd and 4th professional years (phase 3) **Table 1**.

TABLE 1: PHASE-WISE DISTRIBUTION OF MEDICAL (MBBS) STUDENTS

Phase	Professional year	Frequency (n)	Percentage (%)
1	1 (pre-clinical)	91	22.5
2	2 (para-clinical)	214	52.8
3	3 (clinical)	77	19.0
	4 (clinical)	23	5.7
Total		405	100

Knowledge about HPV Infection and Vaccination among Medical Students: About 90% of the students were aware that cervical cancer was caused by HPV infection (94%). In contrast,

only less than 25% of them were aware that somebody could get infected by direct skin-to-skin contact (kiss or touch) (23%; **Fig. 1**).

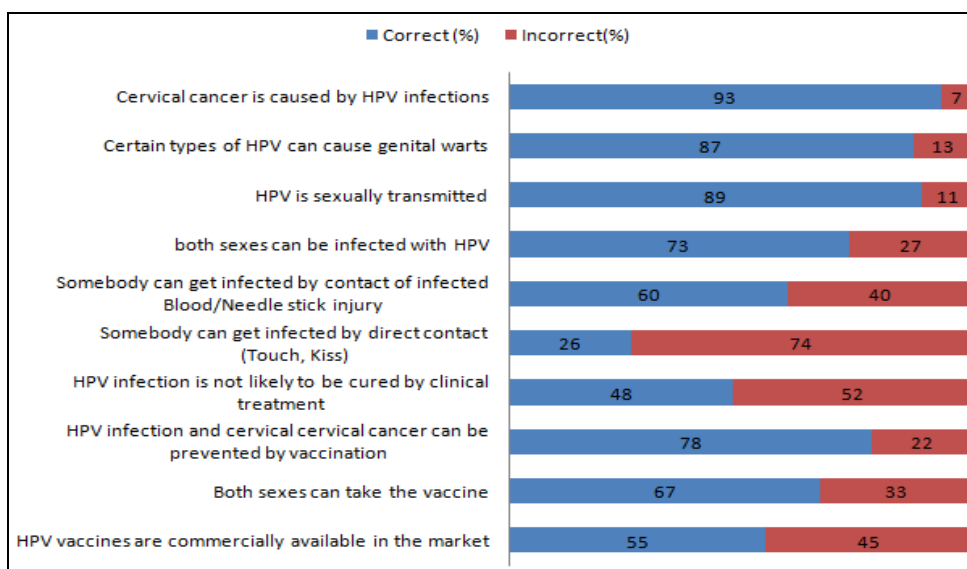


FIG. 1: KNOWLEDGE ABOUT HPV INFECTION AND VACCINATION AMONG MEDICAL STUDENTS

TABLE 2: COMPARISON OF KNOWLEDGE RELATED TO HPV INFECTION AND VACCINATION BETWEEN NON-CLINICAL (PHASE 1&2) AND CLINICAL (PHASE 3) STUDENTS

S. no.	Knowledge items	Comparison group	Response		Chi-square test/ Fisher's exact test#	p value
			Correct n (%)	Incorrect n (%)		
1	Cervical cancer is caused by HPV infections.	Students phases 1 & 2	278(91%)	27(9%)	---#	0.005*
		Students, phase 3	99(99%)	1(1%)		
2	Certain types of HPV can cause genital warts.	Students phases 1 & 2	254(83%)	51(17%)	---#	<0.001*
		Students, phase 3	98(98%)	2(2%)		
3	HPV is sexually transmitted.	Students phases 1 & 2	262(86%)	43(14%)	---#	<0.001*
		Students, phase 3	98(98%)	2(2%)		
4	Both sexes can be infected with HPV.	Students phases 1 & 2	208(68%)	97(32%)	15.014	<0.001*
		Students, phase 3	88(88%)	12(12%)		
5	Somebody can get infected by contact with an infected blood/needle stick injury.	Students phases 1 & 2	187(61%)	118(39%)	0.169	0.681
		Students, phase 3	59(59%)	41(41%)		
6	Somebody can get infected by direct contact (touch, kiss).	Students phases 1 & 2	81(27%)	224(73%)	0.499	0.480
		Students, phase 3	23(23%)	77(77%)		
7	HPV infection is not likely to be cured by clinical treatment.	Students phases 1 & 2	140(46%)	165(54%)	1.521	0.217
		Students, phase 3	53(53%)	47(47%)		
8	HPV infections can be prevented by vaccination.	Students phases 1 & 2	226(74%)	79(26%)	14.308	<0.001*
		Students, phase 3	92(92%)	8(8%)		
9	Both sexes can take the vaccine.	Students phases 1 & 2	198(65%)	107(35%)	2.816	0.093
		Students, phase 3	74(74%)	26(26%)		
10	HPV vaccines are commercially available on the market.	Students phases 1 & 2	161(53%)	144(47%)	2.051	0.152
		Students, phase 3	61(61%)	39(39%)		

*statistically significant at p < 0.01.

From **Table 2**, it was evident that students from phase 3 had better knowledge than students from phases 1 and 2 regarding the prevention of HPV by vaccination (92%, 74%, p < 0.001), and the difference was statistically significant. On the other

hand, there was no statistically significant difference between both groups about HPV transmission through direct skin-to-skin contact (touch or kiss) (27%, 23%, p = 0.48).

TABLE 3: COMPARISON OF OVERALL KNOWLEDGE RELATED TO HPV INFECTION AND VACCINATION BETWEEN NON-CLINICAL (PHASE 1 & 2) AND CLINICAL (PHASE 3) STUDENTS

Students	Frequency (n)	Overall Knowledge		
		Mean with 95% Confidence Interval	+/-Standard Deviation	t value p value
Students, phases 1 & 2	305	6.54 (6.23–6.73)	2.627	- 4.05 <0.001*
Students, phase 3	100	7.45 (7.10–7.76)	1.667	

*Statistics applied: Independent 't' test, significant at p < 0.001.

Overall knowledge of clinical students (mean score = 6.54, p < 0.001) was significantly better than that of non-clinical students (mean score = 7.45, p < 0.001) **Table 3**.

Attitude towards HPV Infection and Acceptability of Vaccination among Medical Students: Around 70–80% of the students agreed

that cervical cancer was a severe disease (81%). In the case of getting afraid of being perceived as “sexually active” upon receiving the HPV vaccine, one-third of them agreed (29%), another third were neutral (38%), and the remaining third disagreed (33%), respectively **Fig. 2**.

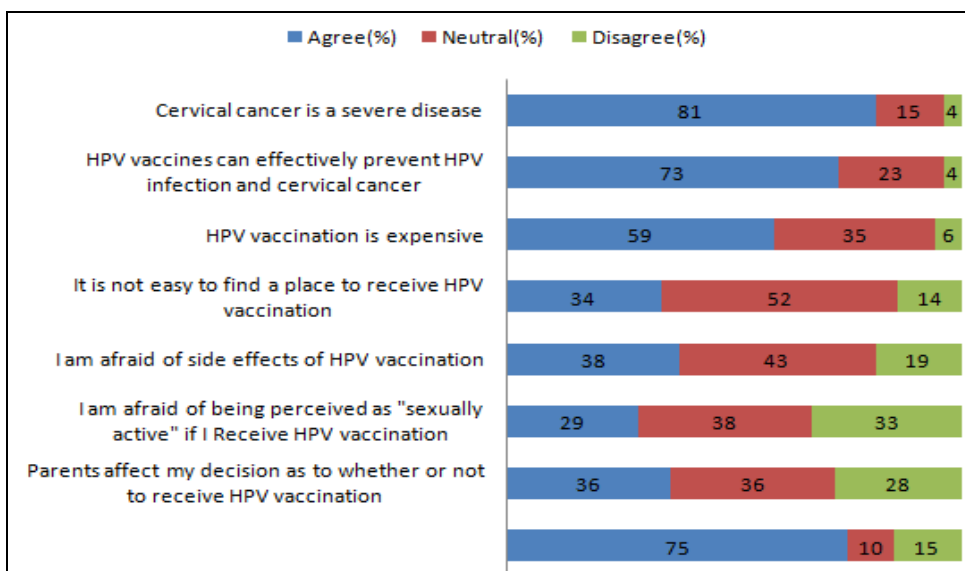


FIG. 2: ATTITUDE TOWARDS HPV INFECTION AND ACCEPTABILITY OF VACCINATION AMONG MEDICAL STUDENTS

TABLE 4: COMPARISON OF ATTITUDE TOWARDS HPV INFECTION AND ACCEPTABILITY OF VACCINATION BETWEEN NON-CLINICAL (PHASES 1 AND 2) AND CLINICAL (PHASE 3) STUDENTS

S. no.	Attitude & acceptability: items	Comparison group	Response			Chi-square test / Fisher's exact test#	p value
			Agreed n (%)	Neutral n (%)	Disagreed n (%)		
1	Cervical cancer is a severe disease.	Students, phases 1 & 2	231(76%)	59(19%)	15(5%)	#	<0.001*
		Students, phase 3	96(96%)	3(3%)	1(1%)		
2	HPV vaccines can effectively prevent cervical cancer.	Students, phases 1 & 2	213(70%)	76(25%)	16(5%)	#	0.021*
		Students, phase 3	83(83%)	16(16%)	1(1%)		
3	HPV vaccination is expensive.	Students, phases 1 & 2	179(59%)	110(36%)	16(5%)	3.012	0.222
		Students, phase 3	58(58%)	32(32%)	10(10%)		
4	It is not easy to find a place to receive an HPV vaccination.	Students, phases 1 & 2	106(35%)	167(55%)	32(10%)	11.778	0.003*
		Students, phase 3	32(32%)	44(44%)	24(24%)		
5	I am afraid of side effects of HPV	Students, phases 1 & 2	127(42%)	132(43%)	46(15%)	13.789	0.001*
		Students, phase 3	28(28%)	41(41%)	31(31%)		

6	vaccination. I am afraid of being perceived as "sexually active" if I receive HPV vaccination.	Students, phases 1 & 2 Students, phase 3	96(32%) 22(22%)	129(42%) 26(26%)	80(26%) 52(52%)	22.891	<0.001*
7	Parents affect my decision as to whether or not to receive HPV vaccination.	Students, phases 1 & 2 Students, phase 3	122(40%) 25(25%)	124(41%) 23(23%)	59(19%) 52(52%)	40.438	<0.001*
8	The opinion of my partner, either at present or in future, will affect my decision as to whether or not to receive HPV vaccination.	Students, phases 1 & 2 Students, phase 3	248(81%) 56(56%)	30(10%) 10(10%)	27(9%) 34(34%)	38.050	<0.001*

*statistically significant at p < 0.01.

From **Table 4**, it was obvious that phase 3 students agreed more readily than phase 1 and 2 students in certain perceptions like severity of cervical cancer (96%, 76%, p < 0.001) and effectiveness of vaccine

(83%, 70%, p = 0.021), and the difference was statistically significant. Both groups agreed with the statement that the HPV vaccine was expensive (59%, 56%, and p = 0.222).

Practice among Students Related to HPV Infection:

TABLE 5: COMPARISON OF PRACTICE RELATED TO HPV INFECTION AND BETWEEN NON-CLINICAL (PHASES 1 AND 2) AND CLINICAL (PHASE 3) STUDENTS

S. no.	Practice items	Comparison group	Response	Chi-square test		p value
				Yes n (%)	No n (%)	
1	Have you previously been screened for HPV infection or cervical cancer in the past?	Students-phases 1 & 2	0(0%)	305(100%)	----	----
		Students, phase 3	0(0%)	100(100%)		
2	Do you have a regular habit of seeking professional help if you have any symptoms?	Students-phases 1 & 2	222(73%)	83(27%)	6.738	0.009*
		Students, phase 3	59(59%)	41(41%)		

*statistically significant at p < 0.01

From **Table 5**, it was evident that none of the students had been screened for HPV infection or cervical cancer in the past.

DISCUSSION: The study was conducted among 405 medical undergraduate students at a tertiary care centre in Karur, India. Nearly two-thirds of the students were female (67%), while the rest were male (33%). We get a similar distribution in various studies conducted by Wen Y *et al.* (male 32%, female 68%), Swarnapriya K *et al.* (male 28, female 72), and Winarto H *et al.* (male 25%, female 75%), respectively ⁶⁻⁸. These results contradicted those of other studies conducted by Gollu AN *et al.* (male 53%, female 47%), Thakur M *et al.* (male 51%, female 49%), and Pandey D *et al.* (male 44%, female 56%), where male and

female students were almost equally distributed ⁹⁻¹¹. Recent trends prove that female candidates getting admitted to medical courses outnumber male candidates. Hence, the sex distribution in the current study and similar studies seems to be aligned with the current scenario.

In the present study, medical students from all 3 phases (1–22%, 2–53%, 3–19%, and 4–6%) participated. Similarly, in various studies like the study by Winarto *et al.* (1–34%, 2–33%, 3–27%, and 4–6%), the study by Wen Y *et al.* (non-clinical: 56% and clinical: 44%), the Thakur M *et al.* study (1–20%, 2–22%, 3–19%, 4–23%, and interns: 16%), Yam PWA *et al.* (< 3 years = 68% and >= 3 years = 32%) and Swarnapriya K *et al.* (1–28%, 2–25%, 3–24%, and 4–23%) students from all phases

participated^{8, 6, 10, 5, 7}. In contrast to the above findings, some studies, like the study by Gollu AN *et al.* (2nd year: 45, 3rd year: 55%) and Pandey D *et al.* (1st year: 55%, final year: 45%), recruited students selectively⁹⁻¹¹. A medical undergraduate is expected to get clinical orientation on the day of admission. Thus, the inclusion of students from all three phases in the present study and similar studies is justified.

In the existing study, 93% of the students correctly responded that HPV infection would lead to cervical cancer. Similarly, in the study done by Gupta H *et al.*, the response was 92%¹². No such immense response was documented in studies conducted by Takur M *et al.* (71.49%) and Wen Y *et al.* (64.6%)¹⁰⁻⁶. In the current study, 87% of them responded fittingly that certain types of HPV could cause genital warts, which mimicked the finding in the Gupta H *et al.* study (90%)¹². Regarding sexual transmission of HPV, the present study recorded a positive result of 89%, while it was 71.26% in the Takur M *et al.* study and 47% in the Wen Y *et al.* study, respectively¹⁰⁻⁶.

In the study presented here, 73% of the students responded appropriately that HPV could infect both sexes, and this finding was far ahead of the response found in the Wen Y *et al.* study (59%)⁶. In the current study, 78% of them responded aptly that HPV vaccines could protect against cervical cancer, which differed from the Wen Y *et al.* study (48%) and Swarnapriya K *et al.* study (60%)⁶⁻⁷. About 67% of the students in the study described here responded correctly that vaccines were available for both sexes, while the response was less marked in the Swarnapriya K *et al.* study (60%)⁷. From the present study, it was evident that students had a better understanding of the role of HPV in cervical cancer and the efficacy of HPV vaccines. Most probably, the basics of HPV might have been taught well at phase 2 in concerned subjects like microbiology.

From the current study, it was evident that almost all students (99%) studying in the clinical phase knew the role of HPV in the aetiology of cervical cancer when compared to students in non-clinical phases (phases 1 and 2) (91%, $p = 0.005$). Similar results were found in the Yam PWA *et al.* study (clinical 96%, non-clinical 88%, $p = 0.026$) and the

Pandey D *et al.* study (clinical 97%, non-clinical 83%, $p = 0.001$)⁵⁻¹¹. In contrast to the above findings in the Gollu AN *et al.* study, no such difference was seen between clinical and non-clinical students (98%, 97%, $p = 0.616$)⁹. It was obvious from the current study that students from the clinical phase had responded promptly, possibly because of their regular ward visits and post-discussion with faculties.

In the present study, students in clinical phases knew better that HPV vaccine could prevent cervical cancer than students in non-clinical phases (92%, 74%, $p < 0.001$), similar to the findings in studies done by Pandey D *et al.* (80%, 71%, $p = 0.017$), Gollu AN *et al.* (62%, 90%, $p < 0.001$), and Yam PWA *et al.* (86.6%, 45%, $p < 0.001$)^{11, 9-5}. In terms of knowledge about the availability of vaccines for both sexes, there was no difference between students in clinical phases and non-clinical phases in the current study (74%, 65%, $p = 0.093$) and the Gollu AN *et al.* study (71%, 57%, $p = 0.062$)⁹. Contradicting the above findings, the Pandey D *et al.* study showed that clinical students knew better than non-clinical students (31%, 20%, $p = 0.005$)¹¹. It was apparently clear from the existing study that clinical students might have benefited from attending integrated (both vertical and horizontal) classes involving various subjects across phases.

In the current study, though students in clinical phases were more aware of sexual transmission of HPV infection than students in non-clinical phases (98%, 86%, $p < 0.001$), there was no significant difference in knowledge about transmission through blood (59%, 61%, $p < 0.681$) or direct skin-to-skin contact (23%, 27%, $p < 0.480$) between the two groups. Knowledge of students from clinical phases was no way better than that of students from non-clinical phases (53%, 46%, $p = 0.217$) in relation to the non-availability of curable treatment for HPV infection. In spite of Community Medicine being taught in all 3 phases, students' target towards final year subjects and postgraduate entrance exams might have left them lagging behind in knowledge about modes of transmission and types of prevention. In the present study, about 81% of the students believed that cervical cancer was a serious disease.

They also believed that the HPV vaccine could effectively protect against cervical cancer (73%). These results are almost similar to studies conducted by Yam PWA *et al.* (100%), Takur M *et al.* (70%)⁵⁻¹⁰. In the study described here, students in clinical phases assumed that cervical cancer was a severe disease more than the students in non-clinical phases (96%, 76%, $p < 0.001$). Clinical students also agreed that the HPV vaccine could effectively prevent cervical cancer more than non-clinical students (83%, 76%, $p = 0.021$). This finding was similar to the Pandey D *et al.* study (84%, 70%, $p < 0.001$)¹¹. But in the study done by Yam PWA *et al.*, no such difference was found between clinical and non-clinical students in terms of perceptions of the efficacy of the HPV vaccine against cervical cancer (92%, 91%, $p = 0.719$)⁵. From the present study, it was evident that students had a better view of the prognosis and vaccine-preventable nature of cervical cancer. Most likely, the basics about cervical cancer and the availability of vaccines might have been taught well at phase 2 in concerned subjects like pathology and pharmacology.

In the current study (59%) as well as in studies conducted by Takur M *et al.* (49%) and Yam PWA *et al.* (47%), a portion of students presumed that the HPV vaccine was expensive¹⁰⁻⁵. In the existing study, 38% of them expressed their fear towards the side effects of the HPV vaccine, and this finding was similar to that of the Yam PWA study (30%)⁵.

Even though there was a significant difference ($p < 0.001$) between students from clinical phases (agree: 28%, neutral: 41% and disagree: 31%) and students from non-clinical phases (agree: 42%, neutral: 43%, and disagree: 15%), the majority of them from both groups had a neutral view on fear towards the side effects of HPV vaccination. Though there was a significant difference ($p = 0.003$) between students from clinical phases (agree 32%, neutral 44% and disagree 24%) and students from non-clinical phases (agree 35%, neutral 55%, and disagree 10%), the majority of them from both groups had a neutral view towards the perception that it was not easy to find a place for HPV vaccination. Though cervical cancer is one of the most common carcinomas in India, the HPV vaccine is not available either free of charge or at a

low cost for Indian women, unlike sanitary napkins. It might have made Indian medical graduates perceive that HPV vaccines were expensive. Medical students would have come across very commonly administered vaccines during their clinical postings. Unfortunately, such a type of exposure might not be available for them in the case of the HPV vaccine. It might have influenced them to have a neutral view towards the difficulty of finding a place to get vaccinated and the side effects of the vaccine.

In the study by Yam *et al.* conducted in Hong Kong, around 91% of the students disagreed with the statement that receiving HPV vaccination would be perceived by others as "active sexual behavior"⁵. But in the current study, irrespective of phase, only 33% of them disagreed. Though clinical students differ significantly with non-clinical students on fear of being perceived as "sexually active" on getting vaccinated (agree 22%, neutral 26%, disagree 52%, $p < 0.001$), the finding that most of the non-clinical students [74%, (agree 32%, neutral 42%)] had a different view than the disagreement (26% only) could not be ignored.

About 52% of the clinical students disagreed with the statement about parents' role in deciding to get vaccinated. Paradoxically, only 19% of the non-clinical students disagreed with the same statement, and this response could not be rejected. In the case of the opinion of the partner, either at present or in the future, in deciding about vaccination, about 81% of the non-clinical students agreed with the statement, and surprisingly, more than half (56%) of the clinical students also agreed with the same statement. In practice, none of the students had undergone screening for HIV infection or cervical cancer in the past, in spite of being medical graduates. Fortunately, about 73% of non-clinical and 59% of clinical students had the practice of seeking professional help in cases of the development of related signs and symptoms.

Findings from the current study are striking, especially in certain areas like "HPV vaccination will be perceived by others as "active sexual behavior," "parents' role in deciding to get vaccinated," "opinion of partner in deciding about vaccination," and "none of the students had undergone screening for HIV infection or cervical

cancer in the past." As mentioned in standard textbooks of community medicine, Indian society is a "closed class" system and it is difficult to make reforms without meeting resistance. In spite of progress in women's empowerment, the right to get vaccinated against a sexually transmitted disease still remains cumbersome, even in the case of medical graduates, and it is strongly rooted in their minds, irrespective of sex¹.

Students in clinical phases had good knowledge, a better attitude, and fair practice when compared with students in non-clinical phases in certain domains like the aetiology and prognosis of cervical cancer, the efficacy of vaccines, and their readiness to get professional help if they developed any related signs or symptoms. On the other hand, there were no differences between both groups in other aspects like transmission of HPV other than sexual route, cure for HPV infection, and availability of vaccines for both sexes. Overall knowledge among clinical students (mean = 7.45) in relation to HPV was significantly better than that of non-clinical students (mean = 6.54, $p < 0.001$). The National Medical Commission has implemented competency-based medical education (CBME) with the aim of integrating clinical knowledge from the first year of medical graduation. Though students from non-clinical phases were able to cross the halfway mark in achieving clinical competencies, they are still lagging behind in specific domains. An effective implementation of CBME is the need of the hour. It would turn students from clinical and non-clinical phases to be competent enough, not only in knowledge related to HBV infection, cervical cancer, and HPV vaccination but also in every aspect of the broader scope of clinical knowledge and practice.

CONCLUSION: From the study conducted among medical students from non-clinical and clinical phases, it was concluded that clinical students have better knowledge than non-clinical students in certain areas related to the aetiology of cervical cancer and host factors related to HPV infection. In terms of knowledge related to modes of HPV transmission, management of HPV infection, eligibility, and affordability of the HPV vaccine, clinical students do not differ much from non-clinical students. It is highly recommended to

implement CBME in an effective manner from the very beginning to integrate clinical knowledge and skills into the competency of every Indian medical graduate.

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