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Mapping Awareness and Attitude Pattern of Medical Students on Cervical Cancer Preventive Vaccination and Screening for Human Papilloma Virus (HPV)

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ABSTRACT

Introduction: *The role of Human Papilloma Virus (HPV) infection in cervical cancer development is a strongly established relationship. Cervical cancer is the second leading cause of death due to cancers in women. The recognition that cervical cancer is caused by HPV infection and can be prevented by vaccination, and curable if diagnosed in the early stages is an immense scientific contribution to the mankind. However, vaccination is a benefaction for the Indian people with low-socio-economic status in whom preventive screening is almost never done.*

Aim: *This study aims to collect and assess the familiarity and recognition on Human papilloma Virus (HPV) infection and HPV vaccination rate among medical students in our medical college. Medical students, the future health care providers are necessary for spreading knowledge among people in the general population. Success of any vaccination program depends on creating awareness in the population.*

Materials and Methods: *This is a cross sectional study carried out in our medical college, Karpagam Faculty of Medical Sciences and Research, in Coimbatore, Tamilnadu, India. Total of 473 students, both male and female from clinical and pre-clinical semesters are approached with a structured explorative questionnaire form in English. The students are assessed after informing them that this study is only for research purpose and their identity will be preserved. Statistically, the collected data were analyzed.*

Results: *Our study has revealed that majority of students from both genders in undergraduate medical education program have limited knowledge on many aspects of the HPV infection and HPC vaccination. Therefore, there is an urgency to implement necessary measures to increase their knowledge as well as the general public with regard to HPV and the benefits of vaccination. Thereby, the burden of cervical cancer will be reduced in a low-income country like India.*

Conclusion: *First, awareness and education among medical people and later among general public will have a great impact on the implementation of the IAP immunization program and its future successful coverage of vaccination and thereby prevention of cervical cancer. Our data will help the national immunization committee to plan the future strategies required to improve the immunization coverage in India. Further studies are suggested on the vaccinated group for clinical effectiveness of the vaccine.*

Keywords: *human papilloma virus (HPV), immunization, medical students, cervical cancer and cytology screening.*

Introduction

Most of the human papilloma virus (HPV) types cause diseases at specific anatomic sites. These include common warts in limbs, benign warts in ano-genital tract region, and respiratory papillomas. Non-oncogenic HPV serotypes 6&11 cause 90% of ano-genital warts. However, some oncogenic HPVs cause anal, vulvar, penile and oro-pharyngeal cancers. Particularly, serotypes 16&18 are associated with 70% cases of cervical cancer[1].Cancer of uterine cervix is the second most common neoplasia and the 2nd leading cause of death in women worldwide including India. Nationally, it accounts for 26-44% of all cancers in women aged 15 to 44 years. Age adjusted incident rate (AAR) of cervical cancer in Indian women is 27/100,000. It may be even higher in rural areas. In 2008, there were 72826 cervical cancer related deaths in India, which is expected to nearly double by 2025[2].Therefore, HPVs are the primary target of cervical cancer prevention and control.

The HPV is transmitted through sexual contact. Infected females transmit the virus more effectively than males. Persistence oncogenic HPV infection is a necessary prerequisite for the development of significant pre-cancerous lesions[3]. Though, sexually active adolescence has detectable HPV, their cytology is normal. The lag period between oncogenic HPV infection and cervical cancer development is 15- 20 years[4]. However, it is preventable through cytological screening. Repeated cytology screening has led to a rapid decline in cervical cancer burden in developed countries. In adequate screening, in contrast is increasing the strain on developing countries. The cytology, however, detect changes only after they have occurred. Though treatment of precancerous and early stage neoplasia prevents cervical cancer, the primary measure is HPV vaccination[5]. Currently, there are two clinically evaluated vaccines available in the market. A quadrivalent vaccine, Gardasil TM is providing protection against both the high-risk (types 16&18) and low-risk (types 6 &11) HPVs, whereas a bivalent vaccine, Cervarix TM grants protection only against the former[6].

Cancer vaccination is an emerging filed, but it assumes more importance in public health in India. The Indian Association of Pediatrics (IAP) in 2013has included HPV vaccination in immunization schedule and recommended the vaccination of girls before their sexual debut[7&8]. However, it has not gained much acceptance among targeted groups partly due to improper endorsements and inadequate awareness among health care providers. As a consequence, majority of adolescences are either not immunized or don't want to. Further, immunized women may get the false feeling of protection against all cancers and stop routine screening[9]. Thus, less number of women undergoes routine cervical cancer screening. Therefore, it is very clear that the mere availability of an effective vaccine is not tantamount to an effective vaccination program.

In effective implementation of preventive HPV vaccination program, and fostering vaccine acceptance and awareness, the education initiatives targeting health care professionals will have important implications[10&11]. Today's medical students as a future community serving physicians must aware of advances on HPV biology, pathology and prevention. They will be sought as the first line of information and they can play an important role in spreading awareness among wide range of population[12&13]. Therefore, we choose medical students and conducted the present study to quantify their knowledge and awareness on HPV infection, cervical cancer etiology, preventive measures, target population, side effects and efficacy of HPV vaccine, their attitude towards vaccination in preventing HPV infection and thereby cervical cancer. Results obtained from the present study might be use fulat the policy level to implement awareness program on this important public health issue among healthcare professionals.

Materials and methods

This cross-sectional questionnaire based study is conducted at Karpagam Faculty of Medical Sciences and Research (KFMS&R), Coimbatore, Tamilnadu, India in January 2016to ascertain the knowledge and awareness level among undergraduate medical students (MBBS) on HPV infection and its prevention. The Institutional Human Ethical Committee (IHEC) has approved this study (IHEC/37/Pediatrics/11/2015). The study population includes both pre-clinical (247) and clinical batches (226) totaling 473 students (total college strength: 600) aged 17-23 years, out of which 219 are males and254 are females. This study besides excluding unwilling participants, it also ensured personal right to withdraw from the survey at any moment. Students are explained and educated in detail about the study, its purpose, and contents and completion of questionnaire. They are encouraged to ask questions on their participation. The participatory consent is obtained from each separately. Students are approached during lecture time to get them in full numbers. This has prevented dissemination of study information as well as textbook referrals to complete the questionnaire. Students are distributed with English printed self-administered questionnaire and are requested to complete it. The questionnaire covers aspects of knowledge and awareness on HPV infection, cervical malignancy, HPV screening and HPV vaccination. Actually, the study has two components. In the first, questions are designed to acquire information on baseline understanding of HPV infection, disease caused by HPV, screening, concept of vaccination and its acceptance level. Secondly, after completion of the questionnaire, answers are provided to educate participants to aware of the facts on HPV and its prevention. The returned questionnaires are checked for completeness and consistency. The responses of participants to questionnaire are stratified based on gender (male and female) and MBBS program level (pre-clinical and clinical), and analyzed accordingly. The obtained data are analyzed using SPSS statistical software version 23. Chi square test is used to assess the significance of responses and a p-value, 0.05 is considered statistically significant.

Results

A total of 473 students of both genders from two stages of MBBS program had enrolled in this study. All participants had completed the assigned questionnaire and thus were included in the final analysis. The age of participants was in the range of 17 to 23 years, in which 278 (58.8%) students had constituted 17-19 years group while 195 (41.2%) students were belonged to 20-23 years group (table 1). Student's representation in this study below the age of twenty was slightly higher. The total participation was comprised of 219 (46.3%) male and 254 (53.7%) female students at gender level (table 1). Similarly, the participation was composed of 247 (52.2%) pre-clinical and 226 (47.8) clinical students at curricular level (table 1).Student's segregation both by sex and program level had nearly an equal distribution across divided categories. We considered students studying pre-clinical curriculum had minimal exposure to clinical teaching and thus to patients. Therefore, we equated this group with general literate public and it had served as a control in our study to evaluate the medical education contributions in contagious cervical cancer prevention and control.

General awareness on diseases caused by HPV (table 2).

All participants were presented with five questions to ascertain student's general awareness on HPVs role in human diseases particularly in cervical cancer. As a source of information, 128 (52.0%) pre-clinical and 197 (87.2%) clinical students had referred primarily teachers while media, friends and others had contributed information to105 (42.3%) pre-clinical and 29 (12.8%) clinical students. Teachers had significant influence ($p<0.0001$) on clinical students, and media, friends and others had considerable impact

(p<0.0001) on pre-clinical group. Only, 14 (5.7%) pre-clinical students had opted for not heard option, which was completely absent in the clinical group. When this exact data was segregated and analyzed based on gender, teachers had more (p<0.0303) influence on female 194 (76.4%) compared to male 131 (59.8%) students. This trend had reversed (p<0.0033) when media, friends and others became the information source. In the case of not heard option, no significant difference was observed between two genders (p<0.1771).On cervical cancer causation, 147 (59.6%) pre-clinical and 224 (99.1%) clinical students had affirmed HPVs role while only 9 (3.6%) pre-clinical students chosen no. In don't know option, pre-clinical 91 (36.8%) students had formed the majority when clinical 2 (0.9%) student's representation had dropped drastically in this category. Nevertheless, clinical students had majorly chosen yes option (p<0.0001) while pre-clinical students had opted predominantly for don't know (p<0.0001). However, division of this data by the sex of participants had resulted in insignificant distribution of numbers between male and female students in each given option (yes, p<0.3088; no, p<0.5776 and don't know, p<0.0630).On causation of ano-genital warts by HPV, nearly 92.9% of clinical students had significantly pronounced yes option (p<0.0001) while it was only 30% in pre-clinical group. However, pre-clinical students had dominated significantly in choosing no (p<0.0001) and don't know (p<0.0001) options compared to the clinical group. Gender based division of this data in contrary, had revealed insignificant distribution of male and female students on yes (p<0.8576) and don't know (p<0.1965) choices. However, only few female students had selected no (p<0.0372) compared to male students. For HPV asa cause of other cancers, nearly 56 (22.7%) pre-clinical and 89 (39.4%) clinical students had (p<0.001) acknowledged significantly its rolein neoplastic development while students number answered no in both curricular group were insignificant (p<0.1694). Majority of pre-clinical 151 (61.1%) students had (p<0.0007) opted significantly for don't know option while clinical group formed only 60% of that number 88 (38.9%).Partition of this data by gender produced insignificant placement of both male and female students in all given options (yes, p<0.3287; no, p<0.9649 and don't know, p<0.4630).On cervical cancer preventability, majority of pre-clinical 199 (80.6%) and clinical 220 (97.4) (p<0.0528) students had chosen yes answer whereas pre-clinical students had judged predominantly no (p<0.0001) and don't know (p<0.0082) choices compared to the clinical group. Gender based bisection of this data had both male 181 (82.7%) and female 238 (93.7%) students largely selecting yes option (p<0.2029) while male students had primarily chosen no (p<0.0006) and don't know (p<0.2076) options compared to the female group.

General awareness on HPV biology (table 3).

Participants were provided with four questions to establish student's general awareness on HPV biology. To the query on HPV types causing cervical cancer in women,47 (19.0%) pre-clinical and 32 (14.2%) clinical students had insignificantly chosen serotypes-6&11 (p<0.1956) while, significant pre-clinical students (175 (70.9%) had preferred don't know (p<0.0001) option compared to the clinical group. However, majority of clinical students 184 (81.4%) had selected serotypes-16&18 (p<0.0001) as a choice compared to the pre-clinical group. Analysis of this data by gender had resulted in insignificant disposition (serotypes-6&11, p<0.4196; serotypes-16&18, p<0.3316 and don't know, p<0.1272) of male and female student groups for the choices provided. In regard to HPV transmission mode, 85 (34.3%) pre-clinical and 87 (38.5%) clinical students insignificantly (p<0.4620) had accepted bad genital hygiene as an option. However, majority of clinical students117 (51.8%)had significantly (p<0.0001) chosen sexual contact as a primary transmission course than the pre-clinical group 59 (24.0%).In contrary, predominant pre-clinical students had significantly opted to blood

transfusion (p<0.0001) and don't know (p<0.0002) choices compared to the clinical group. When this data was analyzed on gender basis, majority of female 106 (41.7%) and male 44 (20.1%) students respectively had decided significantly on bad genital hygiene (p<0.0371) and don't know (p<0.0426) options. However, both sexes were insignificantly associated in the selection of remaining two categories (sexual contact, p<0.7042 and blood transfusion, p<0.5076).On preventive approaches to HPV, insignificant (p<0.0824) proportion of pre-clinical 103 (41.6%) and clinical 119 (52.7%) students had chosen vaccine as a measure. Predominant clinical students 38 (16.8%) had selected cytological screening as a preventive choice (p<0.0001) compared to the pre-clinical group. Clinical students compared to pre-clinical group have significantly disapproved good genital hygiene (p<0.0001) and avoidance of blood transfusion (p<0.0001) as effective HPV preventive methods. In don't know category, both curricular groups were insignificantly disposed (p<0.8979).Examination of this data on gender basis had shown that prevalent number of female 140 (55.1%) and 68 (31.1%) male students respectively had chosen vaccine (p<0.0051) and don't know (p<0.0366) options. However, both sexes were insignificantly associated in the selection of remaining three (screening, p<0.2678, genital hygiene, p<0.3895 and avoidance of blood transfusion, p<0.3822) choices. When the participants were evaluated on their familiarity with HPV vaccine, 138 (55.9%) pre-clinical and 207 (91.6%) clinical students had significantly acknowledged the availability of vaccine for HPV (p<0.0001). However, more number of pre-clinical students 109 (44.1%) compared to clinical group 19 (8.4%) had marked no(p<0.0001). In case of gender wise analysis, the observed frequencies between male and female students were insignificant in any given options (yes, p<0.5357 and no, p<0.3093).

General awareness on HPV vaccine (table 4).

The students were given six questions to evaluate their general awareness on HPV vaccine. To the query on whether HPV vaccine was part of scheduled immunization program,81 (32.8%) pre-clinical and 56 (24.8%) clinical students were insignificantly affirmative(p<0.1057). However, majority of clinical students 161 (71.2%) compared to pre-clinical 116 (47.0%) group, have opted no (p<0.0006) while pre-clinical 50 (20.2%) students majorly preferred don't know option in comparison to 9 (4.0%) clinical group (p<0.0001).Analysis of this data on the basis of gender, none of the given options had significant difference between male and female students (yes, p<0.4477; no, p<0.9281 and don't know P<0.3363). In regard to number of administrative doses of HPV vaccine, 57 (23.1%) pre-clinical and 18 (8.0%) clinical students had selected 3 doses as an option (p<0.0001) while majority of both curricular groups insignificantly (p<0.0735) opted to don't know choice. Gender based analysis of this data had shown no marked difference between male and female students in given options (3 doses, p<0.6895 and don't know, p<0.8623). On optimal HPV vaccination age, both pre-clinical and clinical students for the three given options had insignificant distribution (10-12 years, P<0.3132, >25 years, p<0.9262 and don't know, p<0.3620). Analysis of this data based on gender had shown no marked difference between male and female student groups in two options (10-12 years, p<0.8969 and don't know, p<0.2020) while female students had significantly preferred more than 25 years of age (p<0.0271) as a choice. With regard to HPV vaccination dosage, 39 (15.8%) pre-clinical and 63 (27.9%) clinical students, and 112 (45.3%) pre-clinical and 66 (29.2%) clinical students had significantly favored 0.5ml (p<0.0047) and 1.0ml (p<0.0043) volumes respectively as an administration dosage. However, insignificant number of both curricular groups had chosen the rest of two options (2.0ml, p<0.7740 and don't know, p<0.3787). Analysis of this data based on gender had resulted in

insignificant distribution across all four options between male and female students (0.5ml, p<0.5818, 1.0ml, p<0.7167, 2.0ml, p<0.6260 and don't know, p<0.8756).On route of vaccine administration, both curricular students group insignificantly had selected (IM, P<0.2281, SC, P<0.7307 and don't know, p<0.1197) three options while pre-clinical students had registered predominantly on IV choice (p<0.0001) compared to the clinical group. However, 157 (61.8%) female and 83 (37.9%) male students significantly (p<0.0003) had picked IM as the route of administration while predominant male students had selected the next two options (SC, p<0.0037 and IV, p<0.0047). Nearly, equal number of students from both genders had named the last option(don't know, p<0.1688).On protection conferred by the HPV vaccine, majority of clinical 42 (18.6%) and pre-clinical57 (23.1%) students had respectively favored two protection categories (100%, p<0.021 and 50%, p<0.0004). However, for the remaining two options both curricular groups did not show any significant difference (70%, p<0.4050 and don't know p<0.9441). This data when subjected to gender based analysis had resulted in insignificant difference between male and female students distribution in all four choices provided (100%, p<0.5406, 70%, p<0.4868, 50%, p<0.7219 and don't know, p<0.4202).

General attitude towards HPV vaccination (table 5).

Students were given four questions in this section to assess their general attitude towards HPV vaccination. To the query on whether they had already vaccinated for HPV, 17 (6.9%) pre-clinical and 12 (5.3%) clinical students had (p<0.4902) confirmed their vaccinated status while majority of pre-clinical 230 (93.1%) and clinical students214 (94.7%) had answered no (p<0.8600). When this was supervised through gender, both male and female students did not show significant difference in any given choices (yes, p<0.0992 and no, p<0.6735).When students were asked to endorse HPV vaccination, majority of pre-clinical 163 (66.0%) and clinical 182 (80.5%) students had ratified yes (p<0.0644). However, sizable pre-clinical students 66 (26.7%) had chosen no (p<0.0001) option when compared to the clinical group. Both curricular group equally authorized don't know (p<0.4482) option. When the gender based analysis was conducted on this data, both male and female students more or less in equal strength had embraced yes (p<0.0893) and no (p<0.1487) options respectively. However, male students had predominantly selected don't know choice in comparison with the clinical group (p<0.0041). On the justification of not to take vaccine, majority of clinical 43 (19.0%) and pre-clinical 236 (95.5%) students had marked respectively only for females (p<0.0001) and no idea (p<0.0452) options. In contrary, only few clinical students had selected the remaining three (only for males, p<0.1393; both males and females, p<0.2958 and expensive, p<0.0702) choices. When the data was subjected to gender based analysis, majority of male44 (20.0%) and female 242 (95.3%) students had registered in only for females (p<0.0001) and no idea (p<0.0460) options respectively. Only, few male and female students had selected the remaining three (only for males, p<0.1278; both males and females, p<0.2815 and expensive, p<0.6524) choices. To the personal preference for HPV vaccination, majority of pre-clinical 162 (65.6%) and clinical 200 (88.5%) students had decided on yes (p<0.0044) while only pre-clinical 85 (34.4%) students had majorly selected no (p<0.0001) option. In gender-based partition, majority of female 211 (83.1%) and male 68 (31.0%) had opted for yes (p<0.0800) and no (p<0.0016) answers respectively.

General awareness on HPV detection and screening (table 6).

Students were provided with nine questions in this section to document their awareness level in HPV detection and screening. To the query on HPV detect ability, majority of clinical 216 (95.6%) and

pre-clinical 184 (74.5%) students had overwhelmingly selected yes (p<0.0128) while significant number of pre-clinical 63 (25.2%) students opted to no (p<0.0001) in comparison to the clinical group. In case of gender based analysis, majority of male 184 (84.0%) and female 216 (85.0%) students had answered yes in comparison to no. However, value distribution across gender in both yes (p<0.9042) and no (p<0.7780) options was insignificant. On awareness on Pap smear, maximum number of clinical 218 (96.5%) and pre-clinical 168 (68.0%) students had preferred yes (p<0.0001) and no (p<0.0001) options respectively. In gender-based segregation, female 172 (67.7%) had selected yes insignificantly (p<0.1454) in comparison to male 125 (57.1%) students. The selection of no also had followed similar distribution between male and female students (p<0.0586). In respect to familiarity with colposcopy, sizeable number of clinical 189 (83.6%) and pre-clinical 115 (46.6%) students had favored yes (p<0.0001) and no (p<0.0001) options respectively. However, the gender based analysis of male and female students adopting yes (p<0.7690) and no (p<0.6695) choices respectively were insignificant. With regard to cervical biopsy, majority of clinical 211 (93.3%) and pre-clinical 91 (36.8%) students had selected respectively yes (p<0.0002) and no (p<0.0001) choices. In gender based analysis, female students majorly had chosen insignificantly yes (p<0.2529) compared to male group. However, majority of male students had judged no (p<0.0334) in comparison to female group. In the case of PCR based detection of HPV, maximum number of clinical 145 (64.2%) and pre-clinical 190 (76.9%) students had preferred yes (p<0.0001) and no (p<0.0001) choices respectively. However, the gender based analysis of male and female students preference on yes (p<0.4806) and no (p<0.5049) options were respectively insignificant. To the query on HPV detect ability by ELISA based methods, sizeable number of clinical 134 (59.3%) and pre-clinical 154 (62.3%) students had selected correspondingly yes ((p<0.0007) and no (p<0.0011) options. In gender-based analysis, male and female students had subsequently opted for yes (p<0.4324) and no (p<0.4507) options. In *in-vitro* culturing of HPV, majority of clinical 105 (46.5%) and pre-clinical 202 (81.8%) students had proportionately chosen yes (p<0.0001) and no (p<0.0002) choices. However, insignificant number of both male and female students had opted to yes (p<0.6882) and no (p<0.7845) options. A question on prevention of cervical cancer through cytology-based screening had maximum number of clinical 202 (89.4%) and pre-clinical 145 (58.7%) students favoring appropriately yes (p<0.0001) and no (p<0.0001) options. Similarly, sizeable number of female 182 (71.7%) and 97 (44.3%) male students had represented correspondingly yes (p<0.0310) and no (p<0.0038) choices. A query on pre-vaccinated women requiring cytology based screening had significant number of clinical 190 (84.1%) and pre-clinical 108 (43.7%) students preferred respectively yes (p<0.0003) and no (p<0.0001) options. However, sex based analysis of this exact data did not show any significant difference between male and female responders subsequently for yes (p<0.8833) and no (p<0.8244) options.

Results

Characteristics	Participants (N=473)	Distribution (%)
1. Gender		
Male	219	46.3
Female	254	53.7
2. Program level		
Pre-clinical	247	52.2
Clinical	226	47.8
3. Age		
17-19	278	58.8
20-23	195	41.2

Table1. Population demographics.

Clubs	Program Level				P-Value	Gender				P-Value
	Pre-clinical (N=247)		Clinical (N=226)			Male (N=219)		Female (N=254)		
	Freq	(%)	Freq	(%)		Freq	(%)	Freq	(%)	
1. Information source Teacher	128	52.0	197	87.2	0.0001	131	59.8	194	76.4	0.0303
Media, Friends and others	105	42.3	29	12.8	0.0001	79	36.1	55	21.6	0.0033
Not Heard	14	5.7	000	----	-------	9	4.1	5	2.0	0.1771
2. Can HPV cause cervical cancer?										
Yes	147	59.6	224	99.1	0.0001	162	74.0	209	82.3	0.3088
No	9	3.6	000	----	-------	5	2.3	4	1.6	0.5776
Don't know	91	36.8	2	0.9	0.0001	52	23.7	41	16.1	0.0630
3. Can HPV cause anal or genital warts?										
Yes	74	30.0	210	92.9	0.0001	133	60.7	151	59.5	0.8576
No	33	13.4	5	2.2	0.0001	24	11.0	14	5.5	0.0372
Don't know	140	56.6	11	4.9	0.0001	62	28.3	89	35.0	0.1965
4. Can HPV cause any other cancer?										
Yes	56	22.7	89	39.4	0.0010	73	33.3	72	28.3	0.3287
No	40	16.2	49	21.7	0.1694	41	18.7	48	18.9	0.9649
Don't know	151	61.1	88	38.9	0.0007	105	48.0	134	52.8	0.4630
5. Is cervical cancer preventable?										
Yes	199	80.6	220	97.4	0.0528	181	82.7	238	93.7	0.2029
No	33	13.4	3	1.3	0.0001	27	12.3	9	3.5	0.0006
Don't know	15	6.0	3	1.3	0.0082	11	5.0	7	2.8	0.2076

Table 2. General awareness on HPV.

Clubs	Program Level				P-Value	Gender				P-Value
	Pre-clinical (N=247)		Clinical (N=226)			Male (N=219)		Female (N=254)		
	Freq	(%)	Freq	(%)		Freq	(%)	Freq	(%)	
1. Serotypes responsible for cervical cancer										
Serotypes 6 & 11	47	19.0	32	14.2	0.1956	33	15.1	46	18.1	0.4196
Serotypes 16 & 18	25	10.1	184	81.4	0.0001	90	41.1	119	46.9	0.3316
Don't know	175	70.9	10	4.4	0.0001	96	43.8	89	35.0	0.1272
2. How HPV is transmitted?										
Bad genital hygiene	85	34.3	87	38.5	0.4620	66	30.1	106	41.7	0.0371
Sexual contact	59	24.0	117	51.8	0.0001	84	38.4	92	36.2	0.7042
Blood transfusion	47	19.0	2	0.9	0.0001	25	11.4	24	9.5	0.5076
Don't know	56	22.7	20	8.8	0.0002	44	20.1	32	12.6	0.0426
3. If preventable, how?										
Vaccine	103	41.6	119	52.7	0.0824	82	37.4	140	55.1	0.0051
Screening	0	----	38	16.8	0.0001	21	9.6	17	6.7	0.2678
Good genital hygiene	60	24.4	10	4.4	0.0001	36	16.0	34	13.4	0.3895
Avoid blood transfusion	21	8.5	0	----	0.0001	12	5.5	9	3.5	0.3822
Don't know	63	25.5	59	26.1	0.8979	68	31.1	54	21.3	0.0366
4. Have you heard of HPV vaccine?										
Yes	138	55.9	207	91.6	0.0001	154	70.3	191	75.2	0.5357
No	109	44.1	19	8.4	0.0001	65	29.7	63	24.8	0.3093

Table 3. General awareness on HPV biology.

Clubs	Program Level				P-Value	Gender				P-Value
	Pre-clinical (N=247)		Clinical (N=226)			Male (N=219)		Female (N=254)		
	Freq	(%)	Freq	(%)		Freq	(%)	Freq	(%)	
1. Is it a scheduled immunization vaccine?										
Yes	81	32.8	56	24.8	0.1057	59	26.9	78	30.7	0.4477
No	116	47.0	161	71.2	0.0006	129	58.9	148	58.3	0.9281
Don't know	50	20.2	9	4.0	0.0001	31	14.2	28	11.0	0.3363
2. No of doses administered										
3 doses	57	23.1	18	8.0	0.0001	33	15.1	42	16.5	0.6895
Don't know	190	76.9	208	92.0	0.0735	186	84.9	212	83.5	0.8623
3. Vaccination age										
10-12 years	104	42.1	82	36.3	0.3132	87	39.7	99	39.0	0.8969
> 25 years	45	18.2	42	18.6	0.9292	30	13.7	57	22.4	0.0271
Don't know	98	39.7	102	45.1	0.3620	102	46.6	98	38.6	0.2020
4. Vaccination dosage										
0.5ml	39	15.8	63	27.9	0.0047	50	22.8	52	20.5	0.5818
1.0ml	112	45.3	66	29.2	0.0043	80	36.5	98	38.6	0.7167
2.0 ml	17	6.9	14	6.2	0.7740	13	6.0	18	7.0	0.6260
Don't know	79	32.0	83	36.7	0.3787	76	34.7	86	33.9	0.8756
5. Route of administration										
IM	116	47.0	124	54.9	0.2281	83	37.9	157	61.8	0.0003
SC	30	12.1	30	13.2	0.7307	39	17.8	21	8.3	0.0037
IV	41	16.6	0	----	0.0001	28	12.8	13	5.1	0.0047
Don't know	60	24.3	72	31.9	0.1197	69	31.5	63	24.8	0.1688
6. Protection provided by the vaccine (%)										
100%	26	10.5	42	18.6	0.0210	34	15.5	34	13.4	0.5406
70%	102	41.3	106	47.0	0.4050	91	41.6	117	46.0	0.4868
50%	57	23.1	22	9.7	0.0004	35	16.0	44	17.3	0.7219
Don't know	62	25.1	56	24.7	0.9441	59	26.9	59	23.3	0.4202

Table 4. General awareness on HPV vaccine.

Clubs	Program Level				P-Value	Gender				P-Value
	Pre-clinical (N=247)		Clinical (N=226)			Male (N=219)		Female (N=254)		
	Freq	(%)	Freq	(%)		Freq	(%)	Freq	(%)	
1. Did you take vaccine?										
Yes	17	6.9	12	5.3	0.4902	9	4.1	20	7.9	0.0992
No	230	93.1	214	94.7	0.8600	210	95.9	234	92.1	0.6735
2. Do you recommend HPV vaccination?										
Yes	163	66.0	182	80.5	0.0644	144	65.8	201	79.2	0.0893
No	66	26.7	23	10.2	0.0001	48	21.9	41	16.1	0.1487
Don't know	18	7.3	21	9.3	0.4882	27	12.3	12	4.7	0.0041
3. Reason not to take vaccine										
Only for females	11	4.5	43	19.0	0.0001	44	20.0	10	3.9	0.0001
Only for males	0	----	2	1.0	0.1393	2	1.0	0	----	0.1278
Both males and females	0	----	1	0.4	0.2958	1	0.5	0	----	0.2815
Expensive	0	----	3	1.3	0.0702	1	0.5	2	0.8	0.6524
No idea	236	95.5	177	78.3	0.0452	171	78.0	242	95.3	0.0460
4. Do you like to be vaccinated?										
Yes	162	65.6	200	88.5	0.0044	151	69.0	211	83.1	0.0800
No	85	34.4	26	11.5	0.0001	68	31.0	43	16.9	0.0016

Table5. General attitude towards HPV vaccination.

Clubs	Program Level				P-Value	Gender				P-Value
	Pre-clinical (N=247)		Clinical (N=226)			Male (N=219)		Female (N=254)		
	Freq	(%)	Freq	(%)		Freq	(%)	Freq	(%)	
1. Is HPV detectable?										
Yes	184	74.5	216	95.6	0.0128	184	84.0	216	85.0	0.9042
No	63	25.5	10	4.4	0.0001	35	16.0	38	15.0	0.7780
2. Do you have an idea about Pap smear?										
Yes	79	32.0	218	96.5	0.0001	125	57.1	172	67.7	0.1454
No	168	68.0	8	3.5	0.0001	94	42.9	82	32.3	0.0586
3. Do you have an idea about Colposcopy?										
Yes	132	53.4	189	83.6	0.0001	146	66.7	175	69.0	0.7690
No	115	46.6	37	16.4	0.0001	73	33.3	79	31.0	0.6695
4. Do you know about Cervical biopsy?										
Yes	156	63.2	211	93.3	0.0002	159	72.6	208	81.9	0.2529
No	91	36.8	15	6.7	0.0001	60	27.4	46	18.1	0.0334
5. Do you have an idea about HPV PCR?										
Yes	57	23.1	145	64.2	0.0001	99	45.2	103	40.6	0.4806
No	190	76.9	81	35.8	0.0001	120	54.8	151	59.4	0.5049
6. Do you have an idea about HPV ELISA?										
Yes	93	37.7	134	59.3	0.0007	111	50.7	116	45.7	0.4324
No	154	62.3	92	40.7	0.0011	108	49.3	138	54.3	0.4507
7. HPV cannot be cultured in cell lines?										
Yes	45	18.2	105	46.5	0.0001	67	30.6	83	32.7	0.6882
No	202	81.8	121	53.5	0.0002	152	69.4	171	67.3	0.7845
8. Can cervical cancer be Prevented by screening?										
Yes	102	41.3	202	89.4	0.0001	122	55.7	182	71.7	0.0310
No	145	58.7	24	10.6	0.0001	97	44.3	72	28.3	0.0038
9. Does the vaccinated Women require cervical cancer screening?										
Yes	139	56.3	190	84.1	0.0003	151	69.0	178	70.1	0.8833
No	108	43.7	36	15.9	0.0001	68	31.0	76	29.9	0.8244

Table 6. General awareness on HPV detection and screening.

Discussion

Cancer prevention through vaccination is a novel and effective approach that has been tried against HPV induced cervical cancer worldwide. In India, in-adequate reach of awareness on HPV role in cervical cancer development among general public has left many myths and misconceptions in their minds on HPV vaccination. Now, the oneness is on medical community to bridge this awareness gap. Especially, medical students as

future generation of health care providers are uniquely positioned to create the much-needed general awareness on HPV vaccination. Therefore, this data is gathered from medical students and analyzed for their knowledge and awareness level on HPV, cervical cancer prevention, and for their attitude towards HPV vaccination. Our data has identified that the information source for medical students on HPV infection and cervical cancer varied significantly according to their gender and medical program. For example, students in clinical program and females in majority have relied on their teachers for information. In contrast, pre-clinical and male students are dependent on media, friends and other sources. This varied trend of information source dependence among medical students is never reported earlier[10,11&14]. It is a unique observation of our study and this should be an important component in devising future awareness programs. We have observed that majority of our students are well aware the cause of cervical cancer irrespective of their gender and program level. However, this observed awareness is significantly higher among clinical and lesser in pre-clinical students. We have expected this difference in awareness level between clinical and pre-clinical students as the lateris exposed to clinical learning only in later years of the program. Male and female students have exhibited equal awareness level. A study by Pandey et al.,[13] has also reported similar observation on HPV awareness among final year medical students. Overwhelmingly, our students have identified HPV as a causative of genital or anal warts in humans. However, this understanding is significantly higher in students of clinical program (92.9%) and relatively poor among pre-clinical students (30.0%). No such difference is observed between male and female students. Small group of students have held HPV responsible for other cancers in humans. This is significantly higher among students of clinical program (39.4%) and lesser in pre-clinical students (22.7%). Such a distinction is not observable between male and female students. Medical students in earlier studies have associated HPV with other human cancers at varied level(44% in Mehta et al.,[10] and 89.0% in Challa et al.,[12]). However, like ours, those studies have not categorized the data on program basis. Therefore, it is an interesting observation that is never reported earlier. Participants of our study are predominantly aware of the preventable nature of cervical cancer irrespective of their gender and program level. Similar findings are reported by Mehta et al.,[10] Challa et al.,[12]andPandey et al.,[13] while Saha et al.,[15] observed very low awareness level among female students in Kolkata's premier colleges.

Our students in majority have held HPV serotypes 16, 18 responsible for cervical cancer in women. This identification is significantly more among students in clinical program than pre-clinical. Our result is similar to the observation reported by Challa et al.,[12]. However, they have not compared the response of two groups of medical students. Moreover, there is no difference of opinion is observed between male and female students on this issue. Predominant participating students in our study have rightly stated sexual contact and bad genital hygiene as major modes of HPV transmission. Especially, clinical students in considerable numbers have identified sexual contact as the primary transmission route of HPV. Our findings are similar to the pattern observed in Mehta et al.,[10] and Challa et al.,[12].However, pre-clinical and female students are unaware on the mode of HPV transmission. Majority of our students have identified HPV vaccination and cytological screening as effective cervical cancer preventive tools. This identification rate is higher among students in clinical program than pre-clinical. Similar observations are also made in the study by Challa et al.,[12]. However, sizeable number of female students has identified HPV vaccination as a potential cervical cancer preventive approach. Most students who have participated in our study have known about HPV vaccination. The familiarity on HPV vaccination is higher among students in clinical program

(91.6%) and relatively lesser in pre-clinical students (55.9%). Similar trend has been recorded in studies conducted by Challa et al.,[12] and Pandey et al.,[13]. However, both studies have not differentiated student's response on program level. More importantly, equal percentages of male (70.3%) and female (75.2%) students are familiar with HPV vaccine. Only, few male and female students do not know what is HPV and not aware of the availability of HPV vaccine. This group actually is a representative of literate general public. Therefore, it is expected that awareness on HPV among illiterate general public will be as abysmal as shown ina study conducted at rural Karnataka[16].

The knowledge that HPV vaccine is a scheduled immunization vaccine is limited and insufficient among medical students. This poor rate of awareness on national immunization recommendations has never been studied in previous studies[10,12 &13]. This trend is also continuous among male and female students. Similarly, awareness on vaccination dose is relatively poor among medical students. Only, small percentage of clinical and pre-clinical students have selected correct administration dose for HPV vaccine, however, recently there is a policy change in the administration dose of HPV vaccine and it varies according to the gender and the age of an individual[17]. This poor trend is also reflected in gender-based categorization. Only an average number of students have known appropriate age for HPV vaccination. There is no significant difference observed between pre-clinical and clinical students. Mehta et al.,[10] and Challa et al[12] have recorded targeted population identification rate by medical students at 50% and 72.4% respectively. However, they have conducted the study only on final year medical students. Therefore, their study do not discriminate the response of pre-clinical and clinical students. Similar trend is also observed between male and female medical students. Only a small group of students have identified correct dosage schedule of HPV vaccination. Interestingly, significant number of pre-clinical students has identified correct dosage schedule. Though Challa et al[12] has also observed poor rate of awareness on vaccine dosage schedule, their study could not distinguish students based on the program. However, such a clear distinction is not observable between male and female students. More than half of participants have known the right route of vaccine administration, which is equally distributed between clinical and pre-clinical students. Challa et al[12] has also reported a similar rate of awareness among medical students on route of vaccine administration. However, female students in significant number have chosen correct vaccine administration route. None of the earlier studies have documented differences among gender[10,12 &13]. On percentage of protection provided by HPV vaccines, clinical (47.0%) and pre-clinical (41.3%) students nearly in equal ratio have selected right percentage. But, studies of Mehta et al.,[10] and Challa et al[12] have reported this rate at 24% and 11.8% respectively. In our study, male and female students are equally aware of percentage of protection provided by HPV vaccines against cervical cancer. Altogether, it shows the need of effective HPV awareness program implementation among medical students.

In general, the attitude of medical students on HPV vaccine and HPV vaccination is relatively poor. Only, small percentages of students have noted that they are vaccinated for HPV irrespective of their program level and gender. However, majority of them would like to recommend HPV vaccine for general public when they start their clinical practice. This behavior is higher among clinical (80.5%) and female (79.2%) students. Various other studies have also documented both these observations in final year medical students[10&12]. Equal proportions of clinical (19%) and male (20%) students have assumed that only females should be HPV vaccinated. Interestingly, higher percentages of pre-clinical (95.5%) and female (95.3%) students have not known the reason for poor HPV vaccination rate. Our observation is in direct

contrast with Challe et al study, where they have identified high cost of HPV vaccine as the reason[12]. Personally, significant number of clinical (88.5%) and lesser extent of pre-clinical (65.6%) students have preferred HPV vaccination in our study. This preference is high among female (83.1%) students. Challa et al., has also observed similar response (80.3%) in their student population though they have not categorized the response on program and gender lines[12].Student's lesser preference for HPV vaccination is mainly due to inadequate knowledge on HPV, which is compounded by non-affordability of vaccine, prevailing confusion over targeted gender group whether the vaccine is exclusively for males or females or for both. Only few students are aware that HPV vaccine is for both sexes and preferred to vaccinate for HPV.

Our students in general are well aware of techniques used in the detection and screening of HPV. Nearly all-clinical students (95.6%) have known that the HPV is detectable through various tests. Our result is similar to the observation by Challa et al.,[12] in which only final year medical students are evaluated. However, this awareness on HPV detect ability is lesser in pre-clinical (74.5%) and, equal among male (84.0%) and female (85.0%) students. Similarly, significant numbers of clinical students than their pre-clinical counterparts are well aware of screening procedures like Pap smear ($p>0.0001$), colposcopy ($p>0.0001$) and cervical biopsy ($p>0.0002$).This trend is not observed in earlier studies[10,12&13]. However, male and female students are equally aware of cervical cancer screening procedures. In contrast, awareness on molecular (PCR and ELISA) based detection of HPV among clinical and pre-clinical students is comparatively poor though both have shown significant difference between them. Our observation is better than the numbers recorded by other studies[10,12&13]. However, this observation is equally abysmal in male and female students. Varied proportion of clinical (46.5%) and pre-clinical (18.2%) students has known the possibility of culturing HPV in cell lines. This awareness is similarly poor among male and female students. This is a unique observation of our study, which has not been reported earlier[10,12&13].Our clinical students in significant numbers ($p>0.0001$) in comparison to pre-clinical batcheshave observed that cytological screening might prevent cervical cancer. This is an interesting observation of our study that not been reported earlier[10,12&13]. Like in Challa et al., study (74.8%)[12], majority of our clinical (84.1%) students have felt that HPV vaccinated women should also undergo cytological screening. This feeling is lesser among pre-clinical students (56.3%). However, such a realization is equal between male and female students.

Conclusions

In general, knowledge on HPV and cervical cancers is limited among health care providers. The cervical cancer preventive programs such as periodical cervical screening and HPV vaccination yet to formalize, intense and standard. Above all, the value of cervical cancer preventive program is underrated and the necessity is insufficiently realized. Corresponding approach in a country like ours heightens the risk of cervical cancer incidence. This study has identified caveats of program failure and recommends remedial measures to ensure effective implementation of the program. First, the government should take necessary step to make vaccine available at affordable price. Secondly, it should encourage the involvement of all agencies; both governmental and non-governmental organizations (NGO) that are addressing public health care issues. Thirdly, it should conduct awareness programs for medical fraternity through seminars, conferences and media. The government should bring drug companies, which will play a major role in distributing knowledge and awareness to the general public as well as the doctors practicing in remote areas of the country. Most importantly, we believe that this data might help the national immunization committee to plan the future strategies to improve HPV vaccination coverage.

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