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Research Article

Knowledge, Attitudes, Beliefs and Willingness to Recommend Human Papillomavirus (HPV) Vaccination among Medical Students in Mysore, India

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A B S T R A C T

Context: Approximately 60,000 women in India die annually from cervical cancer. India also has high rates of head and neck cancers (HNCs), with most patients presenting with advanced disease. Uptake of the human papillomavirus (HPV) vaccine, which can prevent both cervical cancer and HNCs, is low in India.

Methods and Material: Study setting was Government Medical College, Mysore and it was a Cross-sectional study.

Between January to March 2018, a web-based self-administered questionnaire was completed by 498 medical students in Mysore, India. Descriptive statistics were conducted using SPSS.

Result: Only 8% of female students and no male students were vaccinated against HPV, and most did not feel susceptible to HPV. Male students were more likely than female students to believe that HPV vaccination can encourage youth to become sexually active (35% vs. 15%; p<0.001). Furthermore, knowledge regarding HPV vaccination for preventing HNCs was no higher among 4th versus 1st year medical students. Knowledge, attitudes, and beliefs favourable toward HPV vaccination improved with years of study.

Conclusion: Medical education that discusses the full range of uses of HPV vaccination for cancer prevention and improves comfort with topics related to adolescent sexuality may increase future provider recommendations.

Keywords: Human papillomavirus, vaccination, cancer, medical students, India

Introduction

Cervical cancer is the most common gynaecological cancer among women worldwide.[1] There were approximately 570,600 new cases in 2018, which represented 6.6% of all female cancers. Approximately 85% of deaths occur in developing countries.[2] By 2030, over 95% of deaths from cervical cancer are expected to be in low and middle income countries.[3]

In South Asia, India has the highest age standardized incidence of cervical cancer at 22 per 100,000 compared to 19.2 in Bangladesh, 13 in Sri Lanka.[4] Despite modest declines in the incidence of cervical cancer in India, approximately 97,000 new cases and 60,000 cancer-related deaths continue to be observed annually in India.[5] Approximately 1 in 50 Indian women will have cervical cancer during their lifetime compared to one in 100 women in the U.S. and Europe.[6] The annual burden of new cases in India is projected to increase to 225,000 by 2025.[7]

Several vaccines are licensed for use against oncogenic HPV infection, a necessary cause of cervical cancer.[8] Bivalent and quadrivalent HPV vaccines were licensed in India in 2008, a nonavalent vaccine was licensed in 2018.[9] The Indian Paediatric Society recommends Gardasil™, a quadrivalent vaccine marketed by Merck, Cervarix™, a bivalent vaccine manufactured by Glaxo Smithkline.[10] Both vaccines can be given as 3 doses at zero, two and six months for Gardasil, and zero, one and six months for Cervarix. Since 2006, HPV vaccines have been recommended with a change to two-dose schedule for children between the ages of nine to fourteen years with the second dose recommended at six to twelve months after the first dose.[11] To date, neither vaccines are included in the Universal Immunisation Program (UIP) in Karnataka, are only available as a recommended vaccine from private healthcare providers. A doctor's recommendation has been found to increase HPV vaccine uptake.[12] In some of the states, like Punjab and Delhi, HPV vaccine program for school girls was introduced as a state level initiative.[13] The vaccine is also protective for some head, neck, anal and penile cancers.[14]

Understanding medical students' perceptions towards HPV vaccination is crucial to implement cancer prevention programs in India successfully. This study examined medical students' perceptions of HPV vaccination and their willingness to recommend the vaccine to the parents of eligible children and adolescents.

Subject and Method

Sample

A cross-sectional study was carried out by Public Health Research Institute of India (PHRII) and Mysore Medical College and Research Institute (MMCRI). A convenience sample of students from the first to fourth year of medical training were enrolled into the study. Among the 700 students registered in 2017, 608 (87%) agreed to be enrolled. In total, 536 (88%) of the selected students consented to participate in the survey.

Instrument and Data Collection

A self-administered questionnaire was used to collect data regarding HPV infection, cervical cancer, Head and Neck Cancers (HNCs) and HPV vaccination for assessing knowledge, attitudes, beliefs and willingness among the students to recommend the vaccine. The questionnaire adapted from Maharajan et al., (2015) was validated for internal consistency by conducting a pilot study with 20 participants. Based on the pilot testing, minor modifications to the questionnaire were made.[15] For construction and content validity, the questionnaire was reviewed by four study investigators and two medical students before data collection. The questionnaire was administered in English, the language of instruction for medical education in India. The only exclusion criterion was unwillingness to participate in the study. The web-based questionnaire included the purpose and consent for the study. The questionnaire consisted of four sections: general information demographic data, knowledge, attitudes, beliefs about HPV, HPV vaccination and cervical cancer and HNCs and willingness to recommend the HPV vaccine. During recruitment, investigators explained the objective of the study and details about the web-based link operation. The participants were then sent the link to access and complete the questionnaire. On completion, data were saved in a cloud-based Qualtrics format and later exported and analysed in SPSS. The survey was open to students from January to March 2018. Ethical approval was obtained by the Research Ethics Committee of MMCRI and PHRII, Mysore.

Data Analysis

Pearson chi-squared tests was used to examine differences in knowledge, attitudes, beliefs and willingness to recommend the HPV vaccine between female and male students and by year of medical education. A p-value of 0.05 was used to determine significant differences.

Result

Table 1, displays the sample characteristics. Approximately half of participants were male with an average age of 20 years old. The representation of students across all four years of medical school was approximately equal. Less than 1% of students (n=3) were married. The majority of students reported their religion as Hindu (88%). While 43% of students reported their caste as General, 41% reported belonging to Other Backward Classes (OBC), and 16% to Scheduled Castes or Scheduled Tribes (SC/ ST). Only 17 (8%) female students and none of the male students had been vaccinated against HPV.

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Table 2, displays the distribution of responses related to knowledge, attitudes and beliefs toward HPV vaccination and cancer prevention stratified by gender. There were no significant differences by gender for most domains. The majority of students of both genders believed that cervical cancer is a severe disease (78%) and preventable (72%), that HPV is extremely harmful (64%), and that the HPV vaccination is safe (62%) and helpful for preventing cervical cancer (76%). Nonetheless, less than one in five students of both genders (19%) felt susceptible to HPV. Although most (74%) believed that accepting HPV vaccination is a good idea based on their existing knowledge, 40% were not ready to accept the HPV vaccination if offered to them today and only 53% believed that men should get the HPV vaccine.

Table 1.Sociodemographic Characteristics of Medical Students in Mysore, India (N=498)

Variable	Number	Percentage
Age in years (Mean, SD)	20.27 (±2.05)	-
Year of Medical Education		
1st Year	114	22.9%
2nd Year	151	30.3%
3rd Year	123	24.7%
4th Year	110	22.1%
Gender		
Female	226	45.4%
Male	272	54.6%
Religion		
Hindu	439	88.2%
Muslim	17	3.4%
Christian	39	7.8%
Other	3	0.6%
Caste		
General	214	43.0%
OBC	205	41.2%
ST/ SC	79	15.9%
Received HPV vaccine		
Yes	17	3.4%
No	481	96.6%

Significant differences by gender included knowledge related to the prevention of cervical cancer and HNCs, risks of HPV vaccination, perceived importance of information for deciding whether to be vaccinated, perceptions regarding the effect of the vaccine on sexual behaviours. Female students were more likely than male students to believe that HPV vaccination is helpful for preventing cervical cancer (80% vs. 74%, p=0.026). However, most students did not know that HPV vaccination could prevent HNCs, and female students were more likely than male students to be unsure (57% vs. 42%, p<0.001). Female students were also more likely to believe that there is less risk in being vaccinated than having HPV infection (75% vs. 67%, p=0.017), to report not wanting to be infected with HPV (85% vs. 76%, p=0.004), to believe that information on HPV is helpful for deciding whether to be vaccinated (86% vs. 77%, p=0.002). Male students were more likely than female students to believe that vaccinating young people against HPV will encourage them to become sexually active (35% vs. 15%, p<0.001) or lead to risky sexual behaviour (25% vs. 15%, p<0.001).

Table 3, displays knowledge, attitudes and beliefs regarding HPV vaccination and cancer prevention stratified by number of years in medical school. Accurate knowledge and favourable attitudes and beliefs were significantly higher among students with more years of medical education for almost all questions. Additionally, the proportion of students responding that they were unsure declined with years of study indicating more confidence in responses. Large significant differences between 1st vs 4th year medical students were observed for perceived susceptibility to HPV infection (7% vs 37%, p<0.001), believing that cervical cancer is preventable (57% vs 88%, p<0.001), that HPV vaccination is safe (55% vs 81%, p<0.001) and helpful for preventing cervical cancer (67% vs 93%, p<0.001), that men should get the HPV vaccine (35% vs 63%, p<0.001) and readiness to accept the HPV vaccine (49% vs 71%, p<0.001). However, the proportion of students who believed that HPV vaccination would not prevent HNCs was lower among 1st vs. 4th year students (6% vs. 22%, p<0.001).

Table 4, displays responses related to willingness of students to recommend HPV vaccination stratified by year in medical school. The proportion of students responding favourably was significantly higher among 3rd and 4th year students than 1st and 2nd year students for most domains, except knowing how to bring up the topic of HPV vaccination with parents, concern regarding the amount of time needed to discuss HPV vaccination, preferring to wait until a child is 15-16 years old before recommending the HPV vaccine. Willingness to discuss and recommend HPV vaccination was endorsed by the majority of medical students across all domains from the 1st year of medical school and increased to near universal approval by 4th year for believing that providers should use every opportunity to recommend the HPV vaccine (97%), intention to recommend the HPV vaccine in their practice (94%), comfort discussing benefits and risks of HPV vaccination (94%). Comparing 1st vs. 4th year students, the proportion of students who reported that they would recommend giving the HPV vaccine to a 9-10 year old girl was significantly higher with years of study (31% vs. 49%, p = 0.002), but the same pattern was

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observed for preferring to wait until the child was 15-16 years old before recommending the vaccine (57% vs. 69%, p = 0.014). Although comfort in discussing HPV-related issues with parents appeared to improve across multiple domains with years of study, 32% of 4th year students still reported discomfort discussing adolescent sexuality with parents, 42% of 4th year students did not know how to bring up the topic of HPV vaccination with parents.

Table 2.Bivariate Analysis of Beliefs and Attitudes about HPV, Cervical Cancer and HPV Vaccination by Gender Among Medical Students in Mysore, India (N=498)

S. No.	Question	Female (n=226)	Male (n=272)	Total (N=498)	P-value
1.	**Cervical cancer is a severe disease**				
	True	79.2%	77.2%	78.1%	0.767
	False	8.4%	10.3%	9.4%	
	Do Not Know	12.4%	12.5%	12.4%	
2.	**Cervical cancer is preventable**				
	True	73.9%	69.5%	71.5%	0.168
	False	7.1%	12.1%	9.8%	
	Do Not Know	19.0%	18.4%	18.7%%	
3.	**HPV can be extremely harmful**				
	True	62.8%	64.3%	63.7%	0.889
	False	15.9%	16.2%	16.1%	
	Do Not Know	21.2%	19.5%	20.3%	
4.	**I am susceptible to HPV infection**				
	True	17.7%	19.5%	18.7%	0.252
	False	42.0%	47.4%	45.0%	
	Do Not Know	40.3%	33.1%	36.3%	
5.	**I am worried about the side effects of the HPV vaccination**				
	True	27.4%	26.1%	26.7%	0.917
	False	44.2%	44.1%	44.2%	
	Do Not Know	28.3%	29.8%	29.1	
6.	**HPV vaccination is helpful to prevent cervical cancer**				
	True	79.6%	73.5%	76.3%	0·026
	False	1.8%	6.6%	4.4%	
	Do Not Know	18.6%	19.9%	19.3%	
7.	**HPV vaccination is safe**				
	True	58.4%	65.8%	62.4%	0.066
	False	5.3%	7.4%	6.4%	
	Do Not Know	36.3%	26.8%	31.1%	
8.	**HPV vaccination will prevent some head and neck cancers**				
	True	31.9%	39.0%	35.7%	0·001
	False	11.1%	19.5%	15.7%	
	Do Not Know	57.1%	41.5%	48.6%	
9.	**There is less risk involved in being vaccinated than having HPV infection**				
	True	75.2%	66.9%	70.7%	0.017
	False	4.9%	11.8%	8.6%	
	Do Not Know	19.9%	21.3%	20.7%	

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10.	**Men should get the HPV vaccine to prevent their partner from getting cervical cancer**				0.066
	True	48.2%	56.3%	52.6%	
	False	12.8%	14.7%	13.9%	
	Do Not Know	38.9%	29.0%	33.5%	
11.	**HPV vaccination can lead to an increase in risky sexual behaviour**				0.001
	True	14.6%	25.0%	20.3%	
	False	34.1%	39.0%	36.7%	
	Do Not Know	51.3%	36.0%	43.0%	
12.	**Vaccinating young people against HPV will encourage them to become sexually active**				0.001
	True	14.6%	34.6%	25.5%	
	False	36.7%	37.1%	36.9%	
	Do Not Know	48.7%	28.3%	37.6%	
13.	**I am worried about safety of the HPV vaccine**				0.507
	True	36.3%	32.0%	33.9%	
	False	35.8%	40.4%	38.4%	
	Do Not Know	27.9%	27.6%	27.7%	
14.	**I believe that both boys and girls should receive the HPV vaccine**				0.211
	True	69.0%	67.6%	68.3%	
	False	4.9%	8.8%	7.0%	
	Do Not Know	26.1%	23.5%	2.4%	
15.	**I would not want to be infected with HPV**				0.004
	True	85.0%	76.1%	80.1%	
	False	1.8%	8.1%	5.2%	
	Do Not Know	13.3%	15.8%	14.7%	
16.	**Information on HPV helps me to decide whether I should be vaccinated against HPV**				0.002
	True	85.8%	76.1%	80.5%	
	False	1.3%	7.4%	4.6%	
	Do Not Know	12.8%	16.5%	14.9%	
17.	**Based on my knowledge accepting HPV vaccination is a good idea**				0.289
	True	73.5%	74.6%	74.1%	
	False	4.0%	6.6%	5.4%	
	Do Not Know	22.6%	18.8%	20.5%	
18.	**If I were offered an HPV vaccination today I would accept it**				0.072
	True	61.1%	59.9%	60.4%	
	False	6.6%	12.5%	9.8%	
	Do Not Know	32.3%	27.6%	29.7%	

Table 3.Bivariate Analysis of Beliefs and Attitudes about HPV, Cervical Cancer and HPV Vaccination by Year of Study Among Medical Students in Mysore, India (N=498)

S. No.	Question	1st Year (n=114)	2 Year (n=151)	3rd Year (n=123)	4th Year (n=110)	Total (n=498)	P value
1.	**Cervical cancer is a severe disease**						0.010
	True	71.1%	75.5%	82.9%	83.6%	78.1%	
	False	7.0%	12.6%	7.3%	10.0%	9.4%	

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	Do Not Know	21.9%	11.9%	9.8%	6.4%	12.4%	
2.	**Cervical cancer is preventable**						
	True	57.0%	62.3%	81.3%	88.2%	71.5%	0.000
	False	7.0%	15.2%	8.9%	6.4%	9.8%	
	Do Not Know	36.0%	22.5%	9.8%	5.5%	18.7%	
3.	**HPV can be extremely harmful**						
	True	66.7%	61.6%	67.5%	59.1%	63.7%	0.000
	False	3.5%	15.9%	17.1%	28.2%	16.1%	
	Do Not Know	29.8%	22.5%	15.4%	12.7%	20.3%	
4.	**I am susceptible to HPV infection**						
	True	7.0%	17.2%	14.6%	37.3%	18.7%	0.000
	False	46.5%	41.1%	54.5%	38.2%	45.0%	
	Do Not Know	46.5%	41.7%	30.9%	24.5%	36.3%	
5.	**I am worried about the side effects of the HPV vaccination**						
	True	23.7%	33.1%	27.6%	20.0%	26.7%	0.000
	False	30.7%	33.1%	50.4%	66.4%	44.2%	
	Do Not Know	45.6%	33.8%	22.0%	13.6%	29.1%	
6.	**HPV vaccination is helpful to prevent cervical cancer**						
	True	66.7%	66.9%	82.1%	92.7%	76.3%	0.000
	False	1.8%	8.6%	4.9%	0.9%	4.4%	
	Do Not Know	31.6%	24.5%	13.0%	6.4%	19.3%	
7.	**HPV vaccination is safe**						
	True	55.3%	57.6%	58.5%	80.9%	62.4%	0.000
	False	2.6%	9.3%	8.1%	4.5%	6.4%	
	Do Not Know	42.1%	33.1%	33.3%	14.5%	31.1%	
8.	**HPV vaccination will prevent some head and neck cancers**						
	True	32.5%	41.7%	31.7%	35.5%	35.7%	0.004
	False	6.1%	14.6%	20.3%	21.8%	15.7%	
	Do Not Know	61.4%	43.7%	48.0%	42.7%	48.6%	
9.	**There is less risk involved in being vaccinated than having HPV infection**						
	True	65.8%	68.2%	78.0%	70.9%	70.7%	0.012
	False	5.3%	7.9%	7.3%	14.5%	8.6%	
	Do Not Know	28.9%	23.8%	14.6%	14.5%	20.7%	
10.	**Men should get the HPV vaccine to prevent their partner from getting cervical cancer**						
	True	35.1%	47.7%	65.9%	62.7%	52.6%	0.000
	False	11.4%	14.6%	12.2%	17.3%	13.9%	
	Do Not Know	53.5%	37.7%	22.0%	20.0%	33.5%	
11.	**HPV vaccination can lead to an increase in risky sexual behaviour**						
	True	15.8%	22.5%	22.8%	19.1%	20.3%	0.000
	False	14.9%	31.1%	43.1%	60.0%	36.7%	
	Do Not Know	69.3%	46.4%	34.1%	20.9%	43.0%	

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12.	**Vaccinating young people against HPV will encourage them to become sexually active**						
	True	14.0%	28.5%	31.7%	26.4%	25.5%	0.000
	False	24.6%	31.1%	41.5%	52.7%	36.9%	
	Do Not Know	61.4%	40.4%	26.8%	20.9%	37.6%	
13.	**I am worried about safety of the HPV vaccine**						
	True	36.0%	34.4%	36.6%	28.2%	33.9%	0.000
	False	30.7%	29.1%	41.5%	55.5%	38.4%	
	Do Not Know	33.3%	36.4%	22.0%	16.4%	27.7%	
14.	**I believe that both boys and girls should receive the HPV vaccine**						
	True	64.0%	67.5%	76.4%	64.5%	68.3%	0.000
	False	0.0%	9.3%	4.9%	13.6%	7.0%	
	Do Not Know	36.0%	23.2%	18.7%	21.8%	24.7%	
15.	**I would not want to be infected with HPV**						
	True	78.9%	72.8%	84.6%	86.4%	80.1%	0.077
	False	3.5%	7.3%	5.7%	3.6%	5.2%	
	Do Not Know	17.5%	19.9%	9.8%	10.0%	14.7%	
16.	**Information on HPV helps me to decide whether I should be vaccinated against HPV**						
	True	83.3%	69.5%	82.9%	90.0%	80.5%	0.000
	False	0.9%	7.9%	6.5%	1.8%	4.6%	
	Do Not Know	15.8%	22.5%	10.6%	8.2%	14.9%	
17.	**Based on my knowledge accepting HPV vaccination is a good idea**						
	True	67.5%	65.6%	80.5%	85.5%	74.1%	0.000
	False	3.5%	8.6%	4.1%	4.5%	5.4%	
	Do Not Know	28.9%	25.8%	15.4%	10.0%	20.5%	
18.	**If I was offered HPV vaccination today I would accept it**						
	True	49.1%	58.3%	64.2%	70.9%	60.4%	0.001
	False	6.1%	11.3%	13.8%	7.3%	9.8%	
	Do Not Know	44.7%	30.5%	22.0%	21.8%	29.7%	

Table 4.Bivariate Analysis of Willingness to Recommend HPV vaccination by Year of Study among Medical Students in Mysore, India (N=498)

S. No.	Question	1st Year (n=114)	2ndYear (n=151)	3rdYear (n=123)	4th Year (n=110)	Total (n=498)	P value
1.	**Providers should use every opportunity to recommend the HPV vaccine to eligible parents**						
	Agree	81.6%	86.8%	94.3%	97.3%	89.8%	0.003
	Disagree	18.4%	13.2%	5.7%	2.7%	10.2%	
2.	**I am comfortable discussing adolescent sexuality with parents**						
	Agree	51.8%	46.4%	65.0%	68.2%	57.0%	0.003
	Disagree	48.2%	53.6%	35.0%	31.8%	43.0%	
3.	**I would recommend the HPV vaccine to eligible parents in my practice**						
	Agree	82.5%	80.1%	94.3%	93.6%	87.1%	0.003
	Disagree	17.5%	19.9%	5.7%	6.4%	12.9%	
4.	**I don't know how to bring up the topic of HPV vaccination with parents**						0.046
	Agree	34.2%	47.7%	41.5%	41.8%	41.8%	

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	Disagree	65.8%	52.3%	58.5%	58.2%	58.2%	
5.	**I am comfortable discussing the benefits and risk of HPV vaccination**						
	Agree	79.8%	73.5%	85.4%	93.6%	82.3%	0.001
	Disagree	20.2%	26.5%	14.6%	6.4%	17.7%	
6.	**I prefer to wait until the child is 15-16 years old before I recommend the HPV vaccine**						
	Agree	59.6%	56.3%	70.7%	69.1%	63.5%	0.014
	Disagree	40.4%	43.7%	29.3%	30.9%	36.5%	
7.	**I am concerned about the amount of time needed to discuss HPV about vaccination with parents**						
	Agree	43.9%	53.6%	55.3%	53.6%	51.8%	0.017
	Disagree	56.1%	46.4%	44.7%	46.4%	48.2%	
8.	**I would recommend the HPV vaccine to a relative**						
	Agree	72.8%	73.5%	85.4%	87.3%	79.3%	0.014
	Disagree	27.2%	26.5%	14.6%	12.7%	20.7%	
9.	**I am willing to discuss HPV vaccination when parents come in for other problems**						
	Agree	59.6%	59.6%	65.0%	77.3%	64.9%	0.009
	Disagree	40.4%	40.4%	35.0%	22.7%	35.1%	
10.	**I am willing to discuss HPV vaccination when parents are seen for chronic conditions**						
	Agree	77.2%	64.9%	82.9%	79.1%	75.3%	0.000
	Disagree	22.8%	35.1%	17.1%	20.9%	24.7%	
11.	**I would recommend giving the HPV vaccine to a 9 to 10-year-old girl**						
	Agree	30.7%	49.0%	48.8%	49.1%	44.8%	0·002
	Disagree	69.3%	51.0%	51.2%	50.9%	55.2%	

Discussion

This study examines the perspectives of Indian medical students on HPV vaccination by gender and year of medical school students' willingness to recommend HPV vaccination. A majority of participants agreed that HPV vaccination could prevent cervical cancer but were less certain about its efficacy for the prevention of HNCs, this knowledge did not appear to improve with years of study.

In this study, very few participants had received the HPV vaccine though most believed that cervical cancer was harmful. Possible reasons for this contradiction could include lack of availability of the vaccine, whether students received a provider recommendation, cost.[16-18] Additionally, the disconnect between beliefs, attitudes and behaviours might be a result of uncertainty about who should receive the vaccine.[18] Although approximately two-thirds of the participants agreed that HPV infection could be harmful, more than two-thirds were unsure if they were susceptible to HPV infection. These results are consistent with existing studies demonstrating medical students' limited knowledge and misperceptions about HPV infection and vaccination in India, particularly at the start of medical school.[19-22]

There were significant differences between female and male medical students in the study regarding the benefits of the HPV vaccine and assumptions about the effect of the vaccine on adolescent sexual behaviours. Previous studies have indicated that female students tend to be more knowledgeable about HPV and the vaccine compared to male students.[23,24] A majority of participants in the current study thought the HPV vaccine was low risk, but female students were more likely to endorse this view than male students, were more likely to say that the risks of HPV infection outweighed the potential risks of the vaccine. However, male students were more likely to believe that the HPV vaccine could prevent certain HNCs, while female students were much more uncertain. The gender difference in uncertainty of the benefits of the HPV vaccine for other types of cancers could be attributed to how the HPV vaccine is marketed in India, predominantly targeting women and girls for the prevention of cervical cancer. Parents may also be more likely to accept vaccinations for girls than boys, which could influence the amount of education boys receive regarding the safety and efficacy of the vaccine for the prevention of cancers affecting both women and men.[24] However, the findings might also be related to social or cultural norms regarding gender in which women are socialized to have less confidence in their knowledge than

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men, thus may question themselves more than men.[25,26]

Male and female students also differed in how they viewed the potential impact of the HPV vaccine on sexual behaviours, which may deter providers from recommending the vaccination to parents of young adolescents, particularly preteen girls and boys. Male students were significantly more likely to believe that HPV vaccination could increase sexual activity and risky sexual behaviours. Past studies have found similar concerns in India among medical students irrespective of gender.[19,27] Sexual health is a stigmatized topic, which is rarely discussed between parents and children in India, and between providers and patients. Furthermore, while premarital sex is increasing in India, it is still not as common as in many other countries, demonstrating the stronghold of conservative attitudes towards sexual activity in India.[28,29] For instance, one study highlighted how parents recognize the importance of conversations regarding sex yet do not discuss sexual health with their children.[30] Social norms around sexual activity could explain why a majority of the medical students in this study, regardless of their gender or year of study, would not recommend HPV vaccination for 9-10 year old girls. In a study by Wong et al., (2010) on the role of men in promoting the uptake of HPV vaccinations, men tended to support vaccination more when it was framed paternalistically as a way to protect their spouses and daughters.[31] Dispelling myths regarding spurious associations between HPV vaccination and sexual activity should be incorporated into medical education in India. A systematic review by Madhivanan et al., (2016) found no association between vaccination and sexual activity, a positive association with safer sex by precautionary measures like condom use and receipt of HPV vaccination.[32] These findings are subject to limitations. First, the survey was conducted with only one medical college with a non-random sample of students, so the findings may not be generalizable to all medical students in India. Second, the responses are all self-reported, so the results are vulnerable to social desirability bias, with participants answering how they believe would be favourably viewed by investigators rather than how they truly believe or act. Nonetheless, this study with a large and diverse sample of medical students across all four years of study offers important insights regarding the role of medical education in altering knowledge and perceptions of students who will be future medical providers. This is our first web based survey to collect data regarding thec most important subject of a preventable cancer in India.

Conclusion

Further exploration of how Indian medical education curriculum addresses HPV and cancer prevention would help to bring changes in the knowledge and attitude of students which in turn help providers' recommendation for vaccine. More emphasis on the effectiveness of HPV vaccination in medical education could help to improve vaccine uptake in India.

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Conflict of Interest: None

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