

An exploratory study of undergraduate healthcare student perspectives regarding human papillomavirus and vaccine intent in India

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Abstract

Objective: Safe and effective human papillomavirus vaccines are available against cervical cancer and other human papillomavirus-associated diseases. Vaccine uptake is low in India given lack of universal vaccination programme. This exploratory study describes the medical, dental and nursing undergraduate student perspectives about human papillomavirus and intentions to receive the vaccine.

Methods: Using a cross-sectional, explorative study design, we conducted two focus group discussions among a convenience sample of male (n = 11) and female (n = 9) student group aged ≥ 18 years, respectively, at a medical college in South India. The focus group discussion sessions were recorded, transcribed and analysed using thematic content analysis.

Results: Over half of the students showed adequate knowledge of cervical cancer and human papillomavirus. Medical students had much in-depth knowledge of cervical cancer, vaccine cost and its side effects compared to dental and nursing students. Human papillomavirus vaccine knowledge was relatively less among males compared to females; most male participants were unaware of the availability of the human papillomavirus vaccine. Intention to receive the vaccine was higher among females than males. All the participants had positive attitude in creating awareness in the community and making the vaccine cost-effective. Cultural concerns and high vaccine cost were cited major barriers for vaccine uptake. Suggestion of physician recommendation in promotion of human papillomavirus vaccine uptake was an emerging theme.

Conclusion: Educating male students and those enrolled in dental and nursing courses about human papillomavirus vaccine, addressing cultural concerns and advocating provider recommendation for promoting vaccine uptake are potential strategies to improve future human papillomavirus vaccine intent among students and recommendations to patients in their role as future healthcare provider.

Keywords

attitudes, human papillomavirus vaccine, India, knowledge, medical students

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Introduction

Persistent infection with oncogenic strains of human papillomavirus (HPV) types 16 and 18 results in 70% of cervical cancers in women.¹ Cervical cancer is the second most common cancer among women aged 15–44 years in India with an estimated 96,922 new diagnosis and 60,078 deaths annually.² In India, two prophylactic HPV vaccines were licensed in 2008. The quadrivalent vaccine targets HPV types 16, 18, 6 and 11 and a bivalent vaccine targets HPV types 16 and 18. In 2018, a nonavalent vaccine was licensed which confers protection against high-risk HPV types 16, 18, 31, 33, 45, 52 and 58.^{3,4} Awareness of HPV-associated cervical cancer and availability of safe and effective vaccine are poor among women in India.^{4–6}

In 2009, the States of Andhra Pradesh and Gujarat in India initiated demonstration projects of HPV vaccine. However, reports of 10 deaths among women who received the vaccine triggered a major concern regarding vaccine safety leading to the suspension of vaccine by the Government of India in all clinical trials and field demonstration projects. However, the vaccine was available for clinical use by prescription.^{4,7} The reported deaths were deemed unrelated to the vaccine, but the ongoing controversy and misconceptions around safety and efficacy of HPV vaccination remains a major challenge to implementation efforts in India.⁷

In 2016, the State Governments in Delhi initiated an HPV vaccination programme followed by two districts in the State of Punjab in 2017 and later in Sikkim in 2018. The demonstration vaccination programmes were associated with high vaccine uptake and safety resulting in a renewed interest among the Government of India, professional societies and other stakeholders to scale-up HPV vaccination programmes.^{4,8,9} HPV vaccine is highly cost-effective for India.⁹

Strong HPV vaccine recommendation by health care providers (HCPs) remains a crucial strategy for successful vaccination implementation programme.¹⁰ In a cross-sectional study of community and academic physicians in our region, knowledge gaps related to HPV were identified. Less than half (47%) of physicians were aware of an approved and commercially available HPV vaccine in India indicating the need for improving education about HPV infection and vaccination among HCP.¹¹

It is important to assess medical and paramedical undergraduate students' knowledge and attitudes regarding HPV and vaccination, given their role in health promotion as future HCP.^{12,13} In a study among undergraduate medical, dental, and nursing students in our setting, two-thirds of surveyed students intended to receive the HPV vaccine. Although students demonstrated an overall good awareness of the HPV-related disease and prevention, considerable knowledge gaps exists in many areas.¹⁴ Compared with high-income countries (e.g. the United States), the

prevailing social, cultural, religious and traditional norms play an important role in vaccine hesitancy among young women and parents of adolescent girls in India and other countries in Asia.^{15,16}

In India, the HPV vaccine is recommended for girls and women, but the vaccine is not licensed for boys. Current HPV vaccine prevents six cancers (i.e. cervix, vaginal, vulva, anus, penile and oropharyngeal) and other HPV-associated diseases (e.g. genital warts).¹ Some of HPV-associated cancers (e.g. anal and oropharyngeal) also afflict males.¹ Thus, it is important to educate all HCPs about the need for this vaccine. In the United States, the quadrivalent HPV vaccine was licensed for use in all girls aged 11–12 years and older in 2006 and boys aged 11–12 years and older in 2011. However, in 2016, only 43% of US adolescents aged 13–17 years were up to date with the HPV series (49.5% for girls; 37.5% for boys). In 2018, 51% of adolescents were fully vaccinated against HPV.¹⁷ Studies have reported several barriers to HPV vaccination, including lack of a strong provider recommendation, vaccine hesitancy among parents, and missed vaccination opportunities.^{10,18} The purpose of this exploratory study is to evaluate undergraduate student understanding towards barriers and facilitators of HPV vaccination and identify potential health education opportunities for HPV vaccination.

Methods

Study design, setting and population

Using a cross-sectional, explorative qualitative design, we conducted two focus group discussions (FGDs) at K S Hegde Medical Academy (KSHEMA) in Mangaluru, India, during April 2017. Mangaluru is the chief port city of the Indian State of Karnataka with five medical colleges. FGD was conducted among medical professional students from four different undergraduate degree courses: medicine (MBBS: Bachelor of Medicine and Bachelor of Surgery degree), dentistry (BDS: Bachelor in Dental Surgery), nursing and Medical Lab Technology (MLT). In India, the MBBS degree is conferred to students after completion of a 4.5-year educational curriculum followed by 1-year of mandatory rotating internship.

The inclusion criteria for the exploratory qualitative study included students aged 18–26 years enrolled in medical, dental, nursing, and MLT degree courses at KSHEMA who previously participated in a previously published quantitative study¹⁴ be able to speak English, give informed consent, willing to participate and share views in a group setting, and willing for the sessions to be audio recorded. The exclusion criteria included students aged less than 18 and >26 years, not enrolled in the medical, dental, pharmacy and MLT degree courses, and those not willing to participate.

Table 1. Focus group discussion guide.**A. Cervical cancer and human papillomavirus (HPV) vaccine – awareness and knowledge**

1. What do you know about cervical cancer?
2. How common do you think cervical cancer is around the world? How often do you come across someone with this condition?
3. Have you heard about human papillomavirus (HPV)
4. Tell me what comes to mind when you hear ‘HPV?’
5. What do you think is the level awareness about the HPV among people?
6. How can you prevent cervical cancer?

B. Screening for cervical cancer, HPV testing and HPV self-sampling

1. What is understood by the term PAP smear?
2. Why is the PAP smear done?
3. Why do you think some women do not get PAP smears done?
4. Have you heard about testing for human papillomavirus (HPV)

C. HPV vaccines – awareness and knowledge

1. Have you heard of the HPV vaccine? If yes, what have you heard about the recently developed HPV vaccine?
2. What do you think is the level awareness about the HPV vaccine among people in the community?
3. Do you think HPV vaccines are available in India?
4. Whom do you think should be vaccinated with HPV vaccine? Any specific groups of people or universal?
5. At what age do you think a girl or a boy should be vaccinated? Why?
6. What do you think are the good things (benefits) of the HPV vaccine?
7. What are your worries or concerns about the HPV vaccine?
8. Do you think the vaccine is accessible to everyone?

D. HPV vaccine – attitude and perception

1. How do you feel about receiving HPV vaccination?
2. If your friends/family knew, you have taken the series of HPV vaccines, would you be embarrassed? If yes/no, why?
3. What information would you need to make a decision?
4. How much are you willing to pay for the vaccine?
5. Knowing the cost of the vaccine, would you still go ahead with it?
6. As the currently available vaccines protect against only few strains of the virus out of many other strains, will you still be willing to get the vaccination?
7. If you were a parent of an adolescent, would you be willing to vaccinate your child if the government approved of the vaccine and professional societies recommended the vaccine?
8. What do you think of someone who contracts an HPV infection?

E. Barriers to HPV vaccine implementation, information sources, and future interventions

1. In your opinion, what are the social and cultural barriers to HPV vaccine in India?
2. What are your primary sources of information on HPV vaccine?
3. What are the ways that you get the knowledge of HPV vaccination?
4. How many of the medical professional students do you think are already aware about the availability of HPV vaccine?
5. What are your views on introducing HPV vaccine as part of the National Universal Immunization Programme?

HPV: human papillomavirus.

Procedures and data collection

The subject cohort were undergraduate healthcare students who previously participated in a quantitative study were invited to participate in the qualitative study.¹⁴ The two FGDs included a convenience sample of 11 male students and 9 female students who had consented to participate in the study. We used a convenience sampling strategy to capture different perspectives (e.g. social and cultural) from undergraduate healthcare male and female students. Each FGD session was conducted on two separate dates (1 April 2017 and 7 April 2017). Each FGD session lasted 45 min and held in a private room. One interviewer (first

author, S.S.) led the discussion, two additional investigators (co-authors, V.S. and S.B.) observed, and a note taker was present as well. Prior to the discussion, the interviewer briefed the participants about the purpose of the study. Participant demographic details were collected. The semi-structured FGD guide used a series of open-ended questions and follow-up prompts aimed to explore students’ beliefs about HPV vaccination (Table 1).

The FGD guide was developed by a review of literature and studies about facilitators and barriers to HPV vaccine input with additional input from experts in the field of vaccinology and qualitative research. The discussion was conducted in English as everyone was fluent in the language.

The FGD was divided into two parts: the first explored the knowledge of cervical cancer, HPV infection and HPV vaccine. Then, participants watched two informative videos on the topic with an HPV disease information sheet, after which the second part assessed their attitude towards vaccination and intentions to receive the vaccine. The exploratory outcomes measures included undergraduate student understanding towards barriers and facilitators of HPV vaccination and identify potential health education opportunities for HPV vaccination.

The institution review boards of KSHEMA (*INST.EC/EC/50*) and Wake Forest School of Medicine (*00058181*) approved the study. All participants provided written, informed consent. The participants did not receive financial compensation.

Statistical analysis

Descriptive statistics were used to describe the demographics of the study participants. The FDGs were recorded using an audiotape recorder, and later transcribed verbatim by the first author (S.S.).¹⁹ The transcripts from these FGDs were reviewed multiple times by two authors (S.S. and A.K.S.) followed by an open-coding session. Following data coding and grouping into labelled categories, the main themes and subthemes emerged. All study team members discussed the categories and themes during the debriefing session; discrepancies were resolved by discussions within the study team. Data analysis was guided by thematic content analysis.²⁰

Results

Demographic characteristics

Table 2 shows the demographic characteristics of the study participants. Male FGD consisted of 11 students and female FGD of 9 students. Male students were recruited from each course: MBBS (2), dentistry (3), nursing (3) and MLT (3), whereas female group consisted of only MBBS (4) and dentistry (5) students. Majority of the participants were aged between 18 and 21 years of age (males=90.9%, females=66.7%); however, a few students were older than 21 years (males=9.1%, females=33.3%). None of the participants were married. All students had completed their first year of degree course, belonged to middle socio-economic status and resided in urban areas.

Focus group themes

Data collected from FGD generated many themes: (1) awareness and knowledge of cervical cancer, HPV and HPV vaccine; (2) barriers to screening for cervical cancer; (3) positive and negative attitudes towards HPV vaccination; (4) barriers to HPV vaccine uptake; (5) sources of information about HPV vaccine; (6) suggestion of

Table 2. Demographic characteristics.

Characteristics	Male (11)		Females (9)	
	n	(%)	n	(%)
Age (years)				
≤21	10	90.9	6	66.7
>21	1	9.1	3	33.3
Degree course				
MBBS	2	18.1	4	44.4
Dental	3	27.3	5	55.6
Nursing	3	27.3	–	–
MLT	3	27.3	–	–
Year of course				
First year	–	–	–	–
Second year	5	45.5	6	66.7
Third year	6	54.5	–	–
Final year	–	–	–	–
Internship	–	–	3	33.3
Smoking status				
Smoker	–	–	2	22.2
Non-smoker	11	100	7	77.8
Drinking status				
Drinks alcohol	1	9.1	4	44.4
Does not drink alcohol	10	90.9	5	55.6
Economic status				
High and middle-high	–	–	–	–
Middle	11	100	9	100
Middle-low and low	–	–	–	–
Location				
Urban	11	100	9	100
Rural	–	–	–	–
Marital status				
Single	11	100	8	88.9
Married	–	–	–	–
Dating	–	–	1	11.1

MBBS: Bachelor of Medicine and Bachelor of Surgery; BDS: Bachelor in Dental Surgery; MLT: Medical Lab Technology.

physician recommendation in promotion of HPV vaccine uptake.

Awareness and knowledge of cervical cancer, HPV and HPV vaccine

Illustrative quotes regarding participants' awareness and knowledge of HPV and HPV vaccine are shown in Table 3. Knowledge of cervical cancer and HPV infection among both male and female groups was high. Majority of participants had a good knowledge about the modes of HPV transmission, signs and symptoms of HPV-associated common diseases, such as cervical cancer and warts.

When asked about the awareness level among people about HPV and HPV vaccines, both groups agreed on the fact that it is very less in the community. One of the participants stated, 'I lived abroad, and I think people living abroad know better . . . awareness is needed in India'.

Table 3. Themes and illustrative quotes from focus group discussions.

Theme	Representative quotes
Cervical cancer and link with HPV	<ul style="list-style-type: none"> • ‘Basically, cancer is differentiation of cells . . . it maybe because of viral infection or old age’ (MBBS, male) • ‘it’s the most common cancer in India’ (MBBS, female) • ‘they might complain of bleeding, white foul smelling discharge through vagina’ (MBBS, female)
Low awareness of HPV-associated diseases among people	<ul style="list-style-type: none"> • ‘People don’t take warts seriously . . . and most of us are not aware since we are in second year [of MBBS]’. (MBBS male) • ‘Warts may be a small thing . . . so they may ignore’. (Nursing student, male)
Screening for cervical cancer and HPV infection	<ul style="list-style-type: none"> • ‘Its [PAP smear] used for detection of cervical cancer. You take a sample from the cervix’. (MBBS male) • ‘It’s an outpatient department procedure done in Obstetrics department. And it’s a painless procedure’. (MBBS female)
Barriers for cervical cancer screening and HPV vaccination	<ul style="list-style-type: none"> • ‘People are conservative and religious here, so they don’t want to get a PAP smear’. (Nursing student, male) • ‘it may be due to lack of knowledge or awareness of cervical cancer’ (MBBS female) • ‘They might think it’s painful’. (BDS, female) • ‘People here would judge you knowing that you’re sexually active and that’s why you will be taking the vaccine’. (MBBS, female) • ‘Don’t know [how much I would be willing to pay for the vaccine]. Depends on how much parents will be willing to spend!’ (MBBS, male)
Awareness and knowledge of HPV vaccine	<ul style="list-style-type: none"> • ‘Yeah [I’ve heard of the HPV vaccine]. There are two types – Cervarix and Gardasil. Cervarix prevents against two strains and Gardasil prevents against 4 strains’. (MBBS female) • ‘Yeah, I’ve heard of it. I think it’s given at 12 to 14 years of age . . .’ (BDS, female) • ‘yeah, about 50 percent of cervical cancer can be prevented with this [HPV vaccine]’ (BDS, male) • ‘Any child aged above 12 years should be selected [for vaccination] . . . that’s the age when they’re more open to ideas. And also, teenagers should be vaccinated’. (MBBS, male)
Positive and negative attitudes towards vaccination	<ul style="list-style-type: none"> • ‘I think it should be made mandatory, but first they should create awareness’. (MBBS, male) • ‘Since it prevents deadly cases like cervical cancer, yes, I would get the vaccines, and it’s better in the long run’. (BDS female) • ‘Don’t know [how much I would be willing to pay for the vaccine]. Depends on how much parents will be willing to spend!’ (MBBS, male) • ‘I think yes, I would still go ahead with it [vaccination, knowing the cost]. I mean, it’s a preventable disease, so better get it done’. (MBBS, female)
Physician recommendation in promotion of HPV vaccine uptake	<ul style="list-style-type: none"> • ‘General practitioners should tell their patients about it [HPV vaccination]. In addition, these health care professionals should visit and give awareness by some radios or something. Like how polio awareness was made’. (MBBS, male) • ‘Same thing . . . doctors should tell people. Information should be put up in bus stands, clinics . . . There should be ads, street plays, something like that to make them aware. And social media, awareness should be created’. (BDS, male) • ‘Even if you tell the teenagers about the vaccine, some parents will be like “no need . . . my child won’t do this . . .” and so on . . . so I think even parents should be educated [about HPV vaccine]’. (BDS, female) • ‘It [HPV vaccine] should be made free of cost . . . and to everyone’. (MBBS, male)

HPV: human papillomavirus; MBBS: Bachelor of Medicine and Bachelor of Surgery; BDS: Bachelor in Dental Surgery.

Talking about prevention of the cervical cancer, both groups had similar ideas such as safe sexual practices, and raising awareness among younger generations.

HPV vaccine knowledge was very high among females compared to males. Among females, MBBS interns were very well aware of different types of HPV vaccines and the strains of the virus included in the vaccine. A MBBS (female) student, ‘I know about the vaccine because I was raised abroad . . . and I’ve also received them as a part of my school’s routine vaccination procedures. It is compulsory there’. Most of the participants expressed that men

having sex with men, women with a same-sex sexual orientation and any sexually active individual must receive HPV vaccination. Some participants expressed opinions regarding their views on optimal age of HPV vaccine initiation, such as ‘anyone who is less than 26 years’ (MBBS female student), ‘around 12 to 14 years . . .’ (BDS female student) and ‘all teenagers should be vaccinated’ (Nursing male student).

When questioned about any concerns regarding HPV vaccine, most of them were not sure, although one of the vaccinated participants said, ‘I have taken two doses of

vaccine so far, and I have not had any complaints or side effects'. All the participants believed that the vaccine is not accessible to everyone and government of India should making the vaccine cost-effective and accessible to general population.

Barriers to screening for cervical cancer

Both the groups reported that they knew about screening for cervical cancer; however, female (MBBS) students were more aware about PAP smear and its procedure in the outpatient department (OPD). Few of the male participants stated that PAP smear is 'to rule out reproductive system cancer' (Nursing male student) and 'we use it for screening any cancer. It is one of the first test' (BDS male student). Although both the groups had knowledge on screening for cervical cancer, none of them had an idea about the self-sampling for HPV testing; when probed on the testing for HPV, a female (MBBS) student stated, '. . . biopsy of the cervix and staging of the histology' and other participants had not heard about it.

Participants from both groups identified lack of knowledge and awareness of cervical cancer as the key barriers for a woman to accept PAP smear. Participants also stressed that a woman might be 'ashamed' to get screening done, or believe 'it's a painful procedure'.

Positive and negative attitudes towards HPV vaccination

Female students perceived the idea of receiving the vaccine and expressed their intentions to accept the vaccine but males were more hesitant. All the students reported that they would like to know the cost of the vaccine and adverse effects before they make their decision. After knowing the cost of the vaccine, males were still uncertain about accepting the vaccine, but females were eager to accept the vaccine. Two of the female (MBBS) participants were already vaccinated, and one of them quoted, '. . . I've already received my vaccination . . . but I think everyone should get vaccinated . . .'.

Participants' expressed mixed reactions to whether they would be embarrassed if their friends/family knew they had accepted HPV vaccination. Although all males said they would not be embarrassed, some female participants were not sure. One of the participants stated, 'I think I would worry a little bit about what my close friend would think . . .'.

Barriers to HPV vaccine uptake

Safety concerns. When questioned about any concerns regarding HPV vaccine adverse effects, most of them were not sure, although one of the vaccinated participants said, 'I have taken two doses of vaccine so far, and I have not had any complaints or side effects'.

Cultural issues. All female students reported that the main cultural barrier faced by an individual for HPV vaccination is the community perception of them. For example, one of the female participants (BDS) stated that, '. . . people would assume I'm sexually active just because I take the vaccine. Even my own mom would doubt me . . .'.

Cost of the vaccine. The HPV vaccine cost was discussed as a potential barrier to uptake of HPV vaccine. All the participants believed that the vaccine is not accessible to everyone and government of India should make the vaccine cost-effective and accessible to general population. Compared to female students, male students believed that cost is the significant obstacle in acceptance of the vaccine by the community. One of the MBBS male participants expressed, 'don't know [how much I would be willing to pay for the vaccine]. Depends on how much parents will be willing to spend!'

Sources of information about HPV vaccine. Many participants reported schools, lectures and media as their main source of HPV and vaccine-related information, but two of the male participants (BDS and Nursing) revealed that they were hearing about HPV vaccine for the first time in this present discussion. Female MBBS participants reported that most of the medical professional students were aware about the vaccine, whereas other groups did not think so. One of the MBBS female participants expressed, '. . . my mom's a doctor . . . so I've heard about it [HPV vaccine] from her'.

Suggestion of physician recommendation in promotion of HPV vaccine uptake

As for further future intervention, the participants believed that doctors should educate the community about HPV vaccine and raise awareness through media. In addition, one of the participants suggested a celebrity giving out HPV vaccine information would definitely make the people more interested.

When asked about their views on introducing HPV vaccine as part of Universal Immunization Programme, all the participants showed a positive attitude and agreed with that statement. In addition, male (MBBS) student added, 'It [HPV vaccine] should be made free of cost. And to everyone' and a nursing student stated that HPV vaccination programme must be initiated in schools.

Discussion

Over half of the participants in this qualitative study showed adequate knowledge of cervical cancer and HPV, consistent with other studies from India.^{13,21} Medical students had comparatively higher knowledge about disease transmission and presentations of HPV-associated diseases (e.g. cervical cancer), vaccine cost and associated side

effects compared to students from dental, nursing and pharmacy. This finding is similar to other reports from India and Malaysia.^{14,22} In one report from India, knowledge regarding HPV was higher among nursing students than medical or dental students.²¹

In this study, vaccine intent differed among male and female student groups despite adequate knowledge of cervical cancer and HPV. Intention to receive the vaccine was higher among female participants than males. Knowledge of HPV vaccine was relatively less among males compared to females; most male participants were unaware of the availability of the HPV vaccine in India consistent with other reports.¹³ In contrast, female students of both MBBS and dentistry courses were aware of the vaccine and its side effects. High vaccine intent has been reported among medical students with higher knowledge and awareness regarding HPV infection and vaccine.^{13,22} Medical students claimed that their source of knowledge was their university classes and parents (who were physicians). In other reports, participated have cited news media, mass media and HCPs as primary source of information related to HPV vaccine.^{22,23}

Overall, the study participants had a positive attitude in creating HPV and vaccine awareness in the community and making the vaccine cost-effective. Study participants expressed concern regarding the high cost of the vaccine and suggested that the vaccine should be affordable through Government of India or should be included in the National Universal Immunization Programme. The cost of the HPV vaccine was approximately 3000 Indian rupees per dose at the time of study completion.

In addition to concerns regarding vaccine cost, many participants believed that cultural barriers play an important role in low acceptability of the vaccine in India. Although many participants did not worry about what their friends or family would think if they received the HPV vaccine, a couple of the female participants did worry about it. In one study from India, surveyed parents expressed that choosing HPV vaccine for their adolescent girls may be perceived as making sex safe resulting in promiscuity and high-risk sexual behaviour leading to social stigma and tarnishing their family's prestige.¹⁶ Open discussions about sexual health are limited in the society. In addition, in some societies in Asia and around the world, women's healthcare decision-making is subjected to religious and social-cultural norms.^{24,25} Concerns regarding high vaccine cost, societal, religious and cultural issues and absence of uniform national policy on screening for cervical cancer are key barriers to HPV vaccine acceptability in India.²⁶⁻²⁸

The main facilitator of the acceptability of the vaccine expressed by the participants included recommendations by the physician (general practitioners and paediatricians), spreading awareness regarding HPV-associated diseases and the benefits of the vaccine to patients who come to their offices, giving awareness talks in the community, and

through classroom instructions in colleges and universities. HCP recommendation is often the most common reason cited by parents when they decide to accept the HPV vaccine for their adolescent children.²⁹ Some participants expressed that parents along with their children should be educated about HPV and vaccine. Studies have indicated that most parents are willing to accept the vaccine for their adolescent daughters after they receive a vaccine information sheet regarding the benefits and adverse effects.³⁰

This study was limited by a small sample size. The study was conducted at a single site. Most of the students in this private medical school belonged to a middle-socio-economic strata, and therefore, their views may be different from students in public medical schools across the country. The study oversampled male students. Given the exploratory nature of the study, our findings may limit generalization to medical students in other settings. We did not use a qualitative software for coding of transcripts. Despite these limitations, this study provides insights to the current awareness, knowledge and attitudes regarding HPV vaccine in our setting and provides a framework to understand the potential barriers and facilitators for HPV vaccine uptake. Educators in one US medical school have implemented innovative curriculum methods utilizing case-based vignettes, simulation and effective communication training to address vaccine hesitancy issues.³¹ Change in the national HPV vaccine policy is warranted so that males can receive the HPV vaccine. Accrediting bodies for all health professional schools should include increased education and information about HPV and the need for an increase in vaccine rates. Finally, this exploratory study calls for a national survey of all HCP students.

Conclusion

Educating male students, and students enrolled in dental and nursing courses about HPV vaccine, addressing cultural concerns and advocating provider recommendation for promoting vaccine uptake are potential strategies to improve future HPV vaccine acceptance among all health care professional students and recommendations to others in their role as future HCPs. In addition, government should share the responsibility to improve the vaccine acceptance by educating the community, promoting the vaccine and implementing HPV vaccine as part of National Immunization Programme for both males and females.

Author contributions

All authors met the International Committee of Medical Journal Editors criteria for authorship. S.S. and V.S. were responsible for the conceptualization, methodology and investigations. S.B. was involved in the methodology and analysis. A.K.S. was responsible for the conceptualization, methodology, investigation and editing the manuscript. All authors were involved in writing and reviewing the manuscript.


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