

Physician's Knowledge, Attitude, and Practice towards Human Papilloma Virus (HPV) Vaccine Recommendation in Anantapur District, Andhra Pradesh, India

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Abstract

Globally, cervical cancer occupies the 4th place. In India, cervical cancer ranks 2nd leading cause of cancer-related deaths. Evidence revealed that the HPV vaccine shows 95% of efficacy in the prevention of cervical cancer. Still, physicians are not recommending the HPV vaccine and it's not available in the universal immunization program (UIP) in India. The study aims to assess the physician's knowledge, attitude, and practice (KAP) towards HPV vaccine recommendation. A cross-sectional study was conducted among physicians of government, private, trust, and primary health care (PHC) hospitals. A suitable, pre-validated KAP questionnaire was used to collect data related to socio-demographics, knowledge about HPV infection and vaccination, attitude towards the barriers (high cost, non-efficacious, STD, unsafe, non-availability in UIP) and practice of HPV vaccine recommendation. A Chi-square test was used to correlate non-modifiable and modifiable factors for HPV vaccine recommendation. Among 296 physicians, the majority (118; 31.8%) are between 20 and 30 years of age with a mean 35.84±10.12. Physician's knowledge towards HPV infection and vaccination is moderate (142; 47.9%, 92; 31.1%) and poor (115; 38.8%, 74; 25.0%). Only, 33.4% of the physicians are recommending the HPV vaccine to their clients. Physician's belief about the "HPV vaccine is not effective" was significantly associated (*P* 0.006) with poor practice. We conclude, the majority of the physicians had moderate or poor knowledge about HPV infection and vaccine. Only, 33.4% of the physicians are recommending the HPV vaccine to their clients. There is a need to fulfill the knowledge gap among physicians to improve practices of vaccine recommendation.

Keywords: Attitude, Cervical cancer, Doctors, Knowledge, Practice, Prevention, Vaccine

INTRODUCTION

Globally, cervical cancer is the fourth most common cancer in women with an estimated 570,000 new cases in 2018 representing 6.6% of all female cancers. Approximately 90% of deaths from cervical cancer occurred in low and middle-income countries.^[1] Infection with Human Papillomavirus (HPV) is a major cause of cervical cancer. Evidence shows that HPV also strongly linked to developing cancer of oropharynx, anus, vulva, penis, and vagina. HPV strain 16 and 18 can cause 70% of precancerous lesions and cancer of the cervix.

According to the Catalan Institute of Oncology (ICO)/International Agency for Research on Cancer (IARC) estimates of 2018, in India, cervical cancer ranks 2nd most common leading cause of female cancer and female cancer deaths. In India, about 96,922 new cases and 60,078 deaths were reported on cervical cancer in 2018. The prevalence of HPV 16/18 strains induced cervical cancer was 83.2% (81.5-

84.8) in India.^[2] HPV 6 and 11 types are majorly associated to develop genital warts.^[3]

HPV vaccination is a primary prevention measure to control cervical cancer. There are two types of HPV vaccines (Bivalent and Quadrivalent) licensed in India in 2006. The

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How to cite this article: Narayana, G., Suchitra, J., Kavya Suma, G., Deepthi, G. N., Divya Jyothi, Ch., Pradeep Kumar, B. Physician's Knowledge, Attitude, and Practice towards Human Papilloma Virus (HPV) Vaccine Recommendation in Anantapur District, Andhra Pradesh, India. Arch Pharma Pract 2020;11(2):137-44.

bivalent vaccine gives protection against HPV 16 and 18 strains, whereas the quadrivalent vaccine covers HPV 6, 11, 16, and 18 strains.^[4] These vaccines are available only on demand at some private hospitals in India. Globally, around 80 countries introduced HPV vaccination into their national routine vaccination schedule.^[5] Indian Academy of Pediatrics added the HPV vaccine into the list of recommended vaccination. Evidence shows that vaccination will reduce the burden of cervical cancer in India, but vaccines are still not available in the national routine immunization program.^[6] In 2017, the World Health Organization (WHO) Executive Board emphasized about HPV vaccination of 9-14 years old girls is one of the 5 recommended interventions against non-communicable diseases.^[7]

The global evidence strongly suggesting that, HPV vaccination will reduce the incidence, morbidity, mortality, and costs associated with cervical cancer. The acceptability of the HPV vaccination in India is still controversial due to high cost, stigma, and lack of knowledge, safety, and efficacy concerns. The safety issues related to HPV vaccination were highlighted in the report of 2010 that, four tribal women were dying due to adverse events in the HPV vaccination project led by a global non-governmental organization in Andhra Pradesh.^[8] Although the reports of the projects shown that deaths are not associated with the HPV vaccine, due to negative media coverage still most of the people in India believe that vaccines will induce serious adverse effects.^[9]

In middle-income countries like India, cost plays a vital role in the acceptance of the vaccine, which is not available in the routine immunization program. The cost of HPV vaccination is 12,000 INR (approximately USD) for three doses. The average annual per capita income in India of 1,36,405 (2017-2018).^[10] About 11.4% of the annual income has to be spent on HPV vaccination. The addition of HPV vaccination in routine immunization programs will reduce the burden of cost for vaccination. Most of the cervical cancer cases in India were reported in the advanced stage due to a lack of awareness and accessibility of the screening program.^[11] The HPV vaccine will reduce the detection rate of cervical cancer, but it is not an alternative to cervical cancer screening.

Health care providers Knowledge, Attitude, and recommendations play a vital role in the acceptance of HPV vaccination among adolescent girls. Parents purely depend on the recommendations given by the health care provider's weather to vaccinate their children or not. After termination of the HPV vaccination project led by a global non-governmental organization in Andhra Pradesh, this is the primary study conducted in this state to know the KAP of health care workers in the recommendation of HPV vaccination. The data generated in this study will have a great scope in the incorporation of HPV vaccination in the routine immunization of the program. This study aims to evaluate the Knowledge, Attitude, and Practice (KAP) of physicians in the recommendation of the HPV vaccination.

MATERIALS AND METHODS

A cross-sectional study was conducted between May 2019 and October 2019 in Anantapuramu District, Andhra Pradesh, India. Anantapuramu is the largest district in the state of Andhra Pradesh in Southern India. A total of Government hospitals, private hospitals, Primary Health Centers (PHCs), and Non-Profit Organization (NGO) Hospitals are involved in providing immunization facilities to the residents of Anantapur district. Physicians practicing in the area of Obstetrics & Gynecology, Pediatrics, Oncology, Family Medicine, Infectious Diseases, and primary care centers were included in the study. These physicians are more likely to recommend HPV vaccination in their practice. There were no financial or material incentives for participation. The study was approved by the Institutional Review Board (IRB) with an approval number of RIPER/IRB/PP/2019/001. Written informed consent was obtained from the physicians after explanation of the study objectives and expected outcomes.

Sample size and sampling technique:

The number of physicians to be included in the study was calculated by using a single population proportion formula. By considering 80% of the HPV vaccine acceptance rate (p) from the previous studies, 95% confidence interval, 80% power, 5% margin of error (d), and the sample size was calculated as 246. Because there may be dropouts or insufficient data or incomplete data sample size was increased by 20% to about 296. A convenient sampling technique was used to select the physicians from different hospital settings (Government, Private, PHC, and Trust) providing immunization facilities in Anantapur district.

Survey instrument:

Validation of KAP Questionnaire:

The KAP questionnaire was subjected to face validation by a panel of experts comprising of a gynecologist (1), pediatrician (1), oncologist (1), epidemiologist (1), and anthropologist (1). Knowledge domain contains 30 questions (HPV infection-16; HPV vaccine-14), attitude domain 5 questions, and practice domain 6 questions. Expert opinion towards each item was placed on a four-point Likert scale ranging strongly agree 4, agree 3, disagree 2, and strongly disagree 1. The Scale level Content Validity Index (S-CVI) for knowledge (HPV infection and vaccination), attitude, and practice domains were estimated as 0.9, 0.84, and 0.9 (≥ 0.8 acceptable).

KAP questionnaire

The questionnaire encompasses four parts to collect data regarding the socio-demographic profile of study physicians and KAP towards HPV vaccine recommendation. The socio-demographic characteristics include age, gender, marital status, qualification, practice location, hospital type, specialty, experience, workload, and age of the patients primarily consulted.

Knowledge about HPV infection and HPV vaccination:

Knowledge regarding HPV infection was assessed by using a 14 - point scale. There were 16 knowledge related questions (HPV infection) that carry 14 correct answers. Each correct answer was given a point of '1' and wrong answer a point of '0'. The maximum expected points were 14 and a minimum of zero. Points to aware about HPV infection is sexually transmitted disease (1 point), HPV infection causes cervical cancer (1 point), HPV 16 and 18 strains causes' cervical cancer (1 point), HPV 6 and 11 strain causes genital warts (1 point), both men and women infected with HPV (1 point), HPV causes vulvar, vaginal and anal cancer in women (1 point), HPV causes anal cancer in men (1 point), HPV causes head and neck cancer (1 point), HPV infection is high in women age 20s and 30s (1 point), HPV infection is asymptomatic (1 point), HPV detection is not possible by PAP smear, PCR and biopsy (1 point) blood test used in HPV detection (1 point), treatment of cervical dysplasia not eliminates HPV (1 point), and condom use does not prevent HPV transmission (1 point).

Knowledge regarding HPV vaccination was assessed by using a 10 point scale. There were 14 HPV vaccine-related knowledge questions that carry 11 correct answers. Each correct answer was given a point of '1' and wrong answer a point of '0'. The maximum expected points were 11 and a minimum of zero. Points to physician aware about several vaccines available in the Indian market (1 point), name of the vaccines (1 point), Use of Cervarix in only females & Gardasil in both males and females (1 point), vaccine recommended age group (1 point), route of administration (1 point), the recommendation of HPV vaccine irrespective of HPV infection (1 point), HPV vaccine protects against cervical cancer and genital warts (1 point), vaccination is not a substitute for screening (1 point), HPV vaccine is contraindicated in pregnancy (1 point), and HPV vaccine offers >90% efficacy (1 point). Knowledge regarding HPV infection and vaccination was divided into three categories based on original blooms cut off criteria. According to the criteria, if the physician gives 80-100% correct responses meant good knowledge, 60-79% correct responses meant a moderate knowledge, and <60% correct responses meant a poor knowledge.

Attitude towards HPV vaccine recommendation:

The physician's attitude towards the barriers of HPV vaccine recommendation was assessed by five dichotomous answerings (Yes/No) statements. The barriers identified and evaluated are high cost, doubt of efficacy, safety concerns, HPV has sexually transmitted infection, and unavailability of the vaccine in the universal immunization program.

Practices of HPV vaccine recommendation:

A total of six questions were used to assess the practices of physicians to HPV vaccine recommendation. The first question is; "have you recommended HPV vaccine to your client". If the physician says 'yes', he/she will be allowed to answer the remaining five questions about the rational

practice. Rational practices included are; Advice of PAP smear even women get vaccinated, HPV vaccine advice after detection of precancerous lesions, vaccine not advised in pregnant women, following standard dosing schedule, and recommendation in the appropriate age group. The rational practice was confirmed if the physician adheres to all the above practices during HPV vaccination recommendation.

Statistical analysis:

Epi-Info 7 for Dos version 3.5.1 software (Centers for Disease Control and Prevention, Clifton Road Atlanta, USA) was used to analyze the data. Descriptive statistics (mean, standard deviation, frequency, and proportion) were used to represent the socio-demographic characteristics and KAP of the study physicians. Inferential statistics like, the chi-square test was used to associate socio-demographics with good knowledge and regular practice towards the HPV vaccine. $P < 0.05$ was considered a statistically significant result.

RESULTS

A total of 296 physicians were answered the KAP questionnaire, in these majority (118; 31.8%) are between 20 and 30 years, with a mean age of 35.84 ± 10.12 . The majority of the respondents were males (160; 54.0%), practices in urban areas (138; 46.6%), and working in a private hospital (152; 51.3). Doctors from general medicine (128; 43.2%), OBG (85; 28.7%), and pediatric (72; 24.3%) departments were high in our study. More than half of the respondents were having less than 10 years' experience (196; 66.2%). The majority of the physicians are treating all age groups of patients (186; 62.8%) and working less than or equal to eight hours (222; 75.0%) as shown in Table 1.

Among 296 physicians, 3/4th of them are aware of the HPV infection is transmitted through sex (226; 89.8%), HPV 16 and 18 strains cause cervical cancer (250; 84.4%), HPV infects both men and women (246; 83.1%), HPV causes vulvar, vaginal, and anal cancers in women (238; 80.4%), types of vaccines available in the Indian market (256; 86.5%), and names of the vaccines (260; 87.8%). Less than half the respondents are aware of detection methods for HPV infection (44; 14.8%), treatment of cervical dysplasia doesn't eliminate HPV (134; 45.3%), and condom use does not help in the prevention of HPV infection (100; 33.8%). More than half of the respondents have answered all questions related to HPV vaccination as depicted in Table 2.

Among all respondents, more than half of them were believed that the HPV vaccine is costly (232; 78.4%), not effective (186; 62.8%), and not safe (176; 59.4%) are the major barriers for the poor recommendation. Because HPV is a sexually transmitted infection (197; 66.5%), and unavailability of vaccine (223; 75.3%) in the universal immunization program are also obstacles for the vaccine recommendation. Only, (99; 33.4%) of physicians are recommending the HPV vaccine in their routine practice. Among 99 practicing physicians, less than 30% adheres to rational practicing procedures as shown in Table 3.

Among all physicians, 35 (13.2%) have good knowledge, 142 (47.9%) moderate knowledge, and 115 (38.8%) poor knowledge about HPV infection. Knowledge towards HPV vaccination revealed, 131 (43.9%) have good knowledge, 92 (31.1%) moderate knowledge, and 74 (25.0%). Among 296 physicians, only 99 are recommending the HPV vaccine for their clients. In these, the majority (77; 77.7%) are having irrational practice as represented in Table 4.

Socio-demographic characteristics like age, location of practice, type of working hospital, specialty, healthcare experience, and age of patients primarily treated are significantly associated with good knowledge and regular practice towards HPV vaccine recommendation as represented in Table 5.

Among all identified barriers, the "HPV vaccine is not safe" is one of the major barriers strongly associated with low recommendation with a *P*-value 0.006. An association of all identified barriers towards vaccine recommendation was represented in Table 6.

DISCUSSION

Optimal knowledge about the HPV vaccine among physicians is an essential requirement to educate and recommend the vaccine. Evidence shows that physician recommendation is an essential and reliable predictor for vaccine acceptance. [12] Our study findings explore the insights of the physician's knowledge, and practices of HPV vaccine recommendation in and around Anantapur district, India, as well as investigating the physician attitude towards major barriers for HPV vaccine recommendation.

Our study findings reveal that, only 52% of the physicians are aware of HPV causes some neck and head cancers. Our findings are even very less compared to the findings (57.1%) of the study conducted by AbiJaoude J *et al* in Lebanon. [13] An Indian cohort study findings revealed that, 32% of the head and neck squamous cell cancer (HNSCC) patients were positive for HPV. [14] This evidence strongly highlights the need for awareness regarding HPV links to HNSCC.

The study physicians falsely believe that, condom use prevents HPV infection, dysplasia treatment eliminates HPV, and HPV detection is not possible by a blood test. There is a need to address and fulfill the knowledge gap exists among our study physicians regarding, the link between HPV infection and HNSCC, condom use cannot prevent HPV infection, treatment of cervical dysplasia not eliminate HPV, and a simple blood test is enough to detect HPV infection.

Findings of knowledge about HPV vaccine reveal that, very few physicians aware (160; 54.0%) about the use of Cervarix is only for females and Gardasil can be used in both males and females. According to WHO guidelines, the primarily targeted age group for vaccination was 9-14 years and the secondary target was more than 15 years. [15] Physicians knowledge about, HPV vaccine recommendation between the

age of 9 and 14 years (172; 58.1%), administered through IM route (160; 54.0%), and not or less effective in HPV infected people (136; 45.9%). In broad, the overall knowledge towards HPV infection and vaccination is moderate (142; 47.9%, 92; 31.1%) and poor (115; 38.8), 74; 25.0%) among physicians practicing in Anantapur District. A similar report type is also observed in the studies conducted in other regions of India. [16-18]

Physicians strongly believing that, high cost (232; 78.4%) is one of the major barriers for HPV vaccine acceptance among the public. Nearly similar results are also observed in a study conducted by Belani HK *et al* in Bangalore, India. [19] A previous hospital-based study on KAP towards cervical cancer among women in Anantapur district, revealed the majority of the participants are low-economic background. [20] These findings support cost is one of the major barriers existing in HPV vaccine acceptance.

Majority of physicians are considering, unavailability of vaccine in UIP (223; 75.3%), sexual transmitted nature of HPV (197; 66.5%), HPV vaccine is not effective (186; 62.8%) and safe (176; 59.4%) are the major barriers for HPV vaccine recommendation. Physicians are more concerned regarding the negative parental reaction to discuss sexually transmitted infections and vaccination for their children. Doubt about the safety and efficacy of the vaccine is nearly similar to the findings of the study conducted by Garbutt JM *et al.* [21]

Our study shows that, only 33.4% of the physicians are recommending the HPV vaccine for their clients. Physician practices are very low compared to the findings (47%) of the study conducted in New Delhi by Chawla *et al.* [6] This wide difference may be due to, physicians practicing in New Delhi may have excessive exposure towards updates of HPV vaccine than physicians in Anantapur district.

The study findings reveal that, physicians age, type of working hospital, specialty, healthcare experience, and age of patients primarily consulted were significantly associated with knowledge about HPV infection and (or) HPV vaccination. Physicians practicing in an urban location, and community medicine specialty were significantly associated with the high practice of vaccine recommendation. These findings help in the planning of targeted, structured educational, or CME programs to physicians in improving knowledge and practice towards HPV vaccine recommendation.

Physician practice towards HPV vaccine recommendation was significantly (*P* 0.006) associated with a barrier (use of HPV vaccine is not safe). This false belief among physicians needs to be addressed to improve the practice of HPV vaccine recommendation.

Strengths and limitations:

The study was limited to hospitals located in Anantapur district, Andhra Pradesh, India. There is a necessity to expand this research in various regions of India, whether the findings are reproducible or not. Physicians are enrolled in the study by using a convenient sampling technique, so, the time and day of visit to the hospital may influence the response towards the KAP questionnaire. This is the prime KAP study conducted among physicians in Andhra Pradesh state. These results help in addressing issues related to poor HPV vaccine recommendations.

CONCLUSION

We conclude, the majority of the physicians had moderate or poor knowledge about HPV infection and vaccine. Only, 33.4% of the physicians are recommending the HPV vaccine to their clients. Poor knowledge, false attitude, or belief about existing barriers (high cost, non-efficacious, STD, unsafe, non-availability in UIP) of the HPV vaccine are the major reasons for the low practice among physicians. So, there is a need to improve physician knowledge, and eliminate false beliefs about barriers towards HPV vaccine recommendation before the implementation of vaccines in the routine immunization programs.

Conflict of interest: Nil

ACKNOWLEDGMENT

The authors would like to thank all physicians who are involved in this research study. All the authors are wholeheartedly thankful to the people who are directly or indirectly responsible for the completion of the work.

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Table 1: Sociodemographic profile of study participants (n=296)

Characteristics	Categories	Frequency (%)
	Mean \pm SD	35.84 \pm 10.12
Age (Years)	20-30	118 (39.8)
	31-40	106 (35.8)
	41-50	42 (14.1)
	51-60	24 (8.1)
	> 60	6 (2.0)
Gender	Male	160 (54.0)
	Female	136 (45.9)
Location of practice	Rural	84 (28.3)
	Semi-urban	74 (25.0)
	Urban	138 (46.6)
Type of hospital working	Government	78 (26.3)
	Private	152 (51.3)
	PHC	8 (2.7)
	Trust	58 (19.5)
	General Medicine	128 (43.2)
Specialty	Pediatrics	72 (24.3)
	Community Medicine	8 (0.3)
	Rheumatology	3 (0.1)
	OBG	85 (28.7)
	Mean \pm SD	8.31 \pm 8.13
Healthcare experience (Years)	<10	196 (66.2)
	10-19	64 (21.6)
	20-29	24 (8.1)
	30-39	10 (3.3)
	>40	2 (0.6)
Working hours per day	Mean \pm SD	7.94 \pm 2.36
	\leq 8	222 (75.0)
	>8	74 (25.0)
Age of the patients primarily consulted (Years)	\leq 15	42 (14.1)
	>15	26 (8.7)
	All age groups	186 (62.8)

SD=Standard Deviation; PHC=Primary Health Centre; OBG=Obstetrics & Gynecology

Table 2: Knowledge about HPV infection and vaccination (296)

HPV infection	
Variable	Frequency (%)
HPV infection is a sexually transmitted disease	266 (89.8)
HPV infection causes cervical cancer	196 (66.2)
HPV 16 and 18 strains cause cervical cancer	250 (84.4)
HPV 6 and 11 strains cause genital warts	216 (72.9)
HPV infects both men and women	246 (83.1)
HPV causes vulvar, vaginal, and anal cancers in women	238 (80.4)
HPV causes anal cancer in men	206 (69.6)
HPV causes some head and neck cancers	154 (52.0)
Incidence of HPV is high among women in their 20s and 30s	204 (68.9)
HPV infection is asymptomatic	210 (70.9)
HPV detection is not possible by Pap smear, PCR, and biopsy	44 (14.8)
The blood test is used in HPV detection	166 (56.1)
Treatment of cervical dysplasia, not complete eliminated HPV	134 (45.3)
Condom use does not prevent HPV infection	100 (33.8)
HPV vaccine	

Two types of vaccines are available in the Indian market	256 (86.5)
Cervarix and Gardasil are the names of HPV vaccines	260 (87.8)
Cervarix is used in only females, whereas Gardasil is used in both males and female	160 (54.0)
HPV vaccine is primarily targeted in the age group between 9 and 14 years	172 (58.1)
HPV vaccine is given through IM route	160 (54.0)
HPV vaccine is less effective or ineffective in HPV infected people	136 (45.9)
HPV vaccine protects against cervical cancer and genital warts	234 (79.0)
HPV vaccination is not a substitute for cervical cancer screening	214 (72.3)
HPV vaccine is contraindicated in pregnant women	226 (76.3)
HPV vaccine offers >90% of efficacy	218 (73.6)

HPV=Human Papilloma Virus; PCR=Polymerized Chain Reaction; IM=Intra Muscular

Table 3: Attitude and practice of HPV vaccine recommendation among respondents (n=296)

Attitude		
Cost is one of the major barriers for acceptance of the HPV vaccination		
Yes		232(78.4)
No		64(21.6)
Doubt on the efficacy of HPV vaccine is one of the barriers for the recommendation		
Yes		186 (62.8)
No		110(37.2)
HPV vaccine is not recommended due to some safety concerns		
Yes		176(59.4)
No		120(40.5)
Sexually transmitted nature of HPV is a barrier for a recommendation		
Yes		197(66.5)
No		99(33.3)
Unavailability of a vaccine in the immunization program is a major barrier		
Yes		223(75.3)
No		73(24.7)
Practice		
Physician recommended HPV vaccine in his/her practice ^a		
Yes		99 (33.4)
No		197 (66.5)
Advice of a Pap smear even women get vaccinated		
		83 (28.0)
HPV vaccine recommendation after detection of precancerous lesions		
		63(21.3)
HPV vaccine is not recommended in pregnant women		
		59 (19.9)
Adherence towards standard dosing schedule		
		74 (25.0)
A recommendation in the appropriate age group		
		82 (27.7)

HPV=Human Papilloma Virus; a=Physicians answered "yes" for this question are allowed to assess the rational practice of HPV vaccine

Table 4: Adequacy of Knowledge, Attitude, and Practice towards HPV vaccine recommendation

Variable	Frequency (%)
Knowledge (n=296)	
Knowledge HPV Infection	
Good	39(13.2)
Moderate	142(47.9)
Poor	115(38.8)
Knowledge HPV Vaccination	
Good	131 (43.9)
Moderate	92(31.1)
Poor	74(25.0)
Practice (n=99)	
Rational practice	22 (22.2)
Irrational practice	77 (77.7)

HPV=Human Pappiloma Virus

Table 5: Association of Sociodemographic characteristics with good knowledge and regular practice towards HPV vaccine recommendation (n=296)

Characteristics	Total (n=296)	Good knowledge on HPV Infection (n=39)		Good knowledge on HPV vaccination (n=131)		Practice (n=99)	
		n (%)	χ^2 (P value)	n (%)	χ^2 (P value)	n (%)	χ^2 (P value)
Age (Years)							
20-30	118	14 (11.8)	1.3 (0.24)	43 (36.4)	13.2 (0.0002)	41 (34.7)	2.3 (0.12)
31-40	106	12 (11.3)	1.5 (0.21)	39 (36.7)	12.6 (0.0003)	41 (38.6)	3.6 (0.05)
41-50	42	7 (16.6)	0.1 (0.71)	27 (64.2)	0.65 (0.41)	11 (26.1)	0.3 (0.54)
>50	30	6 (20.0)	Ref	22 (73.3)	Ref	6 (20)	Ref
Gender							
Male	160	18 (11.2)	1.1(0.28)	77 (48.1)	2.1 (0.14)	49 (30.6)	1.2 (0.26)
Female	136	21 (15.4)	Ref	54 (39.7)	Ref	50 (36.7)	Ref
Location of practice							
Rural	84	13 (15.4)	0.4(0.50)	41 (48.8)	0.3 (0.57)	33 (39.2)	0.2 (0.64)
Semi-urban	74	9 (12.1)	0.001 (0.97)	28 (37.8)	0.9 (0.31)	16 (21.6)	4.7 (0.02)
Urban	138	17 (12.3)	Ref	62 (44.9)	Ref	50 (36.2)	Ref
Type of hospital working							
Government							
PHC	78	16 (20.5)	7.6 (0.005)	31 (39.7)	0.003 (0.95)	28 (35.8)	1.6 (0.19)
Trust	8	0	0	2 (25)	0.72 (0.39)	1 (12.5)	0.8 (0.3)
Private	58	11 (18.9)	5.2 (0.02)	37 (63.7)	9.44 (0.002)	28 (48.2)	8.0 (0.004)
Specialty	152	12 (7.89)	Ref	61 (40.1)	Ref	42 (27.6)	Ref
GM	128	15 (11.7)	0.5 (0.44)	48 (37.5)	0.13 (0.71)	37 (28.9)	0.6 (0.42)
Pediatrics	72	9 (12.5)	0.2(0.61)	45 (62.5)	7.8 (0.004)	25 (34.7)	0.006 (0.93)
CM	8	1(12.5)	0.04(0.83)	2 (25)	0.69 (0.40)	8 (100)	13.2 (0.0002)
Rheumatology	3	1(33.3)	0.7(0.40)	2 (66.6)	0.85 (0.35)	0 (0)	1.5 (0.21)
OBG	85	13 (15.1)	Ref	34 (40)	Ref	29 (34.1)	Ref
Healthcare experience (Years)							
<10	196	22 (11.22)	46.2 (0.0001)	70 (35.7)	11.85 (0.0005)	70 (35.7)	1.03 (0.30)
10-19	64	11 (17.1)	23.2 (0.0001)	35 (54.6)	4.47 (0.03)	17 (26.5)	0.19 (0.65)
20-29	24	6 (25)	0.97 (0.32)	15 (62.5)	2.57 (0.10)	10 (41.6)	1.4 (0.2)
30-39	2	1(50)	4.17 (0.04)	2 (100)	0.21 (0.64)	0 (0)	0.48 (0.48)
>40	10	9(90)	Ref	9 (90)	Ref	2 (20)	Ref
Age of the patients primarily consulted							
All age groups							
Only >18	186	34 (18.2)	14.9 (0.0001)	70 (37.6)	15.1 (0.0001)	60 (32.2)	0.13 (0.77)
Only <18	26	4 (15.3)	9.21 (0.002)	8(30.7)	8.3 (0.003)	10 (38.4)	0.13 (0.71)
	84	1 (1.2)	Ref	53 (63.0)	Ref	29 (34.5)	Ref

HPV=Human Papilloma Virus; GM=General Medicine; HS=House surgeon; OBG=Obstetrics & Gynecology; PHC=Primary Health Centre; CM=Community Medicine

Table 6: Association of identified barriers towards HPV vaccine recommendation

Identified barriers	Total	Practice	χ^2 (P-value)
Cost of HPV vaccine			
Yes	232 (78.37)	77 (33.1)	0.03 (0.85)
No	64 (21.62)	22 (34.3)	Ref
Doubt on the efficacy of HPV vaccine			
Yes	186 (62.83)	59 (31.7)	0.66(0.41)
No	110 (37.16)	40 (36.3)	Ref
HPV vaccine is not safe			
Yes	176 (59.45)	48 (27.2)	7.43(0.006)
No	120 (40.54)	51 (42.5)	Ref
Sexually transmitted nature of HPV is a barrier			
Yes	197 (66.55)	61 (30.9)	1.6(0.2)
No	99 (33.34)	38 (38.3)	Ref
Unavailability of a vaccine in the immunization program			
Yes	223 (75.33)	69 (30.9)	2.5(0.11)
No	73 (24.66)	30 (41.0)	Ref

HPV=Human Papilloma Virus