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Dental Students' Perception, Awareness and Knowledge About HPV Infection, Vaccine, and Its Association with Oral Cancer: A Multinational Study

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Background: Human papilloma virus (HPV) infection forms a major etiological factor for oropharyngeal cancer (OPC), which has exhibited increased global incidence.

Aim: To compare the knowledge regarding HPV, its association with OPC, and HPV vaccine among students from different countries, years of the undergraduate program, and gender.

Methods: The current multinational cross-sectional study was conducted in 886 undergraduate dental students from Egypt, India, Pakistan, Saudi Arabia, UAE, and Sudan through Google survey forms from July 2021 to September 2021. The survey form comprised 27 items divided into four sections. The answers to the questionnaire were compared among students from different countries, different years of the undergraduate program, and males and females. Chi-square test was used to evaluate the correlation between the demographic characteristics of students and their knowledge regarding HPV and OPC.

Results: Females exhibited a better knowledge regarding knowledge and perception on HPV vaccine, whereas males exhibited a better knowledge regarding HPV and its correlation with OPC, and these differences were statistically significant ($P < 0.05$). The third- and fourth-year undergraduate students displayed a higher awareness of OPC and its connection with HPV than other year students, and this variance was found to be statistically significant ($P < 0.001$). Third-year and internship students exhibited a more positive attitude and comfort regarding the vaccine and discussing the same with patients than the other educational-level students. Students from India exhibited better knowledge about HPV and its association with OPC than the students from other countries, and this difference was statistically significant ($P < 0.001$).

Conclusion: Disparities in knowledge regarding HPV-related oral cancer have been detected among the female and male participants among different nations. From the entire study population, Indian students exhibited better knowledge regarding HPV. Females from all the nations exhibited a more positive attitude and comfort regarding the vaccine and discussing the same with patients than males. The results of this necessitate intervention measures including training workshops and awareness campaigns. Improving their knowledge regarding the same may increase their awareness, resulting in better patient care.

Keywords: carcinoma, squamous cell, human papillomavirus 16, oropharyngeal neoplasms, papillomavirus infections, papillomavirus vaccines, sexually transmitted diseases

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Introduction

Oral squamous cell carcinoma comprises a group of malignancies that manifest in various regions of the oral cavity and are the 11th most common cancer worldwide.[1] The global incidence of these malignancies is 4 per 100,000 people, and they form a major economic burden.[2] According to Globocan data, the 5-year prevalence of oropharyngeal cancer (OPC) globally is 2.2% in Africa, 37.6% in Asia, 16.9% in North America, 8.6% in Latin America and the Caribbean and 33.4% in Europe, respectively.[3]

The etiology for oral cancer is multifactorial, including exposure to ultraviolet radiation, betel or areca nut, tobacco, and alcohol.[4,5] Additionally, human papilloma virus (HPV) infection forms a major etiological factor for oral cancer. The significance of this etiological factor can be ascertained from the fact that the prevalence of HPV among OPC increased from 16.3% in 1989 to 72.7% during 2000–2004.[6] Currently, approximately 63% of all OPCs are attributable to HPV and may be preventable.[7,8] Thus, an awareness about HPV-related OPC can facilitate the reduction in the incidence of these cancers.

OPC is associated with high mortality. The primary reason for this is the silent presentation and late diagnosis of most patients.[9] Thus, diagnosis of OPC in the early stages could decrease the mortality and morbidity associated with the condition. The oral cavity is easily accessible for clinical examination, especially for dentists, who can form the frontline for the prevention of oral cancer. Thus, increasing awareness and knowledge among dental professionals and patients could improve survival among patients with oral cancer.

Several HPV-related malignancies caused due to HPV 16 and 18 such as oral and cervical cancer can be prevented through HPV vaccination.[10] Although the HPV vaccine is licensed for both females and males between 9 and 26 years of age, it is recommended in 11- and 12-year-old adolescents.[10] Although it is not yet approved for preventing HPV-related OPCs, molecular and epidemiological data support a contributory role for HPV in OPC, and research is being carried out to investigate the efficacy of HPV vaccines for preventing OPCs.[11] It is therefore vital to target immunizable young adult college-going girls and boys, as both are part of the infection chain and at risk for HPV infection as they are growing adults with independent lifestyles but have a choice to undergo vaccination with the consent from parents and are within the age group of successful vaccination outcome.

HPV is a sexually transmitted infection. Thus, identifying the comfort of the healthcare professional to discuss these etiologies with their patients and the gaps in their knowledge regarding HPV assists in detecting early cases.

Although several studies have investigated the awareness of dentists regarding HPV vaccines, most of these studies have been limited to a single country. Thus, the present study attempted to compare the knowledge regarding HPV, its association with OPC, and HPV vaccine among students from different countries, years of the undergraduate program, and gender among dental undergraduate students from six countries, namely India, Pakistan, Saudi Arabia, Egypt, UAE, and Sudan.

Materials and Methods

Study Participants

The present cross-sectional study was conducted among 1500 dental students from six countries through Google survey forms from 5 July 2021 to 5 August 2021 after obtaining Dar al Uloom University ethical clearance. The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board of College of Dentistry, Dar Al Uloom University, Riyadh, KSA (COD/IRB/2020/22). Students from the third year onwards of undergraduate dental education from Egypt, India, Pakistan, Saudi Arabia, UAE, and Sudan were included in the study. Students from any other country or those not in dental undergraduate training were excluded from the study. Only these countries were included as we could get permission for the concerned academic institutions through our known contacts at respective nations to circulate the survey among their students. The survey form was provided to the students through faculty working in the academic institutions of these countries. The nature of the study was described to every subject before they participate in the survey. The response of the participants was maintained confidential, and their consent was obtained electronically by their willingness to participate in this survey by answering all the questions.

Among 1500 dental students approached, only 886 responded within the stipulated time. The sample size was selected as per reference article and taking into account the number of students in each university fitting our inclusion

criteria from six different nations. Considering the proportion of 0.641 (64.1%) from the pilot study, with relative precision of 5% and 95% confidence level, the calculated sample size came up to 864. The formula for calculating the sample size is as follows:

$$n = Z21 - \alpha/2 \times (1 - P)/\varepsilon 2 \times P$$

where P = expected proportion, 1- α/2 = desired confidence level, and ε = relative precision.

Data Collection

A Google survey form was created using survey items adopted from the studies by Sallam et al and Daley et al[12,13] Prior to the data collection, the questions were pretested among a group of 15 professionals to ensure the level of validity and degree of repeatability. The Google survey form was circulated by the faculty working in the academic institutions of each of the six countries through email and phone numbers. The survey took approximately 5–10 min to answer all the questions.

The survey form comprised 27 items divided into four sections (Figure 1). The first section comprised questions determining the demographics of the group, including age, sex, nationality, marital status, current level of education, and history of smoking. The second section attempted to determine the knowledge of oral cancer among the dental students and was termed as the knowledge-based questionnaire. The third section ascertained the awareness of HPV among participants and was termed as the awareness-based questionnaire. The fourth section comprised questions ascertaining the comfort of the practitioners to disseminate HPV information among patients and was termed as the attitude-based questionnaire.

The aim of the study is to compare the awareness, knowledge, and perception about HPV and OPC among students from different countries, years of the undergraduate program, and gender.

Statistical Analysis

The data were collected and organized in MS-Excel. Statistical analysis was conducted using SPSS v 21 (IBM, Chicago, IL, USA). The demographic and survey data were collected as per frequency and percentage. Chi-square test was used to evaluate the correlation between the demographic characteristics of students and their knowledge regarding HPV and oral cancer. $P < 0.05$ was considered statistically significant.

Results

The demographic characteristics of patients are presented in Table 1. Of the 886 participants, a majority were females (73.1%). Most participants were from India (29.3%), followed by Saudi Arabia (21.8%).

Tables 2 and 3 present the comparison of knowledge between on HPV and its relationship with OPC in males and females. The awareness of HPV and its association with OPC was higher in males than in females, and this difference was statistically significant ($P < 0.05$). On the other hand, females exhibited better knowledge and perception on HPV vaccine than males, and this difference was statistically significant ($P < 0.05$). Females exhibited a more positive attitude and comfort regarding the vaccine and discussing the same with patients than males, and this difference was statistically significant ($P < 0.001$).

Tables 4 and 5 present the comparison of knowledge on HPV and its relationship with OPC among students in different undergraduate years. Third- and fourth-year students exhibited better awareness of HPV and its association with OPC than other year students, and this difference was statistically significant ($P < 0.05$). The third-year and internship students exhibited a more positive attitude and comfort regarding the vaccine and discussing the same with patients than the other educational-level students, and this difference was statistically significant ($P < 0.001$).

Tables 6–8 present the comparison of knowledge on HPV and its relationship with OPC among students from different countries. Majority of Indian students exhibited better knowledge and awareness of HPV and its association with OPC than other year students, and this difference was statistically significant ($P < 0.05$). The Indian students exhibited better knowledge about HPV than other students from other countries, and this difference was statistically significant ($P < 0.001$). Indian students exhibited a more positive attitude and comfort regarding the vaccine and

Question Number Question

5) Marital status
a) Married
b) Single
c) Divorced

6) **Do you smoke** ?(**any type of smoking including e-cigarettes, Hookah etc**)
a) Yes
b) No
c) Previous smoker

7) Have you heard of oral cancer before
a) Yes
b) No

8) **How many oral cancer patients have you seen in clinics so far**?
a) 0 patients
b) less than 5 patients
c) 5 to 10 patients
d) More than 15 patients
e) More than 25 patients

9)**What are the risk factors of oral cancer (need not be one answer)**
a) Smoking
b) Alcohol
c) Positive family history
d) HPV infection
e) Sharp cusp/tooth
f) Nutritional deficiency
g) Immune status

10) **What is the common site of occurrence of oral cancer? (need not be one answer)**
a) Tongue
b) Lips
c) Jawbone
d) Floor of the mouth
e) Palate
f) Oropharynx

11) **Which of the following describes the clinical appearance of the early lesion of oral cancer? (need not be one answer)**
a) White lesion
b) Red lesion
c) Ulcer
d) Mass
e) Bony hard swelling
f) Papillary growth

12) **Are you confident to identify clinically, early lesions of oral cancer**?
a) Somewhat confident
b) Very confident
c) Not confident

13) Before taking this survey, have you heard about Human papilloma Virus (HPV) before?
a) Yes
b) No

14) What diseases you know that HPV can cause? (need not be one answer)
a) No idea
b) Uterine Cervical cancer
c) Oral cancer
d) HIV
e) Hepatitis
f) Cold sores/ mouth ulcers
g) Penile & anal cancer
h) Genital warts

15) **The spread of HPV is by**
a) Air borne/ droplets
b) Sexual contact
c) Saliva
d) Blood borne

16) Most HPV infections resolve within a short time
a) Yes
b) No
c) C) May be
d) d) Don't know

17) Do you know there exists vaccines against HPV?
a) Yes
b) No
c) Maybe
d) Don't know

18) From where you heard about HPV vaccine (need not be one answer) ?
a) None
b) Gynecologist
c) Dentist
d) Online websites
e) Books
f) Friends /family

19) Who are eligible to take HPV vaccine?
a) Only adult females above 30yrs
b) Only adult males above 30yrs
c) Ladies and gents above 30yrs
d) Young females below 30yrs
e) Young males below 30yrs
f) Ladies and gents below 30yrs
g) No idea

20) Are you vaccinated for HPV ?
a) Yes
b) No

21) Do you think it is important to get vaccinated for HPV ?
a) Yes
b) No
c) Maybe

22) What would be your reasons, if you are unwilling to get vaccinated ?(need not be one answer)
a) Not sexually active
b) Too expensive
c) Doctor did not recommend.
d) Worried about safety of vaccine.
e) Don't know where to get vaccine
f) My spouse / family member against it
g) Don't know enough about vaccine
h) Embarrassed to receive STD (sexually transmitted disease) vaccine
i) Currently/Previously infected with HPV
j) Vaccinated against HPV already

23) Are you willing to discuss about HPV vaccine with the same and with the opposite gender patients?
a) Yes
b) No

24) Are you comfortable to discuss with your patients their personal health (sexually transmitted diseases / sexual abuse)
a) Slightly comfortable
b) Not comfortable
c) Most comfortable

25) Which TYPE of HPV can lead to orophyaryngeal cancer?
a) No idea
b) HPV 10
c) HPV 16
d) HPV 25
e) All the types

26) What makes you difficult to discuss with your patients regarding HPV connection with oral cancer? (need not be one answer)
a) Lack of privacy
b) Fear of offending patients
c) Language barrier
d) Lack of time
e) I don't know enough
f) I don't think it is relevant

27) Are you willing to participate in any professional training or continuous dental education program to achieve better knowledge and understanding about HPV & its association with oral cancer.
a) Yes
b) No

Figure 1 Original survey that was circulated.

Table 1 Demographic Characteristics of Participants

		Frequency	Percent
Gender	Female	648	73.1
	Male	238	26.9
Education	Third year	246	27.8
	Fourth year	239	27
	Fifth year	115	13
	Sixth year	79	8.9
	Internship	207	23.4
Country	Egypt	110	12.4
	India	260	29.3
	Pakistan	133	15
	Saudi Arabia	193	21.8
	Sudan	96	10.8
	Sudan	4	0.5
	UAE	90	10.2
Marital status	Divorced	20	2.3
	Married	112	12.6
	Single	754	85.1
Do you Smoke?	No	735	83
	Previous smoker	5	0.6
	Yes	146	16.5

discussing the same with patients than students from other countries, and this difference was statistically significant ($P < 0.001$).

For the knowledge-based questions like Q9, Q14 where the answers could be multiple from the options, in these questions we tried to classify the students who have opted for more than 2 options to be having good knowledge (Table 8).

For Q 15 "The spread of HPV is by?", all the respondents who opted "through sexual contact" and for Q 16 "Most HPV infections resolve within a short time", all the respondents who opted for option "No", and for Q 19 "Who are eligible to take HPV vaccine?", all the respondents who opted for "ladies and gents below 30 years" are classified as having good knowledge as they opted for the correct answers (Figure 1).

Figure 2 illustrates the varying reasons for patients not getting vaccinated. Of the various reasons, lack of knowledge of vaccine is the most common reason for not getting vaccinated.

Discussion

The incidence of HPV-associated OPC is increasing. Thus, awareness among healthcare professionals, especially dentists is required for the early diagnosis of this condition to reduce the associated mortality and morbidity. Thus, the present study evaluated the knowledge, attitude, and awareness of human papilloma virus and its association with oral lesions among dental undergraduate students in different nations.

Table 2 Association of Gender- with Attitude-Based Questionnaires

			Gender		χ^2 Value	P value
			Female	Male		
What would be your reasons, if you are unwilling to get vaccinated	Not sexually active	N(%)	149(74.1)	52(25.9)	82.5	0.001*
	Too expensive	N(%)	75(84.3)	14(15.7)		
	Doctor did not recommend	N(%)	140(69.)	63(31.)		
	Worried about safety of vaccine	N(%)	132(86.8)	20(13.2)		
	Do not know where to get vaccine	N(%)	138(60.3)	91(39.7)		
	My spouse/family member against it	N(%)	5(5.6)	4(4.4)		
	Do not know enough about vaccine	N(%)	238(73.)	88(27.)		
	Embarrassed to receive STD vaccine	N(%)	31(46.3)	36(53.7)		
	Currently/Previously infected with HPV	N(%)	15(78.9)	4(21.1)		
	Vaccinated against HPV already	N(%)	60(78.9)	16(21.1)		
Are you willing to discuss about HPV vaccine with the same and with the opposite gender patients?	(a) Yes	N(%)	488(71.2)	197(28.8)	5.53	0.019*
	(b) No	N(%)	160(79.6)	41(20.4)		
Are you comfortable to discuss with your patients their personal health	(a) Slightly comfortable	N(%)	270(69.9)	116(30.1)	34.37	0.001*
	(b) Not comfortable	N %)	239(85.4)	41(14.6)		
	(c) Most comfortable	N(%)	139(63.2)	81(36.8)		
What makes you difficult to discuss with your parents regarding HPV connection with oral cancer?	Lack of privacy	N(%)	251(66.9)	124(33.1%)	47.4	0.001*
	Fear of offending patients	N(%)	288(68.1)	135(31.9)		
	Language barrier	N %)	131(71.2)	53(28.8)		
	Lack of time	N(%)	96(89.7)	11(10.3)		
	I do not know enough	N(%)	275(71.1)	112(28.9)		
	I do not think it is relevant	N(%)	53(85.5)	9(14.5)		

(*Continued*)

Table 2 (Continued).

			Gender		χ^2 Value	P value
			Female	Male		
Are you willing to participate in any professional training or continuous dental education program to achieve better knowledge and understanding about HPV & its association with oral cancer	(a) Yes	N(%)	493(74.2)	171 (25.8)	1.66	0.198
	(b) No	N(%)	155(69.8)	67(30.2)		

Note: *Statistical significance set at 0.05; N: Number of samples; χ^2 value: Chi-Square value.

Table 3 Comparison of Knowledge Between Males and Females

			Gender		P value
			Female	Male	
			N(%)	N(%)	
Awareness of oral cancer and its association with HPV	What are the risk factors of oral cancer?	Poor knowledge	156(24.1)	44(18.)	0.078
		Good knowledge	492(75.9)	194(81.5)	
	What is the common site of occurrence of oral cancer?	Poor knowledge	334(51.5)	100(42.0)	0.012*
		Good knowledge	314(48.5)	138(58.0)	
	Which of the following describes the clinical appearance of the early lesion of oral cancer?	Poor knowledge	351 (54.2)	84(35.3)	0.001*
		Good knowledge	297(45.8)	154(64.7)	
Knowledge about HPV	What diseases you know that HPV can cause?	Poor knowledge	441(68.1)	122(51.3)	0.001*
		Good knowledge	207(31.9)	116(48.7)	
	What diseases you know that HPV can cause?	Poor knowledge	234(36.1)	52(21.8)	0.001*
		Good knowledge	414(63.9)	186(78.2)	
	Most HPV infections resolve within a short time	Poor knowledge	473(73.0)	193(81.1)	0.013*
		Good knowledge	175(27.0)	45(18.9)	
Knowledge and perception about HPV vaccine	Do you know there exists a vaccine against HPV?	Poor knowledge	338(52.2)	150(63.0)	0.004*
		Good knowledge	310(47.8)	88(37.0)	
	Who are eligible to take HPV vaccine?	Poor knowledge	541(83.5)	216(90.8)	0.007*
		Good knowledge	107(16.5)	22(9.2)	
	Do you think it is important to get vaccinated for HPV?	Poor knowledge	273(42.1)	138(58.0)	0.001*
		Good knowledge	375(57.9)	100(42.0)	

Note: *Statistical significance set at 0.05; N: Number of samples; χ^2 value: Chi-Square value.

Table 4 Association of Education with Awareness-Based Questionnaires

		Education					χ^2 Value	P value
		3rd Year	4th Year	5th Year	6th Year	Internship		
Are you confident to identify clinically, early lesions of oral cancer?	Not confident	31.6%	25.9%	15.%	10.6%	16.9%	123.2	0.001*
	Somewhat confident	26.7%	30.2%	14.4%	2.2%	26.5%		
	Very confident	21.1%	16.5%	0.9%	32.1%	29.4%		
Before taking this survey, have you heard about HPV before?	No	15.%	13.6%	20.7%	25.%	25.7%	77.1	
	Yes	30.2%	29.5%	11.5%	5.9%	22.9%		
From where you heard about HPV vaccine?	Gynecologist	18.5%	75.9%	1.9%	0.%	3.7%	135.6	0.001*
	Dentist	10.6%	25.4%	21.6%	2.7%	39.8%		
	Online websites	34.5%	34.%	15.5%	1.%	15.%		
	Books	31.1%	27.1%	17.6%	14.5%	9.7%		
	Friends /family	31.%	12.%	38.%	2.%	17.%		
Who are eligible to take HPV vaccine?	(a) Only females >30 yrs	0.%	36.1%	0.%	2.8%	61.1%	416.1	0.001*
	(b) Only males >30 yrs	0.%	50.%	50.%	0.%	0.%		
	(c) Both genders >30 yrs	61.9%	25.4%	1.6%	3.2%	7.9%		
	(d) Females < 30yrs	27.1%	16.7%	27.1%	8.3%	20.8%		
	(e) Males < 30yrs	0.%	8.1%	0.%	86.5%	5.4%		
	Everyone	0.%	0.%	0.%	0.%	100.%		
	(f) Both genders < 30 yrs	42.6%	24.8%	20.9%	0.%	11.6%		
	(g) No idea	24.4%	29.1%	12.8%	7.%	26.7%		
Are you vaccinated for HPV?	No	26.8%	29.6%	13.%	10.3%	20.2%	40.63	0.001*
	Yes	32.7%	14.%	12.7%	2.%	38.7%		

Note: *Statistical significance set at 0.05; N: Number of samples; χ^2 value: Chi-Square value.

The present study exhibited that males had better knowledge regarding HPV and its association with OPC, and this difference was statistically significant ($P < 0.05$). This finding differs from that of Reimer et al and Presto et al,[14,15] who exhibited better knowledge among females. This difference may be because of the smaller sample size for males ($n = 238$) in the present study as compared with females ($n = 648$). On the other hand, females exhibited better knowledge about HPV vaccines than males, and this difference was statistically significant ($P < 0.05$). HPV is also responsible for cervical cancer. Cervical cancer is the third most diagnosed cancer globally and the fourth leading cause of cancer-related mortality in women.[16] This cancer is preventable, and the HPV vaccine is recommended to reduce its risk. Thus, women are more aware about the vaccine. This could also explain their increased comfort level to discuss this with patients. Additionally, female students were more comfortable discussing personal health and HPV vaccines with their patients than their male counterparts, and this difference was statistically significant ($p < 0.05$) (Table 2). This may be because females are more emotional than males, making them more at ease with discussing personal health with their patients.

The third-year dental students exhibited better knowledge about HPV than other year students, and this difference was statistically significant ($P < 0.001$). Additionally, students in internship also exhibited better knowledge, awareness, and

Table 5 Comparison of Knowledge Between Students from Different Undergraduate Years

			Education										P value
			3rd Year		4th Year		5th Year		6th Year		Internship		
			N	%	N	%	N	%	N	%	N	%	
Awareness of oral cancer and its association with HPV	What are the risk factors of oral cancer?	Poor knowledge	44	17.9	38	15.9	31	27.0	36	45.6	51	24.6	0.001*
		Good knowledge	202	82.1	201	84.1	84	73.0	43	54.4	156	75.4	
	What is the common site of occurrence of oral cancer?	Poor knowledge	70	28.5	130	54.4	70	60.9	57	72.2	107	51.7	0.001*
		Good knowledge	176	71.5	109	45.6	45	39.1	22	27.8	100	48.3	
	Which of the following describes the clinical appearance of the early lesion of oral cancer?	Poor knowledge	82	33.3	106	44.4	60	52.2	57	72.2	130	62.8	0.001*
		Good knowledge	164	66.7	133	55.6	55	47.8	22	27.8	77	37.2	
Knowledge about HPV	What diseases you know that HPV can cause?	Poor knowledge	99	40.2	123	51.5	102	88.7	74	93.7	165	79.7	0.001*
		Good knowledge	147	59.8	116	48.5	13	11.3	5	6.3	42	20.3	
	What diseases you know that HPV can cause?	Poor knowledge	66	26.8	70	29.3	31	27.0	10	12.7	109	52.7	0.001*
		Good knowledge	180	73.2	169	70.7	84	73.0	69	87.3	98	47.3	
	Most HPV infections resolve within a short time	Poor knowledge	183	74.4	173	72.4	92	80.0	68	86.1	150	72.5	0.079
		Good knowledge	63	25.6	66	27.6	23	20.0	11	13.9	57	27.5	
Knowledge and perception about HPV vaccine	Do you know there exists a vaccine against HPV?	Poor knowledge	129	52.4	108	45.2	64	55.7	63	79.7	124	59.9	0.001*
		Good knowledge	117	47.6	131	54.8	51	44.3	16	20.3	83	40.1	
	Who are eligible to take HPV vaccine?	Poor knowledge	191	77.6	207	86.6	88	76.5	79	100.0	192	92.8	0.001*
		Good knowledge	55	22.4	32	13.4	27	23.5	0	0.0	15	7.2	
	Do you think it is important to get vaccinated for HPV?	Poor knowledge	156	63.4	52	21.8	70	60.9	41	51.9	92	44.4	0.001*
		Good knowledge	90	36.6	187	78.2	45	39.1	38	48.1	115	55.6	

Note: *Statistical significance set at 0.05; N: Number of samples; χ^2 value: Chi-Square value.

Table 6 Association of Country with Awareness-Based Questionnaires

Question		Country						χ^2 Value	P value
		Egypt	India	Pakistan	KSA	Sudan	UAE		
Are you confident to identify clinically, early lesions of oral cancer?	Not confident	27.2%	21.2%	16.6%	20.3%	14.7%	0.%	295.1	0.001*
	Somewhat confident	1.1%	38.1%	15.1%	24.5%	11.6%	9.6%		
	Very confident	16.5%	16.5%	10.1%	14.7%	0.%	42.2%		
Before taking this survey, have you heard about HPV before?	No	12.9%	5.%	18.6%	20.%	11.4%	32.1%	114.4	0.001*
	Yes	12.3%	33.9%	14.3%	22.1%	11.3%	6.%		
Do you know there exists vaccines against HPV?	(a) Yes	10.8%	41.2%	13.1%	21.1%	13.6%	0.3%	250.3	0.001*
	(b) No	10.5%	12.6%	14.1%	23.6%	16.2%	23.%		
	(c) Maybe	0.6%	36.6%	24.2%	18.6%	0.%	19.9%		
	(d) Do not know	33.8%	9.6%	11.%	25.%	11.%	9.6%		
From where you heard about HPV vaccine?	Gyneclologist	1.9%	22.2%	25.9%	16.7%	33.3%	0.%	656.9	0.001*
	Dentist	8.7%	36.%	8.7%	29.9%	0.%	16.7%		
	Online websites	1.5%	34.5%	19.4%	20.9%	23.8%	0.%		
	Books	21.3%	27.1%	13.4%	9.5%	8.7%	20.%		
	Friends/family	0.%	31.%	11.%	10.%	4.%	44.%		
Who are eligible to take HPV vaccine?	(a) Only females >30 yrs	50.%	33.3%	0.%	16.7%	0.%	0.%	483	0.001*
	(b) Only males >30 yrs	0.%	0.%	50.%	50.%	0.%	0.%		
	(c) Both genders >30 yrs	0.%	25.4%	34.9%	15.9%	23.8%	0.%		
	(d) Females < 30 yrs	0.%	45.8%	2.1%	52.1%	0.%	0.%		
	(e) Males <30yrs	0.%	8.1%	0.%	5.4%	0.%	86.5%		
	Everyone	100.%	0.%	0.%	0.%	0.%	0.%		
	(f) Both genders <30 yrs	30.2%	45.7%	10.1%	14.%	0.%	0.%		
	(g) No Idea	9.1%	26.%	16.8%	23.%	14.9%	10.2%		
Are you vaccinated for HPV ?	No	7.2%	31.1%	16.2%	21.9%	11.4%	12.2%	122.1	0.001*
	Yes	38.%	20.7%	9.3%	21.3%	10.7%	0.%		

Note: *Statistical significance set at 0.05; N: Number of samples; χ^2 value: Chi-Square value.

attitude than the other year students. In India, third-year students have clinical subjects such as General Medicine in their curriculum. Thus, topics on HPV and its significance may be introduced. Additionally, students in their internships would have additional practical experience with patients. This would explain their better knowledge and awareness regarding HPV. Oral microbiology is an important component in the curriculum of dentistry. Certain microorganisms including HPV dictate special focus in dentistry not only in relation to cancer but other manifestations too.

Table 7 Association of Country with Attitude-Based Questionnaires

		Country						χ2 Value	P value
		Egypt	India	Pakistan	KSA	Sudan	UAE		
Do you think it is important to get vaccinated for HPV?	(a) Yes	18.9%	37.5%	6.5%	29.1%	8.0%	0.0%	344.6	0.001*
	(b) No	22.9%	3.6%	13.3%	21.7%	0.0%	38.6%		
	(c) Maybe	0.3%	24.1%	27.7%	11.3%	18.9%	17.7%		
Are you willing to discuss about HPV vaccine with the same and with the opposite gender patients?	(a) Yes	10.2%	34.7%	14.2%	17.4%	12.3%	11.2%	76.18	0.001*
	(b) No	19.9%	10.9%	17.9%	36.8%	8.0%	6.5%		
Are you comfortable to discuss with your patients their personal health?	(a) Slightly comfortable	1.3%	39.4%	11.1%	19.2%	9.1%	19.9%	350.3	0.001*
	(b) Not comfortable	36.8%	14.3%	13.2%	25.4%	5.7%	4.6%		
	(c) Most comfortable	0.9%	30.9%	24.1%	21.8%	22.3%	0.0%		
What makes you difficult to discuss with your patients regarding HPV connection with oral cancer?	Lack of privacy	16.5%	16.3%	23.2%	15.2%	17.1%	11.7%	451.3	0.001*
	Fear of offending patients	10.2%	27.9%	16.1%	21.7%	16.5%	7.6%		
	Language barrier	1.1%	30.4%	21.7%	21.2%	25.5%	0.0%		
	Lack of time	36.4%	27.1%	15.0%	21.5%	0.0%	0.0%		
	I do not know enough	21.7%	19.6%	15.0%	20.2%	8.5%	15.0%		
	I do not think it is relevant	9.7%	48.4%	1.6%	40.3%	0.0%	0.0%		
Are you willing to participate in any professional training or continuous dental education program to achieve better knowledge and understanding about HPV and its association with oral cancer?	(a) Yes	13.3%	34.8%	9.9%	22.6%	8.0%	11.4%	104.4	0.001*
	(b) No	9.9%	13.1%	30.2%	19.4%	21.2%	6.3%		

Note: *Statistical significance set at 0.05; N: Number of samples; χ^2 value: Chi-Square value.

The present study exhibited that dental practitioners were able to identify the risk factors associated with oral cancer. This finding was concurrent with that of Sallam et al and Lorenzo-Pouso et al.[12,17] Most dental practitioners exhibited discomfort in discussing the HPV correlation with oral cancer. This reluctance might be related to sociocultural and religious stigmas towards discussing sexually transmitted infections in these countries. It is recorded in the past that high increase in HPV-dependent OPC occurs in the United States, and other European countries and the frequency of HPV-infected OPC vary depending on geographical distribution and religious practices.[18–20] HPV is regarded to be a risk factor for the development of anogenital malignancies and cervical cancers, and HPV vaccines could help in the preventing the same.[20]

This finding was concurrent with that of Sallam et al and Daley et al.[12,13] Additionally, dentists have never been accustomed to a vaccination recommendation as the nature of their work does not include this responsibility. This may be an additional reason for the discomfort among participants.[17,18] An additional reason for the discomfort may be the lack of professional guidelines for recommending the HPV vaccine as a primary prevention measure for OPC.[20]

Table 8 Comparison of Knowledge Between Students from Different Countries

			Country						P value
			Egypt	India	Pakistan	Saudi Arabia	Sudan	UAE	
			N(%)	N(%)	N(%)	N(%)	N(%)	N(%)	
Awareness of oral cancer and its association with HPV	What are the risk factors of oral cancer	Poor knowledge	21(19.1)	34(13.1)	39(29.3)	41(21.2)	32(32.0%	33(36.7)	0.001*
		Good knowledge	89(80.9)	226(86.9)	94(70.7)	152(78.8)	68(68.0)	57(63.3)	
	What is the common site of occurrence of oral cancer?	Poor knowledge	102(92.7)	80(30.8)	44(33.1)	84(43.5)	34(34.0)	90(100.0)	0.001*
		Good knowledge	8(7.3)	180(69.2)	89(66.9)	109(56.5)	66(66.0)	0(0.0)	
	Which of the following describes the clinical appearance of the early lesion of oral cancer?	Poor knowledge	63(57.3)	87(33.5)	56(42.1)	103(53.4)	36(36.0)	90(100.0)	0.001*
		Good knowledge	47(42.7)	173(66.5)	77(57.9)	90(46.6)	64(64.0)	0(0.0)	
Knowledge about HPV	What diseases you know that HPV can cause?	Poor knowledge	105(95.5)	121(46.5)	63(47.4)	149(77.2)	36(36.0)	89(98.9)	0.001*
		Good knowledge	5(4.5)	139(53.5)	70(52.6)	44(22.8)	64(64.0)	1(1.1)	
	What diseases you know that HPV can cause?	Poor knowledge	65(59.1)	90(34.6)	41(30.8)	77(39.9)	0(0.0)	13(14.4)	0.001*
		Good knowledge	45(40.9)	170(65.4)	92(69.2)	116(60.1)	100 (100.0)	77(85.6)	
	Most HPV infections resolve within a short time	Poor knowledge	104(94.5)	196(75.4)	88(66.2)	139(72.0)	49(49.0)	90(100.0)	0.001*
		Good knowledge	6(5.5%	64(24.6)	45(33.8)	54(28.0)	51(51.0)	0(0.0)	
Knowledge and perception about HPV vaccine	Do you know there exists a vaccine against HPV?	Poor knowledge	67(60.9)	96(36.9)	81(60.9)	109(56.5)	46(46.0)	89(98.9)	0.001*
		Good knowledge	43(39.1)	164(63.1)	52(39.1)	84(43.5)	54(54.0)	1(1.1)	
	Who are eligible to take HPV vaccine?	Poor knowledge	71(64.5)	201(77.3)	120(90.2)	175(90.7)	100 (100.0)	90 (100.0%)	0.001*
		Good knowledge	39(35.5)	59(22.7)	13(9.8)	18(9.3)	0(0.0)	0(0.0)	
	Do you think it is important to get vaccinated for HPV?	Poor knowledge	20(18.2)	82(31.5)	102(76.7)	55(28.5)	62(62.0)	90(100.0)	0.001*
		Good knowledge	90(81.8)	178(68.5)	31(23.3)	138(71.5)	38(38.0)	0(0.0)	

Note: *Statistical significance set at 0.05; N: Number of samples; χ^2 value: Chi-Square value.

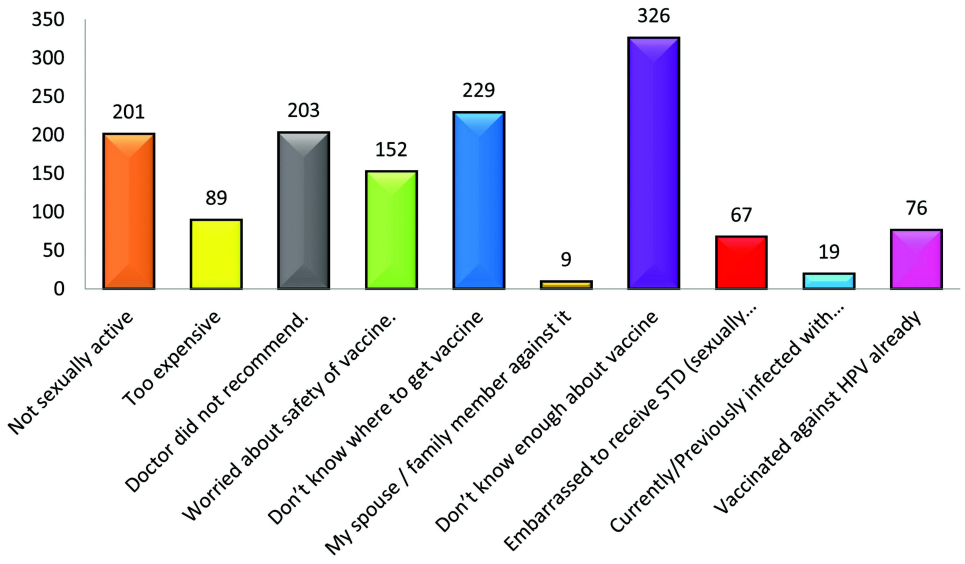

Figure 2 Reasons for unwillingness to get vaccinated.

In the present study, Indian students exhibited better knowledge, awareness, and attitude about HPV than other students from other countries, and this difference was statistically significant ($P < 0.001$). India has the highest number of oral cancers globally, with approximately 1% of the population exhibiting oral premalignant lesions.[21] Thus, Indian dental students have higher clinical exposure to OPC. Moreover, the gynecologists and general hospitals usually exhibit the advertisement boards about the HPV vaccine availability and their price in India. Therefore, they are better aware of the implications of HPV in oral cancer and cervical cancer. Further, the participants were not having information about the availability of HPV vaccine in their city or surrounding hospitals in the Middle East and African countries.

Most participants expressed a desire to participate in any professional training or continuous dental education program to achieve better knowledge and understanding about HPV and its association with OPC. This could be achieved through continuing dental education programs such as workshops, awareness campaigns, and training sessions. In the present study, of the various reasons, lack of knowledge of vaccine is the most common reason for not getting vaccinated, followed by lack of information about where to get the vaccine and lack of recommendation from the doctor. This underlines the necessity to imbibe knowledge regarding HPV and its association with OPV among medical and dental students.

The principal strength of the study is the multinational nature of the study allowing the generalization of the study findings. However, this study has certain constraints. The survey design always carries the risk of bias, with participants attempting to answer as per the researcher's expectation. Additionally, the sample size was relatively small. Furthermore, most patients (73.1%) were female. This could also influence the results. Further studies with a larger sample size and evenly matched groups would strengthen the findings of this study. Several limitations in basic knowledge about HPV was noticed among participants in the clinical group, particularly related to unawareness of the vaccine availability.

Conclusion

Overall knowledge about HPV, the HPV vaccine, and HPV-related OPCs is deficient among students from this sample of undergraduate dental students. Those in their third and fourth clinical years were more knowledgeable about HPV.

More than half of them reported willingness to take the vaccine. With the increasing awareness regarding HPV-related oropharyngeal cancer, dentists must be able to advice and recommend patients regarding the risk factors and preventive measures associated with this condition. To enable this, dental colleges and organizations must provide additional information on HPV and the advances in vaccines to their students and members.

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Disclosure

The authors report no conflicts of interest in this work.

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