

# Evaluation of Knowledge and Awareness of Dentists and Dental Students About Human Papillomavirus Vaccination and Oropharyngeal Cancer Relationship

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**Received:** 14.06.2020

**Accepted:** 27.08.2020

## ABSTRACT

**Objective:** As the incidence of oropharyngeal cancer associated with human papillomavirus has increased rapidly in recent years, the role of dentists on this issue is also increasing. This study aims to determine the knowledge and awareness of dentists and dental students about human papillomavirus vaccination and the relationship of oropharyngeal cancer.

**Methods:** A total of 209 participants, consisting of 82 dentists and 127 dental students filled out the questionnaires about the general human papillomavirus knowledge, human papillomavirus – oropharyngeal cancer relationship, and human papillomavirus vaccination. The Fisher Exact and the Mann Whitney U tests were used for determining the difference between the two groups.

**Results:** The majority of the respondents answered the general questions about human papillomavirus correctly. Almost all of the participants in our study were found to have high awareness about the human papillomavirus – oropharyngeal cancer relationship, most of them did not have enough information about the human papillomavirus – related oropharyngeal cancers have a better prognosis than other oropharyngeal cancers. Both dentists and dental students stated that they did not think they had enough information about human papillomavirus vaccination. Dental students were more conscious and more motivated than dentists in recommending human papillomavirus vaccination to their patients ( $p < 0.05$ ).

**Conclusion:** Our study showed that dentists and dentistry students had a high level of knowledge in general subjects related to human papillomavirus. It was determined that the knowledge of both groups was insufficient regarding the human papillomavirus – oropharyngeal cancer relationship and human papillomavirus vaccination, and the participants were eager to overcome these shortcomings.

**Keywords:** Dental education, dental student, human papillomavirus, human papillomavirus vaccines, oropharyngeal cancer

## 1. INTRODUCTION

Human papillomavirus (HPV) is a small, enveloped, double-stranded, and circular DNA virus (1). HPV, the most common sexually transmitted infection in the world, is known for causing cervical cancer, and its relationship with oropharyngeal cancer (OPC) has been emphasized in recent years (2). The virus can be transmitted to the oral cavity through sexual contact or auto-infection, rarely at birth perinatally (1,3,4). HPV contamination to the oral region is more related to the number of previous oral sex and oral kissing partners than to the number of vaginal sex partners (1,4,5). The prevalence of this virus, which can cause both HPV infections and HPV-related head and neck cancers, in the oral mucosa, ranged from 0.6 to 81% (1,4,5).

Head and neck squamous cell carcinomas are the sixth most common cancers in the world (1). Although there have been

serious advances in the diagnosis and treatment process in recent years, the mortality rate is still high and causes an average of 200 thousand deaths per year (6). The five-year survival rate is about 50%, and in the case of metastasis, the rate drops to 26% (6). Tobacco and alcohol use are among the most common risk factors for OPCs (1). Besides, some HPV types have recently been shown to be an important risk factor for OPC (3). While the type 6 and type 11 of HPV in the low-risk group cause benign papillomatous lesions in the oral mucosa, the type 16 and type 18 groups of the virus are at high risk and may cause OPCs (1).

HPV prevalence in patients with whole OPCs has been reported to range from 0% to 91% (1). It is stated that proportional changes vary according to geographical features, sample type, preparation method, and virus detection method (7).

Ninety percent of OPC cases have been shown to have high-risk HPV type-16 (6). HPV-related OPC is more common in young male patients with high socioeconomic status and has a better prognosis than head and neck cancers not associated with HPV (3,8). HPV-related OPC usually occurs in the tongue base and posterior oropharynx (2).

The incidence of HPV-related OPC is increasing day by day. HPV Type 16 and Type 18, which are the cause of 90% of HPV-related OPCs, can be prevented by HPV vaccination. HPV vaccination not only reduces the incidence of cervical and anal cancer but also reduces the incidence of HPV-related OPC (9). Knowing the importance of HPV vaccination and directing patients to vaccination is important for the prevention of HPV-related OPCs (10). Although the HPV vaccine is included in the vaccination schedule in developed countries, it is not included in the routine vaccination schedule in many countries, including Turkey (11). In a previous study (12), it has been reported that the biggest obstacle in the spread of HPV vaccination is that healthcare professionals do not have enough awareness and knowledge in this regard.

Although there are studies investigating the knowledge of dentists about HPV abroad, to the best of our knowledge, there is no study investigating the knowledge levels and awareness of dentists or dental students about the relationship between HPV vaccination and HPV-related OPCs in our country. The aim of this study is to determine the knowledge level and awareness of dentists and dental students about HPV vaccination and OPC relationship.

## 2. METHODS

Before the study, ethical approval was obtained from the Ethics Committee of Gazi University (No: 91610558-604.01.01, Date of approval: 07.04.2020). The questionnaires were prepared on an online survey website (www.surveey.com) and the link was sent to the participants via e-mail and a mobile phone application (WhatsApp Inc, Menlo Park, CA, USA). The students participating in this study were selected from two dental schools. The participants were informed that their identity information (name, or ID number) would not be requested. It was stated at the beginning of the questionnaire that the study was based on volunteerism, and those who agreed to participate in the study started to answer the questionnaire.

### 2.1. Measuring Tools

A measurement tool (Appendix) consisting of five categories: (A) demographic features (four items), (B) general HPV knowledge (16 items), (C) HPV-OPC relationship (six items), (D) HPV vaccination information (11 items), and (E) HPV vaccination survey (13 items) was applied. B, C and D categories were prepared as "True-False" test type and E was 5-point Likert type scale between "I disagree at all" and "I totally agree". In preparing the true/false questions, Rutkoski et al.'s (13) and Patel et al.'s (10) studies were used, and in the preparation of the survey items, Arnell et al.'s (9) and Patel

et al.'s (10) studies were used. In translating the items from English to Turkish, specialist dentists, and experts' opinions (expert of measurement and evaluation) were received. According to their feedback, the final version of the survey was obtained.

### 2.2. Data Analysis

The measurement tools used in the research were collected online; all of the items were responded by the participants. Therefore, there was no missing data in the data set. Since the questionnaires did not go through a test or scale development process, total scores were not obtained, and all analyzes were conducted on an item basis. The Fisher Exact test was used to test the difference between the dentists and the dental students in answering the True/False information questions correctly. The Mann Whitney U test was used to determine whether these two groups differed in answering other questionnaire items. The level of statistical significance was set at 0.05 for all analyzes performed in this study. Statistical analyzes were performed using R (R Core Team, Vienna, Austria).

## 3. RESULTS

A total of 209 participants, consisting of 82 dentists and 127 dental students responded to the survey. The mean age of the dentists was  $31.8 \pm 8.4$  (ranged from 23 to 53) while the age of dental students was between 18 and 24, with a mean of  $21.8 \pm 1.3$ . The frequency of the demographic characteristics of the participants in the study is presented in Table 1.

Table 1. Demographic Features of Dentists and Dental Students.

Participants	Variables	Number (n)	Percent (%)	
Dentists (n=82, 100%)	Gender	Female	65	79.3
		Male	17	20.7
	Specialty	Oral surgery	4	4.9
		Oral radiology	13	15.9
		Endodontics	3	3.7
		Oral Pathology	1	1.2
		Orthodontics	14	17.1
		Pediatric dentistry	15	18.3
		Periodontology	12	14.6
		Prosthodontics	4	4.9
		Restorative dentistry	2	2.4
	General dentist	14	17.1	
	Experience (years)	1-4 years	39	47.6
5-9 years		37	45.1	
10 years and over		6	7.3	
Dental students (n=127, 100%)	Gender	Female	92	72.4
		Male	35	27.6
	Education level	Third years of school	44	34.6
		Fourth years of school	52	40.9
		Fifth years of school	31	24.4

Regarding Category B, the number of dentists who responded the items correctly was higher than the number of dental students for almost all items. There were statistically significant differences ( $p < 0.05$ ) between two groups for the items 6, 7, 9, 13, 15, and 16. Responses to the items 11, 14 and 18 were statistically similar (Table 2, Figure 1). On the subject of Category C, there was no statistical difference

between the groups in the results of these items (Table 2, Figure 1). Regarding Category D, dentists responded more accurately than dental students ( $p < 0.05$ ) for the items 28 and 32, while dental students gave a statistically significantly higher correct response compared to dentists ( $p < 0.05$ ) in the items of 30, 33, and 34 (Table 2, Figure 1).

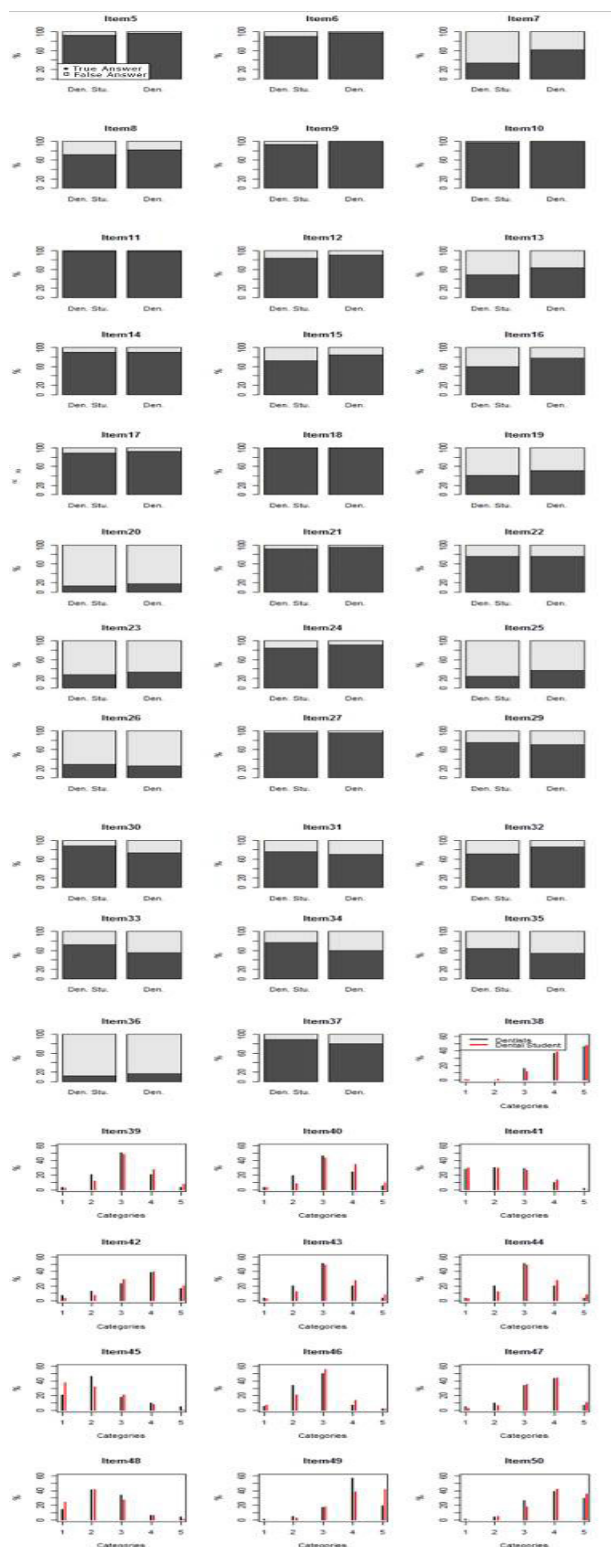


Figure 1. Graphical Distribution of the Items

Table 2. Fisher Exact Test Results on General HPV Knowledge Items, HPV-OPC Knowledge Items, and HPV Vaccination Knowledge Items.

Items	Number and rates of the correct answerers (n, %)		p value
	Dentists (n=82)	Dental students (n=127)	
5	80 (97.6%)	117 (92.1%)	0.132
6	81 (98.8%)	115 (90.6%)	0.018*
7	51 (62.2%)	43 (33.9%)	0.000*
8	67 (81.7%)	91 (71.7%)	0.103
9	82 (100.0%)	119 (93.7%)	0.024*
10	82 (100.0%)	125 (98.4%)	0.521
11	81 (98.8%)	125 (98.4%)	1
12	74 (90.2%)	106 (83.5%)	0.219
13	52 (63.4%)	62 (48.8%)	0.047*
14	74 (90.2%)	115 (90.6%)	1
15	69 (84.1%)	91 (71.7%)	0.045*
16	64 (78.0%)	76 (59.8%)	0.007*
17	76 (92.7%)	113 (89.0%)	0.473
18	82 (100.0%)	127 (100.0%)	1
19	42 (51.2%)	53 (41.7%)	0.202
20	15 (18.3%)	17 (13.4%)	0.431
21	78 (95.1%)	116 (91.3%)	0.413
22	62 (75.6%)	96 (75.6%)	1
23	28 (34.1%)	36 (28.3%)	0.443
24	75 (91.5%)	108 (85.0%)	0.202
25	30 (36.6%)	31 (24.4%)	0.063
26	21 (25.6%)	36 (28.3%)	0.751
27	78 (95.1%)	121 (95.3%)	1
28	77 (93.9%)	103 (81.1%)	0.013*
29	58 (70.7%)	96 (75.6%)	0.520
30	60 (73.2%)	112 (88.2%)	0.009*
31	58 (70.7%)	96 (75.6%)	0.520
32	71 (86.6%)	91 (71.7%)	0.012*
33	45 (54.9%)	91 (71.7%)	0.017*
34	49 (59.8%)	97 (76.4%)	0.013*
35	44 (53.7%)	82 (64.6%)	0.148
36	14 (17.1%)	16 (12.6%)	0.421
37	66 (80.5%)	113 (89.0%)	0.107

\*  $p < 0.05$

Regarding Category E, statistically significant differences ( $p < 0.05$ ) were found between two groups for the items 39, 40, 43, 44, 45, and 49 (Table 3, Figure 1).

**Table 3.** Mann Whitney U Test Results Regarding the Survey For HPV Vaccination.

Items	Dentists		Dental students		U	Z	p value
	Median	Mean rank	Median	Mean rank			
38	4.00	103.67	4.00	105.86	5098.0	-0.279	0.781
39	3.00	95.27	3.00	111.28	4409.5	-2.018	0.044*
40	3.00	93.86	3.00	112.19	4293.5	-2.280	0.023*
41	2.00	106.09	2.00	104.30	5118.0	-0.217	0.828
42	4.00	99.61	4.00	108.48	4765.0	-1.084	0.278
43	3.00	121.35	2.00	94.44	3866.5	-3.234	0.001*
44	3.00	123.35	2.00	93.15	3702.0	-3.627	0.000*
45	2.00	114.95	2.00	98.58	4391.5	-2.006	0.045*
46	3.00	96.72	3.00	110.35	4528.0	-1.750	0.080
47	4.00	100.26	4.00	108.06	4818.0	-0.977	0.329
48	2.00	113.79	2.00	99.33	4486.5	-1.785	0.074
49	4.00	92.70	4.00	112.94	4198.5	-2.543	0.011*
50	4.00	98.55	4.00	109.17	4678.0	-1.316	0.188

\*  $p < 0.05$ 

#### 4. DISCUSSION

Dentists have an important role in OPC screening, diagnosis, awareness, and patient education. Although the general risk factors of cancers in the oral region are well known, information about the role of viruses in oral cancer risk is unclear (10). The relationship between HPV and OPC has been revealed recently (3,9,10,13). HPV vaccines applied to prevent cervical cancers associated with HPV reduce the incidence of cervical, anal, penile cancers as well as OPCs (14). The most frequently referred physicians are dentists, and during the oral examination, they examine the face, neck, lips, gums, floor of the mouth, tongue, hard and soft palates in detail (14). During the dental examinations, in which patients are evaluated at short intervals, oral cancer screening is also performed. Dentists who have a great responsibility in the prevention of HPV-related oral cancers have sufficient knowledge about HPV vaccination and motivate their patients to vaccinate HPV, making them one of the key healthcare professionals in raising awareness about this issue (14,15). In the literature, limited number of studies have been carried out on this subject in the last few years (9,10,13). However, it has been reported that the knowledge and awareness of dentists on this issue is quite low (14,16). Our study aims to reduce this deficiency in the literature.

As HPV-related OPC rates are increasing, the importance of this issue and its place in dentistry are increasing (9,17). The important role of dentists in the prevention of tobacco-related OPCs is as important as the HPV-related OPCs, which can be prevented by HPV vaccination (9). HPV-related OPCs have become popular both in the literature and in the media, so patients can request information from dentists and expect them to direct themselves (14). Thus, the knowledge of dentists on this subject should increase and dentists should prepare themselves to talk about this with their patients (14).

Daley et al (14) conducted an HPV survey for dentists, nearly half of the dentists answered the general information sections about HPV correctly. Arnell et al (9) reported that dentists have moderate knowledge about HPV. In the research of Rutkoski et al (13), it was stated that most of the dental students are sufficient in general subjects related to HPV. In our study, the responses of the participants to the general knowledge questions about HPV were substantially correct. On the other hand, the rate of participants indicating that HPV will recover spontaneously was found to be extremely low in the present study. This result is also compatible with the results of Patel et al (10). Regarding the question about HPV's absence of obvious signs, the majority of dentists in Patel et al's study (10) responded correctly, but in our study, the correct response rate was lower for both dentists and students. In the question of increasing the HPV risk of having multiple sexual partners, the correct response rate was found to be high in both Patel et al's study (10) and the participants in our study.

In a study of Applebaum et al (16), only half of the dentists reported that HPV-related OPC information was up to date, which prevented physicians from talking freely to their patients. On the other hand, dental students are quite inadequate in this regard (13). Almost all of the participants in our study were found to have high awareness about the HPV-OPC relationship. Similarly, almost all dentists who participated in Patel et al's study (10) were reported to know that HPV could lead to OPC. However, the correct response rate for HPV-related OPC prognosis, which group of patients is more common and OPC localization in the oral region was found to be quite low in our study. These results are compatible with the study of Patel et al (10). It was stated that the reason for the inadequacy of dentists in these questions may be due to the missing information of dentists in the pathophysiology of HPV and HPV-related OPCs (10).

Regarding the safety or side effects of HPV vaccination, the level of knowledge of dentists participating in our study was found to be high in many questions, consistent with the previous studies (10,18). However, the correct response rate in our study for questions regarding the administration and pricing of HPV vaccines was low for both dentists and dental students. In the study of Rutkoski et al (13), less than half of the dental students were reported to have sufficient knowledge about HPV vaccination.

In the study of Daley et al (14), it was stated that only 9% of dentists talk with women patients about HPV vaccination and 81% of them have insufficient information about HPV vaccination. In the study of Arnell et al (9), it was reported that dentists do not think that they have sufficient information about HPV vaccination, therefore they refrained from discussing these issues with their patients. In our study, both dentists and dental students stated that they did not think they had enough information about HPV vaccination, in line with previous reports (9,10). In the present study, most of the participants answered most of the questions about HPV vaccination, but the majority answered the question

that HPV vaccines were more effective in individuals who have not previously had sexual intercourse. The results of our study also revealed that, if the participants had sufficient knowledge, they were eager to direct their patients to HPV vaccination and to participate in related training. Putting HPV vaccination on the agenda of training, guides, conferences, and publications of professional organizations can increase the awareness of dentists.

Arnell et al (9) determined that almost all of the dentists thought that they should play an active role in the general health of patients, only half of them believed that HPV vaccination was their responsibility. On the other hand, Daley et al (19) reported that dentists think that information about sexual health issues should be done by family physicians or gynecologists. The dentists in Patel et al's study (10) stated that they were neutral for their role in this matter. In our study, the vast majority of the participants think that they should play an active role in the general health of patients, however, the role of dentists in HPV vaccination was found to be moderate. Our results showed that dental students were more conscious and more motivated than dentists in recommending HPV vaccination to their patients, but dental students have less knowledge about when the vaccination is performed. The role of dentists in HPV vaccination and informative announcements of professional organizations on this topic was reported in previous studies (19). The American Dental Association also issued a declaration in late 2018 on promoting the HPV vaccination (20).

In the study of Arnell et al (9), most of the dentists thought that HPV vaccination could encourage young individuals to undergo earlier/risky sexual intercourse, while in our study the participants gave the opposite view. In the same study (9), it was stated that dentists were keen to have their children vaccinated with HPV, similar to our study. In Patel et al's study (10), the item's score on the point that dentists did not have enough time (and should be) to discuss HPV vaccination with their patients was average. While the score of this item was higher in our study, we think that this situation may be related with dentists treat too many patients. in our country.

According to the best of our knowledge, there is no published article on dentists about HPV and HPV vaccination in Turkey. However, it has been determined that there are many studies evaluating the knowledge levels of other healthcare professionals on subjects such as HPV, HPV vaccine, and cervical cancer (12,21,22). In the survey study conducted by Yuksel et al. among hospital staff (12), medical doctors and nurses were reported to have a higher level of correct knowledge about HPV vaccination compared to other healthcare professionals. In the survey conducted by Gorkem et al. with female healthcare workers other than doctors (21), 85.4% of the participants knew the HPV vaccine. In the same study, it was stated that the highest information rate was 95.7% for midwives and 86.4% for nurses (21). It was determined that the participants in our study were aware of the HPV vaccine but there was a lack of information about its application.

In the study of Yuksel et al. (12), 84.9% of the doctors who participated in the survey stated that they were considering getting their daughter vaccinated with HPV, this rate was reported as 64% in nurses and 52% in other healthcare personnel. In the same study, 58.4% of doctors and 46% of nurses and other healthcare personnel were reported to consider getting their children vaccinated with HPV (12). In the survey conducted by Gorkem et al. with female healthcare staff other than doctors (21), it was reported that three-quarters of the participants wanted to vaccinate their daughters. In the study conducted by Guducu et al (22), approximately two-thirds of the medical students stated that they will get the HPV vaccination to their daughters (in the future), while only half of the nursing students and healthcare workers were positive about vaccination. Dentists and dental students in our study reported their willingness to get their children vaccinated with HPV.

In the study of Yuksel et al. (12), for the question of "Do you think that the widespread HPV vaccine may increase the frequency of sexual intercourse or polygamy?", it was determined that most of the doctors, nurses, and other health personnel answered no. The participants in our study also largely answered the question negatively. In the study of Ozakar-Akca et al among nurses (23), the rate of those who stated that HPV vaccine has high efficacy in the prevention of cervical cancer is 87.8%, The rate of those who reported that they prevented anal, vulvar and head and neck cancers was reported as 73%. In the same study, the rate of those who think that the HPV vaccine is a preventive feature of genital cancer and warts in both sexes is stated to be 86.9% (23). The rate of responses given by dentists and dental students to these items in our study was found similar to the study for nurses (23).

One of the limitations of our research is that the participants in our study were from only one country. However, the fact that dentists who filled out the questionnaire had lower professional experience in general, limits the measurement of knowledge of experienced dentists on the subject. In future studies, dentists from all experience levels can be reached with a higher number of participants, and the current status of dentists in different countries can be evaluated. Also, the change of knowledge levels can be examined after the inclusion of HPV topics in training programs.

## 5. CONCLUSION

According to the results of our research, it was determined that dentists and dental students have a high level of knowledge about general issues related to HPV. However, it was found that the knowledge of both groups was insufficient regarding the HPV-OPC relationship and HPV vaccination and the participants were eager to overcome these shortcomings. A larger place should be reserved for HPV-related OPC and HPV vaccination knowledge, after the graduation to dentists, and dentistry students during the education period.

**Conflict of interest:** The authors declare that there is no conflict of interest.

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**Appendix.** The Items in the Survey and Correct Answers.

Item no	A. Demographic features	
1	Gender	
2	Specialty (for dentists)	
3	Experience (for dentists)	
4	Education level (for dental students)	
	<b>B. General HPV knowledge items</b>	<b>Correct answers</b>
5	HPV is a bacterial infection.	False
6	Antibiotics can treat HPV.	False
7	HPV can cause herpes.	False
8	HPV can cause HIV/AIDS.	False
9	HPV can cause cervical cancer.	True
10	HPV can cause genital warts.	True
11	HPV can be transmitted through sexual contact.	True
12	An individual with HPV without a genital wart can infect HPV.	True
13	HPV usually has no obvious signs.	True
14	A person with HPV can live for many years without realizing this situation.	True
15	HPV rate is highest in women in their 30s.	True
16	Using a condom reduces the risk of HPV contamination.	True
17	Oral sex can cause transmission of HPV infection.	True
18	Having more than one sexual partner increases the risk of HPV.	True
19	Most sexually active people will encounter HPV once in their lives.	True
20	HPV usually resolves spontaneously without any treatment.	True
	<b>C. HPV-OPC knowledge items</b>	
21	HPV can lead to OPC.	True
22	The same HPV types cause genital warts and OPC.	False
23	OPCs caused by HPV have a worse prognosis than OPCs not associated with HPV.	False
24	The early stages of OPC associated with HPV are often asymptomatic.	True
25	HPV-related OPCs are more common in young, well-educated men.	True
26	The tongue is the most common site of HPV-related OPCs.	False
	<b>D. HPV vaccination knowledge items</b>	
27	There are vaccines that immunize against some types of HPV.	True
28	HPV vaccines can protect women against cervical cancer associated with HPV.	True
29	HPV vaccines can protect men and women against HPV-related anal cancer.	True
30	HPV vaccines can protect men and women against HPV-related genital warts.	True
31	HPV vaccines can protect men and women against HPV-related OPC.	True
32	HPV vaccines have serious side effects.	False
33	HPV vaccines are expensive.	True
34	HPV vaccines are covered by health insurance.	False
35	HPV vaccines are administered in one dose.	False
36	HPV vaccines are more effective only for people who have never had sex.	True
37	HPV vaccine is recommended to be applied to both men and women.	True
	<b>E. HPV vaccination survey</b>	
38	It is important that dentists take an active role in the general medical health of patients.	
39	The recommendation of HPV vaccination is the responsibility of dentists.	
40	The recommendation of the HPV vaccine should be within the professional scope and role of a dentist.	
41	HPV vaccination can encourage young individuals to have an earlier or more risky sexual relationship.	
42	I have/would have/plan to have HPV vaccination for my children.	
43	I am knowledgeable about when to apply the HPV vaccine ideally.	
44	I am knowledgeable about which ages are the most appropriate period for the HPV vaccine in women.	
45	I am knowledgeable about which ages are the most appropriate period for the HPV vaccine in men.	
46	If I recommend HPV vaccination to my patients, my patients will get the vaccination.	
47	There is not enough time to discuss HPV vaccination (and need for it) during appointments.	
48	I think I have enough information when talking to my patients about HPV vaccination.	
49	If I have enough information, I will be willing to educate my patients about the importance of the HPV vaccine to prevent OPCs.	
50	I would be willing to participate in a training program to promote and manage the HPV vaccine in dentistry.	

**How to cite this article:** Ozdede M, Bagci N, Gunduz T, Peker I. Evaluation of Knowledge and Awareness of Dentists and Dental Students About Human Papillomavirus Vaccination and Oropharyngeal Cancer Relationship. Clin Exp Health Sci 2020; 10: 309-315. DOI: 10.33808/marusbed.752850