Journal of Cancer Education (2019) 34:782–788
https://doi.org/10.1007/s13187-018-1373-1

Human Papillomavirus-Related Oral Cancer: Knowledge and Awareness Among Spanish Dental Students

Alejandro Ismael Lorenzo-Pouso[1,2] · Pilar Gándara-Vila[1,2] · Cristina Banga[1] · Mercedes Gallas[1,2] · Mario Pérez-Sayáns[1,2] · Abel García[1,2] · Ellen M. Daley[3] · Iria Gasamáns[4]

Published online: 10 May 2018

Abstract
Human papillomavirus (HPV) infections are responsible for a significant part of the global burden of cancer. Epidemiologic studies have shown increasing trends of HPV-related oral cancers worldwide. Dental professionals need comprehensive up-to-date HPV-related information to be able to provide correct advice to their patients. The aim of this paper is to describe knowledge and awareness levels of dental students from Spain on HPV infection, HPV vaccination, oral cancer prevention, and HPV-related oropharyngeal cancer. A survey was distributed to 240 dental students, of which 158 returned it. Most students reported not been vaccinated against HPV ($n = 81$, 51.3%) and believed that HPV infection was linked to oropharyngeal cancer (75%). Overall, advanced students showed better knowledge, attitudes, and perceptions regarding this issue while novice students showed relevant shortcomings. However, their attitudes in relation to the diagnosis of oral cancer were adequate. These results suggest that there are important HPV-related knowledge deficits among Spanish dental students, which hinders their interventions in oropharyngeal primary prevention efforts. Findings of this study suggest the inclusion and standardization of HPV-related educational information to the dental curriculum.

Keywords HPV · Oral cancer · Health literacy · Vaccine · Dental education

Introduction

Worldwide HPV-attributable oropharyngeal cancer represents about 4.5% of all cancers with an estimated 630,000 new cases diagnosed annually [1]. Historically, the causes of oropharyngeal cancer have been closely related with modifiable risk factors such as tobacco or alcohol use. Recent evidence has correlated oropharyngeal cancer with other risk factors such as the human papillomavirus (HPV), a sexually transmitted infection [2, 3]. Despite the decline in the incidence of oral squamous cell carcinoma (OSCC) experienced in the last 30 years, probably due to the awareness of harmful effects of tobacco and alcohol use, the incidence of OSCC in the oropharynx associated to HPV has increased [4–7]. Numerous studies have estimated that the DNA-HPV prevalence oropharyngeal cancer tumor biopsies might be up to 75% [8].

Currently, oropharyngeal cancer patients are predominantly younger men who have minimal or no exposure to tobacco and/or alcohol. Regardless, they have an increased number of risky sexual behaviors, especially unprotected oral sex. Studies have found evidence that having more than nine lifetime sexual partners increases the risk of having oropharyngeal cancer by 34 times [9], and usually presents higher risk HPV genotypes (HR-HPV) in their tumor cells, predominantly HPV 16 and 18 [7, 9]. Moreover, patients with HPV-related oropharyngeal carcinomas seem to have a better response to treatment and better survival rates. For example, a 2011 study found that the survival rate after 3 years was 82.4% for the HPV-positive cancer patients group and 57.1% for the patients with HPV-negative cancer group [10].

Given the association between HPV 16 and 18 and oropharyngeal cancers, it has been suggested that the use of available HPV vaccines may decrease the incidence of these carcinomas.

✉ Alejandro Ismael Lorenzo-Pouso
alexlopo@hotmail.com

[1] Oral Medicine, Oral Surgery and Implantology Unit, Faculty of Medicine and Odontology, University of Santiago de Compostela, Rúa Entrerríos S/N, 15782 Santiago de Compostela, Spain

[2] GI-1319 Research Group, Health Research Institute of Santiago de Compostela (IDIS), Santiago de Compostela, Spain

[3] College of Public Health, University of South Florida, Tampa, Florida; The Chiles Center, College of Public Health, University of South Florida, Tampa, FL, USA

[4] Amsterdam, Netherlands

Plausibility of this hypothesis is reinforced by studies that provide evidence of the HPV vaccine's effectiveness in preventing other carcinomas [10]. In February 2015, the US Advisory Committee on Immunization Practices (ACIP) recommended a 9-valent human papillomavirus (HPV) vaccine (9vHPV) (Gardasil 9, Merck and Co., Inc.) as one of three HPV vaccines that can be used for routine vaccination. HPV vaccine is recommended for vaccination of 11- or 12-year-old adolescents [11]. ACIP also recommends vaccination for females aged 13–26 years and males aged 13–21 years not vaccinated previously. Vaccination is also recommended for men who have sex with men and for immunocompromised patients [12]. While there currently is no conclusive data on the effectiveness of HPV vaccines in preventing oropharyngeal cancer, it is anticipated that the HPV vaccine may be effective in reducing the burden of these cancers [12].

The dental profession has focused on the secondary prevention of oropharyngeal cancers by visual and tactile exploration of the oral cavity and neck palpation to identify potential precancerous lesions. Given the growing incidence of HPV-attributable oropharyngeal cancers, the role that dental providers play in the education and recommendation of the HPV vaccine is vital. Thus, dental care providers may be key agents for promoting HPV prevention [13]. Therefore, the aims of this study were (1) to assess the knowledge about HPV-related oropharyngeal cancer and HPV vaccine among a group of dental students, (2) to report on student's communication skills regarding sensitive issues, and (3) to assess the student's attitudes concerning prevention of oropharyngeal cancers.

Materials and Methods

Study Instrument

This cross-sectional study was conducted at the School of Medicine and Dentistry of Santiago de Compostela (Spain). A self-administered survey was adapted from two previous studies [10, 14]. The survey was structured in four sections: (1) items measuring knowledge regarding HPV-oral cancer relationship, (2) items measuring knowledge regarding HPV vaccination, (3) items related to the ease of talking about sensitive issues in the dental office, and (4) items on knowledge regarding oral cancer screening. Information on demographics (i.e., age, gender, origin—i.e., urban/semi-urban/intermediate [15]), and if they have received HPV vaccine was also collected.

The first and second sections of the survey included multiple choice questions with three possible responses in each case (*Correct*; *Incorrect*; *I do not know*). The last item measured "stage of change" based on the trans-theoretical model (as designed Prochaska & DiClemente) and adapted by Daley et al. [16] to evaluate the readiness among the dental students to discuss HPV vaccine with female patients. With this approach, we were able to divide the students collectively into four groups according to their "stages of change": *precontemplation*, *contemplation*, *action*, and *maintenance.* The third and fourth sections used five-point Likert scales. The five-point Likert scales measuring attitudes towards oral cancer screening were collapsed into dichotomous variables: agreement ("to a considerable extent" and "to a great extent") and disagreement (to a moderate extent, not at all, to a small extent). For the fourth section, the order was reversed in relation to the previous section session to maintain the integrity of the questionnaires.

The survey was pilot tested in a sample of 10 randomly selected students. At that time, we calculated the time needed to complete the questionnaire and the understanding of the language among the subjects. Finally, the survey was distributed in English to enable comparison and reduce the risk of bias derived from the language. Our research group previously demonstrated that in our reference field, the English level of students is optimal for the use of English-written questionnaires [17].The mean time necessary to complete the survey was 9 min.

Sample Size and Sampling Method

We calculated a minimally required sample size using the PASS 15® software for Mac (NCSS, Salt Lake City, UT, USA) by the Dilmans' formula with a 5% margin of error and 95% confidence level (CI). This sample size calculation was based on the number of students at that time ($n = 253$). Based on this number, the minimum sample size required for our design was 153. All students from first to fifth year were invited to participate. Students were informed of the nature of the study and provided with an information sheet. Surveys were distributed during classes. Participation in the survey was anonymous, and voluntary.

Statistical Analysis

Analyses were performed using IBM SPSS Statistics 20.0 software for Mac [18]. Continuous variables were reported as mean ± standard deviation (SD) and were analyzed with the Kolmogorov-Smirnov test to distinguish between normal and non-normal distributions. Frequency analysis was performed for the categorical variables. In bivariate analyses, we applied either χ^2 tests, Fisher's exact tests (FET), Mann-Whitney tests, or Kruskal-Wallis tests depending on the type of outcome variable. Stratifications were made between preclinical vs. clinical students. Pearson correlation coefficients were calculated to examine the relationship between the right responses of the first (oropharyngeal cancer-HPV link) and second section (HPV vaccination). The significance level considered in all statistical analyses was 5% ($p < 0.05$).

To simplify analysis, participants were placed into one of two categories: the preclinical group (composed of first, second, and third year students) and the clinical group (composed of fourth and fifth year students). This subdivision allows us to compare our results with those of other university education systems.

Ethical Approval

The Clinical Research Ethics Committee of Galicia (CRECG) did not consider necessary to approve this study if the questionnaires were anonymous and the participation voluntary.

Results

Description of the Sample

A total of 158 of the 240 students returned the survey (response rate 65.8%). The distribution by preclinical students and clinical students was 89 (56.3%) and 69 (43.7%), respectively. Specifically, by course, 35 were drawn from the first course (22.0%), 22 from the second course (13.8%), 32 from the third course (20.1%), 36 from the fourth course (22.6%), and 33 from the fifth course (20.8%). The mean age was 21.9 ± 3.4. Most of the sample was female ($n = 111$, 69.8%) and Caucasian ($n = 155$, 97.5%). In terms of "origin," the distribution was as follows: 90 (56.6%) were from urban population, 47 (29.6%) were from semi-urban or intermediate population, and 21 (13.2%) were from rural population.

Most students reported not having the vaccine ($n = 81$, 51.3%). Compared by sex, vaccination rates were low for female (57.7%) and male (27.7%) students. This represents about a quarter of the men surveyed (27.7%, $\chi^2 = 11.8$, p value = 0.001). Students (75%) believed that there was a link between HPV and oropharyngeal cancers, with clinical students responding with greater certainty ($\chi^2 = 12.1$, p value < 0.001).

Knowledge Regarding the Relationship Between HPV and Oropharyngeal Cancer, and About HPV Vaccination

Clinical students reached significantly better percentages of right responses in 12 of the 16 items that ask about the link between HPV and oropharyngeal cancer (Table 1). Regarding knowledge about HPV vaccination, none of the six items were answered incorrectly by more than 50% of the students (Table 1). Clinical students reached better percentages of correct responses compared to preclinical ones; this result was statistically significant in all items (Table 1). A significant positive correlation was obtained between the correct responses of the first (oropharyngeal cancer-HPV link) and second section (HPV vaccination) ($R = 0.67$, $p = 0.01$). In relation to the trans-theoretical model item, the number of students in each category was as follows: 7 (4.4%) for precontemplation, 72 (45.3%) for contemplation, 25 (15.7%) for action, and 53 (34%) for maintenance.

Ease in Discussing Sensitive Topics With the Patients

Among the topics covered in the survey, there was only a statistically significant difference between sexes when students were questioned about the ease of talking about eating disorders. Male students had more communication skills than female students regarding this topic ($U = 1841$, $p = 0.003$; Table 2).

Perceptions and Attitudes Regarding Oropharyngeal Cancer Screening

In half of the items, participants agreed to "a great extent" that dentists need to talk to their patients about the relationship of HPV and oropharyngeal cancer, that there is a need for an established protocol for early oropharyngeal cancer detection, and their need for education. This pattern in the answers shows that students feel somewhat insecure on their visual (on average at 2.0 ± 0.9) and palpation skills (on average at 2.0 ± 0.9) in relation to the oropharyngeal cancer diagnosis skills (Fig. 1). There were no statistically significant differences between these items based on sex, or preclinical vs. clinical students.

Discussion

The aims of this study were (1) to assess the knowledge about HPV-related oral cancer and HPV vaccination among a group of dental students, (2) to report on student's communication skills regarding sensitive issues, and (3) to assess the student's attitudes concerning oral cancer screening.

A recent study in a Spanish sample showed that HPV infection was present in the 26% of patients with oral squamous cell carcinomas in the tongue and also found that mortality was significantly increased in patients with HR-HPV (OR 3.97, 95% CI 1.07–14.7) [19]. Oncogenic oral HPV infection is especially prevalent among men in the fifth decade of the life [20], although oral cancer prevalence appears to be increasing in young people [21]. Moreover, HPV has been reported as an agent in the sexual transmission of this disease [22]. These facts are largely unknown by the general public, making this a clear need for public health professionals to address [23]. Specifically, dentists can play a key role in the prevention of this pathology, and unfortunately, among these professionals, more attention is being given to act on other risk factors such as tobacco or alcohol. The education of dentists

Table 1 Assessment of HPV-related oropharyngeal cancer knowledge and HPV vaccination stratified by preclinical vs. clinical dental students

$n = 158$	Preclinical, $n = 89$ Correct	n (%) Incorrect	n (%) I do not know	Clinical, $n = 69$ Correct	n (%) Incorrect	n (%) I do not know	p value
HPV-related oral cancer items (16)							
1. Approximately 50% of patients who get oral cancer will die from this disease	44 (49.4)	36 (40.4)*	9 (10.1)	33 (47.8)	28 (40.6)*	8 (11.6)	0.857
2. Some types of HPV cause oral cancer	52 (58.4)*	24 (27.0)	13 (14.6)	62 (89.9)*	3 (4.3)	4 (5.8)	**< 0.001**
3. Oral cancer is often preceded by the presence of clinically identifiable premalignant changes	50 (56.2)*	27 (30.3)	12 (13.5)	57 (82.6)*	8 (11.6)	4 (5.8)	**0.002**
4. An increasing number of patients diagnosed with oral cancer lack risk factors as tobacco and alcohol use	41 (46.1)*	31 (34.8)	17 (19.1)	37 (53.6)*	28 (40.6)	4 (5.8)	0.051
5. The average age of patients diagnosed with oral cancer is declining	34 (38.2)*	22 (24.7)	33 (37.1)	39 (56.5)*	14 (20.3)	16 (23.2)	0.062
6. The majority of malignant lesions in the oral cavity is diagnosed in an advanced stage of progression	44 (49.4)*	31 (34.8)	14 (15.7)	52 (75.4)*	14 (20.3)	3 (4.3)	**0.003**
7. There are more than 100 types of HPV	18 (20.2)*	13 (14.6)	58 (65.2)	32 (46.4)*	4 (5.8)	33 (47.8)	**< 0.001**
8. A person can have HPV without knowing it	43 (48.3)*	32 (36.0)	14 (15.7)	61 (88.4)*	4 (5.8)	4 (5.8)	**< 0.001**
9. Most HPV infections resolve within a short time	38 (42.7)*	20 (22.5)	31 (34.8)	19 (27.5)*	31 (44.9)	19 (27.5)	**0.010**
10. Some types of HPV cause cervical cancer	41 (46.1)*	24 (27.0)	24 (27.0)	63 (91.3)*	3 (4.3)	3 (5.8)	**< 0.001**
11. HPV causes HERPES and cold sore	31 (34.8)	30 (33.7)*	28 (31.5)	29 (42.0)	29 (42.0)*	11 (15.9)	0.080
12. HPV causes HIV/AIDS	31 (34.8)	32 (36.0)*	26 (29.2)	10 (14.5)	49 (71.0)*	10 (14.5)	**< 0.001**
13. HPV is a sexually transmitted virus	47 (52.8)*	29 (32.1)	13 (14.6)	57 (82.6)*	10 (14.5)	2(2.9)	**< 0.001**
14. Antibiotics can cure a HPV infection	43 (48.3)	25 (28.1)*	21 (23.6)	7 (10.1)	55 (79.7)*	7 (10.1)	**< 0.001**
15. There is a vaccine that prevents against certain types of HPV	49 (55.1)*	32 (36.0)	8 (9.0)	65 (94.2)*	3 (4.3)	1 (1.4)	**< 0.001**
16. Using a condom decreases the chance of transmitting HPV	46 (51.7)*	22 (24.7)	21 (23.6)	66 (95.7)*	1 (1.4)	2 (2.9)	**< 0.001**
HPV vaccination items (6)							
1. The vaccine prevents transmission of some types of HPV	46 (51.7)*	39 (43.8)	4 (4.5)	61 (88.4)*	6 (8.7)	2 (2.9)	**< 0.001**
2. The HPV vaccine protects women against cervical cancer	49 (55.1)*	26 (29.2)	14 (15.7)	51 (73.9)*	11 (15.9)	6 (8.7)	**0.036**
3. Individuals vaccinated against HPV do not have to practice safe sex (e.g., using condoms)	31 (34.8)	51 (57.3)*	7 (7.9)	7 (10.1)	56 (81.2)*	6 (8.7)	**< 0.001**
4. In the national immunization program, the HPV vaccine is only available for females	26 (29.2)*	30 (33.7)	33 (37.1)	50 (72.5)*	3 (4.3)	16 (23.2)	**< 0.001**
5. Men can request their general practitioner for HPV vaccination; however, this is not covered financially	18 (20.2)*	35 (39.3)	36 (40.4)	17 (24.6)*	8 (11.6)	44 (63.8)	**< 0.001**
6. The HPV vaccine is only effective for individuals who have never had sex before	32 (36.0)	39 (43.8)*	16 (18.0)	12 (17.4)	43 (62.3)*	14 (20.3)	**0.029**

Significant results are reported in bold. The correct answer for each item is indicated with an asterisk

will be extremely important to be able to reduce the burden of disease that will be caused by HPV infection. The study of the awareness of these health topics among dental professionals and students is recent in the medical literature. Despite this, there are a growing number of papers related to this topic [10, 14, 24, 25]. Currently, in the Spanish universities, there is a lack of a regulated dental curriculum in relation to the HPV-oral cancer link so the disparity in HPV-related knowledge regarding this topic among different centers may be particularly acute.

In the first section of this survey, 75% of Spanish dental students affirmed that there is a link between HPV infection and oral cancer; this finding is significantly better than the percentage collected in Amsterdam (64%) [14]. In this work, we found differences in the knowledge regarding HPV-oral cancer link on preclinical students compared clinical, even more marked than those previously described among Dutch students [14]. These data may reveal a higher clinical confidence among more experienced students, and at the same time, the poor knowledge among preclinical dental students is comparable to the level detected in younger without medical education [25]. There was limited and inadequate knowledge among students about HPV and related oral cancers. Public health needs well-informed dentists to work reducing the

Table 2 Differences between responses to five questions assessing how easy it is to discuss some topics with the patients stratified by sex and by origin

$n = 158$	Sex			Origin			
Item	Men	Women	p value[a]	Rural	Semi-urban	Urban	p value[b]
Lifestyle	4.2 (± 1.0)	4.3 (± 0.8)	0.643	4.1(± 0.7)	4.3(± 0.9)	4.2(± 1.0)	0.418
Domestic violence	2.6 (± 1.1)	2.3 (± 1.0	0.109	2.4 (± 1.2)	2.6(± 1.0)	2.2(± 1.0)	0.112
Eating disorders	3.7 (± 1.0)	3.1 (± 1.1	**0.003**	3.3 (± 1.1)	3.4(± 1.1)	3.3(± 1.0)	0.713
Sexually transmitted infections	3.3 (± 1.1)	3.1 (± 1.1)	0.168	2.9(± 1.0)	3.3(± 1.0)	3.1(± 1.2)	0.312
Substance abuse	3.2 (± 1.4)	3.1 (± 1.1)	0.533	3.0(± 0.9)	3.2(± 1.2)	3.2(± 1.2)	0.568

Significant results are reported in bold

[a] Mann-Whitney U test

[b] Kruskal-Wallis test

burden of this disease. Dentists can practice primary prevention by educating patients about sensitive topics such as safe sexual practices and secondary prevention through early diagnosis [26].

On the other hand, we found that 48.7% of students claimed to be vaccinated against HPV and that 57.7% of female students were vaccinated. This vaccination rate is slightly lower than the one published by the Spanish Public Health Department related to recent cohorts campaigns which range between 62.5 and 75.2% [27]. Furthermore 27.7% of male students reported to be vaccinated; these findings are quite striking and relevant for public health, taking into account that HPV immunization is not included in the Spanish vaccination schedule for men [28]. It is possible that occupational risk may be a decisive factor in whether students get vaccinated.

The contribution of HPV prevalence to head and neck squamous cell carcinoma, penile cancer, and genital warts reflects the potential benefit of prophylactic vaccines regardless of sex [29]. Pediatric dentists can play a key role by recommending a vaccination against HPV to children under the age of 12 when the vaccine would be more effective [26]. It is important to reinforce the usefulness of this vaccine among the parents of the targeted children to help them on their decision-making [27].

Sexually transmitted infections were also recognized as a difficult issue to discuss with patients. Some studies hypothesize that perhaps the increase in HPV related oral cancers between young people may be due to changes in sexual practices of the new generations [20]. It is important for dentists to feel comfortable promoting safe sex and to feel that this is part of their professional competencies. Difficulty discussing topics with sexual content was also reported by American dentists [10].

Our findings related to students' attitudes concerning oropharyngeal screening showed that most students assumed that the early diagnosis strategies would play a vital role for improving outcomes. We also found a lack of knowledge in relation to technical skills for screening and diagnosis, which will require greater efforts for improvement. What Spanish, Dutch [14], and American students [10] agree on is that they

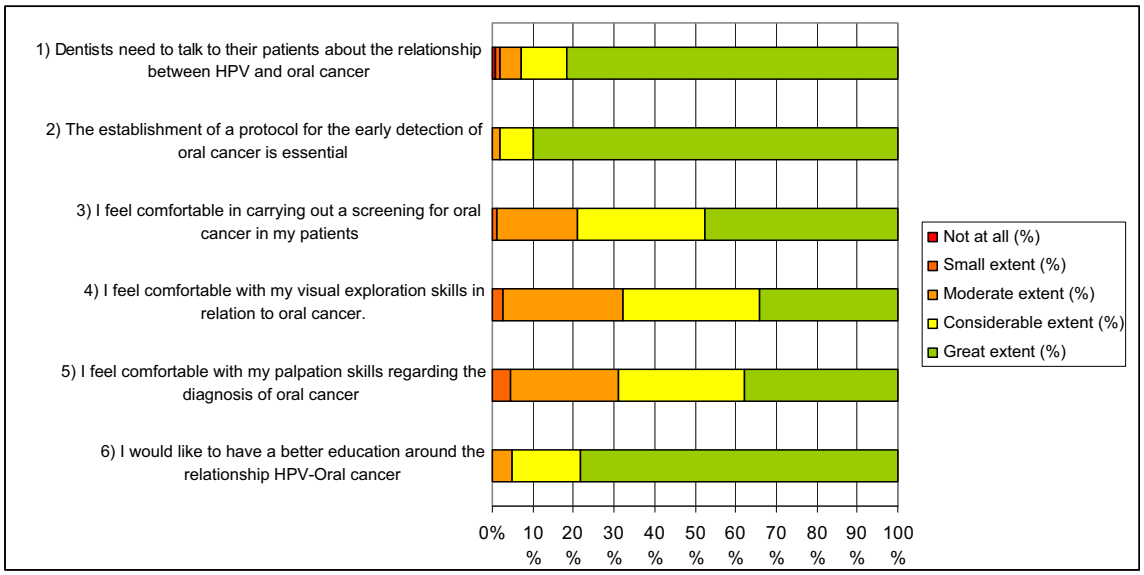

Fig. 1 Bar chart. Dental students' attitudes regarding Oropharyngeal cancer

need this topic to be addressed in greater depth during their training. We agree with what was stated by Poelman et al. [14] on the application of the trans-theoretical model in students. The biggest premise to get a valid trans-theoretical model is the freedom in the execution of the process of change, and probably the obtained results reflect the guides of the students' clinical tutors.

Lastly, the limitations of this study should be noted. The main limitation of this study is that data were collected at a single point in time. Thus, causal relationships cannot be established. Data were also collected before students entered the workforce, meaning that the long-term effect of their education could not be tested in this study. At the same time, this work presents the inherent limitations of the measurement tool applied despite being previously validated [10, 14].

Conclusions

To the best of our knowledge, this is the first paper regarding HPV-related knowledge and awareness among Spanish dental students. Students showed a lack of knowledge to both HPV pathogenesis and the HPV vaccine. In addition, they showed a lack of relevant communication skills necessary to address these discussions in their future practices. However, their attitudes towards the diagnosis of oropharyngeal cancers were adequate. Revised HPV-related curricula could provide knowledge and clinical attitudes that would lead to a professional identity as an oral health care provider who is interested in the prevention of oropharyngeal cancer.

Acknowledgements We thank Prof. Beatriz Figueroa Revilla (Department of English Philology, University of Vigo, Ourense, Spain) for the language editing, Dr. Sergio González Palanca (Department of Obstetrics and Gynecology, Valdeorras Hospital, O Barco de Valdeorras, Ourense Spain) for the comments and suggestions, and Dr. Coralia Vázquez-Otero (College of Public Health, University of South Florida, Tampa, FL, EE.UU.) for her writing assistance.

Author Contributions According to Vancouver Group's (International Committee of Medical Journal Editors) Statement To qualify for authorship, we indicate the contribution of each author to this manuscript:

Iria Gasamáns: conceptualization of the study, drafting, revising the manuscript critically for intellectual content, and final approval of the version to be published.

Pilar Gándara-Vila, Mercedes Gallas-Torreira: acquisition of data, revising the manuscript critically for intellectual content, and final approval of the version to be published.

Cristina Banga, Abel García-García: revising the manuscript critically for intellectual content and final approval of the version to be published.

Ellen M. Daley: conceptualization, drafting, revising the manuscript critically for intellectual content, and final approval of the version to be published.

Mario Pérez-Sayáns: analysis, revising the manuscript critically for intellectual content, and final approval of the version to be published.

Alejandro Ismael Lorenzo-Pouso: design, conceptualization of the study, analysis, interpretation of the data, drafting, revising the manuscript critically for intellectual content, and final approval of the version to be published.

Compliance with Ethical Standards

After revising our protocol, the Clinical Research Ethics Committee of Galicia (CRECG) did not consider necessary to approve this study if the questionnaires were anonymous and the participation voluntary. We confidentially collected and managed all research data within this study, in accordance with the Spanish organic law 15/1999 of 13 December on the Protection of Personal Data, in such a way that the researchers could not trace any of the data to an individual dental student.

Conflict of Interest The authors declare that they have no conflict of interest.

References

1. de Martel C, Plummer M, Vignat J, Franceschi S (2017) Worldwide burden of cancer attributable to HPV by site, country and HPV type. Int J Cancer 141:664–670
2. Cleveland JL, Junger ML, Saraiya M, Markowitz LE, Dunne EF, Epstein JB (2011) The connection between human papillomavirus and oropharyngeal squamous cell carcinomas in the United States: implications for dentistry. J Am Dent Assoc 142:915–924
3. Gillison ML, Chaturvedi AK, Anderson WF, Fakhry C (2015) Epidemiology of human papillomavirus–positive head and neck squamous cell carcinoma. J Clin Oncol 33(29):3235–3242
4. Chaturvedi AK, Engels EA, Pfeiffer RM, Hernandez BY, Xiao W, Kim E, Jiang B, Goodman MT, Sibug-Saber M, Cozen W, Liu L, Lynch CF, Wentzensen N, Jordan RC, Altekruse S, Anderson WF, Rosenberg PS, Gillison ML (2011) Human papillomavirus and rising or opharyngeal cancer incidence in the United States. J Clin Oncol 29:4294–4430
5. Deschler DG, Richmon JD, Khariwala SS, Ferris RLWM (2014) The new head and neck cancer patient—young, nonsmoker, nondrinker, and HPV positive: evaluation. Otolaryngol Head Neck Surg 351:375–338
6. Mehanna H, Beech T, Nicholson T, El-Hariry I, McConkey C, Paleri V, Roberts S (2013) Prevalence of human papillomavirus in oropharyngeal and nonoropharyngeal head and neck cancer–systematic review and meta-analysis of trends by time and region. Head Neck 35:747–755
7. Kreimer AR, Clifford GM, Boyle P, Franceschi S (2005) Human papilloma virus types in head and neck squamous cell carcinomas worldwide: a systematic review. Cancer Epidemiol Biomark Prev 14:467–475
8. Saraiya M, Unger ER, Thompson TD, Lunch CF, Hernandez BY, Lyu CW, Steinau M, Watson M, Wilkinson EJ, Hopenhayn C, Copeland G, Cozen W, Peters ES, Huang Y, Saber MS, Altekruse S, Goodman MT (2015) US assessment of HPV types in cancers: implications for current and 9-valent HPV vaccines. J Natl Cancer Inst 29:107
9. Ang KK, Harris J, Wheeler R, Weber R, Rosenthal DI, Nguyen-Tân PF, Westra WH, Chung CH, Jordan RC, Lu C, Kim H, Axelrod R, Silverman CC, Redmond KP, Gillison ML (2010) Human papillomavirus and survival of patients with oropharyngeal cancer. N Engl J Med 1:24–35
10. Daley E, Dodd V, DeBate R, Vamos C, Wheldon C, Kline N, Smith S, Chandler R, Dyer K, Helmy H, Driscoll A (2014) Prevention of HPV-related oral cancer: assessing dentists' readiness. Public Health 128:231–238

11. World Health Organization (2014) Human papillomavirus vaccines: WHO position paper, October 2014. Wkly Epidemiol Rec 43:465–492
12. Petrosky E, Bocchini JA, Hariri S, Chesson H, Robinette C, Curtis R, Mona Saraiya M, Unger ER, Markowitz LE (2015) Use of 9-Valent human papillomavirus (HPV) vaccine: updated HPV vaccination recommendations of the advisory committee on immunization practices. Morb Mort Wkly Rep (MMWR) 27:300–304
13. Vázquez-Otero C, Vamos CA, Thompson EL, Merrell LK, Griner SB, Kline NS, Catalanotto FA, Giuliano AR, Daley EM (2018) Assessing dentists' human papillomavirus-related health literacy for oropharyngeal cancer prevention. J Am Dent Assoc 149:9–17
14. Poelman MR, Brand HS, Forouzanfar T, Daley EM, Jager DHJ (2017) Prevention of HPV-related oral cancer by dentists: assessing the opinion of Dutch dental students. J Cancer Educ. https://doi.org/10.1007/s13187-017-1257-9
15. National Institute of Statistics (2018) Demography and population. http://www.ine.es/dyngs/INEbase/en/categoria.htm?c=Estadistica_P&cid=1254734710984. Accessed 23 April 2018
16. Prochaska JO, DiClemente CC (1992) Stages of change in the modification of problem behaviors. Prog Behav Modif 28:183–218
17. Lorenzo-Pouso AI, Pérez-Sayáns M, Pérez-López D, Otero-Rey EM, García-García A, Blanco-Carrión A (2017) Knowledge about the relation between tobacco and disease and the attitude toward advising the cessation of its consumption among a group of Spanish dental students. J Cancer Educ. https://doi.org/10.1007/s13187-017-1280-x
18. IBM SPSS (2015) https://www.ibm.com/analytics/data-science/predictive-analytics/spss-statistical-software. Accessed 23 April 2018
19. García-de Marcos JA, Pérez-Zafrilla B, Arriaga Á, Arroyo-Rodríguez S, Poblet E (2014) Human papillomavirus in carcinomas of the tongue: clinical and prognostic implications. Int J Oral Maxillofac Surg 43:274–280
20. D'Souza G, McNeel TS, Fakhry C (2017) Understanding personal risk of oropharyngeal cancer: risk-groups for oncogenic oral HPV infection and oropharyngeal cancer. Ann Oncol 28:3065–3069
21. Llewellyn CD, Linklater K, Bell J, Johnson NW, Warnakulasuriya S (2004) An analysis of risk factors for oral cancer in young people: a case-control study. Oral Oncol 40:304–313
22. Schwartz SM, Daling JR, Doody DR et al (1998) Oral cancer risk in relation to sexual history and evidence of human papillomavirus infection. J Natl Cancer Inst 90:1626–1636
23. Berger MH, Cohen ER, Shamrock AG, Chan B, Camp M, Lo K, Sargi ZB (2017) Assessment of human papillomavirus awareness in association with head and neck cancer at a screening event. Laryngoscope 128:386–392
24. Rutkoski H, Fowler B, Mooney R, Pappas L, Dixon BL, Pinzon LM, Winkler J, Kepka D (2017) Pilot test of survey to assess dental and dental hygiene student human papillomavirus-related oropharyngeal cancer knowledge, perceptions, and clinical practices. J Cancer Educ. https://doi.org/10.1007/s13187-017-1165-z
25. Turhan E, Cetin S, Cetin M, Abacigil F (2017) Awareness and knowledge levels of 18-year-old and older individuals regarding Human Papillomavirus (HPV) and HPV vaccine in Hatay, Turkey. J Cancer Educ. https://doi.org/10.1007/s13187-017-1292-6
26. Syrjanen S, Termine N, Capra G, Paderni C, Panzarella V, Campisi G (2012) Oral HPV infection: current strategies for prevention and therapy. Curr Pharm Des 18:5452–5469
27. Navarro-Illana P, Díez-Domingo J, Navarro-Illana E (2014) Knowledge and attitudes of Spanish adolescent girls towards human papillomavirus infection: where to intervene to improve vaccination coverage. BMC Public Health 14:490
28. Ministry of Health, Social Services and Equality (2018) Vaccination calendar 2018. https://www.msssi.gob.es/profesionales/saludPublica/prevPromocion/vacunaciones/Calendario2018.htm. Accessed 25 Feb 2018
29. Ndiaye C, Mena M, Alemany L, Arbyn M, Castellsagué X, Laporte L, Bosch FX, de Sanjosé S, Trottier H (2014) HPV DNA, E6/E7 mRNA, and p16INK4a detection in head and neck cancers: a systematic review and meta-analysis. Lancet Oncol 15:1319–1331