DOI:10.31557/APJCP.2022.23.8.2719
HPV and Head and Neck and Oral Cancers

RESEARCH ARTICLE

Editorial Process: Submission:02/23/2022 Acceptance:08/07/2022

University Students' Knowledge about the Relation between Human Papillomavirus (HPV) and Head and Neck and Oral Cancers

Valquiria Kulig Vieira[1], Guilherme Welter Wendt[2], Lirane Elize Defante Ferreto[1,2], Claudicéia Risso Pascotto[1,2], Léia Carolina Lucio[1,2]*

Abstract

Introduction: Human papillomavirus (HPV) causes the most common sexually transmitted infection (STI) in the world. It affects people regardless of gender and age, causing genital warts and cancer. Objective: To evaluate university students' knowledge of HPV and its relationship with head and neck and oral cancers. Methods: This is a cross-sectional study using an online questionnaire administered to undergraduate students at a public university (n=335). Results: In total, 69.3% of the participants were unaware of the relationship between HPV and head and neck cancers and 34.6% claimed that HPV may not cause oral cancer. The chances of knowing about the relationship of HPV with head and neck cancers were significant for participants who knew that HPV could be asymptomatic (OR = 9.9; p = 0.029), that might cause genital warts in men (OR = 4.0; p = 0.015), and those aged 24 years or older (OR = 1.9; p = 0.021). However, undergraduate students in the field of health and medicine (OR = 0.419; p = 0.002), who had sex at least twice a week (OR = 0.471; p = 0.017), and were unaware of the target public for the HPV vaccine (OR: 0.222, p<0.001) were less likely to know about the relationship. Students who knew of the relationship between HPV and female (OR = 3.6; p = 0.010) and male genital warts (OR = 3.0; p = 0.005) or were immunized (OR = 1.8; p = 0.020) were more likely to understand the viral interaction with oral cancer. Those who were unaware of the population eligible for HPV vaccine (OR = 0.493; p = 0.017) also showed gaps in their knowledge of this relationship. Conclusion: Our findings showed that there were limitations in the knowledge about HPV, its vaccine, and its relationship with head and neck and oral cancers.

Keywords: Knowledge- head and neck neoplasms- mouth neoplasms- HPV- sexually transmitted diseases

Asian Pac J Cancer Prev, **23 (8)**, 2719-2726

Introduction

Human Papillomavirus (HPV) is an epitheliotropic virus capable of infecting the skin and mucous membranes. It is responsible for the most common sexually transmitted infection (STI) in the world (WHO, 2017). Currently, there are more than 200 different types of HPV known, of which 40 can infect the anogenital tract of men and women. Among these, 12 are considered as high risk that can cause genital warts and cancer (Gomes, 2019; Araújo et al., 2021).

The HPV infection prevalence in Brazil is significant (54.6%). In total, 38.4% of Brazilians (Colpani et al., 2020) have one type of infection and are at a high risk for the development of cancer. The age group most affected by the infection ranges from 16 to 25 years, a group that is not covered by the vaccination program available in the Brazilian Unified Health System (SUS) (Colpani et al., 2020). Moreover, estimates suggest that 25% of adolescents aged 12 to 18 years old are exposed to HPV during the first year after the onset of sexual activity; this figure increases to 70% three years after it (Leite et al., 2018).

About 5% of the male population in the oropharyngeal region are diagnosed with cancer related to HPV infection (Gomes, 2019; Tumban, 2019; Cocchio et al., 2020; Wierzbicka et al., 2021). Head and Neck Squamous Cell Carcinoma (HNSCC) is a set of malignant neoplasms in different head and neck locations which, if diagnosed in advanced stages, is one of the main causes of morbidity and mortality due to malignant neoplasms in Brazil (Furtado, 2015). Several studies have highlighted the relationship between HPV infection and HNSCC, mainly affecting the younger male population who show risky sexual behaviors, such as partner multiplicity and oral sex (Colpani et al., 2016; Lorenzo-Pouso et al., 2019; Tumban, 2019; Jeruzal-Światecka et al., 2020; Wirzbickaet al., 2021).

*[1]Graduate Program in Applied Health Sciences, State University of Western Paraná (UNIOESTE), Francisco Beltrão, Brazil. [2]Center for Health Sciences, State University of Western Paraná (UNIOESTE), Francisco Beltrão, Brazil. *For Correspondence: leiacarol@gmail.com*

The Brazilian population showed a poor knowledge of the possible association between HPV and HNSCC. This includes students in fields other than Health and less than 30% of them recognized this type of neoplasm as a disease that can be caused by HPV (Biselli-Monteiro et al., 2020). Moreover, more than 85% of university students stated that cervical cancer was the only long-term effect of HPV infections (Cirilo et al., 2010) and less than a half knew that it can be orally transmitted (Burlamaqui et al., 2017). Based on this, this study aimed to determine the knowledge of university students, at a Brazilian public university, on HPV and its relationship with head and neck cancers, especially oral cancers. Our findings may have important implications for both future research and for campaigns to expand vaccination coverage.

Materials and Methods

Participants, procedures, and design

A cross-sectional study was conducted between November 2020 and September 2021 with undergraduate students at the Universidade Estadual do Oeste do Paraná, a public higher education institution in the municipality of Francisco Beltrão, Paraná, Brazil. The sample size was calculated using the Open Source Epidemiologic Statistics for Public Health as a basis of the analyses based on previous studies such as He and He (2018) and Rashid, Labani and Das (2016) who reported the knowledge about HPV around 25%. Considering a population of 1500 students enrolled at the time of data collection, we assumed that 25% (±5%) would have knowledge about HPV (HE; HE, 2018) in a model with 95% confidence intervals (d) with a design effect of 1, thus returning a minimum sample of 242 individuals. Students actively enrolled in undergraduate courses were included in this study. Students who had quit their courses, were away on leave of absence or who refused to participate in this research were excluded. Based on these criteria, 1500 students were invited to this study and out of them 335 agreed to participate. The questionnaire was sent individually via e-mails provided and authorized by the academic secretariat of the university and was completed on Google Forms. The questionnaire was structured into two sections containing 40 objectives and three descriptive questions.

The first section of the questionnaire contained questions on the attended undergraduate course, age, gender, ethnicity, monthly income, marital status, parity, age at the onset of sexual activity, sexual intercourse frequency, prevention methods, gynecological examinations, health, and family history of cancer. The second section included two-alternative questions (yes/no) about HPV knowledge, sexual behavior, immunization, and pathologies, including the most commonly known oral cancer (restricted to oral cavity) and also other regions, such as head and neck cancers (comprising the oral cavity, lips, pharynx, larynx, nasal cavity, and thyroid) (Vieira Zanini et al., 2017; Abreu et al., 2018; He, 2018). The second section measured students' knowledge about these cancers separately.

This study was approved by the Ethics Committee in Research on Human Beings of UNIOESTE (opinion No.: 4,379,963). All participants signed an informed consent form.

Statistical Analyses

The variables were categorized for statistical analysis. The Chi-squared test (X^2) was used to evaluate knowledge on the relation between HPV infection and head and neck and oral cancers. A cut-off point of $p<0.20$ was adopted for multivariate analysis. Next, a multivariate logistic regression analysis with Stepwise method was conducted to define the variables influencing knowledge of that relationship, considering $p<0.05$ and CI:95%. Analyses were processed on the Statistical Package for the Social Sciences – SPSS 24.0 and JASP 0.14.1.0.

Results

Out of the 335 participants, the majority were enrolled in Medicine (29%), Nutrition (24.2%), Administration (6%), Economic Sciences (13.7%), Law (9.3%), Geography (3%), Pedagogy (10.8%), and Social Work (4.2%) and most of them were in their first three years of university (73.7%). Participants' age ranged from 16 to 55 years, with a mean of 23.3 years (±5.88); among them 81.2% were single and 18.5% were married or in a stable union. The majority were self-declared white (85.4%), women (74%), and without children (89.9%). Regarding education fields, 53.1% of participants studied Health, 33.1 % studied Applied Social Sciences, and 13.7% studied Human Sciences.

Only 7.5% reported no history of sexual activity. Onset of sexual activity was under the age of 18 years in more than 89% of participants. Condom use was the main form of protection reported (62.8%), often combined with other methods (ie. oral contraceptives and Intra Uterine Device (IUD)). Regarding their own health, 89.3% of participants rated their status as good and very good.

As for the participants' knowledge of the relationship between HPV infection and head and neck cancers, 69.3% were unaware of such a relationship and 34.6% did not know that HPV can cause oral cancer (Table 1). Based on the multivariate analysis, the participants who knew that HPV could be asymptomatic, cause male genital warts, and were 24 years old or older had a higher chance of knowing the viral relation to head and neck cancers by 9.9 ($p=0.029$), 4.0 ($p=0.015$) and 1.9 ($p=0.021$) times (Table 2). On the other hand, students in courses unrelated to Health (AdjOR: 0.419, $p=0.002$), who had sex at least twice a week (AdjOR: 0.471, $p=0.017$), and were unaware of the target audience for the vaccine (AdjOR: 0.222, $p<0.001$) had a lower knowledge of this relationship.

The findings of the relationship between HPV and oral cancer showed that knowledge of the relationship between HPV and female (AdjOR: 3.6, $p=0.010$) and male genital warts (AdjOR: 3.0, $p=0.005$) increased the understanding that HPV is related to oral neoplasms for more than three times (Table 2). Receiving the vaccine (AdjOR:1.8, $p=0.020$) also favorably influenced the understanding of the relationship. However, university students who were unaware of the target audience for the vaccine (AdjOR:

Table 1. Analysis and Result of Knowledge on HPV as the Possible Cause of Head and Neck and Oral Cancers in Students at a Public University in the State of Paraná, Brazil.

Variables	Knowledge of head and neck cancer			Knowledge of oral cancer		
	No (n=232)	Yes (n=103)	P-value	No (n=116)	Yes (n=219)	P-value
Gender						
Female	171 (73.7%)	77 (74.8%)	0.840 [a]	82 (70.7%)	166 (75.8%)	0.310 [a]
Male	61 (26.3%)	26 (25.2%)		34 (29.3%)	53 (24.2%)	
Ethnicity						
White	199 (85.8%)	87 (84.5%)	0.754 [a]	96 (82.8%)	190 (86.8%)	0.324[a]
Other	33 (14.2%)	16 (15.5%)		20 (17.2%)	29 (13.2%)	
Age group						
Up to 23 years	176 (75.9%)	62 (60.2%)	0.004[a]	87 (75.0%)	151 (68.9%)	0.245[a]
24 years or older	56 (24.1%)	41 (39.8%)		29 (25.0%)	68 (31.1%)	
Income (n=334) in USD*						
≤ 208.7	12 (5.2%)	9 (8.7%)	0.323[b]	6 (5.2%)	15 (6.9%)	0.707 [b]
≥ 417.4	219 (94.8%)	94 (91.3%)		110 (94.8%)	203 (93.1%)	
Marital status						
Single	183 (78.9%)	89 (86.4%)	0.104 [a]	89 (76.7%)	183 (83.6%)	0.128[a]
Other	49 (21.1%)	14 (13.6%)		27 (23.3%)	36 (16.4%)	
Offspring						
No	212 (91.4%)	89 (86.4%)	0.164 [a]	105 (90.5%)	196 (89.5%)	0.769a
Yes	20 (8.6%)	14 (13.6%)		11 (9.5%)	23 (10.5%)	
Undergraduate Course						
Health	109 (47.0%)	69 (67.0%)	0.001 [a]	58 (50.0%)	120 (54.8%)	0.403[a]
Other	123 (53.0%)	34 (33.0%)		58 (50.0%)	99 (45.2%)	
Onset of sexual activity (n=330)						
≤ 18 years old	193 (84.3%)	88 (87.1%)	0.502[a]	94 (82.5%)	187 (86.6%)	0.317 [a]
> 18 years old	36 (15.7%)	13 (12.9%)		20 (17.5%)	29 (13.4%)	
Frequency of sexual intercourse						
< 2x a week	163 (70.3%)	80 (77.7%)	0.161 [a]	83 (71.6%)	160 (73.1%)	0.769[a]
≥ 2x a week	69 (29.7%)	23 (22.3%)		33 (28.4%)	59 (26.9%)	
Prevention measures (n=325)						
Not condom	90 (39.8%)	31 (31.3%)	0.144 [a]	49 (43.0%)	72 (34.1%)	0.115[a]
Condom	136 (60.2%)	68 (68.7%)		65 (57.0%)	139 (65.9%)	
Self-rated health						
Bad/not very good	25 (10.8%)	11 (10.7%)	0.979 [a]	10 (8.6%)	26 (11.9%)	0.466[b]
Good/very good	207 (89.2%)	92 (89.3%)		106 (91.4%)	193 (88.1%)	
History of cancer in the family (n=334)						
No	88 (38.1%)	30 (29.1%)	0.113 [a]	39 (33.9%)	79 (36.1%)	0.695[a]
Yes	143 (61.9%)	73 (70.9%)		76 (66.1%)	140 (63.9%)	
Heard about some STI1 campaign						
No	11 (4.7%)	6 (5.8%)	0.883[b]	3 (2.6%)	14 (6.4%)	0.190[c]
Yes	221 (95.3%)	97 (94.2%)		113 (97.4%)	205 (93.6%)	
Have heard of HPV2						
No	10 (4.3%)	2 (1.9%)	0.356 [c]	6 (5.2%)	6 (2.7%)	0.406[b]
Yes	222 (95.7%)	101 (98.1%)		110 (94.8%)	213 (97.3%)	
HPV is a virus						
No	6 (2.6%)	2 (1.9%)	1.000 [c]	2 (1.7%)	6 (2.7%)	0.719[c]
Yes	226 (97.4%)	101 (98.1%)		114 (98.3%)	213 (97.3%)	
HPV causes an STI						
No	8 (3.4%)	0 (0.0%)	0.113 [c]	6 (5.2%)	2 (0.9%)	0.023[c]
Yes	224 (96.6%)	103 (100%)		110 (94.8%)	217 (99.1%)	

Table 1. Continued

Variables	Knowledge of head and neck cancer			Knowledge of oral cancer		
	No (n=232)	Yes (n=103)	P-value	No (n=116)	Yes (n=219)	P-value
HPV may be asymptomatic						
No	22 (9.5%)	1 (1.0%)	0.004[c]	13 (11.2%)	10 (4.6%)	0.039[b]
Yes	210 (90.5%)	102 (99.0%)		103 (88.8%)	209 (95.4%)	
Causes female genital warts						
No	37 (15.9%)	2 (1.9%)	0.000[c]	29 (25.0%)	10 (4.6%)	0.000[b]
Yes	195 (84.1%)	101 (98.1%)		87 (75.0%)	209 (95.4%)	
Causes male genital warts						
No	54 (23.3%)	4 (3.9%)	0.000 [c]	40 (34.5%)	19 (8.2%)	0.000[a]
Yes	178 (76.7%)	99 (96.1%)		76 (65.5%)	201 (91.8%)	
HPV causes cervical cancer						
No	12 (5.2%)	0 (0.0%)	0.021[c]	11 (9.5%)	1 (0.5%)	0.000[c]
Yes	220 (94.8%)	103 (100%)		105 (90.5%)	218 (99.5%)	
HPV may alter pap smear tests (n=334)						
No	20 (8.7%)	3 (2.9%)	0.062 [c]	11 (9.6%)	12 (5.5%)	0.161[a]
Yes	211 (91.3%)	100 (97.1%)		104 (90.4%)	207 (94.5%)	
HPV and HIV3 are different						
No	56 (24.1%)	15 (14.6%)	0.048[a]	28 (24.1%)	43 (19.6%)	0.337[a]
Yes	176 (75.9%)	88 (85.4%)		88 (75.9%)	176 (80.4%)	
There is a relation between HPV and the onset of sexual activity						
No	106 (45.7%)	36 (35.0%)	0.066 [a]	52 (44.8%)	90 (41.1%)	0.511[a]
Yes	126 (54.3%)	67 (65.0%)		64 (55.2%)	129 (58.9%)	
There is a relation between HPV and number of partners						
No	72 (31.0%)	17 (16.5%)	0.005 [a]	36 (31.0%)	53 (24.2%)	0.178[a]
Yes	160 (69.0%)	86 (83.5%)		80 (69.0%)	166 (75.8%)	
You think you have already contracted HPV						
No	209 (90.1%)	85 (82.5%)	0.051 [a]	107 (92.2%)	187 (85.4%)	0.100[b]
Yes	23 (9.9%)	18 (17.5%)		9 (7.8%)	32 (14.6%)	
Condom can protect against HPV						
No	10 (4.3%)	4 (3.9%)	1.000 [c]	7 (6.0%)	7 (3.2%)	0.343[b]
Yes	222 (95.7%)	99 (96.1%)		109 (94.0%)	212 (96.8%)	
There are vaccines against HPV						
No	9 (3.9%)	1 (1.0%)	0.294[c]	6 (5.2%)	4 (1.8%)	0.101[c]
Yes	223 (96.1%)	102 (99.0%)		110 (94.8%)	215 (98.2%)	
Only women can receive the vaccine						
No	176 (75.9%)	84 (81.6%)	0.249 [a]	90 (77.6%)	170 (77.6%)	0.993[a]
Yes	56 (24.1%)	19 (18.4%)		26 (22.4%)	49 (22.4%)	
SUS4 provides vaccines						
No	14 (6.0%)	1 (1.0%)	0.044[c]	12 (10.3%)	3 (1.4%)	0.000[c]
Yes	218 (94.0%)	102 (99.0%)		104 (89.7%)	216 (98.6%)	
Target audience for the vaccine						
Girls aged from 9 to 14 years old and boys from 11 to 14 years old	157 (67.7%)	93 (90.3%)	0.000 [b]	73 (62.9%)	177 (80.8%)	0.000[a]
Other	75 (32.3%)	10 (9.7%)		43 (37.1%)	42 (19.2%)	
Vaccinated against HPV						
No	112 (48.3%)	48 (46.6%)	0.777 [a]	67 (57.8%)	93 (42.5%)	0.008[a]
Yes	120 (51.7%)	55 (53.4%)		49 (42.2%)	126 (57.5%)	

Table 1. Continued

Variables	Knowledge of head and neck cancer			Knowledge of oral cancer		
	No (n=232)	Yes (n=103)	P-value	No (n=116)	Yes (n=219)	P-value
Willingness to receive the vaccine						
No	14 (6.0%)	8 (7.8%)	0.725 [b]	7 (6.0%)	15 (6.8%)	0.956[b]
Yes	218 (94.0%)	95 (92.2%)		109 (94.0%)	204 (93.2%)	
Vaccine stimulates the onset of sexual activity						
No	226 (97.4%)	98 (95.1%)	0.323 [c]	114 (98.3%)	210 (95.9%)	0.342[c]
Yes	6 (2.6%)	5 (4.9%)		2 (1.7%)	9 (4.1%)	
Discusses HPV						
No	146 (63.8%)	60 (58.3%)	0.339 [a]	70 (60.9%)	136 (62.7%)	0.747a
Yes	83 (36.2%)	43 (41.7%)		45 (39.1%)	81 (37.3%)	

*Brazilian minimum wage, R$ 1,100.00 = $ 208.7 USD, 02/02/2022. 1 STI, Sexually Transmitted Infection; 2 HPV, Human Papilloma Virus; 3 HIV, Human Immunodeficiency Virus; 4 SUS, Unified Health System; [a], Pearson's Chi-Squared test; [b], Chi-squared test with Yates' continuity correction; [c], Fisher's exact test. Source: the authors.

0.493, p=0.017) also showed gaps in their knowledge that HPV may cause oral cancer.

Discussion

Brazil has the highest HNSCC incidence rate among South American countries, with an estimated risk of 10.69 new cases per 100,000 men and 3.71 per 100,000 women, the fifth and 13th most frequent causes of neoplasm, among all cancers respectively (Sung et al., 2021). To understand university students' knowledge of HPV and its relationship with HNSCC, especially oral cancer, we found data indicating that students had gaps in their knowledge of the viral relationship with these neoplasms, a fact already observed in other studies (Luz et al., 2014; Silva et al., 2017a, 2017b; Burlamaqui et al., 2017; Costa et al., 2017; Kifle et al., 2020; Saleemet al., 2021). Some studies have shown university students' poor knowledge on the relation

Table 2. Result of Logistic Regression of the Relation between HPV Knowledge and the Cause of Head and Neck Cancers (HNSCC) and Oral Cancer.

Variables	Knowledge of the relation between HPV and head and neck cancer			Variables	Knowledge of the relation between HPV and oral cancer		
	$_{adj}$OR	95%CI	P-value		$_{adj}$OR	95%CI	P-value
Field of the undergraduate course				Causes cervical cancer			
Health	1		0.002	No	1		0.053
Other	0.419	(0.243 – 0.724)		Yes	8.845	(0.8970 – 80.653)	
HPV1 may be asymptomatic				HPV may be asymptomatic			
No	1		0.029	No	1		0.136
Yes	9.936	(1.263 – 78.192)		Yes	2.132	(0.788 – 5.767)	
Causes male genital warts				Causes male genital warts			
No	1		0.015	No	1		0.005
Yes	4.096	(1.309 – 12.82)		Yes	3.043	(1.401 – 6.620)	
Causes female genital warts				Causes female genital warts			
No	1		0.054	No	1		0.01
Yes	4.792	(0.974 – 23.579)		Yes	3.603	(1.350 – 9.616)	
Vaccine intended for				Vaccine intended for			
Girls (9 to 14 years) boys (11 to 14 years)	1		<0.001	Girls (9 to 14 years) boys (11 to 14 years)	1		0.017
Other	0.222	(0.105 – 0.470)		Other	0.493	(0.276 – 0.879)	
Frequency of sexual intercourse				SUS2 provides HPV vaccine			
< 2x a week	1		0.017	No	1		0.061
≥ 2x a week	0.471	(0.254 – 0.873)		Yes	3.9	(0.941 - 16.166)	
Age				Vaccinated			
Up to 23 years	1		0.021	No	1		
24 years or older	1.986	(1.111 – 3.550)		Yes	1.87	(1.105 – 3.162)	0.02

1HPV, Human Papillomavirus; 2SUS, Unified Health System; $_{ajd}$OR, value obtained from multivariate logistic regression; R2Nagelkerke HNSCC, 0.293; R2Nagelkerke Oral, 0.273. Source: the authors.

between HPV and related pathologies, regardless of the course attended (Luz et al., 2014; Freitas et al., 2015; Costa et al., 2017; Spindola et al., 2019). In this study, attending an undergraduate course unrelated to health was associated with poorer knowledge of the relation between HPV, HNSCC, and oral cancer. A different result was reported by a study in Kuwait, where medical students had poor knowledge about the link existing between HPV infection and head and neck cancers (Saleem et al., 2021).

Moreover, unawareness of the target audience of HPV-preventive vaccines was associated with a poorer knowledge of the relationship between the virus, HNSCC, and oral cancer. This may interfere with the number of young people vaccinated and, consequently, increase the spread of HPV and the development of complications due to the infection (VIERO et al., 2015). On the other hand, students who were immunized against the virus and knew about the gratuity of the vaccine seemed to have a greater understanding of the viral relationship to the emergence of oral cancer. A study conducted on students at the Universidade de Campinas, in São Paulo State, Brazil, showed that after an educational intervention on HPV, vaccination rates increased by 52% and 27% for women and men respectively (Biselli-Monteiro et al., 2020). It showed the positive impact of knowledge, resulted in a conscious choice for vaccination in view of the risks of HPV infection and, consequently, vaccination protection.

About 70% of participants in this research were young people aged up to 23 years old. The results suggested that those aged 24 years or older were more likely to know the relationship between HPV and HNSCC. Other studies also highlighted that more than a half (51%) of university students under 23 years of age and enrolled in the first years of undergraduate courses showed poorer general knowledge on the virus than those over 24 and close to graduation. This shows that the younger the public, the poorer their knowledge of HPV (Silva et al., 2017a; Costa et al., 2020).

Furthermore, sexual behavior and knowledge about the symptoms of the virus may influence the understanding of the relationship between HPV and the investigated neoplasms. Research conducted in African populations showed that the reduction of risky sexual behavior in young people and adolescents was associated with increased knowledge about STIs among them (Badawiet al., 2019). We observed a similar phenomenon since the more individuals know about the virus and its infection, the greater their chances of showing protective attitudes toward it. Opposed to our work and showing worrying results, a survey conducted on female students aged between 16 and 20 years old in the city Ziwayna (Ethiopia) revealed that only 7.8% of them correctly identified risk factors for cancer, such as HPV (3.9%), multiple sexual partners (9.8%) and early onset of sexual intercourse (10.1%) (Kifle et al., 2020). According to Biselli-Monteiro (2020), the knowledge that HPV is most often asymptomatic and can lead to the formation of anogenital and oropharyngeal warts in both men and women increased university students' chances of better protecting themselves. A similar condition was observed here in which recognizing that HPV is an asymptomatic virus which causes genital warts in both men and women positively influenced knowledge of the viral relationship and the emergence of HNSCCs including oral cancer.

Although protected sexual relationships (i.e. using condom) reduce the risk of HPV infection by up to 70% (Winer et al., 2006; Giraldo et al., 2008), the results highlighted a possible association between the frequency of sexual intercourse and gaps in understanding the relationship between STIs and HNSCC. It is obvious that the higher the frequency of sexual intercourse, the greater the chances of an HPV infection. Therefore, it is important to promote the knowledge about STI prevention (i.e., vaccines and condom use). In fact, preventive measures can decrease manifested HPV symptoms, such as genital warts in both sexes (ABDALLA et al., 2017). This suggests that the more individuals know about HPV manifestations, signs, and forms prevention, the better their health outcomes.

Although recognizing the relationship between HPV and cervical cancer is a priority, the findings indicated limitations in the knowledge of the infection caused by HPV and HNSCC and oral cancer. Educational campaigns have the potential to expand and demystify the relationship between HPV and the neoplasms treated in this study.

This study may have had a bias related to the low representativeness of university students in their final years of graduation, which may have led to underestimates students' knowledge on the subject. Furthermore, there may have been a bias on the part of participants regarding their affinity with the addressed subject, especially among Health students, compared to the others.

Author Contribution Statement

For transparency we inform the contributions of each author to the paper. Valquíria Kulig Vieira works in Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Validation, Visualization, Roles/Writing - original draft, Writing - review & editing. Guilherme Welter Wendt works in Data curation and investigation, Methodology, Formal analysis, Software, Writing - review & editing. Claudicéia Risso Pascotto works in Writing - review & editing. Lirane Elize Defante Ferreto works in Formal analysis, Date curation, Software, Writing - review & editing. And Léia Carolina Lucio works in Conceptualization, Date curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Roles/Writing – original draft, Writing – review & editing.

Acknowledgements

The study was conducted in the Universidade Estadual do Oeste do Paraná, Francisco Beltrão, and funded by a scholarship from the Coordination for the Improvement of Higher Education Personnel (CAPES; Funding Code 001). We would like to thank Universidade Estadual do Oeste do Paraná, and student community for participating in the study.

Funding statement

The study was conducted with a scholarship from the Coordination for the Improvement of Higher Education Personnel (CAPES; Funding Code 001).

Ethics approval

The study was approved by the Research Ethics Committee in Research with Human Beings of the Western Paraná State University (CEP/UNIOESTE), approval number 4,379,963, and the signatures of the participants in an Informed Consent Form were requested.

Conflicts of interest

The authors have no conflict of interests to declare.

References

Abdalla GK, Fajardo EF, Gomes BBM, et al (2017). analysis of knowledge level in brazilian students about Human Papillomavirus infection and development of penile cancer. *Asian Pac J Cancer Prev*, **18**, 1371–6.

Abreu MNS, Soares AD, Ramos DAO, et al (2018). conhecimento e percepção sobre o hpv na população com mais de 18 anos da cidade de ipatinga, MG, Brasil. *Ciência Saúde Coletiva*, **23**, 849–6.

Araújo LNCC, Sousa AR, Tenório EN, et al (2021). impactos biopsicossociais do diagnóstico positivo de HPV nos portadores. *Rev Eletr Acer Saúde*, **13**, 1–7.

Badawi MM, Salaheldin MA, Idris AB, et al (2019). knowledge gaps of stis in africa; systematic review. *PLoS One*, **14**, e0213224.

Biselli-Monteiro M, Ferracini AC, Sarian LO, Derchain SFM (2020). influence of gender and undergraduate course on the knowledge about hpv and hpv vaccine, and vaccination rate among students of a public university. *Rev Bras de Gin e Obst*, **42**, 96–5.

Brasil. Guia Prático sobre o HPV - Perguntas e respostas para profissionais de saúde (2017). *Ministério Da Saúde*, **44**, 12-8.

Burlamaqui JCF, Cassanti AC, Borim GB, et al (2017). HPV e estudantes no brasil: avaliação do conhecimento de uma infecção comum–relato preliminar. *Braz Jour of Otorhin*, **83**, 120–5.

Cirilo CA, Barbosa ASAA, Zambrano E (2010). level of behavior and knowledge concerning Human Papillomavirus among university students of a nursing college. Rev Soc Bras Med Tropi, **43**, 362–6.

Cocchio S, Bertoncello C, Baldovin T, et al (2020). Awareness of HPV and drivers of HPV vaccine uptake among university students: a quantitative, cross-sectional study. *Health Soc Care Commun*, **28**, 1514–4.

Colpani V, Bidinotto AB, Falavigna M, et al (2016). Prevalence of Papillomavirus in Brazil: a systematic review protocol. *BMJ*, **2016**.

Colpani V, Falcetta FS, Bidinotto AB, et al (2020). Prevalence of Human Papillomavirus (HPV) in Brazil: a systematic review and meta-analysis. *PLoS One*, **15**, 1–34.

Costa A, Gomes JM, Germani A, et al (2020). Knowledge gaps and acquisition about HPV and its vaccine among brazilian medical students. *PLoS One*, **15**, e0230058.

Costa AGA, Reis ACC, Vaz JRR, et al (2017). HPV – O que eles sabem: avaliação com alunos do ensino superior e profissionais de saúde–município de valença-RJ. *Braz J Surg Clin Res*, **18**, 44.

Crow, JM (2012). HPV: the global burden. *Nature*, **488**, 2–3.

Freitas WR, Fedrizzi EM, Aguiar FG, (2015). Conhecimento entre estudantes universitários e funcionários de unidades locais de saúde sobre Papilomavírus Humano e câncer cervical e suas implicações para estratégias de saúde pública e vacinação. *J Bras Doen Sex Trans*, **27**, 40–7.

Giraldo PC, Silva MJP, Fedrizzi EM, et al (2008). Prevenção da infecção por HPV e lesões associadas. *J Bras Doen Sex Trans*, **20**, 132.

Gomes, I.N. Estimativa 2020: Incidência de câncer no brasil (2019). Rio de Janeiro: INCA.

He J, He L, (2018). Knowledge of HPV and acceptability of HPV vaccine among women in western China: a cross-sectional survey. *BMC*, **18**, 1–8.

Jeruzal-Świątecka J, Pietruszewska W (2020). Awareness of Human Papillomavirus and its oncogenic potential in head and neck cancer among students: Still more questions than answers. *Int J Envir Res Public Health*, **17**, 1.

Kifle K, Kebede L, Taye J, et al (2020). Assessment of awareness and attitude on cervical cancer prevention among female preparatory students in Ziway town, oromia regional state, Ethiopia. *Pac J Cancer Care*, **5**, 265-1.

Leite and Sousa PD, Takiuti AD, Baracat EC, Sorpreso ICE, De Abreu LC (2018). Knowledge and acceptance of HPV vaccine among adolescents, parents and health professionals: Construct development for collection and database composition. *JHGD*, **28**, 58–8.

Lorenzo-Pouso AI, Gándara-Vila P, Banga C, et al (2019). Human Papillomavirus-related oral cancer: Knowledge and awareness among spanish dental students. *J Can Edu*, **34**, 782–8.

Luz NNN, Lustosa ÍR, Machado KDC, et al (2014). Acadêmicos: a percepção sobre o Papilomavírus Humano e sua relação com o câncer cervical. *Semina*, **35**, 91.

Saleem L, Mahmoud H, Joseph B (2021). Knowledge and attitude about oral cancer among medical and dental students at Kuwait university: A cross-sectional study. *Asian Pac J Cancer Care*, **6**, 277-3.

Silva SL, Vargas AL, Almeida RJ, et al (2017). Conhecimento dos acadêmicos de medicina acerca do HPV e do câncer de colo uterino. *Saúde*, **43**, 125-8.

Silva SPC, Silva TB, Rocha TODA, et al (2016). Saberes e representações de vulnerabilidade para DST/HIV/AIDS por jovens universitárias. *Id on Line Ver Psico*, **10**, 25-2.

Spindola T, Soares A, Brochado J, et al (2019). Práticas sexuais e o comportamento de jovens universitários frente à prevenção de Infecções Sexualmente Transmissíveis. *Enfer Global*, **58**, 12-5.

Sung H, Ferlay J, Siegel RL, et al (2021). Global cancer statistics 2020: Globocan estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA J Clin*, **71**, 209–19.

Tumban E (2019). A current update on Human Papillomavirus-associated head and neck cancers. *Viruses*, **11**, 922.

Vieira Zanini N, Prado BS, Hendges RDC, et al (2017). Motivos para recusa da vacina contra o Papilomavírus Humano entre adolescentes de 11 a 14 anos no município de Maringá-PR. *Rev Bras Med Fam Comunidade*, **12**, 1–3.

Viero V, Farias JM, Ferraz F, et al (2015). Educação em saúde com adolescentes: Análise da aquisição de conhecimentos sobre temas de saúde. *Escola Anna Nery*, **19**, 484.

WHO (2015). Saúde sexual, direitos humanos e a lei. 1. ed. Rio Grande do Sul: Jane Patten da Green Ink, Reino Unido; tradução realizada por projeto interinstitucional entre Universidade Federal do Rio Grande do Sul, Instituto Federal do Rio Grande do Sul, Universidade Federal do Paraná.

WHO (2017). Weekly epidemiological record. *World Health*

Organization, **92**, 241–8.
Wierzbicka M, Klussmann JP, San GMR, Wuerdemann N, Dikkers FG (2021). Oral and laryngeal HPV infection: Incidence, prevalence and risk factors, with special regard to concurrent infection in head, neck and genitals. *Vaccine*,, **39**, 2344.
Winer RL, Hughes JP, Feng Q, et al (2006). Condom use and the risk of genital Human Papillomavirus infection in young women. *N Engl J Med*, **354**, 2645–4.