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Awareness of Polish undergraduate and graduate students regarding the impact of viral infections and high-risk sexual behaviors on the occurrence of oral cancer

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Abstract

With every passing year, more and more studies and observations demonstrate growing incidence of oral cancer, a decrease in patients' age, and an increasing number of epidemiological factors. The aim of the study was to determine the level of awareness among undergraduate and graduate university students regarding the incidence of oral cancer linked with viral infections and high-risk sexual behavior, including oral sex. Self-administered questionnaire-based survey was carried out among 196 Polish students aged 19 to 25 years. It was found that the young adults understood the meaning of human papillomavirus (HPV), but associated it only with the squamous cell carcinoma of the cervix. A total of 43.4% did not realize that there was any correlation between HPV infection and the development of oral cancer. The students who were aware of this correlation constituted 40.3% of the total. The majority of the participants, that is, 82 subjects (41.8%), did not associate the occurrence of malignant neoplasms of the oral cavity with oral sex. The study group did not present adequate awareness of the fact that occurrence of oral cancer may be associated with high-risk sexual behaviors. Knowledge of oral cancer was not significantly related to the level of university education ($P < .005$).

Abbreviation: HPV = human papillomavirus.

Keywords: HPV, knowledge, oral cancer, oral sex, young adults

1. Introduction

Head and neck cancers constitute, according to various data sources, about 10% of all malignant neoplasms. The epidemiological data show that they are detected late, and their treatment is initiated at advanced stages of their progression. The number of patients with oral cancer continues to grow and observations show evidence related to increasing number of the epidemiological factors.[1,2] The group of oral cancer risk factors include smoking, alcohol consumption, recreational drug use, poor oral hygiene, genetic factors, and late diagnosis of potentially neoplastic lesions of the oral mucosa.[3]

Until recently, it was believed that head and neck cancer occurred mainly in patients in their 50s or 60s. However, a number of epidemiological studies conducted in recent years have demonstrated higher incidences in younger populations. It was concluded that this is associated with human papillomavirus (HPV), HIV, HSV, and EBV infections and high-risk sexual behavior, mainly oral-genital sex. Many authors stress that the increased incidence of oral and oropharyngeal squamous cell carcinoma, especially in younger patients, may be attributed to HPV infections.[4] This has been confirmed in studies carried out by American authors and researchers from highly developed European countries, who have observed a 3-fold increase in oral cancer incidence in the population of 40- to 50-year-old patients. Within the last 25 years, the number of cases of oral cancer in young American men has increased by 225%. Similar data are observed in Western Europe.[5–7] Furthermore, the number of oral cancer cases in men grows by 3% per year, despite the fact that the number of smokers is on the decrease. Epidemiological observations conducted in many countries show that the increase in oral cancer incidence, especially among young patients, results from the HPV infection, which is primarily transmitted via sexual contacts: genital-genital, oral-genital, and anal-genital.[8,9] Conversely, some reports express skepticism with regard to hazards arising from HPV infection and oral sex affecting the development of oral cancer.[10]

This study aimed to assess awareness of undergraduate and graduate Polish university students regarding oral cancer and the impact of HPV infection, and high-risk sexual behavior, including oral-genital contacts, on the incidence of oral cancer.

2. Materials and methods

The cross-sectional study was the first stage of the research project: "Malignant neoplasms of the oral cavity in the

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population of the Subcarpathia Region" in Poland. An anonymous, self-administered questionnaire-based, http://links.lww.com/MD/C554, survey was completed by 196 university students, randomly selected among those doing a variety of graduate and undergraduate courses. The participants were selected by using a random sampling method. The subjects' mean age was 21.9 ± 1.5, and their age was in the range from 19 and 25 years. The study group consisted 98 female (50%) and 98 male participants (50%). These included 91 undergraduate (46.4%) and 105 graduate students (53.6%). In compliance with the decision of the Bioethics Committee of UR Approval number 3/4/2017, informed consent was obtained from all individual participants included in the study.

The questionnaire was self-administered and anonymous. The survey comprised 16 multiple-choice answer questions related to the occurrence of oral cancer caused by viral infections. Respondents were asked mainly about HPV, and to engaging in oral sex.

The data collected from the survey were analyzed using means, percentage, and *t* test. Statistical significance was assumed at $P < .005$. The study material was analyzed using Statistica 7.1 software (StatSoft, Poland).

3. Results

Of the 196 students participating in the survey, the majority (59.7%) understood the meaning of the HPV. The undergraduate students provided correct answers more often (67%) than the graduate students (57.3%), although the difference was not statistically significant ($P = .146$).

A positive answer regarding the impact of viral infections on the occurrence of malignant neoplasms of the oral cavity was given by 40.3% of the students; however, more subjects (41.3%) were not able to answer this question and 16.3% claimed that there was no such correlation. No statistically significant differences in the level of knowledge were found between the undergraduate and the graduate students ($P = .591$) (Table 1).

The option that HPV can occur in the biocenosis of the oral cavity was correctly selected by 25.5% of the students, 38.8% denied this possibility, and the remaining students, constituting 35.7%, had no knowledge in this respect. In this case the graduate students gave the correct answer more often than the undergraduate students. The subjects' opinions regarding the presence of HPV in a healthy oral cavity did not differ significantly in relation to the level of their education; however, the probability values here were close to the threshold of statistical significance ($P = .058$) (Table 1).

Most students (60.7%) reported having an experience with oral sex, typically with 1 or 2 partners, whereas 39.3% of the students denied engaging in oral-genital contacts. More graduate than undergraduate students admitted they had engaged in oral sex. The differences in the number of positive answers in the respective groups were statistically significant ($P < .005$).

A vast majority of respondents did not associate the increasing incidence of oral cancer with oral sex. Only 68 out of 196 students (34.7%) thought it was possible that higher incidence of oral cancer could be attributed to oral sex, whereas 46 students (23.5%) claimed there was no such correlation. A majority, that is, 82 students (41.8%), did not have any knowledge in this respect. The graduate students indicated the probability of oral cancer developing in correlation with high-risk sexual behavior more often than the undergraduate students, who more often believed that there was no such relationship. The differences were not statistically significant ($P = .071$) (Table 1).

Table 1

The level of knowledge of undergraduate and graduate university students regarding the viral infections and high-risk sexual behavior on the development of oral cancer.

	Undergraduate studies		Graduate studies		Total	
	n	%	n	%	n	%
Impact of viral infections on the development of oral cancer						
Yes	34	37.4	45	42.9	79	40.3
No	14	15.4	18	17.1	32	16.3
Do not know	43	47.3	42	40.0	85	43.4
Total	91	100.0	105	100.0	196	100.0
Significance (*P*)			*P* = .591			
Presence of HPV in a healthy oral cavity						
Yes	18	19.8	32	30.5	50	25.5
No	43	47.3	33	31.4	76	38.8
Do not know	30	33.0	40	38.1	70	35.7
Total	91	100.0	105	100.0	196	100.0
Significance (*P*)			*P* = .058			
Oral-genital contacts (oral sex) and the risk of oral cancer						
Yes	30	33.0	38	36.2	68	34.7
No	28	30.8	18	17.1	46	23.5
Do not know	33	36.3	49	46.7	82	41.8
Total	91	100.0	105	100.0	196	100.0
Significance (*P*)			*P* = .071			
Availability of HPV vaccine						
Yes	45	49.5	54	51.4	99	50.5
No	24	26.4	24	22.9	48	24.5
Do not know	22	24.2	27	25.7	49	25.0
Total	91	100.0	105	100.0	196	100.0
Significance (*P*)			*P* = .847			

HPV = human papillomavirus, n = number of subjects, *P* = probability value.

Table 2

Routes of HPV transmission and the most frequent oral cancer symptoms versus the level of respondent education.

	Undergraduate studies		Graduate studies		
	n	%	n	%	Significance (*P*)
Routes of HPV transmission					
Using the same hygiene products	33	36.3	38	36.2	*P*=.991
Kissing	39	42.9	56	53.3	*P*=.143
Genital contact (sexual intercourse)	61	67.0	76	72.4	*P*=.415
Oral-genital contact (oral sex)	41	45.1	54	51.4	*P*=.373
The most frequent oral cancer symptoms					
	N	%	N	%	
Difficulties in food chewing and swallowing	62	68.1	77	73.3	*P*=.423
Nonhealing wounds and ulcers in the oral cavity	58	63.7	66	62.9	*P*=.898
Difficulties in jaw opening and trismus	72	79.1	79	75.2	*P*=.519
Speech disorders, unclear speech	59	64.8	62	59.1	*P*=.405
Bleeding in the mouth	57	62.6	60	57.1	*P*=.434

HPV = human papillomavirus, n = number of subjects, *P* = probability value.

Availability of protective HPV vaccination, as an important measure for preventing malignant neoplasms, such as oral cancer, caused by HPV infections, was indicated by 50.5% of the students, whereas 24.5% claimed that such vaccine was not available. A conclusive answer regarding the availability of a vaccine was not given by 25.0% of the respondents. The subjects' opinions concerning the availability of an HPV vaccine did not differ relative to the level of university education ($P=.847$). Table 1 presents the students' opinions regarding the availability of an HPV vaccine (Table 1).

Both the undergraduate and the graduate respondents indicated that infection is most frequently transmitted through genital contact. This answer was provided by 76 graduate students (72.4%) and 61 undergraduate students (67.0%) ($P=.415$). Kissing as a route of HPV transmission was indicated by 53.3% of the graduate students and 42.9% of the undergraduate students ($P=.143$). Approximately 45% of the undergraduate students believed oral-genital contact is the second most common route of the infection, and 51.4% of the graduate students placed it in the third position ($P=.373$). They commonly agreed that, according to their knowledge, the lowest probability of contracting HPV was associated with using the same objects and hygiene products ($P=.991$) (Table 2). The respondents most frequently thought that the main symptoms of oral cancer included difficulty in opening the jaw and swallowing disorders ($P=.423$).

Analysis of the data in Table 2 shows that the knowledge of symptoms and routes of HPV transmission were not related to the level of the subjects' education.

Considering the methods of preventing oral cancer, the graduate students were more likely (46.7%) to choose the response suggesting limiting the number of sexual partners and oral sex, whereas the undergraduate students (37.4%) selected the use of condoms and protective vaccines with equal frequency (Table 3). Limiting the number of oral sex partners was the only method for preventing oral cancer caused by HPV infection where statistical significance was shown ($P=.034$).

Most undergraduate and graduate students indicated educational TV programs ($P=.624$) followed by radio and mass media ($P=.941$) as a main source of knowledge regarding HPV and its impact in the development of oral cancer. In third place they listed secondary- and university-level education. Knowledge obtained from medical personnel ($P=.212$), mainly from dentists during check-ups or other dental treatment occupied the fourth place (Table 3).

4. Discussion

Epidemiological studies have shown that, despite the developments in diagnostics, the availability of new treatment methods, prophylactic programs, and health promotion, the 5-year survival rates in patients with oral cancer are still the lowest in

Table 3

The sources of knowledge about HPV and induced cancer prevention methods among undergraduate and graduate students.

	Undergraduate studies		Graduate studies		
	N	%	n	%	Significance (*P*)
Methods of HPV-dependent cancer prevention					
Limiting the number of sexual partners	29	31.9	49	46.7	*P*=.034
Using condoms during sexual intercourse and oral sex	34	37.4	30	28.6	*P*=.190
Preventive vaccinations (HPV)	34	37.4	39	37.1	*P*=.974
Improved oral hygiene	14	15.4	19	18.1	*P*=.613
Source of knowledge regarding HPV					
Educational TV programs	67	73.6	74	70.5	*P*=.624
Radio, press, and mass media	55	60.4	64	61.0	*P*=.941
Education in secondary schools and at university	52	57.1	57	54.3	*P*=.688
Medical personnel, dentists	51	56.0	68	64.8	*P*=.212

HPV = human papillomavirus, n = number of subjects, *P* = probability value.

Europe.[11] This results from the fact that patients tend to seek medical treatment at advanced stages of the disease progression, often at the third or fourth stage, even though the symptoms are characteristic and easy to observe by the patients themselves.[12] Malignant neoplasms of the oral cavity are mainly associated with tobacco and alcohol use, and the combination of these 2 stimulants multiplies the risk of the disease.[13] Over the last 10 years, increasing numbers of related studies have been published, suggesting that, apart from tobacco and alcohol, viral infections are a significant factor in the development of oral cancer.[14,15] So far >150 subtypes of HPV have been identified, out of these >40 types of HPV are usually sexually transmitted and infect the anogenital region and oral cavity.[16]

The decreasing mean age of the patients and the growing incidence of oral cancer in the population of young people, as well as the increasing frequency of unconventional sexual behaviors such as oral-genital sex, drew researchers' attention to HPV infection as a potential carcinogenic risk factor. Numerous epidemiological studies have demonstrated correlations between HPV infection, the development of oral cancer, and decreasing age of those affected. Therefore, this knowledge should be widely disseminated and promoted among the public.[17] However, there are fewer studies assessing young adults' knowledge and awareness of the risk factors for oral cancer, such as viral infections and sexual behavior.[18]

The present study carried out among university students shows that less than half of the participants are generally aware of the significance of viral infections in the etiopathogenesis of oral cancer. Both the undergraduate and graduate students lacked sufficient knowledge regarding occurrence of HPV in the oral cavity. The students associated HPV infection mainly with sexual intercourse, ranking oral-genital contacts at the second place. A majority of the graduate students (53.3%) also indicated kissing as a source of HPV infection. Poor awareness related to this issue was also presented by respondents participating in a study conducted by Osazuwa-Peters et al. These authors report that out of the 3677 survey participants only 30% knew that HPV may cause oral cancer. Like in the present study, far more young people associate the virus mainly with cervical cancer (68%).[19] In fact, the present findings show that about 60% of the students correctly answered the questions concerning HPV and its association with cervical cancer. Likewise, Waskow et al found that 78% of the population studied lacked any knowledge regarding HPV, whereas the same result, consistent with the present findings, was obtained by women (60%), who associated HPV with cervical cancer.[20]

Similar to the present findings, the study by Poelman et al showed that more graduate students were aware of the relationship between HPV and oral cancer, compared with undergraduate students (70% and 54.3%, respectively). Even though, according to those authors, the results are not satisfying, they are significantly better than our findings, which are linked with the subjects' courses of study. The above researchers assessed awareness of dental students, whereas the present findings are related to students of various, mainly, nonmedical university courses.[21] A large need for education related to prophylaxis and prevention of HPV infections, also among students, was emphasized by Stock et al. These researchers found that insufficient knowledge of the correlation between HPV infection and oral cancer was presented particularly by students who did not participate in educational interventions.[22]

Pokhatel et al argue that poor awareness of medical students related to HPV may adversely affect the diagnostics and early detection of oral cancer, resulting in delayed treatment of the condition. The most common first symptoms of oral cancer, according to the students participating in the survey, include ulceration in mouth, oral bleeding, whitish or reddish patch, halitosis, and swelling in neck.[23] In the present study most subjects also mentioned difficulties with opening the jaws and swallowing among the symptoms of malignant neoplasms of the oral cavity. Thus, they selected the late symptoms characterizing the advanced stages of the disease rather than its early symptoms. These findings may reflect the fact that those involved in the present study were mainly students of nonmedical university courses.

The present study clearly shows that only 1 in 3 students believed that oral-genital sex may contribute to the occurrence of oral cancer associated with HPV infection. It is disturbing to find that 2 in 3 respondents did not realize or know that there was any correlation between these factors. At the same time, the majority of the subjects (60.7%) admitted they had such experience, typically with 1 or 2 partners. Similar results were obtained by Wroński who emphasized that patients generally are not aware of the risk of oral carcinoma in people having oral sex with numerous partners.[9]

Some evidence shows that incidence of oral cancer may be reduced as a result of preventive HPV vaccination.[15] In the present study, 40% of the students indicated protective vaccinations as a method of limiting the incidence of oral cancer. Like in the study by Poelman et al the present findings do not show significant differences in the level of awareness related to HPV vaccine, depending on stage of the university course.[21]

As reported by Dodd et al the respondents emphasized that harmful and risky factors related to the development of oral cancer should be brought to patients' attention by medical personnel, namely, physicians of all specialties, nurses, speech and language therapists, midwives, and emergency medical personnel.[24] The role of dentists in sharing the necessary knowledge regarding the risk factors for oral cancer and the transmission routes of viral infection is especially important.[25] The results of our study correspond with the findings reported by Stock et al as well as Candotto et al and related to providing information and health education with regard to HPV infection and oral cancer prevention by medical personnel, instead of relying on advertisements and websites.[22,26] The respondents indicated that the knowledge shared by medical personnel is more reliable and more effective than information provided by journalists, the mass media and advertisements. It seems that most health professionals, including dentists, are not prepared for this role, which results from cultural, religious, and social prejudices and the "sex taboos." Positive change may be brought about by amending the curricula of medical studies, postgraduate specialist programs, courses, and workshops. The above and other sources of information should include the necessary aspects discussed in this work.[10] Similar results were obtained by Lorenzo-Pouso et al who assessed 158 dental students for their knowledge of HPV. Although 75% of the subjects believed that HPV infection was linked to oropharyngeal cancer, it was suggested that their knowledge of this virus is insufficient, which adversely affects their interventions in oropharyngeal primary prevention efforts.[27] Likewise, 89% of the dental students participating in the study by Poelman et al report a need for more comprehensive education related to symptoms of oral cancer, which would lead to improved screening for this condition.[21]

Various aspects related to the methodology of effectively communicating factual knowledge are especially important.

Breaking the taboos regarding human sexuality and the impact of various sexual behaviors on health is a significant problem related to public health worldwide. Unsatisfactory knowledge and awareness of problems connected with HPV infections and high-risk sexual behaviors, such as oral sex, can be a significant risk factor of oral cancer among young adults. It is necessary to provide university students with education related to oral cancer, whereby dentists should be involved in promotion of knowledge and healthy attitudes to prevent HPV infections and oral cancer associated with HPV.

5. Limitations

The survey contained closed-ended questions, which, to a degree, limits the respondents' input and narrows the research problem down to the predefined aspects. The main examiners did not control environmental factors at the time the surveys were filled in. The answers provided by the study participants reflect their general knowledge of the problem, they represent certain trends related to the issue, observed in the relevant group of the young people, and they should be interpreted accordingly. To minimize the limitations and explain the causes of the problem, it would be necessary to additionally apply other research methods, for example, structured interview.

Author contributions

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