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Knowledge and Awareness of Human Papillomavirus Vaccination for Oral Cancer Prevention among Dental Practitioners, Students, and Patients at UiTM Faculty of Dentistry, Malaysia

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ABSTRACT

Introduction: HPV (Human papillomavirus) infection is associated with an increased risk of various types of cancer, including cervical and oropharyngeal cancers. HPV vaccines are effective in preventing HPV infection and its associated diseases. This project aims to evaluate the knowledge between UITM's dental practitioners, students, and patients regarding HPV vaccination for oral cancer prevention. Materials and

Methods: A cross-sectional study was conducted using a questionnaire-oriented approach. Respondents were enrolled through convenience sampling. The questionnaire consisted of different sections covering topics related to HPV, its associated cancers, HPV vaccination and oral cancer.

Results: The study included a total of 199 respondents, comprising 14 dental practitioners (DP), 86 dental students (DS), and 99 patients. Majority of DP (85.7%) and DS (89.5%) were aware of HPV, compared to only 26.3% of patients. Moreover, only 14.3% (DP), 26.7% (DS), and

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14.1% (patients) knew that smoking can increase the risk of HPV infection. Additionally, only 23.2% of patients were aware that men can also be infected by HPV. Majority of respondents (n=183) recognized that HPV is one of the viruses that can cause oral cancer. However, 49.5% of patients were not aware that oral cancer can be prevented with HPV vaccination.

Conclusions: The study reveals poor knowledge of HPV and oral cancer among patients. There is a need to implement regular awareness campaigns regarding HPV vaccines and oral cancer prevention, within the UiTM Dental faculty.

INTRODUCTION

HPV is one of the most common sexually transmitted infections (STI). HPV subtypes 16 and 18 are commonly associated with cervical cancer (Okunade, 2020). Recently, HPV has also been linked to oral cancer (Candotto et al., 2017). Over the years, the incidence of tobacco-associated HPV-unrelated HNSCC has declined due to decreased tobacco usage (Jung et al., 2021). However, the current trend reveals an alarming increase in the incidence of HPV-associated oropharyngeal cancers (Venkatesh et al., 2021). This change in trend might be attributed to increasing sexual activity in this modern era, such as oral sex and "French kissing". However, it is currently unclear whether HPV can be casually transmitted, such as from a mother's kiss to her infant. One study supports this statement, indicating that non-sexual activities can also cause transmission of HPV infection (Petca et al., 2020).

There are numerous instances where the HPV virus can be dangerous for immunocompromised patients. For example, oropharyngeal HPV infection among recipients after kidney transplants treated with immunosuppressive therapy is higher than in the overall population (Sindrewicz et al., 2020). Yet, the Ministry of Health Malaysia (MOH) only offers the free HPV vaccination program for 13-year-old schoolgirls to reduce the incidence of cervical cancers. Although this program represents a step forward from relying solely on Papanicolaou (Pap) smear as the main prevention of cervical cancer in Malaysia, there might be a lack of awareness regarding HPV vaccination for oropharyngeal cancer prevention (Muhamad et al., 2018). Additionally, awareness regarding HPV vaccination is essential for men as well. Several studies have revealed that the prevalence of oral HPV infection is approximately three-fold higher in men than in women, with HPV 16 being over five-fold higher in men (Lieblong et al., 2019). Studies have also shown that HPV-associated oral squamous cell carcinoma (OSCC) is more common in men in developed countries. In fact, in the United States, the incidence of cervical cancer is lower than the incidence of HPV-associated OSCC in men (Lieblong et al., 2019). Men have a higher likelihood of contracting HPV infection and HPV-related cancer due to tobacco usage and the number of lifetime oral sex partners (Cheng et al., 2020). However, based on the analysis carried out by MOH, the enforcement of the HPV vaccination program for adolescent boys was found to be probably cost-effective if the vaccine price and coverage are low (Maharita, 2019). Addressing this socio-economic issue may be crucial in implementing HPV vaccination for men in our country. A systematic review has already been conducted, and the coverage for boys' vaccination might soon be possible, considering the 2-dose injections and declining vaccine prices (Sinisgalli et al., 2015).

Currently, three types of HPV vaccines have been approved by the Food and Drug Administration (FDA): Cervarix, Gardasil, and Gardasil 9. One report mentioned a 93% reduction in the prevalence of oral HPV 16 and 18 infections. Gardasil, a quadrivalent vaccine, not only protects against HPV 16 and 18 but also includes HPV 6 and 11, which are responsible for 90% of genital warts (in addition to HPV 16 and 18). Despite the current vaccination program in Malaysia, there still exists a lot of misconception and lack

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of awareness regarding HPV vaccination among the general population (Jalani et al., 2016; Muhamad et al., 2018; Maharita, 2019). In one study, respondents showed poor knowledge level despite high HPV vaccination rates (Jalani et al., 2016). Moreover, recent knowledge, attitude, and practice (KAP) studies related to HPV vaccination were primarily focused on the vaccine's efficacy and safety for cervical cancer (Jalani et al., 2016; Mann and Kingsley, 2020). Studies in the United States have reported a knowledge deficit among dentists and dental hygienists about HPV, including its prevalence, impact on men, and outcomes such as symptoms and treatments (Walker et al., 2019). Furthermore, some studies have mentioned dentists' concerns about the HPV vaccine being linked to birth defects and its effectiveness only against low-risk HPV (Walker et al., 2019). However, another study supports the vital role of dental practitioners in advocating for HPV vaccination. Most parents trust dentists to provide correct information regarding HPV vaccinations and oral cancer (Stull et al., 2020).

Currently, there is limited information about knowledge studies in Malaysia specifically focused on HPV vaccination for oral cancer prevention. Thus, this study aims to explore how the population perceives the HPV vaccine for oral cancer prevention. Moreover, this study will assess the importance of dental practitioners in educating their patients about HPV vaccination for oral cancer prevention and other related HPV-associated cancers.

MATERIALS AND METHODS

Ethical Considerations

Ethical approval was granted by Universiti Teknologi MARA (UiTM) Human Ethics Advisory Committee [REC/04/2021 (UG/MR/357)] prior to the start of the study.

Study Design

A questionnaire oriented cross-sectional study.

Validated Modified Questionnaire

A descriptive survey using a modified validated questionnaire from “Knowledge, Attitude, and Practice of Human Papillomavirus (HPV) Vaccination among Secondary School Students in Rural Area of Negeri Sembilan, Malaysia” (Jalani et al., 2016) was conducted among students, lecturers, and patients at UiTM Sungai Buloh’s dental faculty. This modified questionnaire has undergone content and face validity to check the suitability of the content with our research aims within the target population.

Permission and information of patients has been obtained from the faculty through the dental record management system (iDeRMS). Respondents were required to be within 18 years old and above to ease the process of participating in the survey without the needs of parental consent, they also need to be able to read Malay as the questionnaire is in ‘Bahasa Melayu’. Distribution of the questionnaire was for about 3 months (December 2021 - February 2022).

All participants received a Google Form’s questionnaire consisting of an information sheet regarding research conducted and consent form of agreeing to participate in the survey at the beginning of the google form for patients to fill before answering the question. The questionnaire includes sections on general sociodemographic status, and knowledge regarding HPV, cervical cancer, HPV vaccine and oral cancer due to HPV.

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Sampling

A simple random sampling method was applied to all clinical year students and clinical lecturers of the Faculty of Dentistry, UiTM Sungai Buloh Campus. Whereas patients attending UiTM Dental Centre were subjected to a convenience sampling method using the final questionnaire. Sample size estimation was calculated using the Epi Info software. Prior data indicates that adult respondents from a previous study who are aware that HPV vaccination can prevent other diseases than cervical cancer was 14.9% (14). With the population size of 6128, which is the number of patients attending UiTM Dental Centre in 2020 and the Type I error probability and precision are 0.05 and 0.05, we will need 199 respondents for our study.

Inclusion and Exclusion Criteria

Clinical year students and clinical lecturers of Faculty of Dentistry, UiTM Sungai Buloh Campus, and patients attending UiTM Dental Centre above 18 years-old were included in this study. All incomplete answered surveys will be excluded from the study.

Statistical Analysis

Study data was analysed with SPSS version 27 and descriptive statistics were applied to retrieve frequencies, percentages, means & standard deviation.

RESULTS

Sociodemographic Characteristics

There were a total of 201 respondents: 101 (50.2%) patients, 86 (42.8%) dental students (DS), and 14 (7%) dental practitioners (DP). However, 3 respondents were excluded due to their age being less than 18 years old. Thus, a total of 199 respondents were included in this study. Majority of participants (n=160; 80.4%) were <35 years of age (Table I).

Table 1. Sociodemographic characteristics of respondents

Category		Dental practitioners (DP) n (%)	Dental students (DS) n (%)	Patients n (%)
Age (years old)	<35	7 (50.0)	86 (100)	67 (67.7)
	>35	7 (50.0)	0 (0)	32 (32.3)
Gender	Male	4 (28.6)	14 (16.3)	33 (33.3)
	Female	10 (71.4)	72 (83.7)	66.7 (66.7)
Ethnicity	Malay	14 (100.0)	85 (98.8)	95 (96.0)
	Bumiputera	0 (0.0)	1 (1.2)	0 (0.0)
	Chinese	0 (0.0)	0 (0.0)	3 (3.0)
	Others	0 (0.0)	0 (0.0)	1 (1.0)
Race	Islam	14 (100.0)	85 (98.8)	97 (98.0)
	Buddha	0 (0.0)	0 (0.0)	2 (2.0)

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	Others	0 (0.0)	1 (1.2)	0 (0.0)
Had a family member vaccinated against HPV	No	5 (35.7)	8 (9.3)	30 (30.3)
	Not sure	2 (14.3)	31 (36.0)	43 (43.3)

Knowledge about HPV, Prevention, and Oral Cancer

Out of 199 respondents, the majority of DP (85.7%) and DS (89.5%) have heard about HPV compared to only 26.3% of patients (Table II). All DP (100%), 86.0% DS, and 71.7% patients have heard of cervical cancer, respectively. Similarly, 92.9% of DP and 79.1% DS have heard of HPV vaccine in comparison to only 32.3% of patients. Out of 115 respondents that have heard about HPV, only 14.3% (DP), 26.7% (DS), and 14.1% (patients) knew that smoking can increase the risk of getting HPV infection. Interestingly, 71.4% (DP), 76.7% (DS) and 23.2% (patients) knew that men can also be infected by HPV.

Table 2. Knowledge about HPV, cervical cancer, and HPV vaccine

		Correct Responses, n (%)		
	Items	**Dental practitioners (DP) (N=14)**	**Dental students (DS) (N=86)**	**Patients (N=99)**
	Do you know about Human Papillomavirus (HPV)?	**12 (85.7) - Yes**	**77 (89.5) - Yes**	**26 (26.3) - Yes**
1	HPV infection is uncommon in Malaysia	8 (57.1)	40 (46.5)	15 (15.2)
2	HPV is responsible for sexually transmitted infection	10 (71.4)	68 (79.1)	28 (28.3)
3	HPV is transmitted via close skin-to-skin contact	8 (57.1)	27 (31.4)	15 (15.2)
4	Smoking can increase the risk of getting HPV infection	2 (14.3)	23 (26.7)	14 (14.1)
5	HPV can be cured by using antibiotic	12 (85.7)	63 (73.3)	13 (13.1)
6	Usually, HPV did not have symptom	4 (28.6)	23 (26.7)	5 (5.1)
7	People can get HPV infection for a long time without knowing it	12 (85.7)	60 (69.8)	18 (18.2)
8	HPV can cause genital warts	12 (85.7)	64 (74.4)	21 (21.2)
9	Men can be infected by HPV	10 (71.4)	66 (76.7)	23 (23.2)
10	Men also have a potential to develop cancer due to HPV infection	10 (71.4)	57 (66.3)	19 (19.2)
	Do you know about cervical cancer?	**14 (100.0) - Yes**	**74 (86.0) - Yes**	**71 (71.7) - Yes**
11	HPV can lead to cervical cancer	14 (100.0)	57 (66.3)	35 (35.4)
12	Cervical cancer can affect men	14 (100.0)	56 (65.1)	37 (37.4)

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13	Not all 100 types of HPV contribute to cervical cancer	11 (78.6)	59 (68.6)	26 (26.3)
14	Pap smear test is a screening test to detect cervical cancer	12 (85.7)	62 (72.1)	49 (49.5)
	Do you know about the HPV vaccine?	**13 (92.9) - Yes**	**68 (79.1) - Yes**	**32 (32.3) - Yes**
15	HPV vaccination is currently offered freely to secondary school girl	13 (92.9)	64 (74.4)	28 (28.3)
16	HPV vaccine is currently accessible to men	0 (0.0)	21 (24.4)	7 (7.1)
17	HPV vaccine is delivered in a series of 3 shots injection over 6-month schedule	7 (50.0)	48 (55.8)	16 (16.2)
18	HPV vaccine can prevent cervical cancer	13 (92.9)	65 (75.6)	29 (29.3)
19	HPV vaccine can cure cervical cancer	14 (100.0)	49 (57.0)	22 (22.2)
20	HPV vaccine is most effective on woman that are not sexually active	8 (57.1)	32 (37.2)	16 (16.2)
21	Woman who had vaccinated doesn't need to do Pap smear test	13 (92.9)	40 (46.5)	22 (22.2)
22	Vaccination is allowed in Islam and other religion	14 (100.0)	61 (70.9)	31 (31.3)

Out of 159 respondents that have heard about cervical cancer, more than and almost half of them knew that Pap smear test is a screening tool to detect cervical cancer [85.7% (DP), 72.1% (DS), and 49.5% (patients)]. Majority of dental practitioners and students shows adequate knowledge on HPV vaccination compared to patients as shown by these items: HPV vaccine can prevent cervical cancer 92.9% (DP), 75.6% (DS) and 29.3% (patients); HPV vaccination is currently offered freely to secondary school girl 92.9% (DP), 74.4% (DS) and 28.3% (patients); and vaccination is allowed in their religion 100.0% (DP), 70.9% (DS) and 31.3% (patients). Interestingly, most of the participants do not know that the HPV vaccine is currently accessible to men [0.0% (DP), 24.4% (DS), and 7.1% patients].

Regarding the knowledge on oral cancer (Table III), for the possible causes of oral cancer, smoking was the most chosen answer with a percentage of 92.9% (DP), 98.8% (DS) and 93.9% (patients). For the virus that can cause oral squamous cell carcinoma (OSCC), HPV is the most selected answer with 85.7% (DP), 97.7% (DS) and 87.9% (patients). 78.6% (DP), 87.2% (DS), 27.3% (patients) knew that warts is the most common clinical manifestation of HPV and 71.4% (DP), 93.0% (DS) and 44.4% (patients) knew that HPV in sexually transmitted, respectively. In addition, 100.0% (DP) response correctly that air is in fact, not the route of transmission together with 94.2% (DS) and 90.9% (patients). Furthermore, palatal area as the most commonly seen area for the oral cancer caused by HPV was chosen by DP 78.6%, DS 47.7% and patients 49.5%. As for the reason it is important to differentiate between OSCC and HPV-associated OSCC, due to the treatment strategies for HPV-associated OSCC are different, 85.7% (DP), 80.2% (DS) and 63.6% (patients) was answered correctly by the participants, respectively. Finally, from the questionnaire, 71.4% (DP), 82.6% (DS) and 49.5% (patients) knew that oral cancer associated with HPV can be prevented with HPV vaccine as depicted in Table III.

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Table 3. Knowledge about oral cancer

		Correct Responses, n (%)		
	Items	**Dental practitioners (DP)**	**Dental students (DS)**	**Patients**
	Which of the following are the possible causes of oral cancer?			
1	Smoking	13 (92.9)	85 (98.8)	93 (93.9)
2	Chewing powdered tobacco products	12 (85.7)	81 (94.2)	39 (39.4)
3	Viruses	8 (57.1)	68 (79.1)	65 (65.7)
4	Chronic mechanical irritation	6 (42.9)	53 (61.6)	44 (44.4)
	Which of the following viruses can cause OSCC?			
5	Human papillomavirus	12 (85.7)	84 (97.7)	87 (87.9)
6	Human herpes virus	9 (64.3)	23 (26.7)	69 (69.7)
7	Epstein Barr virus	6 (42.9)	54 (62.8)	16 (16.2)
	Do you know that the most common clinical manifestation caused by HPV are warts?	11 (78.6) - yes	75 (87.2) - yes	27 (27.3) - yes
	Do you know that HPV infection is a sexually transmitted infection?	10 (71.4) - yes	80 (93.0) - yes	44 (44.4) - yes
	Which is the most common transmission route of HPV?			
8	Air	14 (100.0)	81 (94.2)	90 (90.9)
9	Blood	11 (78.6)	36 (41.9)	47 (47.5)
10	Saliva	9 (64.3)	52 (60.5)	33 (33.3)
11	Sexual	11 (78.6)	80 (93.0)	82 (82.8)
	Oral cancers caused by HPV associated infections are commonly seen in which parts of the mouth?			
12	Lateral border of the tongue	8 (57.1)	20 (23.3)	41 (41.4)
13	Labial mucosa	9 (64.3)	36 (41.9)	50 (50.5)
14	Oropharynx/Posterior portion of tongue	10 (71.4)	39 (45.3)	47 (47.5)
15	Palatal area	11 (78.6)	41 (47.7)	49 (49.5)
	Why is it important to differentiate between OSCC and HPV associated with OSCC?			
16	HPV associated OSCC can be treated easily	2 (14.3)	23 (26.7)	33 (33.3)
17	Prognosis of HPV associated OSCC is	5 (35.7)	40 (46.5)	32 (32.3)

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	better than OSCC			
18	Treatment strategies for HPV associated OSCC is different	12 (85.7)	69 (80.2)	63 (63.6)
	Did you know oral cancer associated with HPV can be prevented with HPV vaccination?	10 (71.4) - yes	71 (82.6) - yes	49 (49.5)

DISCUSSION

Oral cancer remains a significant health concern in Malaysia, despite its low prevalence, owing to the increasing trend of HPV infection as an additional risk factor (Venkatesh et al., 2021; Stull et al., 2020). Despite recent evidence linking HPV to oral cancer, there is still limited awareness of this fact due to the scarcity of studies in Malaysia highlighting the correlation between HPV and oral cancer. Most studies on understanding the public knowledge about HPV have focused on cervical cancer (Jalani et al., 2016). Therefore, this study aimed to assess the current understanding of the general Malaysian population, including dental students, dental practitioners, and patients attending UiTM Faculty of Dentistry.

The findings of this study revealed that the majority of patients have insufficient general knowledge about HPV compared to dental students and dental practitioners. Over 50% of the patients provided incorrect responses in the questionnaire, such as assuming that HPV can be cured by antibiotics and that HPV is not a sexually transmitted disease. Approximately 49.5% of the patients correctly indicated that oral cancer associated with HPV can be prevented through vaccination, while the remainder demonstrated a lack of knowledge about HPV vaccination. Patients also showed limited awareness of cervical cancer, mistakenly believing it could affect men, which is concerning, as men do not have a cervix.

Among dental students at UiTM Faculty of Dentistry, 89.5% indicated that they were aware of HPV infection, a finding consistent with a study conducted in Jeddah, Saudi Arabia, where dental students demonstrated awareness of HPV (Farsi et al., 2020). Overall, dental students provided more correct responses compared to patients, which is not surprising considering that HPV is part of their syllabus during both preclinical and clinical years.

Regarding dental practitioners (DP), only a minority admitted to not having knowledge about HPV, suggesting a need for education in this area. Nevertheless, the majority of DP provided correct answers to all four items in the questionnaire. However, a significant number of DP were unaware that HPV-associated oral squamous cell carcinoma (OSCC) can be treated effectively and that the prognosis for HPV-associated OSCC is better than that for non-HPV-associated OSCC. This finding aligns with other studies conducted in Malaysia (Arora et al., 2018) and the United States (Patel et al., 2020). Responses regarding the common locations of HPV-associated oral cancers were mixed, although most correctly identified the oropharynx. Interestingly, none of the DP unanimously agreed that the HPV vaccine is currently inaccessible to men. While this may be true in Malaysia's National Immunization Program, which currently offers it only to 13-year-old girls, the vaccine is accessible in private clinics, and other countries such as the United States, Australia, and the United Kingdom are already vaccinating males as well (Chen et al., 2021). Thus, there is a need for further training and education among DP to ensure they are well-informed about HPV-associated oral cancer, as they play a crucial role in educating dental students and patients. Despite these findings, all three groups primarily responded incorrectly regarding the asymptomatic nature of HPV infection and the link between smoking and an increased risk of HPV infection. In fact, HPV infection can occur in both males and females without any symptoms or clinical manifestations (Giuliano et al., 2010; Ekalaksananan et al., 2001), and smoking does indeed increase the risk of HPV infection (Kaderli et al.,

2014; Schabath et al., 2012). Several studies have reported a significant association between knowledge of HPV and attitudes towards HPV vaccination. A study conducted among secondary school students in rural areas of Negeri Sembilan, Malaysia, revealed students were more willing to get vaccinated if they had a good knowledge of the virus and its associations (Jalani et al., 2016). In addition, a preliminary study among University Tunku Abdul Rahman (UTAR) students in Malaysia reported similar findings (Tusimin et al., 2019). This underscores the importance of increasing awareness among the general population about HPV vaccination to prevent both cervical and oral cancers.

CONCLUSION

This study revealed that dental practitioners and dental students have a solid awareness of HPV, its associated cancers, and prevention due to their educational backgrounds and involvement in dental education activities and curricula. This contrasts with patients, who exhibited insufficient knowledge and awareness of HPV and its prevention. Despite good knowledge levels, there is a gap in translating this knowledge into practice, as seen in other studies, suggesting that healthcare providers do not routinely counsel and educate patients attending dental clinics about HPV vaccination against oral cancers. This information gap can be addressed by promoting HPV awareness among dental practitioners and students, encouraging patient compliance with HPV vaccinations, not only for women but also for men. The practical implication for healthcare providers is to play a pivotal role in emphasizing the importance of HPV vaccination in preventing oral cancers.

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AUTHORS' CONTRIBUTIONS

All authors substantially contributed to drafting and revising the article, as well as the final approval of the version to be submitted.

CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest.

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