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



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RESEARCH PAPER



An educational intervention on HPV knowledge and comfortability discussing vaccination among oral health care professionals of the American Indian and Alaskan Native population

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ABSTRACT

This study aimed to evaluate the effectiveness of an educational intervention at improving Oral Health Professionals (OHP's) knowledge of HPV and comfortability to discuss vaccination with their American Indian and Alaskan Native patients. OHP's attended an educational lecture covering HPV vaccination. Participants completed four validated questionnaires that encompassed a sociodemographic survey, a pre-lecture questionnaire (pre-Q), a post-lecture questionnaire (post-Q), and a follow-up questionnaire (follow-Q). The McNemar test was used to assess the significance of marginal probabilities in the responses between the pre-Q and post-Q and the Chi-square test to assess responses between the post-Q and follow-Q. A total of 122 OHP's completed the sociodemographic survey, pre-Q, and post-Q. Among these, 29 OHP's completed the eight-week follow-Q. The majority of all the participants were White/Caucasian (41%), 31 to 60 years of age (72%), females (64%), and held a graduate/professional degree (52%). Analysis of the pre-Q responses showed that only 6.8% of OHP's discuss the connection between HPV and oropharyngeal cancer with patients and a lack of information on the topic was the major barrier reported. After the educational intervention (post-Q), 86.5% of OHP's reported they were more likely to recommend the HPV vaccine and 69.8% felt more comfortable administering it. Comparison between the pre-Q and the post-Q showed a significant improvement in overall HPV knowledge. Similarly, a comparison between the post-Q and the follow-Q showed retained knowledge overtime. Our study suggests that the educational intervention was effective at improving OHP's knowledge of HPV and enhancing their comfortability and preparedness to discuss the vaccination with their patients.

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HPV vaccine; educational intervention; oral health professional; American Indian; oropharyngeal cancer

Introduction

Human papillomavirus (HPV; mostly HPV 16 and 18) is the leading cause of oropharyngeal cancer. The incidence of HPV-associated oropharyngeal squamous cell carcinoma has steadily increased over the past three decades in the United States (U.S.). This noticeable increase has occurred predominantly among males and recently has exceeded the number of cervical cancers in the U.S.¹ Recent data from the Centers for Disease Control and Prevention (CDC) reported an annual average of 43,999 HPV-associated cancers, and 34,800 of these cancers were HPV-attributable cancers, with 32,100 (92%) attributable to the HPV types targeted by the 9-valent HPV (9vHPV) vaccine. Of these cancers, oropharyngeal is the most prevalent (12,600) followed by cervical (9,700), anal (6,000), vulvar (2,500), penile (700), and vaginal (600).¹ Although there are no standard or routine screening tests for oropharyngeal cancer, the 9vHPV vaccine has the potential to reduce the prevalence of most HPV infections as well as herd-protect unvaccinated individuals.^{2,3}

American Indians and Alaska Natives (AI/AN) experience unique healthcare needs, of which many are either overlooked or unmet. In particular, oropharyngeal and cervical cancers remain the most common HPV-associated cancers among AI/AN men and women, respectively.⁴ The most recent data from Healthy People 2020, shows that vaccination rates among AI/AN adolescents receiving two or three doses of HPV vaccine by age 13–15 are below the 2020 target of 80%, despite being eligible to receive the vaccine for free through the Vaccines for Children Program (females: 64.6%; males: 58.6%).^{5,6} According to the National Health Interview Surveys (NHIS), 85.8% of AI/AN children aged 2–17 had a dental visit in 2016.⁷ Oral health professionals (OHP's; dentist, dental hygienist, dental therapist, and dental assistants) are uniquely positioned to help address low vaccination rates by discussing and recommending HPV vaccination to AI/AN children and their parents/guardians through their high volume of dental visits. However, studies show that efforts must first be made to educate OHP's about HPV

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infection and vaccination.^{8,9} Both the American Academy of Pediatric Dentistry and the American Dental Association (ADA) have issued policy statements supporting HPV vaccinations and encouraged OHP's to educate and counsel patients, parents, and guardians on the relationship of HPV-associated oropharyngeal cancer as well as HPV vaccinations.^{10,11} In May 2019, Oregon was the first state to pass legislation (House Bill 2220) that enables dentists to prescribe and administer vaccines for both the annual influenza and HPV. According to the Oregon Dental Association, the bill is aimed at helping Oregon reach state health goals of 70 percent by 2020. Other states such as Minnesota and Illinois have also passed similar legislations, however they are limited to only the influenza vaccination.^{12,13}

While earlier literature reported on educational interventions aimed at increasing OHP's knowledge, awareness, attitude, and comfort level concerning HPV infection and vaccination, no studies to date have focused on those serving the AI/AN patient population.^{8,9,12–18} The aim of this study is to evaluate the efficacy of an educational intervention at improving HPV infection and vaccination knowledge, comfort levels, and preparedness to discuss the HPV vaccinations among OHP's serving the AI/AN patients. The educational intervention was guided by our previous work with Team Maureen and the Massachusetts Coalition for HPV-Related Cancer Awareness. In which, evidence based strategies served as a framework for increasing knowledge around HPV infections and cancer and improving immunization practices to increase HPV vaccination rates.¹⁴

Materials & methods

HPV educational intervention

An educational intervention was presented via lecture to OHP's serving the AI/AN population in Indian Health Service (IHS) designated areas. In September 2019, the two-hour long lecture was presented by one of the investigators (A.V.). It focused on the connection between HPV and oropharyngeal cancer, vaccination, and communication techniques to discuss HPV immunization practices with dental patients. At the end of the lecture, we distributed an educational HPV toolkit to each participant. It contained talking tips for OHP's, brochures for patients, and a poster for the office. A detailed explanation of the toolkit was previously described.¹⁴ We used a modified questionnaire that was previously piloted and validated.^{19,20} This study was approved by the Harvard Medical School Institutional Review Board.

Questionnaire

Participants were asked to complete a total of four previously validated and piloted questionnaires.²⁰ The pre-Q and post-Q consisted of 19 questions each and the follow-Q consisted of 18 questions. These included topics on HPV knowledge and awareness, comfort discussing HPV, communication methods used in their practice, and recommendations for improving HPV vaccination education and acceptance. Participants who shared their e-mail and agreed to take part in the 8-week

follow-up survey, received an anonymous e-survey link via Qualtrics to complete the follow-Q. An informed consent was obtained before beginning the survey and reminder e-mails to complete the follow-Q were sent biweekly for two months.

Statistical analysis

Response comparisons were made between the pre-Q and post-Q and between the post-Q and follow-Q. We evaluated the comparisons for improvement by assessing for an increased percentage of correct responses. We used the McNemar test to assess the significance of marginal probabilities in the responses between the pre-Q and post-Q. As a secondary analysis, we conducted a Chi-square test to assess how responses changed between the post-Q and follow-Q, even though we acknowledge that participants' characteristics may have varied between groups as a result of the decrease in sample size.

Results

Sociodemographic

A total of 122 OHP's attended the educational intervention and completed the sociodemographic survey, pre-Q, and post-Q (Table 1). Among these, 72 OHP's volunteered their e-mail address to participate in the eight-week follow-Q; and among those, a total of 29 OHP's completed the follow-Q. The majority of all the participants were White/Caucasian (41%), 31 to 60 years of age (72%), and females (64%). Nearly half of the participants held a graduate/professional degree (53%) and slightly less than half were dentists (45%). More than half worked in an IHS/Federal facility (60%) found within the Navajo (19%) and Albuquerque (18%) area.

Comparison between pre-Q and post-Q

When participants were asked about HPV infection prevalence, 83.3% correctly responded that it was not a rare infection in the pre-Q versus 92.3% in the post-Q ($p < .01$; Table 2). When asked if HPV is a sexually transmitted infection in the pre-Q, 77.3% answered correctly as compared to 91.8% in the post-Q ($p < .01$). When asked to "select all that apply" among cancers that may be caused by HPV, 74.8% of participants correctly selected oropharyngeal cancer in the pre-Q versus 94.7% in the post-Q ($p < .01$); 93.3% correctly selected cervical cancer in the pre-Q versus 99.1% in the post-Q ($p > .01$); 52.1% correctly selected anal cancer in the pre-Q versus 93.0% in the post-Q ($p < .01$); 47.1% correctly selected vulvar cancer in the pre-Q versus 81.6% in the post-Q ($p < .01$); 48.7% correctly selected penile cancer in the pre-Q versus 85.1% in the post-Q ($p < .01$); lastly, 59.7% correctly selected vaginal cancer in the pre-Q versus 89.5% in the post-Q ($p < .01$). When asked "what percent of sexually active women and men are infected with HPV" in the pre-Q, 33.0% answered correctly versus 35.6% in the post-Q ($p < .01$). When asked to "select all that apply" among recommended HPV vaccination groups, 92.3% of participants correctly selected girls aged 9–12 years in the pre-Q versus 98.3% in the post-Q ($p > .01$); 80.3% correctly selected boys aged 9–12 years in the

Table 1. Sociodemographic characteristics of the oral health care providers.

Race	N (%)
White/Caucasian	49 (41.2)
American Indian/Alaskan Native	38 (31.9)
Other	12 (10.1)
Native Hawaiian/Pacific Islander	11 (9.2)
Asian	6 (5.0)
Black/African American	3 (2.5)
Age	
18 to 30	8 (6.7)
31 to 40	33 (27.5)
41 to 50	22 (18.3)
51 to 60	21 (25.8)
>60	26 (21.7)
Gender	
Female	76 (64.4)
Male	42 (35.6)
Level of Education	
Graduate/Professional Degree	62 (52.5)
Vocational/Technical school	21 (17.8)
Bachelor's Degree	15 (12.7)
Secondary/High school GED equivalent	11 (9.3)
Other (please specify):	9 (7.6)
Current Occupation	
Dentist	54 (45.0)
Dental Assistant	36 (30.0)
Dental Hygienist	21 (17.5)
Other (please specify):	6 (5.0)
Dental Therapist	3 (2.5)
Type of facility	
IHS/Federal	72 (60.0)
Tribal	42 (35.0)
Other	6 (5.0)
Urban	0 (0.0)
IHS Areas of work	
Navajo	22 (18.5)
Albuquerque	21 (17.7)
Alaska	13 (10.9)
Nashville	13 (11.0)
Phoenix	11 (9.3)
Bemidji	9 (7.6)
Great Plains	9 (7.6)
Billings	5 (4.2)
Oklahoma City	5 (4.2)
Portland	5 (4.2)
Tucson	2 (1.7)
Other (please specify):	2 (1.7)
California	1 (0.8)
HQ	1 (0.8)

Abbreviations: IHS = Indian Health Service; GED = General Education Development; HQ = Headquarters

pre-Q versus 95.6% in the post-Q ($p < .01$). When asked “If someone has HPV, they will develop cancer at some point.”, correct answer responses decreased (33.3%; 23.7%; $p < .01$). In the pre-Q, 12.5% of participants correctly answered that the HPV infection is self-resolving, compared to 62.0% in the post-Q ($p < .01$). When asked if HPV infection is preventable, 90.7% answered correctly in the pre-Q compared to 99.1% in the post-Q ($p < .05$). When asked if HPV infection can cause genital warts in the pre-Q, 65.3% answered correctly compared to 96.5% in the post-Q ($p < .01$). When asked to “select all that apply” among diseases that are reduced or prevented by the HPV vaccine in the pre-Q versus post-Q, 63.2% vs. 91.3% correctly selected head and neck cancers ($p < .01$); 93.2% vs. 97.4% correctly selected cervical cancers ($p > .05$); 48.7% vs. 85.2% correctly selected genital warts ($p < .01$); 10.3% vs. 11.3% incorrectly selected chlamydia ($p > .05$); and 6.8% vs. 7.0% incorrectly selected HIV ($p > .05$). When asked about comfortability discussing the HPV vaccine with patients in the pre-Q versus post-Q, 24.4% vs. 29.6% identified as “very comfortable” and 34.5% vs. 47.8% identified as “A little comfortable” ($p < .01$).

Table 2. Comparison between Pre-questionnaire & Post-questionnaire.

Question	N (%) of answers pre-Q	N (%) of answers post-Q	P value
Do you think HPV infection is rare?^b			
Total participants (N)	120	116	<0.01
Yes	5 (4.2)	8 (6.9)	
No ^a	100 (83.3)	107 (92.3)	
I don't know	15 (12.5)	1 (0.9)	
Do you think HPV is a Sexually Transmitted Infection?^b			
Total participants (N)	119	110	<0.01
Yes ^a	92 (77.3)	101 (91.8)	
No	11 (9.3)	7 (6.4)	
I don't know	16 (13.4)	2 (1.8)	
Which of the following cancers may be caused by HPV? (check all that apply)^b			
Total participants (N)	119	114	
Cervical cancer ^a	111 (93.3)	113 (99.1)	0.63
Anal cancer ^a	62 (52.1)	106 (93.0)	<0.01
Vulvar cancer ^a	56 (47.1)	93 (81.6)	<0.01
Head and neck (Oropharyngeal) cancer ^a	89 (74.8)	108 (94.7)	<0.01
Breast cancer	18 (15.1)	22 (19.3)	0.21
Penile cancer ^a	58 (48.7)	97 (85.1)	<0.01
Vaginal cancer ^a	71 (59.7)	102 (89.5)	<0.01
What percent of sexually active women and men are infected with HPV?^b			
Total participants (N)	115	104	<0.01
5%	7 (6.1)	26 (25.0)	
20%	57 (49.6)	22 (21.2)	
10%	13 (11.3)	19 (18.3)	
80% ^a	38 (33.0)	37 (35.6)	
The HPV vaccine is recommended by the Advisory Committee on Immunization Practices for: (check all that apply)^b			
Total participants (N)	117	115	
30 year old woman with cervical cancer	12 (10.3)	15 (13.0)	0.52
25 year old woman with an abnormal pap	28 (24.0)	21 (18.3)	0.50
Girls 9–12 years ^a	108 (92.3)	113 (98.3)	0.10
Boys 9–12 years ^a	94 (80.3)	110 (95.6)	<0.01
If someone has HPV, they will develop cancer at some point?^b			
Total participants (N)	120	114	<0.01
True	11 (9.2)	22 (19.3)	
False ^a	40 (33.3)	27 (23.7)	
It depends	69 (57.5)	65 (57.0)	
Do you think that an HPV infection would go away on its own without treatment?^b			
Total participants (N)	120	113	<0.01
Yes ^a	15 (12.5)	70 (62.0)	
No	85 (70.8)	39 (34.5)	
I don't know	20 (16.7)	4 (3.5)	
Do you think that an HPV infection can be prevented?^b			
Total participants (N)	118	115	<0.05
Yes ^a	107 (90.7)	114 (99.1)	
No	3 (2.5)	1 (0.9)	
I don't know	8 (6.8)	0 (0.0)	
Do you think that an HPV infection can cause genital warts?^b			
Total participants (N)	121	114	<0.01
Yes ^a	79 (65.3)	110 (96.5)	
No	7 (5.8)	3 (2.6)	
I don't know	35 (28.9)	1 (0.9)	
Which of these do you think the HPV vaccine can reduce or prevent? (Check all that apply)^b			
Total participants (N)	117	115	
Cervical cancer ^a	109 (93.2)	112 (97.4)	0.07
Chlamydia	12 (10.3)	13 (11.3)	0.18
HIV	8 (6.8)	8 (7.0)	0.55
Head and neck cancers ^a	74 (63.2)	105 (91.3)	<0.01
Genital warts ^a	57 (48.7)	98 (85.2)	<0.01
How comfortable do you feel talking to patients about the HPV vaccine?^c			
Total participants (N)	119	115	<0.01
Very comfortable	29 (24.4)	34 (29.6)	
A little comfortable	41 (34.5)	55 (47.8)	
Not very comfortable	39 (32.8)	21 (18.3)	
Not at all comfortable	10 (8.4)	5 (4.4)	

^aDenotes correct answer(s)

^bDenotes questions used to statistically assess OHP's Knowledge of HPV

^cDenotes questions used to statistically assess OHP's comfortability and preparedness to discuss vaccinations

Comparison between post-Q and follow-Q

A secondary assessment of the post-Q and follow-Q seems to show an increased percentage of correct responses for most of the questions and suggests a retained knowledge of HPV over time (Table 3 and Supplementary material).

Facilitators and barriers in HPV prevention

Facilitators and barriers in HPV prevention were assessed in the Pre-Q (Table 4). Most OHP's (94.3%) reported hearing of HPV before the lecture, yet only 16.2% received HPV education/training at their facility. Participants (64.1%) believed that in-person training would be most beneficial, followed by webinar (61.5%), online self-study (32.5%), and offline self-study (7.7%). When participants were asked if they currently discuss the association between HPV and oropharyngeal cancer with their patients, 70.1% responded they do not. When asked "Why do you not currently discuss the connection between HPV and oropharyngeal cancer with your patients", 59% of participants responded they did not have enough information, 26.5% believed that the practice setting is not sufficiently private, 19.7% reported discomfort discussing sexual history with patients, 19.7% responded that it was due to a lack of professional policies and guidelines, 12% stated they could not provide an HPV vaccine to patients, 10.3% reported that appointments are not long enough, 5.9% believed it was not their role as an oral health care provider, 5.9% selected liability reasons, and 2.6% selected concerns with vaccine safety. In contrast, 6.8% reported discussing the connection between HPV and oropharyngeal cancer. The majority of participants (75.2%) believed that informational flyers/brochures tailored to paternal concerns are the most useful tools for increasing education and acceptance of HPV vaccination, 64.1% selected that education for OHP, 55.6% believed discussion guides would be helpful, 47% selected information catered to cultural or ethical preferences, and 41% selected information for parents prior before clinic visit.

Self-reported knowledge and comfortability

Most OHPs reported the educational intervention improved their HPV knowledge (96.5%), improved their likelihood of recommending the HPV vaccine to their patients (86.5%), and enhanced their comfortability of administering the HPV vaccine (69.8%; Table 5).

Discussion

Oropharyngeal cancer is the most common HPV-related cancer attributable to the types targeted by the 9vHPV vaccine in the U.S.²¹ Despite the availability of the vaccine, significant disparities in mortality exist. AI/AN men experience higher rates of death from HPV-associated oropharyngeal cancer as compared to their White/Caucasian counterparts. Similarly, AI/AN women experience higher rates of death from cervical cancer as compared to their White/Caucasian counterparts. In 2012, Dowjak et al.²² assessed overall survival between AI/AN and White Americans with oropharyngeal cancer, and found

Table 3. Comparison between Post-questionnaire and Follow up-questionnaire.

Question	N (%) of answers post-Q	N (%) of answers follow-Q	P value
Do you think HPV infection is rare?^b			
Total participants (N)	116	29	0.30
Yes	8 (6.9)	0 (0.0)	
No ^a	107 (92.2)	29 (100.0)	
I don't know	1 (0.9)	0 (0.0)	
Do you think HPV is a Sexually Transmitted Infection?^b			
Total participants (N)	110	29	0.63
Yes ^a	101 (91.8)	28 (96.6)	
No	7 (6.4)	1 (3.4)	
I don't know	2 (1.8)	0 (0.0)	
Which of the following cancers may be caused by HPV? (check all that apply)^b			
Total participants (N)	114	29	
Cervical cancer ^a	113 (99.1)	29 (100.0)	1.00
Anal cancer ^a	106 (93.0)	27 (93.1)	1.00
Vulvar cancer ^a	93 (81.6)	25 (86.2)	0.76
Head and neck (oropharyngeal) cancer ^a	108 (94.7)	28 (96.6)	1.00
Breast cancer ^a	22 (19.3)	4 (13.8)	0.68
Penile cancer ^a	97 (85.1)	26 (89.7)	0.74
Vaginal cancer ^a	102 (89.5)	28 (96.6)	0.41
What percent of sexually active women and men are infected with HPV?^b			
Total participants (N)	104	28	0.01
5%	26 (25.0)	0 (0.0)	
20%	22 (21.2)	10 (35.7)	
10%	19 (18.3)	1 (3.6)	
80% ^a	37 (35.6)	17 (60.7)	
The HPV vaccine is recommended by the Advisory Committee on Immunization Practices for (check all that apply)^b			
Total participants (N)	115	29	
30 year old woman with cervical cancer	15 (13.0)	1 (3.4)	0.25
25 year old woman with an abnormal pap	21 (18.3)	9 (31.0)	0.21
Girls 9–12 years ^a	113 (98.3)	29 (100.0)	1.00
Boys 9–12 years ^a	110 (95.7)	29 (100.0)	0.57
If someone has HPV, they will develop cancer at some point.^b			
Total participants (N)	114	29	0.12
True	22 (19.3)	1 (3.4)	
False ^a	27 (23.7)	8 (27.6)	
It depends	65 (57.0)	20 (69.0)	
Do you think that an HPV infection would go away on its own without treatment?^b			
Total participants (N)	113	29	0.07
Yes ^a	70 (62.0)	12 (42.9)	
No	39 (34.5)	16 (57.1)	
I don't know	4 (3.5)	0 (0.0)	
Do you think that an HPV infection can be prevented?^b			
Total participants (N)	115	27	1.00
Yes ^a	114 (99.1)	27 (100.0)	
No	1 (0.9)	0 (0.0)	
I don't know	0 (0.0)	0 (0.0)	
Do you think that an HPV infection can cause genital warts?^b			
Total participants (N)	114	28	0.45
Yes ^a	110 (96.5)	26 (92.9)	
No	3 (2.6)	2 (7.1)	
I don't know	1 (0.9)	0 (0.0)	
Which of these do you think the HPV vaccine can reduce or prevent? (Check all that apply)^b			
Total participants (N)	115	29	
Cervical cancer ^a	112 (97.4)	29 (100.0)	0.88
Chlamydia ^a	13 (11.3)	3 (10.3)	1.00
HIV ^a	8 (7.0)	1 (3.4)	0.79
Head and neck cancers ^a	105 (91.3)	26 (89.7)	1.00
Genital warts ^a	98 (85.2)	24 (82.8)	0.97
How comfortable do you feel talking to patients about the HPV vaccine?^c			
Total participants (N)	115	29	0.61
Very comfortable	34 (29.6)	7 (24.1)	
A little comfortable	55 (47.8)	16 (55.2)	
Not very comfortable	21 (18.3)	6 (20.7)	
Not at all comfortable	5 (4.4)	0 (0.0)	

^aDenotes correct answer(s).

^bDenotes questions used to statistically assess OHP's Knowledge of HPV.

^cDenotes questions used to statistically assess OHP's comfortability and preparedness to discuss vaccinations.

Table 4. Pre-questionnaire only.

Question(s)	N (%) of answers pre-Q
Did you hear of human papillomavirus (HPV) before today?^d	
Total participants (N)	120
Yes	116 (94.3)
No	3 (2.4)
I don't know	1 (0.8)
I currently discuss the connection between HPV and oropharyngeal cancer with my patients or their parents?^d	
Total participants (N)	117
No, and I do not intend to start	17 (14.5)
No, but I have considered it	65 (55.6)
Yes, but only with some patients	19 (16.2)
Yes, with all or most (75% or more) of my patients	3 (2.6)
Other (please specify):	13 (11.1)
Why do you not currently discuss the connection between HPV and oropharyngeal cancer with your patients? (Select all that apply.)^d	
Total participants (N)	117
I don't have enough information	69 (59.0)
Practice setting is not sufficiently private	31 (26.5)
Discomfort discussing sexual history with my patients	23 (19.7)
No professional policies/guidelines	23 (19.7)
I cannot provide an HPV vaccine to my patients	14 (12.0)
Appointments not long enough	12 (10.3)
I discuss the connection between HPV and oropharyngeal cancer with my patients	8 (6.8)
Other (please specify):	8 (6.8)
Not my role as oral health provider	7 (5.9)
Liability Reasons	7 (5.9)
Concern with safety of vaccine	3 (2.6)
Which of the following tools for increasing education and acceptance of HPV vaccination are most useful to you? (Select all that apply.)^d	
Total participants (N)	117
Informational flyers or brochures tailored to specific parental concerns	88 (75.2)
Education for oral health professionals regarding HPV	75 (64.1)
Discussion guide or health script for oral health professionals	65 (55.6)
Information catered to cultural or ethical preferences	55 (47.0)
Information for parents provided before clinic visit	48 (41.0)
Other (please specify)	3 (2.6)
None	0 (0.0)
At your facility have you received education/trainings about HPV?^d	
Total participants (N)	117
Yes	19 (16.2)
No	89 (76.1)
I don't know	9 (7.7)
If training could be provided, what format of training would be beneficial to your facility? (Select all that apply.)^d	
Total participants (N)	117
In person	75 (64.1)
Webinar	72 (61.5)
Online self-study	38 (32.5)
Offline self-study	9 (7.7)
Other (please specify):	2 (1.7)

^dDenotes questions used to assess OHP's self-reported facilitators and barriers in HPV prevention.

a significantly lower overall survival among AI/AN. In 2014, White et al.¹⁵ concluded that HPV-associated cervical cancer incidence and mortality are disproportionately higher among AI/AN women than White American women. Data from the IHS-National Immunization Reporting System (NIRS) shows AI/AN adolescent HPV vaccination rates are low when compared to the Healthy People 2020 target rate of 80%. In FY 2018 Q4, the IHS-NIRS reported 85.1% (54,433/63,958) of adolescents aged 13–17 years had received the first dose, 73.3% (46,902/63,958) had received the recommended two doses of HPV, and only 48.4% (30,972/63,958) had received the final third dose.¹⁶ As a result, interventions are needed to increase HPV vaccination rates among the AI/AN population and therefore reduce the incidence of HPV infection and its associated cancers.

Table 5. Post-questionnaire only.

Question(s)	N (%) of answers post-Q
How likely are you to use the information in the HPV toolkit in your clinic?	
Total participants (N)	111
1 Not at all	5 (4.5)
2	6 (5.4)
3	17 (15.3)
4	31 (27.9)
5 Extremely likely	52 (46.9)
This seminar improved my HPV knowledge.^e	
Total participants (N)	115
Strongly Agree	92 (80.0)
Somewhat Agree	19 (16.5)
Neutral	2 (1.7)
Somewhat Disagree	0 (0.0)
Strongly Disagree	2 (1.7)
I am more likely to recommend the HPV vaccine after this seminar.^e	
Total participants (N)	115
Strongly Agree	80 (70.0)
Somewhat Agree	19 (16.5)
Neutral	15 (13.0)
Somewhat Disagree	0 (0.0)
Strongly Disagree	1 (0.9)
Would you feel comfortable administering the HPV vaccine if it is within your scope of practice as a dentist?^e	
Total participants (N)	96
Very comfortable	33 (34.4)
A little comfortable	34 (35.4)
Not very comfortable	15 (15.6)
Not at all comfortable	14 (14.6)

^eDenotes questions used to assess OHP's self-reported knowledge, comfortability and preparedness to discuss vaccinations.

This study was the first of its kind to focus on OHP's serving AI/AN patients in IHS designated areas. The aim is to improve OHP's knowledge surrounding HPV and HPV vaccines and increase OHP's comfort with discussing vaccinations with their patients. By comparing the results from the pre-Q responses to the post-Q responses and the post-Q responses to the follow-Q responses, our results demonstrate two main findings. First, OHP's showed a statistically significant improvement in HPV knowledge and a retained knowledge overtime. Second, comfortability and preparedness to discuss vaccinations with patients also improved. Analysis of OHP's comfort level to discuss vaccinations revealed a 5.2% improvement in the "very comfortable" category and a 13.3% in the "somewhat comfortable" category. Prior to the lecture, only 6.8% of OHP's reported discussing the relationship between HPV and oropharyngeal cancer with patients, and the major barrier reported was a lack of information on the topic. After the lecture, more than 85% reported they are more likely to recommend the HPV vaccine and 69.8% felt comfortable administering the vaccine.

For OHP's to contribute toward improving HPV vaccination rates among the AI/AN population, it is essential to acknowledge barriers to vaccination. In 2014, Daley et al.¹⁷ assessed dentists' readiness to discuss the HPV vaccine with female patients and found the majority of participants (97%) fell into the pre-contemplation and contemplation stages of readiness to discuss the HPV vaccine. In 2016, a national online survey by Lazalde G. et al.¹⁸ assessed U.S. parent perceptions of dentists' roles in HPV vaccination and revealed that 23% of parents are comfortable with their children receiving vaccines from their dentist. In a 2017 cross-sectional study, Hosking Y. et al.²³ surveyed pediatric dentistry

program directors in the U.S. and showed that 77% believe they should be discussing HPV vaccines with their patients, however, only 25% included information about HPV in their curricula. Naleway AL et al.²⁴ reported that 66% of dentists said that lack of knowledge, uncertainty about whether patients would accept the recommendations, and lack of time were the significant barriers in discussing vaccines with patients. In 2019, Walker et al.⁹ systematically reviewed studies of OHP's communication about HPV vaccination. Although results showed there were deficiencies in knowledge about HPV-related outcomes and its effect on the male population, most OHP's understood that HPV is a sexually transmitted infection and a vaccine is available. However, OHP's less frequently recommended HPV vaccinations if they were uncomfortable discussing sexual intercourse, perceived parents as hesitant, or believed patients to be low risk. They concluded that additional educational interventions aimed at helping OHP's deliver effective HPV oropharyngeal cancer education and vaccination recommendations are needed.

Kline et al. evaluated OHP's perceived roles in preventing HPV-related cancers and identifying needs to overcome barriers to fulfill prevention objectives. The study anticipated that dental providers may be the next line in HPV-related prevention and further concluded by suggesting that OHP organizations may need to consider HPV vaccination training.²⁵ Recent expansions in Oregon's legislature now enables dentists to prescribe and administer the HPV vaccination. Thus, future studies may consider additional educational interventions on HPV immunization practices among OHP's working within designated IHS areas.

The interpretation of this study should be viewed within the context of its limitations. First, the study population was limited to a small sample of IHS-OHP's serving the AI/AN population; findings cannot be generalized to OHP's practicing elsewhere. Second, OHP's chose to attend the HPV lecture to improve knowledge, which introduces sample bias. Lastly, some OHP's that completed the pre-Q did not respond to all questions in the post-Q. Furthermore, only 29 participants responded to the follow-Q. As a result, we were unable to capture the full efficacy of the educational intervention, and more extensive sample size studies are needed.

Conclusion

This study suggests that our educational intervention effectively improved OHP's HPV knowledge, comfort levels, and preparedness to discuss HPV vaccines with their AI/AN patients. The ADA fully supports HPV vaccination and encourages OHP's to educate and counsel their patients on the importance of HPV vaccination. In conjunction with the ADA, our study further elucidates the importance of continuing HPV educational interventions to reach a broader range of OHP's. By improving knowledge, comfortability, and preparedness to counsel and educate patients, OHP's may overcome these missed opportunities and common barriers that exist to improving HPV vaccination rates.

Disclosure of potential conflicts of interests

No potential conflicts of interests were disclosed.

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