

Association between E-cigarette use and oral HPV infection

Patrick Herndon, BS¹ Japnam Jassal, BS² John Cramer, MD²

¹Oakland University William Beaumont School of Medicine ²Wayne State University School of Medicine

Introduction

Human papillomavirus (HPV) is established to have a causal role in the development of oropharyngeal squamous cell carcinoma (OPSCC).¹

In the United States, HPV-associated (HPV+) OPSCC has been rapidly increasing such that it now accounts for over 70% of cases.²

HPV+ OPSCC differs from tobacco-associated head and neck squamous cell carcinoma (HNSCC) in its pathophysiology and response to treatment. with studies showing tumor HPV status being a strong and independent prognostic factor for survival among patients with oropharyngeal cancer.²

There is a well established causal link between cigarette & tobacco usage and oral-HPV infection³

Electronic cigarette can cause mouth and throat irritation through a mechanism similar to tobacco use.

However, it is currently unknown if e-cigarette use is associated with an increased risk of oral HPV.⁴

Aims and Objectives

To determine if E-cig use is associated with an increased risk of oral HPV (any type)

Methods

We utilized the National Health and Nutrition Examination Survey (NHANES) to identify participants who had oral HPV and e-cigarette usage between 2015 and 2016.⁵

Of the 9,971 participants that completed the survey, a total of 4544 participants were included in the study

Associations were explored using logistical regression analysis through SPSS Statistics

Results

Among current e-cigarette users, 10 (3.8%) had high-risk oral HPV detected, compared to 59 (1.4%) in nonusers. In univariate analysis, e-cigarette use was associated with an increased likelihood of high-risk oral HPV infection (OR 2.89; 95% CI, 1.50–5.30) (Table 1).

Similarly smoking greater than 20 conventional cigarettes in the previous 5 days was also associated with oral HPV infection (OR 1.32; 95% CI 0.52–3.30).

After adjustment for age, sex, race, and oral sexual partners, e-cigarette remained significantly associated with high-risk oral HPV infection (OR 2.46; 95% CI, 1.16–5.20).

Table 1. Association of Smoking Variables with High-risk Oral HPV Infection (Using NHANES sample weighting)

	No. of Participants	Bivariable OR (95% CI)	No. of Participants	Multivariable OR (95% CI)
Current E-cigarette Use				
No	4284	1 [Reference]	3350	1 [Reference]
Yes	260	2.89 (1.59-5.30)	226	2.46 (1.16 – 5.20)
No. of Cigarettes smoked in past 5d				
0	3167	1 [Reference]	2691	1 [Reference]
<10	494	0.80 (0.32 - 2.00)	433	0.64 (0.22 – 1.81)
10-19	220	2.89 (1.50 - 5.70)	180	1.63 (0.69 – 3.86)
20-	147	1.80 (0.75 - 4.32)	124	1.32 (0.52 – 3.30)
Marijuana use in past 30 days				
No	1160	1 [Reference]	1160	1 [Reference]
Yes	496	1.23 (0.68 - 2.23)	494	1.03 (0.55 – 1.93)

Conclusions

In this large cross-sectional analysis, we demonstrate a relationship between the current use of e-cigarettes and the likelihood of high-risk oral HPV infection.

E-cigarette use has previously been shown to be associated with a decreased expression of immune-related genes, especially in nasal epithelial cells.⁶

The use of e-cigarettes may alter the course of oral-HPV prevalence and may be compounded with concurrent cigarette usage.

References

1. Gillison ML, Koch WM, Capone RB, et al. Evidence for a causal association between human papillomavirus and a subset of head and neck cancers. *J Natl Cancer Inst* 2000; 92:709-720
2. Mehanna H, Beech T, Nicholson T, et al. Prevalence of human papillomavirus in oropharyngeal and nonoropharyngeal head and neck cancer--systematic review and meta-analysis of trends by time and region. *Head Neck* 2013; 35:747-755
3. Fakhry, C., Gillison, M. L. & D'Souza, G. Tobacco use and oral HPV-16 infection. *JAMA - Journal of the American Medical Association* (2014) doi:10.1001/jama.2014.13183.
4. Dai, H. & Leventhal, A. M. Prevalence of e-Cigarette Use among Adults in the United States, 2014-2018. *JAMA - Journal of the American Medical Association* (2019) doi:10.1001/jama.2019.15331.
5. Centers for Disease Control and Prevention (CDC). National Health and Nutrition Examination Survey Questionnaire. *National Center for Health Statistics (NCHS)* (2009).
6. Martin, E. M. *et al.* E-cigarette use results in suppression of immune and inflammatory-response genes in nasal epithelial cells similar to cigarette smoke. *Am. J. Physiol. - Lung Cell. Mol. Physiol.* (2016) doi:10.1152/ajplung.00170.2016.