



Association of periodontitis and human papillomavirus in oral rinse specimens

Results from the National Health and Nutrition Survey 2009-2012

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Worldwide, head and neck carcinomas are the sixth most common cancer, with an incidence of 400,000 to 500,000 annual cases¹⁻⁵ and nearly \$3.2 billion in treatment costs. Even with aggressive treatment, patients with this type of cancer are at risk of experiencing significant morbidity and mortality.⁶ In 1983, investigators identified human papilloma virus (HPV) as a risk factor for oropharyngeal squamous cell carcinoma.⁷ Between 5% and 20% of head and neck squamous cell carcinomas and between 40% and 90% of oropharyngeal carcinomas are related to HPV.^{1,8} There are more than 150 different HPV types⁹ (or strains), most of which are not considered high-risk types.

High-risk types of HPV include the following: HPV-16, -18, -26, -31, -33, -35, -39, -45, -51, -52, -53, -56, -58, -59, -66, -68, -73, and -82.¹ High-risk types of HPV have been found in nearly one-fourth of oral and laryngeal squamous cell carcinomas¹⁰; HPV-16 was associated with 45% to 90% of oropharyngeal carcinomas.¹¹ In contrast to the incidence of HPV-negative (HPV-) oropharyngeal squamous cell carcinomas, HPV-positive (HPV+) oropharyngeal squamous cell carcinomas have been increasing in incidence in the United States,¹²⁻¹⁵ from 0.8 in 100,000 in 1998 to 2.6 in 100,000 in 2004.⁸ HPV is an 8,000 base-pair DNA genome in an icosahedral 55-nanometer capsid protein.¹⁶ The virus is small, non-enveloped, and epitheliotropic.¹⁷

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ABSTRACT

Background. Human papillomavirus (HPV)-positive oropharyngeal squamous cell carcinomas are increasing in incidence and are becoming significant public health concerns. Periodontitis is a chronic condition in which the affected tissue may facilitate oral HPV infection and persistence. The purpose of this study was to determine if an association of the presence of HPV in oral rinse specimens and periodontal disease exists.

Methods. The authors combined the National Health and Nutrition Examination Survey (NHANES) data for years 2009-2010 and 2011-2012. The authors included participants aged 30-69 years who had clinically assessed periodontal and HPV data (n = 6,004). The authors analyzed the data using the Rao-Scott χ^2 test and logistic regression.

Results. There were 498 participants who had the presence of HPV in oral rinse specimens. The adjusted odds ratio for the presence of HPV in oral rinse specimens with relation to periodontal disease was 1.04 (95% confidence interval, 0.63-1.73), adjusting for sex, race and ethnicity, education, age, income-to-poverty ratio, smoking, alcohol use, and number of sex partners during their lifetime.

Conclusions. The authors failed to reject the hypothesis of no association of the presence of HPV in oral rinse specimens and periodontitis.

Practical Implications. Although oral HPV infection is a serious concern, the authors found that periodontitis was not shown to be related to the presence of HPV in oral rinse specimens in adjusted analyses in this study.

Key Words. Periodontal diseases; risk assessment; public health and community dentistry; National Health and Nutrition Examination Survey.

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Although there is a growing awareness of the association of HPV and oropharyngeal squamous cell carcinomas, there is a lack of information about oral HPV infection and infectivity. D'Souza and colleagues¹⁸ reported that the prevalence of HPV-16 infection in exfoliated oral epithelial cells increased the odds of oropharyngeal carcinoma by 13 times.

Periodontitis is a complex chronic oral condition involving teeth, bone, epithelial cells; a biofilm community of bacteria, fungi, and viruses^{16,19,20}; and the immune system's response to the biofilm community. Periodontitis has been associated with other chronic inflammatory diseases such as diabetes and cardiovascular disease.¹⁵ Periodontitis involves a continuous release of inflammatory cytokines and biomarkers that adversely affects systemic health⁵ and is related to a modulation in epithelial barrier function protection.

It is unknown if the biofilm and chronic inflammation of periodontitis with a decrease in epithelial barrier protection may be associated with oral HPV infectivity. The purpose of this study was to determine if there is an association of the presence of HPV in oral rinse specimens and periodontitis. The null hypothesis was that the adjusted odds ratio for the presence of HPV in oral rinse specimens would be the same in people who have periodontitis as in people who do not have periodontitis. The adjusted odds ratio included variables selected as having had previously been shown to have an association with HPV infectivity,^{6,21-24} and sex, race and ethnicity, education, age, income, and smoking were also previously shown to be related to periodontal disease.²⁵⁻³⁰ The results of previous studies have been equivocal.^{16,17,20,31,32} Some studies' results were limited by the investigators' use of self-reports for oral health.^{28,30} Other studies' results also have had limitations such as small sample sizes or hospital-based cases.^{16,17,20,33-35} We are adding to the literature by reporting the results of this study, which we conducted by studying a large, nationally represented sample in which the investigators had performed clinical assessment of all teeth. We used the definition for

periodontitis that is based on the definition for population surveillance of the Centers for Disease Control and Prevention in partnership with the American Academy of Periodontology.³⁶

METHODS

Study design and data source. The West Virginia University Institutional Review Board (protocol 1408392538) acknowledged this study. We used a cross-sectional study design to determine the association of the presence of HPV in oral rinse specimens (HPV+ or HPV-) and periodontitis. The data source was the National Health and Nutrition Examination Survey (NHANES; years 2009-2012). NHANES is a national population study of the noninstitutionalized and civilian public that has a stratified, multistage probability sampling design. The National Center for Health Statistics Institutional Review Board approved the NHANES study. Participants gave written informed consent. Interviewers surveyed a household member and requested a physical evaluation of the participant at an NHANES mobile examination center. Eligible participants in the NHANES were aged 14 to 69 years. Details are available

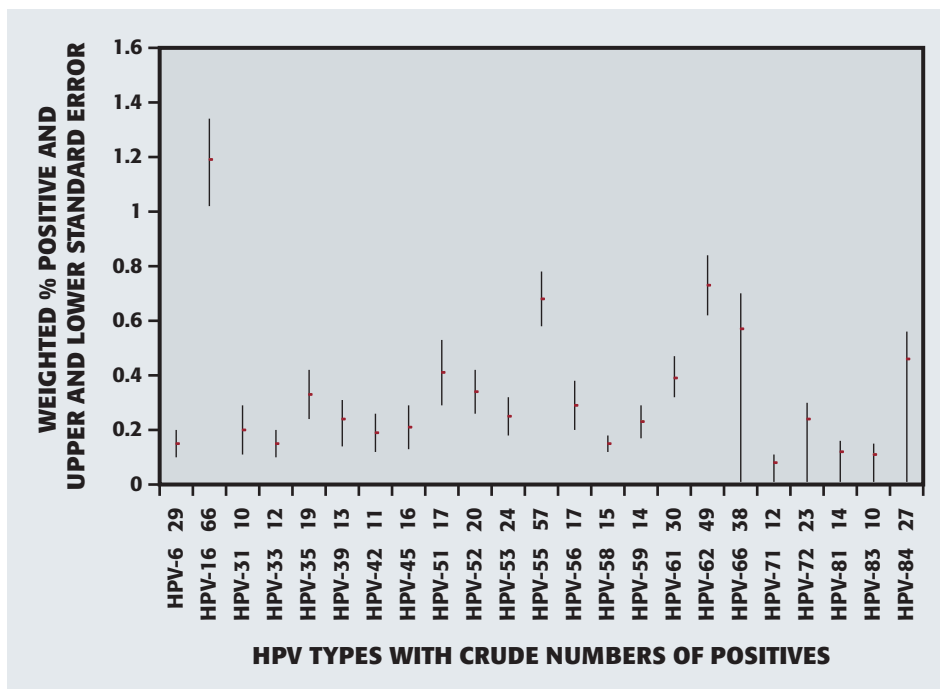


Figure. Prevalence of oral human papillomavirus (HPV) by HPV type. HPV types with fewer than 10 crude numbers of positives were suppressed.

ABBREVIATION KEY. HPV: Human papillomavirus. HPV-: HPV negative. HPV+: HPV positive. NHANES: National Health and Nutrition Examination Survey.

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