

# Frequency of Human Papillomavirus-Related Squamous Cell Carcinoma in the Oral Cavity and Oropharynx: A Cross-Sectional Study

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## ABSTRACT

**Background:** Human papillomavirus (HPV) is an established etiologic factor in a subset of oropharyngeal squamous cell carcinomas; its contribution to oral cavity cancers remains variable, particularly in populations with substantial tobacco exposure, poor oral hygiene or oral sexual history.

**Methods:** In this cross-sectional study, 58 adults with biopsy-proven squamous cell carcinoma of the oral cavity or oropharynx were enrolled at a tertiary-care center in Jaipur, India, between July 2024 and December 2025. Demographic and behavioral data were recorded using a semi-structured proforma. HPV-DNA status was assessed by polymerase chain reaction (PCR). Associations were evaluated using the p values reported in the thesis.

**Results:** The mean age was 50.67 +/- 14.57 years; 50 participants (86.2%) were male and 38 (65.5%) reported tobacco exposure. HPV-DNA was detected in 3/58 cases (5.2%). All HPV-positive cases occurred among participants younger than 40 years (3/13 vs 0/45; p=0.009). HPV positivity was not significantly associated with gender (p=0.062), tobacco exposure (p=0.561), oral-sex history (p=1.000), or oral hygiene (p=1.000).

**Conclusions:** HPV-DNA positivity was infrequent in this cohort, while tobacco exposure was common. The concentration of HPV-positive cases in younger participants warrants confirmation in larger, multicenter studies using complementary biomarkers for HPV-driven disease.

**Keywords:** human papillomavirus; HPV-DNA; squamous cell carcinoma; oral cavity; oropharynx; oral-sex history; polymerase chain reaction; tobacco

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## INTRODUCTION

Human papillomavirus (HPV) contributes to a distinct subset of head and neck squamous cell carcinomas, particularly those arising in the oropharynx. Viral oncoproteins E6 and E7 can disrupt p53- and retinoblastoma-pathway regulation, respectively, supporting malignant transformation in persistent high-risk infection.<sup>1,2</sup> HPV-positive oropharyngeal tumors differ epidemiologically and biologically from tobacco-associated tumors, and their frequency varies by anatomic site, population, and detection method.<sup>3,4</sup>

In India and other settings with prevalent smokeless and smoked tobacco exposure, oral cavity and oropharyngeal cancers remain strongly associated with established carcinogenic exposures. Oral HPV infection can be acquired through mucosal contact, including oral sexual exposure, although self-reported oral-sex history is an imperfect measure of exposure and its relationship

with tumor HPV status may vary by population. The contribution of HPV-DNA to these tumors is heterogeneous across studies.<sup>15,20,27</sup> Local data are therefore important to contextualize HPV testing and preventive strategies. This study estimated the frequency of HPV-DNA positivity among patients with squamous cell carcinoma of the oral cavity and oropharynx and examined its association with demographic and behavioral variables, including reported oral-sex history.

## AIM & OBJECTIVES

### Aim:

To estimate the frequency of HPV-related squamous cell carcinoma in the oral cavity and oropharynx and to evaluate its association with demographic and behavioural factors.

### Objectives:

To identify human papilloma virus related squamous cell carcinoma in oral cavity &

oropharynx patient with Human papilloma virus DNA PCR test.

**Inclusion criteria**

Eligible participants were adults older than 18 years with biopsy-proven squamous cell carcinoma of the oral cavity or oropharynx who provided written informed consent.

**Exclusion criteria**

Patients with a history of human papillomavirus vaccination were excluded.

**MATERIALS AND METHODS**

This cross-sectional study was conducted in the Departments of Otorhinolaryngology and Oncology at the National Institute of Medical Sciences and Research, Jaipur, India. The study frame was July 1, 2024 through December 31, 2025 (18 months). Adults older than 18 years with biopsy-proven squamous cell carcinoma of the oral cavity or oropharynx who provided written informed consent were eligible. Patients with a history of HPV vaccination were excluded. The enrolled sample comprised 58 participants.

**Data collection and HPV testing**

Clinical, demographic, and risk-factor data, including tobacco exposure, oral-sex history, and oral-hygiene

| Characteristic          | Value           |
|-------------------------|-----------------|
| Participants            | 58              |
| Age, years, mean +/- SD | 50.67 +/- 14.57 |
| Male sex, n (%)         | 50 (86.2)       |

**Table 1. Baseline characteristics of the study cohort.**  
HPV-DNA status

| HPV-DNA PCR status | n  | %    |
|--------------------|----|------|
| Positive           | 3  | 5.2  |
| Negative           | 55 | 94.8 |

**Table 2. HPV-DNA PCR status among participants.**

All HPV-positive cases were observed in participants younger than 40 years. This association was statistically significant (p=0.009). Nine participants reported oral-sex history; 3 were HPV positive and 6 were HPV negative. Among the 49 participants reporting no oral-sex history, none was HPV positive. Despite this

| Variable       | HPV positive | HPV negative | Total | p value |
|----------------|--------------|--------------|-------|---------|
| Age <40 years  | 3            | 10           | 13    | 0.009   |
| Age >=40 years | 0            | 45           | 45    |         |
| Male           | 1            | 49           | 50    | 0.062   |
| Female         | 2            | 6            | 8     |         |

status, were collected using a semi-structured proforma. Squamous cell carcinoma was confirmed histopathologically. HPV-DNA detection was reported as PCR-based in the abstract, methods technique list, results tables, and summary of the thesis; this manuscript therefore reports PCR as the HPV test.

Author verification required: one methods paragraph in the thesis additionally mentions in-situ hybridization. The thesis does not provide sufficient procedural detail to confirm whether in-situ hybridization was performed, on which samples, or how it informed the reported HPV status. This manuscript does not claim in-situ hybridization results.

**Statistical analysis**

The thesis reports descriptive statistics and p values for associations between HPV status and selected variables. The specific statistical tests, software, and significance threshold were not stated; they are not inferred here. Two-sided p values are presented as reported.

**RESULTS**

**Participant characteristics**

Among 58 participants, the mean age was 50.67 +/- 14.57 years. Fifty participants (86.2%) were male, and 38 (65.5%) reported tobacco exposure (Table 1).

| Characteristic             | Value     |
|----------------------------|-----------|
| Female sex, n (%)          | 8 (13.8)  |
| Tobacco exposure, n (%)    | 38 (65.5) |
| No tobacco exposure, n (%) | 20 (34.5) |

HPV-DNA PCR was positive in 3 participants (5.2%) and negative in 55 (94.8%) (Table 2).

| HPV-DNA PCR status | n  | %     |
|--------------------|----|-------|
| Total              | 58 | 100.0 |

**Associations with HPV-DNA positivity**

distribution, the reported association between oral-sex history and HPV-DNA positivity was not statistically significant (p=1.000). No statistically significant association was reported for gender, tobacco exposure, or oral hygiene (Table 3).

| Variable                 | HPV positive | HPV negative | Total | p value |
|--------------------------|--------------|--------------|-------|---------|
| Tobacco exposure present | 1            | 37           | 38    | 0.561   |
| Tobacco exposure absent  | 2            | 18           | 20    |         |

| Variable             | HPV positive | HPV negative | Total | p value |
|----------------------|--------------|--------------|-------|---------|
| Oral-sex history yes | 3            | 6            | 9     | 1.000   |
| Oral-sex history no  | 0            | 49           | 49    |         |

| Variable          | HPV positive | HPV negative | Total | p value |
|-------------------|--------------|--------------|-------|---------|
| Good oral hygiene | 1            | 17           | 18    | 1.000   |
| Poor oral hygiene | 2            | 38           | 40    |         |

**Table 3. Associations between selected variables and HPV-DNA PCR status. P values are shown for each variable as reported in the thesis.**

## DISCUSSION

In this cross-sectional cohort, HPV-DNA was detected in 5.2% of oral cavity and oropharyngeal squamous cell carcinoma cases. Tobacco exposure was common (65.5%), consistent with the continued importance of conventional carcinogenic exposures in the study setting. The low frequency of HPV-DNA positivity should be interpreted within the combined oral cavity and oropharyngeal sample and with awareness that prevalence estimates vary by site and assay.<sup>15,27</sup>

The most notable finding was the association between age younger than 40 years and HPV-DNA positivity: all three positive cases occurred in this group. This aligns directionally with literature describing a younger clinical profile for HPV-associated oropharyngeal cancer, although this small dataset cannot establish causal or prognostic distinctions.<sup>3,11,28</sup>

Gender, tobacco exposure, oral-sex history, and oral hygiene were not statistically associated with HPV-DNA positivity in the reported analyses. The small number of HPV-positive cases limits precision and may explain the lack of statistical significance despite apparent differences across some strata. Self-reported behavioral variables may also be subject to under-reporting. These data should not be interpreted as evidence that these exposures have no relation to HPV acquisition or cancer risk.

PCR detection of HPV-DNA identifies viral DNA but does not independently establish transcriptionally active, HPV-driven carcinogenesis. The absence of p16 immunohistochemistry and other complementary biomarkers prevents classification of tumors as definitively HPV-driven. Future multicenter studies should report anatomic site separately, use standardized HPV-testing algorithms, and include clinically relevant outcomes.

## CONCLUSION

HPV-DNA positivity was found in 3 of 58 cases (5.2%) of oral cavity and oropharyngeal squamous cell carcinoma in this tertiary-care cohort, whereas tobacco exposure was common. Although all HPV-positive cases were among the 9 participants reporting oral-sex history with poor oral hygiene, this association was not statistically significant ( $p=1.000$ ) and should be interpreted cautiously because of the small number of positive cases and reliance on self-reported behavior. HPV positivity was significantly concentrated among participants younger than 40 years. Larger, site-specific,

multicenter studies incorporating complementary biomarkers are needed to clarify the epidemiology and clinical significance of HPV-associated disease in this population.

## DECLARATIONS

Ethics approval and consent to participate

The thesis reports Scientific and Ethics Committee approval and written informed consent. The ethics approval identifier was not provided.

Financial support

There was no financial support for this study.

Conflicts of interest

There is no conflict of interest.

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