

## IMPACT OF TOBACCO CHEWING ON ORAL HEALTH: A HOSPITAL-BASED STUDY IN EASTERN, INDIA

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### Abstract

**Background:** Tobacco use, encompassing various forms such as chewing, smoking, and sniffing, poses significant global health risks. In India, Gutkha and betel quid chewing are prevalent, contributing to oral health issues and potentially malignant disorders. **Materials and Methods:** A hospital-based cross-sectional study was conducted from April to September 2019 at MKCG Medical College and Hospital, enrolling 640 adult patients aged 20–80 years. Clinical examinations and statistical analyses were performed to assess the oral health status of tobacco users and non-users. **Result:** Tobacco users exhibited higher frequencies of gingival bleeding, pocket formation, loss of attachment, attrition, and oral potentially malignant disorders compared to non-users ( $p < 0.005$ ). The mean Decayed, Missing, and Filled Teeth (DMFT) score was lower among tobacco chewers. Longer durations of tobacco chewing correlated with increased oral health issues. Tobacco chewing was associated with poor periodontal status, although the prevalence varied across studies. Areca nut's cytotoxicity and nicotine's adverse effects contribute to periodontal diseases. However, tobacco chewers showed lower prevalence of dental caries, attributed to betel stain's protective effect. **Conclusion:** Tobacco chewing significantly impacts oral health, necessitating effective preventive measures. Understanding its implications can aid in developing targeted interventions to mitigate its adverse effects.

## INTRODUCTION

Tobacco use remains a significant global health concern, posing multifaceted threats to public well-being.<sup>[1]</sup> It encompasses various forms, including chewing, smoking, sucking, and sniffing, each demonstrating detrimental effects when used as intended.<sup>[2]</sup> Notably, smokeless tobacco users can attain blood nicotine levels comparable to, if not surpassing, those observed in smokers.<sup>[3]</sup>

In India, Gutkha stands out as a prevalent tobacco product, introduced commercially in 1975, comprising areca nut, slaked lime, catechu, and powdered tobacco.<sup>[4]</sup> Similarly, betel quid chewing, an ancient practice dating back over 2000 years, remains widespread, especially in South and Southeast Asia.<sup>[5]</sup> Despite its historical significance, betel quid has been classified as a Group 1 carcinogen by the International Agency for Research on Cancer, primarily due to its composition including betel leaf,

areca nut, slaked lime, and catechu.<sup>[6]</sup> Areca nut, ranking as the fourth most commonly used psychoactive substance globally, underscores the magnitude of this habit's prevalence.<sup>[7]</sup>

India, home to approximately 400 million individuals aged 15 and above, reports a substantial proportion (16%) engaging in smokeless tobacco use.<sup>[8,9]</sup> Alarming, oral cancer incidence in India stands at 20 per 100,000 population, contributing to over 30% of all cancers nationwide.<sup>[10]</sup> Projections from the World Health Organization suggest that tobacco-related deaths in India could surpass 1.5 million annually by 2020.<sup>[11]</sup> Recent data from the Global Adult Tobacco Survey reveal a smokeless tobacco prevalence of 21.4% among individuals aged 15 and above, with certain states like Tripura, Manipur, Odisha, and Assam reporting notably higher rates.<sup>[12]</sup> Ganjam, situated in the Indian state of Odisha, presents a pertinent context for investigating tobacco's oral health effects, particularly given its

prevalent use of gutkha and betel quid across age groups and social strata. Recognizing the intricate interplay of host, microbial, and environmental factors in oral disease pathogenesis, we deemed it imperative to explore tobacco's role as a risk factor in this specific setting. Therefore, this study was undertaken to elucidate the oral health implications of tobacco chewing among adult patients attending the dental outpatient department (OPD) of Ganjam MKCG Medical College and Hospital in Odisha.

## MATERIALS AND METHODS

A hospital-based cross-sectional study was conducted from April 2019 to September 2019 at the Outpatient Department (OPD) of MKCG Medical College and Hospital. The study enrolled 640 adult patients aged 20–80 years from Ganjam district in Odisha, comprising 340 tobacco chewers and 340 nonchewers.

Tobacco chewers were defined as individuals consuming smokeless tobacco once daily or more frequently for at least the preceding year.<sup>[13]</sup> Participants attending the dental OPD of Ganjam district were included, while those using non-smokeless tobacco products, having alcohol habits, medically compromised individuals, and those unwilling to disclose their habits were excluded. Sample size estimation, based on the prevalence of loss of attachment from a pilot study, ensured 80% power and 5% error, resulting in 340 participants per group. With OPD hours from 9 am to 5 pm, a minimum of 18 patients were examined daily, assuming an average examination time of 20 minutes per person (as per WHO guidelines). Daily OPD numbers were collected, and participants were randomly selected using a SRS method, meeting inclusion/exclusion criteria.

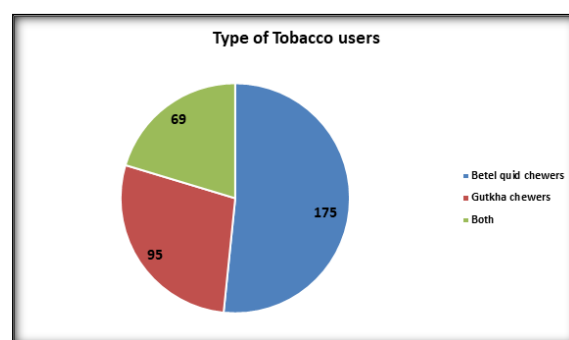
Participants were categorized into four age groups (24–35, 34–45, 44–55, and 54–65 years) and matched for age and sex within each group. Tobacco chewers were matched with corresponding nonchewers until achieving the required sample size. Clinical examinations were conducted by a trained examiner following the WHO Basic Oral Health guidelines, with additional assessment for tooth attrition. ADA specification Type III examination was employed, with participants seated comfortably on a dental chair. Data were analyzed using R software, employing Chi-square tests and t-tests for quantitative data, and binary logistic regression to

assess associations between oral health problems and tobacco chewing habits.

## RESULTS

The hospital-based study conducted at MKCG Medical College and Hospital over a six-month period from April 2019 to September 2019 aimed to investigate the influence of tobacco use on oral health. A total of 640 participants were included in the study, comprising 340 tobacco users and 340 non-users.

[Figure 1] illustrates the distribution of tobacco usage patterns among the study participants. Of the 340 tobacco users, 175 (51.47%) were betel quid chewers, 95 (27.94%) were gutkha chewers, and 69 (20.29%) used both betel quid and gutkha.



**Figure 1: Type of tobacco users visiting the hospital**

[Table 1] presents the oral health status among tobacco users and non-users, along with the corresponding p-values. Compared to non-users, tobacco users exhibited significantly higher frequencies of gingival bleeding (203 [59.71%] vs. 158 [46.47%],  $p = 0.004$ ), pocket formation (138 [40.59%] vs. 97 [28.53%],  $p = 0.003$ ), loss of attachment (102 [30.00%] vs. 51 [15.00%],  $p < 0.001$ ), attrition (164 [48.24%] vs. 93 [27.35%],  $p < 0.001$ ), oral submucous fibrosis (8 [2.35%] vs. 0 [0.00%],  $p < 0.003$ ), and leukoedema (7 [2.06%] vs. 0 [0.00%]). Moreover, tobacco users had a higher prevalence of dental caries experience compared to non-users (138 [40.59%] vs. 186 [54.71%],  $p < 0.001$ ).

The mean Decayed, Missing, and Filled Teeth (DMFT) score among tobacco chewers was  $1.47 \pm 1.94$ , while among non-chewers it was  $1.89 \pm 1.86$ . The distribution of oral health-related conditions among tobacco users based on the duration of chewing habit is depicted in [Table 2].

**Table 1: Oral health status among study participants**

	Oral conditions	Tobacco users		Tobacco non users		P- value
		Frequency	Percentage	Frequency	Percentage	
1	Gingival bleeding	203	59.71	158	46.47	0.004
2	Pocket	138	40.59	97	28.53	0.003
3	Loss of attachment	102	30.00	51	15.00	<0.001
4	Attrition	164	48.24	93	27.35	<0.001
5	Potentially malignant disorders					
	Oral submucous fibrosis	8	2.35	0	0.00	<0.003
	Leukoedema	7	2.06	0	0.00	

6	Dental caries experience	138	40.59	186	54.71	<0.001
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**Table 2: Distribution of oral conditions among tobacco users based on the duration of chewing habit**

Oral conditions	≤10 years		>10 years		P- value
	Frequency	Percentage	Frequency	Percentage	
Gingival bleeding	104	51.6	67	48.4	<0.001
Pocket	76	37.5	86	62.5	<0.002
Loss of attachment	32	15.6	116	84.4	<0.003
Attrition	81	40.3	82	59.7	<0.004
Dental caries experience	128	63.6	50	36.4	0.477
Potentially malignant disorders	132	65.4	48	34.6	0.222

It was observed that longer durations of tobacco chewing were associated with significantly higher frequencies of gingival bleeding, pocket formation, loss of attachment, and attrition (all  $p < 0.005$ ). However, there was no statistically significant difference in the prevalence of dental caries experience and potentially malignant disorders between users with  $\leq 10$  years and  $> 10$  years of chewing habit ( $p > 0.05$ ).

Overall, these findings underscore the detrimental impact of tobacco use on oral health, highlighting the need for effective preventive and intervention strategies to mitigate its adverse effects.

## DISCUSSION

The present study, a comparative hospital-based cross-sectional investigation, aimed to enhance understanding of tobacco chewing's impact on the oral health of adult patients at the dental Outpatient Department (OPD) of MKCG Medical College and Hospital in Odisha. Notably, a significantly higher proportion of tobacco chewers (40.6%) exhibited periodontal pockets in this study compared to findings by Agili and Park in Saudi Arabia, which reported a lower prevalence of 0.7%.<sup>[15]</sup> Similar odds ratios (OR) for periodontal pockets were noted by Parmar et al. in Gujarat,<sup>[16]</sup> but higher values were reported by Akhter et al. in Dhaka,<sup>[17]</sup> and Sumanth et al. in Karnataka.<sup>[18]</sup> Areca nut's hardness and its interaction with periodontal tissues, along with nicotine's adverse effects on periodontal ligament fibroblasts, might contribute to the poor periodontal status among chewers.<sup>[16,18]</sup>

Loss of attachment was significantly higher among tobacco chewers in this study, although lower than the prevalence reported by Anand et al. in Bhopal.<sup>[19]</sup> ORs for loss of attachment were similar to those reported by Parmar et al. in Gujarat and Anand et al. in Bhopal,<sup>[16,19]</sup> but lower than Sumanth et al.'s findings in Karnataka.<sup>[18]</sup> Arecoline's cytotoxicity to periodontal fibroblasts and its role in impairing periodontal reattachment, along with nicotine's adverse effects, may exacerbate preexisting periodontal disease.<sup>[16,18]</sup>

Dental caries prevalence among tobacco chewers was lower in this study compared to findings in Saudi Arabia.<sup>[15]</sup> Mean DMFT values were lower in this study compared to studies in Pakistan and Kochi.<sup>[2,20]</sup> Possible reasons for reduced dental caries among tobacco chewers include betel stain acting as a

physical barrier to demineralization, tannin content with antimicrobial properties, attrition eliminating stagnation areas, and the presence of slaked lime and fluoride.<sup>[15,21-23]</sup>

The prevalence of potentially malignant disorders and oral submucous fibrosis among chewers in this study was lower compared to other studies.<sup>[15,20,24-26]</sup> Arecoline, a psychoactive alkaloid in areca nut, is implicated in fibroblast stimulation crucial in oral submucous fibrosis.<sup>[5,28]</sup> Predominantly observed in younger age groups, potentially malignant disorders align with findings from Jaipur.<sup>[29]</sup> The prevalence of leukoedema in this study was similar to that reported in Manipal.<sup>[30]</sup>

This study has limitations, including its cross-sectional design, hindering temporal sequence establishment between tobacco use and oral health conditions. Further studies should explore other confounders like socioeconomic status and nutritional status. Additionally, investigations into the oral health effects of chewing betel quid with and without tobacco are warranted.

## CONCLUSION

In conclusion, our comparative hospital-based cross-sectional study sheds light on the profound impact of tobacco chewing on oral health among adult patients attending the dental Outpatient Department (OPD) of MKCG Medical College and Hospital in Odisha. The findings underscore the heightened prevalence of periodontal pockets and loss of attachment among tobacco chewers, indicative of exacerbated periodontal disease compared to non-chewers. Additionally, tobacco chewing was associated with a lower prevalence of dental caries but a higher prevalence of potentially malignant disorders, including oral submucous fibrosis, albeit lower than reported in some other studies.

Overall, addressing the oral health consequences of tobacco chewing is imperative to alleviate the burden of oral diseases and enhance the well-being of individuals and communities. Collaborative efforts among healthcare professionals, policymakers, and community stakeholders are essential in combating the tobacco epidemic and promoting oral health equity.

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