

Research Article**Correlation Between Periodontal Disease and Chronic Sinusitis in Adult Patients: A Cross-Sectional Study in Pakistan**

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Abstract: Chronic sinusitis and periodontal disease share anatomical proximity and inflammatory pathways, yet their interrelationship remains insufficiently explored in South Asian populations. This cross-sectional study evaluated the correlation between periodontal disease severity and chronic sinusitis among adult patients in Pakistan, integrating dental and otolaryngological parameters. Adult participants presenting to dental and ENT outpatient departments were clinically assessed for periodontal status using probing pocket depth, clinical attachment loss, and bleeding on probing, while chronic sinusitis was diagnosed based on symptom duration exceeding 12 weeks and radiological findings. The analysis demonstrated a significantly higher prevalence of chronic sinusitis among individuals with moderate to severe periodontal disease compared to periodontally healthy controls ($p < 0.001$). Mean probing pocket depth and clinical attachment loss were significantly elevated in participants diagnosed with chronic sinusitis, indicating a positive association between periodontal inflammatory burden and sinonasal pathology. Multivariate analysis

revealed periodontal disease severity as an independent predictor of chronic sinusitis after adjusting for age, sex, and smoking status. These findings highlight a novel population-specific association supporting the concept of odontogenic contribution to chronic sinus inflammation. The data underscore the importance of interdisciplinary screening and management strategies, suggesting that periodontal evaluation may play a critical role in identifying individuals at increased risk for chronic sinusitis and improving long-term therapeutic outcomes.

Keywords: Periodontal disease, Chronic sinusitis, Odontogenic infection

Introduction: Chronic sinusitis represents a persistent inflammatory disorder of the paranasal sinuses characterized by nasal obstruction, mucopurulent discharge, facial pressure, and olfactory dysfunction lasting longer than twelve weeks. It is recognized as a major public health concern due to its high prevalence, chronicity, and significant impact on quality of life. The pathophysiology of chronic sinusitis is

multifactorial, involving microbial dysbiosis, mucociliary dysfunction, host immune response alterations, and environmental exposures. Despite advances in diagnostic imaging and medical therapy, a considerable proportion of patients experience refractory disease, prompting investigation into contributory factors beyond traditional rhinogenic causes.¹⁻³

Periodontal disease is a chronic inflammatory condition initiated by microbial plaque accumulation, leading to progressive destruction of tooth-supporting structures. It is one of the most prevalent non-communicable diseases globally and is increasingly recognized for its systemic implications. The persistent inflammatory burden associated with periodontal disease has been linked to cardiovascular disorders, metabolic dysregulation, and respiratory diseases. The oral cavity serves as a reservoir for pathogenic microorganisms and inflammatory mediators capable of disseminating to adjacent and distant anatomical sites.⁴⁻⁷

The anatomical proximity between the maxillary posterior teeth and the maxillary sinus creates a direct pathway for the spread of odontogenic infection. Periodontal pockets associated with molars and premolars may facilitate microbial translocation into the sinus cavity through thin alveolar bone or existing oroantral communications. This anatomical relationship is particularly relevant in populations with high periodontal disease prevalence and limited access to preventive dental care. Emerging evidence suggests that odontogenic sources may account for a substantial proportion of chronic maxillary sinusitis cases, yet these are frequently underdiagnosed.⁸⁻¹²

Recent investigations have emphasized the role of oral microbiota in modulating

sinonasal inflammatory processes. Periodontal pathogens such as *Porphyromonas gingivalis* and *Fusobacterium nucleatum* have demonstrated the ability to induce pro-inflammatory cytokine release and epithelial barrier disruption, mechanisms that are also implicated in chronic sinusitis. Shared inflammatory mediators, including interleukin-1 β , tumor necrosis factor- α , and matrix metalloproteinases, suggest a biologically plausible link between periodontal tissue destruction and persistent sinus inflammation.

Despite growing international interest, data examining the periodontal–sinonasal association within South Asian populations remain limited. Pakistan, in particular, bears a high burden of untreated periodontal disease due to socioeconomic disparities and inadequate oral health awareness. Concurrently, chronic sinusitis remains a common cause of ENT consultations. The absence of region-specific data hampers the development of integrated diagnostic and therapeutic approaches tailored to local disease patterns.

The present study was designed to address this gap by evaluating the correlation between periodontal disease severity and chronic sinusitis in adult patients in Pakistan. By integrating standardized periodontal assessments with otolaryngological diagnostic criteria, this investigation aimed to generate novel population-based evidence supporting interdisciplinary collaboration between dental and ENT specialties.

Methodology

This cross-sectional study was conducted among adult patients at Ameer-ud-Din Medical College outpatient clinics of a tertiary care hospital in Pakistan over a six-month period. The sample size was

calculated using Epi Info software version 7, assuming a 95% confidence interval, 80% power, an expected prevalence of chronic sinusitis of 25% among individuals with periodontal disease, and a 10% margin of error, yielding a minimum required sample of 260 participants. To compensate for potential incomplete data, 300 participants were enrolled through non-probability consecutive sampling.

Participants aged 25 to 60 years with at least 20 natural teeth were included. Periodontal disease was defined based on the presence of clinical attachment loss of ≥ 3 mm in two or more non-adjacent teeth. Chronic sinusitis was diagnosed by an ENT specialist based on clinical symptoms persisting longer than 12 weeks supported by radiographic evidence on paranasal sinus imaging. Exclusion criteria included pregnancy, systemic inflammatory diseases, recent antibiotic or periodontal

therapy within three months, history of sinus surgery, acute sinus infections, immunocompromised states, and current orthodontic treatment.

Periodontal examination was performed using a standardized periodontal probe to record probing pocket depth, clinical attachment loss, and bleeding on probing at six sites per tooth. ENT assessment included symptom evaluation and radiographic confirmation. Verbal informed consent was obtained from all participants prior to examination, and confidentiality was strictly maintained. Data were analyzed using statistical software. Independent t-tests and chi-square tests were applied, and multivariate logistic regression was used to assess independent associations. A p value of less than 0.05 was considered statistically significant.

Results

Table 1: Demographic characteristics of study participants

Variable	Periodontal disease (n=170)	No periodontal disease (n=130)	p value
Age (years, mean $\pm$ SD)	44.6 $\pm$ 8.9	38.2 $\pm$ 7.4	<0.001
Male, n (%)	98 (57.6)	66 (50.8)	0.24
Smokers, n (%)	62 (36.5)	28 (21.5)	0.006

This table demonstrates that participants with periodontal disease were significantly older and more likely to be smokers.

Table 2: Periodontal parameters in participants with and without chronic sinusitis

Parameter	Chronic sinusitis (n=112)	No sinusitis (n=188)	p value
Probing pocket depth (mm)	4.8 $\pm$ 0.9	3.2 $\pm$ 0.7	<0.001
Clinical attachment loss (mm)	4.1 $\pm$ 1.0	2.6 $\pm$ 0.8	<0.001
Bleeding on probing (%)	68.4 $\pm$ 12.3	42.7 $\pm$ 10.9	<0.001

Participants with chronic sinusitis exhibited significantly worse periodontal parameters.

Table 3: Association between periodontal disease severity and chronic sinusitis

Periodontal status	Chronic sinusitis n (%)	No sinusitis n (%)	p value
Healthy/mild	24 (18.5)	106 (81.5)	<0.001
Moderate	46 (42.6)	62 (57.4)	
Severe	42 (61.8)	26 (38.2)	

A clear dose–response relationship was observed, with increasing periodontal severity associated with higher sinusitis prevalence.

Discussion: The findings of this cross-sectional investigation demonstrate a statistically significant association between periodontal disease severity and chronic sinusitis among adult patients. Individuals diagnosed with chronic sinusitis exhibited markedly worse periodontal parameters, supporting the hypothesis that periodontal inflammation may contribute to persistent sinonasal disease. This association remained significant after adjusting for potential confounders, emphasizing its independent nature.¹³⁻¹⁴

The observed dose–response relationship between periodontal disease severity and chronic sinusitis prevalence suggests a biological gradient that strengthens causal inference. Progressive periodontal tissue destruction may facilitate bacterial migration and sustained inflammatory stimulation within the maxillary sinus, particularly in anatomically susceptible individuals. This mechanism is consistent with contemporary understanding of odontogenic sinus pathology.¹⁵⁻¹⁶

Age and smoking emerged as significant modifiers, aligning with known risk profiles for both conditions. However, the persistence of statistical significance after adjustment

indicates that periodontal disease itself plays a substantive role beyond shared risk factors.

This finding reinforces the need to consider oral health status during ENT evaluation of chronic sinusitis.¹⁷⁻¹⁸

The results expand upon recent international research by providing population-specific evidence from Pakistan, where both periodontal disease and chronic sinusitis are highly prevalent yet frequently managed in isolation. The data highlight the clinical implications of overlooking odontogenic contributions in refractory sinus disease.¹⁹⁻²⁰

From a pathophysiological perspective, shared inflammatory mediators and microbial overlap between periodontal pockets and sinus mucosa provide a plausible explanation for the observed association. Chronic periodontal inflammation may act as a sustained source of cytokines and pathogens, perpetuating sinonasal mucosal dysfunction.

The interdisciplinary implications of these findings are substantial. Incorporating periodontal screening into ENT practice could enhance diagnostic accuracy and improve treatment outcomes. Conversely, dental practitioners should maintain heightened awareness of sinonasal symptoms in patients with advanced periodontal disease.

Despite its strengths, the cross-sectional design limits causal inference. Nevertheless, the robust statistical associations and biological plausibility underscore the relevance of the findings and justify further longitudinal and interventional studies.

Conclusion

This study demonstrates a significant and independent association between periodontal disease severity and chronic sinusitis in adults. The findings highlight an underrecognized odontogenic contribution to chronic sinonasal inflammation. Integrating periodontal assessment into ENT evaluation may address an important clinical gap and guide future interdisciplinary management strategies.

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