PERIODONTITIS, OLFACTORY CAPACITY AND HALITOSIS: A PILOT STUDY

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Introduction

Periodontitis is a chronic inflammatory disease characterized by the progressive destruction of the supporting tissues of the teeth, including the periodontal ligament, cementum, and alveolar bone. It is primarily initiated by the accumulation of bacterial biofilm and involves a complex interaction between pathogenic microorganisms and the host's immune response. One of the common and socially significant manifestations of periodontitis is halitosis (bad breath), which is predominantly caused by the production of volatile sulfur compounds (VSC), resulting from the anaerobic metabolism of proteins by periodontal pathogens. Recent studies have highlighted that chronic exposure to elevated levels of VSC may not only contribute to oral malodor but also have systemic implications, including the potential to impair olfactory function.

Aims

The objective of this study is to investigate the association between periodontitis and halitosis, with special emphasis on the role of olfactory capacity in shaping patients' subjective perception and experience.

Materials and methods

An observational pilot cross-sectional study was conducted at the Periodontology Department of Egas Moniz Dental Clinic. Periodontal charting and diagnosis were performed according to the 2018 classification of the European Federation of Periodontology / American Academy of Periodontology. Halitosis was measured using a *Halimeter®* (VSC concentration), and olfactory capacity was assessed using the *Sniffin' Sticks screening 12® test*. Data were analyzed using the R software platform, and statistical significance was set at $p < 0.05$.

INCLUSION / EXCLUSION CRITERIA

- ✓ Periodontitis diagnosis
- ✓ Age between 18 and 65
- ✓ Informed consent

- X Previous periodontal treatment
- X Radiotherapy / Chemotherapy
- X IP or IG > 25%
- X Extraoral causes of halitosis
- X Pregnant or recent covid-19 diagnosis
- X Drugs with hyposalivation effects
- X Incomplete data

PERIODONTITIS DIAGNOSIS

- Six sites per tooth
- Probing depth
- Clinical attachment level
- Plaque index
- Gingival index
- Tooth mobility
- Furcation involvement
- Missing teeth

HALITOSIS DIAGNOSIS

1. Self-reported questionnaire, to exclude causes of extra-oral halitosis
2. Three measurements were taken for the volatile sulfur compounds

< 80ppb → no perceptible odor
> 80ppb → halitosis

OLFACTORY CAPACITY

- The test consisted of 12 pens, each with four possible odor options
- the test was repeated three times for each nostril.
- At the end of the assessment, the individual scores were totaled to determine the presence or absence of hyposmia in the patient

Results

The initial participant recruitment took place at the Periodontology Department and the screening unit of the Egas Moniz dental clinic, yielding a total of 93 individuals (Figure 1). After excluding 15 participants due to missing data and 4 due to healthy periodontal status—an exclusion criterion—only 79 remained. An additional 27 were excluded for not completing the Sniffin' Sticks® test. The final sample consisted of 48 participants.

Table1. SAMPLE DESCRIPTION, n (%)

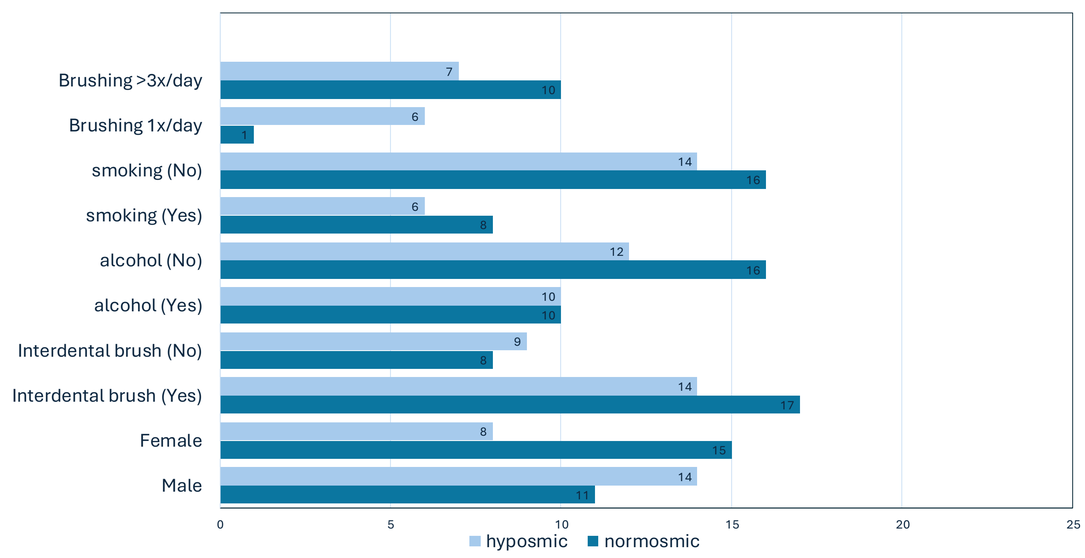

Table2. Self-perception of olfactory capacity

Do you usually experience any difficulties in your daily life due to altered olfactory perception?			
	Total N (%)	Hyposmia N (%)	Normosmia N (%)
I do not experience any difficulties	42 (87,5)	24 (50)	18 (37,5)
I experience few difficulties in my daily life	4 (8,3)	1 (2,1)	3 (6,3)
I experience some difficulties in my daily life	1 (2,1)	0 (0.0)	1 (2,1)
I experience many difficulties in my daily life	1 (2,1)	1 (2,1)	0 (0.0)

Discussion

Among the 48 participants, hyposmia was more prevalent in males (63.6%) than females (36.4%), though not statistically significant ($p = 0.236$), echoing previous findings on gender as a risk factor (Mullol et al., 2020). Hyposmic individuals were older on average (60.4 ± 12.4 years) than normosmics (53.4 ± 10.4 years), in line with age-related olfactory decline (Marin et al., 2018), although the result approached but did not reach significance ($p = 0.066$).
Oral hygiene habits appeared relevant: brushing only once per day was associated with a higher hyposmia rate (85.7%) compared to brushing three or more times daily (41.2%) ($p = 0.070$). Interdental brush use was the only variable with statistical significance ($p = 0.024$), though users paradoxically showed higher hyposmia rates (66.7%), possibly due to more advanced periodontal disease and resulting professional guidance.
A disconnect was observed between self-reported and actual olfactory function: 87% claimed no issues, yet 57.1% of them had hyposmia, reinforcing the unreliability of self-perception (Keller & Malaspina, 2013) and the value of objective testing such as *Sniffin' Sticks®*.
Though not significant ($p = 0.512$), 62.7% of participants with halitosis had olfactory dysfunction, indicating a potential relationship warranting further investigation.
Patients with stage IV periodontitis performed significantly worse in olfactory tests than those in stage III, especially for odors like cinnamon ($p = 0.003$), pineapple ($p = 0.011$), and fish ($p = 0.003$), supporting the link between periodontal inflammation and impaired olfaction (Schertel Cassiano et al., 2024). Unexpectedly, patients with grade C periodontitis showed better olfactory performance than those with grade B, possibly due to uncontrolled variables and sample size limitations.

Conclusion

This study suggests a link between periodontitis, poor oral hygiene, and impaired olfactory function. Hyposmia was more common among individuals with inadequate hygiene habits and advanced periodontal disease. Age and male sex were also associated with greater olfactory decline. A clear gap was observed between self-perceived and actual olfactory ability. These findings highlight the need for preventive care and early screening. Further studies with larger, more diverse samples are recommended to confirm and expand these results.

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Marin, C., Vilas, D., Langdon, C., Alobid, I., López-Chacón, M., Haehner, A., Hummel, T., & Mullol, J. (2018). Olfactory Dysfunction in Neurodegenerative Diseases. In Current Allergy and Asthma Reports (Vol. 18, Issue 8). Current Medicine Group LLC 1. https://doi.org/10.1007/s11882-018-0796-4
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