

Multi-factorial Lifestyle Influences on Periodontal Homeostasis: An Analytical Survey Elucidating the Convergence of Psychosocial Stress, Sleep Dysrhythmia, and Digital Screen Exposure

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Abstract

Background: Psychosocial stress, sleep dysrhythmia, and excessive digital screen exposure are increasingly recognised as lifestyle determinants capable of influencing periodontal health through inflammatory, behavioural, and circadian-mediated pathways. Public awareness of these associations, however, remains limited.

Aim: To examine the interrelationships between psychosocial stress, sleep quality, and digital screen-time behaviours, and to assess their perceived impact on periodontal and oral health among adults.

Materials and Methods: A cross-sectional, web-based questionnaire comprising 40 structured questionnaire elements was disseminated, yielding 182 voluntary responses. Variables assessed included demographic characteristics, stress burden, sleep duration and disturbances, screen-time patterns, and self-reported oral and gingival health changes. Descriptive statistics were applied to analyse the data.

Results: High psychosocial stress (69.8%) corresponded with behaviours known to aggravate gingival inflammation and plaque retention. Sleep dysrhythmia, marked by inadequate sleep duration (56.6%) and frequent disturbances, was associated with reduced gingival health awareness and elevated predisposition to inflammatory gingival changes. Excessive screen exposure, particularly bedtime use (70.3%), compounded sleep disruption and was perceived to negatively affect oral-hygiene behaviours (58.2%), reflected in irregular brushing and early gingival symptoms.

Conclusion: Stress, sleep dysrhythmia, and digital screen exposure were prevalent and appeared to collectively heighten susceptibility to periodontal compromise. Limited awareness underscores the need for targeted education and preventive behavioural interventions.

Keywords: stress; sleep dysrhythmia; digital screen-time; lifestyle determinants; periodontal health; oral health

INTRODUCTION

Periodontal health is shaped by a complex interplay of behavioural, psychological, and physiological influences. Emerging evidence highlights that lifestyle-derived factors, particularly psychosocial stress, sleep dysrhythmia, and excessive digital screen engagement, exert measurable effects on systemic inflammation, immune modulation, and oral-tissue homeostasis (Castro et al., 2020; Wadia, 2020; Botelho et al., 2020). Chronic psychosocial stress activates neuroendocrine pathways, elevates cortisol, and disrupts host-response mechanisms, thereby predisposing individuals to gingival inflammation, impaired healing, and accelerated periodontal breakdown (Mannem & Chava, 2012; Macrì et al., 2024). Sleep is an equally critical determinant of systemic and oral health. Adequate sleep maintains circadian rhythm stability, hormonal regulation, and immunological balance. Conversely, insufficient sleep, poor sleep quality, and sleep fragmentation have been associated with heightened gingival inflammation, altered inflammatory biomarkers, and increased susceptibility to periodontitis (Refulio et al., 2013; Carra et al., 2024; Jayachandran et al., 2023). Late-night screen use, a growing behavioural trend, further disrupts circadian alignment, aggravates sleep dysrhythmia, and intensifies systemic stress responses.

Digital screen exposure itself has emerged as a contemporary lifestyle determinant. Prolonged screen engagement is associated with eye strain, delayed sleep onset, sedentary behaviour, and stress, all of which may indirectly contribute to oral-hygiene neglect, irregular brushing practices, and plaque retention (Aksaka et al., 2025; Guerra-Pacheco et al., 2024). Young adults and adolescents, in particular, display increased screen dependency, raising concerns regarding its cumulative impact on long-term oral and periodontal health.

Despite substantial literature describing the biological pathways linking stress, sleep disturbances, and digital behaviour to periodontal disease, population-level awareness of these associations remains limited. Most studies have examined these determinants in isolation, with few addressing how adults perceive the combined impact of these behaviours on their oral and gingival health.

The present study aims to address this knowledge gap by examining psychosocial stress, sleep dysrhythmia, and digital screen-time exposure in an adult population, while evaluating their perceived influence on oral and periodontal health. Understanding these behavioural determinants is essential for shaping targeted preventive strategies, informing public-health messaging, and promoting lifestyle-based periodontal risk reduction.

MATERIALS AND METHODS

A cross-sectional, web-based questionnaire survey was conducted at Thai Moogambigai Dental College and Hospital among members of the general public to assess the associations between psychosocial stress, sleep dysrhythmia, digital screen-time behaviours, and perceived oral and periodontal health among adults. Ethical clearance was obtained from the Institutional Ethical Committee prior to commencement of the study.

The survey instrument was administered through Google Forms and consisted of 40 systematically structured questionnaire elements, organised into the following thematic sections:

- **Section A – General Information**

Included questions related to age, gender, profession, frequency of dental visits, medical history, and to-

bacco use.

- **Section B – Stress Levels**

Assessed the frequency and sources of stress, perceived stress severity (Likert scale), stress-related physical manifestations, coping mechanisms, and participants' beliefs regarding the influence of stress on gum health. Stress-associated oral symptoms such as bleeding gums, halitosis, xerostomia, bruxism, and plaque accumulation were also evaluated.

- **Section C – Sleep Quality**

Captured sleep duration, sleep continuity, perceived restfulness, sleep disturbances, overall sleep-quality rating, and the perceived impact of inadequate sleep on mood, stress levels, and gingival health. Participants additionally reported sleep-related oral symptoms including bleeding, swelling, and halitosis.

- **Section D – Screen-Time Habits**

Quantified daily screen exposure, primary screen activity, bedtime device use, the interval between screen cessation and sleep onset, perceived effects of screen use on sleep quality, and screen-related physical symptoms such as eye strain and headaches. Respondents also reported oral symptoms experienced during prolonged screen use.

- **Section F – Perceptions & Awareness**

Explored participants' beliefs regarding the interconnected influence of stress, sleep quality, and screen-time habits on gum health and whether they had ever received professional dental guidance regarding these lifestyle determinants.

- **Section G – Awareness & Educational Needs**

Assessed prior participation in oral-health awareness programs, interest in lifestyle-focused periodontal education, preferred learning formats (webinars, seminars, infographics, short videos), and specific topics participants considered essential for inclusion in such programs.

The questionnaire underwent content validation by subject-matter experts in Periodontology to ensure clarity, relevance, and comprehensiveness. Participation was entirely voluntary, and no personally identifiable information was collected at any stage.

Informed electronic consent was obtained from all participants. The introductory section of the questionnaire included a detailed consent statement outlining the study's objectives, voluntary participation, confidentiality assurances, and maintenance of anonymity. Only individuals selecting "I agree to participate" were permitted to proceed to the survey.

The collected responses were systematically coded and tabulated in Microsoft Excel, followed by statistical analysis to assess differences in periodontal health perception, lifestyle awareness, and reported oral-hygiene practices among participants. Both descriptive and comparative statistical approaches were utilised to delineate intergroup variations in awareness and perception metrics.

RESULTS

A total of 182 respondents participated in the survey, consisting of 54.9% females and 44% males, representing a wide range of age groups and professional backgrounds. Most participants (77.5%) reported no diagnosed medical conditions, and an overwhelmingly high proportion (98.9%) abstained from tobacco use, indicating a generally healthy study population.

With respect to stress, 69.8% experienced daily stress, and the mean stress score was moderate at 2.55. Approximately half of the participants (50.5%) reported stress-related physical symptoms, while work

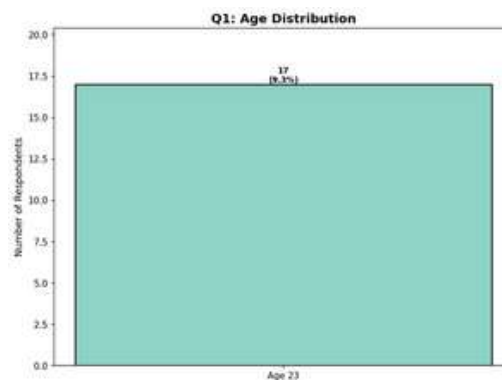
and academic demands were identified as the most common stressors (26.4%). Notably, 42.9% of respondents remained uncertain about the association between stress and gum health, demonstrating limited awareness of stress-mediated periodontal consequences.

Sleep assessment revealed significant disturbances: 56.6% reported suboptimal sleep duration of 5–6 hours per night, and 62.6% experienced sleep fragmentation. Although 72.5% felt rested upon waking, the overall sleep-quality rating was moderate (mean 3.39). Nearly half of the respondents (47.3%) were unsure whether inadequate sleep influenced gingival health, indicating another area of awareness deficit. Screen-time analysis showed high levels of digital engagement, with 70.3% using screens before bedtime and 61% reporting digital eye strain or headaches. Daily screen exposure ranged between 2–4 hours for 40.7% of participants. Over half believed that screen use negatively affected sleep quality (53.8%) and oral-hygiene behaviour (58.2%), with many reporting difficulty maintaining consistent brushing routines during increased screen use.

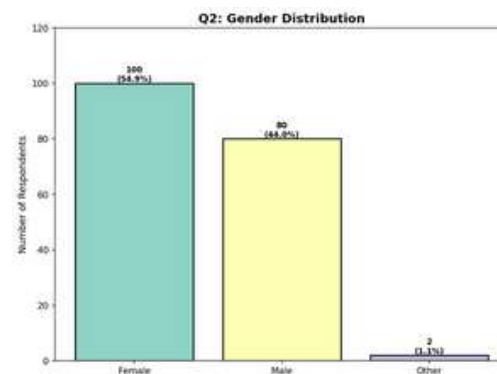
Substantial knowledge and awareness gaps were evident. A majority (71.4%) had never received dental guidance on the influence of lifestyle factors : stress, sleep, or screen time—on gingival health. Additionally, 66.5% had never attended an oral-health awareness program, although 67% expressed interest in learning more. Notably, 73.1% supported targeted periodontal awareness initiatives aimed at young adults, with short video modules (36.3%) emerging as the preferred educational format.

DEMOGRAPHIC & HEALTH INFORMATION

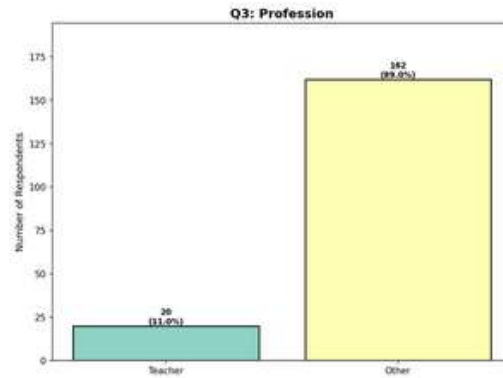
Q1: Age Distribution



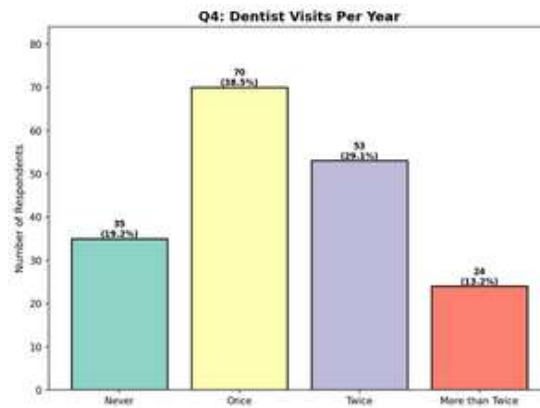
Q2: Gender Distribution



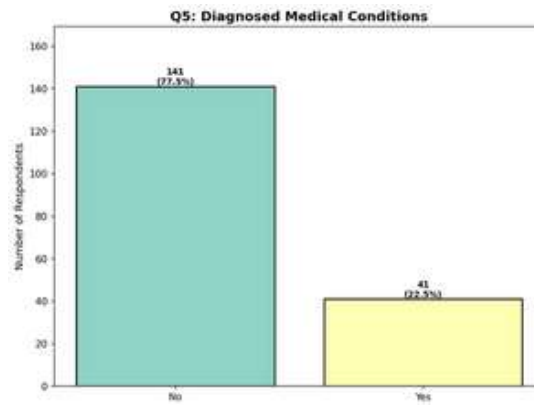
Q3: Profession



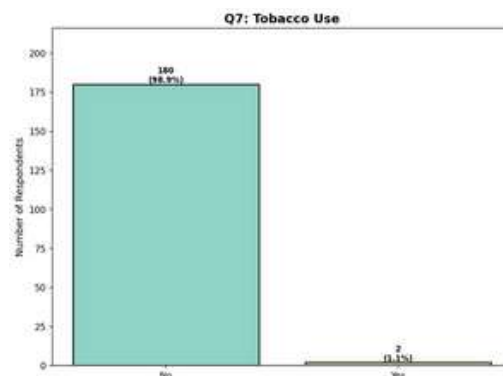
Q4: Dentist Visits Per Year



Q5: Diagnosed Medical Conditions

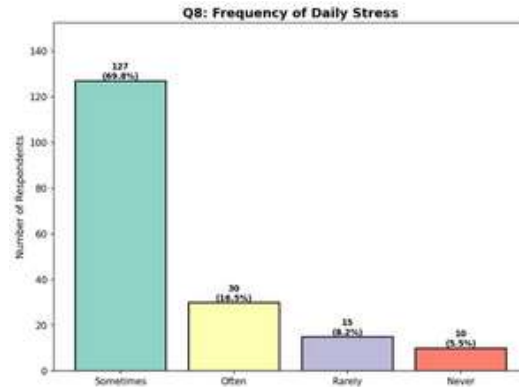


Q7: Tobacco Use

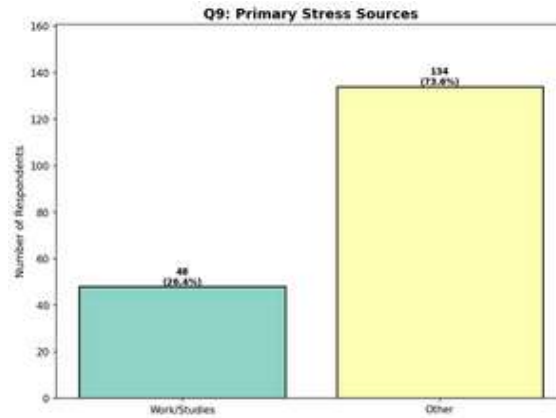


STRESS FINDINGS

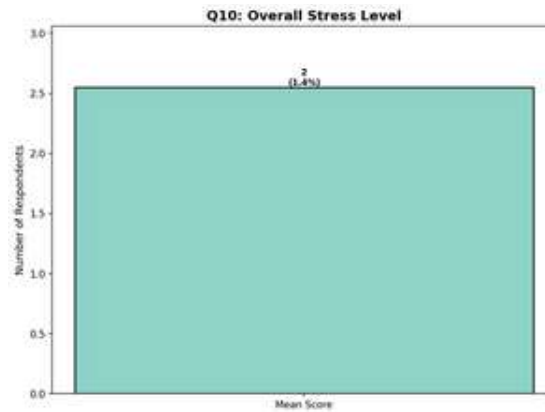
Q8: Frequency of Daily Stress



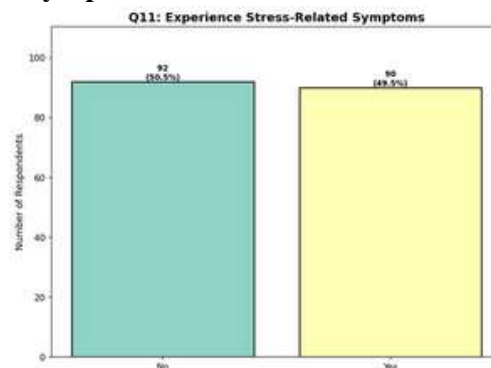
Q9: Primary Stress Sources



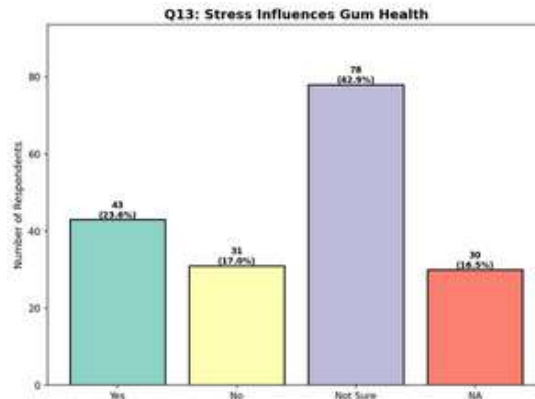
Q10: Overall Stress Level



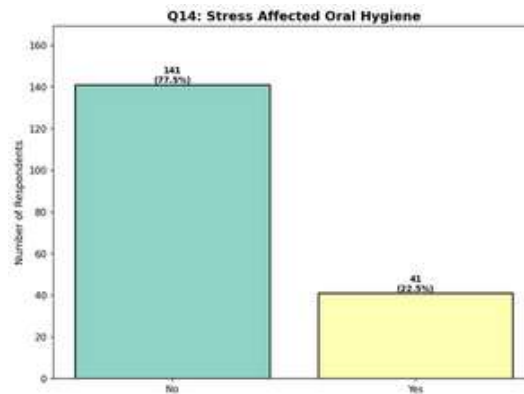
Q11: Experience Stress-Related Symptoms



Q13: Stress Influences Gum Health



Q14: Stress Affected Oral Hygiene

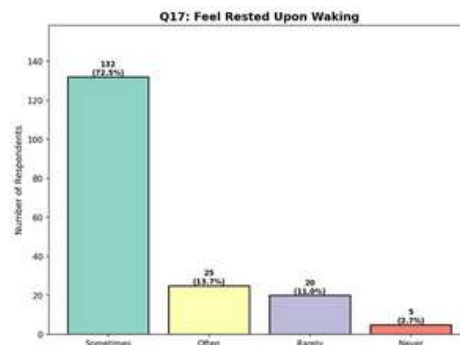


SLEEP QUALITY FINDINGS

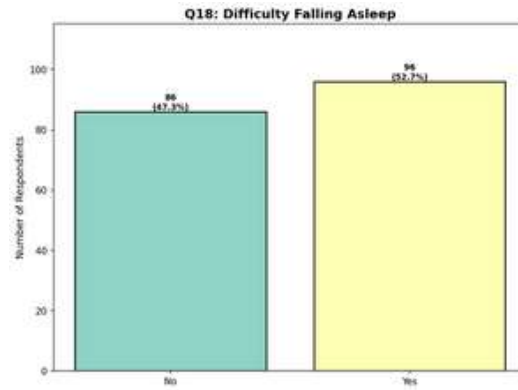
Q16: Hours of Sleep Per Night



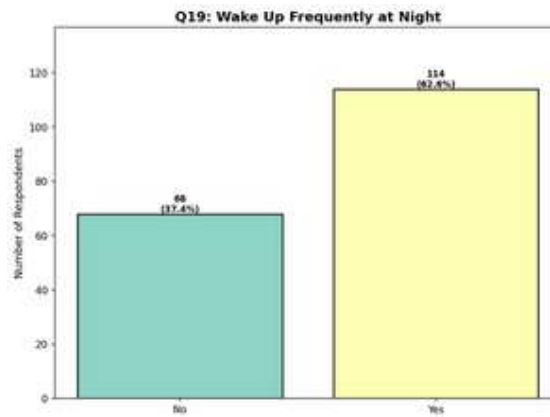
Q17: Feel Rested Upon Waking



Q18: Difficulty Falling Asleep



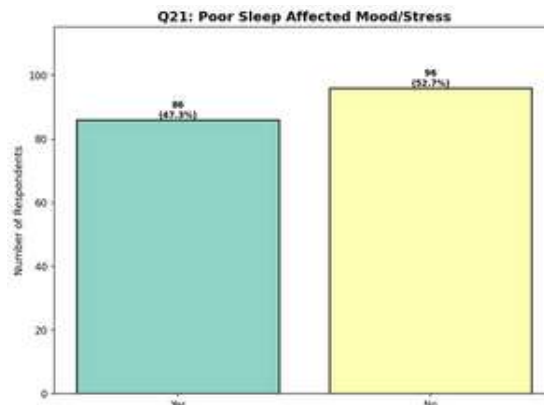
Q19: Wake Up Frequently at Night



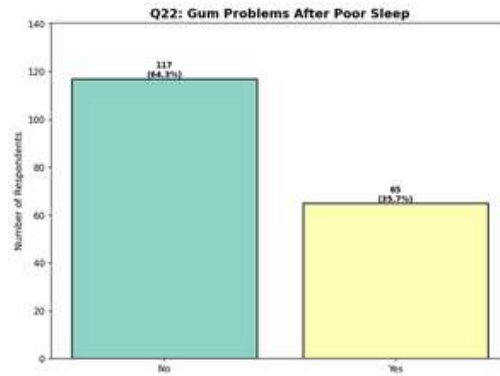
Q20: Sleep Quality Rating



Q21: Poor Sleep Affected Mood/Stress



Q22: Periodontal Problems After Poor Sleep

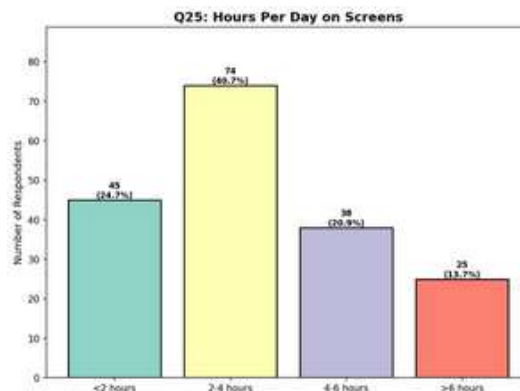


Q23: Sleep Quality Impacts Gum Health

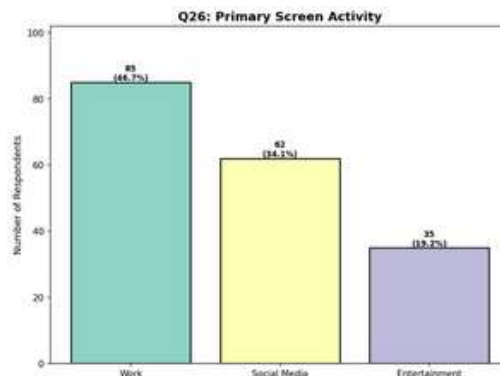


SCREEN TIME FINDINGS

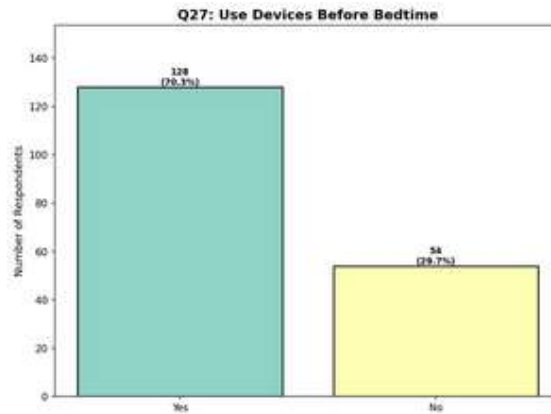
Q25: Hours Per Day on Screens



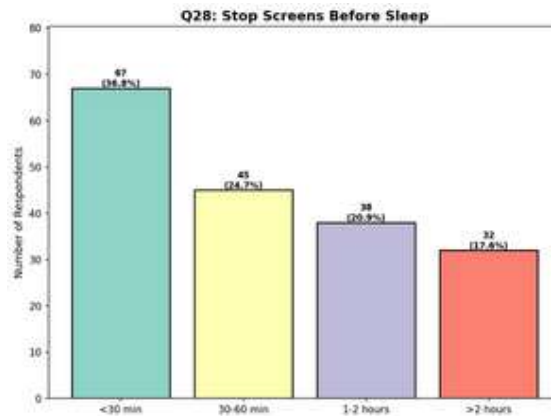
Q26: Primary Screen Activity



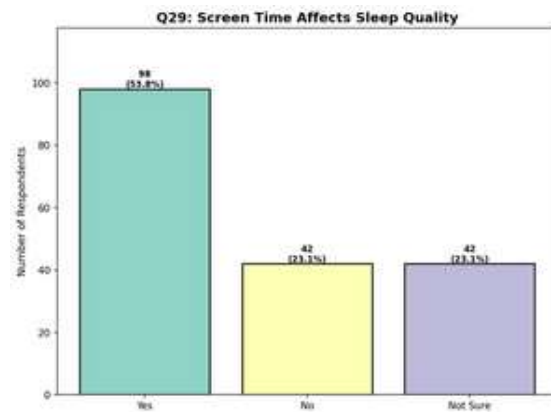
Q27: Use Devices Before Bedtime



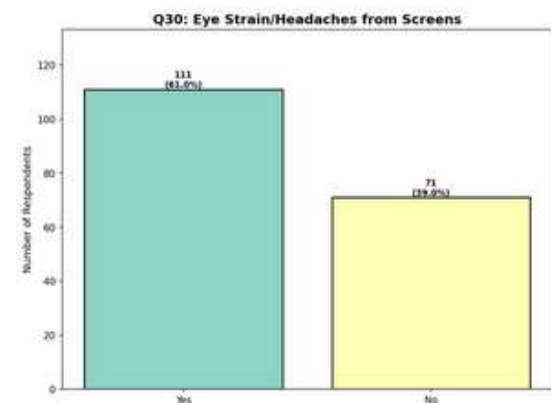
Q28: Stop Screens Before Sleep



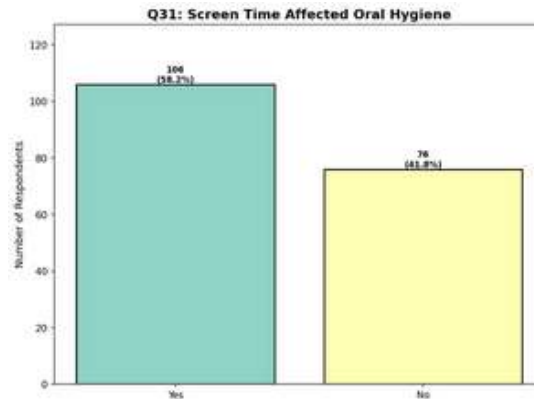
Q29: Screen Time Affects Sleep Quality



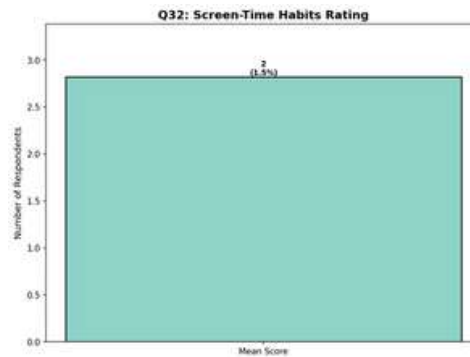
Q30: Eye Strain/Headaches from Screens



Q31: Screen Time Affected Oral Hygiene

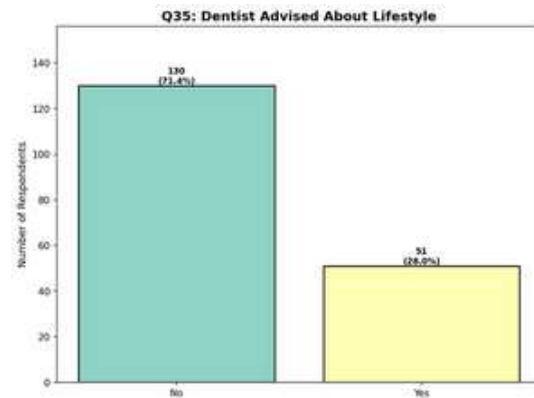


Q32: Screen-Time Habits Rating

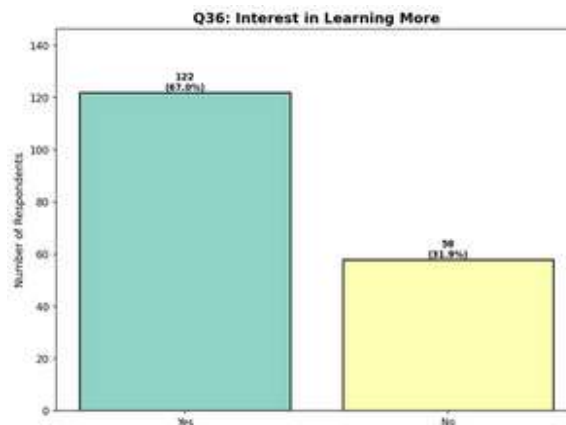


KNOWLEDGE & AWARENESS

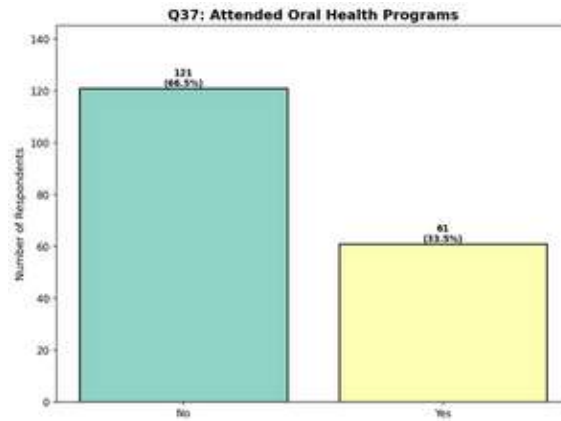
Q35: Dentist Advised About Lifestyle



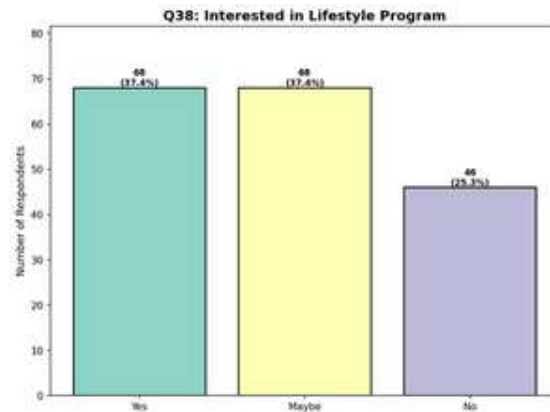
Q36: Interest in Learning More



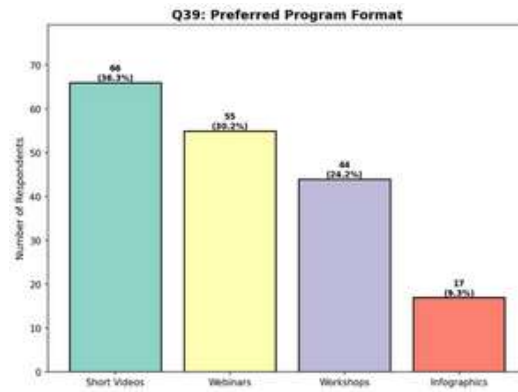
Q37: Attended Oral Health Programs



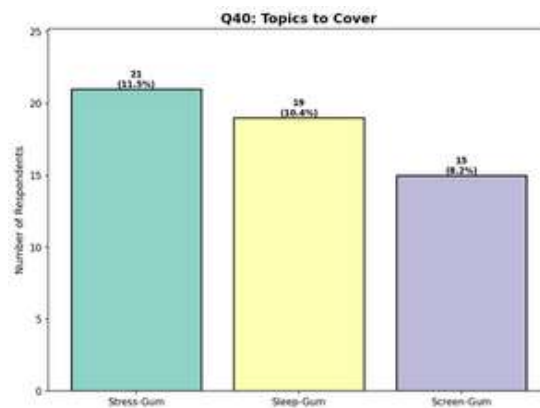
Q38: Interested in Lifestyle Program



Q39: Preferred Program Format



Q40: Topics to Cover



DISCUSSION

The present study examined the interrelationship between stress levels, sleep quality, screen-time behaviours, and periodontal awareness among adults. The findings contribute to the expanding evidence that lifestyle and psychosocial determinants play a substantial role in periodontal health.

A high proportion of respondents reported experiencing daily stress, consistent with prior literature identifying psychological stress as a major predictor of periodontal inflammation (Genco & Ho, 1999; Kapoor et al., 2020). Elevated cortisol levels associated with chronic stress have been shown to impair immune function, alter host–microbial balance, and facilitate periodontal disease progression (Peruzzo et al., 2007; Kiecolt-Glaser et al., 2010). The limited awareness observed among respondents regarding stress–periodontium relationships mirrors findings from earlier population-based surveys, which similarly documented inadequate public understanding of behavioural risk factors for gum disease (Peruzzo et al., 2007).

Sleep insufficiency was also prevalent, with more than half of the participants reporting a habitual sleep duration of only 5–6 hours. This aligns with existing evidence demonstrating that short sleep duration and poor sleep quality significantly elevate the risk of periodontal tissue destruction (Carra et al., 2020; Panchal et al., 2021). Studies by Carra et al. and Jayachandran et al. have specifically linked inadequate sleep to heightened inflammation, impaired healing responses, and accelerated periodontal breakdown, supporting the present survey’s observation that respondents who experienced poor sleep often reported compromised periodontal wellbeing (Carra et al., 2020; Jayachandran et al., 2017).

Screen-time exposure constituted another prominent finding, particularly device use before bedtime. Such behaviours are known to disrupt circadian rhythms, delay melatonin secretion, and impair restorative sleep (Twenge, 2019; Chang et al., 2015). Digital eye strain, reported by most respondents, is similarly associated with prolonged blue-light exposure. Behavioural science literature suggests that excessive screen engagement increases stress levels and contributes to neglect of routine self-care practices, including oral hygiene (Twenge, 2019). Parallel findings in adolescent populations have demonstrated associations between extended screen time, sleep disruption, and poorer oral health outcomes (Nagata et al., 2020), supporting the multifactorial behavioural pathway identified in this study.

Collectively, the convergence of elevated stress, inadequate sleep, and excessive digital exposure suggests a pattern of lifestyle-related risks that may indirectly compromise periodontal health. These results highlight the need for enhanced public health strategies, as the survey revealed substantial knowledge gaps, particularly regarding the effects of stress and sleep on the periodontium. Although only a minority of respondents reported receiving lifestyle counselling from dental professionals, a majority demonstrated interest in acquiring such knowledge, underscoring an important opportunity for preventive education.

The findings support the hypothesis that behavioural and lifestyle factors significantly influence periodontal-related awareness and oral hygiene behaviours. However, the results also indicate that many participants may not perceive early or subtle periodontal symptoms, reflecting the need for greater education on recognising early disease indicators.

This study possesses several limitations, including its cross-sectional design, reliance on self-reported data, and potential recall and social desirability biases. The sample, while diverse, may not fully represent broader populations. Despite these limitations, the study’s strengths lie in its integration of three lifestyle dimensions : stress, sleep, and screen time, rarely evaluated concurrently in periodontal

research. The robust sample size and multifactorial behavioural framework offer novel contributions to preventive dentistry literature.

Digital lifestyle-coaching platforms, sleep-tracking devices, and stress-management applications may serve as promising tools for enhancing patient adherence and improving periodontal outcomes. Education programmes delivered in preferred formats—such as short videos and webinars—may further enhance public understanding of lifestyle–periodontium relationships. Collectively, these approaches may advance a more holistic, preventive model of periodontal care that integrates behavioural science with evidence-based clinical practice.

CONCLUSION

This study establishes that psychosocial stress, inadequate sleep, and excessive screen-time exposure are highly prevalent behavioural patterns that may exert deleterious effects on periodontal health. The results reinforce the biological plausibility that elevated cortisol levels—triggered by chronic stress—impair host immune function, disturb the oral microbiome, and potentiate inflammatory pathways central to periodontal tissue destruction. Similarly, insufficient and fragmented sleep, often aggravated by late-night screen exposure and circadian dysregulation, may exacerbate systemic inflammatory responses and diminish the body’s capacity for periodontal repair and immune modulation. Despite these well-documented mechanisms, the survey revealed limited public awareness of how these lifestyle factors converge to influence periodontal outcomes.

These findings underscore an urgent need for multidimensional public health initiatives that integrate stress-management strategies, sleep-hygiene optimisation, and responsible digital-use practices into periodontal disease prevention frameworks. By addressing the neuroendocrine and behavioural pathways linking lifestyle habits to periodontal deterioration, clinicians and policymakers can advance a more comprehensive, biologically informed, and preventive model of periodontal care. Such an approach holds promise for improving population-level periodontal resilience and mitigating the burden of lifestyle-mediated periodontal disease.

REFERENCES

1. Aksaka N, Chen Y, Li R, et al. Digital screen exposure and its systemic and oral health impacts. *BMC Oral Health*. 2025;25:67–49.
2. Botelho J, Machado V, Proença L, et al. Sleep quality, stress, and digital behaviour as determinants of oral health. *J Oral Rehabil*. 2020;47(2):182–190.
3. Carra MC, Alkhouri I, Schwahn C, et al. Sleep disorders and periodontal diseases: A comprehensive review. *Periodontol 2000*. 2024;84(1):343–360.
4. Castro MML, Vale D, Andrade L, et al. Impact of lifestyle factors on periodontal disease. *Int J Environ Res Public Health*. 2020;17(18):1–10.
5. Chang A-M, Aeschbach D, Duffy JF. Evening screen exposure and circadian disruption. *PNAS*. 2015;112(4):1232–1237.
6. Genco RJ, Ho AW. Stress and periodontal disease progression: A critical review. *Ann Periodontol*. 1999;4(1):91–100.
7. Guerra-Pacheco MM, Salinas-Pérez JA, Díaz-Rodríguez L, et al. Screen time, behavioural patterns, and oral hygiene outcomes. *BMC Oral Health*. 2024;24:4714.

8. Jayachandran G, Prasad M, Rajkumar K, et al. Effects of sleep fragmentation on oral and periodontal health. *Sleep Med Res.* 2023;14(3):157–165.
9. Jayachandran S, Paramasivam V, Muthu J. Impact of sleep quality on periodontal breakdown. *J Clin Diagn Res.* 2017;11(7):ZC24–ZC28.
10. Kapoor P, Sharma A, Sood N, et al. Psychosocial stress and periodontal inflammation. *J Periodontal Res.* 2020;55(3):367–378.
11. Kiecolt-Glaser JK, Gouin J-P, Hantsoo L. Stress-induced immune dysfunction and health outcomes. *Nat Rev Immunol.* 2010;10(4):268–276.
12. Macrì M, Romano F, Aimetti M, et al. Neuroendocrine dysregulation and periodontal breakdown. *J Clin Med.* 2024;13(10):2942.
13. Mannem S, Chava VK. Stress and periodontal disease: Pathophysiology and clinical implications. *J Indian Soc Periodontol.* 2012;16(3):365–369.
14. Nagata JM, Cortez CA, Cattle CJ, et al. Screen time and oral health in adolescents. *J Adolesc Health.* 2020;67(6):888–896.
15. Panchal V, Patel A, Chavda N. Sleep disturbances as a risk factor for periodontitis. *Sleep Med Rev.* 2021;58:101442.
16. Peruzzo DC, Benatti BB, Ambrosano GM, et al. Stress and periodontal disease: Public awareness. *J Clin Periodontol.* 2007;34(5):347–352.
17. Refulio Z, Rocafuerte M, Cafferata EA, et al. Association between sleep deficiency and periodontal inflammation. *J Periodontal Implant Sci.* 2013;43(2):96–100.
18. Twenge JM. Screen time, stress, and self-care behaviours: A behavioural health analysis. *Psychol Sci.* 2019;30(9):1271–1287.
19. Wadia R. Lifestyle influences on periodontal and oral health. *Br Dent J.* 2020;229(9):593–598.