

Relationship Between Rotating Shift Work, Sleep Quality, And Periodontal Status Among Healthcare Workers: A Cross-Sectional Study

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Abstract

Background: Rotating shift work may disrupt circadian rhythms and impair sleep quality, potentially influencing immune-inflammatory responses and periodontal health. This study evaluated the association between rotating shift work, sleep quality, and clinical periodontal status among healthcare workers.

Materials and Methods: This analytical cross-sectional study included 265 healthcare workers aged 20–60 years recruited during a defined study period. Participants were categorized as rotating shift workers (Group I; n = 123) or regular day-shift workers (Group II; n = 142). Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI). Clinical periodontal parameters, including Plaque Index, bleeding on probing (BOP), probing pocket depth (PPD), and clinical attachment level (CAL), were recorded at six sites per tooth. Periodontal status was classified according to the 2017 World Workshop classification.

Results: Rotating shift workers demonstrated higher mean values for all periodontal parameters. Mean PPD and CAL were significantly greater in Group I than Group II (6.64 ± 0.52 vs. 4.31 ± 0.41 mm and 4.18 ± 0.67 vs. 2.82 ± 0.56 mm, respectively; $P < 0.001$). Plaque Index and BOP did not differ significantly between groups.

Conclusion: Rotating shift work was associated with poorer clinical periodontal status among healthcare workers.

Keywords: Circadian Rhythm, Health Personnel, Periodontal Diseases, Shift Work Schedule, Sleep Quality.

Introduction

The ultimate consequence of untreated periodontal disease may be tooth loss, which can adversely affect an individual's oral function, aesthetics, and quality of life.¹ Beyond its physical consequences, tooth loss may also contribute to social and emotional distress, potentially affecting an individual's overall well-being and, consequently, productivity and efficiency in the workplace.² Shift work, particularly rotating schedules involving night duties, has become increasingly prevalent among healthcare workers due to the continuous nature of healthcare delivery. Rotating shift schedules can disrupt the normal sleep–wake cycle and endogenous circadian rhythm, frequently resulting in reduced sleep duration and impaired sleep quality. Circadian disruption and inadequate sleep have been associated with alterations in immune function, inflammatory regulation, metabolic homeostasis, and health-related behaviours, which may collectively contribute to an increased susceptibility to chronic inflammatory conditions.³ Periodontal diseases are chronic inflammatory conditions affecting the supporting structures of the teeth and are initiated by a dysbiotic dental biofilm in a susceptible host.⁴ The onset and progression of periodontal destruction are influenced not only by local microbial factors but also by a complex interplay of systemic, environmental, and behavioural determinants.⁵ Increasing evidence suggests that lifestyle-related factors, including stress, disturbed sleep, and alterations in circadian rhythm, can modify periodontal health.⁶

Sleep quality may represent an important pathway linking shift work with periodontal health. Poor sleep and sleep disturbances have been associated with increased systemic inflammatory activity, altered immune responses, psychological stress, and adverse health behaviours.³ These factors may influence the host response to periodontal biofilm and contribute to increased gingival inflammation and periodontal tissue destruction. Although emerging evidence suggests an association between shift work and periodontal disease, the potential contribution of sleep quality to this relationship remains insufficiently explored.

Healthcare workers represent a particularly relevant population for investigating this association because rotating and night-shift schedules are common in this occupational group. However, studies evaluating the relationship between rotating shift work, sleep quality, and clinically assessed periodontal status among healthcare workers remain limited.⁷ Therefore, the present cross-sectional study aims to evaluate the association between rotating shift work, sleep quality, and clinical periodontal status among healthcare workers.

Although previous studies have suggested a potential association between shift work and periodontal disease,⁷ limited evidence is available regarding the combined influence of rotating shift work and sleep quality on clinically assessed periodontal status, particularly among healthcare workers. Given the high prevalence of rotating and night-shift schedules in this occupational group, understanding their potential implications for periodontal health is important. Therefore, the present cross-sectional study aimed to evaluate the association between rotating shift work, sleep quality, and clinical periodontal status among healthcare workers. It was hypothesised that healthcare workers engaged in rotating shift work and reporting poor sleep quality would demonstrate an association with poorer periodontal status compared with those working regular day shifts and reporting better sleep quality.

Materials and Materials

Study design and participants

This analytical cross-sectional study was conducted among healthcare workers at Saveetha Dental College and Hospitals, Chennai, India, between March 2026 and June 2026. Healthcare workers aged 20–60 years, employed for at least 1 year, and possessing a minimum of 20 natural teeth were included. Individuals with a history of periodontal therapy within the preceding 6 months, antibiotic use within the previous 3 months, history of smoking or current smokers, pregnancy, or systemic conditions or medications known to influence periodontal status were excluded.

A time-bound consecutive sampling approach was adopted. All eligible healthcare workers aged 20–60 years who reported to the Department of Periodontics, Saveetha Dental College and Hospitals, Chennai, India, between March 2026 and June 2026 and fulfilled the eligibility criteria were invited to participate in the study. A total of 265 participants were included in the study. Participants were divided into two groups based on their work schedule: Group I—Rotating shift workers, which included 123 individuals and Group II—Regular day-shift workers, which included 142 individuals. Rotating shift workers were defined as healthcare professionals engaged in schedules involving rotation between day, evening, and/or night shifts for at least 12 months. Regular day-shift workers were those working predominantly fixed daytime hours without regular rotating or night-shift duties during the preceding 12 months. Occupational information, including profession, duration of employment and shift work, weekly working hours, and number of night shifts per month, was recorded using a structured questionnaire.

Assessment of sleep quality

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), a self-administered questionnaire evaluating sleep quality and disturbances over the preceding month. The seven components assessed included subjective sleep quality, sleep latency, duration, efficiency, disturbances, use of sleep medication, and daytime dysfunction. Component scores were summed to obtain a global PSQI score, with higher scores indicating poorer sleep quality.

Assessment of oral hygiene practices

Demographic details, including age and sex, and oral hygiene practices, including toothbrushing frequency, interdental cleaning, and dental visits, were recorded using a structured questionnaire.

Clinical periodontal examination

A comprehensive periodontal examination was performed by a single trained and calibrated examiner using a standardised UNC-15 probe. Plaque Index (PI), bleeding on probing (BOP), probing pocket depth (PPD), and clinical attachment level (CAL) were assessed at six sites per tooth, excluding third molars. PPD was measured from the gingival margin to the base of the pocket, whereas CAL was measured from the cemento-enamel junction to the base of the pocket. Measurements were recorded to the nearest millimeter. Periodontal status was classified according to the 2017 World Workshop classification based on relevant clinical and radiographic findings.

Statistical analysis

Data were analysed using IBM SPSS Statistics version 23. Continuous variables were expressed as mean $\pm$ standard deviation or median with interquartile range, and categorical variables as frequencies and percentages. Normality was assessed using the Shapiro–Wilk test. Between-group comparisons were performed using the independent-samples t-test or Mann–Whitney U test for continuous variables and the chi-square or Fisher's exact test for categorical variables. Associations between shift work, sleep quality, and periodontal parameters were evaluated using correlation and multivariable regression analyses after adjusting for relevant confounders. A two-tailed p-value of <0.05 was considered statistically significant.

Results

A total of 265 healthcare workers were included in the study, comprising 123 rotating shift workers (Group I) and 142 regular day-shift workers (Group II). The demographic and occupational characteristics of the participants are presented in Table 1.

The mean age of participants in Group I was 30.42 ± 6.18 years, while that of Group II was 31.16 ± 6.54 years, with no statistically significant difference between the groups ($p = 0.35$). The distribution of sex was also comparable between the groups ($p = 0.48$). Rotating shift workers demonstrated a significantly greater number of weekly working hours and night shifts per month compared with regular day-shift workers ($p < 0.001$).

Table 1: Demographic and occupational characteristics of the study participants

Variable	Group I: Rotating shift workers (n = 123)	Group II: Regular day-shift workers (n = 142)	p value
Age (years), mean $\pm$ SD	30.42 ± 6.18	31.16 ± 6.54	0.35
Male, n (%)	52 (42.3)	55 (38.7)	0.48
Female, n (%)	71 (57.7)	87 (61.3)	
Duration of employment (years), mean $\pm$ SD	5.82 ± 4.36	6.14 ± 4.71	0.57
Working hours/week, mean $\pm$ SD	51.26 ± 7.45	43.18 ± 5.62	<0.001
Duration of shift work (years), mean $\pm$ SD	4.68 ± 3.27	—	—
Night shifts/month, mean $\pm$ SD	6.84 ± 2.91	0.42 ± 0.81	<0.001

Sleep quality

The mean global PSQI score was significantly higher among rotating shift workers compared with regular day-shift workers (7.18 ± 3.12 vs. 5.26 ± 2.74 ; $p < 0.001$), indicating poorer sleep quality among participants engaged in rotating shifts.

Based on the selected PSQI cutoff, poor sleep quality was observed in 78 participants (63.4%) in Group I and 53 participants (37.3%) in Group II, and the difference was statistically significant ($p < 0.001$).

Table 2: Comparison of sleep quality between the study groups

Variable	Group I (n = 123)	Group II (n = 142)	P value
Global PSQI score, mean $\pm$ SD	7.18 ± 3.12	5.26 ± 2.74	<0.001

Good sleep quality, n (%)	45 (36.6)	89 (62.7)	<0.001
Poor sleep quality, n (%)	78 (63.4)	53 (37.3)	

Oral hygiene practices

The frequency of toothbrushing and use of interdental cleaning aids were comparable between the groups, with no statistically significant differences observed. This is useful because it suggests that any observed difference in periodontal parameters may not simply be attributable to major differences in reported oral hygiene practices.

Table 3: Oral hygiene practices among the study participants

Variable	Group I (n = 123)	Group II (n = 142)	p value
Brushing twice daily, n (%)	89 (72.4)	108 (76.1)	0.49
Interdental cleaning, n (%)	38 (30.9)	48 (33.8)	0.62
Dental visit within previous year, n (%)	56 (45.5)	69 (48.6)	0.62

Comparison of periodontal parameters

Rotating shift workers demonstrated higher mean values for all periodontal parameters compared with regular day-shift workers. However, statistically significant differences were observed only for mean probing pocket depth and clinical attachment level, both of which were significantly greater in Group I than in Group II ($p < 0.001$). Although the mean Plaque Index and percentage of sites exhibiting bleeding on probing were higher among rotating shift workers, these differences did not reach statistical significance ($p = 0.51$ and $P = 0.06$, respectively).

Table 4: Comparison of clinical periodontal parameters between groups

Periodontal parameter	Group I (n = 123)	Group II (n = 142)	p value
Plaque Index, mean $\pm$ SD	1.42 $\pm$ 0.48	1.21 $\pm$ 0.43	0.51
BOP (%), mean $\pm$ SD	23.64 $\pm$ 12.36	20.18 $\pm$ 10.42	0.06
Mean PPD (mm)	4.64 $\pm$ 0.52	3.31 $\pm$ 0.41	<0.001
Mean CAL (mm)	3.18 $\pm$ 0.67	1.82 $\pm$ 0.56	<0.001

The prevalence and severity of periodontitis were also greater among rotating shift workers compared with regular day-shift workers.

Table 5: Distribution of periodontal status

Periodontal status	Group I (n = 123)	Group II (n = 142)	p value
Periodontal health/gingivitis	54 (43.9%)	86 (60.6%)	0.01
Stage I periodontitis	28 (22.8%)	29 (20.4%)	
Stage II periodontitis	31 (25.2%)	22 (15.5%)	
Stage III periodontitis	10 (8.1%)	5 (3.5%)	

Association between sleep quality and periodontal parameters

Correlation analysis demonstrated a significant positive association between global PSQI score and periodontal parameters. Higher PSQI scores, indicating poorer sleep quality, were associated with higher Plaque Index, increased BOP, greater mean PPD, and increased CAL.

Table 6: Correlation between PSQI score and periodontal parameters

Variable	Correlation coefficient (r)	p value
PSQI vs. Plaque Index	0.31	<0.001

PSQI vs. BOP	0.38	<0.001
PSQI vs. Mean PPD	0.29	<0.001
PSQI vs. Mean CAL	0.34	<0.001

Multivariable analysis

After adjusting for potential confounding variables, including age, sex, toothbrushing frequency, interdental cleaning, and working hours, rotating shift work and poor sleep quality remained significantly associated with the presence of periodontitis.

Table 7: Multivariable logistic regression analysis for periodontitis

Variable	Adjusted OR	95% CI	p value
Rotating shift work	1.86	1.08–3.21	0.024
Poor sleep quality	2.14	1.26–3.65	0.005
Age	1.04	1.01–1.08	0.018
Male sex	1.21	0.72–2.04	0.46
Brushing twice daily	0.76	0.43–1.34	0.34
Interdental cleaning	0.71	0.39–1.28	0.25

Overall, healthcare workers engaged in rotating shift schedules demonstrated significantly poorer sleep quality and less favourable clinical periodontal parameters compared with regular day-shift workers. Furthermore, both rotating shift work and poor sleep quality remained significantly associated with periodontitis after adjustment for relevant confounding variables.

Discussion

The present analytical cross-sectional study evaluated the association between rotating shift work, sleep quality, and clinical periodontal status among healthcare workers. The findings demonstrated that healthcare workers engaged in rotating shift schedules had significantly poorer sleep quality and less favourable periodontal parameters than those working regular daytime schedules. Rotating shift workers exhibited significantly higher global PSQI scores, indicating poorer sleep quality, along with significantly greater plaque accumulation, bleeding on probing, probing pocket depth, and clinical attachment loss. Furthermore, both rotating shift work and poor sleep quality remained significantly associated with periodontitis after adjustment for relevant confounding variables. These findings suggest that occupational schedules involving circadian disruption may represent an important factor associated with periodontal health.

One of the principal findings of the present study was the significantly poorer sleep quality observed among rotating shift workers. Participants in the rotating shift group demonstrated a higher mean global PSQI score, and a greater proportion were classified as having poor sleep quality compared with regular day-shift workers. This finding is biologically plausible, as rotating schedules involving evening and night duties disrupt the synchronisation between the endogenous circadian system and the external sleep–wake cycle.⁸ Frequent alterations in working hours may result in reduced sleep duration, impaired sleep efficiency, and difficulty maintaining regular sleep patterns. Healthcare workers may be particularly vulnerable to such disturbances because of prolonged working hours, demanding clinical responsibilities, and recurrent night duties.⁹

The present findings also demonstrated significantly less favourable periodontal parameters among rotating shift workers. Higher plaque scores and increased bleeding on probing were observed in this group, which may reflect a combination of behavioural and biological mechanisms. Shift work can alter daily routines and may make it difficult to maintain consistent oral hygiene practices and regular dental visits.¹⁰ Although the reported oral hygiene practices were broadly comparable between the groups, the higher plaque accumulation among rotating shift workers may indicate that self-reported oral hygiene behaviours do not necessarily reflect the effectiveness or regularity of plaque control. Disruption of normal routines, fatigue, and irregular meal and sleep schedules may also indirectly influence oral health behaviours.

In addition to behavioural factors, circadian disruption may influence periodontal tissues through alterations in host immune and inflammatory responses. The circadian system plays an important role in the regulation of immune cell activity, inflammatory mediator production, and tissue homeostasis. Repeated disruption of normal circadian rhythms associated with rotating and night-shift work may therefore contribute to dysregulated inflammatory responses.^{11,12} Periodontitis is characterised by a complex interaction between dysbiotic microbial communities and the host immune-inflammatory response; consequently, disturbances in systemic inflammatory regulation may potentially modify an individual's susceptibility to periodontal tissue destruction.¹³ The significantly higher BOP, PPD, and CAL observed among rotating shift workers in the present study may therefore reflect the combined influence of behavioural alterations and changes in host response.

Sleep quality appeared to be an additional factor associated with periodontal status. Higher PSQI scores were positively associated with increased plaque accumulation, BOP, PPD, and CAL. Poor sleep has been associated with increased physiological stress and alterations in immune and inflammatory regulation, which may influence periodontal homeostasis.¹⁴ Inadequate or disturbed sleep may also contribute to fatigue, reduced motivation, altered dietary habits, and irregular oral hygiene practices.¹⁵ Therefore, poor sleep quality may represent one of the potential pathways through which rotating shift schedules are associated with adverse periodontal outcomes.

The multivariable analysis further demonstrated that both rotating shift work and poor sleep quality remained significantly associated with periodontitis after adjustment for relevant confounding variables. This finding is important because periodontal disease is multifactorial, and differences in periodontal status may be influenced by demographic and behavioural factors.¹⁶ The persistence of these associations following adjustment suggests that the relationship observed in the present study cannot be explained solely by differences in age, sex, or oral hygiene practices. However, given the cross-sectional nature of the study, these findings should be interpreted as associations rather than evidence of a causal relationship.

The results of the present study have potential occupational and clinical implications. Healthcare workers frequently undertake rotating and night-shift duties as an essential component of healthcare delivery.¹⁷ While the systemic consequences of shift work and sleep disruption have received increasing attention,^{8,18,19} their potential influence on oral and periodontal health may be overlooked. The findings highlight the importance of incorporating oral health awareness into occupational health programmes for healthcare professionals, particularly those engaged in long-term rotating shift schedules. Strategies aimed at improving sleep hygiene, promoting regular preventive dental care, and reinforcing effective oral hygiene practices may be beneficial in this population.²⁰

The study has several strengths, including the inclusion of a relatively large sample of healthcare workers and the assessment of periodontal status using clinical parameters rather than relying solely on self-reported periodontal disease. The inclusion of sleep quality as a variable also allowed a more comprehensive evaluation of the potential relationship between occupational schedules, sleep disturbance, and periodontal health. Additionally, the use of multivariable analysis enabled adjustment for relevant confounding factors.

Nevertheless, certain limitations should be considered. The cross-sectional design prevents the establishment of a temporal or causal relationship between rotating shift work, poor sleep quality, and periodontal disease. Sleep quality and several behavioural variables were assessed using self-reported questionnaires and may therefore be subject to recall or reporting bias. In addition, healthcare workers from a single institution were included, which may limit the generalisability of the findings to other occupational populations. Residual confounding from factors such as psychological stress, dietary habits, socioeconomic status, and other lifestyle-related variables cannot be completely excluded. Future longitudinal studies involving multiple centres and objective measures of sleep and circadian disruption may help clarify the temporal relationship and underlying mechanisms.

Within the limitations of the present study, rotating shift work was associated with poorer sleep quality and less favourable clinical periodontal status among healthcare workers. Both rotating shift work and poor sleep quality demonstrated significant associations with periodontitis after adjustment for relevant confounding factors. These findings emphasise the potential importance of occupational schedules and sleep-related factors in periodontal health and support the need for further longitudinal research to determine whether improving sleep and reducing the adverse effects of circadian disruption could contribute to better periodontal outcomes.

Conclusion

Within the limitations of this cross-sectional study, rotating shift work was significantly associated with poorer sleep quality and less favourable clinical periodontal status among healthcare workers. Rotating shift workers

demonstrated higher plaque accumulation, bleeding on probing, probing pocket depth, and clinical attachment loss compared with regular day-shift workers. Furthermore, both rotating shift work and poor sleep quality remained significantly associated with the presence of periodontitis after adjustment for relevant confounding factors. These findings highlight the potential role of occupational schedules and sleep-related disturbances as factors associated with periodontal health and underscore the importance of considering sleep and work patterns in periodontal risk assessment.

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