

Sleep Quality Impact on the Oral Health Status of Thermal Power Plant Workers in Visakhapatnam: A Cross-sectional Study

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Abstract

Background: The occupational environment plays a crucial role in the general and oral health of workers. Thermal power plant is one of the main sources of electricity generation. In India, a large number of people work in thermal power plants. Long working hours and shift work also affect the oral health and general health of thermal plant workers due to inadequate sleep, and heavy workload. The aim of the present study is to assess the impact of sleep quality on oral health in thermal power plant workers in Visakhapatnam. **Materials and Methods:** A convenience sampling technique is used. The questionnaire included various demographic factors and the overall sleep quality of each worker will be determined using the Pittsburgh Sleep Quality Index among thermal power plant workers. The collected data were entered into Microsoft Word Excel Sheet 2019 version and were analyzed using statistical software (SPSS version 21). Chi-square test had been used. **Results:** The results showed that 19.6% of workers were employed for 20 years. Of the total workers, 149 (62.86%) were doing shift work. Sixty-three (41.7%) workers were working for >8 h/day. **Conclusion:** The present study has shown that a significant proportion of production line workers, especially shift workers, had poor sleep quality.

Keywords: Sleep quality, Oral health, Sleep latency, Stress.

INTRODUCTION

The World Health Organization (WHO) has a definition of good oral health: “Oral health means being free of chronic mouth and facial pain, oral and throat cancer, oral sores, birth defects such as cleft lip and palate, periodontal (gum) disease, tooth decay and tooth loss, and other diseases and disorders that affect the mouth and oral cavity” (Håkansson 2010). A person spends one-third of his life at work on average; thus, the environment in which he works can be a major factor in determining health (Singh *et al.*, 2015).^[1] The occupational environment plays a crucial role in the general and oral health of workers. An occupational disease is a negative change in health condition caused by more or less prolonged exposure to hazardous substances or conditions directly related to an individual’s work.^[2]

In practice, any work schedule that does not fall within the hours of 09:00–17:00 or 08:00–16:00 is called shift work. Shift workers typically experience symptoms similar to those experienced in people suffering from jet lag as a result of their internal biological clock being disrupted. During working hours, they frequently grow unreasonably drowsy.^[3]

Shift workers have a higher risk of mental, cardiovascular, gastrointestinal, and emotional issues.

Thermal power plant is one of the main sources of electricity generation. In India, a large number of people work in thermal power plants. The health of employees is jeopardized by many modern industrial processes. The thermal power plant has had an impact on the environment at all stages of the process in the area.^[4] Because the majority of the work is done with coal, steam, and other potentially hazardous materials, it causes a variety of occupational diseases in the workers. Sleep deprivation is becoming increasingly common in today’s society^[5]. Long working hours and shift work also affects the oral health and general health of thermal plant

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workers due to inadequate sleep, and heavy workload.^[4] Because the majority of the work is done with coal, steam, and other potentially hazardous materials, it causes a variety of occupational diseases in the workers.^[6] The disruption of the regular circadian rhythm activity in the body, shift work may lead to several dangerous health conditions.^[7] The resulting sleep deprivation leads to increased short term illness and long term medical problems.^[8]

Hence, the present study had been conducted with the aim to assess the impact of sleep quality on oral health in thermal power plant workers in Visakhapatnam.

MATERIALS AND METHODOLOGY

The present cross-sectional study had been conducted among the employees working in the thermal power plant of Visakhapatnam. Ethical approval to conduct the study was obtained from the ethical committee of Anil Neerukonda Institute of Dental Sciences, before commencing the study under Ref No. ANIDS\IEC\2121014.

Before the inclusion of respondents in the survey, an investigator will be in charge of assessing the legitimacy of participation, describing the facts of the research, the goal of the research, the processes, and the content of the questions. Data anonymity, confidentiality, and privacy will be explained. Both production line and administrative line workers, who gave consent for the study, had been included in the study.

Sample size was calculated based on the prevalence of the poor sleep quality, that is, 72.25%. The sample size is assessed using the formula $N = z^2 pq / L^2$. 95% confidence interval and 6% allowable error and the minimum sample size are determined as 224 which is rounded off to 225. A convenience sampling technique was employed.

The questionnaire included various demographic factors (age, sex, type of work, shift work, and working hours per day) and habits including personal habits and adverse habits (smoking, tobacco chewing, and alcohol) with their duration and frequency, and the overall sleep quality of each worker will be determined using the Pittsburgh Sleep Quality Index (PSQI). The PSQI is a tool used to assess the quality and patterns of sleep in older adults. It is a self-reported measure of sleep quality that is brief, reliable, valid, and standardized.

It differentiates “poor” from “good” sleep by measuring seven domains: (1) Subjective sleep quality (self-perceived), (2) sleep latency (how long it usually takes to fall asleep), (3) sleep duration (actual sleeping hours), (4) habitual sleep efficiency, (5) sleep disturbances (while sleeping), (6) daytime dysfunction, and (7) use of sleep medication over the past month. All participants rated each of these seven areas of sleep. PSQI questionnaire will be modified from the original to include the seven questions representing each domain. Scoring of the answers was based on a 0–3 scale, whereby 3 reflected the negative extreme on the Likert scale. Finally, we added up the points obtained for the seven questions that contribute

to the total score. The component scores will be summed to produce a global score (range 0–21). 0 indicates no difficulty in sleep while 21 indicates severe difficulty.

The clinical examination was conducted by a single calibrated examiner. The WHO Type III examination carried out using the WHO probe, natural light, mouth mirror, and explorer while the study participants will be seated on ordinary chairs. Following the interview, the examiner assessed, the periodontal status and dental caries will be recorded using the rules and criteria of the community periodontal index and respectively, and loss of attachment (LOA) recorded using the guidelines of the WHO Oral Health Assessment Form 2013.^[9]

Statistical analysis

The collected data were coded, compiled, and entered into Microsoft Word Excel Sheet 2019 version and were analyzed using statistical software (SPSS version 21). Chi-square test had been used.

RESULTS

The present study was conducted on a study population of 152 participants. Table 1 shows the number of participants where males were 151 (98.7%) and females were 1 (1.3%). Results showed that 19.6% of workers were employed for 20 years. Of the total workers, 149 (62.86%) were doing shift work. 63 (41.7%) workers were working for >8 h/day. A total number of 54 (35.8%) workers had the habit of tobacco, and 62 (41.1%)

Table 1: Demographic details of Participants

Variable	N (%)
Age	
30–39	17 (11.3%)
40–49	87 (57.6%)
50–59	47 (31.1%)
Gender	
Males	151 (98.7%)
Females	1 (1.3%)
Years of work experience (years)	
Up to 3	70 (46.4%)
3–10	48 (31.8%)
10–20	14 (9.3%)
Over 20	19 (12.6%)
Type of work	
Administrative	65 (43.0%)
Production line	86 (58.3%)
Shift work	
Yes	63 (41.7%)
No	88 (58.3%)
Working hours (per day)	
≤8	74 (49%)
8–12	70 (46.4%)
≥12	7 (4.6%)
Adverse habits	
Smoking	54 (35.8%)
Tobacco chewing	35 (23.2%)
Alcohol	62 (41.1%)

had the habit of consuming alcohol. Most of the workers (159, 67.09%) were using a brush, administration line and 65 (43.0%) production line 86 (58.3%) workers, respectively.

Table 2 shows the participants' scores for the seven components of PSQI showed that the subjective sleep quality of most of the workers (150, 63.3%) was fairly good. Maximum workers (82) had sleep latency of 1=16–30 and 83 workers had slept for 6–7 h in a day. Of the 152 workers, 61 had sleep disturbance

once a night, and 53 never had sleep disturbance. Workers who felt daytime dysfunction about twice a week during work were 87 and once a week 47. Around 87 workers needed medication once for sleep during the 1 month.

Table 3 shows that there are majority of participants of age group of 30–39 years with 51.7% of LOA and 78.3% of oral mucosal lesions. Table 4 shows the significant relationship between subjective sleep quality, sleep duration (h), and oral health status.

Table 2: The sleep quality of the patients using PSQI

Components of PSQI	N (%)
Subjective sleep quality	
0=Very good	9
1=Fairly good	65
2=Fairly bad	65
3=Very bad	12
Sleep latency (min)	
0≤15	52
1=16–30	82
2=31–60	17
3≥60	0
Sleep duration (h)	
0≥7	50
1=6–7	83
2=5–6	18
3≤5	0
Habitual sleep efficiency (%)	
0≥85	9
1=75–84	64
2=65–74	72
3≤65	6
Sleep disturbance	
0=Never	53
1=Once	61
2=Twice	22
3=Thrice	15
Daytime dysfunction	
0=Not during the last month	17
1=Once in a week	87
2=Twice in a week	47
3=Thrice in a week	
Need for sleep medications	
0=Not during last month	17
1=Once in a week	87
2=Twice in a week	47
3=Thrice in a week	0

PSQI: Pittsburgh Sleep Quality Index

DISCUSSION

The present study shows that majority of the workers were from over 20 years. These findings are in contrast with the study done by Anaise *et al.* in which sweet industry workers, the maximum workers were employed from 3 to 10 years. The majority of workers in the present study were engaged in shift work and longer working hours (8–12 h) in a day, and this is in line with the study done on bakery workers by Grover *et al.*^[5,10]

When sleep latency was evaluated, maximum workers in this study usually took ≤15 min to fall asleep. This may be due to the reason that increased exposure to the heat may tire them completely; the majority of the workers reported daytime dysfunction once which is in contrast with the study done by Kolo *et al.* in which maximum workers never had daytime dysfunction. This can be due to increased stress during the process of the machinery.^[7,11] The present study showed a majority of the production line workers were engaged in shift work and had poor sleep quality which was in line with the study done on factory workers.

The study's findings showed a negative correlation between factory workers' functional outcomes scores and their sleep quality (for the PSQI, a higher score denotes "bad" sleep quality, whereas a lower score denotes greater dysfunction) which is similar to the study conducted by Almetrek MA *et al.*^[8] This Index has proved to be a useful tool dental epidemiology and program evaluation.^[9] Prevalence of tobacco consumption was found to be 41.1% which is similar to the study done by Unalacak M *et al* coal workers in turkey.^[10]

Almetrek MA *et al* in which shift workers usually have poor sleep quality as compared to no shift workers. Though there is an association between sleep quality and periodontal status among different age groups in previous studies there is a significant relationship observed subjective sleep quality and sleep duration was associated with poor oral health status in this present study.^[12–14]

Table 3: Prevalence of oral health status according to age group

Age (in years)	Dental caries ^(0.136)	Gingival bleeding ^(0.806)	Pockets ^(0.379)	Loss of attachment ^(0.543)	Trauma ^(0.844)	Oral mucosal lesions ^(0.274)	Interventional urgency ^(0.155)
20–29	12 (18.3%)	5 (8.3%)	5 (8.3%)	5 (8.3%)	5 (8.3%)	2 (3.3%)	15 (25.0%)
30–39	30 (51.7%)	37 (61.7%)	37 (61.7%)	37 (51.7%)	31 (51.6%)	47 (78.3%)	27 (45.0%)
40–49	10 (16.7%)	10 (16.7%)	10 (16.7%)	10 (16.7%)	16 (26.6%)	7 (11.6%)	10 (16.7%)
50–59	4 (6.7%)	4 (6.7%)	4 (6.7%)	4 (6.7%)	8 (13.3%)	5 (8.3%)	4 (6.7%)
60–69	4 (6.7%)	4 (6.7%)	4 (6.7%)	4 (6.7%)	0 (0%)	4 (6.7%)	4 (6.7%)

Table 4: Impact of the PSQI scale on oral health status

Domains	Oral health status	P-value
Subjective sleep quality	Dental caries	0.004*
	Gingival bleeding	
	Pockets	
	Loss of attachment	
	Trauma	
	Oral mucosal lesions	
Sleep disturbance	Dental caries	0.114
	Gingival bleeding	
	Pockets	
	Loss of attachment	
	Trauma	
	Oral mucosal lesions	
Sleep duration (h)	Dental caries	0.001*
	Gingival bleeding	
	Pockets	
	Loss of attachment	
	Trauma	
	Oral mucosal lesions	

PSQI: Pittsburgh Sleep Quality Index

Although there is an association between sleep quality and periodontal status among different age groups in the previous studies conducted by Islam *et al.* and Romandini *et al.*, there is a significant relationship observed between subjective sleep quality and sleep duration and they are found to be associated with poor oral health status in the present study.^[15,16]

The limitations of the study were general health status of the subjects that were not taken into consideration which could have been an influencing factor on their oral health status. There is a need to incorporate oral health check-ups in the regular general health check-ups which are being carried out regularly. Oral health education programs, posters related to tobacco ill effects, and cessation benefits must be displayed. Tobacco cessation counseling centers must be established to provide individual attention and help to the workers who are addicted to tobacco to quit the habit.

CONCLUSION

The present study has shown that a significant proportion of production line workers, especially shift workers, had poor sleep quality. The working environment of thermal plants influences the sleep quality of the workers which indirectly affects their oral health as sleep deprivation leads to neglected oral care, more adverse habits, and thus poor oral health. The

findings of the present study encourage a need for an alternative working environment that might bring positive change in sleep quality and will help to improve the oral health of workers. To further assess the concerned scenario, there is a need to assess the knowledge, attitude, and practice among the thermal plant workers to have an insight into the level of awareness regarding oral health.

REFERENCES

1. Amin WM, Al-Omouh SA, Hattab FN. Oral health status of workers exposed to acid fumes in phosphate and battery industries in Jordan. *Int Dent J* 2001;51:169-74.
2. Singh K, Pandita V, Patthi B, Singla A, Jain S, Kundu H, *et al.* Is oral health of the sugar mill workers being compromised? *J Clin Diagn Res* 2015;9:ZC07-10.
3. Kohyama J. Which is more important for health: Sleep quantity or sleep quality? *Children (Basel)* 2021;8:542.
4. Abbas I, Mohammad SA, Pedireddy PR, Mocherla M, Koppula YR, Avidapu R. Oral health status of underground coal mine workers of Ramakrishnapur, Adilabad district, Telangana, India-a cross-sectional study. *J Clin Diagn Res* 2015;10:ZC28-31.
5. Grover V, Malhotra R, Kaur H. Exploring association between sleep deprivation and chronic periodontitis: A pilot study. *J Indian Soc Periodontol* 2015;19:304-7.
6. Rao KY, Reddy PP, Anjum S, Monica M, Irram A. and Pravalika TS. Oral health status of thermal power plant workers in Ramagundam, Telangana state, India – A cross-sectional study. *Int J Current Res* 2017;9:46190-3.
7. Cengiz Mİ, Zengin B, İçen M, Köktürk F. Prevalence of periodontal disease among mine workers of Zonguldak, Kozlu district, Turkey: A cross-sectional study. *BMC Public Health* 2018;18:361.
8. AlMetrek MA. Effect of shift-work on sleeping quality of male factory workers in Saudi Arabia. *Natl J Physiol Pharm Pharmacol* 2014;4:61-8.
9. Greene JC, Vermillion JR. The simplified oral hygiene index. *J Am Dent Assoc* 1964;68:7-13.
10. Kawalkar UG, Kakrani VA, Nagaonkar AS, Vedpathak VL, Dahire PL, Kogade PG. Morbidity profile of employees working in a thermal power station Parali. *Natl J Community Med* 2014;59:161-4.
11. Kumar A, Shrivatsava SM, Jain NK, Patel P. Identification of occupational diseases, health risk, hazard and injuries among the workers engaged in thermal power plant. *Int J Res Eng Technol* 2015;4:149-56.
12. Ursin R, Baste V, Moen BE. Sleep duration and sleep-related problems in different occupations in the Hordaland health study. *Scand J Work Environ Health* 2009;35:193-202.
13. Asad R, Jubeen S, Iqbal S. Effects of industrial environment on health status of workers. A case of noon sugar mill Bhalwal. *Acad Res Int* 2013;4:215-22.
14. Islam MM, Ekuni D, Toyama N, Taniguchi-Tabata A, Kataoka K, Uchida-Fukuhara Y, *et al.* Association between sleep quality and duration and periodontal disease among university students: A cross-sectional study. *Int J Environ Res Public Health* 2020;17:3034.
15. Romandini M, Gioco G, Perfetti G, Deli G, Staderini E, Lafori A. The association between periodontitis and sleep duration. *J Clin Periodontol* 2017;44:490-501.
16. Anaise JZ. Prevalence of dental caries among workers in the sweets industry in Israel. *Community Dent Oral Epidemiol* 1980;8:142-5.