ORIGINAL RESEARCH ARTICLE

Sleep Quality and Perceived Stress in Diverse Work Environments: The Role of Noise Exposure and Sociodemographic Factors

Abhishek S Afinwala[1*], Naresh T Chauhan[2], Kavita G Bodar[3], Jigna D Gohil[4], Harshad M Patel[5], Jayendrakumar K Kosambiya[6]

[1,2,5]Department of Community Medicine, Government Medical College, Surat, Gujarat, India
[3]Department of Community Medicine, Pacific Institute of Medical Sciences (PIMS), Udaipur, Rajasthan, India
[4]Indian Institute of Public Health Gandhinagar, Gujarat, India
[6]Department of Community Medicine, Kiran Medical College, Surat, Gujarat, India

DOI: 10.55489/njcm.161020255359

ABSTRACT

Background: Sleep disturbance is the most detrimental non-auditory effect of noise exposure. Study aims to assess perceived stress and sleep quality across different occupational and noise exposure environments, and to identify sociodemographic and occupational predictors of poor sleep.

Methodology: A cross-sectional study in Surat included 160 participants from three work environments based on noise exposure: New Civil Hospital Surat (30-50 dB), the urban field practice area (50-70 dB), and textile industries (>70 dB) using stratified, systematic, and simple random sampling methods, respectively. Univariate analysis using Chi-square and Kruskal-Wallis H tests identified associations, while binary logistic regression determined independent predictors.

Results: Textile workers reported the highest poor sleep quality (88.9%). Significant differences in sleep quality (p=0.001), but not stress (p=0.650), were observed across groups. Poor sleep was significantly associated with education, occupation, socioeconomic class, and shift work. Logistic regression revealed age, postgraduate education, and higher socioeconomic status as independent predictors of poor sleep.

Conclusion: Sleep quality is influenced by education, job type, socioeconomic class, and shift work, with poorer sleep in older, educated, and wealthier individuals. No significant association was found for perceived stress.

Keywords: Noise Exposure, Occupational Health, Perceived Stress, Sleep Quality

ARTICLE INFO

Financial Support: None declared

Conflict of Interest: The authors have declared that no conflict of interests exists.

Received: 21-03-2025, **Accepted**: 25-08-2025, **Published**: 01-10-2025

***Correspondence:** Dr. Abhishek Afinwala (Email: abhishekafinwala03@gmail.com)

How to cite this article: Afinwala AS, Chauhan NT, Bodar KG, Gohil JD, Patel HM, Kosambiya JK. Sleep Quality and Perceived Stress in Diverse Work Environments: The Role of Noise Exposure and Sociodemographic Factors. Natl J Community Med 2025;16(10):946-953. DOI: 10.55489/njcm.161020255359

www.njcmindia.com | pISSN: 0976-3325 | eISSN: 2229-6816 | Published by Medsci Publications

Introduction

In 1910, the foresight of esteemed physician and Nobel laureate Robert Koch foretold that "one day man will have to fight noise as fiercely as cholera and pest."[1,2]

Noise, often described simply as "unwanted sound," is a measurable yet often underestimated factor that profoundly impacts health. Its effects are particularly pronounced in influencing sleep quality, a cornerstone of overall well-being.[1,3] For adults, prolonged exposure to excessive noise in work environments not only induces stress but also disrupts sleep patterns, leading to a range of adverse effects.[4] This disruption of the sleep-wake cycle results in poor sleep quality,[5] which can impair cognitive function, mood stability, productivity, and increase absenteeism. Sleep disturbance, a prevalent non-auditory consequence of noise exposure, has been linked to various health issues, including depression, diabetes, cardiovascular diseases, as well as physical and mental disorders, which ultimately lead to escalated healthcare costs.[3,5-7]

Despite noise being quantifiable, its health implications have often been overlooked, emphasizing the urgency for effective mitigation strategies. The Noise Pollution Rules of 2012, utilizing decibels (dB) Leq, set specific limits on sound levels in various zones such as Industrial, Commercial, Residential, and Silence Zones.[8]

The city of Surat, a bustling textile centre accommodating a substantial workforce exposed to potential noise-related stress, presents an ideal setting for investigating the correlation between occupational noise and sleep quality in adults.[9,10]

This study aims to assess stress and sleep quality among three groups exposed to different noise levels, comparing these outcomes across noise categories, identifying sociodemographic and occupational factors linked to poor sleep, and determining independent predictors through logistic regression.

Methodology

A cross-sectional study was conducted at three distinct sites in Surat over a span of 2.5 months, from August 1st to October 15th, 2023. The sites included: 1) New Civil Hospital Surat (NCHS): Silent zone; 2) Ambedkarnagar (Azadnagar and Rasulabad), Bhatar, Surat (Urban Field Practice Area of the Community Medicine Department of NCHS): Residential and commercial area; and 3) Textile Industry located in Sachin and Pandesara Gujarat Industrial Development Corporation (GIDC).

Sample size: The sample size of 160 was calculated using the formula n=4pq/l^2, taking into account a 10% estimated prevalence of individuals with noise exposure exceeding 85 dB (as per the Occupational Safety and Health Administration (OSHA) standards' stringent action level),[11] derived from a piloted study involving 30 participants. Additionally, to accommodate a 10% potential non-response or bias and assuming a 95% confidence level, the rounded sample size was determined to be 160.

Sampling method and site: 160 participants were selected through simple, stratified, and systematic random sampling methods across three sites, chosen purposively. Specifically, 53 participants were collected from NCHS, 53 from the Urban field practice area, and 54 from the textile industry (27 from each location in Sachin and Pandesara GIDC). (Table 1)

At NCHS, a stratified random sampling approach was used, where residents were grouped by academic year and unique numbers were assigned based on calculated proportions, followed by random selection. In the Urban field practice area, a systematic random sampling method was employed, with six lanes randomly selected and participants distributed using a sampling interval (k). For Sachin and Pandesara GIDC, a simple random sampling method was utilized, with the total sample size evenly divided between the two sites, and participants selected using a random number generator after assigning unique IDs to all workers.

Noise exposure measurement procedure: Noise exposure levels at each site were measured using a digital sound level meter (accuracy ± 1.5 dB) by taking 5-minute readings at multiple fixed points representing key activity areas (e.g., wards at NCHS, lanes in Ambedkarnagar, factory floors in textile units). Measurements were conducted in the morning between 10- 11 am on two separate days at each site.

Inclusion criteria: The study included participants aged 18 to 59 years old, who had at least 6 months of experience in their current occupational setting, consistently achieved 7 or more average hours of sleep, and expressed a willingness to participate in the study.

Exclusion criteria: Individuals with a history of sleep disorders, mental health conditions impacting

Table 1: Study Site Statistics: Participants and Sampling

Study Sites	Noise Exposure*	Participants (n=160)	Sampling Technique
New Civil Hospital Surat (NCHC)	30-50 dB	Resident doctors (n=53)	Stratified random sampling
Ambedkarnagar (Urban FPA)	50-70 dB	General population (n=53)	Systematic random sampling
Sachin and Pandesara (GIDC)	>70 dB	Textile workers (n=54)	Simple random sampling

NCHC - New Civil Hospital Surat; FPA - Field Practice Area; GIDC - Gujarat Industrial Development Corporation
*Measured by Digital Sound Level Meter- Accuracy ± 1.5 dB)

sleep quality, hearing impairment, sensory deficits affecting noise perception, and those currently taking medications such as sedatives or antidepressants were excluded from the study. Participants sleeping less than 7 hours on average were excluded to reduce confounding effects of chronic sleep deprivation unrelated to noise exposure, as insufficient baseline sleep (<7 hours) is an established independent risk factor for poor sleep quality and heightened stress, which could bias associations with noise exposure.

Data collection procedure and study tool: Data were collected using a pre-designed, pre-tested, structured questionnaire with three parts. The first part gathered personal and socio-demographic information, the second part focused on stress assessment using the Perceived Stress Scale (PSS), and the third part assessed sleep quality using the Pittsburgh Sleep Quality Index (PSQI).

The **Perceived Stress Scale** (PSS), developed by Cohen et al. in 1983, utilized a 5-point Likert scale to measure psychological stress levels in individuals aged 12 and older. PSS scale has good validity and reliability and it comprises 10 questions, assessing feelings and thoughts over the past month, with scores ranging from 0 to 40. Scores between 0-13 indicate low stress, 14-26 suggest moderate stress, and 27-40 signify high perceived stress.[12,13]

The **Pittsburgh Sleep Quality Index (PSQI),** developed by Buysse and colleagues at the University of Pittsburgh in 1988, was used to assess sleep quality over a 1-month interval. Consisting of 19 items organized into 7 components, it generates a global score ranging from 0 to 21, with scores of 0-4 indicating "good" sleep and 5-21 indicating "poor" sleep. The tool has good validity and reliability (internal reliability of Cronbach's alpha = .83, a test-retest reliability of .85 for the global scale, a sensitivity of 89.6%, and a specificity of 86.5%).[14] The PSQI was translated into Hindi through a rigorous linguistic validation process, involving forward and back translation by native speakers until matching the original English version. Pretesting on 10 adults not included in the study ensured accuracy, with verbal administration provided for illiterate participants upon request.

Ethical clearance: The study obtained ethical clearance from the institutional ethics committee. (GMCS/STU/ETHICS-2/Approval/18978/23) Participants provided informed consent in their preferred language with signed consent forms. Confidentiality and anonymity were preserved through private interviews and data presentation without identifiers. Health education, counselling, and referral procedures were conducted post-interview as needed.

Statistical analysis: Data were entered and analysed in MS Excel (Version: 2021) and Epi Info (Version: 7.2.5.0). Initial univariate analysis included mean, standard deviation, frequency, and percentage calculations, followed by Chi-square tests for associations. The Perceived Stress Scale (PSS) scores were categorized into three groups and compared using chi-square analysis, with significance set at $p < 0.05$. The Pittsburgh Sleep Quality Index (PSQI) scores were dichotomized into good and poor sleep categories and compared across the three groups. Independent variables influencing sleep quality with $p < 0.2$ were further analysed using binary logistic regression to identify independent predictors of sleep quality, employing a stepwise method with significance set at $p < 0.05$.

Results

A total of 160 participants were included in the study, with a mean age of 31 ± 10.57 years. Among the participants (n = 160), perceived stress and sleep quality showed notable differences across groups. Resident doctors demonstrated the highest proportion of moderate stress (45.3%), while the general population had the highest prevalence of moderate stress overall (52.8%). Textile workers reported comparatively higher levels of high perceived stress (27.8%). Sleep quality patterns also varied substantially; almost all resident doctors reported good sleep (98.1%), whereas the majority of textile workers experienced poor sleep (88.9%). The general population showed a more balanced distribution, with 43.4% reporting poor sleep and 56.6% reporting good sleep. These findings suggest that both occupation and lifestyle factors play a significant role in influencing perceived stress and sleep quality. (Table 2)

A Kruskal-Wallis H test ((non-parametric test applied as the Kolmogorov-Smirnov test was significant with p = 0.000) showed no significant difference in perceived stress scores among resident doctors, the general population, and textile workers ($\chi^2 = 0.860$, $p = .650$), with mean scores of 19.11 (SD = 7.91), 20.68 (SD = 7.95), and 19.17 (SD = 8.20), respectively. However, sleep scores differed significantly ($\chi^2 = 15.072$, $p = .001$), with mean scores of 14.45 (SD = 2.88) for resident doctors, 23.19 (SD = 7.19) for the general population, and 32.54 (SD = 8.01) for textile workers. (Figure 1,2)

Table 2: Distribution of Perceived Stress and Sleep Quality Among Study Participants (n = 160)

Study Participants	Category Based on Perceived Stress n (%)			Category Based on Sleep Quality n (%)	
	Low Stress	Moderate Stress	High Perceived Stress	Poor Sleep	Good Sleep
Resident Doctors (n=53)	17 (32.1)	24 (45.3)	12 (22.6)	1 (1.9)	52 (98.1)
General Population (n=53)	13 (24.6)	28 (52.8)	12 (22.6)	23 (43.4)	30 (56.6)
Textile Workers (n=54)	20 (37.0)	19 (35.2)	15 (27.8)	48 (88.9)	6 (11.1)

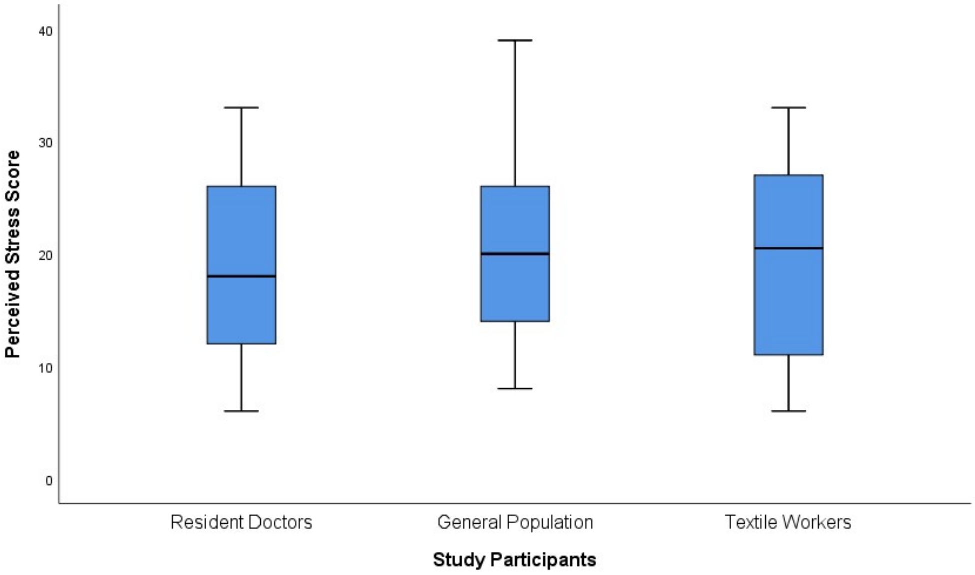

Figure 1: Comparison of Perceived Stress Scores Among Study Participants (n=160)

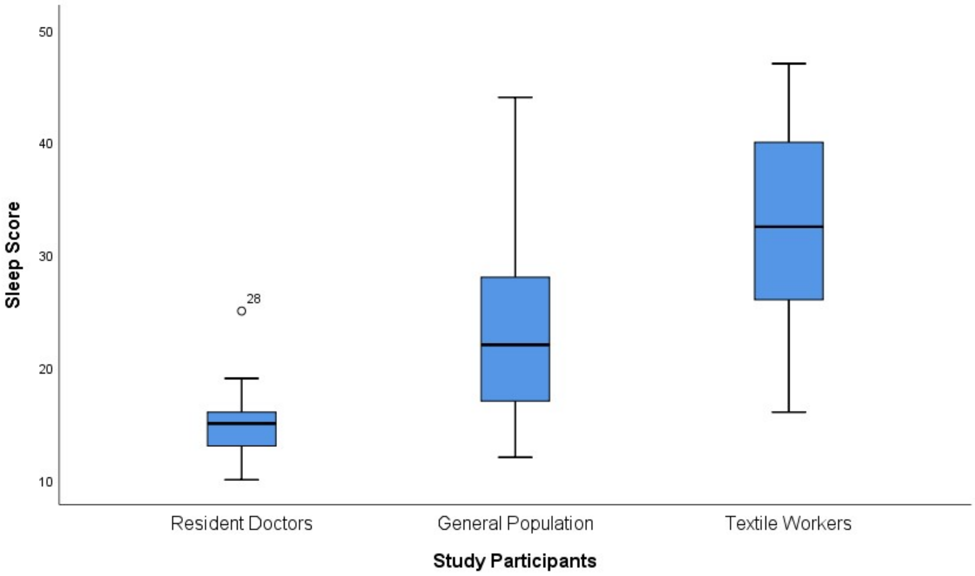

Figure 2: Comparison of Sleep Scores Among Study Participants (n=160)

In bivariate analysis, significant associations were found between Sleep Quality and Education (p= 0.00), Occupation (p= 0.00), Socioeconomic class (p= 0.013), and Shift work (p= 0.004). (Table 2) However, variables like sex, exercise habit, smoking habit, alcohol consumption, caffeine consumption, smartphone use before sleep, and watching TV before sleep showed no significant association with sleep quality. (Table 3,4)

Variables with a p-value below 0.2 were included in a stepwise binomial logistic regression model for sleep quality (good vs. poor). Linearity was assessed by evaluating model fit and pseudo-R^2 statistics for continuous variables. Multicollinearity was checked using correlation coefficients (<0.7), VIF (<10), and tolerance values (>0.1). Outliers were assessed using case-wise diagnostics. The logistic regression model was statistically significant, χ^2 (115.3, p = 0.00), accounting for 68.7% of the variance in sleep quality and correctly classifying 85.6% of cases.

Among the variables studied, including age, post-graduate education, upper socio-economic class, and upper-middle socio-economic class, it was found that they are significant predictors of sleep score. Specifically, older individuals had a 1.2 times higher likelihood of poor sleep quality (95% CI: 1.076-1.326) compared to their younger counterparts. Participants with post-graduate education exhibited a 41.4 times higher likelihood of poor sleep quality (95% CI: 0.020-428.963) than those who were illiterate. Additionally, participants belonging to the Upper Middle class and Upper class had 78.6 (95% CI: 1.077-5740.425) and 93.3 (95% CI: 1.813-47797.981) times higher likelihood of poor sleep quality respectively, compared to those in the lower socio-economic class. (Table 5)

Table 3: Variables with significant association with Sleep Quality (n=160)

Variables of Interest	Total (n=160)(%)	Good Sleep (n=88) (%)	Poor Sleep (n=72) (%)	χ2 Value	P value
Education					
Illiterate	8 (5)	2(25)	6(75)	64.6	0.00
Primary education	59 (36.9)	28(47.5)	31(52.5)		
Secondary education	20 (12.5)	4(20)	16(80)		
Higher secondary education	7 (4.4)	3(42.9)	4(57.1)		
Diploma	12 (7.5)	5(41.7)	7(58.3)		
Graduate	14 (8.7)	4(28.6)	10(71.4)		
Postgraduate	40 (25)	36(90)	4(10)		
Occupation					
Unskilled	19 (11.9)	7(36.8)	12(63.2)	67.2	0.00
Semiskilled	21 (13.1)	4(19)	17(81)		
Skilled	28 (17.5)	8(28.6)	20(71.4)		
Professional	62 (38.7)	30(48.4)	32(51.6)		
Shop owner	7 (4.4)	3(42.9)	4(57.1)		
Housewife	23 (14.4)	20(87)	3(13)		
Socioeconomic class (Modified BG Prasad)					
Lower Class	7 (4.4)	6(85.7)	1(14.3)	10.8	0.013
Lower middle class	6 (3.7)	3(50)	3(50)		
Middle class	10 (6.25)	4(40)	6(60)		
Upper middle class	52 (32.5)	24(46.1)	28(53.9)		
Upper class	85 (53.1)	57(67.1)	28(32.9)		
Shift worker	71 (44.4)	30(42.3)	41(57.7)	8.4	0.004

Table 4: Variable with no significant association with Sleep Quality (n=160)

Variables of Interest	Total (n=160)(%)	Good Sleep (n=88) (%)	Poor Sleep (n=72) (%)	χ2 Value	P value
Gender					
Female	54 (33.8)	32(59.3)	22(40.7)	0.6	0.44
Male	106 (66.2)	56(52.8)	50(47.2)		
Exercise habit					
Once a week or less	118 (73.8)	67(56.8)	51(43.2)	0.6	0.47
More than once a week	42 (26.2)	21(50)	21(50)		
Smoking status					
Never smoked	143 (89.4)	82(57.3)	61(42.7)	4.3	0.117
Former smoker	6 (3.8)	1(16.7)	5(83.3)		
Current smoker	11 (6.8)	5(45.5)	6(54.5)		
Consume alcohol	57 (35.6)	33(57.9)	24(42.1)	0.3	0.584
Consumption of caffeinated beverages					
One cup per day	64 (40)	35(54.7)	29(45.3)	0.0	0.948
More than one cup per day	96 (60)	53(55.2)	43(44.8)		
Using smartphone before sleep	131 (81.9)	69(52.7)	62(47.3)	1.6	0.208
Watching TV before sleep	102 (63.7)	57(55.9)	45(44.1)	0.1	0.766

Discussion

The urban landscape of Surat, Gujarat, harbours a pervasive issue of workplace noise, potentially leading to sleep deprivation among its inhabitants.

Participant Characteristics and Demographics: This study included 160 participants with a mean age of 31±10.57 years, comprising resident doctors, the general population, and textile workers. This age range aligns closely with studies such as Hailu Tesfaye A et al.[15] (30.5±10.6 years) and Sun W et al.[16] (33.1±10.6 years), but contrasts with younger groups like Getahun GK et al.[17] (25.3±2.4 years), and older cohorts in Kim SM et al.[18] (40.21±10.32 years), Berhanu H et al.[19] (38.7±12.5 years), and Kang JM et al.[20] (56.6-57.8 years). Yamagami Y et al.[21] studied even older individuals (71.8±7.1 years), while Felden ÉPG et al.[22] and Doane LD et al.[23] focused on adolescents and children, respectively.

Perceived Stress: No significant difference in perceived stress scores was found among the three occupational groups (χ^2 (2) = 0.860, p=.650), although textile workers had the highest proportion of high stress (27.8%), and moderate stress was more common in the general population (52.8%) and resident doctors (45.3%). Kim SM et al.[18] observed a comparable mean PSS-10 score (17.89±6.07), with higher stress among males (p <0.05) and a strong positive correlation between stress and poor sleep quality (r=0.544, p<0.001). Similarly, Getahun GK et al.[17] found 45.7% experienced work stress, significantly linked to sleep quality.

Table 5 Binary Logistic Regression for the association between the variables of interest and sleep quality (n=160)

Variables of Interest	Unadjusted		Adjusted	
	Odd's Ratio (95% CI)	p value	Odd's Ratio (95% CI)	p value
Age	1.1 (1.082-1.190)	0.00	1.2 (1.076-1.326)	0.001
Education				
Illiterate (Reference)	1	0.00	1	
Primary Education	0.4 (0.069-1.980)	0.245	7.3 (0.408-132.513)	0.176
Secondary Education	1.3 (0.192-9.273)	0.771	0.5 (0.008-28.481)	0.718
Higher Secondary Education	0.7 (0.037-11.936)	0.783	0.9 (0.013-57.634)	0.953
Diploma	0.7 (0.037-11.936)	0.783	0.3 (0.002-65.996)	0.691
Graduate	4.3 (0.326-57.649)	0.267	1.3 (0.004-353.731)	0.936
Post Graduate	0.0 (0.002-0.111)	0.00	41.4 (0.020-428.963)	0.028
Occupation				
Unskilled (Reference)	1	0.065	1	
Semiskilled	8.4(1.958-33.867)	0.04	1.1(0.179-6.810)	0.916
Skilled	20.6 (2.184-193.790)	0.08	16.6 (0.346-799.782)	0.155
Professional	2.3 (0.558-9.366)	0.251	7.2 (0.152-345.297)	0.315
Shop owner	1.9(0.494-7.769)	0.339	0.7(0.107-4.561)	0.709
Housewife	0.1(0.33-0.524)	0.004	1.2 (0.010-148.666)	0.784
Socioeconomic Class (Modified BG Prasad)				
Lower Class (Reference)	1	0.619	1	
Lower Middle Class	1.3 (0.192-9.273)	0.783	70.2 (0.893-5515.742)	0.056
Middle Class	1.5 (0.164-13-749)	0.72	1.1 (0.179-6.810)	0.916
Upper Middle Class	1.4 (0.188-10.935)	0.728	78.7 (1.077-5740.425)	0.018
Upper Class	0.5 (0.066-3.672)	0.489	93.4 (1.813-47797.981)	0.029
Shift Worker				
Yes (No: Reference)	2.6(1.346-4.858)	0.004	1.3(0.432-3.971)	

CI - Confidence Interval

Sleep Quality Prevalence and Characteristics: A striking 88.9% of textile workers in my study experienced poor sleep quality, which is higher than reported by Hailu Tesfaye A et al.[15] and Getahun GK et al.[17] (both 75.4%), Kim SM et al.[18] (69.7%), Berhanu H et al.[19] (65.4%), Kang JM et al.[20] (38.0%), and Sun W et al.[16] (26.98%). Significant differences in mean PSQI scores were observed across groups ($\chi^2(2)=15.072$, p=.001): 14.45±2.88 for resident doctors, 23.19±7.19 for the general population, and 32.54±8.01 for textile workers. These were notably higher than those reported by Hailu Tesfaye A et al.[15] (6.03±2.1) and Kim SM et al.[18] (7.30±2.94). Sun W et al.[16] also found occupational variations in sleep quality. Yamagami Y et al.[21] provided both objective (TST 420.6±69.1 min, SE 84.8±7.4%) and subjective sleep parameters. Getahun GK et al.[17] found average sleep latency of 22 min, with most sleeping >7 hours. Doane LD et al.[23] reported average sleep duration of 8.11±0.71 hours for children.

Factors Associated with Sleep Quality (Bivariate Analysis): My analysis showed significant associations between sleep quality and education (p=0.00), occupation (p=0.00), socioeconomic class (p=0.013), and shift work (p=0.004). Similar associations were reported by Berhanu H et al.[19] and Felden ÉPG et al.[22] (education), Sun W et al.[16] and Berhanu H et al.[19] (occupation), and multiple studies regarding socioeconomic status, though with some contradictions. While some studies linked lower SES to poor sleep (Berhanu H et al.[19], Felden ÉPG et al.[22], Doane LD et al.[23]), others like the Brazilian study in Felden ÉPG et al.[22] and my own suggest poorer sleep-in higher SES groups. Shift work, significant in my study, was also highlighted by Hailu Tesfaye A et al.[15] and Getahun GK et al.[17].

Conversely, gender, exercise, smoking, alcohol, caffeine, smartphone use, and TV watching were not significantly associated with sleep quality in my study. However, others like Kang JM et al.[20] and Sun W et al.[16] did find gender differences. Associations with substance use were also noted in Sun W et al.[16], Hailu Tesfaye A et al.[15], Berhanu H et al.[19], and Getahun GK et al.[17]. Regarding electronic device use, my findings differed from Hailu Tesfaye A et al.[15] and Getahun GK et al.[17], who found significant associations. Noise, though not analysed in my study, was reported by Berhanu H et al.[19], Yamagami Y et al.[21], and Getahun GK et al.[17] as significantly impacting sleep.

Predictors of Poor Sleep Quality (Multivariable Logistic Regression): The logistic regression model ($\chi^2=115.3$, p=0.00) explained 68.7% of the variance and identified significant predictors. Age was associated with a 1.2 times increased likelihood of poor sleep (p=0.001), consistent with Berhanu H et al.[19] and Sun W et al.[16], though Kang JM et al.[20] found no such link. Education showed a strong effect: those with postgraduate education had 41.4 times higher odds of poor sleep (p=0.028), though with a wide CI, suggesting caution. Berhanu H et al.[19] and Kang JM et al.[20] found weaker or no associations. Socioeconomic class was also a strong predictor: upper middle- and upper-class individuals had 78.7- and 93.4-times higher odds, respectively, of poor sleep. This contrasts with findings from Berhanu H et al.[19] and Kang JM et al.[20], though aligns with the Brazilian study in Felden ÉPG et al.[22] and some aspects of Doane LD et al.[23]

Interestingly, occupation and shift work, though significant in bivariate analysis, were not retained in the adjusted model, indicating possible confounding effects from other variables. In contrast, Hailu Tesfaye A et al.[15] and Getahun GK et al.[17] found night shifts and working hours to be significant predictors. Other studies identified additional predictors: dietary diversity and caffeine intake (Hailu Tesfaye A et al.[15]), obesity (Berhanu H et al.[19]), khat chewing (Berhanu H et al.[15]), depression (Kang JM et al.[20]), drinking behaviour (Kang JM et al.[20]), avoidance coping (Kim SM et al.[18]), electronic device use (Getahun GK et al.[17]), and indoor noise (Yamagami Y et al.[21]). These diverse findings underscore the multifactorial nature of sleep disturbances and highlight both shared and context-specific predictors across populations.

This study boasts several strengths, including its novelty as the first of its kind in Gujarat, a robust sample size of 160 participants from various occupational backgrounds, utilization of a validated questionnaire, and thorough analysis of associations between sleep quality and demographic factors. However, this study has several limitations. Being cross-sectional, it could not establish causal relationships between noise exposure, stress, and sleep quality. Both stress and sleep data were collected using self-reported tools, which may introduce recall bias and social desirability bias. Noise levels were not measured individually for each participant but were estimated based on general ambient data at the study sites, with measurements limited to daytime hours. Additionally, some participants required assistance in understanding the questionnaire. Lastly, as the study was conducted in selected urban and industrial areas of Surat, the findings may not be generalizable to populations in other geographic or occupational settings.

Conclusion

This cross-sectional study assessed perceived stress and sleep quality among individuals exposed to varying occupational noise levels in Surat and identified associated sociodemographic and occupational factors. Although no significant difference in stress levels was observed across the groups, sleep quality varied significantly, with textile workers exposed to the highest noise levels reporting the poorest sleep. Education level, occupation, socioeconomic class, and shift work showed significant associations with sleep quality. Binary logistic regression identified older age, postgraduate education, and higher socioeconomic status as independent predictors of poor sleep.

Individual Authors' Contributions: AA conceptualized the study, designed the methodology, collected and analyzed the data, and drafted the manuscript. **NC** assisted in the study design and contributed to data analysis and manuscript review. **KB** provided input on the methodology, helped with data interpretation, and reviewed the manuscript for critical revisions. **JG** assisted in the development of the questionnaire, coordinated participant recruitment, and contributed to manuscript editing. **HP** guided the statistical analysis, validated the results, and provided technical expertise in manuscript preparation. **JK** provided overall supervision, ensured research integrity, and critically reviewed and approved the final manuscript.

Availability of Data: Readers can assess data through the email id of corresponding author.

Declaration of Non-use of Generative AI Tools: This article was prepared without the use of generative AI tools for analysis, or data generation. All findings and interpretations are based solely on the authors' independent work and expertise.

References

1. Lie A, Skogstad M, Johannessen HA, Tynes T, Mehlum IS, Nordby KC, Engdahl B, Tambs K. Occupational noise exposure and hearing: a systematic review. Int Arch Occup Environ Health. 2016 Apr;89(3):351-372. DOI: https://doi.org/10.1007/s00420-015-1083-5 PMid:26249711.

2. Natarajan N, Batts S, Stankovic KM. Noise-Induced Hearing Loss. J Clin Med. 2023 Mar 17;12(6):2347. DOI: https://doi.org/10.3390/jcm12062347 PMid:36983347.

3. Basner M, Babisch W, Davis A, Brink M, Clark C, Janssen S, Stansfeld S. Auditory and non-auditory effects of noise on health. Lancet. 2014 Apr 12;383(9925):1325-1332. DOI: https://doi.org/10.1016/S0140-6736(13)61613-X PMid:24183105

4. Golmohammadi R, Darvishi E. The combined effects of occupational exposure to noise and other risk factors - a systematic review. Noise Health. 2019 Jul-Aug;21(101):125-141. PMID: 32719300; PMCID: PMC7650855.

5. Albinsaleh AA, Al Wael WM, Nouri MM, Alfayez AM, Alnasser MH, Alramadan MJ. Prevalence and Factors Associated With Poor Sleep Quality Among Visitors of Primary Healthcare Centers in Al-Ahsa, Kingdom of Saudi Arabia: An Analytical Cross-Sectional Study. Cureus. 2023 Jul 29;15(7):e42653. DOI: https://doi.org/10.7759/cureus.42653 PMid:37644931

6. Kumari RK, Jain KJ, Nath B. Sleep quality assessment among college students using Pittsburgh Sleep Quality Index in a municipal corporation area of Uttarakhand, India. Ceylon Med J. 2020 Dec 31;65(4):86-94. DOI: https://doi.org/10.4038/cmj.v65i4.9279 PMid:34821487

7. Ikeda Y, Morita E, Muroi K, Arai Y, Ikeda T, Takahashi T, Shiraki N, Doki S, Hori D, Oi Y, Sasahara SI, Ishihara A, Matsumoto S, Yanagisawa M, Satoh M, Matsuzaki I. Relationships between sleep efficiency and lifestyle evaluated by objective sleep assessment: SLeep Epidemiology Project at University of Tsukuba. Nagoya J Med Sci. 2022 Aug;84(3):554-569.

8. Ministry of Environment and Forests, Government of India. The Noise Pollution (Regulation and Control) Rules, 2000 (as amended up to 2010 and 2012). New Delhi: MoEF; 2012.

9. Top Textile Industries in Surat, Housing News Desk, September 18, 2023. Available from: https://housing.com/news/ textile-industries-in-surat/

10. Chambers H. Brief industrial profile of Surat district. Ahmedabad (Gujarat): MSME-Development Institute, Government of India; 2011.

11. Occupational Noise Exposure - Overview | Occupational Safety and Health Administration. Available from: https://www.osha.gov/noise

12. Yadav J. The impact of job stress and work-life balance among Indian nurses: a correlational study. Open Access Library Journal. 2025;12(2):1-16. DOI: https://doi.org/10.4236/oalib.1112841

13. Baik SH, Fox RS, Mills SD, Roesch SC, Sadler GR, Klonoff EA, Malcarne VL. Reliability and validity of the Perceived Stress Scale-10 in Hispanic Americans with English or Spanish language preference. J Health Psychol. 2019 Apr;24(5):628-639. DOI: https://doi.org/10.1177/1359105316684938

14. Shahid A, Wilkinson K, Marcu S, Shapiro CM, editors. STOP, THAT and One Hundred Other Sleep Scales. New York (NY): Springer; 2012. 435 p. DOI: https://doi.org/10.1007/978-1-4419-9893-4

15. Hailu Tesfaye A, Masresha AG, Tadesse T, Aragaw FM, Desye B, Abere G. Prevalence and associated factors of poor sleep quality among industrial workers in Addis Ababa, Ethiopia: Findings from a cross-sectional study. BMJ Open. 2023;13(10):1-13. DOI: https://doi.org/10.1136/bmjopen-2023-073340 PMid:37793920 PMCid:PMC10551987

16. Sun W, Yu Y, Yuan J, Li C, Liu T, Lin D, et al. Sleep duration and quality among different occupations China national study. PLoS One. 2015;10(3):e0117700. DOI: https://doi.org/10.1371/journal.pone.0117700 PMid:25782005

17. Getahun GK, Genene A, Tadesse T. Poor sleep quality and associated determinants among textile and garment manufacturing workers in Addis Ababa, Ethiopia. Sleep Med X. 2023;5:100075. DOI: https://doi.org/10.1016/j.sleepx.2023.100075 PMid:37249945 PMCid:PMC10220473

18. Kim SM, Um YH, Kim TW, Seo HJ, Jeong JH, Hong SC. Mediation Effect of the Coping Strategies on the Relation Between Stress and Sleep Quality. Psychiatry Investig. 2022 Jul;19(7):580-587. DOI: https://doi.org/10.30773/pi.2022.0015

19. Berhanu H, Mossie A, Tadesse S, Geleta D. Prevalence and Associated Factors of Sleep Quality among Adults in Jimma Town, Southwest Ethiopia: A Community-Based Cross-Sectional Study. Sleep Disord. 2018 Apr 22;2018:8342328. DOI: https://doi.org/10.1155/2018/8342328

20. Kang JM, Lee JA, Jang JW, Kim YS, Sunwoo S. Factors associated with poor sleep quality in primary care. Korean J Fam Med. 2013;34(2):107-14. DOI: https://doi.org/10.4082/kjfm.2013.34.2.107 PMid:23560209 PMCid:PMC3611098

21. Yamagami Y, Obayashi K, Tai Y, Saeki K. Association between indoor noise level at night and objective/subjective sleep quality in the older population: a cross-sectional study of the HEIJO-KYO cohort. Sleep. 2023 May 10;46(5):zsac197. DOI: https://doi.org/10.1093/sleep/zsac197 PMid:36708171

22. Felden ÉP, Leite CR, Rebelatto CF, Andrade RD, Beltrame TS. Sono em adolescentes de diferentes níveis socioeconômicos: revisão sistemática [Sleep in adolescents of different socioeconomic status: a systematic review]. Rev Paul Pediatr. 2015;33(4):467-473. DOI: https://doi.org/10.1016/j.rpped.2015.01.011 PMid:26298657 PMCid:PMC4685568

23. Doane LD, Breitenstein RS, Beekman C, Clifford S, Smith TJ, Lemery-Chalfant K. Early Life Socioeconomic Disparities in Children's Sleep: The Mediating Role of the Current Home Environment. J Youth Adolesc. 2019 Jan;48(1):56-70. DOI: https://doi.org/10.1007/s10964-018-0917-3 PMid:30121716 PMCid:PMC6360097