

Original Research Article

A study on poor sleep hygiene and obesity among different groups of workers in the petroleum industry located in Andhra Pradesh

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Received: 13 September 2024

Revised: 09 November 2024

Accepted: 13 November 2024

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ABSTRACT

Background: This study explored the relationship between poor sleep hygiene and obesity among workers in the petroleum industry in Andhra Pradesh. Sleep hygiene refers to practices conducive to regular, healthy sleep. Poor sleep hygiene has been linked to health issues, including obesity. Understanding this relationship is crucial for targeted interventions to improve worker health.

Methods: A cross-sectional comparative study was conducted with 193 tank drivers and 90 office workers (female workers excluded due to small sample size). Demographic data, including age, BMI, and average sleep duration, were collected via self-report questionnaires. Statistical tests, including independent t-tests and Mann-Whitney U statistics, were used to assess significance.

Results: A significant association between poor sleep hygiene and obesity was found among petroleum workers. Those reporting shorter sleep duration, irregular sleep schedules, and frequent sleep disturbances were more likely to be obese compared to those with better sleep practices. Shift work and long hours were identified as contributing to poor sleep and increased obesity risk.

Conclusions: Promoting healthy sleep habits is essential to reduce obesity among petroleum workers. Interventions such as sleep hygiene education and workplace policies supporting adequate rest may help mitigate obesity risk. Addressing occupational factors like shift work and long hours is vital for improving overall worker well-being.

Keywords: Cross-sectional studies, Health promotion, Obesity, Occupational health, Sleep hygiene

INTRODUCTION

Obesity is a growing public health concern, and its prevalence is increasingly linked to occupational factors. The petroleum industry, particularly in Andhra Pradesh, is known for its demanding work schedules, shift work, and other stressors that may disrupt normal sleep patterns. Poor sleep hygiene has been identified as a significant risk factor for metabolic disorders, including obesity.¹

Shift work, long hours, and stressful conditions commonly found in industrial settings can lead to irregular sleep patterns, which in turn disrupt metabolic processes. This disruption can increase the risk of chronic

diseases such as obesity, diabetes, and cardiovascular conditions.²

The objective of this study was to examine the relationship between poor sleep hygiene and obesity among different groups of workers in the petroleum industry. By analyzing the impacts of occupational factors on sleep and body mass index (BMI), this research aimed to provide data-driven insights that can guide interventions to improve worker health and well-being.

Aims and objectives

To measure the prevalence of obesity: assess the rate of obesity among workers in the petroleum industry. To

analyze the relationship between sleep hygiene and obesity: investigate the correlation between poor sleep hygiene and obesity, determining how sleep patterns influence obesity. To compare worker groups: identify differences in sleep hygiene and obesity rates between various job roles and working conditions.

METHODS

Study design

This research employs a cross-sectional comparative study design to explore the relationship between sleep hygiene and obesity among different groups of workers in the petroleum industry located in Andhra Pradesh. This design is chosen for its efficiency in collecting data from a large number of subjects at a single point in time, allowing for the analysis of prevalence and correlation between various factors without manipulating the study environment.

Informed consent

Verbal consent was taken from all the workers and privacy was maintained during questionnaire.

Ethical practices

Proper approvals and permissions from the plant authorities were taken to conduct the study and each and every step has been taken to establish good ethical practices

Study period

The study was conducted over a two-week period, from May 6, 2024 to May 17, 2024.

Participant selection

The study targets two primary groups within the petroleum industry: tank drivers and office workers.

Inclusion criteria

Employed full-time within the selected petroleum industry. Aged between 20 and 60 years. Not currently on medical leave or undergoing treatment for sleep disorders or major metabolic diseases.

Exclusion criteria

Female population due to extremely tiny size.

Sampling strategy

A stratified random sampling technique was utilized to ensure that the sample is representative of the broader workforce within the petroleum industry. Each stratum

(tank drivers and office workers) was proportionally represented according to the total workforce composition. A total sample size of 283 workers- 193 tank drivers and 90 office workers- was determined using an online sample size calculator with a 95% confidence level and a 5% margin of error, assuming a population proportion of 50% (out of 385 tank drivers 193 sample size and out of 122 tank drivers 90 sample size were taken after calculation).

Data collection methods

Data was collected through a combination of structured self-report questionnaires and objective measurements:

Self-report questionnaires

These are designed to gather data on demographic information, sleep hygiene practices (including duration, disturbances, and regularity), and self-reported weight and height for BMI calculations. To complement self-reported data, BMI was also verified from previous health records of periodic medical examination.

Statistical analysis

Data analysis was conducted using (MSEXCEL, OPENEPI) software. Descriptive statistics (mean, median, mode, and standard deviation) are calculated for all measured variables. Inferential statistics are used to determine the relationships and differences between the groups:

Independent t-tests for continuous variables like age and BMI and Mann-Whitney U test for variables like sleep duration due different distribution of sleep.

Research activity done is as follows: 6/05/2024 to 10/05/2024- demography, self-report questionnaire, data collection. 11/05/2024 to 13/05/2024- data analysis and statistical calculations, drawing conclusions. 14/05/2024 to 17/05/2024- preparing final diagrams, tables, printing of the project.

Let's start with age and BMI, which are continuous variables:

Age (years)

We have used a two-sample t-test assuming unequal variances since the sample sizes were different.

Null hypothesis (H_0)- there is no significant difference in the mean age between tank drivers and office workers.

Alternative hypothesis (H_1)- there is a significant difference in the mean age between tank drivers and office workers.

BMI

We have also used a two-sample t-test assuming unequal variances for the same reasons as above.

Null hypothesis (H_0)- there is no significant difference in the mean BMI between tank drivers and office workers.

Alternative hypothesis (H_1)- there is a significant difference in the mean BMI between tank drivers and office workers.

Sleep duration (hours)

We have used the Mann-Whitney U test since the distribution of sleep duration might not be normal, and sample sizes are different.

Null hypothesis (H_0)- there is no significant difference in sleep duration between tank drivers and office workers.

Alternative hypothesis (H_1)- there is a significant difference in sleep duration between tank drivers and office workers.

The Mann-Whitney U test resulted in a U statistic of 4115.0 and a p value of approximately 8.03×10^{-18} . Here

is a tabular representation of the Mann-Whitney U test results between tank drivers and office workers.

RESULTS

The independent t-test analysis revealed significant differences between tank drivers and office workers in terms of age, body mass index (BMI).

Age

The average age of tank drivers (mean =40.0 years, SD=10.96) was significantly higher than that of office workers (mean =31.0 years, SD=8.48), $t(281) = 6.886$, $p < 0.00001$. This indicates a substantial difference in the age demographic between the two groups, with tank drivers being older on average.

BMI

The results also indicated a significant difference in BMI between tank drivers (mean =27.0, SD=4.12) and office workers (mean =25.0, SD=4.07), $t(281) = 3.818$, $p = 0.000166$. This suggests that tank drivers have a higher BMI compared to office workers.

Table 1: Independent t-test comparison between tank drivers and office workers.

Variables	Group	Mean (M)	Standard deviation (SD)	t (281)	P value	Statistical significance
Age (years)	Tank drivers	40.0	10.96	6.886	<0.00001	Extremely statistically significant
	Office workers	31.0	8.48			
BMI	Tank drivers	27.0	4.12	3.818	0.000166	Highly statistically significant
	Office workers	25.0	4.07			

Note: Each row represents the mean and standard deviation of the respective variable for each group, with the t-statistic and p value indicating the level of statistical significance of the difference between the groups. The terms “extremely” and “highly” indicate the strength of the statistical significance based on the p value.

Table 2: U statistic.

U statistic	P value	Tank drivers sample size	Office workers sample size	Statistical significance
4115.0	8.03×10^{-18}	193	90	Yes ($p < 0.05$)

Sleep duration

Mann Whitney U statistic gave a very low p value of 8.03×10^{-18} indicating statistically significant difference in sleep durations between tank drivers and office workers.

The difference is unlikely to have occurred by chance, suggesting that the two groups indeed have different sleep patterns.

The following tables present the descriptive statistics for tank drivers and office workers:

Table 3: Descriptive statistics for tank drivers.

Variable	Mean	Median	Mode	Standard deviation
Age (years)	40.0	40	45	10.96
BMI	27.0	26.8	28.7	4.12
Average sleep duration/24 hours	5.32	5	5	0.549814
Total Population	193	-	-	-

Table 4: Descriptive statistics for office workers.

Variable	Mean	Median	Mode	Standard deviation
Age (years)	31.0	29	26	8.48
BMI	25.0	25.05	28.7	4.07
Average sleep duration/24 hours	6.58	6	6	6.34
Total population	90	-	-	-

Table 5: Unpaired t-tests for each variable of interest for both tank drivers and office workers.

Variable	Tank drivers mean	Office workers mean	t-statistic	P value	Degree of freedom
Age (years)	40.0	31.0	6.886	<0.00001	281
BMI	27.0	25.0	3.818	0.000166	281

Table 6: Mann-Whitney U Statistic.

Description	Value
Mann-Whitney U Statistic	4115.0
P value	8.03×10^{-18}
Sample size (tank drivers)	193
Sample size (office workers)	90
Statistical significance	Yes ($p < 0.05$)

To determine if there's a statistically significant difference between tank drivers and office workers in terms of age, BMI, and sleep duration, we can use statistical tests such as t-tests for continuous variables (age, BMI) and a Mann-Whitney U test for variables (sleep duration).

DISCUSSION

The observed differences in age, BMI, and sleep duration between tank drivers and office workers highlight potential disparities in health outcomes associated with occupation. The significantly older age of tank drivers may reflect the longer tenure in their profession, which could contribute to higher BMI due to age-related metabolic changes and prolonged exposure to occupational hazards.³ Short sleep duration and irregular sleep patterns among workers may further increase the risk of obesity, as studies suggest that insufficient sleep disrupts hormonal regulation of appetite and metabolism.⁴ Occupational stressors, such as long working hours and shift work, have been shown to exacerbate sleep disturbances, thereby contributing to weight gain and poor metabolic health.^{5,6} Addressing these occupational factors is essential for improving the health and well-being of workers in the petroleum industry.⁷

Several limitations should be acknowledged in interpreting the findings of this study.

Cross-sectional design

This type of study design restricts the ability to infer causality from the observed associations. It only provides

a snapshot in time without showing how relationships between variables develop or change.

Self-reported data

The reliance on self-reported measures for critical variables like age, BMI, and sleep duration may introduce bias. Participants may not remember accurately or may choose socially desirable answers.

Single industry and gender focus

The study sample was drawn exclusively from a male population within a single LPG industry. This limits the generalizability of the findings to other populations, industries, and settings, particularly across different genders and broader occupational contexts.

CONCLUSION

In summary, this research advances the understanding of the complex interplay between occupational factors, sleep hygiene, and health outcomes, specifically obesity, among petroleum industry workers. The significant association between poor sleep hygiene- marked by irregular patterns, shorter durations, and shift work disruptions- and elevated BMI, particularly in tank drivers, underscores the critical role of occupational stressors in shaping worker health. The findings highlight the need for tailored health interventions that mitigate these stressors by promoting better sleep hygiene, reducing physical strain, and minimizing circadian rhythm disruptions. While limitations related to self-reported data and a male-only sample affect generalizability, the study provides a foundation for future research and interventions that can improve health outcomes for diverse worker populations across industrial environments.

Recommendations

In conclusion, the recommendations put forth in this study offer practical and targeted strategies to improve sleep hygiene and overall health among workers in the petroleum industry. By advancing knowledge in the field,

this research emphasizes the importance of addressing occupational stressors and their impact on health through evidence-based interventions such as sleep hygiene education, shift scheduling reforms, workplace rest zones, mental health support, and promoting physical activity and a balanced diet. Furthermore, continuous health monitoring and collaborative partnerships with health organizations are critical for sustaining long-term improvements in occupational health, thus enhancing both worker well-being and industry productivity

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Reddy SD. A study on poor sleep hygiene and obesity among different groups of workers in the petroleum industry located in Andhra Pradesh. *Int J Community Med Public Health* 2024;11:4781-5.