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Prevalence of Poor Sleep Quality and Its Physiological Associations in adults

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Abstract

Background: Sleep is an essential physiological process that plays a vital role in maintaining metabolic, cardiovascular, and psychological health. Disturbances in sleep quality have increasingly been recognized as a significant public health concern, particularly among adults, and have been associated with various physiological abnormalities. The present study aimed to determine the prevalence of poor sleep quality among adults and to examine its association with selected physiological parameters. ***Material and Methods:*** A cross-sectional analytical study was conducted among 400 adults aged 18 years and above. Sociodemographic information was collected using a structured questionnaire. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), with a global score >5 indicating poor sleep quality. Physiological parameters including body mass index (BMI), blood pressure, resting heart rate, fasting blood glucose, and serum lipid profile were measured using standardized methods. Data were analyzed using appropriate statistical tests, including the independent t-test and chi-square test, with a p-value <0.05 considered statistically significant. ***Results:*** Among the 400 participants, 214 (53.5%) were males and 186 (46.5%) were females. The largest proportion of participants belonged to the 18–30 year age group (28.0%). Poor sleep quality (PSQI >5) was observed in 164 participants (41.0%), while 236 (59.0%) had good sleep quality. Participants with poor sleep quality demonstrated significantly higher mean values of BMI (25.8 ± 4.5 vs 23.9 ± 3.6 kg/m^2), systolic blood pressure (125.3 ± 14.1 vs 120.8 ± 12.4 mmHg), diastolic blood pressure (81.4 ± 9.2 vs 78.6 ± 7.9 mmHg), resting heart rate (78.1 ± 9.6 vs 74.8 ± 8.7 beats/min), fasting blood glucose (105.3 ± 20.6 vs 98.7 ± 16.4 mg/dL), total cholesterol (195.8 ± 37.6 vs 185.2 ± 34.7 mg/dL), and triglycerides (158.9 ± 44.3 vs 142.1 ± 40.6 mg/dL) compared to those with good sleep quality (p <0.05). HDL cholesterol levels were significantly lower among individuals with poor sleep quality (43.4 ± 9.6 vs 47.2 ± 8.9 mg/dL). Logistic regression analysis identified elevated BMI, increased systolic blood pressure, higher fasting glucose levels, elevated triglycerides, and low HDL as significant predictors of poor sleep quality. ***Conclusion:*** Poor sleep quality was prevalent among a considerable proportion of adults and showed significant associations with several adverse physiological parameters related to cardiometabolic health. These findings highlight the importance of routine assessment of sleep quality and the implementation of preventive strategies to improve sleep and reduce associated health risks.

Keywords: Sleep quality, Pittsburgh Sleep Quality Index, adults, physiological parameters, cardiometabolic risk.

INTRODUCTION

Sleep is a fundamental physiological process necessary for the maintenance of physical, cognitive, and metabolic health. Adequate sleep plays an essential role in restoring body systems, regulating endocrine and immune functions, and maintaining optimal daytime functioning. Disturbances in sleep patterns or poor sleep quality may impair cognitive performance, emotional regulation, and overall well-being, thereby affecting quality of life and productivity. Consequently, sleep health has emerged as an important component of public health and preventive medicine.

Sleep quality represents a multidimensional concept that includes subjective satisfaction with sleep, sleep latency, duration, efficiency, and the presence of disturbances during the sleep period. The Pittsburgh Sleep Quality

Index (PSQI) is one of the most widely used standardized instruments for assessing sleep quality in both clinical and community settings, providing a global score that reflects overall sleep status during the previous month [1]. A PSQI score greater than five is generally considered indicative of poor sleep quality and has been widely applied in epidemiological studies of adult populations.

Poor sleep quality has been increasingly recognized as a common problem in the general population. Community-based studies across different countries have reported that a considerable proportion of adults experience sleep disturbances, with prevalence estimates ranging from approximately 20% to over 60% depending on demographic characteristics and assessment methods [2–4]. For example, a cross-sectional community study reported that about one-fifth of middle-aged and older adults experienced poor sleep quality when assessed using the PSQI [2], while other investigations in specific populations have reported substantially higher prevalence rates exceeding 60% [3]. Such findings highlight the growing burden of sleep disturbances in modern societies.

Beyond its high prevalence, poor sleep quality has been linked to several adverse health outcomes. Increasing evidence indicates that disturbed sleep may contribute to cardiometabolic abnormalities such as obesity, hypertension, dyslipidemia, and impaired glucose metabolism [5]. Epidemiological analyses have demonstrated that both insufficient sleep and sleep disturbances are associated with increased risk of cardiovascular disease and metabolic disorders [6]. More recent studies have further shown that individuals with poor sleep quality tend to have poorer cardiovascular health profiles and a higher likelihood of metabolic syndrome [7].

Despite the growing recognition of sleep as an important determinant of health, sleep quality remains an under-evaluated aspect of routine health assessment in many populations. Furthermore, the relationship between sleep quality and physiological parameters such as body mass index, blood pressure, and metabolic indicators has not been adequately explored in several community settings. Understanding these associations may help identify individuals at risk and guide preventive strategies aimed at improving sleep health and overall physiological well-being. Therefore, the present study was undertaken to determine the prevalence of poor sleep quality among adults and to examine its association with selected physiological parameters.

MATERIALS AND METHODS

Study Design: A community-based cross-sectional analytical study was conducted to determine the prevalence of poor sleep quality among adults and to evaluate its physiological associations. Cross-sectional methodology is commonly used in epidemiological sleep research to estimate prevalence and examine associations between sleep quality and health-related parameters in adult populations.

Study Setting: The study was conducted in the general adult population attending community health facilities and residing in the surrounding urban area. Data collection was performed over a period of six months. All participants were recruited through convenience sampling after obtaining informed consent.

Study Population: The study population consisted of adults aged 18 years and above.

Inclusion Criteria

- Adults aged ≥18 years
- Individuals willing to participate and provide written informed consent

Exclusion Criteria

- Individuals with previously diagnosed major psychiatric disorders
- Individuals with severe chronic illness or acute medical conditions requiring hospitalization
- Pregnant women
- Individuals currently using sedative–hypnotic medications on a regular basis

Sample Size Determination: The sample size was calculated based on the expected prevalence of poor sleep quality among adults. Previous epidemiological studies have reported prevalence rates ranging from approximately 20% to over 50% in different adult populations assessed using the Pittsburgh Sleep Quality Index (PSQI).

Using the formula for prevalence studies: n=Z2pq/d2

Where:

- Z=1.96Z = 1.96Z=1.96 for 95% confidence level
- p=40%p = 40\%p=40% (expected prevalence of poor sleep quality)
- q=1−p=60%q = 1 - p = 60\%q=1−p=60%
- d=5%d = 5\%d=5% allowable error

The calculated minimum sample size was 369 participants. After accounting for a potential non-response rate of approximately 5–10%, the final sample size was rounded to 400 participants.

Data Collection Tools: Data were collected using a structured questionnaire consisting of three sections:

1. Sociodemographic variables: age, sex, occupation, education, and lifestyle habits.
2. Sleep quality assessment: Sleep quality was evaluated using the Pittsburgh Sleep Quality Index, a validated self-reported questionnaire widely used in sleep research. The PSQI evaluates sleep quality over the previous month across seven components including sleep duration, sleep latency, sleep disturbance, sleep efficiency, use of sleep medication, daytime dysfunction,

and subjective sleep quality. A global PSQI score greater than 5 was considered indicative of poor sleep quality.

3. Physiological parameters: Selected physiological parameters were recorded to evaluate associations with sleep quality. These included:

- o Body mass index (BMI)
- o Blood pressure (systolic and diastolic)
- o Resting heart rate
- o Fasting blood glucose
- o Serum lipid profile (total cholesterol, triglycerides, HDL, LDL)

Anthropometric measurements were obtained using standardized procedures. Blood pressure was measured using a calibrated sphygmomanometer after the participant rested for at least five minutes.

Data Collection Procedure: Participants fulfilling the eligibility criteria were enrolled after obtaining informed consent. Sociodemographic and lifestyle data were recorded through face-to-face interviews. Anthropometric and physiological measurements were taken by trained personnel using standardized methods. The PSQI questionnaire was administered to assess sleep quality during the preceding one month.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using statistical software. Continuous variables were expressed as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages.

- The prevalence of poor sleep quality was calculated as the proportion of participants with PSQI scores greater than 5.
- The Chi-square test was used to evaluate associations between categorical variables.
- The independent t-test was applied to compare physiological parameters between participants with good and poor sleep quality.
- Multivariate logistic regression analysis was performed to identify independent physiological predictors of poor sleep quality.

A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 400 adults participated in the study. The sociodemographic characteristics of the participants are presented in Table 1. The largest proportion of participants belonged to the 18–30 years age group (28.0%), followed by 31–40 years (26.0%), while 23.0% each were in the 41–50 years and >50 years age groups. Among the participants, 214 (53.5%)

were males and 186 (46.5%) were females. With respect to occupation, the majority were employed (49.0%), followed by students (18.5%), self-employed individuals (17.0%), homemakers (10.5%), and unemployed participants (5.0%). In terms of educational status, 33.5% were graduates, 28.0% had completed higher secondary education, 24.0% had education up to secondary level, and 14.5% were postgraduates (Table 1).

The distribution of sleep quality based on the Pittsburgh Sleep Quality Index (PSQI) is shown in Table 2. Among the 400 participants, 236 (59.0%) had good sleep quality (PSQI ≤5), whereas 164 (41.0%) were classified as having poor sleep quality (PSQI >5).

The mean values of physiological parameters of the study participants are summarized in Table 3. The mean body mass index was 24.7 ± 4.1 kg/m². The average systolic and diastolic blood pressure were 122.6 ± 13.4 mmHg and 79.8 ± 8.6 mmHg, respectively. The mean resting heart rate was 76.2 ± 9.3 beats per minute. The mean fasting blood glucose level was 101.4 ± 18.7 mg/dL. Regarding lipid profile parameters, the mean total cholesterol, triglycerides, HDL cholesterol, and LDL cholesterol levels were 189.6 ± 36.2 mg/dL, 149.3 ± 42.8 mg/dL, 45.6 ± 9.4 mg/dL, and 118.4 ± 31.7 mg/dL, respectively (Table 3).

The association between sleep quality and physiological parameters is presented in Table 4. Participants with poor sleep quality had significantly higher mean values of BMI (25.8 ± 4.5 kg/m² vs 23.9 ± 3.6 kg/m²), systolic blood pressure (125.3 ± 14.1 mmHg vs 120.8 ± 12.4 mmHg), diastolic blood pressure (81.4 ± 9.2 mmHg vs 78.6 ± 7.9 mmHg), resting heart rate (78.1 ± 9.6 beats/min vs 74.8 ± 8.7 beats/min), fasting blood glucose (105.3 ± 20.6 mg/dL vs 98.7 ± 16.4 mg/dL), total cholesterol (195.8 ± 37.6 mg/dL vs 185.2 ± 34.7 mg/dL), and triglycerides (158.9 ± 44.3 mg/dL vs 142.1 ± 40.6 mg/dL) compared with participants with good sleep quality. In contrast, HDL cholesterol levels were lower among participants with poor sleep quality (43.4 ± 9.6 mg/dL) compared with good sleepers (47.2 ± 8.9 mg/dL). These differences were statistically significant (Table 4).

Logistic regression analysis was performed to identify predictors of poor sleep quality, and the findings are shown in Table 5. Elevated BMI (>25 kg/m²) was associated with a higher likelihood of poor sleep quality (OR = 1.84, 95% CI: 1.22–2.76). Similarly, elevated systolic blood pressure (>130 mmHg) (OR = 1.67, 95% CI: 1.08–2.59), higher fasting blood glucose (>110 mg/dL) (OR = 1.72, 95% CI: 1.11–2.66), elevated triglycerides (>150 mg/dL) (OR = 1.58, 95% CI: 1.03–2.42), and low HDL cholesterol (<40 mg/dL) (OR = 1.69, 95% CI: 1.10–2.60) were identified as significant predictors of poor sleep quality (Table 5).

Table 1. Sociodemographic Characteristics of Study Participants (n = 400)

Variable	Category	Frequency (n)	Percentage (%)
Age Group (years)	18–30	112	28.0
	31–40	104	26.0
	41–50	92	23.0
	>50	92	23.0
Gender	Male	214	53.5
	Female	186	46.5
Occupation	Student	74	18.5
	Employed	196	49.0
	Self-employed	68	17.0
	Homemaker	42	10.5
	Unemployed	20	5.0
Educational Status	Up to Secondary	96	24.0
	Higher Secondary	112	28.0
	Graduate	134	33.5
	Postgraduate	58	14.5

Table 2. Distribution of Pittsburgh Sleep Quality Index (PSQI) Scores (n = 400)

Sleep Quality Category	PSQI Score	Frequency (n)	Percentage (%)
Good Sleep Quality	≤5	236	59.0
Poor Sleep Quality	>5	164	41.0

Table 3. Mean Physiological Parameters of Study Participants (n = 400)

Parameter	Mean ± SD
Body Mass Index (kg/m²)	24.7 ± 4.1
Systolic Blood Pressure (mmHg)	122.6 ± 13.4
Diastolic Blood Pressure (mmHg)	79.8 ± 8.6
Resting Heart Rate (beats/min)	76.2 ± 9.3
Fasting Blood Glucose (mg/dL)	101.4 ± 18.7
Total Cholesterol (mg/dL)	189.6 ± 36.2
Triglycerides (mg/dL)	149.3 ± 42.8
HDL Cholesterol (mg/dL)	45.6 ± 9.4
LDL Cholesterol (mg/dL)	118.4 ± 31.7

Table 4. Association Between Sleep Quality and Physiological Parameters

Parameter	Good Sleep Quality (n = 236) Mean ± SD	Poor Sleep Quality (n = 164) Mean ± SD	p value
Body Mass Index (kg/m²)	23.9 ± 3.6	25.8 ± 4.5	0.001
Systolic BP (mmHg)	120.8 ± 12.4	125.3 ± 14.1	0.003
Diastolic BP (mmHg)	78.6 ± 7.9	81.4 ± 9.2	0.007
Resting Heart Rate	74.8 ± 8.7	78.1 ± 9.6	0.002
Fasting Blood Glucose	98.7 ± 16.4	105.3 ± 20.6	0.004
Total Cholesterol	185.2 ± 34.7	195.8 ± 37.6	0.011
Triglycerides	142.1 ± 40.6	158.9 ± 44.3	0.006
HDL Cholesterol	47.2 ± 8.9	43.4 ± 9.6	0.002
LDL Cholesterol	115.3 ± 29.8	122.8 ± 33.5	0.028

Table 5. Logistic Regression Analysis for Predictors of Poor Sleep Quality

Variable	Odds Ratio (OR)	95% CI	p value
BMI (>25 kg/m²)	1.84	1.22 – 2.76	0.003
Elevated Systolic BP (>130 mmHg)	1.67	1.08 – 2.59	0.019
High Fasting Glucose (>110 mg/dL)	1.72	1.11 – 2.66	0.015
High Triglycerides (>150 mg/dL)	1.58	1.03 – 2.42	0.035
Low HDL (<40 mg/dL)	1.69	1.10 – 2.60	0.017

DISCUSSION

The present study assessed the prevalence of poor sleep quality among adults and examined its association with selected physiological parameters. In this study, 41.0% of participants were identified as poor sleepers based on

PSQI scores, indicating that sleep disturbances are relatively common in the adult population. Similar findings have been reported in several epidemiological studies where a considerable proportion of adults were found to experience poor sleep quality. For instance, studies conducted among different populations have reported prevalence rates exceeding 50%, highlighting the widespread nature of sleep disturbances in modern lifestyles [8,9].

In the present investigation, individuals with poor sleep quality demonstrated higher mean body mass index (BMI) compared with those who reported good sleep quality. This finding is consistent with earlier research suggesting that disturbed sleep may contribute to weight gain and metabolic dysregulation. A cross-sectional study evaluating sleep quality among adults reported that participants with poor sleep had significantly higher BMI compared to good sleepers, suggesting a relationship between sleep disturbances and body weight regulation [8]. The mechanisms underlying this association may involve alterations in appetite-regulating hormones, increased caloric intake, and reduced physical activity associated with sleep deprivation.

The current study also observed significantly higher systolic and diastolic blood pressure among individuals with poor sleep quality, indicating a potential link between sleep disturbances and cardiovascular risk. Previous large population-based investigations have demonstrated similar findings. Studies examining PSQI scores in relation to blood pressure have shown that individuals with poorer sleep quality tend to have higher blood pressure levels and a greater likelihood of hypertension [10,11]. Furthermore, research involving large community cohorts has demonstrated that the odds of hypertension increase progressively with worsening sleep quality scores, emphasizing the importance of sleep health in cardiovascular risk assessment [10].

Another important observation in this study was the association between poor sleep quality and elevated fasting blood glucose levels. Individuals with poor sleep exhibited higher mean fasting glucose compared to good sleepers, indicating a possible link between sleep disturbance and impaired glucose metabolism. Evidence from clinical studies suggests that sleep disruption can adversely affect insulin sensitivity and glucose regulation, thereby increasing the risk of metabolic disorders such as type 2 diabetes mellitus [9].

The present study also demonstrated unfavorable lipid profile parameters among poor sleepers, including higher total cholesterol and triglyceride levels along with lower HDL cholesterol. Such findings are supported by earlier studies indicating that poor sleep quality may contribute to dyslipidemia and other cardiometabolic abnormalities. Sleep disturbances have been associated with increased metabolic syndrome risk factors, including abnormal lipid levels, hypertension, and obesity, suggesting that sleep plays an important role in maintaining metabolic homeostasis [12].

Furthermore, logistic regression analysis in the present study identified increased BMI, elevated blood pressure, high fasting glucose, elevated triglycerides, and low HDL cholesterol as significant predictors of poor sleep quality. These findings support the growing body of evidence linking sleep disturbances with cardiometabolic risk factors. Recent studies have highlighted that individuals with poor sleep are more likely to develop cardiometabolic disorders, and lifestyle factors such as physical inactivity and obesity may further exacerbate these associations [13].

Overall, the findings of this study are consistent with existing literature suggesting that poor sleep quality is closely associated with multiple physiological parameters related to cardiometabolic health. Considering the increasing prevalence of lifestyle-related disorders, assessment of sleep quality should be integrated into routine health evaluations. Early identification and management of sleep disturbances may contribute to improved metabolic and cardiovascular health outcomes in the adult population.

CONCLUSION

This study demonstrated that poor sleep quality is common among adults, with a substantial proportion of participants exhibiting PSQI scores indicative of impaired sleep. Individuals with poor sleep quality showed significantly higher values of several physiological parameters, including body mass index, blood pressure, fasting blood glucose, and unfavorable lipid profile components, suggesting a potential link between disturbed sleep and adverse cardiometabolic status. These findings highlight the importance of recognizing sleep quality as an essential component of overall health. Early identification of sleep disturbances and the implementation of appropriate lifestyle and behavioral interventions may help reduce the risk of associated physiological abnormalities and improve long-term health outcomes in the adult population.

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