

CORRELATION BETWEEN SLEEP DURATION AND SLEEP QUALITY WITH BMI IN YOUNG ADULTS

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INTRODUCTION:

Sleep is essential for maintaining optimal health and overall well-being, as it influences various physiological and psychological processes.[1].

Like exercise and a balanced diet, getting adequate sleep plays a crucial role in preventing a wide range of health issues, including cardiovascular diseases, metabolic disorders, and mental health conditions such as depression.[3].

The right amount of sleep is important for the mind and body to function properly. A healthy sleep is characterized by adequacy of sleep duration, good quality, appropriate timing, and freedom from sleep disorders.[3].

A healthy human adult requires an average of 7 to 9 h of sleep per day.[2]

Maintaining adequate sleep duration and high-quality sleep is essential for young adults to support physical health, mental well-being, and overall quality of life.[5], as this stage of life demands high levels of energy and mental alertness for academic, professional, and social responsibilities.

Overweight is a condition of excessive fat deposits.

Obesity is a chronic complex disease defined by excessive fat deposits that can impair health.[6].

Overweight and Obesity are well-known risk factors for cardiovascular, metabolic, musculoskeletal diseases, and various other adverse health outcomes [6]. Obesity influences the quality of living, such as sleeping or moving.

The prevalence of obesity has increased worldwide in the last few decades and the World Health Organization has now declared it a global epidemic.[6].

The diagnosis of overweight and obesity is made by calculating the body mass index (BMI). BMI stands for Body Mass Index, which is a numerical value calculated from a person's height and weight.

It is used as a screening tool to categorize individuals into different weight categories: underweight, normal weight, overweight, and obesity.[7].

BMI is considered as an indicator of general health.

The BMI categories for defining obesity vary by age and gender in infants, children and adolescents.

The Asian classification of BMI:

Underweight : < 18.5 kg/m²

Normal weight: 18.5–22.9 kg/m²

Overweight: 23.0–24.9 kg/m²

Pre obese : 25.0–29.9 kg/m²

Obesity Type I: 30.0 - 40 kg/m²

Obesity Type II: 40.1 – 50 kg/m²

Obesity Type III: > 50 kg/m²

Given the increasing burden of obesity and the importance of adequate sleep in maintaining health, exploring the correlation between sleep duration, sleep quality, and BMI in young adults is of significant relevance.

NEED FOR THE STUDY:

Obesity is a significant public health concern associated with numerous adverse health outcomes, including cardiovascular disease, diabetes, and certain cancers [6].

Sleep plays a vital role in regulating metabolism, appetite hormones, and energy balance [3].

Short sleep duration and poor sleep quality are prevalent in modern society due to various factors such as work demands, academics, electronic device usage, and lifestyle habits.[8].

Studying the effect of sleep duration and sleep quality on BMI is important for understanding potential correlations between sleep patterns and weight management.

Studying this correlation will help us to understand whether poor sleep habits are associated with higher BMI and obesity and how sleep might influence weight management.

Understanding these relationships can inform individuals about the importance of prioritizing healthy sleep habits for overall well-being and developing effective strategies to promote healthy sleep habits and weight management.

REVIEW OF LITERATURE:

1.Preeti Gupta, Neena Srivastava, Vani Gupta, Sunita Tiwari and Monisha Banerjee. Association of sleep duration and sleep quality with body mass index among young adults. Journal of Family Medicine and Primary Care (Jun 2022)

A cross-sectional study, 88 individuals selected from King George's Medical University were taken as participants. Weight and height of the volunteers were measured, and neck circumference and waist circumference were also measured. BMI was calculated using the formula: $BMI = \text{Weight (kg)}/\text{Height (m}^2\text{)}$. The sleep assessment was done using Pittsburgh Sleep Quality Index (PSQI) questionnaire. On the basis of BMI, the volunteers were categorized as follows: Underweight (BMI <18.5 kg/m²), Normal weight (BMI 18.5–22.9 kg/m²), Overweight (BMI 23.0–24.9 kg/m²), Obese Grade I (BMI 25.0–34.9 kg/m²), and Obese Grade II (BMI >35.0 kg/m²). This study concludes that short sleep duration and poor sleep quality were associated with overweight obesity among young adults.

2. Dr. Nazish Rafique. Short sleep duration is a novel independent risk factor for overweight and obesity. Saudi Medical Journal (Nov 2023)

A cross-sectional study was carried out on health sciences students aged 16-22 years, from Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia. Measurement of height and weight was carried out and BMI was calculated by the formula= $\text{weight in kg}/\text{height in m}^2$. On the basis of BMI calculation, the subjects were categorized into 3 main groups: underweight (UW): BMI of ≤ 18.5 ; normal weight (NW): BMI of ≤ 24.9 ; and OW and OB: BMI of > 25

in m^2 . The online questionnaire inquired on SD, eating habits, and PA in the last one year. Sleep duration was calculated from the short form of the perceived quality index questionnaire. Based on SD, subjects were divided into 3 groups: short SD: <7 hours/24 hours; normal SD: 7-9 hours/24 hours; and increased SD: >9 hours/24 hours. Participants with a SSD had significantly higher BMI than normal and long sleepers. Short sleep duration is an independent risk factor for increased BMI, which potentially leads to 1.47 times increased odds ratio of having OW and OB.

3. Huan Chen, Li-Juan Wang, Fei Xin ,Guo Liang & Yuan Chen. Associations between sleep duration, sleep quality, and weight status in Chinese children and adolescents. BMC Public Health (7 June 2022)

A cross-sectional research was conducted among 2019 children and adolescents (1029 boys and 990 girls) aged 8–16 years in Shanghai. An open-question was used to obtain data on sleep duration, which was categorized into the following four groups based on the age-specific National Sleep Foundation Sleep Duration Recommendations: 1) very short, 2) short, 3) recommended, and 4) long. The Pittsburgh Sleep Quality Index was used to assess sleep quality. Weight and height were measured for all participants. The variable weight status was estimated with the Chinese children and adolescent age- and sex-specific body mass index (BMI) and was categorized into overweight/obesity and normal weight. Overall, short sleep duration increased

the risks of overweight/obesity in children and adolescents in China, independent of sleep quality. This relationship is significant for girls and children aged 8–13 years instead of boys and adolescents aged 14–16 years.

AIM:

To study correlation between sleep duration and sleep quality with BMI in young adults.

OBJECTIVES:

- a) To assess sleep duration and sleep quality using Sleep Quality Scale in young adults.
- b) To assess BMI in young adults.
- c) To find correlation between sleep duration and sleep quality with BMI in young adults.

METHODOLOGY:

STUDY DESIGN: Observational Study.

STUDY TYPE: Correlational Study.

STUDY SETTING: Community

STUDY POPULATION: Young Adults (18-25 Years)

SAMPLING TECHNIQUE: Convenience Sampling.

SAMPLE SIZE: 65

INCLUSION CRITERIA: Young Adults of Age group 18-25 years

EXCLUSION CRITERIA: People with sleep disorders (eg. Insomnia)

Family history of Obesity

Individuals with endocrine disorders (eg. PCOD, Thyroid,etc)

Individuals on sedatives/hypnotic drugs.

TOOLS AND MATERIALS: Sleep Quality Scale (SQS)

STUDY PROCEDURE:

IRB approval was taken.



The population was selected based on inclusion criteria using a convenience sampling method.



BMI was assessed and Sleep Quality Scale questionnaire were administrated.



The data was collected and analysed.

STATISTICAL ANALYSIS:

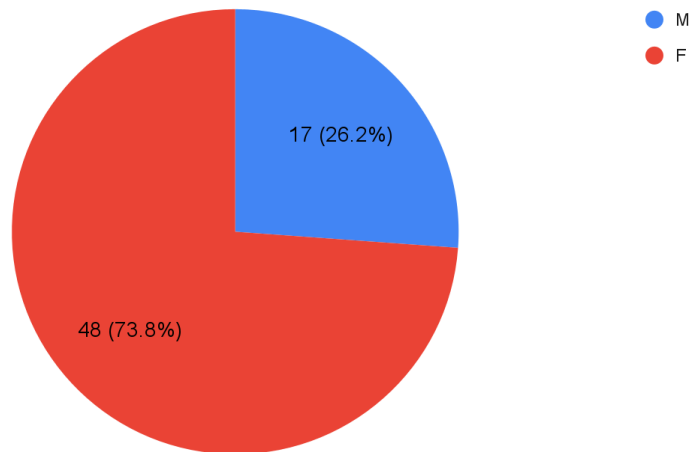
Microsoft Excel was used for data entry.

Descriptive analysis was done using pie chart.

Normality testing was done using Shapiro Wilk Test.

To determine the correlation between two variables Spearman correlation test was used as the data did not pass the normality .

GENDER wise distribution of study participants



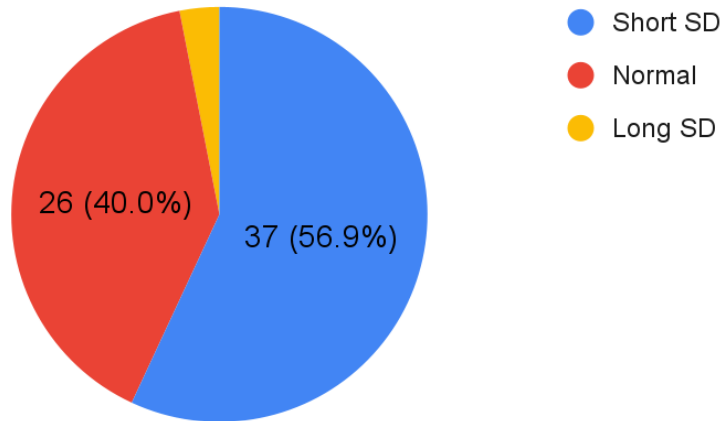
RESULT:

n= 65 (no. of participants)

Female (F): 48 individuals (73.8%)

Male (M): 17 individuals (26.2%)

SLEEP DURATION CLASSIFICATION

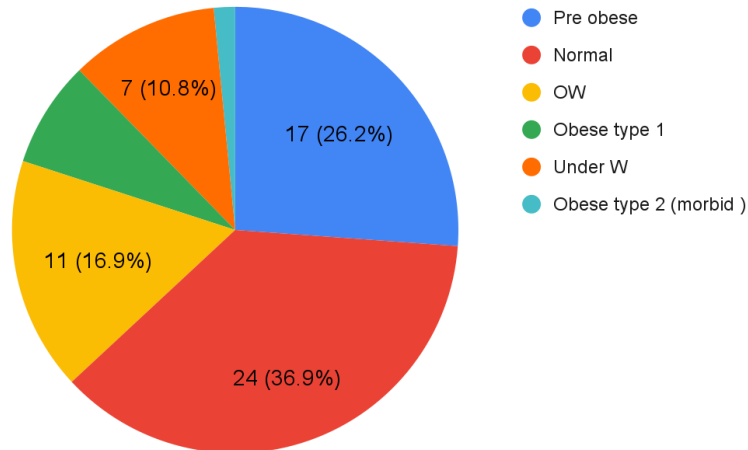


Short Sleep Duration (SD): 37 individuals (58.9%)

Normal SD: 26 individuals (40.0%)

Long SD: 2 individual (1.1%)

Count of Asian Classification of BMI



Pre obese: 17 individuals (26.2%)

Normal: 24 individuals (36.9%)

Overweight (OW): 11 individuals (16.9%)

Obese type 1: 5 individuals (7.7%)

Underweight (Under W): 7 individuals (10.8%)

Obese type 2 (morbid): 1 individual

Shapiro Wilk Normality Test

Variable	Shapiro Statistics	Wilk	P value	Normality Conclusion
BMI	0.938		0.0029	Not normal ($p < 0.05$)
Sleep Duration (hrs)	0.963		0.0470	Marginal ($p=0.047$)
Sleep Quality Score	0.972		0.1400	Normal ($p > 0.05$)

Interpretation:

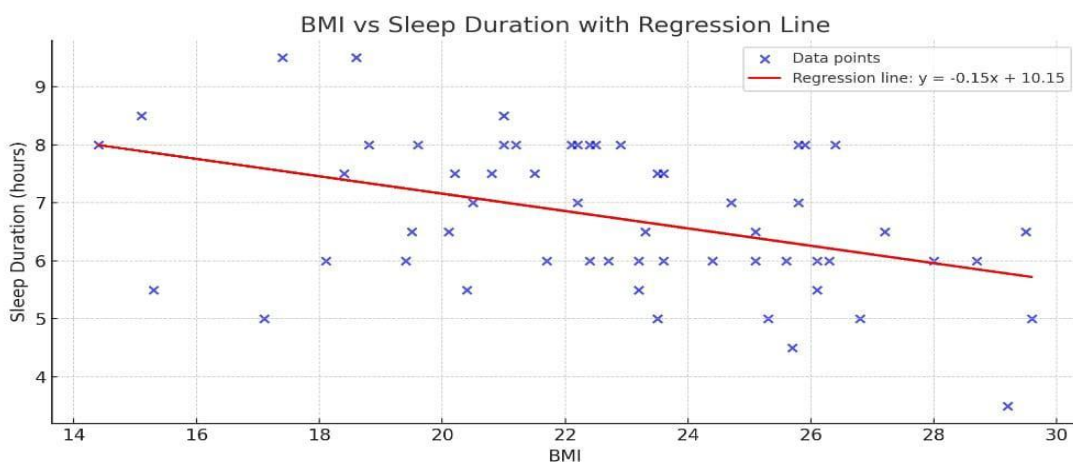
The BMI variable significantly deviates from normality.

Sleep Duration is borderline ($p \approx 0.047$), suggesting possible non-normality.

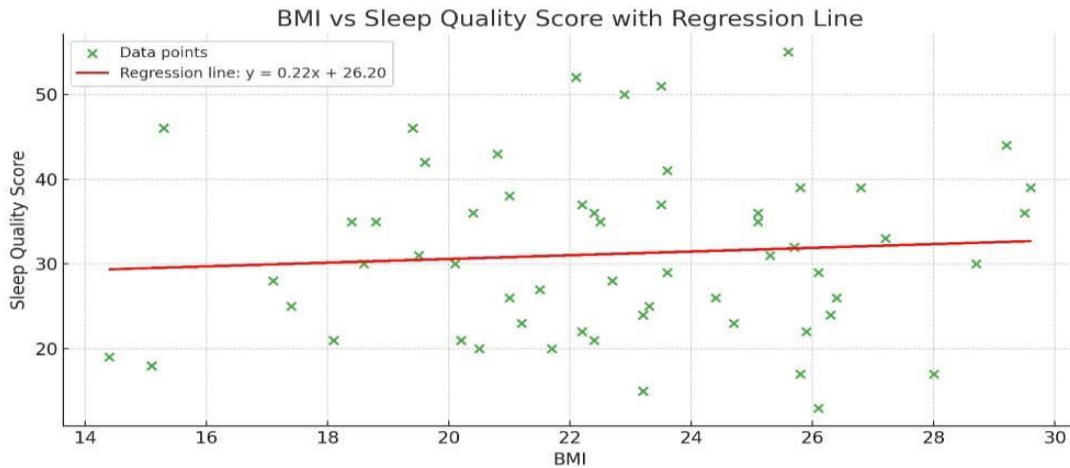
Sleep Quality Score appear to follow a normal distribution

Spearman correlation :

Variable Pair	Spearman Correlation Coefficient	p-value	Interpretation
BMI vs Sleep Duration (hrs)	-0.447	0.00019	Moderate negative correlation (statistically significant)
BMI vs Sleep Quality Score	0.106	0.403	Very weak positive correlation (not statistically significant)



BMI vs Sleep Duration: The regression line highlights the negative trend, consistent with the negative Spearman correlation.



BMI vs Sleep Quality Score: The regression line is nearly flat, reinforcing the lack of significant relationship.

DISCUSSION

The study was conducted on 65 young adults in the age group of 18 to 25 years . The objective of the study was to assess sleep duration and sleep quality in young adults , to assess BMI in young adults and to find correlation between sleep duration and sleep quality with BMI in young adults.

Studying this correlation is important to understand whether the poor sleep habits are associated with higher BMI and obesity and how sleep might influence weight management.

The present study examined the relationship between sleep duration, sleep quality, and body mass index (BMI) among young adults. The findings demonstrated a moderate negative correlation between sleep duration and BMI, indicating that individuals with shorter sleep duration tended to have higher BMI values. In contrast, sleep quality scores showed only a very weak positive correlation with BMI, suggesting that subjective perceptions of sleep quality may not be strongly associated with BMI in this population.[5,9]

The observed inverse association between sleep duration and BMI highlights insufficient sleep as a risk factor for obesity. Biological mechanisms such as alterations in appetite-regulating hormones (increased ghrelin and reduced leptin) have been identified as potential pathways through which reduced sleep duration contributes to weight gain.[3]. Furthermore, insufficient sleep may lead to increased fatigue, resulting in lower levels of physical activity and poor dietary choices, further contributing to higher BMI.[8].

On the other hand, the weak correlation between sleep quality and BMI suggests that subjective sleep assessments may not fully capture the physiological aspects of sleep that influence metabolic outcomes. While poor sleep quality has been associated with weight gain in some studies, particularly in older adults or clinical populations, its effects in young adults may be less pronounced.[7]. It is also possible that sleep duration exerts a stronger influence on BMI than perceived quality, overshadowing its contribution in this cohort. Additionally, self-reported sleep quality is prone to recall bias and may not accurately reflect objective sleep disturbances such as apnea or fragmented sleep [10].

The findings of this study emphasize the importance of adequate sleep duration in maintaining a healthy BMI during young adulthood, a critical period for establishing lifelong health behaviors. However, it is important to acknowledge that BMI is a multifactorial outcome influenced by various factors including diet, physical

activity, stress, and socioeconomic status, which were not controlled in this study.[11].

Despite these limitations, the study contributes to the growing evidence linking sleep and metabolic health. It highlights the potential of promoting healthy sleep habits as a preventive strategy against overweight and obesity in young adults.

CONCLUSION:

The aim of the study was to understand the correlation between sleep duration and sleep quality with BMI in young adults (age group of 18-25 years).

This study concludes that shorter sleep duration is associated with higher BMI in young adults, while subjective sleep quality has minimal impact. Ensuring adequate sleep duration appears to be a key lifestyle factor for maintaining healthy body weight during young adulthood.

The present study can be concluded in the following points:

- Sleep Duration is inversely associated with BMI (significant relationship).
- No significant relationship is found between Sleep Quality Score and BMI.

CLINICAL IMPLICATIONS:

- ❖ Aiming at improving sleep duration (e.g., promoting consistent sleep schedules, minimizing screen time before bed, and managing sleep disorders) could serve as an effective strategy to help prevent or reduce excess weight gain.
- ❖ Young adults often prioritize academic or social activities over sleep, contributing to sleep deprivation. Clinicians should counsel patients on the long-term metabolic and hormonal effects of poor sleep.
- ❖ Healthcare providers should routinely assess sleep habits as part of general health evaluations, especially in young adults at risk for overweight or obesity.
- ❖ Clinicians should counsel patients on the long-term metabolic and hormonal effects of poor sleep.
- ❖ Obesity prevention strategies should adopt a multifactorial approach, where adequate sleep is considered alongside diet, physical activity, and mental health.

LIMITATIONS & SUGGESTIONS:

- ❖ Sleep quality is self-reported and may not accurately reflect objective sleep disturbances.
- ❖ Sample size and population specifics (e.g., geographic location, ethnicity) may limit generalizability.
- ❖ Use objective sleep measurement tools (like actigraphy or polysomnography) to assess sleep quality and duration.
- ❖ Study diverse populations to enhance generalizability of findings.
- ❖ Incorporate additional variables such as diet, physical activity, and psychological factors to understand their combined effects on BMI.

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SLEEP QUALITY SCALE (SQS):

Reliability and Validity: An initial psychometric evaluation conducted by Yi and colleagues found an internal consistency of .92, a test-retest reliability of .81.

Scoring: Total scores can range from 0 to 84, with higher scores denoting more acute sleep problems.

Sleep Quality Scale (SQS)

85

Purpose Consisting of 28 items, the SQS evaluates six domains of sleep quality: daytime symptoms, restoration after sleep, problems initiating and maintaining sleep, difficulty waking, and sleep satisfaction. Developers hoped to create a scale that could be used as an all-inclusive assessment tool – a general, efficient measure suitable for evaluating sleep quality in a variety of patient and research populations.

Population for Testing The scale has been validated in individuals aged 18–59 years.

Administration Requiring between 5 and 10 min for administration, the scale is a simple self-report, pencil-and-paper measure.

Reliability and Validity An initial psychometric evaluation conducted by Yi and colleagues [1] found an internal consistency of .92, a test-retest reliability of .81. The SQS is strongly correlated with results obtained on the Pittsburgh Sleep Quality Index (Chap. 67). Scores achieved by the insomnia sample were significantly higher than those of controls, indicating good construct validity.

Obtaining a Copy A list of the scale's 28 items can be found in the original article published by developers [1].

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Scoring Using a four-point, Likert-type scale, respondents indicate how frequently they exhibit certain sleep behaviors (0 = “few,” 1 = “sometimes,” 2 = “often,” and 3 = “almost always”). Scores on items belong to factors 2 and 5 (restoration after sleep and satisfaction with sleep) and are reversed before being tallied. Total scores can range from 0 to 84, with higher scores denoting more acute sleep problems.

Sleep Quality Scale

The following survey is to know the quality of sleep you had for the last one month. Read the questions and check the closest answer.

Examples

Rarely : None or 1-3 times a month
 Sometimes : 1-2 times a week
 Often : 3-5 times a week
 Almost always : 6-7 times a week

		Rarely	Sometimes	Often	Almost always
1	I have difficulty falling asleep.				
2	I fall into a deep sleep.				
3	I wake up while sleeping.				
4	I have difficulty getting back to sleep once I wake up in middle of the night.				
5	I wake up easily because of noise.				
6	I toss and turn.				
7	I never go back to sleep after awakening during sleep.				
8	I feel refreshed after sleep.				
9	I feel unlikely to sleep after sleep.				
10	Poor sleep gives me headaches.				
11	Poor sleep makes me irritated.				
12	I would like to sleep more after waking up.				
13	My sleep hours are enough.				
14	Poor sleep makes me lose my appetite.				
15	Poor sleep makes hard for me to think.				
16	I feel vigorous after sleep.				
17	Poor sleep makes me lose interest in work or others.				
18	My fatigue is relieved after sleep.				
19	Poor sleep causes me to make mistakes at work.				
20	I am satisfied with my sleep.				
21	Poor sleep makes me forget things more easily.				
22	Poor sleep makes it hard to concentrate at work.				
23	Sleepiness interferes with my daily life.				
24	Poor sleep makes me lose desire in all things.				
25	I have difficulty getting out of bed.				
26	Poor sleep makes me easily tired at work.				
27	I have a clear head after sleep.				
28	Poor sleep makes my life painful.				

DATA RECORD SHEET:

DATE:

NAME:

AGE:

GENDER:

OCCUPATION:

WEIGHT:

HEIGHT:

BMI:

SLEEP DURATION:
(HOW MANY HOURS DO YOU SLEEP?)

HOW MANY HOURS OF UNDISTURBED SLEEP:

SLEEP QUALITY SCALE SCORE:

CONSENT FORM

Research Title: Correlation between sleep duration and sleep quality with BMI in young adults.

Name of participant:

1. I confirm that I have read and understood the Information Sheet for the above study.
2. I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason.
3. I agree not to restrict the use of data or results that arise from this study provided such use is only for scientific purposes.
4. I agree to take part in the above study.

I, thus give my consent to participate in the above-mentioned study.

SIGNATURE - _____

DATE-

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