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ORIGINAL ARTICLE

Association Between Quality of Sleep, Dietary Intake and Obesity Among Adults in Mandya City: A Cross-Sectional Study

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Abstract

Introduction: Sleep is a periodic, reversible physiological condition of unconsciousness that is essential for people's recovery and well being from which a person can be aroused by sufficient stimulus. Sleep problems and obesity are considered an emerging global pandemic. Both the quantity and quality of sleep are crucial for maintaining health and wellbeing. Additionally, one of the main modifiable behavioural risk factors for the development of obesity is an unhealthy diet. **Materials and Methods:** Anthropometric measurements were used to calculate BMI, which was categorized using Indian standards. Sleep quality was assessed using the PSQI and diet using a pre-tested questionnaire. Descriptive statistics, correlation analysis, and visualizations were employed to examine the association between obesity, sleep quality and diet. **Results:** The mean BMI of the participants was 27.46±1.59 kg/m² in males and 27.36±1.57kg/m^2 in females, with all participants classified as obese per Indian BMI guidelines. In this study it was found that age does not correlate significantly with BMI, PSQI, or Diet. Across all four variables (Age, BMI, PSQI, Diet), $p > 0.05$, there are no males and females differ statistically significantly. But BMI, PSQI, and Diet scores are all strongly and positively correlated with each other (r values > 0.97, all $p < 0.001$). This suggests that individuals with higher BMI tend to have higher PSQI (poorer sleep quality) and higher Diet scores (poorer dietary pattern). Thus, this study demonstrated that dietary changes and sleep deprivation cause obesity. **Conclusion:** The findings highlight a significant relationship between obesity and poor sleep quality in young adults in Mandya City. Given the interplay of dietary habits in influencing both factors, targeted interventions focusing on healthy eating and sleep hygiene may be crucial in mitigating obesity-related health risks.

Keywords: Obesity, Body Mass Index (BM), Pittsburgh Sleep Quality Index (PSQI)

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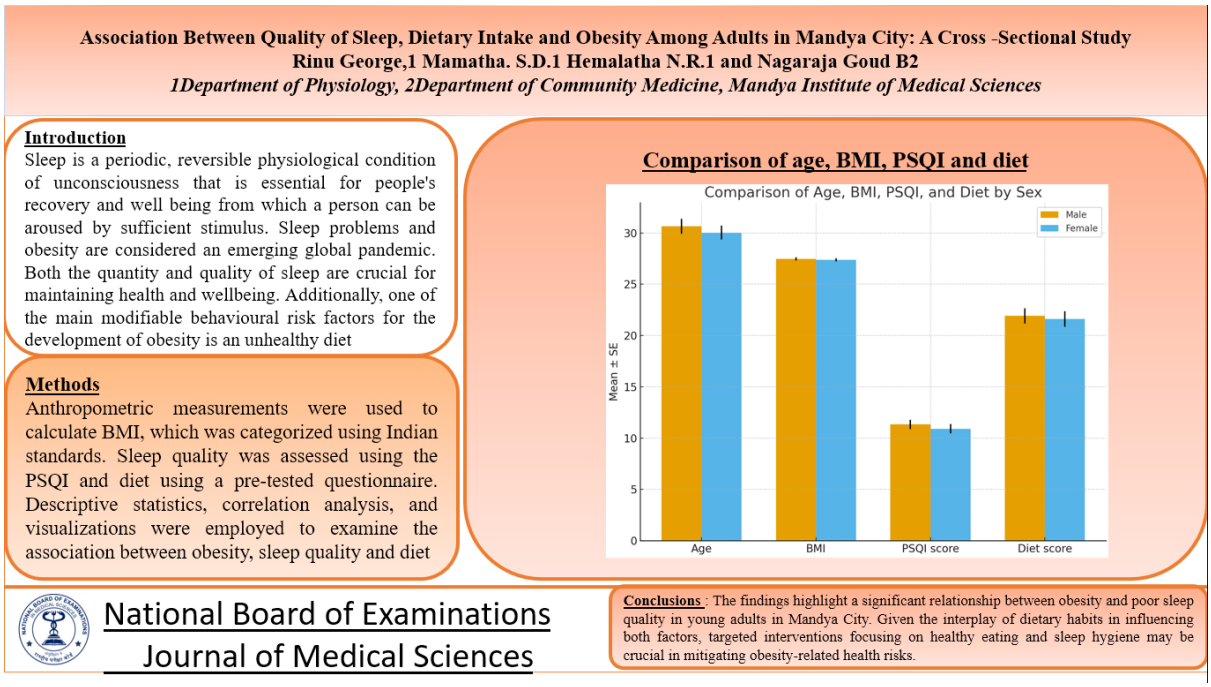
Graphical Abstract



Introduction

Sleep is a periodic, reversible physiological condition of unconsciousness that is essential to people's recovery and wellbeing and can be eliminated with sufficient stimulus. Sleep issues are seen as a new global pandemic [1,2]. Obesity is another global epidemic and short sleep length (6 hours) was linked to a 45% higher risk of obesity compared to regular sleep duration, according to a recent meta-analysis of prospective studies [3,4].

Research has shown that patterns in sleep issues are similar to those in obesity. Weight gain results from behavioural, metabolic, and endocrine changes brought on by shorter sleep duration and lower sleep quality [3,4]. Additionally, because obese people are more likely to experience sleep apnoea, obesity exacerbates sleep issues [5]. Furthermore, because it is linked to a number of chronic illnesses, including an increased risk of cardiovascular disease, insulin resistance, and hypertension, it continues to be one of the key health concerns [6]. Globally approximately 1.9 million (39%) adults were overweight and 609 million (13%) adults were obese in 2015 according to the World Health Organization [7]. Obesity is also thought to be a strong risk factor elevating the risk of disability and poor overall health among older adults [8]. A chronic pattern of sleep duration of 6 hours a night has been associated with a higher body mass index (BMI) [9]. A meta-analysis of 604509 adults showed obesity for less than (5hrs) of sleep and a dose effect of sleep duration such that for each additional hour of sleep BMI decreased by 0.35kg/m^2 [10].

Sleep takes up 20% to 40% of the day and is a physiological aspect of human life that is mostly regulated by the nervous system. Sleep amount and quality are crucial for maintaining health and wellbeing [11,12]. The recommended sleep duration, according to the National Sleep Foundation is 7 to 9hr for young adults [13].

Reduced consumption of dietary fibre and increased intake of carbs, total sugar, total cholesterol, and total saturated fat are linked to short sleep duration. This increases calorie intake and throws off the equilibrium between energy intake and energy expenditure, which results in obesity [14]. Due to the growing demands of work, school, and leisure activities as well as the widespread use of electronic gadgets and the internet, it is a global phenomenon that both adults and adolescents are sleeping for shorter periods of time than they did a few decades ago [15]. As a result, obesity has become an epidemic on a global scale and significantly increases the burden of chronic illnesses and disabilities.

Additionally, one of the main modifiable behavioural risk factors for the development of obesity is an unhealthy diet [16]. Fast food has been more accessible due to rising urbanization and affluence, which has resulted in numerous modifications over the past few decades. Nutrition has changed quickly as a result of these dietary and lifestyle changes brought on by watching television, using computers, the internet, and smartphones leading to obesity among children, adolescents and adults [17,18]. A variety of dietary recommendation have been proposed to prevent obesity. The major factors contributing to obesity being improper dietary habits like Mealtime irregularities, poor food quality, consuming excessive amounts of junk food, and dining out [17].

According to National Family Health Survey (NFHS-5), India (2019–21) measured population-level estimates: ~24% of women and ~23% of men (age 15–49) are overweight or obese (BMI ≥25), and obesity (BMI ≥30) ~6.4% in women and 4.0% in men. A cross-sectional study among adults in rural Mandya found that 25.9% of participants had hypertension and the study identified obesity (along with a history of diabetes) as a significant risk factor for hypertension in this population [19].

Hence this study was taken up with the primary hypothesis that poor sleep quality (higher PSQI scores) is significantly associated with higher BMI and increased risk of obesity and secondary hypothesis that Unhealthy dietary patterns are significantly associated with higher BMI, poor sleep quality is associated with unhealthy dietary behaviours (e.g., increased caloric intake, poor food choices) and that sleep quality and dietary patterns together have a combined effect on BMI and obesity risk. The objective of the study was to access the association between sleep quality (using PSQI), dietary patterns (using a diet questionnaire), and obesity status (using BMI).

Materials and Methods

This cross-sectional study, was conducted from August 2025 to October 2025 on 209 subjects of age group 20–45 years who are adults with BMI > 25kg/m^2 of Mandya city. The Institutional Ethical committee approved study on August 12, 2025. After obtaining informed consent, data was gathered using a four-part, semi-structured questionnaire.

Socio Demographic Characters

The data shall be recorded using a semi-structured questionnaire which contains 3 parts:

- The first part shall collect details of socio-demographic characteristics like

name, age, sex etc and height and weight of the individual will be measured using stadiometer and a digital weighing scale respectively from which BMI is calculated using Quetelet's index.

- The second part contains The Pittsburgh Sleep Quality Index (PSQI).

Pittsburgh sleep quality index (PQSI)

PSQI has been found to be most effective in terms of reliability and validity. It includes 19 self-rated items, which focus on seven main areas including: subjective sleep quality, sleep latency (time taken to fall asleep), sleep duration, habitual sleep efficiency (the ratio of total sleep time to time in bed), sleep disturbances, the use of sleep-inducing medicines and daytime dysfunction.

PSQI Scoring -The PSQI includes a scoring key for calculating a patient's

seven sub scores, each of which ranges from 0 to 3.

A score of 0 indicates no difficulty.

A score of 3 indicates severe difficulty.

The 7 component scores are then added to make a global score with a range of 0-21

A score of 0 means no difficulty.

A score of 5 or more indicates poor sleep quality.

A score of 21 means severe difficulties in all areas.

(The higher the score, the worse the quality).

- The third part contains details of dietary habits based on a pre-tested questionnaire.[20]

The diet questionnaire contains consists of 11 questions with a global score ranging from 0-34.

(The higher the score, the worse the quality).

Data Collection

Data were collected by convenience sampling technique, among 209 adults of Mandya city. A five minutes briefing session was given to explain the study and various terms which are used in the study, total time of 10 -15 minutes was provided to the adults to fill the questionnaire. They were assured about the confidentiality of their personal information.

Inclusion Criteria

- Adults in Mandya city willing to give informed consent to participate in the study.
- Age group of 20-45 years.
- Adults with BMI >25kg/m^2

Exclusion Criteria

- Adults with a BMI less than 25kg/m^2
- Any physical or mental illness affecting their sleep.
- Any diagnosed psychiatric illness, neurological disorders.
- Adults with history of any endocrinal disorders.
- Adults with habit of smoking, alcohol and drug abuse.

Statistical Analysis

Collected data was entered in Microsoft Excel and analysed using SPSS (Statistical Package for Social Sciences).

Descriptive statistics for categorised data like sex, sleep quality scores, dietary scores etc and for continuous data like age, sleeping hours etc.

Inferential statistics-Chi square test to know association of sleep quality and dietary habits and obesity. Other suitable statistical tests were applied.

Statistical significance was considered if P<0.05.

Results

The total number of participants was 209 with 104 females and 105 males. Group statistics output (descriptive stats for each sex) was done by an independent samples t-test (Figure 1 and Table 1).

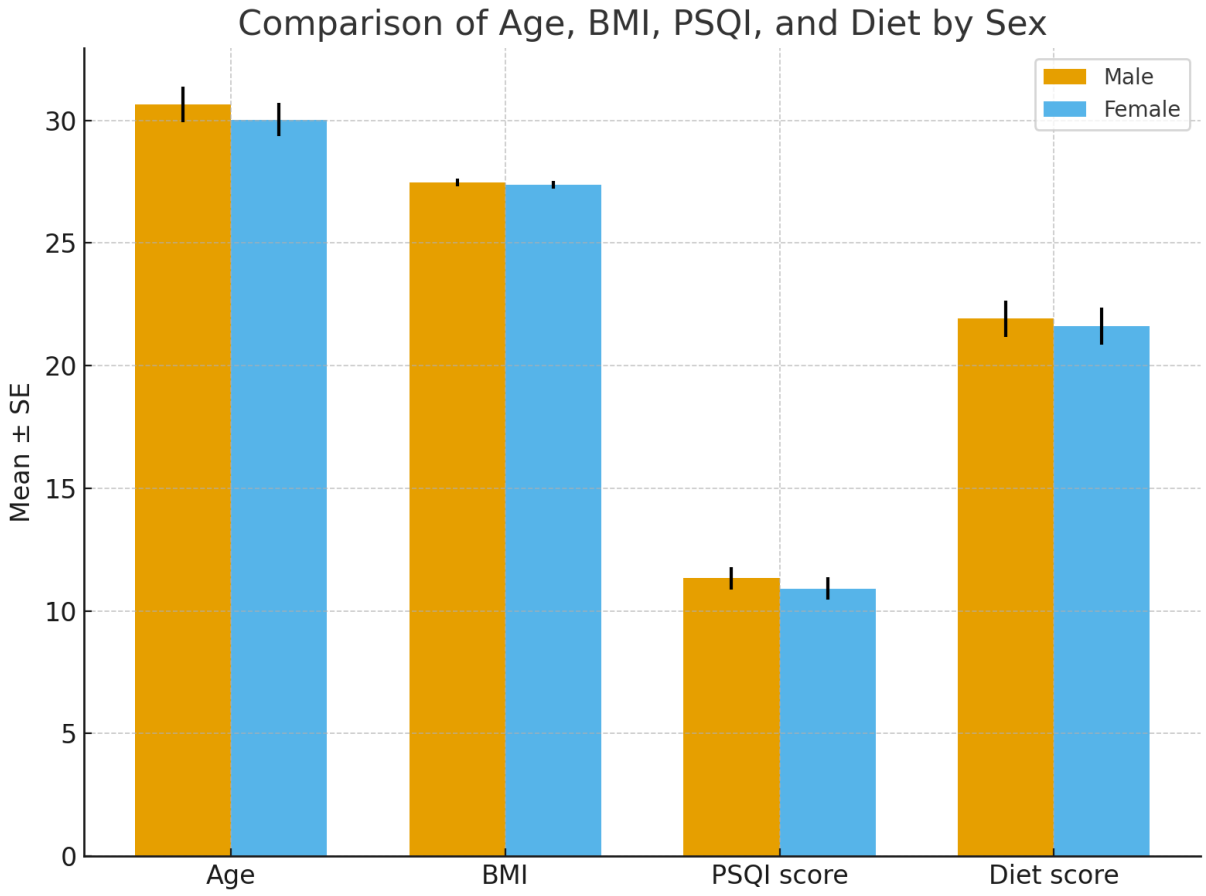


Figure 1. Comparison of age, BMI, PSQI and diet with sex of the individuals

Table 1. Independent sample test for comparison of Age, BMI, PSQI and diet with sex

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
Age	Equal variances assumed	.685	.409	.614	207	.270	.540	.619	1.008	-1.369	2.607
	Equal variances not assumed			.614	206.242	.270	.540	.619	1.008	-1.368	2.606
BMI	Equal variances assumed	.040	.842	.459	207	.323	.647	.1004	.2186	-.3306	.5313
	Equal variances not assumed			.459	206.998	.323	.647	.1004	.2186	-.3306	.5313
PSQI score	Equal variances assumed	.017	.896	.645	207	.260	.520	.420	.651	-.864	1.704
	Equal variances not assumed			.645	206.991	.260	.520	.420	.651	-.864	1.704
Diet score	Equal variances assumed	.252	.616	.282	207	.389	.779	.299	1.062	-1.794	2.392
	Equal variances not assumed			.282	206.935	.389	.779	.299	1.062	-1.794	2.392

Across all four variables (Age, BMI, PSQI, Diet), $p > 0.05$, there are no statistically significant differences between males and females (Table 2).

Table 2. Correlation of age, BMI, PSQI score and diet score

		Age	BMI	PSQI score	Diet score
Age	Pearson Correlation	1	.059	.053	.085
	Sig. (2-tailed)		.393	.448	.219
	N	209	209	209	209
BMI	Pearson Correlation	.059	1	.987**	.971**
	Sig. (2-tailed)	.393		<.001	<.001
	N	209	209	209	209
PSQI score	Pearson Correlation	.053	.987**	1	.970**
	Sig. (2-tailed)	.448	<.001		<.001
	N	209	209	209	209
Diet score	Pearson Correlation	.085	.971**	.970**	1
	Sig. (2-tailed)	.219	<.001	<.001	
	N	209	209	209	209

**. Correlation is significant at the 0.01 level (2-tailed).

Age does not correlate significantly with BMI, PSQI, or Diet.

BMI, PSQI, and Diet scores are all strongly and positively correlated with each other (r values > 0.97, all $p < 0.001$).

This suggests that individuals with higher BMI tend to also have higher PSQI (poorer sleep quality) and higher Diet scores.

Discussion

This study showed that higher BMI was associated with poorer quality of sleep and poor dietary habits.

Sleep is a naturally occurring process of mind and body. The National Sleep foundation suggests that healthy adults need 7–9 hours of sleep per night and previous studies showed that sleep loss led to increased ghrelin and decreased leptin levels which has positive correlation with obesity [21]. Ghrelin also known as hunger hormone is secreted mainly by the oxyntic cells of the stomach mucosa and stimulates appetite and food intake. Whereas leptin also known as satiety hormone secreted by adipose tissue suppresses appetite. Inadequate sleep influences food intake, appetite regulation, satiety, and overall

energy balance by altering these hormonal responses [22-24]. Some studies have shown a causal relationship between short sleep duration and the increased consumption of dietary carbohydrates and/or carbohydrate-rich foods, which might lead to an increased risk of obesity [25]. Further the possible mechanism connecting sleep and obesity include reduced physical activity [26,27]. Additionally, poor sleep quality is frequently linked to unhealthy lifestyle patterns, such as increased consumption of high-calorie foods and beverages [28,29].

Normally Ghrelin level decreases in obesity, however regulation fails and hunger persists. Whereas Leptin level increases in obesity but receptors become resistant (Leptin resistance) and satiety signals fail. Although poor sleep health could increase the risk for obesity by increasing appetite and the consumption of a low-quality diet to our knowledge, few studies have examined the relationship between sleep status and obesity in conjunction with dietary intake [30,31].

In the present study PSQI score has shown that the majority of people had disturbances in sleep and inadequate sleep alters the appetite affecting BMI. These alterations affect quality of growth, stress hormones, immune system leading to lifestyle related health problems [32].

The majority of adults worldwide are expected to be obese or overweight by 2030 due to the rising incidence of obesity in many nations. The World Health Organization reports that 340 million children and teenagers between the ages of 5 and 18 were obese in 2016 [33]. The average amount of sleep decreased from 9 hours per night in 1910 to 7.5 hours in 1975 and fewer than 7 hours now due to growing social and professional responsibilities, the introduction of artificial lighting at the turn of the century, and, more recently, the widespread use of computers and other electronic media [34]. Lack of sleep also negatively affects thinking, learning, memory, and recall, which in turn affects one's capability for productive work and unrestricted social interaction. It also leaves one feeling "disconnected" from the outside world. A poor lipid-lipoprotein profile, type 2 diabetes mellitus (DM), hypertension, various cardiovascular diseases (CVD), obesity, and even early death are all linked to sleep deprivation. Long-term poor "Western" eating habits are frequently linked to sleep disturbances [35].

Although many studies have been done in Western countries regarding the same, very few studies have been done in India. Hence this study was taken up.

In this study it was found that age does not correlate significantly with BMI, PSQI, or Diet. But BMI, PSQI, and Diet scores are all strongly and positively correlated with each other (r values > 0.97, all $p < 0.001$). This suggests that individuals with higher BMI tend to also have higher PSQI (poorer sleep quality) and higher Diet scores.

Thus, this study showed strong positive association between poor sleep quality, BMI and poor dietary habits.

Conclusion

Our study concludes that there is a significant association between obesity and poor sleep quality among young adults in Mandya City. Given the interplay of dietary habits in influencing both factors, targeted interventions focusing on healthy eating and sleep hygiene may be crucial in mitigating obesity-related health risks.

Limitations of the Study

- PSQI and diet questionnaires rely on self-report, which may lead to recall bias and social desirability bias (participants underreporting unhealthy food or poor sleep).
- Diet questionnaires may not capture portion sizes correctly, snacking or binge episodes and long-term eating habits.
- Diet and sleep patterns may vary daily or seasonally.
- PSQI measures perceived sleep quality, not objective sleep parameters. Does not include Actigraphy and Polysomnography.

Future Scope of the Study

- Future research can adopt longitudinal designs to track changes in sleep quality, diet, and BMI over time.
- Using tools such as actigraphy, wearable trackers, or polysomnography can provide more accurate and comprehensive sleep data. This helps validate PSQI findings and detect disorders like sleep apnoea.
- Assessing markers such as fasting glucose, lipid profile, insulin resistance (HOMA-IR, inflammatory markers would provide insight into mechanisms linking poor sleep, diet, and obesity.
- Future research can explore emotional eating, stress-related eating and sleep-related behaviour patterns. These may mediate the relationship between sleep quality, diet, and obesity.
- Findings can be used to design sleep–diet–weight management programs for schools, workplaces, and communities.

Key Message

Sleep plays an important role in cognitive and physical functions, in removal of cellular toxins and prevention of various diseases. Higher BMI is significantly linked to poorer sleep quality. Unhealthy diet also leads to obesity. It Emphasizes need for diet, weight, and sleep interventions. Counseling, yoga and meditation may be useful in combating these stress effects and prevent future complications. Future research should explore causal links and dietary patterns.

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Statements and Declarations

Conflicts of interest

The authors declare that they do not have conflict of interest.

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