

The Relationship between Dietary Intake and Sleep Patterns among Medical Students: A Cross-Sectional Study

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Abstract

Background: Sleep is a crucial behavioral state for bodily processes, protein production, and avoiding sluggishness. A normal individual requires 7-9 hours of quality sleep each day. Studies suggest that dietary adjustments can improve sleep quality.

Objectives: Our study aimed to highlight how dietary intake affected sleep patterns. The relationship between food's nutritional components and how they affect medical students' sleep quality was investigated.

Materials and Methods: The cross-sectional study was carried out among 316 healthy volunteers. Volunteers underwent sleep evaluation through the PSQ1 scale and diet evaluation through a self-made questionnaire extracted from a food frequency questionnaire.

Results: A total of 316 participants (267 females, 49 males) completed the questionnaire. 53.9% of them were between the ages of 20 and 25, and 82.4% of them belonged to urban areas. We assessed the relationship between proteins, carbohydrates, and lipids in the diet and drew correlations between them. For proteins, the correlation showed a value of 0.04, which indicates a very weak positive relationship. For Lipids, the value was 0.15, and for carbohydrates, it was 0.13, which showed a weak positive correlation. So, people having high amounts of proteins, carbohydrates, and fats in their diet tend to have slightly longer sleep hours. Moreover, 35.1% of people reported that the intake of spicy foods decreased their sleep quality.

Conclusion: There is a strong relationship between the quality of sleep and the consumption of specific dietary items. Research on the nutritional underpinnings of these correlations in clinical trials may result in a renewed emphasis on functional foods as a means of preventing sleep disorders and other sleep-related illnesses.

Keywords: Food, Eating, Sleep, Students, Medical

Introduction

For humans, sleep is defined as the complicated, reversible state of activity characterized by a person's perceptual disconnection from and insensitivity to their environment.¹ The repair of bodily processes, the production of proteins, and the avoidance of sluggishness are the three most crucial roles played by sleep. Nutrition and Sleep are two crucial aspects of life that influence one another and play a significant role in determining future health conditions.² Mental health and sleep issues have been linked in the general population. Elders, small children, those who work long hours, use alcohol, or are overweight,³ have lower sleep durations. Sleep lengths of more than or less than 7-8 hours per day are linked to cardiovascular illnesses, diabetes, obesity,³ depression⁴, and other conditions. They are also linked to work failures, high mortality rates, and issues with learning and memory. Pakistani medical students have been observed to have more irregular sleep cycles as compared to their non-medical age fellows.⁵ The main factor affecting one's health status is diet. Students from various countries tend to have diets that are often deemed unhealthy, lacking in fruits and vegetables, characterized by irregular eating habits and frequent consumption of fast food, raising concerns since the dietary patterns formed during this stage in life can significantly influence individuals' health in the long term.⁶ The Sleep Heart Study revealed that individuals experiencing insomnia or subpar sleep with reduced sleep duration had a 29% increased risk

of heart disease. Sleep disorders could also affect early mortality rates.⁷ Adopting healthy eating habits is essential since it has a major impact on students' academic performance and general well-being.⁸ Promoting healthy eating habits among university students and tackling food addiction in this demographic is essential. Following the pandemic, promoting healthy eating habits over unhealthy ones has become necessary.⁹ Studies suggest that dietary adjustments might result in improved sleep quality.

Even with increasing evidence linking diet to sleep quality and characteristics, earlier research has varied in incorporating diet into the examination of the relationship between sleep and human health. Since diet significantly influences health, it is vital to evaluate how much the connection between diet and sleep could act as a confounding variable or a mediating element in their impact on health.¹⁰ A Japanese study conducted to examine the link between sleep quality and diet among young men revealed that psychological factors related to poor sleep quality were significantly linked to lower consumption of fat, beta-carotene, retinol, alpha-tocopherol, vitamin K, vitamin B1, daidzein, genistein, and iron. Low sleep quality was linked to diminished consumption of pulses, fats, and oils, along with high consumption of sugary drinks.¹¹ Another study conducted in India suggested that the regular sleepers ingested a notably greater amount of energy and specific nutrients, including carbohydrates, folic acid, and vitamin B12, in

comparison to those experiencing insomnia. Aside from this, protein and thiamine consumption showed notable variations (at 5%). Nonetheless, the intake of all nutrients, irrespective of statistical significance, was observed to be significantly lower in insomniacs than in regular sleepers.¹² Research suggests that high-quality sleep is associated with a varied eating pattern. However, the relationship between sleep quality and a high-protein diet was not statistically significant, despite the diet's high protein content.¹³

A cross-sectional study conducted in Karachi, Pakistan, indicated significant associations between the Soya beans, Whole grains, Meats, Leafy greens, dark chocolate, spices, dairy products, products high in fats, sugar, lima beans, carbohydrates, and sleep quality. The odds of good sleeping quality were 2.5 times more likely with soybean intake, 3.6 times more likely with carbohydrates, and 6.5 times more likely with lima beans. Intake of papaya was associated with reduced sleep quality.¹⁴

This research endeavors to elucidate the relationship between dietary intake and sleep patterns amongst medical students. By examining the correlation between specific nutrients and sleep quality, this study aims to contribute to the burgeoning evidence base on the intricate relationship between diet and sleep. Elucidating the relationship between dietary intake and sleep patterns is of paramount importance for promoting optimal health and well-being, particularly amongst medical students who are predisposed to heightened

stress levels and irregular sleep patterns. By identifying specific dietary patterns and nutrients that modulate sleep quality, this study can inform evidence-based strategies for enhancing sleep and mitigating the risk of sleep-related disorders, ultimately enhancing the overall well-being and academic performance of medical students.

Few studies have been conducted on this topic in our society, so we aim to conduct this research to address a significant lacuna in the existing literature by exploring the nexus between dietary intake and sleep patterns in this distinct population.

Materials and Methods

The investigation was designed as a cross-sectional descriptive study conducted over a duration of 6 months. The study sample consisted of 316 medical students. The research included students from the 5 years of MBBS who consented to participate. Those who were not willing to participate or were already suffering from insomnia or other medical conditions related to sleep were excluded from the research. The sample size came out to be 316 by using the WHO calculator with a confidence interval of 95% and a margin of error of 5%. So, we collected a total of 320 samples, and 4 were rejected because they didn't meet the inclusion criteria. A probability sampling technique was utilized. Questionnaires were rotated, filled out, and the answers were recorded on the questionnaires. A structured questionnaire containing the following 3 parts was used,

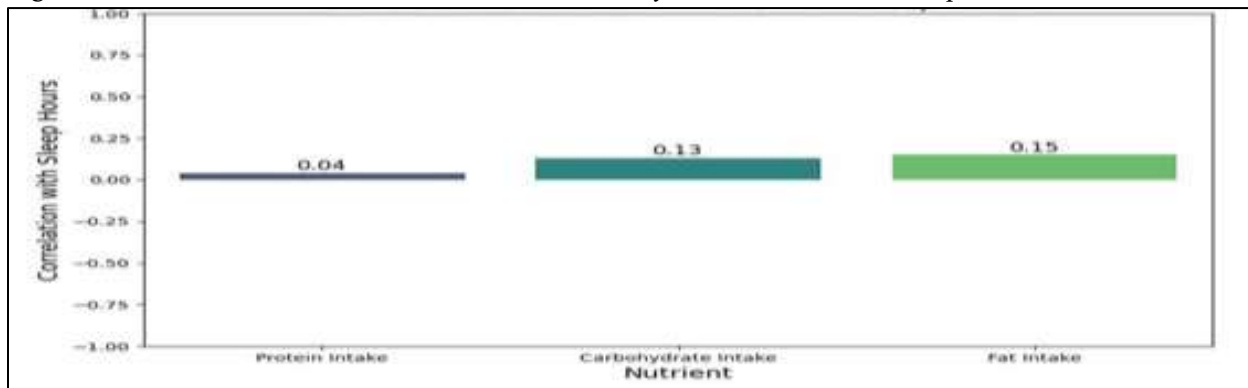
including the Demographic details, a Self-made questionnaire for assessing dietary intake, a food frequency questionnaire developed by the Priority Research Centre for Physical Activity and Nutrition, and a Pittsburgh Sleep Quality Index (PSQI) questionnaire. Data obtained from the completed questionnaires were analyzed using the Statistical Package of Social Sciences (SPSS) program version 22. Chi-square test was used for analysis of categorical variables, and an independent t-test for analysis of continuous variables. A p-value less than 0.05

was considered significant. Permission to conduct research was obtained from the Institutional Research Forum (IERB), and the informed consent of the participants was obtained.

Results

316 participants (267 females, 49 males) completed the questionnaire. 53.9% of them were between the ages of 20 and 25, and 82.4% belonged to urban areas.

Figure 1: Correlation Between Nutrients (Proteins, Carbohydrates, and Fats) and Sleep Hours

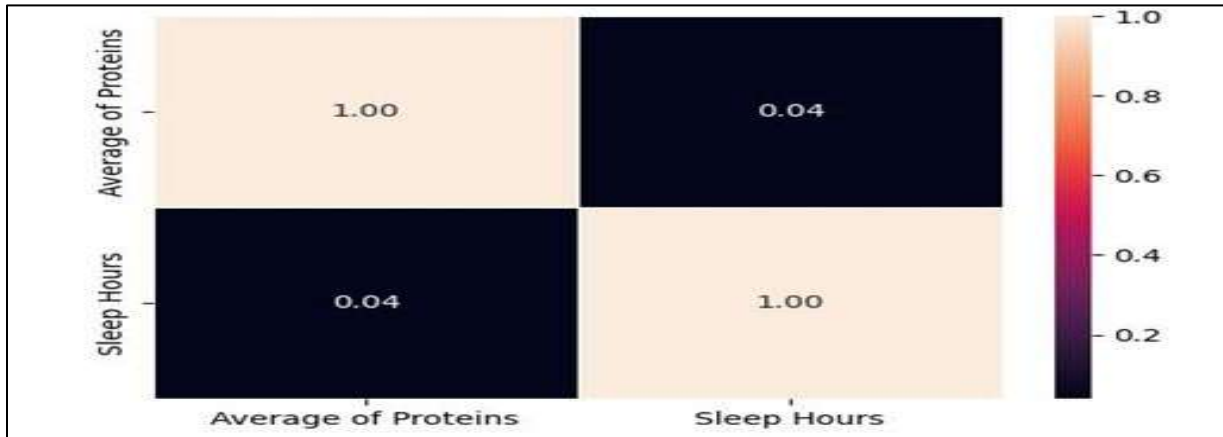


Note. This bar chart illustrates the correlation between nutrient intake (protein, carbohydrates, and fats) and sleep hours. Protein intake shows a very weak correlation ($r = 0.04$), indicating almost no relationship. Carbohydrate intake has a weak positive correlation ($r = 0.13$). Fat intake shows the highest, but still weak, positive correlation ($r = 0.15$).

Proteins: 0.04. This indicates a very weak positive correlation between protein intake and sleep hours. It suggests that there is a slight

tendency for individuals with higher protein intake to have slightly longer sleep hours, but the relation is weak.

Figure 2 Correlation Between Sleep and Protein Intake

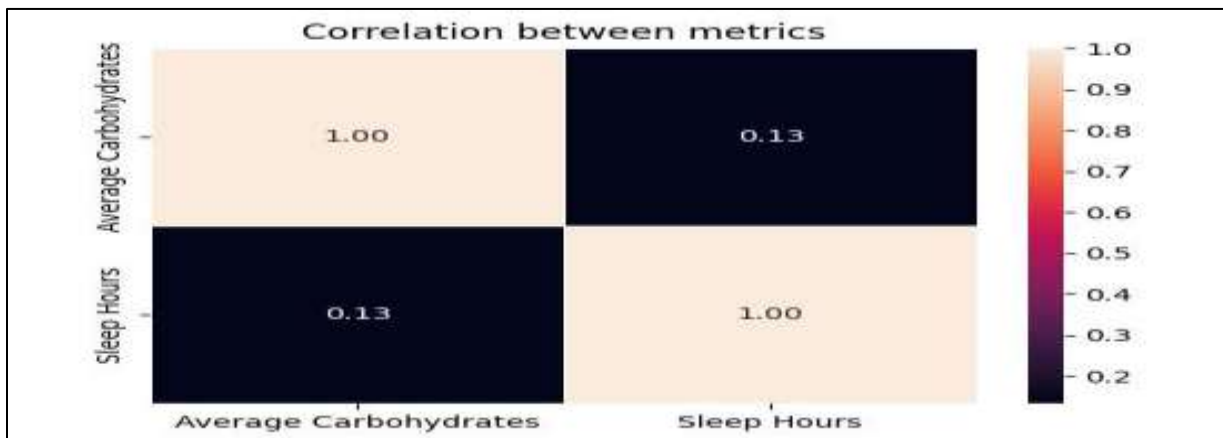


Note. This is a correlation matrix showing the relationship between "Average of Proteins" and "Sleep Hours." The values range from -1 to 1. The 0.04 value between "Average of Proteins" and "Sleep Hours" shows a very weak positive correlation

Carbohydrates: 0.13. This shows a weak positive correlation between carbohydrate intake and sleep hours. It suggests that individuals with

higher carbohydrate intake may tend to have slightly longer sleep hours as compared to people with low carbohydrate intake.

Figure 3 Correlation Between Carbohydrate Intake and Sleep Hours

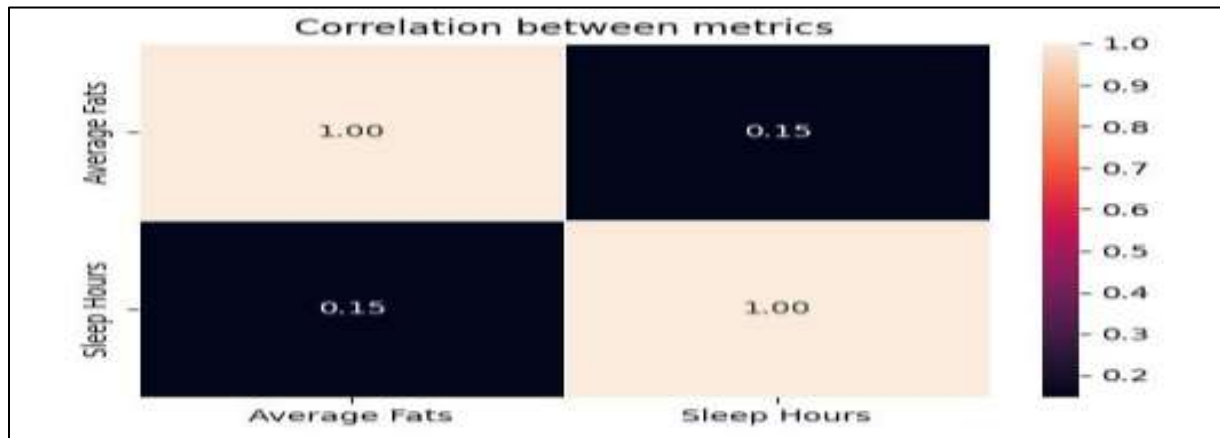


Note. This is a correlation matrix heatmap that illustrates the strength and direction of the linear relationship between Average Carbohydrates and Sleep Hours. The value 0.13 between Average Carbohydrates and Sleep Hours represents a very weak positive correlation.

Fats: 0.15. This indicates a weak positive correlation between fat intake and sleep hours. It suggests that individuals with higher fat

intake may tend to have slightly longer sleep hours compared to those with lower fat intake.

Figure 4 Correlation Between Fat Intake and Sleep Hours



Note. This heatmap represents a correlation matrix between Average Fats and Sleep Hours. The values in the matrix are correlation coefficients. The off-diagonal value 0.15 shows a very weak positive correlation between average fat intake and sleep hours.

Discussion

The study aimed to investigate the relationship between dietary intake and sleep patterns among medical students of Rawalpindi Medical University. A total of 316 participants participated in the study. Most of the participants were from urban areas. The findings revealed weak positive correlations between dietary components (carbohydrates, protein, fats) and sleep duration. Additionally, a significant proportion of participants reported that consumption of spicy foods decreased their sleep quality.

These results can be interpreted by the fact that various foods influence neurotransmitter serotonin, crucial for regulating the body's sleep-wake cycle. Tryptophan, which is an amino acid present in proteins, is a precursor to serotonin and melatonin, notably contributing to inducing sleep. Additionally, L-ornithine can enhance sleep quality by alleviating stress and

anxiety.¹⁴ Complex carbohydrates are beneficial as they elevate serotonin levels while reducing cortisol, a sleep-inhibiting stress hormone.¹⁴ The National Sleep Foundation asserts that carbohydrates aid in delivering tryptophan to the brain for improving sleep.¹⁴ The reported association between spicy food consumption and decreased sleep quality is consistent with existing literature linking spicy foods to disturbances in sleep quality. Spicy foods may increase body temperature, leading to discomfort, potentially interfering with sleep onset and maintenance.

According to research, consuming a high-calorie meal before bedtime was associated with increased time taken to fall asleep, indicating a positive correlation between nocturnal calorie intake and sleep latency.¹⁵ Our findings are also supported by research conducted in Spain, which confirmed the hypothesis that inadequate adherence to national dietary guidelines, reflected in poor dietary quality, is

notably linked to impaired sleep patterns.¹⁶ Another research study discovered a correlation between a Western Diet marked by a high intake of tea, fast food, snacks, and chicken—an unhealthy dietary pattern — and a marked rise in stress, anxiety, sadness, and insomnia, as well as a decline in quality of life.¹⁷

This study provides valuable insights into the relationship between dietary intake and sleep patterns and supports the existence of a meaningful link between the two factors. The study's strength lies in its focus on medical students, a population with unique stressors and sleep patterns. The study has potential for practical applications and informs dietary recommendations and interventions to improve sleep quality. Even while the exact mechanisms governing the relationship between sleep quality (SQ) and health are still unclear, it seems very probable that a number of mechanisms, including alterations in hormone levels, metabolic decline, and inflammatory processes, are responsible for this relationship.¹⁶ While findings suggest a modest association between dietary constituents and sleep duration, effect sizes are small, suggesting the multifactorial nature of sleep regulation.

The data relied on self-reporting, raising a potential for bias stemming from or underreporting, such as regarding the use of sleep medications or body weight.¹⁶ The study's cross-sectional design limits the ability to establish causality between dietary intake and sleep patterns. Future investigations should prioritize conducting additional clinical trials to

elucidate the causal connection between promising dietary options and sleep quality. Furthermore, the study relies on self-reported data, which may be subject to bias and underreporting. Given Pakistan's status as a low income agricultural country, this innovative shift towards exploring the potential of Pakistani food to address sleep deficiencies and related ailments promises to be convenient and cost effective as well.¹⁴ Moreover, interventions targeting dietary modification will also offer a superior alternative to escalating dependence on sleeping pills, caffeine and alcohol for sleep management in people with sleep disturbances and will contribute to the overall well-being of individuals.

The study found a weak positive correlation between dietary components and sleep duration, whereas some previous studies have reported a stronger correlation. Furthermore, the study's findings on the specific nutrient (e.g., proteins, carbohydrates, fats) relationship with sleep duration differ from previous studies.

Conclusion

Although all three macronutrients (proteins, carbohydrates, and fats) show positive correlations with sleep hours, the strength of these correlations is weak. This means that while there might be a tendency for individuals with higher protein, carbohydrate, or fat intake to have longer sleep hours, the relationship is not strong enough to draw definitive conclusions because other factors, such as individual metabolism, lifestyle, and overall diet

composition, likely play a more significant role in determining sleep duration. Therefore, while maintaining a balanced diet with adequate protein, carbohydrates, and fats is important for overall health, it may not strongly influence the duration of sleep hours independently.

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