The Relationship Between Sleep Quality With Fat Mass and BMI Among Students of Medicine Faculty Unjani

Kharissa Rahma Fitrah Deani[1], Apen Afgani[2], Dinar Mutiara[3]
[1] Medical Student, Medical Faculty, Jenderal Achmad Yani University, [2] Department of Physiology, Medical Faculty, Jenderal Achmad Yani University, [3] Department of Public Health, Medical Faculty, Jenderal Achmad Yani University
Email: kharissadeani@gmail.com

Sleep is one of the physiological needs that plays a role in maintaining the body's metabolic balance. Poor sleep quality can affect the regulation of hormones related to appetite, that potentially increase fat mass and Body Mass Index (BMI). Medical students are at risk of experiencing sleep quality disorders due to high academic demands. This study aims to determine the relationship between sleep quality and fat mass and BMI among medical students at the Faculty of Medicine, Jenderal Achmad Yani University, from class of 2022 and 2023. This study used a cross-sectional design. Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI), height was measured using a microtoise, weight was measured using a beam balance scale, fat mass was measured using Bioelectrical Impedance Analysis (BIA), and BMI was calculated as weight (kg) divided by height (m)². Data analysis was tested by using Spearman's correlation test. 110 people were taken as the sample. The results of the analysis showed that there was no significant relationship between sleep quality with fat mass (p=0.565) and BMI (p=0.200). This may be influenced by lifestyle factors, such as physical activity and diet, also stress levels, which play a role in determining body composition.

Keywords: body mass index, fat mass, medical students, sleep quality

Corresponding Author:
Kharissa Rahma Fitrah Deani
Medical Student, Medical Faculty, Jenderal Achmad Yani University
kharissadeani@gmail.com

1. Introduction

Sleep is one of basic human needs for maintaining physiological balance. Sleep has role in metabolism, appetite regulation, also immune and hormonal functions. Good sleep quality is achieved when the normal amount of rest is fulfilled and not get disturbed during sleep. The normal duration of sleep for 18-25 years old people is 7-9 hours.[1,2,3]

National Sleep Foundation states that 60% do not get the recommended amount of sleep.[4] Poor sleep quality is common among college students, with a prevalence between 30% and 70%. In Indonesia 37,7%-38% of young people experience poor sleep quality.[2,5]

Poor sleep quality can disrupt the secretion of melatonin, which acts as the main mediator of the balance between energy and body weight, leading to obesity and fat accumulation, where fat measurement will depend on body weight, height, and body impedance values.[6,7] Ghrelin hormone works to increase appetite and decrease the use of fat reserves, while leptin hormone works to suppress hunger and stimulate satiety. When someone is in lack of sleep condition, ghrelin will increase and causing the increase of hunger, while leptin will decrease and suppress hunger.[8,9] Medical students have high intensity of study and academic demands. The higher the level of the student, the more processes they must finish to complete their education. As a result, additional time for studying and completing the assignments is taken from sleep, which can put individuals at risk of getting poor sleep quality. This can cause individuals to become easily

tired and lost physical fitness which can lead to decreasing daily activities and cause changes in nutritional status.[10,11]

2. Methods

This study used an analytical research design with a cross-sectional approach that was held at the Medical Faculty, Universitas Jenderal Achmad Yani, in October 2025. The study population consisted of medical students from class of 2022 and 2023. The inclusion criteria were students with all BMI and fat mass classifications also the students who are willing to participate in the study and fill out an informed consent form. The exclusion criteria included students who consume substances/medications that affect sleep quality (e.g., alcohol, caffeine (minimum 8,8 hours before before bedtime), beta-blockers, morphine) also medications that may affect fat absorption, appetite, and weight loss (e.g., orlistat, apisate, sibutramine).

The sample size was calculated by using the sample size for testing the hypothesis of a difference in proportions between two groups. The minimum required sample was 110 participants as the result. Consecutive sampling was applied, and data collection was closed once the required sample size had been achieved.

Data were collected using a validated questionnaire which is Pittsburgh Sleep Quality Index (PSQI) that was administered online via Google Forms. It contains 7 components, which are subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, sleep medication, and daytime dysfunction. The classifications will be $\leq$5 for good sleep quality and >5 for poor sleep quality. The survey link was distributed to everyone in class of 2022 and 2023. After filling the questionnaire, the participants were measured by using Bioelectrical Impedance Analysis (BIA) to get their fat mass level and BMI.

Electronic informed consent was given at the first page of the questionnaire. Participants had to confirm their agreement before continuing to fill the questionnaire. The consent form explained the study objectives, emphasized voluntary participation, and assured confidentiality.

This study was approved by the Research Ethics Committee of Medical Faculty Universitas Jenderal Achmad Yani (Ethical Approval No. 058/UM1.10/2025) on October 7, 2025.

3. Results And Discussion

The study was conducted at Medical Faculty, Universitas Jenderal Achmad Yani, in October 2025. A total of 110 respondents were sampled in the study according to the inclusion and exclusion criteria using consecutive sampling, which became the final sample size.

Data were collected online using the Pittsburgh Sleep Quality Index (PSQI) questionnaire along with an additional structured questionnaire regarding medications used for excluding the sample. The collected data were processed and analyzed to determine the distribution of respondent characteristics, depiction of sleep quality, fat mass, and BMI, also for knowing the relationship between sleep quality with fat mass and BMI.The findings are presented systematically according to the study objectives and are followed by discussion.

Participant Characteristics Age and Gender

This study involved 19-25 year old medical students from Medical Faculty, Universitas Jenderal Achmad Yani. The majority of respondents were female(63,6%), while 36,4% were male. These demographic characteristics provide an overview of the study population included in the analysis.

Table 1. Research Subjects by Age

Age	N	%
19	4	3,6%
20	18	16,4%
21	65	59,1%
22	18	16,4%
23	3	2,7%
24	1	0,9%
25	1	0,9%%
Total	110	100,0%

Table 2. Research Subjects by Gender

Gender	N	%
Male	40	36,4%
Female	70	63,6%
Total	110	100,0%

This difference can occur due to biological differences. Women normally have estrogen levels change throughout the menstrual cycle. This causes changes in the sensitivity of the ghrelin system in regulating appetite and energy metabolism. Ghrelin can modulate estrogen receptors and the same thing applies to the opposite provision. It makes ghrelin become estrogen-sensitive in women. Ghrelin increases the release of growth hormone from the pituitary gland, specifically from the anterior pituitary cells. Growth hormone secretagogue receptor (GHS-R)1a is concentrated in the hypothalamus and plays a role in regulating eating behavior.[12,13]

Depiction of Sleep Quality Among Medical Students

Based on the classification of the Pittsburgh Sleep Quality Index (PSQI) questionnaire. The result shows equal between good sleep quality and poor sleep quality which is 50,0% each.

Table 3. Depiction of Sleep Quality Among Medical Students

Sleep Quality	N	%
Good	55	50,0%
Poor	55	50,0%
Total	110	100,0%

These findings can happen due to the demands and stress experienced as a final year student, which affects the quality of sleep.[14] Sleep deprivation is considered a reasonable choice for students to maintain a balance between study demands, social obligations, and lifestyle, especially for students who are in the final stages of their studies. This can lead to changes in sleep quality.[5] Sleep habits and behaviours can be applied to get optimal sleep and good quality of sleep.[15]

Depiction of Fat Mass Among Medical Students

The result shows normal fat mass was the dominant (37,3%) that was followed by overfat (32,7%), obesity (29,1), and underfat (0,9%).

Table 4. Depiction of Fat Mass Among Medical Students

Fat Mass	N	%
Underfat	1	0,9%
Normal	41	37,3%

Fat Mass	N	%
Overfat	36	32,7%
Obesity	32	29,1%
Total	110	100,0%

Sleep disturbances experienced by students have the potential to cause hormonal changes that contribute to body fat accumulation. A decrease in leptin causes satiety signals to weaken, so individuals feel satisfied more slowly after eating, while an increase in ghrelin strengthens hunger signals, increasing the urge to eat.[16,17,18]

Unhealthy eating patterns, such as high consumption of snacks, fast food, and foods high in fat and sugar, as well as low consumption of fruits and vegetables, can contribute to an increase in energy intake that is not balanced with adequate nutritional quality, so that excess energy is stored in the form of body fat and an increase in fat mass occurs.[19]

Depiction of BMI Medical Students

The result shows normal fat mass was the dominant (30,9%) that was followed by obesity type I (30,0%), overweight (22,7%), obesity type II (9,1%), and underweight (7,3%).

Table 5. Depiction of Fat Mass Among Medical Students

Fat Mass	N	%
Underweight	8	7,3%
Normal	34	30,9%
Overfat	25	22,7%
Obesity I	33	30,0%
Obesity II	10	9,1%%
Total	110	100,0%

Students are a group of young adults who are susceptible to have sleep disorders due to academic demands, stress, and lifestyle changes. This can affect the balance of hormones that regulate appetite and energy metabolism, which increases hunger and energy intake. Lack of sleep can cause fatigueness and the decreasing of physical activity, which can contribute to weight gain and increased BMI. Low physical activity can be demonstrated by the dominance of academic activities involving prolonged sitting, such as attending lectures and completing assignments, which minimizes energy expenditure.[19,20]

Relationship Between Sleep Quality with Fat Mass and BMI among Students of Medical Faculty

This study was tested by using Spearman's correlation test to determine the relationship between sleep quality and fat mass and BMI in students of Medical Faculty, Jenderal Achmad Yani University, class of 2022 and 2023. It showed that r = 0,077 and p = 0,427 for sleep quality with fat mass and r = 0,156 and p = 0,103 for sleep quality with BMI. It showed that there is no significant relationship between sleep quality and fat mass.

Table 6. Relationship Between Sleep Quality with Fat MAss and BMI Among Students of Medical Faculty

Variable	r	p-value
Sleep quality vs fat mass	0,077	0,427
Sleep quality vs BMI	0,156	0,103

Sleep is one of the basic human needs to fulfill the needs of each individual in maintaining physical, mental, and emotional balance, as well as restoring the body to its normal activity level.[2,21] As medical students, the burden and demands of studying and completing assignments with considerable intensity can be a reason

to reduce sleep time, thereby impacting sleep quality. This can lead to an increase in ghrelin and a decrease in leptin. Ghrelin and leptin play a role in regulating appetite, food intake, and energy metabolism. Ghrelin is mainly found in the fundus of the stomach. Leptin levels in the body are directly proportional to fat mass. The GH-IGF-1 axis has IGF-1 levels that are directly proportional to leptin levels. This suggests that when sleep duration is insufficient, a decrease in leptin may inhibit the regulation of the GH-IGF-1 axis, thereby increasing the desire to consume energy.[22,23]

Lifestyle factors, such as physical activity and diet, also have a role in influencing the relationship between sleep and body composition. Individuals with shorter sleep durations tend to have longer waking hours, which can lead to fatigueness and the decreasing of physical activity, so it can increase the risk of obesity. In addition, psychological factors resulting from academic pressure can cause stress and anxiety, which can impact sleep and eating patterns. Irregular and unbalanced eating patterns, both in terms of quantity and type of food, can potentially lead to excess energy intake, so it can increase the risk of overweight or obesity. Physical activity and unhealthy food consumption behavior is also influenced by various factors, such as individual level, social and family factors, and environment factors.[19,23,24,25]

4. Conclusion

This study showed that there was no significant relationship between sleep quality and fat mass (p = 0,427) and BMI (p= 0,103) among students of Medical Faculty, Jenderal Achmad Yani University class of 2022 and 2023. Lifestyle factors, such as physical activity and diet, also have a role in influencing the relationship between sleep and body composition. The limitations of the research are the population was restricted to students of Medical Faculty, Jenderal Achmad Yani University, class of 2022 and 2023, and the imbalance in the distribution of samples between class of 2022 and 2023 has the potential to cause confounding. The dominance of samples from one group can affect the statistical power of the test, making the relationship between variables insignificant. In addition, there are other factors, such as physical activity levels, diet, and stress levels, which have the potential to affect sleep quality, fat mass, and body mass index (BMI).

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