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THE EFFECT OF INTERMITTENT FASTING ON SLEEP QUALITY AMONG MEDICAL STUDENTS AT DIPONEGORO UNIVERSITY

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ABSTRACT

Background: Intermittent Fasting (IF) is a type of fasting where a person alternates between fasting and eating within specific time intervals. Medical students tend to have poorer sleep quality compared to students from other faculties. This can negatively affect their academic performance, as well as their physical and mental health. While intermittent fasting is known to offer various health benefits, its effect on sleep quality in medical students has not been widely studied. Therefore, further research is needed to explore the impact of intermittent fasting on sleep quality among medical students. **Objective:** To determine the effect of intermittent fasting on the sleep quality of medical students. **Methods:** This study employed a quasi-experimental design with a one-group pretest-posttest design. The sample consisted of 24 medical students from the Faculty of Medicine, Diponegoro University, Semarang. The sample was selected using purposive sampling based on predetermined criteria. In this study, the intervention involved intermittent fasting using the 12:12 Time Restricted Feeding method. Fasting started from 6 PM to 6 AM on Mondays, Wednesdays, and Fridays for three consecutive weeks. Data analysis on sleep quality before and after the intervention was conducted using the Paired Sample T-Test. The correlation between confounding variables, such as stress levels and physical activity levels, and sleep quality was analyzed using Spearman's correlation test. **Results:** There was a significant decrease in the global PSQI score after the participants underwent intermittent fasting compared to before, with a p-value < 0.05 (p = 0.05 (p = 0.493). **Conclusion:** Intermittent fasting can improve the sleep quality of medical students.

BACKGROUND

Intermittent Fasting (IF) is a type of fasting where a person alternates between periods of fasting and eating at specific intervals.[1,2] There are several types of intermittent fasting.[3] The practice of intermittent fasting in Islam is similar to the observance of sunnah fasting on Mondays and Thursdays, the David fast, and Ramadan fasting. Other methods include Alternate Day Fasting (ADF) and Time Restricted Feeding (TRF). ADF is a practice where fasting days alternate with eating days. TRF, on the other hand, involves restricting the eating window to 4– 12 hours, followed by fasting during the remaining hours of the day, during which only water and non-caffeinated, unsweetened beverages are allowed.[1–6]

Speculation that intermittent fasting may improve sleep quality has increased in recent years.[4,7] McStay et al. (2021) suggested that one of the hypothesized mechanisms is that intermittent fasting enhances circadian rhythm, which in turn improves sleep quality.[4,8] According to Harvie et al. (2011) in Natassha FA et al. (2022), humans can adapt to a new eating pattern within 3 to 6 weeks.[1]

Medical students tend to have poorer sleep quality compared to students from other faculties, which can negatively affect their academic performance as well as their physical and mental health.[9–11]

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Intermittent fasting offers many benefits, such as enhancing parasympathetic activity in the digestive system, heart, and blood vessels, which can improve gut motility, lower heart rate and blood pressure, and promote cardiovascular health.[12] Additionally, this fasting practice can reduce glycogen levels in hepatocytes, induce lipolysis, aid in weight loss, and improve cognitive brain function.[1,13] Although previous research has highlighted these benefits, few studies have specifically examined the effects of intermittent fasting on sleep quality, particularly among medical students. Therefore, further research is needed to explore the impact of intermittent fasting on sleep quality in medical students.

METHODS

This study employed a quasi- experimental design with a one-group pretest-posttest design. The sample consisted of 24 medical students from the Faculty of Medicine, Diponegoro University, Semarang. The sample was selected using purposive sampling based on criteria determined by the researcher. The inclusion criteria included students from the Faculty of Medicine, Diponegoro University, Semarang, class of 2021, aged 18-22 years, having poor sleep quality (PSQI score > 5), being able to practice intermittent fasting with the 12:12 Time Restricted Feeding method, and willing to participate as research respondents. The exclusion criteria included students currently taking psychotropic drugs, anti- anxiety medications, or other drugs that may cause sedative effects, such as antihistamines.

The intervention in this study involved practicing intermittent fasting using the 12:12 Time Restricted Feeding method. Fasting started from 6 PM to 6 AM on Mondays, Wednesdays, and Fridays for three consecutive weeks. The dropout criteria included students who, during the intervention, did not follow the procedure for practicing intermittent fasting using the 12:12 Time Restricted Feeding method or did not complete 9 full days of the intermittent fasting practice.

The type of data collected was primary data, obtained from the PSQI questionnaire, the PSS questionnaire, and the IPAQ questionnaire filled out by the participants to measure sleep quality, stress levels, and physical activity levels. The collected data were first assessed for distribution and normality using the Shapiro-Wilk test. The analysis of sleep quality before and after the interventions was conducted using the Paired Sample T- Test. The correlation between confounding variables, such as stress levels and physical activity levels, and sleep quality was analyzed using Spearman's correlation test. This study received ethical clearance from the Health Research Ethics Committee (KEPK) of the Faculty of Medicine, Diponegoro University, under the letter No. 175/EC/KEPK/FK-UNDIP/IV/2024.

RESULTS

This study on the effect of intermittent fasting on sleep quality was conducted in May 2024, involving medical students from the Faculty of Medicine, Diponegoro University, who agreed to participate in the research. Figure 1 below presents the CONSORT diagram, illustrating the stages of this study.

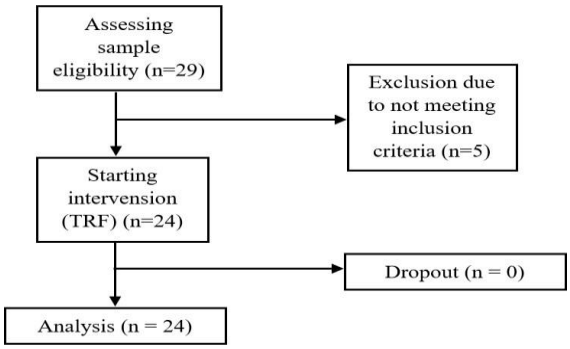

Figure 1. CONSORT diagram of the study

This study involved an intervention conducted on 24 students aged 18-22 years, with the treatment group consisting of 5 males and 19 females. The distribution of the subjects' characteristics is presented in Table 1 below.

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Table 1. Distribution of Subject Characteristics

Variable	Frequency	Percentage (%)
Age		
19 years	2	8.3
20 years	11	45.8
21 years	11	45.8
Gender		
Male	5	20.8
Female	19	79.2
Stress Level		
Low	13	54.2
Moderate	10	41.7
High	1	4.2
Physical Activity Level		
Low	10	41.7
Moderate	11	45.8
High	3	12.5

The table above shows the characteristics of the study subjects, consisting of 24 medical students, with the majority aged 20 and 21 years (each 45.8%). Most of the subjects were female (79.2%), and their stress levels were predominantly in the low category (54.2%), followed by moderate stress (41.7%), and one subject with a high stress level (4.2%). The majority of subjects had a moderate level of physical activity (45.8%), followed by a low level of physical activity (41.7%), and three subjects with a high level of physical activity. Table 2 below presents the paired difference test results between the pretest and posttest PSQI scores of the study subjects using the Paired Sample T- Test.

Table 2. Pretest and Posttest Global PSQI Scores Results

Global PSQI Score	Mean ± SD (min – max)	p
Intervention		
Pretest	8.63 ± 1.952 (6 – 12)	<0.001*
Posttest	5.04 ± 2.053 (1 – 9)	

Note : * Significant (p < 0,05)

The table above shows a comparison of the global PSQI scores before and after intermittent fasting. The average pretest PSQI score was 8.63 ± 1.952, while the average posttest PSQI score decreased to 5.04 ± 2.053, indicating an improvement in sleep quality. This difference is statistically significant with a p-value < 0,001. Below, Table 3 presents the results of the correlation test between stress levels and sleep quality using the Spearman correlation test.

Table 3. Correlation Test Between Stress Levels and PSQI Difference

Stress Level	PSQI Difference		
	Mean ± SD	p	r
Low	-4,00 ± 3,00	0.493	0.147
Moderate	-3.50 ± 2.55		
High	1.00		

The table above shows the results of the Spearman correlation test for the relationship between stress levels and the PSQI difference, yielding a p-value of 0.493 and an r-value of 0.147. The p-value obtained (p > 0.05) indicates that there is no significant relationship. The following Table 4 presents the results of the Spearman correlation test for the relationship between physical activity levels and sleep quality.

Table 4. Correlation Test Between Physical Activity and PSQI Difference

Variable	Mean ± SD	p	r
Physical activity	1405.42 ± 2125.67	0.283	0.228
PSQI difference	-3.58 ± 2.87		

The table above shows the results of the correlation test between physical activity and the PSQI difference using Spearman's correlation test, with a p-value of 0.283 and an r-value of 0.228. The p- value obtained is p > 0.05, indicating that there is no significant relationship.

DISCUSSION

The results of this study indicate that intermittent fasting using the Time Restricted Feeding (TRF) 12:12 method, where fasting starts at 6 PM and ends at 6 AM on Mondays, Wednesdays, and Fridays for three consecutive weeks, has an effect on sleep quality. The intermittent fasting intervention significantly improved the sleep quality of the medical students at Diponegoro University.

Intermittent fasting has positive effects on cardiovascular and metabolic health, such as reducing blood pressure, blood sugar, and cholesterol levels. Additionally, intermittent fasting can enhance cognitive function and serve as an effective and sustainable approach to weight loss, benefiting individuals who are overweight or obese. The complications of obesity are not only limited to increased risks of diseases like diabetes mellitus,

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hypertension, stroke, and fatty liver, but also impact sleep quality.[13,14]

Intermittent fasting can influence a person's sleep. One type of intermittent fasting, the TRF regimen, which involves not consuming food at night (dinner- skipping), affects cortisol and serotonin neurotransmitter levels. Cortisol levels tend to be lower at night and rise again in the morning.[15,16] Furthermore, tryptophan, the main precursor of serotonin, increases, accompanied by an increase in brain serotonin synthesis during fasting. Serotonin plays a crucial role in sleep physiology, particularly in the homeostasis mechanism of sleep, as it is converted into melatonin in dark conditions, inducing feelings of drowsiness. This process can enhance sleep quality, optimize productivity, and minimize dysfunction the following day.[17,18]

Melatonin is a hormone secreted by the pineal gland and plays a key role in regulating the body's circadian rhythm, which is influenced not only by the light- dark cycle but also by eating patterns and timing. Melatonin levels start to rise as darkness falls at night and peak between 2 and 4 AM.[19] The increase in serotonin levels during intermittent fasting, especially with food intake restriction in the evening and night, is followed by an increase in melatonin secretion, which helps improve sleep quality.[16]

Intermittent fasting can improve insulin sensitivity proinflammatory by cytokines. reducing Fasting consistently optimizes physical health, exerts anti-inflammatory effects, protects pancreatic beta cells, enhances glucose metabolism, and lowers blood sugar levels.[20] Previous research has found that higher glucose levels in the body can disrupt sleep quality. Typically, individuals with high blood sugar levels experience poor sleep due to overeating and increased urination frequency, while individuals with normal blood sugar levels tend to have better sleep quality.[21]

Cytokine levels in the body can be influenced by intermittent Increased levels fasting. of proinflammatory cytokines can be triggered by various factors, such as physiological factors, physical diseases, and environmental factors.[22] TNF-α and IL-6 are proinflammatory cytokines that, when elevated, trigger activation of the HPA axis, contributing to reduced sleep duration, especially in the slow-wave sleep (SWS) phase and REM sleep phase.[23] Previous literature shows that intermittent fasting can reduce inflammation and inhibit the inflammatory response, significantly lowering C-Reactive Protein (CRP) and other proinflammatory cytokines such as TNF-α, IL-1β, IL-6, and IL-18.[20,24]

CONCLUSION

The sleep quality of medical students was initially poor prior to undergoing intermittent fasting. After participating in the fasting intervention, their sleep quality improved and was categorized as good. A comparison between the conditions before and after fasting showed a notable improvement in sleep quality. These findings suggest that intermittent fasting has an effect on the sleep quality of medical students.

RECOMMENDATION

Future studies may consider implementing fasting as an intervention using alternative fasting regimens or by varying the duration of eating and fasting windows over a longer period. It is also recommended that future research collects and analyzes dietary intake data during the eating window, along with anthropometric measurements of study subjects before and after the intermittent fasting intervention.

ETHICAL APPROVAL

Ethical approval for this study was granted by Health Research Ethics Commission, Faculty of Medicine, Diponegoro University (No. 175/EC/KEPK/FK-UNDIP/IV/2024).

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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