



Chrononutrition, Social Support, and Sleep Quality Associated with Overweight Among Health Students

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Abstrak

Background: Obesity and overweight are major risk factors for morbidity and mortality from non-communicable diseases, and health students are particularly vulnerable due to demanding academic schedules and high study loads. In Indonesia, the prevalence of overweight and obesity among medical students reached 35.5% in 2023, reflecting a concerning level that warrants further investigation. Purpose: This study aimed to examine the association between chrononutrition, social support, sleep quality, and energy and protein intake with the occurrence of overweight among health students, and to identify the most dominant factor influencing this condition. Methods: This quantitative analytic study used a cross-sectional design involving 90 health students at Universitas Pendidikan Indonesia, selected through proportionate stratified random sampling based on inclusion criteria. Data were collected using the Chrononutrition Profile Questionnaire (CPQ), the Social Support for Eating Habits (SSEH) questionnaire, the Pittsburgh Sleep Quality Index (PSQI), a 2 x 24-hour food recall, and anthropometric measurements. Data were analyzed using chi-square tests and multiple logistic regression. Results: Overall, 47.80% of students were classified as overweight. Eating window (OR = 0.34), family support (OR = 2.69), and sleep quality (OR = 3.24) were significantly associated with overweight. Multivariate analysis identified family support as the most dominant factor influencing overweight among students. Conclusion: Family-based interventions are essential in preventing overweight among health students by promoting healthy eating patterns, appropriate chrononutrition behaviors, and good sleep quality, alongside consistent motivation and supervision to support sustained healthy lifestyle behaviors.

Keywords: Overweight; Obesity; Family Support; Chrononutrition; Sleep Quality

1. Introduction

Overweight and obesity are major risk factors for morbidity and mortality related to non-communicable diseases (Ren et al., 2023). Currently, obesity ranks as the 5th leading cause of death worldwide (Safaei et al., 2021). Overweight and obesity refer to the excessive accumulation of body fat or adipose tissue, which can lead to various chronic diseases such as type 2 diabetes mellitus, dyslipidemia, hypertension, and cardiovascular disorders. These conditions may reduce quality of life and shorten life expectancy (Clark et al., 2023).

The prevalence of overweight and obesity continues to increase both globally and in Indonesia. World Obesity Federation (2024) reported that the global prevalence of obesity in 2022 reached 15.8%, indicating that approximately one in six individuals worldwide is affected by obesity. The prevalence of overweight and obesity in Southeast Asia in 2021 was 26.3% among men and 36.2% among women (Marie et al., 2025). The National Health Survey (Survei Kesehatan Indonesia) in 2023 reported an increase in the prevalence of overweight and obesity among adults aged over 18 years in Indonesia, from 35.4% in 2018 to 37.8%. The prevalence in West Java also increased from 36.7% in 2018 to 39.8%. A literature review conducted by Diani et al. (2023) reported that the prevalence of overweight and obesity among medical students in Indonesia was 35.5%.

University students are vulnerable to changes in dietary patterns due to academic pressure, particularly health students who face higher academic demands (Maillet & Grouzet, 2023). Despite receiving health education during their studies, health students do not consistently apply healthy eating behaviors. Health students also tend to have irregular eating patterns, such as frequently skipping breakfast due to demanding academic schedules and clinical practice (Avram et al., 2024). Excessive caloric intake beyond the body's requirements is a primary contributing factor to overweight (Ariftyana, 2024).

Meanwhile, inappropriate chrononutrition behaviors, particularly the misalignment between meal timing and intake, may disrupt circadian rhythms and contribute to overweight (Taslim et al., 2023). Social support, especially from family and peers, also plays a role in influencing nutritional status by providing motivation and

encouragement to adopt healthy eating behaviors (Tan et al., 2024). However, among some health students, support from the surrounding environment remains limited. In certain cases, family may even act as a barrier by exerting negative influences on healthy dietary practices (Alshehri et al., 2023). Short sleep duration and sleep disturbances associated with poor sleep quality have been identified as independent risk factors for overweight (Huang et al., 2024). A literature review by Putri et al. (2023) found that the majority of medical students in Indonesia experience poor sleep quality.

Based on the aforementioned background, this study aims to examine the association and identify the most dominant factors among chrononutrition, social support, sleep quality, energy intake, and protein consumption in relation to the occurrence of overweight among health students at Universitas Pendidikan Indonesia.

2. Research Methods

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3. Results and Discussion

3.1. Result

Table 1 shows that a total of 90 students were included in this study. The majority of participants were female (76.70%). The mean age of the students was 20.05 years. The prevalence of overweight/obesity was 24% based on BMI and 43% based on body fat percentage. Most participants were from the nursing program and lived in rented accommodation (boarding houses). The average monthly allowance of the students was IDR 2,134,444.

Table 1 Frequency Distribution of Students by Sex, Age, Study Program, Living Arrangement, Monthly Allowance, BMI, and Body Fat Percentage

Characteristics	n	%
Gender		
Male	21	23,30
Female	69	76,70
Age ($\bar{x} \pm SD$)	20,05 $\pm$ 1,009	
Study program		
Medicine	14	14,60
Nursing	42	46,70
Nutrition	34	37,80
Residence status		
Living with parents	31	34,40
Boarding house	56	62,20
Dormitory	1	1,10
Others	2	2,20
Monthly allowance (Rp) ($\bar{x} \pm SD$)	2.134.444 $\pm$ 4.611.451	
BMI (kg/m²) ($\bar{x} \pm SD$)	23,39 $\pm$ 4,078	
Normal	66	73,30
Overweight/obesity	24	26,70
Body Fat (%) ($\bar{x} \pm SD$)	28,09 $\pm$ 6,12	
Normal	47	52,20
Overweight/obesity	43	47,80

Overall, Table 2 shows that the majority of students had a poor eating window (51.10%) and frequently skipped breakfast (62.20%). Evening latency was predominantly categorized as good (52.20%), while dinner timing showed an equal distribution between good and poor categories (50%). The largest meal was generally consumed in the evening (54.4%). Social support from both family and peers was mostly categorized as high (52.20% and 55.60%, respectively).

Most students were classified as having poor sleep quality (68.90%), whereas energy and protein intake were largely within the adequate category (58.90% and 57.80%, respectively). These findings indicate that the adoption of healthy lifestyle behaviors among health students remains suboptimal, particularly in terms of meal timing and sleep patterns.

Table 2 Frequency Distribution of Students by Chrononutrition Behaviors, Social Support, Sleep Quality, and Energy and Protein Intake

Characteristics	n	%
Eating windows (h/day) ($\bar{x} \pm SD$)	10,34 $\pm$ 1,98	
Good	44	48,90
Not good	46	51,10
Skipping breakfast (day/week) ($\bar{x} \pm SD$)	2,99 $\pm$ 2,11	
Not often	34	37,80
Often	56	62,20
Evening latency (h) ($\bar{x} \pm SD$)	3,41 $\pm$ 1,06	
Good	47	52,20
Not good	43	47,80
Evening eating (h) ($\bar{x} \pm SD$)	19,71 $\pm$ 1,19	

Characteristics	n	%
Good	45	50
Not good	45	50
Largest meal		
Breakfast	14	15,60
Lunch	27	30
Dinner	49	54,40
Family support ($\bar{x} \pm SD$)	35,44 $\pm$ 5,11	
High	47	52,20
Low	43	47,80
Peer group support ($\bar{x} \pm SD$)	29,41 $\pm$ 3,94	
High	50	55,60
Low	40	44,40
Sleep quality ($\bar{x} \pm SD$)	7,11 $\pm$ 2,69	
Good	28	31,10
Not good	62	68,90
Energy intake		
Adequate	—	58,90
Inadequate	38	42,20
Protein intake		
Adequate	—	57,80
Inadequate	—	—

The chi-square test results presented in Table 3, the eating window variable showed a p-value of 0.01 ($p < 0.05$), indicating a significant association with the occurrence of overweight. The odds ratio (OR) was 0.34 (OR < 1). For family support, the p-value was 0.02 ($p < 0.05$), demonstrating a significant association with overweight. The OR of 2.69 (OR > 1) indicates that students with low family support had approximately 2.69 times higher risk of being overweight compared to those with high family support.

Sleep quality also showed a significant association with overweight, with a p-value of 0.01 ($p < 0.05$). The OR of 3.24 (OR > 1) suggests that students with poor sleep quality had approximately 3.24 times higher risk of being overweight compared to those with good sleep quality.

The variables of breakfast skipping ($p = 0.59$), evening latency ($p = 0.15$), dinner timing ($p = 0.29$), largest meal timing ($p = 0.06$), peer support ($p = 0.22$), as well as energy intake ($p = 0.57$) and protein intake ($p = 0.08$), did not show a statistically significant association with the occurrence of overweight.

Table 3 Analysis of the Association Between Eating Window, Breakfast Skipping, Evening Latency, Dinner Timing, Largest Meal, Family Support, Peer Support, Energy Intake, and Protein Intake

Variable	Overweight/obesity: Yes (n / %)	No (n / %)	p value	OR (95% CI)
Eating windows				
Good	27 / 61,40	17 / 38,40	0,01*	0,34
Not good	16 / 34,80	30 / 65,20		
Skipping breakfast				
Not often	15 / 44,10	19 / 55,90	0,59	1,27
Often	28 / 50	28 / 50		
Evening latency				
Good	26 / 55,30	21 / 44,70	0,15	0,53

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Variable	Overweight/obesity: Yes (n / %)	No (n / %)	p value	OR (95% CI)
Not good	17 / 39,50	26 / 60,50		
Evening eating				
Good	24 / 53,30	21 / 46,70	0,29	0,64
Not good	19 / 42,20	26 / 57,80		
Largest meal				
Good	24 / 58,50	17 / 41,50	0,06	0,45
Not good	19 / 38,80	30 / 61,20		
Family support				
High	17 / 36,20	30 / 63,80	0,02*	2,69
Low	26 / 60,50	17 / 39,50		
Peer group support				
High	21 / 42	29 / 58	0,22	1,69
Low	22 / 55	18 / 45		
Sleep quality				
Good	8 / 28,60	20 / 71,40	0,01*	3,24
Not good	35 / 56,50	27 / 43,50		
Energy intake				
Adequate	24 / 45,30	29 / 54,70	0,57	1,27
Inadequate	19 / 51,40	18 / 48,60		
Protein intake				
Adequate	29 / 55,80	23 / 44,20	0,08	0,46
Inadequate	14 / 36,80	24 / 63,20		

Multivariate analysis was conducted on the variables of eating window, evening latency, largest meal timing, family support, peer support, sleep quality, and protein intake, as all variables had p-values < 0.25 in the bivariate analysis. The modeling process was performed by retaining or removing variables based on p-values > 0.05 and changes in the odds ratio (OR) of more than 10% for each variable.

Based on the results presented in Table 4, the final model included eating window, evening latency, largest meal timing, family support, peer support, sleep quality, and protein intake. Among these variables, only family support showed a statistically significant association with overweight (p-value < 0.05). Meanwhile, the other variables acted as confounding variables in the model, potentially influencing the relationship between family support and the occurrence of overweight.

Table 4 Final Multivariate Model of Variables Associated with Overweight Among Health Students

Variable	Sig	OR	95% CI
Eating windows	0,11	0,43	0,155–1,20
Evening latency	0,15	0,46	0,16–1,32
Largest meal	0,06	0,39	0,14–1,06
Family support	0,04*	2,86	1,06–7,68
Peer group support	0,24	1,78	0,67–4,73
Sleep quality	0,35	1,72	0,55–5,35
Protein intake	0,10	0,43	0,16–1,18

Note. Omnibus Test: $p = 0.002$, Nagelkerke $R^2 = 0.296$.

3.2. The Association Between Eating Windows with Overweight

There was an association between eating window and overweight. These findings are consistent with several previous studies using NHANES 2017–2020 data, which reported a relationship between eating window, obesity, and BMI categories (Kim et al., 2025; O'Connor et al., 2022). However, in contrast, a study by Farsijani et al. (2021) reported no association between eating window and BMI.

Respondents reported that the shortest eating window duration was 5.36 hours (5 hours 22 minutes), while the longest was 14.43 hours (14 hours 26 minutes). This variability reflects considerable differences in eating behavior patterns among participants. The majority of respondents (51.1%) had a prolonged eating window (>10.34 hours). Among health students, dietary patterns tend to be irregular due to academic demands and habits such as staying up late to study or complete assignments (Nishimura et al., 2023). This condition may encourage late-night food consumption, which contributes to extending the interval between the first and last meal, resulting in a longer eating window duration (Xu et al., 2026). This is further supported by the finding that the average eating window duration was longer on weekdays (10.79 hours) compared to weekends (9.23 hours), indicating a tendency toward extended eating windows during working days.

Eating window duration may influence cardiometabolic indicators, including glycemic profile, lipid levels, blood pressure, as well as markers of inflammation and oxidative stress (Silva et al., 2026). This finding is consistent with the theory proposed by Blum (1974), which states that health status is influenced by behavioral factors, including dietary behavior. The eating window plays an important role in maintaining energy balance, which is also affected by total caloric intake during the eating period. A longer eating window tends to increase the likelihood of excessive caloric intake, whereas a shorter duration or prolonged fasting period may help limit energy intake. This condition contributes to weight reduction through improved insulin sensitivity and better regulation of circadian rhythms (Peters et al., 2024).

3.3. The Association Between Family Support with Overweight

There was a significant association between family support and the occurrence of overweight. Several previous studies have reported similar findings, indicating a relationship between family support and the prevalence of overweight and obesity (Alshehri et al., 2023). Zhang et al. (2025) also support this finding, demonstrating that family support is associated with eating behaviors and acts as a mediator in reducing caloric intake and body weight. This suggests that social support functions as a protective factor that can help reduce both internal and external barriers. Strong and consistent support may assist students in overcoming lack of motivation, fluctuations in motivation, and academic pressure, while promoting healthier eating behaviors (Aini & Ichsan, 2026).

Based on the analysis of the 10 items in the SSEH questionnaire, the highest level of support reported by respondents was observed in item number 3, "reminding me not to eat foods high in fat and salt," followed by item number 1, "preventing me from consuming unhealthy foods (such as cakes and flavored snacks) when I am tempted." These findings indicate that the dominant form of family support is related to controlling and limiting the consumption of unhealthy foods.

On the other hand, family support is not limited to the aspects measured in the questionnaire, but can also be provided in other forms, such as instrumental support through the provision of a monthly allowance. Allowance plays a role in influencing an individual's ability to choose and access food. The average allowance of IDR 2,134,444 among respondents reflects the family's contribution to meeting dietary needs. A higher allowance may increase purchasing power for energy-dense foods and potentially lead to higher caloric intake (Dong et al., 2023), whereas a limited allowance may restrict food choices and reduce diet quality (Palupi & Rahmawaty, 2025). Therefore, family support through financial provision also influences both the quantity and quality of dietary intake.

Positive family support promotes adherence to health behavior change programs, enhances psychological well-being, and facilitates weight management, whereas negative social support, such as passive behaviors, may hinder these efforts (Ogden & Quirke-McFarlane, 2023). Family support serves as a resource that helps individuals recognize barriers, cope with sociocultural challenges, and develop coping and recovery strategies to maintain healthy eating behaviors (Jiang et al., 2023). Individuals with higher levels of social support are more likely to adopt healthier dietary patterns and demonstrate better self-efficacy in regulating their eating behaviors, thereby significantly reducing the risk of overweight and obesity (Gallin et al., 2024).

3.4. The Association Between Sleep Quality with Overweight

The statistical analysis showed a significant association between sleep quality and the occurrence of overweight. This finding is consistent with previous studies, a study by Hur et al. (2021), which reported a relationship between sleep quality and obesity. Good sleep quality provides various benefits throughout life, including improved emotional well-being, productivity, cognitive function, as well as overall physical and metabolic health. However, this finding is not entirely consistent, as Fadlina and Anwar (2024) reported no significant association between sleep quality and overweight or obesity.

Further analysis showed that 68.9% of respondents had poor sleep quality. The mean sleep quality score was 7.11 (>5), with the best score being 2 and the worst reaching 14, indicating that the majority of respondents experienced poor sleep quality. This condition may be influenced by several factors, one of which is stress level. Students experiencing high levels of stress are more likely to have sleep disturbances, both in terms of duration and quality. In addition, health students generally face high academic demands, such as coursework and practical sessions, which may lead to later bedtimes and shorter sleep duration. This is supported by the finding that the average sleep duration among respondents was only 5.96 hours.

During sleep, the body undergoes essential restorative processes, including tissue repair, hormonal regulation, and immune system strengthening (Widiyanto & Wijayati, 2025). Conversely, poor sleep quality may disrupt hormonal balance involved in appetite regulation. Poor sleep quality has been associated with increased ghrelin levels and decreased leptin levels. Ghrelin plays a role in maintaining fat storage and inhibiting lipid oxidation. This hormonal imbalance may also increase hunger and energy intake. In vitro studies have shown that ghrelin exerts anti-lipolytic effects on adipocytes and muscle cells (Putri et al., 2023). Therefore, poor sleep quality may contribute to weight gain through hormonal mechanisms.

3.5. Multivariate Analysis of Factors Associated with Overweight Among Health Students

The result of multivariate statistical analysis, family support was the only variable significantly associated with the occurrence of overweight among health students after controlling for eating window, evening latency, largest meal timing, peer support, sleep quality, and protein intake as confounding variables. Compared to other variables included in the model, family support demonstrated a relatively stronger association, and thus can be considered the dominant variable in this study.

The dominant role of family support indicates that the immediate environment plays an important role in shaping individual health behaviors. Support provided by family members, such as reminding individuals to avoid unhealthy foods and encouraging dietary changes, contributes to the development of more controlled eating behaviors. This finding is consistent with Blum's (1974) theory, which emphasizes that environmental factors, including family, play a crucial role in determining individual health status.

However, this relationship does not exist in isolation, as it may be influenced by confounding variables. In this analysis, all relevant variables were controlled, showing that each factor has the potential to strengthen or weaken the association between family support and overweight. This indicates the presence of confounding effects within the model, which may influence the magnitude of the estimated association after adjustment in multivariate analysis. Other variables included in the model did not show statistically significant associations with overweight. This suggests that although these variables are theoretically relevant in influencing nutritional status, their effects were not statistically strong in this study.

3.6. Research Limitations

This study has several limitations. The cross-sectional design does not allow for the establishment of causal relationships, but rather only describes associations at a single point in time. The respondents were health students who are still in the learning phase, and therefore their behaviors may not fully reflect real-world conditions. Consequently, the findings of this study are limited in representing actual conditions. Further research is recommended to examine similar associations in working populations, such as healthcare professionals, to provide more applicable and contextual insights.

4. Conclusion

Based on the findings of this study, there were significant associations between eating window, family support, and sleep quality with the occurrence of overweight among health students at Universitas Pendidikan Indonesia. Family support was identified as the most influential factor associated with overweight after controlling for eating window, evening latency, largest meal timing, peer support, sleep quality, and protein intake. Families are expected to play an active role in providing support, such as promoting regular eating patterns, providing

nutritionally balanced meals, reminding individuals about meal and rest times, and creating an environment that supports healthy sleep habits. In addition, motivation and supervision from family members are essential to help individuals consistently adopt healthy lifestyle behaviors, including maintaining proper dietary patterns, chrononutrition behaviors, and sleep quality. Future researchers are encouraged to use a longitudinal study design and include a larger sample size.

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