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Night Eating Syndrome, Fiber Intake, and Household Income with Occurrence of Overnutrition among SMAN 6 Depok Students

Sindrom Makan Malam, Asupan Serat, dan Pendapatan Rumah Tangga dengan Kejadian Gizi Lebih pada Siswa SMAN 6 Depok

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ABSTRACT

Background: The nutritional issues faced by adolescents have shifted towards the condition of overnutrition, which includes obesity and overweight. Overnutrition occurs when there is an excessive body fat accumulation, potentially increasing the risk of degenerative diseases such as hypertension, diabetes mellitus, heart disease, and others. According to Riskesdas 2018, the national prevalence of overnutrition adolescent was 13.5%. Some risk factors for the occurrence of overnutrition include genetics, psychological factors, excessive energy intake, physical activity, and socioeconomic status. Night eating syndrome is considered as a deviant eating behavior associated with overweight and obesity.

Objectives: To analyze the relationship between night eating syndrome, fiber intake, and household income with the occurrence of overnutrition among students of SMAN 6 Depok.

Methods: The research study design was cross-sectional. The sample was obtained using a stratified random sampling technique, resulting in 100 students from SMAN 6 Depok. Nutritional status was assessed based on body weight and height, night eating syndrome was measured using the Night Eating Syndrome Questionnaire, fiber intake was measured using the Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ), and household income was classified based on the minimum wage of Depok City. Data analysis was conducted using chi-square and fisher's exact tests.

Results: The bivariate analysis revealed that night eating syndrome (p=0.004) had a significant association with the occurrence of overnutrition. Fiber intake (p=1.00) and household income (p=0.954) showed no association with the occurrence of overnutrition. Based on the multivariate analysis, night eating syndrome was found to be the most significant factor associated with overnutrition.

Conclusions: Night eating syndrome is the most significant factor associated with overnutrition. Researchers suggest avoiding stress, getting enough sleep, and controlling intake, especially in the evening.

INTRODUCTION

Adolescents are defined as individuals aged 10 to 18 years[1]. Adolescence is a transition from childhood to adulthood that is identified by several changes, including increases in muscle and fat mass, as well as hormonal changes[2]. This period is critical, marked by rapid growth and development of the body, leading to a continuous increase in the required intake of energy and nutrients. Adolescents are vulnerable to nutritional problems, which, in turn, pose risks to their health[3].

Overnutrition is emerging as a significant concern among adolescents. Overnutrition, which includes overweight and obesity, involves the accumulation of excess fat in the body, posing a risk of degenerative diseases such as diabetes mellitus, hypertension, cardiovascular disease, and various other illnesses[3].

According to the results of the Basic Health Research conducted in Indonesia in 2013, the prevalence of overnutrition in adolescents aged 16 to 18 years was 7.3%, with 5.7% classified as obese and 1.6% as overweight. Over the past five years, there has been an increase in the number of undernutrition adolescents aged 16-18 years, reaching 13.5%, which includes 9.5% classified as overweight and 4% as obese. One of the provinces with an incidence of overnutrition among adolescents aged 16-18 years that exceeds the national incidence rate is the West Java region, with an incidence of overnutrition reaching 15.4%. Depok, one of the cities in West Java Province, has the highest prevalence of obese adolescents, specifically 18.13%[4].

Night Eating Syndrome is characterized by the recurrence of eating at night, involving the consumption

of excessive food after waking up from sleep or when dinner time has passed[5]. Theoretically, this syndrome can lead to an increase in body mass due to the intake of excessive calories at night[6]. Inadequate sleep duration and late sleeping patterns can impact mood and stress levels, influencing night time eating behavior[6]. A low intake of fiber also plays a role in increasing nutritional status. The consumption of fiber creates a prolonged feeling of fullness as it absorbs water and slows down the digestive process[8]. Presently, the diets of adolescents often exhibit high energy content but are deficient in fiber[9]. Several factors contribute to adolescents not consuming fiber-rich food sources such as vegetables and fruits. These reasons include the unavailability of vegetables and fruits at home, adolescents not liking the vegetables served, and not having the desire to eat vegetables.

A person's nutritional status can be influenced by several external factors unrelated to them, one of which is household income, indirectly contributing to nutritional problems[10]. Nutrition and health are highly correlated with household income; higher income tends to improve the overall nutritional and health conditions of family members. However, higher household income also tends to alter eating patterns, leading to increased intake of fat, animal protein, and sugar, and associated with a higher frequency of eating out, which tends to be high in fat and can increase the risk of obesity[11]. The level of household income is determined by the father's job. High income affects purchasing power, increases food consumption, and leads to changes in the diet, shifting towards one low in carbohydrates and fiber, and high in fat, thereby posing a risk of overnutrition among adolescents[12]. Therefore, researchers are interested in investigating whether there is a correlation between night eating syndrome, fiber intake, household income, and the incidence of overnutrition in students at SMA Negeri 6 Depok.

METHODS

This research is an analytical observational study utilizing a cross-sectional approach, involving students at SMAN 6 Depok. The independent variables in this study include total fiber intake, night eating syndrome, and household income, while the dependent variable is the incidence of overnutrition. The hypothesis test formula for the difference between two proportions was employed to determine the sample size for this study, resulting in a total of 100 students, including both male and female students from classes X and XI at SMA Negeri 6 Depok, who met the predetermined criteria. The samples were selected using a stratified random sampling technique. The study's population consisted of active students in classes X and XI at SMA Negeri 6 Depok, divided into strata based on class levels. Subsequently, the researcher randomly selected samples from each class using a random picker and combined them to form the final sample.

Research data were collected using a respondent characteristics questionnaire, which included personal identity details such as initials, age, date of birth, class, telephone number, household income, and father's occupation. Additionally, the Night Eating Questionnaire (NEQ) was utilized to assess night eating syndrome in adolescents. To measure fiber intake, a Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ) was employed. The respondent's body weight and height were measured using digital scales and a stature meter.

The results of adolescent anthropometric measurements are subsequently categorized based on Body Mass Index/Age (BMI/U), with the classification as 'non-overnutrition' if <+1SD and 'overnutrition' if >+1SD[13]. Night eating syndrome is identified if the score from The Night Eating Questionnaire (NEQ) calculation is >25 points, and non-night eating syndrome is indicated if the score is ≤25 points. Adolescent fiber intake is classified based on WNPG (2012), deemed adequate if ≥90% and deficient if <90%. Household income is categorized based on the Depok City Regional Minimum Wage (UMR), classified as low if <IDR 4,377,231 and high if ≥IDR 4,377,231. Father's occupation is classified as either unemployed or employed.

Data collection took place after students at SMAN 6 Depok received an explanation and provided prior approval (PSP) for research, along with signing informed consent. Subsequently, respondents completed research questionnaires, participated in intake interviews, weight and height measurements lasting approximately 30 minutes. Data were analyzed using univariate, bivariate, and multivariate analysis methods. Univariate analysis presented the frequency and percentage distribution of research variables. Chi-Square and Fisher Exact tests were employed for bivariate analysis. The Chi-Square test was utilized to analyze the relationship between night eating syndrome and household income with the incidence of overnutrition, while the Fisher Exact test was employed to analyze the relationship between fiber intake and father's occupation with the incidence of overnutrition. Multivariate analysis involved multiple logistic regression tests. This research has received approval from SMAN 6 Depok, along with ethical approval from the Health Research Ethics Committee the University of Pembangunan Nasional "Veteran" Jakarta under letter number 68/IV/2023/KEPK.

RESULTS AND DISCUSSION
Respondent Characteristics

The research involved 100 respondents who were active students in classes X-XI at SMAN 6 Depok. Respondents were characterized based on age and gender. The distribution of respondents based on these characteristics is outlined in Table 1, revealing that most respondents were 16 years old (63%) and male (52%).

Table 1. Distribution of respondent characteristics

Characteristics Respondent	(n = 100)	(%)
Age		
16	63	63
17	35	35

Characteristics Respondent	(n = 100)	(%)
18	2	2
Gender		
Male	52	52
Female	48	48

A diet consists of the type and amount of food consumed every day within a certain period. The quality and quantity of food and drink a person consumes can affect their nutritional intake, subsequently impacting their health condition[14]. A diet high in calories, fat, carbohydrates, and low in fiber can pose a risk of obesity[15]. Currently, adolescents' intake tends to be high in saturated fat and sodium, while being low in vitamins, minerals, and fiber[16]. The low intake of fiber in adolescents is evident in research conducted by Harti, Indriasari, and Hidayanti[9], where 91 adolescents at SMP Negeri 3 exhibited a low frequency of consuming food sources of fiber. Several reasons contribute to adolescents not consuming food sources of fiber, such as the unavailability of vegetables and fruit at home, adolescents' dislike for the vegetables, and a lack of desire to eat vegetables. Obesity during adolescence can have serious implications for a person's health as an adult, including psychosocial problems, an increased risk of cardiovascular disease, impaired glucose metabolism, digestive and liver disorders, sleep apnea, complications with bone health, and even death[2].

Female adolescents have a higher risk of obesity compared to males. Naturally, women tend to have more fat stores in the body, particularly in the abdominal area. This can be attributed to the fact that women's metabolism is 10% slower than men. As a result, women are more susceptible to converting excess food into fat, while men tend to convert food into muscle and energy stores that can be readily utilized[17].

Tabel 2. Distribution of nutritional status, night eating syndrome, fiber intake, and household income

Variable	n	%
Nutritional status		
Non-overnutrition	84	84
Overnutrition	16	16
Night eating syndrome		
Non-night eating syndrome	84	84
Night eating syndrome	16	16
Fiber intake		
Adequate	5	5
Deficient	95	95
Household income		
Low	35	35
High	65	65
Father's occupation		
Unemployed	2	2
Employed	98	98

Nutritional Status, Night Eating Syndrome, Fiber Intake, Household Income

In this study, the nutritional status of adolescents was measured using the BMI/U parameter with a z-score threshold. If the z-score is in the range <+1 SD, it is classified as non-overnutrition, and if the z-score is in the range >+1 SD, it is classified as overnutrition[13]. Most respondents had non-overnutrition (84%) (Table 2). Several factors influence the increase in adolescent nutritional status, including genetic factors, unhealthy eating habits, increased consumption of high-calorie foods, lack of physical activity, lifestyle, high stress levels, family socioeconomic level, sleep duration, and demographic factors such as age and gender[18].

Optimal nutritional status is achieved by consuming sufficient nutrients for the growth and development of the body and brain, as well as for maintaining overall health. Insufficient consumption of the necessary nutrients leads to problems related to nutritional deficiencies in the body, encompassing both macro and micronutrients, while imbalances between energy intake and expenditure contribute to nutritional status issues[19]. Additionally, insufficient fiber intake can contribute to compromised nutritional status, as adolescents often prefer fatty foods that are easier to digest than those containing fiber[20]. Fiber plays a crucial role in preventing overnutrition by delaying gastric emptying, reducing hunger, and enhancing digestion[9].

Based on Table 2, most respondents did not experience night eating syndrome (84%). Related research indicates that the majority of adolescents do not experience night eating syndrome (62%)[21]. Night eating syndrome is associated with eating patterns, sleep disorders, and emotions. Sleep disturbances experienced by adolescents when they are stressed are connected to the likelihood of eating at night. Consequently, the habit of eating at night poses a risk of developing night eating syndrome in adolescents. Individuals experiencing night eating syndrome typically have a habit of consuming food after 7 pm[22].

Deviant eating behavior is linked to overweight and obesity, with one example being night eating syndrome. Individuals with night eating syndrome typically experience excess weight due to an increased calorie intake before bedtime. This elevated calorie

intake can contribute to obesity and complications such as diabetes, hypertension, and heart disease[23].

Most respondents did not consume enough fiber (95%) (Table 2). Related research indicates that the majority of respondents do not consume sufficient fiber (97.8%)[20]. Fiber plays a crucial role in preventing overnutrition as it can delay stomach emptying, reduce hunger, and improve digestion. Low fiber intake can contribute to enhancing nutritional status. Fiber provides a prolonged feeling of fullness in the stomach, reducing the frequency of hunger. Additionally, high fiber consumption does not contribute excess energy, assisting in monitoring body weight[9].

Fruits and vegetables are easily accessible sources of fiber. The presence of vegetables and fruits at home is a means to optimize the amount of fiber intake in adolescents. Factors such as knowledge, gender, and body image influence an individual's food choices, including the intake of vegetables and fruits[24]. Adolescents often consume minimal or no high-fiber foods, like fruits and vegetables, due to taste preferences. Additionally, the infrequent inclusion of vegetables and fruits in the family menu contributes to lower fiber consumption among adolescents[8].

Most respondents had parents with high incomes (≥ IDR 4,377,231) accounting for 65%, and 98% had fathers who were employed. Increased income correlates with heightened purchasing power for food sources, expanded family food provision, and elevated food consumption, which are closely linked to the issues of overweight and obesity[2].

In families with high incomes, the diet tends to be high in fat, animal protein, and sugar. Increasing income also influences the choice of type and total food consumed. Educational levels are rising along with the improvement in people's well-being, leading to a shift from traditional lifestyles and food habits towards more pragmatic eating habits focused on fast food. This can result in an imbalance in nutritional quality. If this diet is not regulated wisely, it can lead to excessive calorie intake and result in excess body weight or obesity[25].

Table 3. Bivariate analysis of the relationship between night eating syndrome, fiber intake, household income, and father's occupation with the incidence overnutrition among students at SMAN 6 Depok

Variable	Nutritional Status				Bivariate Analysis		Multivariate Analysis	
	Non-overnutrition		Overnutrition		OR (95% CI)	p-value	OR (95% CI)	p-value
	n	%	n	%				
Night eating syndrome								
Non-night eating syndrome	75	89.3	9	10.7	6.5 (1.9 – 21.6)	0.004	6.5 (1.9 – 21.6)	0.002
Night eating syndrome	9	56.3	7	43.8				
Fiber intake								
Adequate	5	100	0	0	-	1	-	
Deficient	79	83.2	16	16.8				
Household income								
Low	30	85.7	5	14.3	-	0.954	-	
High	54	83.1	11	16.9				
Father's occupation								
Unemployed	2	100	0	0	-	1	-	
Employed	82	83.7	16	16.3				

Relationship Between Variables

Table 3 shows that 75 students (89.3%) at SMA Negeri 6 Depok do not experience night eating syndrome with non-overnutrition, and 7 students (43.8%) experience night eating syndrome with overnutrition. The results of bivariate and multivariate analyses reveal that night eating syndrome has a significant relationship with the incidence of overnutrition among students at SMAN 6 Depok (p-value = 0.004). Statistical analysis produced an Odds Ratio (OR) = 6.5 (1.9-21.6). Adolescents with night eating syndrome are 6.5 times more likely to experience overnutrition than adolescents who do not experience night eating syndrome. These findings align with previous research on adolescents aged 10-17 years in Ukraine (p < 0.05)[26]. Night eating syndrome is linked to various factors, including a nocturnal lifestyle, sleep quality, physical activity, and Body Mass Index. A nocturnal lifestyle can be characterized by the habit of eating more frequently late at night and consuming foods that tend to be high in calories. Night eating syndrome is also a risk factor associated with high-fat food preferences. A very late bedtime also affects mood and stress levels, influencing eating behavior. Sleep time affects eating time, subsequently impacting metabolism and increasing body weight[7].

A person with night eating syndrome usually experiences excess weight due to increased calorie intake before bed. The eating disorder known as night eating syndrome is identified with the following behaviors: skipping breakfast, overeating at night (≥ 25% of daily intake), feeling the urge to eat at night, and experiencing changes in appetite, mood, and sleep patterns. A person with night eating syndrome has a higher tolerance for food at night, which can increase the desire to eat during that time. If a person is awake at night, this can contribute to the amount and type of food consumed during nighttime hours[7]. This increased calorie intake can lead to obesity and complications such as diabetes, hypertension, and heart disease[23]. Previous research on students in Turkey also showed similar results, indicating a positive correlation between night eating syndrome and BMI. Students typically engage in late-night studying, leading to food consumption at night and subsequent breakfast skipping[27].

Based on Table 3, there are 5 students at SMA Negeri 6 Depok with adequate fiber intake and non-overnutrition nutritional status (100%), while 16 students (16.8%) have deficient fiber intake with non-overnutrition. The analysis results indicate that there is no relationship between fiber intake and the incidence of overnutrition in students at SMA Negeri 6 Depok (p-value = 1.00). These findings align with previous research[20]. Fiber provides the benefit of stimulating the digestive system to produce sufficient digestive juices, creating volume that triggers a feeling of fullness, and supporting stool formation[28]. Low fiber intake is associated with an increased nutritional status because individuals often consume more fatty foods than fiber. Therefore, low fiber intake causes a reduction in bile acids excreted in the feces, leading to an increase in the amount of cholesterol reabsorbed from the remaining bile. This abundance of cholesterol accumulates, contributing to an increase in nutritional status[20].

The absence of a correlation between fiber intake and the incidence of overnutrition in this study is thought to be because the average respondent has a low level of fiber adequacy. The findings in this study align with the results of research conducted on a sample of adolescents in Banjarmasin City (p-value = 1)[29]. According to the 2019 AKG, the recommended fiber intake for adolescent boys aged 16-18 years is 37 grams, while for adolescent girls aged 16-18 years, it is 29 grams[30].

The analysis results indicate that there are 30 students at SMA Negeri 6 Depok with low household income and non-overnutrition (85.7%), while there were 11 students (16.9%) with high household income and overnutrition. The results further show that there is no relationship between household income and the incidence of overnutrition among students at SMA Negeri 6 Depok (p-value = 0.954). Previous research on adolescents in Banjarmasin City yielded similar results[29]. This differs from the findings of other studies that report a relationship between high parental income and the incidence of adolescent obesity[31]. Increased income correlates with an enhanced ability to purchase food, leading to increased availability and consumption of family food. The trend of eating out, such as fast food, which is high in energy and low in fat and fiber, also increases. Consequently, the incidence of obesity was higher in high socioeconomic groups than in low socioeconomic groups[2]. High parental income was also associated with more pocket money for adolescents, making it easier for them to buy food, with a consequent impact on obesity[31].

Other previous research showed different results, indicating that adolescents in the lowest parental income quartile had a 2.1 times higher risk of being overweight and a 4.1 times higher risk of being obese compared to adolescents in the highest parental income quartile. Food prices and household income play a crucial role in influencing a person's food choices, diet quality, and eating habits. Therefore, the poor eating patterns observed in adolescents in the study were largely attributed to economic limitations. A restricted food budget is positively correlated with a diet high in energy and low in nutrients, as well as limited consumption of fruits and vegetables[32].

The analysis results reveal no correlation between father's occupation (p-value = 1.00) and the incidence of overnutrition among students at SMA Negeri 6 Depok. These findings align with previous research on adolescents in Semarang City[12]. The father's occupation influences the level of household income used to meet living needs. High income impacts purchasing power, increases food consumption, and leads to changes in eating patterns with low carbohydrates and fiber, and high fat, posing a risk of overnutrition among adolescents[12].

CONCLUSIONS

The conclusion of this research is that there was a relationship between night eating syndrome and the incidence of overnutrition in students at SMAN 6 Depok. However, there was no association between fiber intake, household income, and father's occupation with the incidence of overnutrition in students at SMAN 6 Depok. The findings from this research provide valuable information to the public, especially adolescents, enabling them to take preventive measures against overnutrition, particularly by being mindful of nighttime eating behavior. Researchers recommend that students at SMAN 6 Depok avoid stress, ensure adequate sleep, and exercise control over their intake, particularly during the night, to prevent overnutrition.

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