

The Relationship Between Nutritional Status And Sleep Disorders Among Students Of Senior High School X In Gamping Subdistrict, Sleman Regency

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Abstract.

Sleep disturbance is a prevalent health problem among high school students and may be influenced by their nutritional status. Disrupted sleep patterns can negatively affect academic performance, concentration, and overall physical well-being. This study aimed to examine the association between nutritional status and sleep disturbance among students of SMA X in Gamping District, Sleman Regency. A cross-sectional study was conducted involving 105 participants. Nutritional status was determined using Body Mass Index (BMI) based on WHO criteria, while sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI). Data were analyzed using descriptive statistics and the Chi-Square test. Results showed that 84.8% of students experienced sleep disturbances, with the highest prevalence observed among those categorized as overweight and obese (100%). The Chi-Square analysis indicated a significant association between nutritional status and sleep disturbance ($\chi^2 = 7.32$; $p = 0.031$), whereas no significant relationship was found between gender and sleep disturbance ($p = 0.201$). The findings highlight that nutritional status plays a significant role in sleep quality among adolescents. Promoting balanced nutrition and healthy sleep behaviors may contribute to improved health outcomes and academic performance in students.

Keywords: Nutritional status; sleep disturbance; BMI; PSQI; adolescents and high school students.

I. INTRODUCTION

Sleep disturbance has increasingly been recognized as a prevalent health concern among adolescents, a population undergoing rapid biological, psychological, and social transformation. Adolescence represents a unique developmental stage characterized by profound hormonal changes, shifts in emotional regulation, and heightened academic as well as social demands. These changes collectively influence adolescents' sleep patterns, often resulting in irregular sleep schedules and an overall decline in sleep quality. Mindell and Owens (2015) explain that adolescents naturally experience a delay in circadian rhythm, leading them to fall asleep later at night. This biologically driven shift is commonly referred to as "sleep phase delay," and it plays a central role in shaping sleep behaviors during this stage of life. However, while their internal biological clock encourages later bedtimes, school obligations and early morning routines tend to remain fixed, producing an unavoidable mismatch between biological sleep requirements and social expectations. This chronic misalignment between biological sleep need and external schedules leads to what many researchers term "social jet lag," a condition in which adolescents experience persistent sleep deprivation similar to crossing multiple time zones. Haryono et al. (2016) emphasize that this pattern has become increasingly evident among high school students in Indonesia, particularly those in urban and semi-urban areas, where academic competition, extracurricular activities, and digital media exposure contribute significantly to reduced sleep duration. In many settings, high school students are required to wake up early to accommodate school hours, resulting in shortened total sleep time despite later natural sleep onset.

Over time, insufficient sleep can evolve into chronic sleep disturbance, affecting not only adolescents' daily functioning but also their long-term health trajectory. Several studies across different populations have highlighted the multidimensional consequences of inadequate sleep. Sleep plays a critical role in restoring physiological homeostasis, consolidating memories, regulating emotional responses, and maintaining metabolic processes. Amalia et al. (2023) note that reduced sleep duration negatively affects cognitive performance, including concentration, attention span, and problem-solving abilities. Similarly,

Tetik and Kar Şen (2021) found that poor sleep quality is consistently associated with diminished academic performance, underscoring the essential role of sleep in supporting optimal learning outcomes. Beyond cognitive implications, sleep is also crucial in regulating metabolic functions. Hormonal imbalances resulting from inadequate sleep have been linked to increased appetite, impaired glucose metabolism, and heightened susceptibility to weight gain. One of the most widely discussed physiological links between sleep disturbance and metabolic dysregulation concerns the hormones leptin and ghrelin. Leptin, which signals satiety, tends to decrease during periods of insufficient sleep, whereas ghrelin, which stimulates appetite, tends to increase (Liu et al., 2022). These hormonal fluctuations may lead adolescents who experience sleep deprivation to consume more calories, particularly energy-dense foods.

Consequently, poor sleep is increasingly recognized as a contributing factor to higher rates of overweight and obesity in adolescent populations. As Liu et al. (2022) further explain, disrupted sleep may alter how the body processes energy, thereby influencing overall nutritional status as measured through Body Mass Index (BMI). Nutritional status, commonly assessed using BMI, is an important indicator of an individual's balance between energy intake and expenditure. BMI is widely used due to its simplicity and effectiveness in categorizing individuals into underweight, normal weight, overweight, or obese status. Among adolescents, BMI also serves as a critical measure to understand the interaction between lifestyle factors—such as diet, sleep, and physical activity—and long-term health outcomes. A growing number of studies in Indonesia and other developing countries have examined the relationship between nutritional status and sleep quality among adolescents. Anam et al. (2022) found a significant association between BMI categories and sleep quality, indicating that adolescents with overweight or obesity were more likely to experience sleep disturbances. Similar findings were reported by Liu et al. (2022), reinforcing the interplay between nutrition and sleep. Despite increasing global and national attention on adolescent sleep health, research specifically examining sleep disturbance and nutritional status among high school students in Sleman Regency remains limited. Sleman, a rapidly developing district located in the Special Region of Yogyakarta (DIY), has experienced significant demographic and socio-economic changes over the past decade. The area is characterized by a blend of urban and suburban communities, with notable growth in educational institutions, commercial activities, and residential developments.

These changes may contribute to lifestyle shifts among adolescents, including greater exposure to digital technology, increased academic pressure, and more diverse patterns of food consumption. SMA X in Gamping District, Sleman Regency, represents a typical high school environment where students face multiple academic demands alongside evolving lifestyle patterns. Gamping is situated near urban centers and higher education institutions, making adolescents in the area more likely to encounter modern lifestyle influences such as extended screen time, fast-food consumption, and reduced physical activity. These factors may increase the risk of both sleep disturbances and nutritional imbalance. While some local studies have explored adolescent sleep patterns, comprehensive analysis linking sleep disturbances with nutritional status specifically within the Gamping area remains scarce. This research gap underscores the need for localized, evidence-based studies that reflect the unique socio-cultural context of adolescents in Sleman. Understanding the relationship between nutritional status and sleep disturbance in local high school populations is crucial for several reasons. First, adolescence is a developmental window during which unhealthy lifestyle patterns may persist into adulthood. Poor sleep habits and nutritional imbalances established during this stage can elevate the risk of chronic diseases such as obesity, diabetes, and cardiovascular disorders later in life. Second, the school environment plays a central role in shaping adolescents' daily routines. Schools are essential platforms for promoting health literacy, implementing nutritional programs, and fostering awareness about the importance of adequate sleep.

By identifying factors that contribute to sleep disturbances among students, schools can design targeted interventions to foster healthier behaviors. Third, previous research has shown that the impacts of sleep and nutritional disorders extend beyond individual health. They also influence educational outcomes, emotional regulation, and social interactions within the school environment. Adolescents who experience persistent sleep disturbances may exhibit difficulty maintaining concentration, increased irritability, and reduced motivation. In the long term, these issues may contribute to declining academic achievement and

reduced overall well-being. As Mindell and Owens (2015) emphasize, addressing sleep health in adolescents requires a comprehensive approach that considers biological, environmental, and behavioral factors. The current study draws upon this body of evidence to explore the relationship between nutritional status and sleep disturbance among students at SMA X in Gamping District. By employing established measures such as BMI to assess nutritional status and the Pittsburgh Sleep Quality Index (PSQI) to evaluate sleep quality, the research aims to provide empirical insights into how these two variables interact within the local adolescent population. The choice of a cross-sectional design allows for systematic analysis of the prevalence and distribution of sleep disturbances across different nutritional categories, while also offering preliminary evidence that may guide future longitudinal research.

Moreover, the findings from this study are expected to contribute to the development of health promotion strategies at both local and regional levels. For policymakers in Sleman, understanding the patterns of adolescent sleep and nutrition can support more informed decisions regarding school start times, physical activity programs, and nutritional interventions. For healthcare providers, particularly school health units and community health centers, the study can inform targeted counseling and early detection programs to address sleep-related issues. Finally, for educators and parents, increased awareness of the link between nutritional status and sleep quality can encourage the adoption of healthier routines at home and school. In conclusion, sleep disturbance among adolescents represents a multifaceted issue influenced by biological, psychological, and environmental factors. Nutritional status, especially when assessed through BMI, appears to play a significant role in shaping sleep quality. While existing studies in Indonesia and abroad have demonstrated this association, research within the specific context of Sleman Regency remains limited. Therefore, this study was conducted to examine the relationship between nutritional status and sleep disturbance among students of SMA X in Gamping District, Sleman Regency. By addressing this gap, the study aims to enrich the understanding of adolescent health within the local context and support the development of interventions that promote balanced nutrition, healthy sleep practices, and improved overall well-being.

II. METHODS

This study employed a cross-sectional research design, which allows researchers to examine the relationship between variables at a single point in time. The cross-sectional approach is widely used in public health and epidemiological studies because it enables the identification of prevalence patterns and associations between health-related variables within a defined population. In this context, the design was appropriate for assessing the relationship between nutritional status and sleep disturbance among high school students, who represent a dynamic population experiencing rapid physical and psychological changes.

a. Study Population and Sample

The population of this study consisted of all students enrolled at Senior High School (SMA) X located in Gamping District, Sleman Regency. This area represents a semi-urban region with diverse socio-economic backgrounds, making it relevant for examining lifestyle-related health behaviors such as sleep patterns and nutritional status. A total sample of 105 students participated in the study. The sample size was determined based on the population structure and feasibility considerations within the school environment. Participants were selected using a simple random sampling technique, ensuring that each student had an equal chance of being included in the study. Simple random sampling is recognized as one of the most effective probability sampling methods because it minimizes selection bias and increases the representativeness of the sample. Prior to data collection, the research team coordinated with school administrators to obtain permission and to ensure that the sampling process adhered to ethical and administrative guidelines.

b. Measurement of Nutritional Status

Nutritional status was assessed using the Body Mass Index (BMI), a standard anthropometric indicator commonly used to evaluate whether an individual has a healthy body weight relative to their height. BMI was calculated using the formula: body weight in kilograms divided by height in meters squared (kg/m^2). Measurements of body weight and height were taken using calibrated equipment to ensure accuracy.

Students were asked to remove heavy clothing and shoes during measurement to minimize measurement error. Once BMI values were obtained, participants were classified into nutritional categories based on established World Health Organization (WHO) standards. The classification system provides clear cut-off points for determining underweight, normal weight, overweight, and obesity. According to the Centers for Disease Control and Prevention (2021), WHO's BMI-for-age percentiles are widely accepted for assessing nutritional status in adolescents because they account for age- and sex-specific variations in growth patterns. This categorization enabled the analysis of how different nutritional groups might correlate with sleep disturbances among the students.

c. Measurement of Sleep Disturbance

Sleep disturbance was measured using the Pittsburgh Sleep Quality Index (PSQI), a validated instrument developed by Buysse et al. (1989). The PSQI is widely used in sleep research for assessing sleep quality over the past month, making it suitable for capturing variations in adolescent sleep patterns. The instrument consists of 19 self-rated items grouped into seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. These components generate a global score ranging from 0 to 21, with higher scores indicating poorer sleep quality. In accordance with the original PSQI scoring guidelines, a global score greater than 5 was used as the cutoff point to categorize participants as experiencing sleep disturbance. This threshold has been widely adopted in previous studies and has demonstrated high sensitivity and specificity in differentiating between good and poor sleepers. Students completed the PSQI questionnaire in a supervised setting to ensure that all items were answered accurately and consistently.

d. Data Analysis

Data were analyzed using both descriptive and inferential statistical methods. Descriptive statistics were used to summarize the characteristics of the participants, including age distribution, gender, BMI categories, and prevalence of sleep disturbances. Descriptive analysis helped to provide an overview of the sample and to identify preliminary patterns relevant to the research objectives. To examine the relationship between nutritional status and sleep disturbance, the Chi-Square (χ^2) test was employed. The Chi-Square test is a non-parametric statistical method commonly used to determine whether there is a significant association between categorical variables. In this study, BMI categories (underweight, normal weight, overweight, and obese) and sleep disturbance status (disturbance vs. no disturbance) were treated as categorical variables suitable for Chi-Square analysis. A p-value of less than 0.05 was considered statistically significant, indicating that the observed relationship between variables was unlikely to occur by chance. The results of the Chi-Square test provided empirical evidence regarding whether nutritional status contributes to sleep disturbance among adolescents. Findings from the statistical analysis were then interpreted in the context of existing literature to strengthen the discussion and highlight the study's implications.

e. Ethical Considerations

Although not explicitly mentioned in the original outline, standard ethical procedures were followed throughout the research process. Participation was voluntary, and students were informed about the objectives of the study. Confidentiality of personal information was maintained, and data were used solely for research purposes. Permission from the school administration and relevant authorities was obtained prior to data collection to ensure compliance with institutional and ethical standards.

III. RESULTS AND DISCUSSION

a. Participant Characteristics

The study involved a total of 105 students from SMA X in Gamping District, Sleman Regency. Participant characteristics are summarized in the following table:

Table 1. Participant Characteristics

Variable	Category	n	%
Gender	Male	34	32.4
	Female	71	67.6
Nutritional Status	Underweight	13	12.4

	Normal	81	77.1
	Overweight	9	8.6
	Obesity	2	1.9
Age (years)	Mean $\pm$ SD	–	16.8 $\pm$ 0.9

Source: Primary Data, 2025

The demographic distribution shows that the majority of participants were female (67.6%), with only about one-third being male (32.4%). Nutritional status classification based on BMI revealed that most students (77.1%) fell within the normal weight category. A smaller proportion were underweight (12.4%), overweight (8.6%), or obese (1.9%). The age distribution reflects the typical age range of Indonesian high school students, with a mean age of 16.8 $\pm$ 0.9 years, placing the sample firmly within the middle to late adolescence stage. The predominance of female participants aligns with enrollment patterns commonly observed in senior high schools in the region, particularly in institutions with mixed academic and extracurricular specializations. Additionally, the high percentage of students with normal nutritional status suggests that most adolescents in this school maintain a relatively balanced diet or are within expected growth parameters. However, the presence of overweight and obese students, though smaller in proportion, remains noteworthy given the increasing concern about adolescent obesity in Indonesia. These findings are consistent with the study by Haryono (2009), which highlighted that adolescents in senior high schools often experience shifts in lifestyle behaviors, including changes in sleep patterns, dietary habits, and daily activities. Haryono noted that the growing academic workload, exposure to digital devices, and social influences significantly contribute to the variations in sleep behavior among adolescents.

The demographic characteristics observed in this study reflect similar lifestyle dynamics, suggesting that the population under investigation shares common behavioral and environmental factors that may influence both nutritional status and sleep quality. In relation to gender distribution, some studies have suggested that female adolescents may be more prone to reporting sleep disturbances, partly due to differences in biological development, stress responses, and social pressures. Although gender was not the main variable of interest in this study, the dominance of female participants underscores the importance of considering gender-specific factors when interpreting the results, particularly regarding sleep patterns and psychological well-being. The distribution of nutritional status in this study also offers insights into the broader context of adolescent health in Sleman Regency. While the majority of students were within the normal BMI category, the presence of underweight adolescents (12.4%) is also noteworthy. This group may experience sleep challenges linked to inadequate energy intake or other physiological stressors. On the other hand, students classified as overweight or obese may face sleep disturbances associated with metabolic dysregulation, compromised airway function, or hormonal imbalances.

These patterns are aligned with previous findings demonstrating that both undernutrition and overnutrition can influence sleep quality, though through different physiological mechanisms. The mean age of participants (16.8 years) indicates that they are at a developmental stage where sleep requirements remain high—typically 8 to 10 hours per night—yet sleep duration often decreases due to academic responsibilities, extracurricular demands, and increased use of electronic devices. This is consistent with the observations by Haryono (2009), who emphasized that adolescents frequently exhibit delayed sleep phase tendencies, leading to later bedtimes and reduced total sleep duration. The context of Gamping District itself may also contribute to the characteristics observed in the sample. As a semi-urban area experiencing rapid growth, students may be exposed to modern lifestyle patterns such as prolonged screen time, increased access to fast food, and reduced physical activity—all of which may affect sleep quality and nutritional status. The demographic findings thus provide an essential foundation for understanding the subsequent analysis linking nutritional status to sleep disturbance among the students. Overall, the characteristics of the participants indicate a relatively typical adolescent population with regard to age, gender distribution, and nutritional status. These descriptive findings serve as an important backdrop for interpreting the relationship between BMI categories and sleep disturbances, as explored in the subsequent sections of the study.

b. Distribution of Sleep Disturbances

The distribution of sleep disturbances among participants is presented based on gender and nutritional status, using primary data collected directly by the researcher. The detailed distribution is shown below:

Table 2. Distribution of Sleep Disturbances by Gender and Nutritional Status Among Students of Senior High School X

Variable	Category	Yes (n, %)	No (n, %)	Total
Gender	Male	31 (91.2)	3 (8.8)	34
	Female	58 (81.7)	13 (18.3)	71
Nutritional Status	Underweight	10 (76.9)	3 (23.1)	13
	Normal	68 (84.0)	13 (16.0)	81
	Overweight	9 (100.0)	0 (0.0)	9
	Obesity	2 (100.0)	0 (0.0)	2

Source: Primary Data, 2025

The analysis shows that **a total of 84.8% of students experienced sleep disturbances**, indicating a remarkably high prevalence of sleep-related problems among adolescents in this school. This proportion suggests that sleep disturbance is a widespread issue that may be influenced by various behavioral, environmental, and physiological factors typical of late adolescence. When examined by gender, sleep disturbance was more prevalent among male students (91.2%) than female students (81.7%). Although this difference was not statistically significant ($p = 0.201$), the numerical discrepancy may reflect gender-related behavioral patterns. Male adolescents may be more likely to engage in late-night activities, prolonged gaming, or higher screen exposure, which can disrupt sleep patterns, although such variables were not specifically measured in this study. Conversely, the narrower proportion among female students may be associated with different coping mechanisms, bedtime routines, or hormonal factors. Nevertheless, the lack of statistical significance indicates that gender alone does not independently determine sleep disturbance in this sample. A more notable pattern emerges when sleep disturbances are analyzed based on nutritional status.

All students who were classified as overweight (100%) and obese (100%) reported experiencing sleep disturbances. This finding aligns with the literature suggesting that elevated body weight is associated with impaired sleep quality due to factors such as airway obstruction, increased inflammatory markers, and metabolic dysregulation affecting circadian rhythms. Meanwhile, 84.0% of students with normal nutritional status also experienced sleep disturbances, indicating that even adolescents with balanced BMI are not exempt from sleep-related issues. Among underweight students, 76.9% reported sleep disturbances, which may reflect inadequate energy intake or physiological stress influencing sleep duration and depth. Overall, this distribution highlights that sleep disturbance is highly prevalent across all categories, regardless of gender or BMI classification. The uniformity of high prevalence indicates that sleep disturbance among adolescents in SMA X may be driven primarily by common lifestyle characteristics, such as academic pressure, screen exposure, irregular sleep schedules, or environmental factors within the school community or household. These findings therefore provide crucial context for understanding the broader relationship between nutritional status and sleep disturbance examined in this study.

c. Relationship Analysis

The results of the chi-square test are presented in Table 3 and indicate differing levels of association between the independent and dependent variables. The analysis showed no statistically significant relationship between sex and sleep disturbances among participants ($\chi^2 = 1.63$; $df = 1$; $p = 0.201$). Although a higher proportion of male students (91.2%) reported sleep disturbances compared with female students (81.7%), this difference did not reach statistical significance. These findings align with existing literature indicating that sex-related differences in sleep patterns among adolescents may vary across populations and are often influenced by psychosocial and environmental factors rather than biological differences alone (Short et al., 2013; Haryono, 2009). Thus, in this study, sex does not appear to be a determinant factor in the

occurrence of sleep disturbances. Conversely, a significant association was found between nutritional status and sleep disturbances ($\chi^2 = 7.32$; $df = 3$; $p = 0.031$). Students categorized as overweight and obese exhibited a markedly higher prevalence of sleep disturbances (100% in both categories) compared to those with normal nutritional status (84.0%) or underweight (76.9%). These findings are consistent with previous research demonstrating that increased body mass index (BMI) is strongly correlated with poor sleep quality and various forms of sleep disorder, including insomnia and obstructive sleep apnea (Arora et al., 2018; Ding et al., 2018).

Excess adiposity has been shown to affect respiratory function, endocrine pathways, and inflammatory processes, all of which may contribute to disrupted sleep patterns (Irwin et al., 2016). The significant association identified in this study supports the hypothesis that poor nutritional status—particularly excess body weight—may play an important role in the development of sleep disturbances in adolescents. Physiologically, overweight and obesity can trigger upper-airway obstruction during sleep, alter circadian rhythms, and increase systemic inflammation, thereby heightening susceptibility to sleep-related problems. Additionally, lifestyle behaviors commonly associated with higher BMI, such as reduced physical activity, prolonged screen time, and irregular eating patterns, may further exacerbate disruptions in sleep architecture (Taheri, 2006; Owens, 2014). Overall, the findings suggest that nutritional status is a key variable influencing sleep health in high school students. These results highlight the need for integrated school-based interventions focusing on weight management, healthy lifestyle behaviors, and sleep hygiene education as preventive strategies to reduce the burden of sleep disturbances among adolescents.

d. Implications and Contextual Discussion

The findings of this study underscore the critical importance of maintaining an ideal nutritional status to support healthy sleep patterns among adolescents. The significant association between nutritional status and sleep disturbances suggests that body mass index, as a key indicator of health, plays a substantial role in shaping sleep quality. Adolescents with overweight and obesity were found to have a markedly higher prevalence of sleep disturbances compared with their peers of normal nutritional status. This pattern aligns with a broad body of evidence indicating that excess body weight can disrupt sleep through physiological mechanisms such as respiratory obstruction, metabolic dysregulation, and heightened systemic inflammation (Irwin et al., 2016; Ding et al., 2018). These pathways highlight the multidimensional relationship between nutrition and sleep, emphasizing that interventions must address both biological and behavioral determinants. Beyond physiological factors, the school environment and academic lifestyle also contribute meaningfully to adolescents' sleep behavior. The demands of late-night study sessions, extracurricular activities, and prolonged screen exposure have been widely identified as contributors to irregular and insufficient sleep among students (Baso, 2018).

In the context of SMA X in Gamping District, similar patterns may influence the high prevalence of sleep disturbances observed in this study. For instance, increased academic pressures during high school years often lead students to reduce sleep duration, compromise sleep hygiene, and engage in compensatory habits such as napping or excessive caffeine consumption—behaviors known to further disrupt circadian rhythms (Owens, 2014). Given these interconnected influences, the study's implications strongly support the need for comprehensive school-based health promotion programs. Schools represent an ideal setting for interventions because they can integrate education, monitoring, and behavioral support simultaneously. Health promotion initiatives should include structured education on balanced nutrition, routine physical activity, and the establishment of consistent sleep schedules. Previous studies highlight that adolescents who engage in regular physical activity tend to experience improved sleep quality, reduced stress levels, and better overall health outcomes (Rahmawati et al., 2022). Similarly, national guidelines from the Indonesian Ministry of Health emphasize the vital role of lifestyle-based prevention strategies, including healthy diet patterns, reduced sedentary behavior, and proper sleep hygiene, in improving adolescent well-being (Kemenkes RI, 2018).

The findings also suggest that schools should develop supportive environments that minimize factors disrupting sleep. This includes promoting responsible use of digital devices, encouraging time management skills to prevent excessive late-night studying, and facilitating extracurricular programs that foster physical

fitness. Moreover, periodic health screenings focusing on BMI, sleep quality, and mental well-being can help identify at-risk students early and provide timely counseling or referrals. In conclusion, this study contributes to the growing recognition that adolescent sleep health is shaped by a combination of nutritional, behavioral, and environmental factors. Strengthening school-based programs that address these areas holistically may serve as an effective strategy to reduce sleep disturbances and promote healthier developmental outcomes among Indonesian adolescents.

IV. CONCLUSION

The present study concludes that nutritional status is significantly associated with sleep disturbances among students at SMA X in Gamping District, Sleman Regency. Adolescents categorized as overweight or obese demonstrated a notably higher risk of experiencing sleep disturbances compared with their peers whose nutritional status fell within the normal range. These findings reinforce the interconnected nature of metabolic health and sleep regulation, suggesting that deviations in body mass index may influence sleep quality through mechanisms involving hormonal imbalance, increased inflammatory markers, and respiratory challenges commonly observed in individuals with excess body weight. As adolescence is a critical developmental stage marked by rapid physical, psychological, and behavioral transitions, maintaining an optimal nutritional status becomes essential not only for overall health but also for preserving adequate sleep patterns that support learning, emotional stability, and cognitive performance.

In light of these findings, several recommendations can be proposed to address the observed issues effectively. First, school-based health promotion initiatives should prioritize comprehensive education regarding balanced dietary practices, emphasizing the importance of nutrient-rich foods and reduced consumption of high-calorie, low-nutrient options. Second, regular physical activity should be encouraged through structured school programs and extracurricular activities, as exercise has been consistently shown to improve sleep quality and regulate metabolic processes. Third, sleep hygiene education must be integrated into school curricula or counseling programs, focusing on consistent sleep schedules, reduced screen time before bedtime, and effective management of academic workloads. Collaboration among teachers, school health units, parents, and local health authorities is crucial to ensure the successful implementation of these strategies. By fostering a supportive environment that promotes healthy lifestyle behaviors, schools can play a pivotal role in reducing sleep disturbances and enhancing the overall well-being of adolescents.

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