Dietary Knowledge and Physical Activity Level as Correlates of Excess Weight Categories Among Grade VIII Students: A Cross-Sectional Study at SMPN 271 Jakarta

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Abstract: Adolescent overweight is increasing in many low- and middle-income settings and is shaped by diet-related knowledge, daily activity patterns, and the school environment. **Objective**: This study aimed to examine the association between students' dietary knowledge and physical activity level with excess weight categories among Grade VIII students at SMPN 271 Jakarta in 2024. **Methodology**: A quantitative cross-sectional analytic study was conducted among 183 Grade VIII students selected using stratified random sampling. Dietary knowledge was measured using a validated 11-item questionnaire (Cronbach's alpha = 0.931) and categorized as good, moderate, or poor. Physical activity was assessed using the WHO Global Physical Activity Questionnaire (GPAQ) and categorized into low or moderate levels. Associations between dietary knowledge and excess weight categories, and between physical activity and excess weight categories, were tested using the chi-square test (p < 0.05). **Findings**: Almost half of students had good dietary knowledge (48.1%), while most reported low physical activity (89.1%). Dietary knowledge level was significantly associated with excess weight category (p = 0.004), and physical activity level was also significantly associated with excess weight category (p = 0.004). **Implications**: The findings support integrated school-based interventions that combine nutrition education with strategies to increase daily physical activity and reduce sedentary routines, including optimizing the school food environment and expanding opportunities for active breaks and extracurricular activities. **Originality**: This study provides context-specific evidence from an urban junior high school in Jakarta by assessing dietary knowledge and physical activity concurrently in relation to excess weight categories, offering practical insights for designing comprehensive school health programs targeting adolescents.

Keywords: Dietary Knowledge, Physical Activity, Excess Body Weight, Adolescents, School Health Programs

INTRODUCTION

Overweight among school-aged children and adolescents has increased rapidly and is now a priority public health concern. UNICEF's Child Nutrition Report 2025 (Feeding Profit: How food environments are failing children) notes that in nine countries including Indonesia the prevalence of overweight among those aged 5–19 increased at least threefold

between 2000 and 2022, reaching a "moderate" level (approximately 15% to <25%) (UNICEF, 2025). UNICEF links this rise to obesogenic food environments characterized by widespread availability and aggressive marketing of inexpensive ultra-processed foods and sugar-sweetened beverages, with adolescents being especially vulnerable due to greater autonomy and purchasing power in retail food settings (UNICEF, 2025). Consistent with these concerns, WHO estimates that more than 390 million children and adolescents aged 5–19 were overweight in 2022 and frames obesity as a chronic public health crisis shaped by diet and physical activity environments (WHO, 2025). In Indonesia, repeated national survey analyses indicate that adult obesity (Asian cutoff) nearly doubled from 19.7% to 38.3% between 2007 and 2023, with central adiposity rising to 42.0% by 2023, underscoring an accelerating nutrition transition (Muharram et al., 2025). For adolescent populations, accurate classification requires age-referenced standards; WHO recommends BMI-for-age to define overweight (> +1 SD) and obesity (> +2 SD) for individuals aged 5–19 (WHO, 2025).

Evidence on diet- and activity-related determinants indicates that adolescent excess weight is shaped by interacting cognitive, behavioral, and contextual factors. School-integrated nutrition interventions have been associated with improved nutrition-health knowledge and selected nutritional indicators among adolescents (Patimah et al., 2023), and technology-supported education has also increased nutrition knowledge (Tallon et al., 2020). However, knowledge effects appear context-dependent: longitudinal evidence suggests adolescents' and parents' dietary knowledge may not show uniform relationships with adolescents' BMI over time (Cai et al., 2023) and parental knowledge may operate through mediators such as perceived severity and risk perception (Guan & Chen, 2025). Socioeconomic conditions remain relevant as well, with lower economic level linked to overweight risk among Indonesian secondary school students and diet quality influenced by multiple contextual drivers in urban settings (Hidayat et al., 2024; Nugroho et al., 2025).

Movement behaviors provide a complementary pathway. Outdoor physical activity and compliance with activity recommendations are associated with lower excess weight (Sampasa-Kanyinga et al., 2020) and isotemporal substitution analyses suggest that replacing sedentary time with physical activity can reduce overweight/obesity risk (Chen et al., 2025). Screen exposure is consistently associated with higher BMI and is treated as a modifiable prevention target (Abu Salma et al., 2025; Wu et al., 2024), while meeting both physical activity and screen-time recommendations has been linked to lower odds of

overweight/obesity (Crowe et al., 2020). Emerging studies also indicate clustering between physical activity and healthier dietary habits (Karaoglou et al., 2025) and highlight psychosocial correlates relevant to adolescent obesity pathways (Angel et al., 2021; Gutiérrez Tolentino et al., 2024).

Accordingly, this study aims to examine the association between dietary knowledge and physical activity level with excess weight status among Grade VIII students at SMPN 271 Jakarta in 2024. The study will also describe students' dietary knowledge particularly understanding of portion size, quantity, and meal timing and characterize activity patterns relevant to the school routine (e.g., break-time behaviours). Excess weight status will be classified using age-appropriate BMI-for-age standards for adolescents.

Based on the energy-balance framework and recent empirical evidence, the study hypothesizes that students with better dietary knowledge and higher physical activity will be less likely to present excess weight, while students with lower activity and greater sedentary/screen exposure (if measured) will be more likely to present excess weight (Chen et al., 2025). It is further hypothesized that the highest likelihood of excess weight will be observed among students showing a combined risk profile low dietary knowledge alongside low physical activity supporting the need for integrated school-based strategies that address diet-related knowledge and movement behaviors simultaneously (Crowe et al., 2020).

RESEARCH METHOD

Study design and setting

This study employed a quantitative cross-sectional analytic design and was conducted at SMPN 271 Jakarta, Indonesia, from March to June 2024. The design was selected to assess the distribution of dietary knowledge and physical activity levels and to test their associations with excess weight categories among Grade VIII students during a single measurement period.

Population and sample

The population comprised Grade VIII students enrolled at SMPN 271 Jakarta. Participants were selected using probability sampling, specifically stratified random sampling (by class/section). The initial sample size was 166 students, and a 10% allowance for incomplete data/non-response was added, resulting in a final sample of 183 students.

Variables and measurements

The primary independent variables were dietary knowledge level (good/moderate/poor) and physical activity level (low/moderate). The dependent variable was excess weight category presented in three levels (overweight, obesity class I, obesity class II) as reported in the results tables. Body mass index (BMI) was calculated using weight (kg)/height (m).

Instruments and data collection

Dietary knowledge was measured using a questionnaire initially consisting of 15 items. Validity testing was performed among 30 Grade VII students at the same school; 11 items were retained as valid and 4 items were removed. The retained items showed high internal consistency (Cronbach's alpha = 0.931). Responses were scored using a Guttman-type approach, and total scores were categorized into good, moderate, and poor based on predefined cut-off points.

Physical activity was assessed using the Global Physical Activity Questionnaire (GPAQ) consisting of 16 items referring to activities during the previous 7 days. Total physical activity was calculated using MET-minutes/week and categorized into low, moderate, and high; in the present dataset, only low and moderate categories were observed.

Statistical analysis

Descriptive statistics were used to summarize dietary knowledge and physical activity distributions. Associations between (1) dietary knowledge level and excess weight category and (2) physical activity level and excess weight category were tested using the chi-square test, with significance set at $p < 0.05$.

RESULT AND DISCUSSION

Dietary knowledge levels among Grade VIII students at SMPN 271 Jakarta are summarized in the following Table 1. The classification into good, moderate, and poor categories provides a baseline description of students' understanding of appropriate dietary practices.

Table 1. Distribution of Dietary Knowledge Level among Grade VIII Students at SMPN 271 Jakarta (N = 183)

No.	Knowledge of Dietary Patterns	Frequency	Percentage (%)
1	Good	88	48.1
2	Moderate	50	27.3
3	Poor	45	24.6
	Total	**183**	**100**

Table 1 shows that 88 students (48.1%) had good dietary knowledge, 50 (27.3%) had moderate knowledge, and 45 (24.6%) had poor knowledge. Although nearly half of the students demonstrated good knowledge, more than half remained in the moderate-to-poor categories, indicating potential gaps in dietary understanding.

Physical activity levels of Grade VIII students at SMPN 271 Jakarta are presented in the following Table 2. The distribution across low and moderate categories offers an initial snapshot of movement patterns within the study population.

Table 2. Distribution of Physical Activity Level among Grade VIII Students at SMPN 271 Jakarta (N = 183)

No.	Physical Activity Level	Frequency	Percentage (%)
1	Moderate	20	10.9
2	Low	163	89.1
	Total	**183**	**100**

As presented in Table 2, the majority of students had low physical activity (163; 89.1%), while only 20 students (10.9%) were categorized as having moderate physical activity. This distribution suggests that insufficient activity is common in this population.

The relationship between dietary knowledge level and excess weight category among Grade VIII students at SMPN 271 Jakarta is displayed in the following table. The cross-tabulation compares overweight and obesity categories across knowledge groups and supports the statistical assessment of their association.

Table 3. Association between Dietary Knowledge Level and Excess Weight Category among Grade VIII Students at SMPN 271 Jakarta, 2024 (N = 183)

Level of Dietary Knowledge	Overweight n (%)	Obesity Class I n (%)	Obesity Class II n (%)	Total n (%)	p-value
Good	56 (30.6)	21 (11.4)	11 (6.0)	88 (48.1)	0.004

Level of Dietary Knowledge	Overweight n (%)	Obesity Class I n (%)	Obesity Class II n (%)	Total n (%)	p-value
Moderate	30 (16.3)	14 (7.6)	6 (3.2)	50 (27.3)	
Poor	19 (10.3)	25 (13.6)	1 (0.5)	45 (24.6)	
Total	**105 (57.4)**	**60 (32.6)**	**18 (9.8)**	**183 (100.0)**	

Table 3 indicates differences in the distribution of excess weight categories across dietary knowledge levels. Among students with good dietary knowledge, 56 were classified as overweight, 21 as obesity class I, and 11 as obesity class II. Among those with moderate knowledge, 30 were overweight, 14 were obesity class I, and 6 were obesity class II. Among students with poor knowledge, 19 were overweight, 25 were obesity class I, and 1 was obesity class II. The chi-square test showed a statistically significant association between dietary knowledge level and excess weight category (p = 0.004), indicating that the distribution of weight categories varied by knowledge level.

The chi-square statistical test showed a p-value of 0.004, which is lower than the significance level of 0.05. This result indicates that the null hypothesis was rejected, meaning there is a statistically significant relationship between the level of dietary knowledge and the incidence of excess body weight among eighth-grade students at SMPN 271 Jakarta.

The relationship between physical activity level and excess weight category among Grade VIII students at SMPN 271 Jakarta is shown in the following table. This cross-tabulation illustrates how overweight and obesity categories vary by activity level and serves as the basis for testing their association

Table 4. Association between Physical Activity Level and Excess Weight Category among Grade VIII Students at SMPN 271 Jakarta, 2024 (N = 183)

Physical Activity Level	Overweight n (%)	Obesity Class I n (%)	Obesity Class II n (%)	Total n (%)	p-value
Low	88 (48.0)	60 (32.7)	15 (8.1)	163 (89.0)	0.004
Moderate	17 (9.2)	0 (0.0)	3 (1.6)	20 (11.0)	
Total	**105 (57.3)**	**60 (32.7)**	**18 (9.8)**	**183 (100.0)**	

Table 4 shows that among students with low physical activity, 88 were classified as overweight, 60 as obesity class I, and 15 as obesity class II. In the moderate physical activity group, 17 were overweight, none were obesity class I, and 3 were obesity class II. The chi-square test indicated a statistically significant association between physical activity

level and excess weight category (p = 0.004), suggesting that weight category distribution differed by activity level.

Discussion

The present study examined dietary knowledge, physical activity, and excess weight categories among Grade VIII students at SMPN 271 Jakarta. Overall, nearly half of respondents demonstrated good dietary knowledge (48.1%), yet the vast majority reported low physical activity (89.1%). The bivariate analyses indicated statistically significant associations between (1) dietary knowledge level and excess weight category (p = 0.004) and (2) physical activity level and excess weight category (p = 0.004). These findings suggest that the distribution of overweight and obesity categories differs across knowledge and activity groups, highlighting the importance of considering both cognitive and behavioral determinants in school-based adolescent health.

Several mechanisms may explain why dietary knowledge is associated with excess weight categories but does not necessarily prevent students from experiencing excess weight. First, knowledge can improve awareness without guaranteeing behavior change when the food environment promotes unhealthy choices. UNICEF emphasizes that adolescents are particularly vulnerable to unhealthy retail and marketing environments, where energy-dense snacks and sugary drinks are easily accessible and repeatedly purchased (UNICEF, 2025). Second, knowledge may be mediated by motivation, risk perception, and family factors; parental knowledge may influence adolescent weight outcomes through perceived severity and risk perception rather than through knowledge alone (Guan & Chen, 2025). Longitudinal evidence also shows that adolescents' and parents' dietary knowledge may not have uniform relationships with adolescent BMI over time, indicating that knowledge–behavior pathways can vary by context and actor (Cai et al., 2023). In the current study, the presence of substantial overweight/obesity even among students with good knowledge may reflect a "knowledge–practice gap," where daily routines, peer norms, snack availability, and habitual eating override what students know about healthy eating.

Physical activity patterns provide an additional explanation for the high burden of excess weight categories observed. The dominance of low physical activity in this sample aligns with broader concerns that reduced movement and increased sedentary routines contribute to energy imbalance among adolescents (WHO, 2025). Evidence indicates that

outdoor activity and compliance with activity recommendations are associated with lower excess weight (Sampasa-Kanyinga et al., 2020) and isotemporal substitution analyses suggest that replacing sedentary time with physical activity can reduce overweight/obesity risk (Chen et al., 2025). Screen exposure and sedentary behavior are also consistently linked with higher BMI and remain modifiable targets for prevention (Abu Salma et al., 2025; Wu et al., 2024). The very small proportion of students with moderate activity in this study further implies that most students may not accumulate enough daily movement to offset frequent snacking and energy-dense intake, particularly in an urban setting where sedentary leisure is common.

Comparisons with previous studies show both convergence and added value. School-based interventions that integrate nutrition education within broader support systems have demonstrated improvements in nutrition-health knowledge and selected nutritional indicators (Patimah et al., 2023), and technology-supported education can increase nutrition knowledge among adolescents (Tallon et al., 2020). However, evidence also suggests that knowledge is shaped by socioeconomic and contextual constraints; lower economic level has been linked to overweight risk among Indonesian secondary school students, and diet quality is influenced by multiple drivers in urban settings (Hidayat et al., 2024; Nugroho et al., 2025). The present study contributes by providing context-specific evidence from a junior high school setting in urban Jakarta and showing that dietary knowledge and physical activity are both associated with variation in excess weight categories. This supports a view that single-component approaches (knowledge only or activity only) may be insufficient for meaningful risk reduction.

The broader meaning of these findings is that adolescent excess weight should be understood as a school-embedded, environment-sensitive phenomenon rather than only an individual responsibility. UNICEF's description of modern food environments—characterized by frequent exposure to affordable ultra-processed snacks and beverages—helps explain why risk persists even when adolescents have some nutrition knowledge (UNICEF, 2025). At the same time, the clustering of behaviors documented in recent literature suggests that physical activity and healthier dietary habits may co-occur, potentially amplifying benefits when both domains are targeted together (Karaoglou et al., 2025). Psychosocial correlates also matter, as adolescent obesity-related pathways can intersect with mental health indicators such as depression and anxiety, and with body-related perceptions, which may influence participation in physical activity and eating

behavior (Angel et al., 2021; Gutiérrez Tolentino et al., 2024). Therefore, interventions should be framed not only as weight management but also as wellbeing-oriented strategies that reduce stigma and support healthy routines.

A balanced reflection highlights both potential benefits and risks. On the positive side, improving dietary knowledge and increasing physical activity can be actionable targets within schools, and short-term interventions have demonstrated improvements in adolescents' eating habits and nutrition knowledge (Berger et al., 2021). On the risk side, programs that focus narrowly on weight outcomes may unintentionally increase body dissatisfaction or stigma, which can undermine wellbeing and engagement (Angel et al., 2021). This implies that school-based programs should prioritize supportive messaging, emphasize health and function (energy, fitness, concentration), and avoid punitive or appearance-focused approaches.

Based on these results, several school-level action steps are recommended. First, nutrition education should be strengthened but paired with environmental change, such as healthier canteen options, restrictions on sugary drinks and highly processed snacks during school hours, and clear labeling or "healthy choice" cues, aligned with the food-environment concerns raised by UNICEF (UNICEF, 2025). Second, physical activity promotion should move beyond scheduled physical education by introducing active breaks, structured after-school activity clubs, and opportunities for safe outdoor play; evidence supports the value of outdoor activity and reducing sedentary time through time-use shifts (Chen et al., 2025; Sampasa-Kanyinga et al., 2020). Third, screen-time reduction strategies should be integrated (e.g., screen-time education, family engagement, and alternative leisure options) because screen exposure is consistently linked with higher BMI (Abu Salma et al., 2025; Wu et al., 2024). Finally, multi-component programs that target both activity and screen-time guidelines may offer stronger protection than addressing one behavior alone (Crowe et al., 2020) and parental engagement should be included to strengthen risk perception and support at home (Guan & Chen, 2025).

CONCLUSION

This study highlights a key lesson: excess weight among Grade VIII students at SMPN 271 Jakarta is closely linked to both cognitive and behavioral determinants, particularly dietary knowledge and physical activity patterns. Although nearly half of students demonstrated good dietary knowledge, most students reported low physical activity, and

the distribution of excess weight categories differed significantly across both dietary knowledge levels and physical activity levels (p = 0.004 for each association). These findings indicate that knowledge alone may be insufficient without supportive routines and opportunities for movement, and that school-based prevention must address diet-related understanding alongside daily activity behavior.

The main scientific contribution of this study lies in providing context-specific evidence from an urban junior high school setting and examining dietary knowledge and physical activity simultaneously in relation to excess weight category/severity. By documenting the distribution of knowledge and activity levels and their statistical associations with excess weight categories, the study offers empirical support for integrated school-health approaches that combine nutrition education with strategies to increase physical activity and reduce sedentary routines.

Several limitations should be acknowledged. First, the cross-sectional design limits causal inference; the study identifies associations but cannot confirm directionality. Second, the study appears to include only students within excess weight categories, which restricts generalizability and prevents estimation of excess weight prevalence among all Grade VIII students. Third, physical activity was highly skewed toward the low category, and sparse cells (including zero counts) may affect chi-square assumptions. Future research should include the full student population (including normal-weight students), apply standardized adolescent classification (BMI-for-age), incorporate additional confounders (e.g., dietary intake, socioeconomic indicators, and screen time measured explicitly), and use multivariable models to better estimate independent effects and guide targeted interventions.

REFERENCES

Abu Salma, B. M. et al. (2025). Adolescent Obesity and Sedentary Screen Time: A Public Health Perspective. *Universal Journal of Public Health*, *13*(2), 496–503. https://doi.org/10.13189/ujph.2025.130221

Angel, T.-S. M. et al. (2021). Mediating effect of fitness and fatness on the association between lifestyle and body dissatisfaction in Spanish youth. *Physiology and Behavior*, *232*. https://doi.org/10.1016/j.physbeh.2021.113340

Berger, T. D. et al. (2021). The Impact of a Short-term Intervention on Adolescent Eating Habits and Nutritional Knowledge. *Israel Medical Association Journal*, *23*(11), 720–724. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85122116407&partnerID=40&md5=8eff8b2ffe615c7ddd4a1372031a3405

Cai, Z. et al. (2023). Influence of adolescents' and parental dietary knowledge on adolescents' body mass index (BMI), overweight/obesity in 2004–2015: a longitudinal study. *Archives of Public Health*, *81*(1). https://doi.org/10.1186/s13690-023-01197-x

Chen, Z. et al. (2025). Associations of sleep, sedentary behavior, and physical activity during out-of-school time and the risk of overweight and obesity in children and adolescents: a dose-response and isotemporal substitution analysis. *BMC Public Health*, *25*(1). https://doi.org/10.1186/s12889-025-23011-9

Crowe, M. et al. (2020). Combinations of physical activity and screen time recommendations and their association with overweight/obesity in adolescents. *Canadian Journal of Public Health*, *111*(4), 515–522. https://doi.org/10.17269/s41997-020-00313-6

Guan, L., & Chen, F. (2025). Perceived severity: a mediator of parental nutrition knowledge and overweight/obesity in adolescents. *British Food Journal*, *127*(2), 680–694. https://doi.org/10.1108/BFJ-07-2024-0677

Gutiérrez Tolentino, R. et al. (2024). Epidemiological Overview of Overweight and Obesity Related to Eating Habits, Physical Activity and the Concurrent Presence of Depression and Anxiety in Adolescents from High Schools in Mexico City: A Cross-Sectional Study. *Healthcare (Switzerland)*, *12*(6). https://doi.org/10.3390/healthcare12060604

Hidayat, Z. F. et al. (2024). Factors Related to Diet Quality in Adolescent at Yadika 12 High School Depok. *Amerta Nutrition*, *8*(3SP), 402–411. https://doi.org/10.20473/amnt.v8i3SP.2024.402-411

Karaoglou, A. et al. (2025). Exploring the Associations Between Systematic Engagement in Physical Activity, Dietary Habits and Body Composition in a Sample of Greek Adolescents. *Adolescents*, *5*(2). https://doi.org/10.3390/adolescents5020013

Muharram, F. R. et al. (2025). Trends in the double burden of malnutrition among Indonesian adults, 2007 to 2023. *Scientific Reports*. https://doi.org/10.1038/s41598-025-17348-9

Nugroho, A. et al. (2025). Low Economic Level and the Risk of Overweight Among Indonesian Junior and Senior High School Students. *Kesmas: Jurnal Kesehatan Masyarakat Nasional*, *20*(3), 222–229. https://doi.org/10.7454/kesmas.v20i3.2391

Patimah, S. et al. (2023). Effect of School-Integrated Interventions on Improvement of Nutrition-Health Knowledge and Nutritional Status among Adolescent Girls: A Quasi-Experimental Study. *Current Research in Nutrition and Food Science*, *11*(2), 880–893. https://doi.org/10.12944/CRNFSJ.11.2.35

Sampasa-Kanyinga, H. et al. (2020). Outdoor physical activity, compliance with the physical activity, screen time, and sleep duration recommendations, and excess weight among adolescents. *Obesity Science and Practice*, *6*(2), 196–206. https://doi.org/10.1002/osp4.389

Tallon, J. M. et al. (2020). Pilot evaluation of an interactive multimedia platform to provide nutrition education to Portuguese adolescents. *European Journal of Public Health*, *30*(2), 353–537. https://doi.org/10.1093/eurpub/ckz136

UNICEF. (2025). Feeding Profit: How food environments are failing children. In *Child Nutrition Report 2025*. UNICEF. https://www.unicef.org/media/174091/file/CNR2025-FeedingProfit-FinalReport-English-FINAL.pdf.pdf

WHO. (2025). *Obesity and overweight*. https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight

Wu, S. et al. (2024). Pathway of the effect of screen exposure on overweight and obesity among children and adolescents. *Zhongguo Ertong Baojian Zazhi*, *32*(11), 1252-1255and1265. https://doi.org/10.11852/zgetbjzz2024-0335