

RESEARCH ARTICLE

Energi Intake and Physical Activity with the Incidence of Obesity in Adolescents

Asupan Energi dan Aktivitas Fisik dengan Kejadian Kegemukan pada Remaja

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Abstract

Obesity in adolescents is a health issue that requires attention because it can trigger various future disease risks. This study aims to analyze the relationship between energy intake and physical activity and obesity among adolescents at Ihsanul Amal Islamic Junior High School (SMP IT), within the Alabio Inpatient Health Center (Puskesmas Rawat Inap) working area. The study used a cross-sectional design, with a sample size of 142 students selected through a combination of stratified random sampling and simple random sampling. Energy intake was obtained using a 3 x 24-hour food recall method, physical activity was measured using the Physical Activity Level (PAL) value, while obesity status was determined by measuring height and weight based on BMI/A. Bivariate analysis was conducted to determine the relationship between energy intake and physical activity and obesity among adolescents using the Gamma test. The results showed that the majority of adolescents at Ihsanul Amal Islamic Junior High School had insufficient energy intake (71.8%) and light physical activity (73.2%). Bivariate analysis using the Gamma test revealed a very strong and significant negative relationship between energy intake and obesity ($\gamma = -0.991$; $p < 0.001$), as well as a very strong negative relationship between physical activity levels and obesity ($\gamma = -0.979$; $p < 0.001$). These findings confirm that the higher the energy intake or the lower the level of physical activity, the greater the risk of obesity in adolescents.

Keywords: adolescents, energy intake, obesity, physical activity

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Abstrak

Kegemukan pada remaja merupakan masalah kesehatan yang perlu mendapatkan perhatian karena dapat memicu berbagai risiko penyakit di masa depan. Penelitian ini bertujuan untuk menganalisis hubungan antara asupan energi dan aktivitas fisik dengan kejadian kegemukan pada remaja di SMP IT Ihsanul Amal, wilayah kerja UPT Puskesmas Rawat Inap Alabio. Penelitian menggunakan desain cross-sectional dengan jumlah sampel 142 siswa yang dipilih melalui kombinasi stratified random sampling dan simple random sampling. Asupan energi diperoleh dengan metode food recall 3 x 24 jam, aktivitas fisik diukur dengan nilai Physical Activity Level (PAL), sedangkan status kegemukan dilakukan dengan mengukur TB dan BB berdasarkan IMT/U. Analisis bivariat dilakukan untuk mengetahui hubungan antara asupan energi dan aktivitas fisik dengan kejadian kegemukan pada remaja menggunakan uji Gamma. Hasil penelitian menunjukkan bahwa mayoritas remaja di SMP IT Ihsanul Amal memiliki asupan energi kurang sebesar 71,8% dan aktivitas fisik ringan sebesar 73,2%. Analisis bivariat menggunakan uji Gamma menunjukkan adanya hubungan negatif yang sangat kuat dan signifikan antara asupan energi dengan kejadian kegemukan ($\gamma = -0,991$; $p < 0,001$), serta adanya hubungan negatif yang sangat kuat antara tingkat aktivitas fisik dengan kejadian kegemukan ($\gamma = -0,979$; $p < 0,001$). Temuan ini menegaskan bahwa semakin tinggi asupan energi atau semakin rendah tingkat aktivitas fisik, semakin besar risiko terjadinya kegemukan pada remaja.

Kata Kunci: remaja, asupan energi, kegemukan, aktivitas fisik

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Highlight:

- Energy intake falling short of daily recommended allowances is driven by taste-driven food selection made without regard for nutritional value, limited nutritional literacy, and established family dietary habits.
- Higher dietary energy intake positively correlates with an elevated risk of adolescent obesity.
- The predominance of a low-intensity lifestyle is influenced by restricted environmental support, individual motivation, and daily school routines.

INTRODUCTION

Obesity is a condition characterized by excessive body fat accumulation that increases the risk of various health disorders (Saraswati et al., 2021). It has currently emerged as one of the most pressing public health challenges worldwide (Nabila et al., 2024). Obesity no longer affects adults exclusively; its prevalence has surged significantly among children and adolescents across various countries, including Indonesia (Aminda and Sulaiman, 2025). Adolescent obesity is of growing concern because its ramifications extend beyond physical health to long-term psychological, social, and economic dimensions.

According to the World Health Organization (WHO), an estimated 35 million children under five years of age were overweight in 2024. Once regarded as a problem unique to high-income nations, overweight prevalence is now rapidly escalating in low-

and middle-income countries. In Africa, the number of overweight children under five years has increased by nearly 12.1% since 2000. Furthermore, almost half of all overweight children under five in 2024 resided in Asia ([World Health Organization, 2025](#)). Findings from the Indonesian Health Survey (SKI) published by the Ministry of Health reveal that the prevalence of obesity among adults (aged >18 years) reached 23.4%. Meanwhile, the national prevalence of central obesity stood at 36.8%, exhibiting a continuous upward trajectory year over year ([Kemenkes RI, 2023](#)).

Data from the Indonesian Health Survey (SKI) and records from the Ministry of Health indicate that the prevalence of obesity in South Kalimantan ranged from approximately 19.52% to over 29% across several age groups. This figure reflects an increasing trend in excess body weight driven by shifts in lifestyle and dietary patterns ([Kemenkes RI, 2023](#)). Furthermore, the Health Office of Hulu Sungai Utara Regency reported that adolescent obesity prevalence in Alabio District reached 11.2% in 2024, marking an increase from 9.3% in 2023 ([Dinkes Kab HSU, 2024](#)).

The nutritional status screening conducted in 2025 revealed varying rates of obesity across several schools. At SMP IT Ihsanul Amal, 49 out of 219 students were classified as obese, comprising 15 Grade 7 students (30.6%), 17 Grade 8 students (34.7%), and 17 Grade 9 students (34.7%). This figure surpasses the national prevalence rate of 14%, indicating that adolescent obesity—particularly within school environments—remains a critical concern. In comparison, 27 out of 195 students at SMP 1 and 25 out of 180 students at SMAN 1 Sungai Pandan were identified as obese. The high rate of obesity observed at SMP IT Ihsanul Amal positions the school as a highly relevant research site, providing detailed insights into students' nutritional status and serving as a foundation for understanding the factors influencing adolescent nutrition in academic settings.

In addition to physical health impacts—such as increased risks of diabetes mellitus, hypertension, and dyslipidemia—obesity adversely affects adolescent mental health ([Fitriyani et al., 2025](#)). Psychological effects such as self-consciousness, low self-esteem, and body image dissatisfaction frequently accompany adolescent obesity, consequently impairing academic performance, social relationships, and overall quality of life ([Dianingrum and Satwika, 2021](#)). Adolescents with obesity tend to withdraw socially, experience lack of confidence, and are vulnerable to emotional distress that may progress to stress or depression ([Rahayu et al., 2024](#)). Left unaddressed, these conditions may persist into adulthood, compounding the risk of chronic diseases and severe psychiatric disorders.

Modern lifestyle transitions serve as a primary driver of the rising obesity prevalence ([Syifa and Djuwita, 2023](#)). Unrestricted access to fast food, sugar-sweetened beverages, and ultra-processed, energy-dense yet nutrient-poor foods further accelerates adipose tissue accumulation ([Asmi et al., 2025](#)). Concurrently, technological advancement promotes sedentary behaviors among adolescents, including prolonged screen time on electronic gadgets, television viewing, and social media engagement. [Assagaf et al. \(2023\)](#) noted that sedentary habits, particularly prolonged sitting and screen use, suppress basal metabolic rates and impede efficient fat oxidation [Agustina et al. \(2023\)](#) Furthermore, a marked deficit in physical activity strongly correlates with an increased incidence of obesity ([Agustina et al., 2023](#)).

Meanwhile, adolescence is a period characterized by rapid growth and development, demanding high energy intake ([Helamliah et al., 2024](#)). However, when caloric intake significantly exceeds total energy expenditure from physical exertion, surplus energy is sequestered and stored as body fat. This energetic imbalance between

caloric intake and physical expenditure constitutes the root cause of obesity etiology (Pradika et al., 2022). Empirical evidence demonstrates that excessive energy intake, particularly from processed foods and high-sugar beverages, serves as a primary contributor to weight gain. Specifically, Ghalin et al. (2025) elucidated that the consumption of high-calorie items such as fast food significantly elevates the risk of adolescent obesity.

Numerous studies have investigated the relationship between energy intake, physical activity, and adolescent obesity. However, limited research has examined this association within the specific context of Indonesian junior high schools, particularly while considering local determinants such as dietary habits and the availability of physical activity facilities (Yanti et al., 2021). SMP IT Ihsanul Amal, the study site, is a modern school equipped with various supporting amenities, including an on-campus minimarket and three sports courts for futsal and basketball. Nevertheless, the presence of these facilities does not fully reflect the actual dietary consumption or physical activity levels of the students.

Based on preliminary observations and brief interviews with several students, the majority prefer purchasing sugary snacks or fast food at the school minimarket rather than bringing healthy home-packed meals. Additionally, the school provides morning snacks consisting of one fried food item (*gorengan*), a small package of roasted peanuts (approximately ± 50 grams), a sweet pastry, 600 mL of mineral water, as well as lunch. The scarcity of nutritious food options—such as fruits, vegetables, or home-cooked meals—leads students to frequently consume convenience foods with low nutritional density.

Students' physical activity levels are also categorized as low due to their enrollment in a full-day school system operating from 08:00 to 17:00 with restricted break times. Break periods are limited to 40 minutes (10:30–11:10) and 60 minutes (12:30–13:30), which are primarily utilized for resting, praying, and eating (ISHOMA). Although the school possesses comprehensive sports facilities and schedules a weekly 90-minute physical education class, utilization remains sub-optimal because the demanding academic schedule leaves students with insufficient leisure time for physical exertion. Upon returning home, most students feel exhausted and refrain from additional physical activities, resulting in a predominantly sedentary lifestyle. The availability of facilities does not necessarily correlate directly with the adoption of a healthy lifestyle, as it remains highly dependent on individual awareness, motivation, and habits (Rizona et al., 2020).

This study was specifically conducted at SMP IT Ihsanul Amal within the working area of the Alabio Inpatient Public Health Center (UPT Puskesmas Rawat Inap Alabio). This site was selected because the school exhibits unique learning environment characteristics and student activity patterns compared to other institutions in the same catchment area, such as SMP 1 and SMAN 1 Sungai Pandan. Students at SMP IT Ihsanul Amal undergo an integrated education system with an intensive academic schedule and varied physical activities, which potentially influences the balance between energy intake and energy expenditure. Furthermore, initial observations by school authorities and local health personnel revealed emerging indications of weight gain among several students. Consequently, this location is deemed representative for investigating the relationship between energy intake, physical activity, and the incidence of adolescent obesity.

METHODS

This study was an observational analytic investigation employing a quantitative cross-sectional design. We examined the association between energy intake, physical activity, and the incidence of obesity among adolescents at SMP IT Ihsanul Amal, located within the service area of the Alabio Inpatient Public Health Center (UPT Puskesmas Rawat Inap Alabio). The study was conducted from September to October 2025. The study population comprised all 219 registered students at SMP IT Ihsanul Amal across three grade levels: Grade 7 with 69 students (45 males and 24 females), Grade 8 with 78 students (45 males and 33 females), and Grade 9 with 72 students (36 males and 36 females).

A sample of 142 subjects was determined using Slovin's formula (Notoatmodjo, 2018). Sampling was conducted using a proportionate stratified random sampling technique, yielding 45 participants from Grade 7, 50 from Grade 8, and 47 from Grade 9. Following stratum allocation, individual participants were selected via simple random sampling within each stratum to ensure that every student within a given stratum had an equal probability of selection.

Collected variables included independent variables, consisting of students' energy intake and physical activity level, and the dependent variable, defined as the incidence of obesity. Energy intake was obtained using a 3×24 -hour food recall method (2 weekdays and 1 weekend day) and processed using NutriSurvey 2007 software. Output values were compared against age- and sex-specific Recommended Dietary Allowances (RDA) and categorized as follows: Deficit ($< 80\%$ RDA), Adequate (80% – 110% RDA), and Excess ($> 110\%$ RDA). Physical activity was evaluated using the Physical Activity Level (PAL), which expresses daily physical activity as the ratio of Total Energy Expenditure (TEE) to Basal Metabolic Rate (BMR). According to WHO classifications, PAL values were categorized into three groups: Vigorous (2.00–2.40), Moderate (1.70–1.99), and Light (1.40–1.69). Obesity status was assessed by measuring height and body weight to calculate body mass index-for-age (BMI-for-age) Z-scores in accordance with national guidelines Kemenkes RI (2020), categorized into Non-obese (BMI-for-age Z-score $< +2$ SD) and Obese (BMI-for-age Z-score $\geq +2$ SD).

Univariate analysis was conducted to describe the characteristics of each variable. Bivariate analysis was performed to determine significant associations between the independent variables (energy intake and physical activity) and the dependent variable (incidence of obesity) among adolescents. Gamma test was utilized for bivariate analysis because the data were measured on an ordinal scale, aiming to evaluate the strength and direction of the association. Statistical significance was set at $\alpha = 0,05$. This study received ethical approval from the Health Research Ethics Committee of Health Polytechnic of Ministry of Health Banjarmasin (Approval No. 878/KEKP-PKB/2025). Ethical principles observed throughout the study included informed consent, anonymity, confidentiality, beneficence, non-maleficence, and justice.

RESULT AND DISCUSSION

Subject characteristics

The general baseline characteristics of the study participants are presented in Table 1. These parameters encompass the distribution of subjects based on age groups and sex.

Table 1. Subject characteristics (n=142)

Characteristics	n	%
Age		
Early adolescence (10–12 years)	30	21.1
Middle adolescence (13–15 years)	112	78.9
Sex		
Male	62	43.7
Female	80	56.3

Source: Primary data, 2025.

Regarding age distribution, the majority of participants belonged to the middle adolescence category (13–15 years), comprising 112 individuals (78.9%), whereas early adolescents (10–12 years) accounted for 30 individuals (21.1%). This indicates that the study predominantly involved adolescents in their middle developmental stage. In terms of sex distribution, females constituted the majority of the study population (80 individuals, 56.3%), while males comprised 62 individuals (43.7%), demonstrating a higher female representation within the study sample.

Univariate analysis

The univariate analysis presented in Table 2 reveals that the majority of adolescents at SMP IT Ihsanul Amal had deficient energy intake, accounting for 102 subjects (71.8%). Meanwhile, 22 subjects (15.5%) had adequate energy intake, and 18 subjects (12.7%) were categorized as having excessive energy intake. Regarding physical activity levels, the majority of adolescents engaged in light physical activity, totaling 104 individuals (73.2%). Those participating in vigorous physical activity comprised 20 individuals (14.1%), whereas 18 individuals (12.7%) performed moderate physical activity. Thus, most adolescents at this school exhibited low physical activity levels. In terms of obesity status, the vast majority of subjects were non-obese (114 subjects, 80.3%), while 28 subjects (19.7%) were obese.

Table 2. Univariate analysis (n=142)

Variable	n	%
Energy Intake		
Deficient	102	71.8
Adequate	22	15.5
Excessive	18	12.7
Physical Activity		
Vigorous	20	14.1
Moderate	18	12.7
Light	104	73.2
Obesity Status		
Non-obese	114	80.3
Obese	28	19.7

Source: Primary data, 2025.

The findings demonstrate that most adolescents at SMP IT Ihsanul Amal exhibited deficient energy intake, reflecting an inability to meet daily energy requirements. This low energy intake may be attributed to various factors, including

daily eating habits and individual food selection. Adolescents tend to choose food based on taste preferences without considering energy and nutrient density, resulting in insufficient total caloric intake. This aligns with Agustina et al. (2023), who stated that dietary behavior is influenced by individual knowledge and eating habits. Furthermore, the family environment and home dietary patterns play a crucial role in shaping adolescent consumption habits (Amin and Sulaiman, 2025).

Regarding physical activity, the majority of adolescents were categorized under light physical activity, indicating a predominantly low-intensity daily lifestyle. The high proportion of light physical activity among students may be influenced by environmental factors, personal interest, and daily routine habits. This finding is consistent with Rizona et al. (2020), who highlighted that environmental support and activity opportunities significantly influence adolescent participation in physical activity. Therefore, targeted interventions are necessary to promote physical activity among this group to ensure more equitable engagement across the entire student population.

Based on the research findings, the majority of adolescents at SMP IT Ihsanul Amal were non-obese. Nevertheless, 28 subjects (19.7%) were categorized as obese. This indicates that adolescent obesity is driven not solely by physical activity, but also by other contributing factors, including dietary patterns, energy intake, and daily lifestyle habits. Adolescents with lower physical activity levels or unbalanced dietary intake are susceptible to energy imbalances that may ultimately lead to obesity. A supportive school environment plays a pivotal role in encouraging adolescents to remain physically active and maintain optimal nutritional status. This aligns with Agustina et al. (2023), who stated that a conducive environment fosters active behaviors in adolescents. However, family support is equally essential, particularly in managing dietary habits and establishing healthy lifestyle practices at home.

Association between energy intake and adolescent obesity

Table 3 shows that among adolescents at SMP IT Ihsanul Amal in 2025, the majority of subjects in the deficient energy intake group were non-obese, totaling 101 individuals (71.1%), with only 1 subject (0.7%) categorized as obese. In the adequate energy intake group, 13 adolescents (9.2%) were non-obese and 9 adolescents (6.3%) were obese. Meanwhile, in the excessive energy intake group, all 18 subjects (12.7%) were obese. The Gamma test yielded a coefficient of $\gamma = 0.991$ ($p < 0.001$ ($p < 0.05$), indicating a statistically significant, very strong positive association between energy intake and obesity. Consequently, higher dietary energy intake directly correlates with an increased risk of adolescent obesity.

Table 3. Association between energy intake and adolescent obesity

Energy Intake	Incidence of Obesity				Total		p-Gamma	Sig.
	Non-obese		Obese					
	n	%	n	%	N	%		
Excessive	0	0.0	18	12.7	18	12.7	0.991	<0.001*
Adequate	13	9.2	9	6.3	22	15.5		
Deficient	101	71.1	1	0.7	102	71.8		
Total	114	80.3	28	19.7	142	100		

Note: *Gamma test, significant if p-value < 0.05

Based on the research findings regarding the association between energy intake and obesity among adolescents at SMP IT Ihsanul Amal in 2025, the proportion of obesity varied significantly across energy intake categories. In the deficient energy intake group, almost all subjects were non-obese (99.02%), whereas only 0.98% were obese. This finding demonstrates that adolescents with deficient energy intake tend not to develop obesity.

In the adequate energy intake group, the majority of subjects were non-obese (59.1%), though 22% were found to be obese. This suggests that even within the adequate intake category, obesity risk remains present, indicating that factors beyond total energy intake may also influence adolescent nutritional status.

Conversely, in the excessive energy intake group, all subjects were obese (100%). This finding underscores that excessive energy intake is strongly linked to the onset of obesity, exhibiting a clear trend where obesity prevalence rises alongside increased energy intake levels.

Statistical analysis using the Gamma test revealed $\gamma = 0.991$ ($p < 0.001$ ($p < 0.05$), confirming a statistically significant, very strong positive association between energy intake and obesity among adolescents at SMP IT Ihsanul Amal in 2025. A coefficient approaching 1 signifies an extremely high correlation strength. This directional relationship demonstrates that lower energy intake corresponds to a lower incidence of obesity, whereas higher energy intake substantially elevates obesity risk.

The findings of this study support the energy balance concept, wherein obesity occurs when energy intake exceeds total energy expenditure over a sustained period. According to [World Health Organization](#) (2025), unutilized surplus energy is stored as adipose tissue, thereby elevating obesity risk. Conversely, energy intake that aligns with or remains below individual physiological requirements is associated with a lower incidence of obesity.

Although the majority of adolescents in this study were categorized under deficient energy intake and were non-obese, analytical results demonstrate that higher energy intake categories were consistently accompanied by a progressive increase in obesity proportions. This reinforces dietary energy intake as a critical determinant associated with adolescent nutritional status, specifically in the onset of obesity.

These results correspond with the findings of [Hutagalung et al. \(2025\)](#), who documented a significant relationship between high energy intake and adolescent obesity. Likewise, [Rahayu et al. \(2025\)](#) demonstrated that adolescents with excessive energy intake face an elevated risk of obesity relative to their peers with adequate or deficient intake levels. Collectively, these aligned outcomes underscore the critical role of energy intake regulation in mitigating adolescent obesity.

Ultimately, this study establishes a statistically significant, robust positive correlation between dietary energy intake and obesity incidence among adolescents at SMP IT Ihsanul Amal in 2025. Consequently, tailoring energy intake to individual physiological requirements must be prioritized within adolescent obesity prevention frameworks. Achieving this necessitates comprehensive nutrition education, structural promotion of balanced dietary habits, and rigorous dietary surveillance across both institutional (school) and domestic (home) settings.

Association between physical activity level and adolescent obesity

Table 4 illustrates the association between physical activity levels and the incidence of obesity among adolescents at SMP IT Ihsanul Amal in 2025. Among adolescents engaging in vigorous physical activity, the majority were classified as obese

(19 individuals, 13.4%), whereas only 1 subject (0.7%) was non-obese. The moderate physical activity group comprised 11 non-obese adolescents (7.7%) and 7 obese adolescents (4.9%). Conversely, within the light physical activity group, the vast majority were non-obese (102 individuals, 71.8%), with only 2 individuals (1.4%) categorized as obese. The Gamma test yielded a correlation coefficient of $\gamma = -0.979$ ($p < 0.001$ ($p < 0.05$), demonstrating a statistically significant and inverse association between physical activity level and adolescent obesity.

Table 4. Association between physical activity level and adolescent obesity

Physical Activity Level	Incidence of Obesity				Total		p-Gamma	Sig.
	Non-obese		Obese					
	n	%	n	%	N	%		
Berat	1	0.7	19	13.4	20	14.1	-0.979	<0,001*
Sedang	11	7.7	7	4.9	18	12.7		
Ringan	102	71.8	2	1.4	104	73.2		
Total	114	80.3	28	19.7	142	100		

Note: *Gamma test, significant if p-value <0.05

Based on empirical data collected at SMP IT Ihsanul Amal in 2025, obesity incidence among adolescents exhibited distinct patterns across physical activity levels. Notably, the group engaging in vigorous physical activity presented the highest proportion of obesity (19 subjects, 13.4%), while non-obese individuals accounted for only 0.7% (1 subject). This outcome underscores a substantially elevated proportion of obesity within the high-intensity activity cohort relative to other categories.

In the moderate physical activity group, 7 adolescents (4.9%) were classified as obese, whereas 11 adolescents (7.7%) were non-obese. This demonstrates that while the proportion of obesity in the moderate physical activity cohort was lower than that in the vigorous group, a notable obesity risk remains. Within the light physical activity group, the vast majority of subjects were non-obese (102 individuals, 71.8%), with only 2 individuals (1.4%) exhibiting obesity. These findings indicate that while light physical activity predominated among the majority of adolescents, their relative obesity risk remained lower compared to the vigorous activity cohort.

Statistical analysis using the Gamma test yielded a coefficient of $\gamma = -0.979$ ($p < 0.001$ ($p < 0.05$), confirming a statistically significant, robust negative correlation between physical activity level and the incidence of obesity. Paradoxically, this indicates that higher physical activity levels were accompanied by a higher proportion of obese subjects.

High levels of physical activity frequently stimulate appetite. In the absence of adequate nutritional education, adolescents may engage in excessive compensatory intake (overeating), such as consuming fast food, high-sugar snacks, or carbonated beverages post-exercise. Consequently, caloric intake may surpass total energy expenditure (Azzahra and Soeyono, 2025). Furthermore, an individual may participate in high-intensity physical activity—such as vigorous exercise for one hour daily—yet spend the remaining 10–12 hours engaging in sedentary behaviors, including prolonged sitting, gaming, or screen time. Thus, extended sedentary behavior can heighten obesity risk despite a regular exercise routine.

These findings align with Novelli et al. (2017), who reported that daily habits and

environmental factors substantially influence adolescent physical activity patterns. Unsupportive environments tend to foster sedentary behaviors, which ultimately elevate obesity risk.

Optimal physical activity must satisfy appropriate dimensions of intensity, duration, and frequency to exert maximum efficacy in weight management (Verde et al., 2023). These results are consistent with prior literature demonstrating a significant association between low physical activity levels and an increased incidence of adolescent obesity (Ningrum et al., 2023; Irawan et al., 2025; Sandalayuk et al., 2024).

The findings indicate that adolescents engaging in vigorous physical activity exhibited a higher frequency and duration of bodily movement, including participation in physical education classes, extracurricular activities, and active play within the school environment. These activities promote greater energy expenditure, thereby contributing to weight management. Conversely, adolescents with light physical activity levels demonstrated more restricted movement duration and intensity. Their daily routines were predominantly occupied by passive behaviors, such as sitting, studying, or screen viewing, leading to low daily energy expenditure and an increased risk of body fat accumulation.

Overall, the research highlights that physical activity level shares a statistically significant and robust relationship with obesity incidence among adolescents at SMP IT Ihsanul Amal in 2025. Consequently, promoting regular and sustained physical activity must be prioritized as a pivotal strategy in adolescent obesity prevention.

COCLUSIONS

The majority of adolescents at SMP IT Ihsanul Amal exhibited energy intake in the deficit category and physical activity levels classified as light. Additionally, most adolescents were categorized as non-obese. A statistically significant, very strong positive correlation was identified between energy intake and the incidence of obesity among adolescents at SMP IT Ihsanul Amal. All adolescents with excessive energy intake were classified as obese, whereas almost all adolescents with deficient energy intake were non-obese. Conversely, a statistically significant, very strong negative correlation was observed between physical activity level and the incidence of adolescent obesity.

SMP IT Ihsanul Amal school authorities are encouraged to strengthen programs supporting healthy lifestyles, such as establishing healthy canteens, organizing structured physical exercise schedules, and providing regular nutrition education to students. Furthermore, the school may collaborate with healthcare professionals for routine monitoring of students' nutritional status. Parents are expected to educate adolescents on the importance of age-appropriate meal portions. Given the very strong association between energy intake and obesity, parents are advised to be more selective in providing dietary choices at home.

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