Journal of Global Nutrition (JGN)
Volume 6 No 1 (2026) April: page 730-744
ISSN: 2776-7051
Published by *Ikatan Sarjana Gizi Indonesia (ISAGI)* – The Indonesian Nutrition Scholars Association

Original Research

Association of Food Consumption Patterns and Physical Activity and the Nutritional Status of Students at Nuraida Islamic Boarding School in Bogor

Hubungan Pola Konsumsi Pangan dan Aktivitas Fisik dengan Status Gizi Siswi Nuraida Islamic Boarding School Di Bogor

Rahma Varizka Ramadhani[1], Khoirul Anwar[1*], Dadi Hidayat Maskar[1]
[1]Nutrition Study Program, Faculty of Food Technology and Health, Sahid University, Jakarta, Indonesia

* Email corresponding author: khoirul_anwar@usahid.ac.id

Abstract: *Adolescence is a period of rapid growth and development that requires optimal nutritional needs and physical activity. Adolescent girls are more susceptible to nutritional problems due to increased nutrient needs and a tendency to restrict food consumption, especially in boarding school environments with structured living systems. This study aims to determine the relationship between food consumption patterns and physical activity with the nutritional status of female students at Nuraida Islamic Boarding School, Bogor City. This study used an observational analytical design with a cross-sectional approach. The study subjects were 73 high school female students selected using a purposive sampling technique. Data on food consumption patterns were collected through food weighing and food records for 2x24 hours, while physical activity was measured using the Physical Activity Questionnaire for Adolescents (PAQ-A). Data processing involved editing, coding, data entry, and data cleaning. Relationship analysis was performed using the Spearman Rank test. The results showed that the majority of female students had good nutritional status (67.1%). Food consumption patterns based on type and frequency were classified as adequate, as indicated by consumption of more than four food groups on the first day (65.8%) and the second day (79.5%), as well as sufficient meal frequency on the first day (28.4%) and the second day (73.0%). However, the adequacy of energy and macro and micronutrients was still largely below the required levels. Physical activity was mostly classified as light (86.3%). There was no significant relationship between meal type and frequency with nutritional status, while physical activity did not show a significant relationship with nutritional status.*

Key word: Physical activity, food consumption patterns, Islamic boarding schools, adolescent girls, nutritional status

1. INTRODUCTION

Adolescence is a developmental stage during which rapid physical, psychological, and cognitive changes occur (1). High nutritional needs and food choices significantly impact adolescent health, both now and in the future. Insufficient nutritious food intake is the main cause of nutritional problems in adolescents, namely malnutrition, micronutrient deficiencies, and overnutrition (2–4). Based on 2023 SKI data, adolescents in West Java province aged 13-15 years were undernourished, reaching 8.4%, while 17% were overnourished. For adolescents aged 16-18 years, undernourishment was 8.2% and overnourishment was 13.1% (5). These figures indicate that nutritional problems in adolescents, both undernourishment and overnourishment, remain a significant issue requiring attention. Adolescent girls are a more vulnerable group due to their increased nutritional needs and the tendency to limit food consumption due to appearance factors.

This situation also has the potential to occur in boarding school environments, where students' food consumption patterns and physical activity are heavily influenced by the structured dormitory system. Boarding school systems provide food intake regulated by the school. However, adolescents' nutritional needs are often not met properly due to a lack of variety and food choices (6). Research results (7) indicate that 52.9% of students fall into the category of eating patterns that are below their dietary requirements. This occurs because the lack of food variety and frequency of meals, resulting in the unmet caloric needs of students at the Roudatul Hidayah Islamic Boarding School in Pakis Village, Trowulan District, Mojokerto Regency. Meanwhile, research conducted by (8) found significant differences in nutrient intake between boarding and non-boarding students at SMAIT Al Uswah Surabaya. This difference occurs related to the lack of diversity in the daily menu, which results in students losing their appetite or getting bored, and students choosing to reduce their meal portions or even not eating at all.

Furthermore, physical activity is a factor that can influence nutritional status (9,10). Adolescents in boarding schools tend to have busy and scheduled activities, which can affect daily energy balance. Research conducted by (11) found a significant relationship (p-value <0.05) between physical activity and nutritional status in adolescents at the Muhammadiyah Boarding School Pleret in 2024. This also aligns with research conducted by (12) that found that 58.3% of adolescents who engaged in light physical activity tended to have overweight and 72.2% of adolescents who engaged in moderate physical activity tended to have normal nutritional status. Adolescents who engaged in light physical activity were more susceptible to overweight. Based on these limitations, this study aims to analyze the nutritional status of female students in a boarding school environment based on food consumption patterns and physical activity. This study has novelty value by using more accurate intake assessment methods, namely food weighing and food records, as well as physical activity assessment through standardized questionnaires, so it is hoped that it can provide a more comprehensive picture of the nutritional status of female adolescents in a structured boarding school system.

2. METHODS

This is an observational analytical study with a cross-sectional design conducted from May to December 2025 at Nuraida Islamic Boarding School, Bogor City, West Java. The study location was chosen because of its centralized food service system and the students' scheduled daily activities, allowing for observation of food consumption patterns and physical activity in a controlled environment. This study has obtained ethical approval from the Health Research Ethics Committee of Prima Indonesia University under number 182/KEPK/UNPRI/VI/2025. The study population was all 140 female students of SMA Nuraida Islamic Boarding School. Sampling was conducted using a purposive sampling technique with inclusion criteria being female students of SMA Nuraida Islamic Boarding School, aged 14-17 years, and willing to be respondents by agreeing to informed consent. Female students who were absent and in unhealthy conditions, as well as female students who were fasting or dieting were not included as respondents in this study. The sample size was determined using the Slovin formula, obtained a minimum of 64 people with an estimated dropout rate of 10%, and the final number of respondents who participated in this study was 73 female students.
The data collected included anthropometric data, food consumption patterns, and physical activity. Anthropometric measurements included weight, height, and mid-

upper arm circumference (MUAC) using standard measuring instruments. Body weight was measured using a GOTO Body Scale Character digital scale with a capacity of 180 kg and an accuracy level of 0.3 – 0.5 kg. Height was measured using a Onehealth HT721 Wireless digital microtoise with a measurement range of up to 200 cm and an accuracy of 0.1 cm. Upper Arm Circumference (MUAC) was measured using a standardized MUAC measuring tape. The nutritional status of female students was determined based on BMI/U, which includes five categories, namely, malnutrition (<-3SD), undernutrition (-3SD to <-2SD), good nutrition (-2SD to +1SD), overnutrition (+1SD to +2SD), obesity (>+2SD). Physical activity data was obtained by filling out the Physical Activity Questionnaire for Adolescents (PAQ-A) questionnaire via Google Form. This questionnaire consists of 9 questions that describe the level of physical activity over the past seven days.

Food consumption pattern data were collected using the food weighing and food record method for 2 x 24 hours, covering one school day (weekday) and one holiday (weekend). The food weighing method was used to assess main food intake by weighing food before and after consumption, while the food record method was used to record food and beverage consumption outside of main mealtimes. All consumption data was converted into grams and analyzed for nutrient content, then compared with the Recommended Dietary Allowance (RDA) for the respondents' age.Data processing included editing, coding, entry, and cleaning using Microsoft Excel 2019. Data analysis was performed using SPSS version 25.0. Univariate analysis was used to describe the characteristics of respondents, food consumption patterns, physical activity, and nutritional status. Bivariate analysis was performed using the Spearman test to determine the relationship between food consumption patterns and physical activity with the nutritional status of boarding school students.

3. RESULTS

Student Characteristics and Nutritional Status

The number of respondents who met the inclusion criteria for this study was 73 respondents, all of whom were female students. Based on Table 5, most respondents were in the 14-15 age group, namely 42 female students (57.5%), while 31 female students (42.5%) were aged 16-17 years. This indicates that most respondents were in the middle adolescence phase (Rahayu et al. 2023). From the grade level, the number of 10th grade female students was higher, namely 41 female students (56.2%), compared to 11th grade students, namely 32 female students (43.8%). Meanwhile, the characteristics of respondents based on monthly pocket money showed that most female students had pocket money in the range of IDR 250,000–IDR 500,000, namely 36 students (49.3%). There were 7 female students (9.6%) with pocket money <Rp250,000, 13 female students (17.8%) with pocket money between Rp500,000–Rp750,000, 12 female students (16.4%) with pocket money between Rp750,000–Rp1,000,000, and 5 female students (6.8%) with pocket money above Rp1,000,000

Table 1. Frequency distribution of student characteristics

Subject Characteristics	n	%
Age		
14-15 years	42	57,5
16-17 years	31	42,5
Total	**73**	**100,0**
Grade Level		
Grade 10	41	56,2
Grade 11	32	43,8
Total	**73**	**100,0**
Pocket Money (per month)		
< Rp 250.000	7	9,6
Rp 250.000 – Rp 500.000	36	49,3
Rp 500.000 – Rp 750.000	13	17,8
Rp 750.000 – Rp 1.000.000	12	16,4
> Rp 1.000.000	5	6,8
Total	**73**	**100,0**

Source: primary data 2025

Based on Table 2, most female students have a normal nutritional status based on the BMI for Age indicator, namely 49 female students (67.1%). In addition, there are 11 female students (15.1%) with an overweight status, and 8 female students (11.0%) are classified as obese. Meanwhile, 4 female students with underweight status (5.5%), and only 1 female student (1.4%) is included in the category of malnutrition.

Table 2. Distribution of Nutritional Status of Female Students

Nutritional Status	n	%
BMI for Age		
Malnutrition (<-3 SD)	1	1,4
Undernutrition (-3 SD to <-2 SD)	4	5,5
Normal (-2 SD to +1 SD)	49	67,1
Overnutrition (+1 SD to +2 SD)	11	15,1
Obesity (> +2 SD)	8	11,0
Total	**73**	**100,0**
Mid Upper Arm Circumference (MUAC)		
At Risk (< 23,5 cm)	18	24,7
Normal (> 23,5 cm)	55	75,3
Total	**73**	**100,0**

Source: primary data 2025

Based on the results of the Upper Arm Circumference (MUAC) measurements, it was found that 18 female students (24.7%) were at risk of experiencing chronic energy deficiency (CED). Meanwhile, 55 female students (75.3%) were included in the normal category.

Food Consumption Patterns

In this study, dietary patterns were assessed based on the variety of food types and meal frequency consumed over two days.

Table 3. Distribution of female students' food consumption patterns based on food type

Food Consumption Patterns	Day 1 *(Weekend)*		Day 2 *(Weekday)*	
	n	%	n	%
Types of Food Consumed				
Incomplete (<4 food groups)	25	34,2	15	20,5
Complete (>4 food groups)	48	65,8	58	79,5
Total	**73**	**100,0**	**73**	**100,0**

Source: primary data 2025

Based on Table 3, it is known that on the first day, most female students consumed a complete diet (>4 food groups), namely 48 students (65.8%), while 25 students (34.2%) still consumed less diverse foods. On the second day, the number of female students consuming a complete diet increased to 58 students (79.5%), while consumption of incomplete diets decreased to 15 students (20.5%). This indicates an increase in the variety of food types consumed by female students from the first to the second day. Food consumption patterns in this study were classified by food type, namely complete and incomplete foods, with the aim of providing a general overview of consumption variation. Based on the results of food weighing and food record recordings, the food groups that were relatively under consumed by female students were vegetables on the first day and fruit on the second day. Although the menu included vegetables such as capcay and vegetable soup, as well as melon and papaya, not all female students consumed and finished these food groups, so their contribution to dietary variety was less than optimal.

Table 4. Distribution of female students' food consumption patterns based on meal frequency.

Food Consumption Patterns	Day 1 *(Weekend)*		Day 2 *(Weekday)*	
	n	%	n	%
Meal Frequency				
Insufficient (<3 times/day)	52	70,3	19	25,7
Sufficient (≥3 times/day)	21	28,4	54	73,0
Total	**73**	**100,0**	**73**	**100,0**

Source: primary data 2025

Based on the results in Table 4, the distribution of female students' meal frequency shows a difference between holidays and school days. On the first day, most female students ate fewer than three meals a day (52 students (70.3%), while only 21 students (28.4%) ate more than three meals a day. Conversely, on the second day, most female students met the recommended meal frequency, with 54 students (73.0%) consuming more than three meals a day and 19 students (25.7%) still eating less. These results indicate that female students' meal frequency tends to be more regular on school days than on holidays. Based on observations, variations in meal frequency may be influenced by several conditions within the boarding school environment. Although the kitchen provides three meals per day through a buffet system, not all female students adhere to the established meal schedule. On the first day of observation, which coincided with a parent visit, some female students chose to eat food brought by their families rather than taking food from the dormitory kitchen. Irregular eating frequency is also influenced by several student habits, such as skipping breakfast due to waking up late, skipping dinner due to buying food from outside, or deliberately reducing portion sizes to maintain body shape. This situation creates differences in eating

frequency among students and leads to a mismatch between the food provided in the kitchen and the food consumed.

Physical Activities of Students

The assessment of physical activity levels in female students was conducted using the PAQ-A instrument as a measuring tool to determine variations in their levels of activity in daily activities. Based on the resulting scores, physical activity was classified into three categories: light, moderate, and heavy the results in Table 5 show that most female students, 63 (86.3%), had light levels of physical activity. Ten (13.7%) had moderate levels of physical activity, while none were classified as vigorous.

Table 5. Distribution of physical activity levels

Physical Activity Level	n	%
Mild (score 1-2.3)	63	86,3
Moderate (score 2.4-3.7)	10	13,7
Severe (score 3.8-5)	0	0
Total	**73**	**100**

Source: primary data 2025

The Relationship between Food Consumption Patterns and Nutritional Status

The following is an analysis of the relationship between food consumption patterns and nutritional status based on the results of research data processing.

Table 6. Test of the relationship between food consumption patterns based on food type and nutritional status of BMI for Age

Types of Food	Nutritional status												*p-value*	r
	malnutrition		Undernutrition		Normal		Overnutrition		Obesity		Total			
	n	%	n	%	n	%	n	%	n	%	n	%		
Incomplete (<4 food groups)	0	0,0	3	9,1	21	63,6	5	15,2	4	12,1	33	100	0,525	0,076
Complete (>4 food groups)	1	2,5	1	2,5	28	70,0	6	15,0	4	10,0	40	100		
Total	1	1,4	4	5,5	49	67,1	11	15,1	8	11,0	73	100		

Source: Spearman test

Based on the results of the study in Table 6, there were 33 female students who had a food consumption pattern with incomplete food types (<4 food groups). In this group, there were 3 female students (9.1%) with malnutrition status, while 21 female students (63.6%) were in the good nutritional status category. In addition, 5 female students (15.2%) were in the overnutrition category, and 4 female students (12.1%) were in the obesity category. Meanwhile, in the group of female students who consumed complete food types (≥4 food groups) there were 40 female students. Of these, there was 1 female student (2.5%) with malnutrition status and 1 female student (2.5%) with

undernutrition status. Most of the female students were in the good nutritional status category, namely 28 female students (70.0%). In addition, there were 6 female students (15.0%) with overnutrition status and 4 female students (10.0%) with obesity nutritional status. The Spearman Rank correlation test yielded a p-value of 0.525 and a correlation coefficient (r) of 0.076. A p-value >0.05 indicates no significant relationship between food types and nutritional status, while an r value approaching zero indicates a very weak direction and strength of the relationship between the variables.

Table 7. Test of the relationship between food consumption patterns based on food frequency and nutritional status BMI for Age

Food Frequency	Nutritional status												*p-value*	r
	Malnutrition		Undernutrition		Normal		Overnutrition		Obesity		Total			
	n	%	n	%	n	%	n	%	n	%	n	%		
Insufficient (<3 times/day)	1	1,8	4	7,3	33	60,0	11	20,0	6	10,9	55	100	0,668	-0,51
Sufficient (≥ 3 times/day)	0	0,0	0	0,0	16	88,9	0	0,0	2	11,1	18	100		
Total	1	1,4	4	5,5	49	67,1	11	15,1	8	11,0	73	100		

Source: Spearman test

Based on the research results in table 7, the distribution of female students' nutritional status according to meal frequency shows variations in each category. In the group of 55 female students with low meal frequency (<3 times/day), the majority were in the good nutritional status category, namely 33 female students (60.0%). In addition, there were 4 female students (7.3%) with undernutrition status, 11 female students (20.0%) with overnutrition status, and 6 female students (10.9%) with obesity nutritional status, and 1 female student (1.8%) with poor nutritional status. Meanwhile, in the group of 18 female students with sufficient meal frequency (≥3 times/day), the majority had good nutritional status, namely 16 female students (88.9%), and there were 2 female students (11.1%) who were classified as obese. The results of the Spearman Rank correlation test showed a p-value of 0.668 and a correlation coefficient (r) of -0.51. A p-value >0.05 indicates no significant relationship between meal frequency and BMI for Age nutritional status. Meanwhile, the correlation value indicates a tendency towards an inverse relationship between meal frequency and nutritional status.

In the context of this study, the insignificant relationship between meal frequency and BMI for Age nutritional status can be explained by the results of meal frequency recording, food weighing and food records, and field observations. The female students' meal frequency varied between days, with most eating less than three times a day on holidays, while the majority ate more than three main meals a day on school days. This indicates that meal frequency is inconsistent and does not reflect a stable eating pattern. Although the dormitory kitchen provides three main meals per day, not all female students adhere to the established meal schedule. Some female students skipped meals due to consuming food brought by family members during visits, disliked the menu, woke up late, or deliberately restricted their intake to maintain their body shape. Furthermore, observations indicated that female students relatively frequently consumed snacks outside of main mealtimes. This situation results in energy and nutrient intake not only coming from main meals but also from snacks, which are generally high in energy but low in nutrients. Therefore, the recorded frequency of main

meals does not necessarily reflect the adequacy of energy intake and overall consumption quality, resulting in a significant relationship between meal frequency and nutritional status.

The Association of Physical Activity and Nutritional Status (BMI for Age)

An analysis of the association between physical activity levels and nutritional status of female students was conducted to determine whether differences in physical activity were associated with differences in nutritional status. The results of the analysis are presented in Table 8.

Table 8. Test of the relationship between physical activity and nutritional status BMI for Age

physical activity	Nutritional Status												*p-value*	r
	Malnutrition		Undernutrition		Normal		Overnutrition		Obesity		Total			
	n	%	n	%	n	%	n	%	n	%	n	%		
Mild (score 1-2.3)	0	0,0	1	1,6	40	63,5	11	17,5	11	17,5	63	100		
Moderate (score 2.4-3.7)	0	0,0	0	0,0	9	90,0	0	0,0	1	10,0	10	100	0,050	-0,230
Severe (score 3.8-5)	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0		
Total	0	0,0	1	1,4	49	67,1	11	15,1	12	16,4	73	100		

Source: Spearman test

Based on the research results in Table 15, 63 female students (100%) were in light physical activity (score 1-2.3). Within this group, 1 student (1.7%) had undernutrition, 40 students (63.5%) had light physical activity with good nutritional status, and 11 students (17.5%) were in the overnutrition and obesity categories. In the moderate physical activity group (score 2.4-3.7), 10 students (100%) were in the moderate physical activity group, with 9 students (90.0%) having good nutritional status and 1 student (10.0%) being obese. The Spearman Rank correlation test showed a p-value of 0.050, indicating no statistically significant relationship between physical activity and nutritional status. The correlation coefficient (r) of –0.230 indicates a negative relationship with weak strength. The insignificant relationship between physical activity and nutritional status in this study can be explained by the relatively homogeneous characteristics of the students' physical activity. Almost all students engaged in light physical activity, and no vigorous physical activity was observed. Therefore, variation in physical activity intensity was very limited, and its contribution to differences in nutritional status was statistically insignificant. This condition is related to the busy academic routines in boarding schools, dominated by sedentary activities. Consequently, physical activity does not play an optimal role in increasing daily energy expenditure,

and students' energy balance is more influenced by other factors such as diet, snack consumption habits, and total energy intake.

4. DISCUSSION

The result showed that most female students have pocket money in the middle category, while the proportion of those with very low or very high pocket money is relatively small. The amount of pocket money for female students is influenced by the family's economic condition and this is one of the factors that influence food consumption patterns. The amount of pocket money owned determines the ability of female students to buy additional food outside the menu provided by the school kitchen. However, consumption levels are not only influenced by pocket money, but also by social environmental factors, such as peer influence and habits formed in daily life in the dormitory (13,14). These results indicate that most female students are in the normal nutritional status category. However, there are still several female students with malnutrition, underweight, overweight, and obesity, which require attention because it can cause health problems if not managed properly. These results are in line with research conducted by (15) which reported that more than 50% of female adolescents at the Firdaus Islamic Boarding School have good nutritional status, while the others are overweight (17.3%), obese (13.46%), and underweight (1.93%). An imbalance between dietary intake and physical activity is a major factor causing both undernutrition and overnutrition in adolescents (16). The impact can include an increased risk of degenerative diseases and cardiovascular disorders in over nourished adolescents, as well as susceptibility to infectious diseases and impaired nutrient absorption in undernourished adolescents (17). Optimal nutritional status is essential for supporting health, thinking skills, and learning performance (6).

These results indicate that most female students have sufficient body energy reserves. However, there are still some female students who are at risk of experiencing energy deficiency and require further attention. Adolescent girls who experience chronic energy deficiency (CED) and do not receive appropriate treatment are at risk of impaired organ development, impaired physical growth, long-term health impacts, and can increase the risk of complications during pregnancy and childbirth later in life (18). Dietary patterns significantly influence nutritional status because they reflect the frequency, portion size, and type of food consumed. In adolescents, a good diet requires special attention because it directly impacts their growth and development (19). Based on field observations, as well as food weighing and food record keeping, students' meal variations are significantly influenced by their meal choices. Not all students consume the complete menu according to the food composition specified in the menu cycle. Therefore, even though the kitchen provides menus with four or more food groups, individual consumption does not always reflect a complete dietary pattern. Furthermore, inconsistencies in the serving process contribute to differences in the types and quantities of food received by each student. A similar situation was also found among students at the Ki Hajar Dewantara Islamic Boarding School, where some students choose to purchase food from outside or skip the food provided by the boarding school due to the limited menu variety. The repetitive presentation of menus using the same ingredients can lead to boredom, thus affecting students' eating behavior and consumption choices (20). In addition to technical presentation factors, food variety is also closely related to adolescent food preferences. Preferences for certain types of food can shape consumption patterns and influence students' decisions regarding menu choices (21). Adolescents are naturally inclined to try new foods and are easily influenced by environmental changes, including food trends. This condition

encourages them to choose convenience or instant foods, which are often consumed without control (22). These preferences generally lead to foods high in sugar, fat, and energy but low in nutrients, especially industrial products with strong flavors. The more delicious a food is, the more likely adolescents are to consume it in excess (23). Therefore, the variety of food types recorded in food weighing and food records is influenced not only by the menu provided but also by adolescents' preferences and consumption behaviors.

These results align with previous research, which found that low eating frequency, such as only eating twice a day, is still categorized as an inadequate diet even if the type of food consumed is quite varied (24). More frequent eating increases the likelihood of meeting energy intake, while low energy intake is often associated with inadequate consumption patterns (25). The habit of skipping meals to maintain body shape and changes in appetite, which are common in adolescents, also contribute to irregular eating patterns (Amalia 2020). In this study, although breakfast was provided before class, some students still skipped it due to busy routines and the habit of waking up late. Thus, environmental factors, personal habits, and food preferences play a significant role in shaping students' eating frequency. These results indicate that students' daily physical activity in boarding schools tends to be low. This is influenced by their busy academic routines, where most of their time is spent studying in class, limiting opportunities for moderate to vigorous physical activity. These results align with (22) who found that students' physical activity in Islamic boarding schools tends to be light because they spend most of their time sitting, studying, and participating in other academic activities for 7-8 hours per day. Some students use their free time to rest or socialize, thus reducing opportunities for increased physical activity (26). Variations in physical activity levels can be influenced by students' interests, motivation, and involvement in non-academic activities and sports. Physical activity plays a crucial role in maintaining energy balance. The higher the level of physical activity, the greater the energy expenditure, thus minimizing the risk of energy accumulation and weight disorders (27). Conversely, low physical activity can increase the risk of overweight, obesity, or underweight if it is not balanced with energy intake (28,29). If persisted over the long term, low physical activity can decrease fitness, reduce the body's functional capacity, and increase the risk of non-communicable diseases in adulthood (16). An imbalance between physical activity and energy consumption can trigger nutritional problems. The lower a person's physical activity, the lower their energy expenditure (30). In Islamic boarding schools, the physical activity of students is generally homogeneous, showing no significant variation in either activity level or energy intake (22).

Food consumption patterns are a crucial factor that can influence a person's nutritional status. The variety of foods consumed, and their frequency play a role in meeting daily nutritional needs. These results can be explained by field observations and the results of food weighing and food record recordings. Although some female students were recorded as consuming a complete range of foods, actual consumption at the individual level indicated that certain food groups were relatively under consumed and not always finished. Furthermore, field observations revealed variation in food selection at mealtimes, with not all female students choosing menus according to the established food composition. This condition means that the completeness of food types by category does not necessarily reflect the adequacy of actual nutritional intake at the individual level. These results showed that nutritional status is not solely determined by food diversity but is also influenced by other factors such as the amount of food consumed, the frequency of eating, and the habit of restricting food intake practiced by

some female students (31). Differences in food preferences mean that not all female students consume the complete menu provided. Some students only choose foods they like, so the composition of the types of food consumed does not always match the prepared menu. Furthermore, low physical activity can contribute to the risk of overnutrition or obesity, even though the types of food consumed are considered complete (32). The results of this study are consistent with those of (33), which showed no relationship between food types and nutritional status (p-value 0.69). Similar results by (34), which showed no significant relationship between food types and nutritional status. The study categorized the results of food types into three variables: traditional diets, modern diets, and mixed diets. However, this study disagrees with (35), which stated a significant relationship between dietary patterns based on food types and the body mass index of students at the At-Taufuqurrahman Islamic Boarding School. In this study, food diversity plays an important role in determining the quality of daily intake and contributing to achieving optimal nutritional status. This principle aligns with general guidelines for balanced nutrition, which emphasize that the more diverse the food consumed, the greater the body's ability to meet its nutritional needs through a complete intake of carbohydrates, protein, fat, vitamins, and minerals (35).

Adolescents fundamentally require a diverse diet to meet daily nutritional needs and support growth. However, food preferences at school age often led them to choose foods high in sodium and fat but low in vitamins and minerals (7). Research (35) also shows that even when consuming a complete variety of foods, excess carbohydrate or fat intake can still lead to overnutrition. Conversely, some adolescents who only consume certain foods, such as instant noodles, bread, or fried foods, are at risk of malnutrition due to low dietary diversity. Therefore, although dietary diversity is an indicator of a healthy diet, the relationship between dietary diversity and nutritional status is not always direct and can be influenced by total energy, food quality, eating habits, and physical activity (33). The results of this study align with those of (33), which showed no significant relationship between meal frequency and nutritional status (p-value 0.38). However, these results are inconsistent with research conducted by (36), which showed that 41.5% of respondents had irregular eating patterns. Some respondents with irregular eating patterns were obese, and this finding supports the results of a research analysis that showed a significant relationship between eating patterns and obesity in adolescents at SMA Negeri 1 Abuki (p-value 0.000). This study illustrates that irregular eating patterns, such as skipping breakfast due to rushing to school and eating lunch instead, also affect nutritional status. Several studies have shown that Islamic boarding school students often have irregular eating patterns due to their busy schedules (24). Skipping meals due to a dislike of the menu provided by the dormitory also contributes (8). Infrequent mealtimes can lead to an imbalance in energy intake. Nutritional status is not only determined by meal frequency but is also influenced by various other factors, such as the number of calories consumed, the types of food chosen, physical activity levels, stress levels, and snacking habits (37). Long-term imbalanced nutritional intake can impact adolescents' nutritional status. Excessive energy intake can potentially lead to excess weight, while insufficient intake can lead to thinness and susceptibility to disease (37) . Prolonged low meal frequency can also hinder the fulfillment of daily nutrient needs, potentially impacting nutritional status (7). The contribution of physical activity to energy expenditure is influenced by variations in the type, duration, and intensity of activity. An imbalance between energy intake and energy expenditure can lead to nutritional disorders, both undernutrition and overnutrition (30). In adolescents and Islamic boarding school students (pesantren), physical activity tends to be limited due to the high study load. Therefore, if not balanced with an appropriate diet, energy balance can be disrupted. The

differences in results between these studies may be influenced by the relatively homogeneous physical activity levels of female students in the boarding school environment, as well as school or Islamic boarding school routines that are dominated by sedentary activities such as sitting and studying for 7–8 hours per day (22). Furthermore, variations in dietary patterns, snack consumption habits, and daily physical activity levels may also influence research results (26).

5. CONCLUSION

Based on the results, it shows that the boarding menu includes four or more food groups, not all female students consume complete meals, and the frequency of most eating is less than three times a day. Physical activity of female students is relatively low due to busy academic routines and sedentary habits. Nutritional status based on BMI for Age is mostly good, although some are overweight, obese, or at risk of energy deficiency. The analysis results show that there is no significant relationship between food consumption patterns, both in terms of type and frequency of meals, with nutritional status, and physical activity with nutritional status shows no significant relationship.

CONFLICT OF INTEREST

The authors declare that there were no conflicts of interest in this study.

ACKNOWLEDGEMENT

Thank you for LPPM Sahid University and all the research team.

REFERENCES

1. Purba NP, Kirani N, Sitepu ASB, Siregar IR, Priantono D, Partisya NM, Et Al. Faktor-Faktor Yang Mempengaruhi Status Gizi Remaja Mts Al-Washliyah Desa Celawan Kec. Pantai Cermin Kab. Serdang Bedagai. Cendekia Utama J Keperawatan Dan Kesehat Masy. 2024;13(1):72–81.

2. Irdiana W, Nindya TS. Hubungan Kebiasaan Sarapan Dan Asupan Zat Gizi Dengan Status Gizi Siswi SMAN 3 Surabaya Correlation Between The Habit Of Eating Breakfast , Nutrient Intake And Nutritional Status Of Female Students In SMAN 3 Surabaya. Amerta Nutr. 2017;2017:227–35.

3. Hafiza D, Utmi A, Niriyah S. Hubungan Kebiasaan Makan Dengan Status Gizi Pada Remaja Smp Ylpi Pekanbaru. Al-Asalmiya Nurs / Vol 9, No 2, Tahun 2020 [Internet]. 2020;9:86–96. Available From: Https://Jurnal.Stikes-Alinsyirah.Ac.Id/Index.Php/Keperawatan/

4. Hartanti A, Harwati R, Studi P, Kebidanan S, Studi P, Kebidanan S, Et Al. Hubungan Pengetahuan Tentang Nutrisi Dengan Status Gizi Pada Remaja Putri Kelas Vii Di SMP N 3. J Cakrawala Keperawatan. 2024;01(02):134–45.

5. Kemenkes RI. Survei Kesehatan Indonesia (SKI) Dalam Angka. Survei Kesehatan Indonesia Dalam Angka. Jakarta: Badan Kebijakan Pembangunan Kesehatan; 2023.

1–926 P.

6. Oktavia A, Sukamto E, Utami RP. Hubungan Tingkat Konsumsi Dengan Status Gizi Santri Di Pondok Pesantren Nabil Husein Samarinda. Indones Food Nutr Res J. 2025;1:9–17.

7. Khusniyati E, Sari AK, Ro I. Hubungan Pola Konsumsi Makanan Dengan Status Gizi Santri Pondok Pesantren Roudlatul Hidayah Desa Pakis Kecamatan Trowulan Kabupaten Mojokerto. Midwiferia J Kebidanan. 2016;2(2).

8. Neda ZA, Indrawati V, Ismawati R, Pratama SA. Perbedaan Pola Konsumsi Asupan Zat Gizi Dan Status Gizi Siswa SMAIT Al Uswah Surabaya Yang Tinggal Di Asrama Dan Non Asrama. 2023;2(3):369–79.

9. Salmi, Markuri TD. Faktor Sosioekonomi Dan Tingkat Aktivitas Fisik Remaja Pada Masa Pandemi COVID-19 : Studi Pada Siswa SMK. J Ilmu Keolahragaan Undiksha. 2022;10(2):194–200.

10. Murtadlo A, Hafid A. Aktivitas Olahraga Di Pondok Pesantren Waung Baron Nganjuk Saat Masa Pandemi Covid-19. J Prestasi Olahraga. 2021;4(10).

11. HASANAH ADN. Pengaruh Jenis Pekerjaan Dan Tingkat Pendidikan Orang Tua Terhadap Motivasi Belajar Siswa Pada Mata Pelajaran Akidah Akhlak Di Mts Muhammadiyah I Ponorogo Tahun Ajaran 2018/2019. Skripsi. 2019;Mei.

12. Sofiani EK, Vera M, Rahayu P, Senia E, Luakusa AR, Retno C. Hubungan Aktifitas Fisik Dengan Status Gizi Remaja Usia Sekolah Menengah Pertama. Indones J Nutr Sci Food. 2023;2(17):26–31.

13. Hidayah N, Bowo PA. Pengaruh Uang Saku, Locus Of Control, Dan Lingkungan Teman Sebaya Terhadap Perilaku Konsumtif. Econ Educ Anal J. 2018;7:1025–39.

14. Ibrahim AK, Naryoto P, Arief H. Analisis Perilaku Keuangan Santri Di Pondok Pesantren Darunnajah 9 : Fokus Pada Literasi Keuangan , Gaya Hidup Dan Pendapatan Orang Tua. J Account Financ Manag. 2025;6(1):361–72.

15. Setiyaningrum Z. Asupan Zat Gizi Dan Status Gizi Remaja Putri DI. J Ilm Gizi Dan Kesehat (JIGK. 2021;3(01):1–8.

16. Mutiaraningrum I, Herdiani N, Asih AYP, Fasya AHZ. Pengaruh Asupan Energi Dan Aktivitas Fisik Terhadap Status Gizi Santri Putri Di Pondok Pesantren Islam At-Tauhid Surabaya. J Promot Prev. 2023;6(6):821–8.

17. Siswanto Y, Lestari IP. Pro Health Jurnal Ilmiah Kesehatan Gambaran Status Gizi Remaja Siswa Di Kabupaten Semarang. Pro Heal J Ilm Kesehat. 2021;3(1):98–103.

18. Indallah NW, Nurhidayati S. Program Osgirl Tingkatkan Pemahaman Gizi Remaja Putri Dengan Skrining Imt Dan Lila SMP Sila Dharma. J Kreat Pengabdi Kpd Masy. 2025;8:3521–37.

19. Nurwulan E, Furqan M, Safitri DE. Pengetahuan Gizi Dengan Status Gizi Santri Di Pondok Pesantren Yatim At-Thayyibah Sukabumi. ARGIPA. 2017;2(2):65–74.

20. Trisna A, Hasanah LN. Hubungan Kepuasan Mutu Hidangan Terhadap Status. J Kesehat TAMBUSAI. 2025;6:881–6.

21. Kalangi BJ, Sanggelorang Y, Malonda NSH. Keberagaman Konsumsi Makanan Pada Remaja Di Daerah Pesisir Kota Bitung Diversity Of Food Consumption In Adolescents In The Coastal Area Of Bitung City Billy. J Dunia Kesmas. 2024;13(1):1–10.

22. Nabawiyah H, Khusniyati ZA, Damayanti AY, Naufalina MD. Hubungan Pola Makan, Aktivitas Fisik, Kualitas Tidur Dengan Status Gizi Santriwati Di Pondok Modern Darussalam Gontor Putri 1. Darussalam Nutr J. 2021;5(1):78–89.

23. Nurbaiti K, Marjan AQ, Maryusman T, Octaria YC. Hubungan Asupan Energi , Preferensi Makan , Pengaruh Teman Sebaya , Dan Pendidikan Orang Tua Dengan Kejadian Gizi Lebih Remaja Di Depok Relationship Between Energy Intake , Food Preferences , Peer Influence , And Parental Education With The Incidence Of O. Amerta Nutr. 2023;7(2):31–8.

24. Oktaviana R, Permadi MR. Hubungan Pola Makan Dan Status Gizi Dengan Kejadian Anemia Pada Santriwati Pondok Pesantren Annuriyyah Rambipuji. HARENA J Gizi. 2021;2(2):54–61.

25. Nurlabibah N, Hapsari AI, Rosmana D, Hastuti W, Gizi J, Bandung PK. The Relationship Of Energy And Macro Nutritional Intakes With. J GIZI DAN Diet. 2023;2(2):79–90.

26. Saputro H, Syagata AS, Dewi ADA. Aktivitas Fisik Berhubungan Dengan Status Gizi Lebih Pada Siswa Di Asrama Putri. PONTIANAK Nutr J. 2024;7(September):538–43.

27. Ritan AFG, Murdiono WR, Syafitri EN, Studi P, Keperawatan SI, Respati U. Hubungan Body Image Dengan Pola Makan Dan Aktivitas Fisik Pada Mahasiswa Obesitas Di Fakultas Ilmu Kesehatan Universitas Respati Yogyakarta Body Image , Food Consumption Patterns And Physical Activities Correlation In Obese. ILMU GIZI Indones. 2018;02(01):25–32.

28. Serly V, Sofian A, Ernalia Y. Hubungan Body Image , Asupan Energi Dan Aktivitas Fisik Dengan Status Gizi Pada Mahasiswa Fakultas Kedokteran Universitas Riau Angkatan 2014. Jom FK. 2015;2(2).

29. Pertiwi A, Nadhiroh SR. Hubungan Tingkat Adiksi Media Sosial Dan Aktivitas Fisik Dengan Status Gizi Pada Mahasiswa Universitas Airlangga. Heal Tadulako J (Jurnal Kesehat Tadulako). 2023;9(2):176–82.

30. Rochmah A, Nadhiroh SR. Aktivitas Fisik Dengan Status Gizi Remaja Di SMP Negeri 25 Surabaya Physical Activity With Adolescent Nutritional Status In State Junior High School 25 Surabaya. Media Gizi Kesmas. 2024;13(1):234–40.

31. Rokhmah F, Muniroh L, Nindya TS. Dengan Status Gizi Siswi Sma Di Pondok Pesantren Al-Izzah Kota Batu. Media Gizi Indones. 2016;11(1):94–100.

32. Tumangger DER, Siregar EIS, Romeli F, Angkat AH. Hubungan Preferensi Makanan Asrama Dan Asupan Energi Dengan Status Gizi Siswa Asrama. J Ilmu Kesehat Dan Gizi. 2024;2(2):39–52.

33. Sitompul SO, Samodra YL, Kuntjoro I, Kedokteran F, Kristen U, Wacana D. Hubungan Pola Makan Anak Dengan Status Gizi Siswa TK Pendahuluan. Indones J Nurs Heal Sci. 2020;5(2):126–33.

34. Sobhani SR, Keshtkar A, Dorosty AR, Farhadnejad H. The Association Between

Dietary Pattern And Weight Status In School-Aged Children : A Cross-Sectional Study. J Compr Ped. 2017;8(4).

35. Nasution LA, A DA. (The Indonesian Journal Of Public Health) Hubungan Pola Makan Dengan Indeks Massa Tubuh Pada Santri / Santriwati. J Kesehat Masy Indones. 2022;17:52–7.

36. Saputri ES, Samsudi. Hubungan Pola Makan Dan Aktivitas Fisik Dengan Kejadian Obesitas Pada Remaja Di SMA Negeri 1 Abuki. J Penelit Sains Dan Kesehat Avicenna. 2024;3(2):156–64.

37. Novarin EY, Jamila F, Rahagia R. Hubungan Pola Konsumsi Pangan Harian Dan Pengetahuan Gizi Seimbang Dengan Status Gizi Pada Remaja Di Smk 2 The Relationship Between Daily Food Consumption Patterns And Balanced Nutrition Knowledge With Nutritional Status In Adolescents At Smk 2 Antartika. J Info Kesehat. 2023;13(2):92–8.