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The Relationship between Dietary Patterns and Dietary Diversity with Nutritional Status among Early Childhood Children

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Abstract

Nutritional status is a crucial indicator of young children's growth, with dietary patterns and dietary diversity hypothesized to influence it significantly. This study aimed to analyze the relationship between dietary patterns and dietary diversity and nutritional status based on the Height-for-Age Z-score (HAZ) index among young children. Using an analytic observational cross-sectional design, 37 children aged 60–72 months were selected through total sampling. Dietary patterns, dietary diversity, and nutritional status were assessed using the FFQ, IDDS, and HAZ, respectively, and analyzed using the Spearman Rank test. Most children had good dietary patterns (75.7%), moderate or high dietary diversity (45.9% each), and normal HAZ status (75.7%). Dietary patterns showed a very strong positive relationship with HAZ ($r = 0.804$; $p = <0.001$), while dietary diversity showed a moderate positive relationship ($r = 0.516$; $p = <0.001$). Thus, better dietary patterns and greater dietary diversity were significantly associated with more favorable height-for-age nutritional status, highlighting the importance of balanced and varied diets in supporting optimal child growth and development.

Keywords

Dietary Diversity, Dietary Patterns, Height for Age Z-Score, Nutritional Status, Young Children.

1. Introduction

Nutrition is one of the major public health concerns worldwide, including in Indonesia, particularly because nutritional problems during early childhood can have long-term consequences for growth and development (Flores et al., 201). According to UNICEF, WHO, and the World Bank in 2024, approximately 22.3% of children under five years of age worldwide are still affected by stunting. In Indonesia, the results of the Indonesian Nutritional Status Survey (*Survei Status Gizi Indonesia/SSGI*) in 2024 reported a national stunting prevalence of 19.8% (Ministry of Health of the Republic of Indonesia, 2025). At the regional level, Indramayu Regency recorded a stunting prevalence of 9.8% based on SSGI 2024. However, the situation at the local level remains a concern, as the third-quarter report of UPTD Puskesmas Kerticala in 2025 indicated that stunting prevalence in Kerticala Village reached 13.24% (UPTD Puskesmas Kerticala, 2025). These figures indicate that although the prevalence at the regional level may be relatively lower than the national prevalence, nutritional problems among young children in Kerticala Village remain an important issue that requires attention through early identification of contributing factors.

Early childhood represents a critical period of physical and cognitive development, during which adequate nutrition is essential to support linear growth, brain development, physical activity, immunity, and the establishment of healthy eating behaviors (Hendrata & Muliarta, 2025). Nutritional status reflects the balance between nutrient requirements and nutrient intake, and an imbalance may interfere with optimal growth and development (Sambo et al., 2020; Kusriani et al., 2020; Moelyo et al., 2025). Among various indicators of nutritional status, Height-for-Age Z-Score (HAZ) is particularly important because it reflects linear growth and can identify growth faltering associated with chronic nutritional inadequacy.

Examining nutritional status based on HAZ indicates prolonged nutritional constraints during children's growth. Dietary patterns may influence nutritional status and describe habitual food consumption by type, timing, and frequency. Appropriate dietary patterns enable children to obtain nutrients according to physiological requirements, whereas inappropriate or repetitive eating habits may limit nutrient intake. Dietary diversity is also important because consuming various food groups increases adequate macro- and micronutrient intake. Almatsier et al. (2019) and Lestari et al. (2024) emphasize that balanced and varied food consumption is essential for meeting nutritional requirements. Thus, dietary patterns and diversity are theoretically related to nutritional status, particularly linear growth, as inadequate food quantity, frequency, quality, or variety may contribute to insufficient nutrient intake over time (Samosir et al., 2023).

Nevertheless, empirical evidence regarding these relationships remains inconsistent. Yuniar et al. (2021) found a relationship between dietary patterns and the nutritional status of preschool-aged children, whereas Saputri and Rusmariana (2023) reported no significant relationship in the population they studied. Similarly, research concerning dietary diversity has demonstrated that individual dietary diversity is associated with the nutritional status of children aged 2–5 years (Prasetyo et al., 2023). These differences suggest that the relationship between dietary practices and nutritional status may be influenced by contextual factors such as regional characteristics, socioeconomic conditions, parental feeding practices, and food availability. Thus, findings from one population cannot necessarily be generalized to other communities with different environmental and social characteristics.

The local situation at PAUD R.A. Kartini further highlights this research gap. A preliminary study conducted in September 2025 found that children tended to bring similar types of food, mainly rice, fried side dishes, and snacks, with vegetables and

fruits rarely included. Interviews with five parents also indicated that some parents had limited understanding of the importance of providing varied foods for children. This condition suggests a potential mismatch between children's nutritional needs and their habitual dietary practices. However, the extent to which dietary patterns and dietary diversity are related to children's nutritional status based on HAZ in this specific population remains unclear. Therefore, the novelty of this study lies in examining these two dietary dimensions simultaneously in young children at PAUD R.A. Kartini, Kerticala Village, while specifically assessing nutritional status using the HAZ index. This approach provides context-specific evidence that may complement previous studies with inconsistent findings and support more targeted nutrition interventions at the local level. Based on this background, this study aimed to analyze the relationship between dietary patterns and dietary diversity and nutritional status based on the HAZ index, among young children.

2. Literature Review and Hypothesis Development

2.1. Dietary Patterns and Nutritional Status

Dietary patterns refer to habitual food consumption practices encompassing food types, meal frequency, and eating schedules, which are foundational for meeting children's energy and nutrient requirements (Ministry of Health of the Republic of Indonesia, 2023; Ministry of Health of the Republic of Indonesia, 2024). In early childhood, appropriate dietary patterns ensure consistent nutrient delivery to support hormonal regulation, particularly Insulin-like Growth Factor-1 (IGF-1), which is essential for linear growth and bone mineralization. The Food Frequency Questionnaire (FFQ) is widely employed to assess long-term dietary patterns, capturing the frequency of consumption across various food groups over a defined period (Ayoubi et al., 2021; Zhu et al., 2022). Empirical evidence predominantly demonstrates significant positive associations between dietary patterns and nutritional status in preschool children.

Previous studies by Mamahit et al. (2019), Ciuntasari and Godelifa (2020), Yuniar et al. (2021), and Saputra (2025) consistently reported significant relationships between dietary patterns and children's nutritional status. These studies indicate that children with better dietary patterns tend to demonstrate more favorable nutritional and anthropometric outcomes. Adequate and balanced dietary intake provides essential nutrients required for growth and development, which may be reflected in height-for-age as an indicator of chronic nutritional status. Therefore, dietary patterns are theoretically and empirically expected to be associated with nutritional status based on the height-for-age index among children aged 60–72 months. Based on the theoretical framework and supporting empirical evidence, the following hypothesis is proposed:

H1: There is a significant relationship between dietary patterns and nutritional status among children aged 60–72 months.

2.2. Dietary Diversity and Nutritional Status

Dietary diversity is a key indicator of diet quality and micronutrient adequacy, reflecting the number and variety of food groups consumed over a specific period (FAO, 2010). While energy intake may be sufficient, monotonous diets lacking variety often result in micronutrient deficiencies, particularly iron, zinc, and vitamin A, which are critical for bone growth, immune function, and cognitive development. The Individual Dietary Diversity Score (IDDS), assessed through 24-hour dietary recall, measures the number of food groups consumed, with higher scores indicating more diverse and potentially more nutritious diets (FAO, 2023). Empirical studies consistently demonstrate positive associations between dietary diversity and

nutritional outcomes. Hu et al. (2022) reported that children consuming from a greater variety of food groups have better chances of achieving adequate micronutrient intakes and improved anthropometric indicators. Wahyuningrum and Utari (2024) found that children with high dietary diversity scores exhibited better nutritional status and fewer micronutrient deficiencies. UNICEF (2021) emphasized that limited dietary diversity is a primary driver of stunting, as the lack of variety fails to provide the complementary nutrients essential for linear growth. Conversely, diverse diets provide a broader range of essential nutrients that work synergistically to support physiological functions and growth. Based on the theoretical rationale and consistent empirical support, the following hypothesis is proposed:

H2: There is a significant relationship between dietary diversity and nutritional status among children aged 60–72 months.

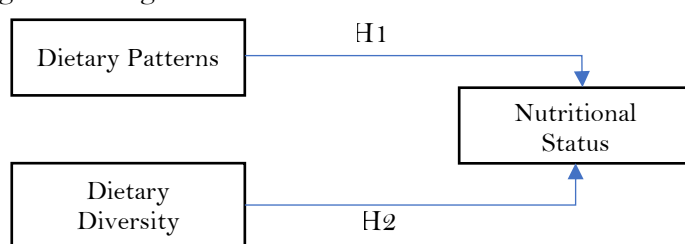


Figure 1. Research Framework

Figure 1 illustrates the conceptual framework linking dietary patterns and dietary diversity to nutritional status. Both dietary factors are positioned as important determinants that may influence children’s nutritional status. The framework suggests that the quality, frequency, and variety of food consumption can affect the adequacy of nutrient intake and, consequently, children’s nutritional outcomes.

3. Methods

This study employed an analytical observational design with a cross-sectional approach because the study aimed to examine the relationship between dietary patterns, dietary diversity, and nutritional status without manipulating or intervening in the participants’ dietary behaviors, with all variables assessed at a single point in time. The study was conducted in R.A. Kartini Kerticala Village, Indramayu Regency, in June 2026. The study population was children aged 60–72 months who were enrolled in R.A. Kartini. Of the population, 37 children met the inclusion and exclusion criteria and thus became the respondents of the study. The study used total sampling. Dietary Data were collected through interviews using the FFQ to determine the frequency of consumption of various types of food during the past month. In the recommended food groups, a frequency of consumption score is given based on the daily frequency of consumption, up to never. For foods that need to be restricted, reverse scoring is used. The total score is then categorized into less (<60%), sufficient (60–79%), and good (≥80%).

Food diversity was measured using the IDDS based on food consumption recall. The food groups consumed were given a score of 1, and those not consumed were given a score of 0. The IDDS scores were categorized as low (3 food groups), medium (4–5 food groups), and high (6 food groups) according to FAO (2010). Nutritional Status was determined using the height-for-age Z-score. Height was measured using a microtoise with an accuracy of 0.1 cm, while age was determined by date of birth. Z-score values are classified into very short (<-3 SD), short (≥-3 SD to <-2 SD), normal (≥-2 SD to ≤+3 SD), and high (>+3 SD) according to the standard child anthropometry (Ministry of Health of the Republic of Indonesia, 2020).

Data were processed through editing, coding, processing, and cleaning using Microsoft Excel and IBM SPSS Statistics version 26. Univariate analysis was used to describe the distribution of each variable. Bivariate analysis was conducted using the Spearman Rank correlation test because of ordinal-scale research variables, with a significance level of $\alpha = 0.05$. The research has obtained ethical approval from Mahardika Institute of Technology and Health with number 141/KEPK.ITEKESMA/VI/2026.

4. Results

The study results provide an overview of the dietary patterns, dietary diversity, and nutritional status of the respondents. The data were analyzed to describe the distribution of each variable and identify patterns observed among the participants. The findings are presented based on the data obtained during the study. The analysis also examines the relationships between the variables included in the study. The results provide an empirical basis for understanding the nutritional conditions of the children studied.

Table 1. Characteristics of Respondents (n = 37)

Category	Characteristics	Frequency	Percentage (%)
Gender	Male	14	37.8
	Female	23	62.2
Parental Education	High school	20	54.1
Income	Income $\geq$ IDR 2,910,254	33	89.2
	Income < IDR 2,910,254	4	10.8
Total		37	100

Based on Table 1, the study involved a total of 37 children aged 60–72 months, with a mean age of 66.14 ± 3.53 months. In terms of sex distribution, female respondents were more predominant, comprising 23 children (62.2%), while male respondents accounted for 14 children (37.8%). Regarding parental education, the majority of respondents had parents whose highest educational attainment was senior high school, representing 20 respondents (54.1%). In terms of socioeconomic characteristics, most families had a monthly income of $\geq$ IDR 2,910,254, accounting for 33 respondents (89.2%), while only four families (10.8%) had an income below IDR 2,910,254. The characteristics indicate that the respondents predominantly came from families with senior high school-educated parents and household incomes at or above the specified income threshold.

Table 2. Dietary Patterns, Dietary Diversity, and Nutritional Status

Variable	Category	Frequency	Percentage (%)
Dietary Pattern	Poor	2	5.4
	Fair	7	18.9
	Good	28	75.7
Dietary Diversity	Low (≤ 3)	3	8.1
	Medium (4–5)	17	45.9
	High (≥ 6)	17	45.9
Nutritional Status	Very short	2	5.4
	Short	5	13.5
	Normal	28	75.7
	High	2	5.4
Total		37	100

Based on Table 2, the majority of respondents (28 children, or 75.7%) fell into the “good” category for dietary patterns. Regarding dietary diversity, 17 children (45.9%) fell into the moderate and high categories, respectively, while 3 children

(8.1%) were in the low category. In terms of nutritional status based on height-for-age (TB/U), the majority of children (28 children, or 75.7%) were in the normal category, followed by 5 children (13.5%) classified as short. Meanwhile, 2 children (5.4%) were categorized as very short, and another 2 children (5.4%) were classified as high. Good dietary patterns in early childhood are crucial because, during this period, children require sufficient energy, protein, vitamins, and minerals to support growth and development (Almatsier et al., 2019).

The continued presence of children with “adequate” or “poor” dietary patterns indicates that the daily nutritional intake of some children still requires attention, particularly regarding the types and frequency of food consumed. Good dietary diversity can also help meet micronutrient needs such as iron and vitamin A, which are essential for a child’s growth and development. These results indicate that, overall, the dietary patterns and dietary diversity of the respondents were reasonably good, although some children still required attention regarding their daily food intake. While the majority of children had normal nutritional status based on height-for-age, there were still children classified as short or severely short. This suggests that growth-related issues persist among some respondents and warrant attention. A child’s nutritional status can be influenced by the adequacy of food intake, health conditions, parenting practices, environmental sanitation, and the family’s socioeconomic status (Indonesian Ministry of Health, 2023).

Table 3. Spearman Rank Correlation Test

Dietary Habit	Very Short	Short	Normal	High	Total	Correlation Coefficient	p-value
Poor	2	0	0	0	2		
Adequate	0	5	2	0	7		
Good	0	0	26	2	28		
Total	2	5	28	2	37	0.804	<0.001

According to Table 3, the distribution of nutritional status varied across the categories of dietary patterns. Among the two children with poor dietary patterns, all were classified as severely stunted based on height-for-age. Of the seven children with adequate dietary patterns, five (71.4%) were classified as stunted, while two (28.6%) had normal nutritional status. In contrast, among the 28 children with good dietary patterns, the majority, 26 (92.9%), had normal nutritional status, while only two (7.1%) were classified as high. This distribution suggests that children with better dietary patterns tended to have more favorable height-for-age nutritional status. In contrast, poorer dietary patterns were more frequently observed among children experiencing impaired linear growth. The observed pattern also indicates that the adequacy and quality of children’s dietary intake may be closely related to their ability to achieve optimal growth. The Spearman Rank test further showed a very strong and statistically significant positive correlation between dietary patterns and nutritional status based on height-for-age ($r = 0.804$; $p = 0.000$), indicating that improvements in dietary pattern were significantly associated with better nutritional status among the respondents.

Table 4. Spearman Rank Correlation Test

Food Diversity	Very Short	Short	Normal	High	Total	Correlation Coefficient	p-value
Poor	2	1	0	0	3		
Adequate	0	4	12	1	17		
Good	0	0	16	1	17		
Total	2	5	28	2	37	0.516	<0.001

According to Table 4, dietary diversity showed a noticeable pattern in relation to nutritional status based on height-for-age. Among the three children with low dietary diversity, two (66.7%) were classified as severely stunted, while one (33.3%) was classified as stunted. Of the 17 children with moderate dietary diversity, 12 (70.6%) had normal nutritional status, whereas the remaining children were classified into other nutritional status categories. Meanwhile, among the 17 children with high dietary diversity, the majority, 16 (94.1%), had normal nutritional status. This distribution indicates that children with higher dietary diversity tended to have more favorable nutritional status, while children with lower dietary diversity were more likely to experience impaired linear growth. The increasing proportion of children with normal height-for-age status across higher dietary diversity categories further suggests a consistent pattern between the variety of foods consumed and children's growth outcomes. A more diverse diet may provide access to a broader range of essential nutrients needed to support children's growth and development. The Spearman Rank test demonstrated a significant, moderate positive correlation between dietary diversity and nutritional status based on height-for-age ($r = 0.516$; $p = 0.001$), indicating that greater dietary diversity was significantly associated with better height-for-age nutritional status among the respondents.

5. Discussion

The findings of this study demonstrate that dietary patterns and dietary diversity were significantly associated with the nutritional status of preschool children based on height-for-age (Flores et al., 2021). Most children had good dietary patterns, while dietary diversity was generally classified as moderate to high, and the majority had normal height-for-age status. However, the presence of children with stunted and severely stunted status indicates that growth problems may still occur despite generally favorable dietary conditions. This finding highlights that children's nutritional status is influenced not only by the amount of food consumed but also by the quality, variety, and regularity of their daily food intake.

The significant relationship between dietary patterns and height-for-age indicates that children with better dietary patterns tended to have more favorable nutritional status. This finding is consistent with Yuniar et al. (2021), who reported a significant relationship between dietary patterns and nutritional status among preschool children. A good dietary pattern can help provide adequate energy and essential nutrients required to support children's physical growth and development. Almtsier et al. (2019) emphasize that children during periods of rapid growth require sufficient energy, protein, vitamins, and minerals. Similarly, the Ministry of Health of Indonesia (2024) emphasizes the importance of balanced food consumption through appropriate proportions and variety of food groups. These findings suggest that appropriate and consistent eating habits may contribute to maintaining optimal linear growth during the preschool period.

The present findings are also supported by Flores et al. (2021), who found that dietary patterns among preschool children were associated with both stunting and overweight. This suggests that dietary patterns may influence nutritional status through the overall composition and quality of children's diets rather than simply through the quantity of food consumed. Nevertheless, the association observed in this study should not be interpreted as evidence of a causal relationship because of the cross-sectional design. Nutritional status based on height-for-age reflects a cumulative process and may be influenced by nutritional conditions over a prolonged period. Previous or recurrent nutritional deficiencies may therefore continue to affect linear growth even when children's current dietary practices have improved.

In addition to dietary patterns, dietary diversity was significantly associated with nutritional status. Children with greater dietary diversity generally demonstrated more favorable height-for-age status. Dietary diversity reflects the variety of food

groups consumed and can serve as an indicator of dietary quality and the potential adequacy of nutrient intake (Kennedy et al., 2011). The finding is consistent with Prasetyo et al. (2023), who reported a significant relationship between individual dietary diversity and nutritional status among children aged 2–5 years. Similar findings were reported by Motadi et al. (2023) among preschool children in South Africa, while Khamis et al. (2019) found that inadequate dietary diversity was associated with a greater risk of stunting among young children. Rizky and Krianto (2025) also highlighted the importance of food variety in supporting children's nutritional status.

Despite these significant relationships, some children with moderate or high dietary diversity were still classified as stunted or severely stunted. This indicates that dietary diversity alone cannot fully explain differences in children's linear growth. Other determinants, including infectious diseases, parenting practices, sanitation, socioeconomic conditions, and previous nutritional history, may also contribute to height-for-age status. Ruel and Alderman (2013) emphasize that nutrition-sensitive interventions should address the broader determinants of maternal and child nutrition rather than focusing solely on food intake. Therefore, efforts to improve preschool children's nutritional status should combine balanced and diverse diets with disease prevention, appropriate caregiving practices, and improvements in environmental conditions. The findings reinforce the importance of maintaining good dietary patterns and adequate dietary diversity as part of a comprehensive strategy to support optimal growth among preschool children.

6. Conclusion

This study concludes that dietary patterns and dietary diversity were significantly associated with nutritional status based on height-for-age among early childhood children at R.A. Kartini, Kerticala Village, Indramayu Regency. Dietary patterns showed a very strong positive relationship with nutritional status, while dietary diversity demonstrated a moderate positive relationship. These findings indicate that children with better dietary patterns and greater dietary diversity tended to have more favorable height-for-age nutritional status. However, the findings should be interpreted as associations rather than causal relationships.

The findings have practical implications for parents, healthcare professionals, and educational institutions. Parents and caregivers should encourage children to consume balanced and varied diets with regular eating schedules, while healthcare professionals should strengthen nutrition education and routine growth monitoring. Educational institutions can support these efforts by collaborating with health workers to provide nutrition education for parents and promote healthy eating practices. This study has several limitations. The cross-sectional design does not allow temporal or causal relationships to be established. In addition, the relatively small sample of 37 children from a single educational institution may limit the generalizability of the findings. Dietary information collected through the FFQ may also be subject to recall and reporting bias.

Future research should involve larger and more diverse samples and consider longitudinal designs to examine changes in dietary patterns, dietary diversity, and linear growth over time. Further studies should also incorporate other factors, such as infectious diseases, parenting practices, sanitation, socioeconomic conditions, and previous nutritional history, to provide a more comprehensive understanding of factors influencing children's nutritional status.

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Ethical Approval and Originality Statement

Ethical approval was obtained for this study. The manuscript represents original work and has not been previously published, nor is it under consideration by another journal.

Data Disclosure Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.



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