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# Maternal Local Food Literacy and Food Regulation as Determinants of Nutritional Status in Children Under Five: A Study in North Aceh, Indonesia

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**ORIGINAL ARTICLES**

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**ABSTRACT**

The nutritional status of children aged 0 – 59 months remains a major public health concern in Indonesia, particularly in rural areas. Although local foods are often rich in essential nutrients, their utilization is frequently constrained by limited maternal food literacy. This study aimed to examine the association of maternal local food literacy and food regulation on the nutritional status of children under five in Keude Amplah, Nisam District. This study employed a quantitative analytical design with a cross-sectional approach. A total of 87 mothers with children aged 0–59 months were selected using proportional random sampling across 12 villages to ensure geographical representation. Data were collected using structured questionnaires assessing maternal local food literacy and food regulation, along with anthropometric measurements of children's nutritional status based on weight-for-age and height-for-age indicators. Data analysis was conducted using the Chi-square test and multiple linear regression. The Chi-square analysis revealed a significant association between maternal local food literacy and the nutritional status of children under five ($p < 0.001$), as well as between food regulation and nutritional status ($p < 0.001$). Descriptive results showed that 12.6% of the children were stunted and 17.2% were undernourished. Multiple linear regression analysis indicated that maternal local food literacy ($B = 0.482$; $p < 0.001$) and food regulation ($B = 0.635$; $p < 0.001$) were significant predictors of child nutritional status, explaining 72.2% of the variance ($R^2 = 0.722$). The study concludes that maternal food literacy and regulatory support are critical determinants of child health; therefore, local food literacy should be integrated into community health programs, such as posyandu (a community-based health posts) to optimize child nutritional outcomes.

**Key Messages:**

- When mothers understand and use local foods better, their children tend to have better nutritional status. This shows that everyday knowledge and food choices at home matter greatly for child growth.
- Supportive food rules and practices in the community help improve children's nutrition. When local food systems are well managed, families are better able to provide nutritious food for their children.

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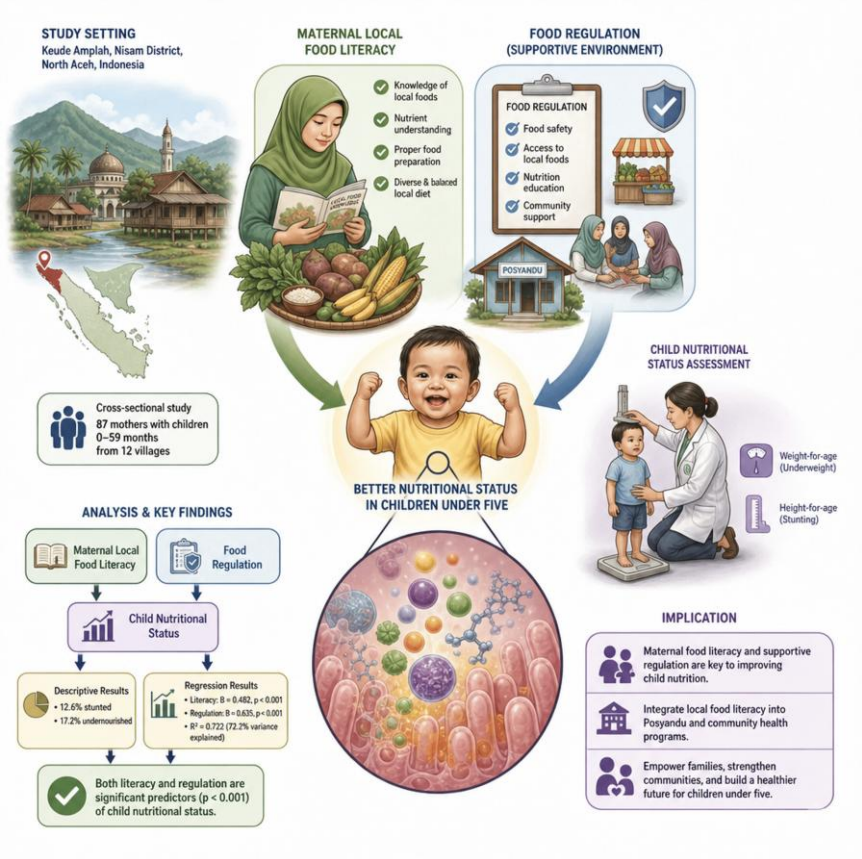
## GRAPHICAL ABSTRACT




## INTRODUCTION

The nutritional status of children aged 0 – 59 months in Indonesia remains a serious public health concern. From 2019 to 2024, the Indonesian government conducted the Indonesian Nutritional Status Survey (SSGI) to monitor and evaluate the nutritional conditions of young children nationwide. Children under five (0 – 59 months) represent a critical stage of development marked by rapid physical growth and the advancement of motor skills (1). Data from the 2023 Indonesia Health Survey (SKI) indicate that the prevalence of stunting among Indonesian children under five remains high at 21.5%, posing a major challenge to the future quality of human resources in the country (2,3). Crucially, child nutritional outcomes are not only determined by individual choices but are also shaped by food regulation and local governance. Community-managed food systems, such as the *posyandu* (integrated health post provides monthly growth monitoring, immunizations, and nutrition counseling for mothers and children), and regional food distribution policies provide the structural framework that facilitates or constrains a mother's ability to provide adequate nutrition.

Dietary practices are among the key determinants of nutritional status in young children. Parents, particularly mothers, play a central role in selecting, preparing, and serving food for their children (4). Nutritional status serves as an important indicator for assessing and monitoring the adequacy of nutrient intake among children under five (5). However, many mothers still have limited knowledge regarding appropriate food management, especially in relation to the utilization of local food resources as nutritionally rich alternatives (6). Indonesia has a wide diversity of local foods (7), many of which are valuable sources of essential nutrients that support child health and growth (8), including underutilized resources such as moringa, local tubers, and diverse freshwater protein sources that are valuable sources of essential nutrients. Despite this potential, maternal understanding of how to process and present local foods in a healthy and nutritionally appropriate manner remains inadequate (9).

Local food literacy is defined as the functional, interactive, and critical proficiency in identifying, procuring, and preparing culturally relevant, locally available foods to meet nutritional requirements (10).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In this context, literacy encompasses three primary pillars: knowledge of nutrient content, hygienic processing techniques, and the application of cultural food wisdom to improve dietary quality (11). Low levels of local food literacy may limit the optimal use of these resources. Consequently, it is important to examine the influence of maternal local food literacy on the nutritional status of children under five (4), in order to identify effective approaches to improving maternal knowledge and, ultimately, child nutritional outcomes in Indonesia (12).

Community awareness of nutritional adequacy, particularly among mothers, is fundamental to improving child health outcomes (13). Local food wisdom represents a viable alternative for meeting the nutritional needs of young children (14). When appropriately prepared, local foods can be transformed into meals with high nutritional value; however, improper processing techniques may interfere with nutrient absorption and compromise dietary quality. Balanced nutrition during early childhood is essential for preventing stunting (15). Nutrition support initiatives for children under five often involve mothers as key participants in identifying suitable food ingredients and meal options (16). The use of locally available foods as sources of child nutrition offers a practical and accessible solution, particularly in rural settings (11).

This study aims to analyze how maternal local food literacy influences the nutritional status of children aged 0–59 months in Keude Amplah, Nisam District. Specifically, this study is identifying the relationship between mothers' levels of local food literacy and the nutritional status of children under five in the study area. In addition, the study explores whether maternal local food literacy affects the selection and preparation of nutritious meals based on local food sources, as well as how village-level food governance and regional health programs support or hinder these practices.

The urgency of this study is underscored by the localized nutritional crisis in Nisam District; data from the North Aceh District Health Office indicate a prevalence of undernutrition and stunting of approximately 23% in 2024. Poor nutritional status, including stunting, is associated with long-term health consequences that may adversely affect cognitive development, productivity, and overall quality of life, thereby influencing the future quality of human resources. Although Indonesia possesses abundant local food resources with high nutritional value, their utilization remains limited, largely due to inadequate maternal food literacy and insufficient regulatory support at the village level.

Improving mothers' understanding of how to process and serve nutritious local foods is expected to contribute substantially to improvements in child nutritional status. Furthermore, it is important to evaluate local food policies and government-mandated nutrition programs to determine how these frameworks facilitate or constrain efforts to strengthen local food literacy at the community level. This study is expected to provide valuable insights into the role of maternal local food literacy and institutional food support in improving the nutritional status of children under five and to serve as an evidence base for policy recommendations aimed at enhancing child nutrition in Indonesia, particularly in Keude Amplah, Nisam District.

## METHODS

This study employed a quantitative analytical approach using a cross-sectional design. The research was conducted in Keude Amplah, Nisam District, North Aceh Regency, Aceh Province, Indonesia, from September 2025 to October 2025. The study aimed to evaluate the relationship between maternal local food literacy, food regulation, and the nutritional status of children aged 0–59 months across 12 villages in the Keude Amplah area.

The study population consisted of 667 mothers who had children aged 0–59 months and resided permanently in Keude Amplah. The sample size was determined using the Slovin formula with a margin of error of 10%. A 10% margin of error was deemed acceptable for this exploratory study due to the relatively high homogeneity of the rural population in Nisam District and logistical constraints in reaching remote village areas (17). This resulted in a minimum sample of 87 respondents. Participants were selected using proportional random sampling to ensure representation from each village.


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The sample size was calculated as follows:

$$n = N / [1 + N(\alpha^2)]$$
$$n = 667 / [1 + 667 (0.10^2)]$$
$$n \approx 87$$

The inclusion criteria were mothers who had healthy aged 0–59 months, had permanent residence in the study area, and were willing to participate. Maternal local food literacy and food regulation were assessed using structured questionnaires developed by the researchers. The structured questionnaire was developed based on established frameworks and its face validity was confirmed through an expert review process involving senior researchers in the field of nutrition. To ensure clarity and cultural appropriateness, the instrument was pre-tested on a small group of mothers (n=5) from a similar demographic area; based on their feedback, minor adjustments were made to the wording of the questions to prevent ambiguity. Food regulation was evaluated based on mothers' perceptions of local food-related policies and practices within the community. The scoring system for maternal literacy and food regulation was based on a cumulative score. Total scores were categorized into three levels using the Bloom's cut-off point or similar criteria: Low (<56%), Moderate (56%–75%), and High (76%–100%) of the total possible score.

The nutritional status of children under five was measured using anthropometric indicators, specifically weight-for-age (W/A) and height-for-age (H/A), in accordance with the Indonesian Ministry of Health Regulation No. 2 of 2020. Measurements were performed using a digital weighing scale with a precision of 0.1 kg and a microtoise or length board with a precision of 0.1 cm.

Baseline data on nutritional problems were obtained from the North Aceh District Health Office records for the year 2024, which reported a prevalence of undernutrition and stunting of approximately 23% in the Nisam area. The research procedures were conducted in several stages: preparation, data collection, data analysis, and report writing. The preparation phase lasted one month and included obtaining research permits from village authorities and relevant institutions, developing and reviewing questionnaires to assess maternal local food literacy, food regulation, and child nutritional status, and training data collectors on standardized measurement and interview techniques.

The data collection phase was conducted over two months. Data were gathered through face-to-face interviews using structured questionnaires administered to mothers in the 12 villages of Keude Amplah. Anthropometric measurements of children, including body weight and height, were taken directly. Additional information related to maternal local food literacy and perceptions of food regulation was collected through interviews and questionnaire responses.

Data analysis was performed using statistical software. Bivariate relationships between variables were examined using the Chi-square test. Multiple linear regression analysis was applied to assess the influence of maternal local food literacy and food regulation on the nutritional status of children under five. Statistical significance was determined at a p-value of less than 0.05.

This study was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from the Ethics Committee of the Health Polytechnic of the Ministry of Health, Jambi, Indonesia (approval number LB.02.06/2/1865/2025). Informed consent was obtained from all participants prior to data collection. Respondents were informed about the study's purpose, their right to withdraw at any time, and the guaranteed confidentiality of their personal data.

## RESULTS

### *Characteristics of Respondents and Children*

As shown in Table 1, most mothers were aged 25–35 years (44 respondents; 50.6%), followed by those aged over 35 years (28 respondents; 32.2%). Regarding educational attainment, nearly half of the mothers had completed senior high school (42 respondents; 48.3%). Regarding the children's nutritional status, the data reveals that the majority (65.5%) had a normal status. However, 12.6% of the children were identified as stunted and 17.2% were categorized as undernourished. For the purposes of this analysis, child nutritional status was categorized based on the most severe indicator; a child was classified as "Normal" only if they met the criteria for both normal height-for-age (H/A) and weight-for-age (W/A).


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Children who met the criteria for stunting (H/A) were classified as such regardless of their weight status to prioritize long-term growth outcomes.

**Table 1. Characteristics of Respondents and Children (n = 87)**

| Variable | Category | Frequency (Percentage) |
|---|---|---|
| Mother's age (years) | < 25 | 15 (17.2) |
| | 25–35 | 44 (50.6) |
| | > 35 | 28 (32.2) |
| Education | Primary school | 8 (9.2) |
| | Junior high school | 10 (11.5) |
| | Senior high school | 42 (48.3) |
| | Bachelor's degree | 27 (31.0) |
| Child's nutritional status | Normal | 57 (65.5) |
| | Undernutrition | 15 (17.2) |
| | Stunting | 11 (12.6) |
| | Overnutrition | 4 (4.6) |

***Association of Maternal Local Food Literacy and Food Regulation with Child Nutritional Status***

Table 2 presents the distribution of child nutritional status according to maternal local food literacy and food regulation. The data reveals a stark disparity based on literacy levels: 50.0% of children in the "Low Literacy" group (10 out of 20) were identified as stunted, whereas 0.0% of children in the "High Literacy" group suffered from stunting. In contrast, among mothers with high local food literacy, most children were classified as having normal nutritional status (n = 21). The Chi-square test indicated a statistically significant association between maternal local food literacy and the nutritional status of children aged 0–59 months ($p < 0.001$).

A similar pattern was observed for food regulation. In areas with low food regulation, 50.0% of children (9 out of 18) were affected by undernutrition, compared to 0.0% in the "High Regulation" group, where 100% of children (n=20) exhibited normal nutritional status. Statistical analysis confirmed a significant association between food regulation and child nutritional status ($p < 0.001$). These findings suggest that both maternal knowledge related to local food utilization and the regulatory environment surrounding food availability and practices play important roles in determining nutritional outcomes among children under five.

**Table 2. Association of Maternal Local Food Literacy and Food Regulation with Nutritional Status of Children Aged 0–59 Months (n = 87)**

| Variable | Category | Overnutrition | Stunting | Undernutrition | Normal | Total | p-value* |
|---|---|---|---|---|---|---|---|
| Local food literacy | Low | 1 | 10 | 7 | 2 | 20 | |
| | Moderate | 2 | 1 | 7 | 34 | 44 | |
| | High | 1 | 0 | 1 | 21 | 23 | |
| | **Total** | 4 | 11 | 15 | 57 | 87 | **0.000** |
| Food regulation | Low | 2 | 6 | 9 | 1 | 18 | |
| | Moderate | 2 | 5 | 6 | 36 | 49 | |
| | High | 0 | 0 | 0 | 20 | 20 | |
| | **Total** | 4 | 11 | 15 | 57 | 87 | **0.000** |

*p-value (Chi-square) < 0.05.

***Multivariate analysis***

Before conducting the regression analysis, the data were tested for the required statistical assumptions. The residuals were found to be normally distributed, and there was no evidence of multicollinearity between "Local Food Literacy" and "Food Regulation" (VIF < 2.0).

Multiple linear regression analysis was conducted to assess the combined association of maternal local food literacy and food regulation on the nutritional status of children aged 0–59 months (Table 3). The model demonstrated a strong association ($R = 0.850$, $R^2$ value of 0.722). Both variables showed statistically significant independent effects. Specifically, the model suggests that for every one-unit



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improvement in maternal local food literacy, child nutritional status scores improved by 0.482 units, while a one-unit improvement in food regulation was associated with a 0.635-unit improvement in nutritional outcomes, holding other factors constant.

**Table 3. Multiple Linear Regression Analysis of Factors Associated with Child Nutritional Status (n = 87)**

| Variable | B | Std. Error | 95% Cl | Beta | t | P-value |
|---|---|---|---|---|---|---|
| Constant | 1.210 | 0.185 | [0.84 – 1.58] | – | 6.540 | <0.001 |
| Local food literacy | 0.482 | 0.097 | [0.29 – 0.67] | 0.402 | 4.969 | <0.001 |
| Food regulation | 0.635 | 0.088 | [0.46 – 0.81] | 0.523 | 7.216 | <0.001 |
| **Model statistics:** | | | | | | |
| R = 0.850 | $R^2$ = 0.722 | Adjusted $R^2$ = 0.715 | Standard error = 0.412 | | | |

## DISCUSSION

The findings of this study indicate that most participating mothers were aged 25–35 years and had completed senior high school education. Maternal age and educational attainment are widely recognized as important determinants of child nutritional care. Higher levels of maternal education are associated with better nutritional knowledge, improved food-related decision-making, and healthier child-feeding practices. Previous studies have demonstrated that parental nutrition education is directly linked to children's food literacy through the quality of parent–child interactions and learning motivation (17). Similarly, evidence from Indonesia suggests that mothers with higher secondary education consume healthier diets compared with those with lower educational levels, thereby reducing the risk of malnutrition among children (18).

Bivariate analysis in this study revealed that low levels of maternal local food literacy were associated with higher rates of stunting and undernutrition. This trend in Keude Amplah reflects national patterns observed in the 2023 Indonesia Health Survey (SKI), where regions with limited access to nutritional information consistently report higher stunting prevalences (2). These findings are consistent with those reported by (19), who identified a significant relationship between parental nutrition literacy and child-feeding practices. In addition, (19) reported, in a national-scale study conducted in Lebanon, that low parental food literacy was associated with increased rates of malnutrition, anemia, and household food insecurity. In Nisam District, the "literacy gap" appears to stem less from a lack of general awareness and more from specific deficiencies in hygienic processing and the optimal utilization of locally available nutrient-dense resources, such as moringa or local legumes, which are often underutilized in complementary feeding.

The present study also highlights the important role of food regulation in shaping the nutritional status of children aged 0–59 months. Interestingly, multivariate analysis demonstrated that food regulation (B = 0.635) exerted a stronger association with nutritional status than maternal literacy (B = 0.482). This suggest that in rural settings like Keude Amplah, the structural environment may be more influential than individual knowledge. Even highly literate mothers may struggle to maintain child nutritional status if the local food system lacks oversight, or if the distribution of safe, affordable local produce is poorly managed. This finding supports global evidence from Chile, where strong food policies have been shown to reduce the purchase of unhealthy foods (20). However, in the context of rural Aceh, "regulation" likely manifests through the effectiveness of village-level governance and the consistency of *posyandu* programs in monitoring food safety and availability.

The combined influence of these factors explained 72.2% of the variance ($R^2$ = 0.722), indicating that maternal health literacy is a significant predictor of linear growth. Higher food literacy enables mothers to optimize local resources, which is a critical factor in preventing growth faltering in resource-limited settings (21). Similar conclusions were reported by (17), who emphasized that strengthening global food regulation is a key strategy for protecting children from the harmful effects of unhealthy food and beverage marketing. Similarly (22), emphasized that women's empowerment—including food literacy and household decision-making capacity—serves as an important predictor of dietary diversity and child growth.



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Beyond individual-level factors, the relationship between parental food literacy and child nutritional status also involves family interaction processes. Previous studies have highlighted that parental engagement in food and nutrition education enhances children's motivation to learn about nutrition, which subsequently shapes healthier eating behaviors (17). Maternal nutrition literacy has also been shown to support physical and motor development in early childhood (23). Taken together, these findings suggest that improvements in local food literacy extend beyond increased maternal knowledge and may generate long-term benefits for child health and development.

These findings have several practical implications. While generic "nutrition labeling" is effective for processed goods, local authorities in Nisam District should focus on community-led initiatives. This could include posyandu-based "nutrition scorecards" for traditional recipes or local produce markets to guide mothers in choosing nutrient-dense ingredients. Strengthening local food literacy should be integrated into community-based health programs, such as *posyandu* and primary healthcare centers, using approaches that emphasize locally available foods to ensure contextual relevance. The dominance of the regulation variable suggests that policy interventions should prioritize stabilizing local food systems and ensuring that village-level health programs provide a reliable framework for nutritional support.

Despite these contributions, this study has certain limitations. The analysis was restricted to local food literacy and food regulation, while other relevant factors—such as household income, food access, and maternal empowerment—were not included in the model. Future research is recommended to employ longitudinal study designs and incorporate additional variables in order to provide a more comprehensive understanding of the determinants of nutritional status among children under five.

## CONCLUSION

This study demonstrates a significant association between maternal local food literacy, food regulation, and the nutritional status of children aged 0–59 months in Keude Amplah, Nisam District. The findings reveal that while both factors are critical, community-level food regulation serves as the primary driver of child nutritional status in this area ($B = 0.635$), outweighing the individual influence of maternal literacy. Together, these two factors account for 72.2% of the variation in child nutritional status, indicating their substantial contribution to child nutrition outcomes. In rural settings like Nisam District, where external resources may be limited, the strategic utilization of locally available food resources represents the most practical and accessible solution for improving child health. Efforts should be directed toward improving maternal local food literacy by integrating hands-on local food processing workshops into posyandu activities, specifically focusing on nutrient-retention techniques for traditional recipes. Simultaneously, local authorities are encouraged to strengthen village-level governance through the implementation of simplified nutrition labeling for local products and stricter monitoring of food distribution to ensure safety and accessibility for households with young children. Further studies employing longitudinal designs are recommended to further investigate the causal pathways of these determinants, while incorporating additional variables such as parenting practices, infectious diseases, and household economic access to provide a more comprehensive understanding of the nutritional status among children under five.

## DECLARATION OF THE USE OF AI

The authors declare that no artificial intelligence (AI), AI-assisted technologies, or large language models (LLMs) were used in the conception of the study, data analysis, or the drafting, writing, and editing of this manuscript. The only exception is the graphical abstract, which was created using the design platform Illustrae (https://illustrae.co/). The authors take full responsibility for the content and accuracy of the graphical abstract and the entire manuscript.

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## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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