



Parental Health Literacy and Nutritional Practices as Predictors of Stunting Prevention in Rural Indonesia: A Rasch Analysis

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Abstract

Purpose – Stunting remains a critical threat to early childhood development, with impacts on both physical growth and long-term cognitive outcomes, yet prevention efforts remain uneven. This study examines the role of parental health literacy in translating nutritional awareness into consistent daily feeding practices to support stunting prevention.

Design/methods/approach – This study used a descriptive survey design with Rasch analysis to examine parental health literacy and parental attention to children’s nutritional needs in the context of stunting prevention. The study involved 176 parents of young children in Sukabumi Regency, Indonesia, selected through random sampling. Questionnaire data were used as the main source of analysis, while observations and brief conversations with parents were used only as contextual support in interpreting the setting. Rasch modeling was employed to assess item functioning, reliability, separation, and the distribution of respondents and items on the same logit scale.

Findings – The findings indicate that parents more readily endorsed general forms of nutritional concern than structured feeding practices requiring consistent regulation of meal portions and meal times. This suggests that parental health literacy functions as an enabling condition, but does not automatically translate into stable household practice. The Rasch results showed strong measurement performance, with person reliability of 0.93, item reliability of 0.99, Cronbach’s alpha of 0.94, person separation of 3.63, and item separation of 13.67. Taken together, the results point to a meaningful gap between nutritional awareness and the practical organization of everyday feeding routines, which is where prevention appears most vulnerable.

Research implications/limitations – The findings indicate that the main challenge in stunting prevention lies not in parental knowledge alone but in the consistent enactment of household feeding routines, positioning health literacy within everyday caregiving practices and constraints. The study is limited by self-reported data and a cross-sectional design, which preclude causal inference and longitudinal verification of child growth outcomes.

Practical implications – The results suggest that interventions should move beyond general nutrition awareness toward strengthening routine-based practices such as portion control, meal timing, and balanced diet planning. These insights inform policymakers, health educators, early childhood practitioners, and families in designing more actionable, context-sensitive prevention strategies at the household level.

Originality/value – This study advances stunting research by analytically distinguishing parental health literacy from the practical regulation of children’s feeding routines. By applying Rasch analysis to map differential item difficulty, it reveals a critical gap between nutritional awareness and structured practice, offering a grounded perspective for family-based prevention in rural and Global South contexts.

Keywords: Stunting prevention, Health literacy, Household feeding practices, Early childhood development, Rasch measurement model

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1. Introduction

Stunting remains one of the most persistent threats to early childhood development because it combines biological vulnerability with long-term cognitive and social consequences. Children who experience stunting are not only shorter than expected for their age, but may also face constraints in physical growth, learning, and later-life functioning (Pitoyo et al., 2022). This concern is especially important in low- and middle-income settings, where early nutrition shapes children's ability to think, learn, interact, and adapt across the life course. Global estimates indicate that stunting has declined over time, yet the burden remains high, with around 149 million children affected in 2018, down from approximately 198.2 million in 2000 (Aguayo et al., 2023). The concentration of this burden in Asia and Africa, including Southeast Asia, shows that stunting is not a marginal problem but a durable developmental challenge with uneven regional impacts (UNICEF, 2017).

Indonesia continues to face this challenge despite substantial policy attention and repeated efforts to reduce child malnutrition. National data have shown a decline in stunting prevalence, yet the problem remains firmly within the category of serious public health concern, especially when it is read alongside malnutrition, undernutrition, and emerging obesity burdens among young children (Pusat Data dan Informasi Kementerian Kesehatan RI, 2018; Sadiq et al., 2024; Abad-Jorge, 2013). Other estimates likewise indicate that stunting remains widespread and difficult to reduce evenly across regions, even when national targets are set aggressively and cross-sectoral interventions are introduced (World Health Organization, 2015; Jeti & Manan, 2022). This broader pattern suggests that the challenge is not merely a lack of policy intention, but a recurring difficulty in converting nutrition agendas into effective household-level practice. The analytical question, therefore, is not only whether stunting is recognized as a problem, but why preventive efforts remain inconsistent despite policy visibility and repeated intervention campaigns.

That question becomes particularly pressing in rural settings such as Sukabumi Regency, where stunting prevalence remains high and where prevention is shaped by local inequalities in knowledge, access, and caregiving conditions. Sukabumi has been identified as an area where stunting reduction remains difficult, even though the district government has aligned itself with the national target and intensified cross-sector collaboration at sub-district and village levels (Oktaviani et al., 2024; Kemenkes RI, 2018). The area is analytically important not only because of its prevalence, but because it includes districts with different stunting trajectories and persistent rural constraints that complicate prevention efforts. Such variation matters because regional differences, remoteness, and uneven service reach may shape whether families can turn nutritional awareness into sustainable feeding practices (Nemerimana et al., 2023). For that reason, Sukabumi is not treated here as a mere backdrop, but as a context that reveals how household prevention can falter even when stunting is already a recognized public issue.

Existing literature has made it clear that stunting is associated with multiple and overlapping determinants, including maternal nutrition, feeding practices, infectious disease, socioeconomic conditions, and household care environments. Studies on child malnutrition have also shown that stunting coexists with wasting, undernutrition, and obesity, confirming that nutritional risk cannot be understood through a single deficiency model alone (Hidayati et al., 2021; Clark et al., 2020; Beckett et al., 2003; UNICEF, 2020). At the same time, the consequences of stunting extend beyond childhood height deficits and involve later burdens for family welfare, human capital formation, and national development (Zhang et al., 2021). Yet this body of work often emphasizes prevalence, risk factors, or programmatic response more than the question of how parents translate nutritional knowledge into organized daily care. That gap is important because preventive success ultimately depends not only on knowing that nutrition matters, but on whether caregivers can enact that knowledge through regular feeding, hygiene, and household management.

This study approaches that problem by focusing on two closely related but analytically distinct dimensions: parental health literacy and parental nutritional practice. Health literacy refers to parents' ability to obtain, understand, evaluate, and use health-related information in

ways that support appropriate decisions for children's well-being (Naveed, 2022). This dimension is especially significant during early childhood, when rapid development places heavy demands on caregiving quality, nutritional adequacy, and sustained parental attention (da Cruz et al., 2021). In practical terms, parents are expected not only to understand the general value of nutrition, but also to recognize the need for balanced food provision, meal regulation, and preventive attention to hygiene and growth monitoring. Prior interventions in Indonesia have therefore stressed outreach, maternal classes, supplementation, breastfeeding support, and broader awareness-building efforts, even though these initiatives do not always resolve the gap between knowledge and consistent practice (Zukhairina et al., 2020; Saputri & Risnawati, 2024).

A second issue concerns the substantive content of nutritional care itself. Stunting prevention depends on more than caloric sufficiency, because children require balanced intake, appropriate feeding schedules, and sustained access to diverse food sources that support growth and development. Prior studies have emphasized maternal nutrition, breastfeeding, complementary feeding, and balanced dietary composition, while also showing that parental understanding of protein, vitamins, minerals, fruits, and vegetables remains uneven across settings (Manas, 2020; Agnihotri et al., 2021; Hasbi, 2020). In many Indonesian contexts, nutrition knowledge is fragmented by educational inequality, limited access to services, and uneven circulation of practical information, which can produce unbalanced diets even when families recognize the general need to feed children well (Manas, 2020; Pala et al., 2010). This is precisely why parental practice deserves closer measurement: the challenge is not only whether parents endorse healthy eating, but whether they can organize it repeatedly under ordinary household constraints.

To address this gap, the present study draws selectively on four complementary theoretical perspectives rather than treating stunting as a purely biomedical problem. The Social Ecological Model helps situate child nutrition within nested layers of influence, ranging from household behavior to community resources and environmental barriers. Health Literacy frames parents' cognitive capacity to interpret and act on nutrition-related information, while Social Cognitive Theory highlights self-efficacy as a bridge between knowing and doing. Parental Investment Theory adds a further layer by drawing attention to how time, care, and limited household resources are allocated to children in ways that affect survival and development (Zhang et al., 2021). Read together, these perspectives do not justify a simplistic causal chain; instead, they provide a more disciplined way to examine why parental awareness may coexist with uneven feeding practice in rural contexts.

The logic of this framework is summarized in Figure 1, which visualizes how literacy, self-efficacy, parental investment, and ecological constraints are conceptually connected in the analysis. Rather than treating parents as passive recipients of health messages, the framework positions them as actors who must interpret information, manage competing demands, and regulate food-related practice within everyday limitations. This study therefore asks how parental health literacy is reflected in the effort to meet children's nutritional needs and how those efforts can be read in relation to stunting prevention in rural Indonesia. To make that relationship empirically visible, the article uses Rasch analysis to examine item functioning, respondent distribution, and the hierarchy of parental responses related to nutrition and prevention. The contribution of the study lies in moving beyond generic claims about parental importance by identifying where preventive practice becomes difficult, which dimensions of household care are easier or harder to sustain, and why that distinction matters for both Indonesian policy and wider global discussions on stunting prevention.

The analytical structure of the study is further clarified in Table 1, which links the conceptual flow, the supporting theories, the research hypotheses, and the indicators used in the Rasch analysis. The table is retained not as a decorative summary, but as a way to show how the instrument operationalizes the article's conceptual claims. At the same time, the hypotheses should be read cautiously because the study is designed to map and interpret patterned relationships in parental responses, not to establish definitive causal effects. This caution is important given that stunting prevention involves layered social, nutritional, and environmental conditions that exceed any single explanatory variable. Even so, organizing the conceptual model

in matrix form remains useful because it makes clear how the study moves from theoretical framing to measurable parental indicators.

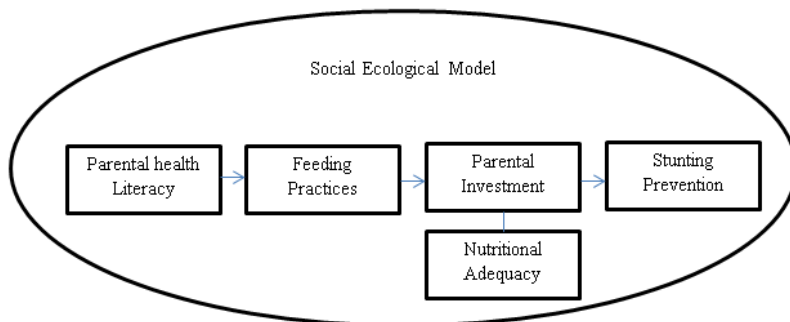


Figure 1. Visualization Diagram Structure of the Conceptual Model

Table 1. Integration Matrix for Theories, Hypotheses, and Instruments

Conceptual Flow	Supporting Theory	Research Hypothesis	Constructs/Indicators in Rasch Analysis
Parental Knowledge	Health Literacy	Higher parental health literacy is substantially associated with a better grasp of the hazards and prevention of stunting.	Understanding of nutrition labels, growth charts, and how to offer complimentary meals.
Feeding Practices	Social Cognitive Theory	In rural contexts, parental self-efficacy serves as a mediator between health literacy and feeding behaviors. Parents' desire to improve their children's quality of life supports increased allocation of household resources to provide proper nourishment for youngsters.	Parents' confidence that they can provide animal protein despite high market prices or great distances. Spending priorities include purchasing eggs/fish for children rather than cigarettes, phone credit, or other tertiary necessities.
Nutritional Adequacy	Parental Investment Theory	Nutrition approaches based on literacy and collective family investment lower the likelihood of stunting in children in rural settings.	Nutritional status (TB/U Z-score) is linked to environmental conditions (availability to clean water and community sanitation).
Stunting Prevention	Social Ecological Model		

2. Methods

2.1. Research Approach

This study was conducted in the city of Sukabumi between July and August 2024, using a quantitative approach with a survey method. The selection of this approach was very helpful and facilitated the collection of the expected data and information (Al Baqi, 2023). The research location was chosen based on careful consideration, as there are many rural areas in the district where young children are not receiving adequate nutrition for their growth. Young children who are attending preschool and are always accompanied by their parents make it easier to obtain sensitive information about their children. A quantitative approach, coupled with data collection methods through surveys, is believed to provide information that is easy to obtain, even if it is difficult, and to increase the efficiency of the research process.

2.2. Research Design

A descriptive quantitative design was used to determine the relationship between parents' roles through their important roles and affection in meeting children's nutritional needs to assist in the recovery of stunting in early childhood. This data and information can be obtained through teachers in early childhood education settings and early childhood participants accompanied by their parents at early childhood education centres in Sukabumi Regency. Respondents included 176 early childhood children accompanied by their parents. The survey was conducted using a measuring tool in the form of an instrument prepared for parents. Parents were given the opportunity to respond to the instrument as evaluation material during the provision of nutrition for their children's food needs.

2.3. Participant

The study participants were parents of children aged over two years. A total of 176 samples were selected using a sequential sampling method. This sample selection was made based on the results of a previous preliminary study of several early childhood education centers, which found that children over the age of 2 experienced a drastic decline in weight. In addition, another consideration was the results of observations based on the demographic characteristics of the children's parents.

Table 2. Demographic characteristics

Socio-Demographics Characteristics	Parents (Mother&Father)
Parental age	
< 20 years	-
21 – 30 years	100
31 – 40 years	60
41 – 50 years	16
>50 years	-
Educational Level	
Elementary or Lower	80
Middle School	40
High School	56
Diploma	-
Strata 1 of University	-
Socio-Economic Status	
Very Poor	-
Poor	98
Modal	60
Rich	18
Very Rich	-

2.4. Data Collection

A tested questionnaire was used as the measuring instrument (Mumu et al., 2022). Primary data were used in this study. Parents of young children were given questionnaires through a survey to collect primary data, the data will later be analyzed quantitatively and descriptively. Several tactics were applied in this study to ensure that the data quality criteria were met. The selection of field officers was the first control measure in this study. The selected field officers were skilled in collecting qualitative field data. They underwent training before entering the field to align their perspectives and techniques for measuring and collecting data.

The function of interviews in this study is only to support the data, where structured interviews are conducted to meet the needs of the preliminary study. This is done because the prevention of stunting through the role of parents is very sensitive and information about it is very difficult to ascertain if only reviewing articles and studies that have been conducted related to stunting. Structured interviews were conducted with parents, classroom teachers, and child

health observers. The findings and conclusions from these interviews were then incorporated into the preliminary background to reinforce the existing problems and the research to be conducted.

2.5. Data Analysis

Rasch modeling analysis was used to analyze data from interventions focusing on parents of young children. The use of the Winsteps program for Rasch modeling. The information provided relates to the suitability of the items to the criteria. Specifically, Rahayu et al. (2020) explain that when the data conforms to the model expectations, the mean square infit and outfit (MNSQ) values in Rasch analysis are used (Lange, 2017). Items with MNSQ scores between 0.50 and 1.50 indicate that the data model fits the data reasonably well. According to Vaughan (2018), model fit is evaluated using the standard deviation of the residuals (SD). The standard deviation between the observed responses and the responses predicted by the Rasch model is represented by the adjustment residual. A normal distribution with a mean of zero and a standard deviation of one indicates that each individual and object fits the Rasch model perfectly. If an object or person does not fit the Rasch model, the adjustment residual (SD) is outside the range of ± 1.5 . Similar to the interpretation of Cronbach's Alpha, the Person Separation Index (PSI) indicates how well an item spreads across the test sample. The number of statistically distinct groups or strata that make up this spread can be identified as a related statistic.

2.6. Research Instrument

The next step was to standardize the research tools as measurement instruments in the form of questionnaires. Field experiments were conducted in accordance with the conditions of the research location for standardization. The questionnaire trial was conducted in the Sukabumi region of West Java.

Table 3. Indicators of stunting in early childhood

Variable	Indicator	Item	Total
Stunting	- Growth retardation	1,2,3,	10
	- Poor performance on attention and learning memory tests	4,5,6,	
	- Nutritional status (TB/U Z-score)	7,8,	
	- Prone to infectious diseases	9,10	
Parental Knowledge and Attention	- Obtaining better health information	11,12,13	10
	- Implementation of child feeding patterns	,	
	- Impact on child growth and development	14,15,16	
		17,18,19	
		,20	
Children's Food Requirements	- Nutritional intake	21,22,23	11
	- Gender	,	
	- Birth weight and length	24,25,26	
	- Environmental hygiene	,	
		27,28,29	
		30,31	
Total	31	31	

The instruments used as measuring tools in this study were developed independently and adapted to the instrument grid. However, we ensured that the instruments were designed according to the needs of early childhood. How were the statement items compiled in accordance with the context of stunting prevention in early childhood education settings in Indonesia? Then, the instrument was tested for validity and reliability using Rasch modeling. This was done so that the instrument items measured each indicator of stunting prevention.

After the instrument was prepared, the survey was conducted using the instrument given to the parents of the children. First, the parents were given instructions on how to fill out the instrument by researchers who went directly to the field accompanied by classroom teachers. The instrument we created was quite simple, as parents filled it out and ensured that their children's

nutritional needs had been met. The instrument served as a measuring tool that provided valuable data and information for researchers. The duration given for filling out the instrument was one week, with the aim of enabling parents and children to work together to ensure good nutrition for the children. Then, after completion, the researchers checked back on the responses given by the parents in the instrument. Finally, the researchers analyzed the data obtained from the parents.

2.7. Validity and Reliability

Based on Rasch modeling, validity analysis was performed using Winsteps software. The information provided is in the form of item suitability criteria, namely: according to Yusuf and Widyaningsih (2020) explain that when the data is in line with the model expectations, infit and outfit mean square (MNSQ) in Rasch analysis. Items with MNSQ values ranging from 0.50 to 1.50 indicate that the data model fits reasonably well.

Vaughan (2018) state that the standard deviation of the fit residual (SD) is used to evaluate the fit of items and persons. Fit residuals represent the standard difference between observed responses and responses expected by the Rasch model. Perfect fit of persons and items to the Rasch model is indicated by a normal distribution with a mean of zero and a standard deviation of one. Fit residuals (SD) outside the range of ± 1.5 indicate that the item or person does not fit the Rasch model. The Person Separation Index (PSI) provides an indication of an item's ability to spread the test sample and is interpreted in the same way as Cronbach's Alpha. The related statistic is the number of statistically distinct strata or groups that allow for this spread to be identified. Another opinion from Hidayati et al. (2021) states that standard fit residuals between -2.5 and +2.5 (99% confidence interval) indicate adequate fit for each individual. Any reliability value close to one can be considered internally consistent (Kam et al., 2011; Maat and Rosli, 2016). Reliability is considered ideal if it is greater than 0.90. The table shows a Person reliability index value of 0.93, an item reliability value of 0.99, and a Cronbach Alpha coefficient of 0.94. A higher person separation index and item separation index indicate a greater likelihood of respondents' spread in responding to items correctly and a wider spread of items from easy to difficult (Mez et al. 2012; Perera et al., 2018). The separation index value ranges from zero to infinity, with a higher separation value indicating better separation. According to, an index value of 1.50 is acceptable, 2.00 is good, and 3.00 is very good.

3. Result

This study applied Rasch modeling to examine the functioning of the instrument items and to map respondents' positions in relation to parental health literacy and parental attention to children's nutritional needs in the context of stunting prevention. Rasch analysis was used because it does not only estimate item difficulty, but also evaluates whether each item functions appropriately within the measurement model. In this study, the results are presented through relative item testing, item fit statistics, reliability and separation indices, item contrast, and the item-person variable map. The fit indicators used in this analysis include outfit mean-square, outfit z-standard, and point-measure correlation, which are commonly employed to determine the extent to which each item fits the Rasch model (Perera et al., 2018).

3.1. Relative item testing

Before examining item fit and respondent distribution in greater detail, it is necessary to first observe how the statement items are positioned in relation to the Rasch model curve. This configuration offers an early picture of which items are relatively more extreme and which ones remain closer to the overall pattern of the scale. From this arrangement, the relative difficulty of the items can already be identified at a broad level. Such an overview is useful because it lays the groundwork for the more detailed analyses that follow.

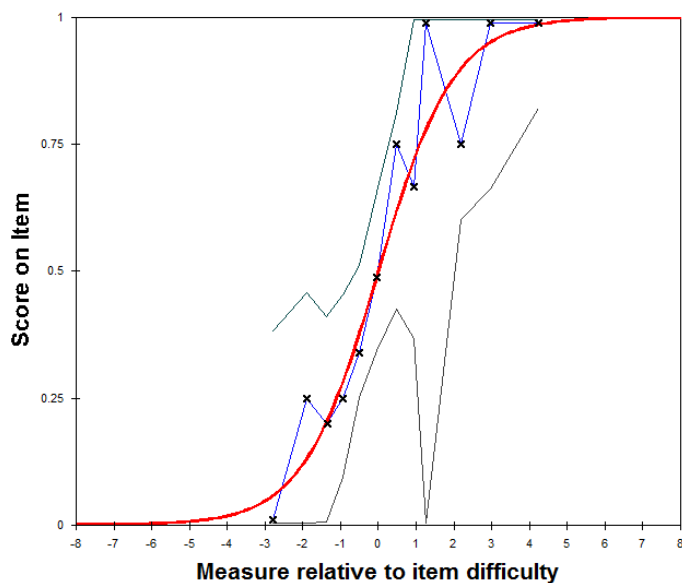


Figure 2. Relative item testing

Figure 2 presents the relative item testing results. When compared with the model curve, items B27 and B28 showed the most extreme characteristics among the statement items. These two items were positioned at the upper end of item difficulty, indicating that they were relatively harder for respondents to endorse than the other items in the instrument. Through the item variable map, the categorization of items is influenced by the level of item achievement reflected in the item characteristic pattern (Perera et al., 2018). In substantive terms, the location of B27 and B28 suggests that the practices represented by these statements were not easily affirmed by parents, which means that these items captured more demanding aspects of parental regulation related to children's nutrition.

The relative item pattern shown in Figure 2 also provides an early overview of how the items were distributed in relation to respondent performance. Rather than showing a flat or uniform distribution, the figure indicates that some items occupied more difficult positions and therefore contributed more strongly to distinguishing respondents with different levels of parental awareness and attention. This condition becomes an important reference point for further analysis of item functioning and respondent variation.

3.2. Item measurement, fit statistics, and reliability

A closer look at the measurement results is needed to determine how consistently the items operated within the Rasch model. At this point, attention is directed not only to item fit, but also to the broader quality of the instrument as reflected in its reliability and separation indices. These indicators help show whether the scale was capable of distinguishing respondents as well as ordering items across different levels of difficulty. Read together, they offer a fuller picture of the psychometric strength of the instrument used in this study.

Figure 3 presents the item measurement results based on Rasch fit statistics. In Rasch analysis, the outfit mean-square, outfit z-standard, and point-measure correlation are used to assess whether an item functions normally within the measurement process (Perera et al., 2018). The z-standard statistic may be interpreted together with the mean-square statistic, and it can be treated cautiously when the mean-square value remains within an acceptable range (Sa et al., 2019). Thus, the fit analysis provides information on whether the instrument items are suitable for measuring parental literacy and attention related to the prevention of child stunting.

Based on Figure 3, four items, namely B3, B5, B8, and B16, did not show measurement performance as strong as the other items and therefore require closer attention in the interpretation of the scale. These items were less effective in producing optimal measurement results for capturing information on parental knowledge and attention in supporting children's nutritional fulfillment. The problematic areas reflected in these items were associated with

children's calmness, attention and learning memory performance, and the use of eating routines. Although these items remained part of the instrument, their locations in the fit analysis indicate that they should be interpreted more carefully than the other items.

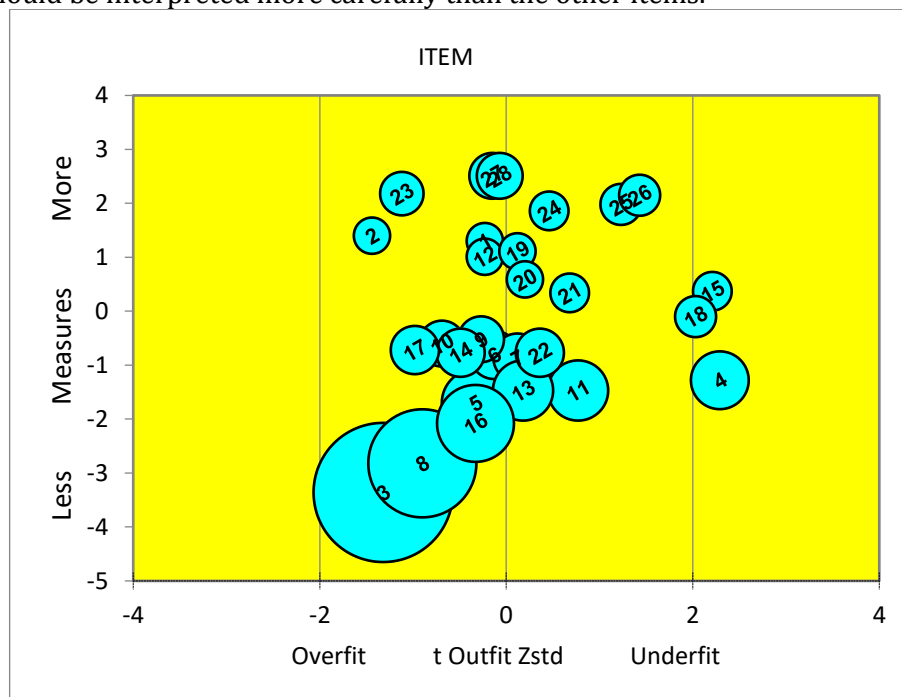


Figure 3. Item measurement

The figure also shows that some parents were attentive to their children's body weight and to the importance of environmental hygiene. Maintaining environmental cleanliness is relevant because poor hygiene may contaminate the components of children's nutritional intake and indirectly affect their growth and development. In this regard, the measurement results suggest that parental concern was not limited to food intake alone, but also extended to the surrounding conditions that support or disrupt nutritional fulfillment.

The reliability analysis further demonstrated strong instrument performance. Person Reliability was 0.93, Item Reliability was 0.99, and Cronbach's Alpha was 0.94. Person Reliability and Item Reliability are used to examine the stability of persons and items, with Rasch reliability values ranging from zero to one and interpreted similarly to Cronbach's Alpha (William J Boone & Noltemeyer, 2017). Any value close to one can be considered internally consistent (Maat & Rosli, 2016). Since reliability is generally considered ideal when it exceeds 0.90, these values indicate that the interaction between respondents and items was highly consistent.

The separation indices also support the strength of the measurement model. The Person Separation Index was 3.63, while the Item Separation Index was 13.67. The Person and Item Separation Index estimate the ability of the instrument to distinguish among respondents' abilities and to classify items from easier to more difficult statements. A higher person separation index and item separation index indicate a greater spread of respondents in responding to items and a clearer spread of items from easy to difficult (Perera et al., 2018). In practical terms, the obtained values suggest that the instrument was able to differentiate respondents with varying levels of parental health literacy and parental attention to children's nutritional needs.

Taken together, the fit, reliability, and separation results indicate that the instrument functioned well overall, despite the fact that several items, particularly B3, B5, B8, and B16, require more cautious interpretation. The measurement evidence therefore supports the use of the instrument to examine variation in parental literacy and attention in relation to the nutritional context of child stunting.

3.3. Item contrast and response variation

Beyond fit and reliability, the response structure also needs to be viewed from the standpoint of internal contrast. This makes it possible to see whether the items broadly move within a common dimension and whether any unusual tendencies appear in the response pattern. In Rasch analysis, such a step is valuable because measurement quality is not judged only from average fit statistics, but also from the coherence of the overall response structure. The contrast plot therefore helps reveal whether the data follow a stable pattern or whether certain deviations remain visible.

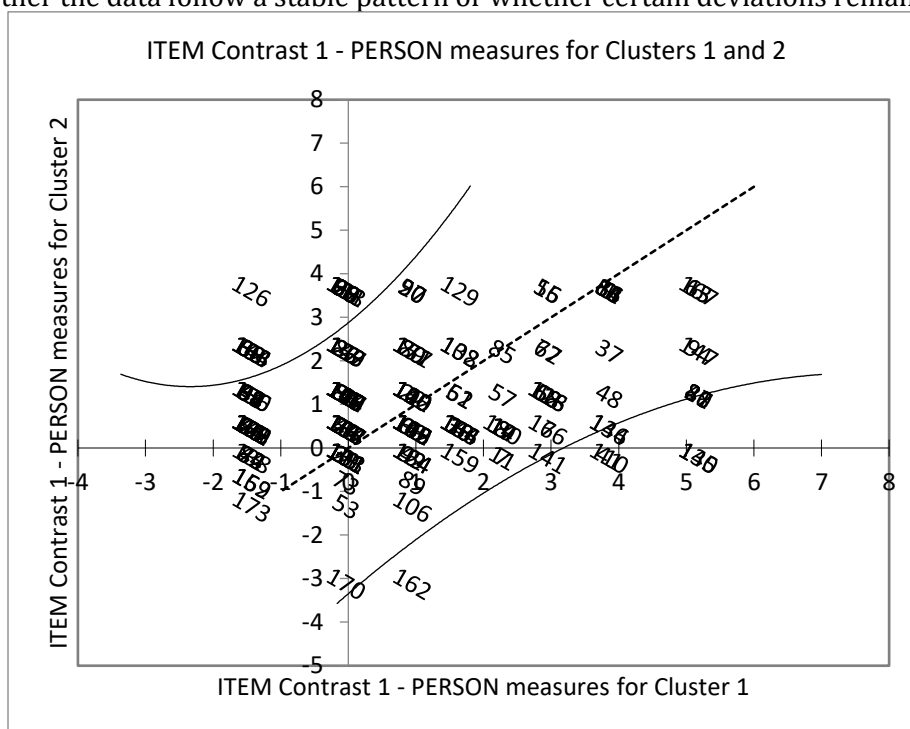


Figure 4. Item contrast

Figure 4 presents the item contrast pattern. This analysis was used to inspect the unidimensionality of the statement items and to detect possible bias in the response pattern. Based on the contrast plot, there was no indication of strong overall bias across the full set of responses. Most respondents followed the dominant trend line, suggesting that the items generally operated within a common measurement structure.

At the same time, the figure shows that several respondents displayed noticeable variation from the average line. This means that a small number of response patterns differed from the dominant pattern represented in the data. The plot therefore suggests that the measurement results were broadly acceptable, although limited response variation remained visible. In substantive terms, this indicates that while the instrument worked adequately for the sample as a whole, the response distribution was not entirely uniform across all cases.

The contrast results thus reinforce the overall adequacy of the measurement model. They do not indicate a level of distortion that would undermine the full analysis, but they do show that some response variability should be acknowledged in interpreting the findings. This is consistent with the broader logic of Rasch modeling, in which the item-person relationship is evaluated not only in terms of average fit but also in terms of possible deviations across persons and items.

3.4. Item-person variable map

The relationship between respondents and statement items becomes more visible when both are placed on the same logit scale. Through this map, it is possible to observe how respondent positions correspond to item difficulty and whether the instrument can distinguish different levels of parental literacy and nutritional attention. The shared continuum also makes clear the spread of respondent ability alongside the hierarchy of item difficulty. For that reason, this part offers one of the most informative views of how the measurement operated across the sample.

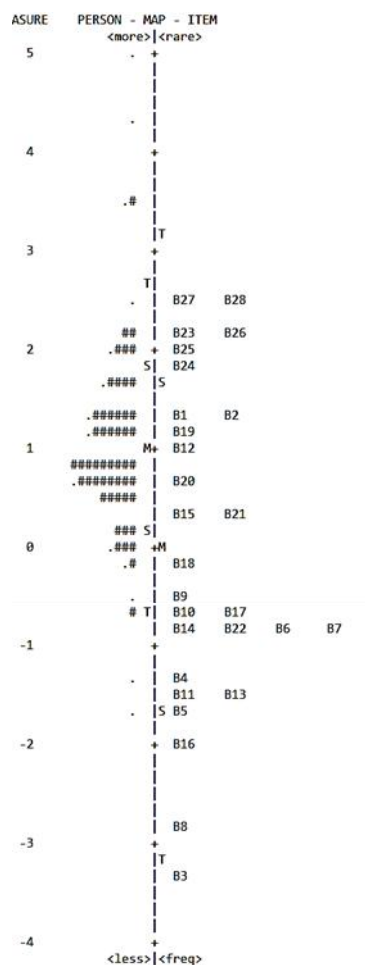


Figure 5. Item-person variable map

Figure 5 presents the results of testing 31 appropriate items and the mapping of respondents and items on the same logit scale. The variable map shows the relative position of respondents and item statements, allowing the analysis to identify both the distribution of respondent levels and the relative difficulty of the items. The item-person variable map indicates that respondents were distributed across high, moderate, and low levels, which reflects variation in parental awareness and attention to children’s nutritional needs (Chauhan et al., 2021). Overall, the items were located in a moderate range, indicating that they were able to distinguish respondents with high and low levels as well as those near the logit average (Chasanah et al., 2019).

This mapping provides a clearer basis for classifying respondents according to the statement items. The spread of respondent positions suggests that parental health literacy and parental attention to nutritional fulfillment were not uniform across the sample. Some respondents occupied higher positions on the map, indicating stronger literacy and attention, whereas others were located at moderate or lower levels. The item distribution also shows that the instrument contained statements with different levels of difficulty, which enabled the model to distinguish between stronger and weaker respondent positions.

The Wright Map further identified the items that were most difficult and easiest for respondents to endorse. Parents found items B27 and B28 more difficult to answer, with MNSQ values above +1.5. These items were located under the dimension of children’s nutritional needs. Item B27 stated, “Parents do not have clear rules regarding their children’s meal portions,” while item B28 stated, “Parents do not have clear rules regarding their children’s meal times.” The location of these two items suggests that establishing clear feeding regulations related to meal portions and meal times was among the most difficult practices captured by the instrument.

By contrast, the easier items were B3 and B6, with lower difficulty values and MNSQ values below +0.5. Item B3, under the stunting dimension, asked, "If yes, how do you convince your child to eat?" Item B6 asked, "Does your child eat a varied menu (rice, vegetables, meat, fish)?" These items were more readily endorsed by respondents, which indicates that parents found it easier to report basic feeding encouragement and recognition of varied food intake than to report consistent regulatory practices regarding portion control and meal scheduling.

The pattern shown in the item-person map therefore indicates that respondents' literacy and awareness were not always accompanied by equally strong nutritional practices. In particular, the more demanding items were related not merely to knowing about nutrition, but to maintaining structured feeding rules within daily household routines. This result shows an empirical distinction between relatively accessible forms of parental awareness and the more difficult practices associated with regularized nutritional management.

The Rasch analysis demonstrated that the instrument had strong psychometric characteristics. The results showed clear variation across items and respondents, high reliability indices, and strong person and item separation. Figure 2 identified B27 and B28 as the most extreme items in the relative item test. Figure 3 showed that several items, particularly B3, B5, B8, and B16, required closer interpretive attention, while the instrument as a whole still showed high reliability. Figure 4 indicated that the response pattern was generally acceptable despite limited response variation among a small number of respondents. Figure 5 showed that the respondents were distributed across high, moderate, and low levels and that the most difficult items were related to parents' ability to establish clear rules on children's meal portions and meal times.

These findings indicate that parental health literacy and parental attention to children's nutritional needs varied meaningfully across the sample. The Rasch model was able to map these differences and to distinguish between easier and more difficult aspects of parental nutritional practice. These empirical results provide the basis for the interpretation developed in the subsequent discussion section.

4. Discussion

The Wright Map indicates that parental health literacy and parental attention to children's nutritional needs were not distributed evenly across the sample. This uneven spread is important because it shows that the issue is not a simple division between knowledgeable and unknowledgeable parents, but a gradation in how far nutritional understanding is carried into practice. The map also supports the classification of respondents into higher, moderate, and lower positions, which helps explain why parental responses to children's nutritional needs are not uniform across households (Chauhan et al., 2021; Chasanah et al., 2019). Read analytically, this pattern suggests that stunting prevention is shaped by differences in everyday caregiving capacity rather than by awareness alone. For that reason, the findings are more usefully interpreted as evidence of uneven practical readiness than as evidence of a single, homogeneous parental profile. This point matters because intervention design should begin from the recognition that families do not enter prevention efforts with the same level of preparedness.

The most demanding items in the scale were concentrated around parents' ability to regulate meal portions and meal times. These practices are not difficult because parents fail to recognize the importance of food, but because they require routine, consistency, and ongoing behavioral management within the home. In practical terms, portioning and scheduling often become unstable when children refuse food, when caregivers have limited time, or when family routines are not organized around regular eating patterns. That is why the difficulty of these items should be read as a sign of strain in household nutritional regulation, not merely as a cognitive gap in parental knowledge. This interpretation is consistent with work emphasizing that balanced nutrition in early childhood depends not only on what food is available, but also on how feeding is organized and sustained over time (Agnihotri et al., 2021; Lemieux & Surampudi, 2019). Within the context of stunting prevention, structured feeding therefore appears to be one of the most fragile links between parental concern and effective daily practice.

The easier items, by contrast, were associated with encouraging children to eat and recognizing a varied menu. These responses suggest that parents more readily affirm visible and socially familiar acts of care than they do practices that require longer-term regulation and discipline. Encouraging a child to eat is concrete and immediate, while maintaining appropriate portioning, timing, and dietary balance requires repeated judgment across many daily situations. This difference is important because it shows that basic acknowledgment of nutritional needs does not automatically indicate an equally strong capacity to manage food quality and regularity. The contrast also aligns with broader nutritional literature showing that adequate child feeding depends on the combined presence of carbohydrates, proteins, vitamins, and meal diversity rather than on one isolated element of intake (Agnihotri et al., 2021; Shahrajabian et al., 2019; Sulaiman, 2020). What emerges from the item hierarchy, then, is a gap between accessible nutritional awareness and the more demanding work of sustaining nutritionally organized care.

This gap helps clarify how health literacy should be understood in the present study. Health literacy is better treated as an enabling condition that improves the possibility of sound nutritional care, rather than as a direct guarantee that parents will implement that care consistently. Parents may know that children need balanced meals, hygienic surroundings, and regular feeding patterns, yet the translation of that knowledge into routine action remains uneven across contexts. Such an interpretation is more defensible than claiming that literacy alone predicts recovery or prevention outcomes in a straightforward manner. It is also more consistent with evidence showing that parental knowledge becomes effective only when it is tied to daily feeding practices, caregiving habits, and the ability to navigate changing flows of information in contemporary family life (Lemieux & Surampudi, 2019; Casale, 2020). In other words, knowledge matters, but its practical force depends on whether families can operationalize it under real household conditions.

The findings also resonate strongly with Parental Investment Theory, which emphasizes that children's development depends on how time, energy, care, and material resources are allocated within the household (Wiegand-Grefe et al., 2019). From this perspective, preventing stunting is not achieved by nutritional understanding alone, because it requires sustained investment in food preparation, supervision, monitoring, and the management of feeding routines. The higher difficulty of items related to meal rules can therefore be read as an index of how costly such investment is in practical terms for many families. Parents may understand what should be done, yet still struggle to do it consistently when income is limited, caregiving is divided across multiple adults, or fatigue reduces the ability to maintain daily structure. This interpretation is compatible with evidence that animal protein, balanced food provision, and appropriate dietary composition are important for child growth, but only become developmentally meaningful when caregivers can provide them regularly and in age-appropriate forms (Sulaiman, 2020; Shahrajabian et al., 2019). The discussion thus shifts away from a deficit view of parents and toward a more realistic account of the burdens involved in maintaining preventive nutritional care.

A similar point can be developed through Social Cognitive Theory, especially with regard to self-efficacy and behavioral regulation. Feeding practices are rarely sustained by information alone because caregivers must also feel capable of handling refusal, adjusting food choices, and maintaining routines when everyday conditions become unpredictable. The present findings suggest that the more difficult aspects of nutritional care are not simply matters of ignorance, but matters of confidence, persistence, and practical decision-making under pressure. This reading strengthens the argument that responsive feeding and supportive parenting styles are more effective than information transfer alone in improving nutrition-related behavior (Smith et al., 2022). It also helps explain why parents living in rapidly changing informational environments may possess general awareness but still struggle to convert that awareness into stable practice, particularly when advice is fragmented across formal counselling, family tradition, and digital media exposure (Casale, 2020). For intervention design, this means that strengthening parental confidence and behavioral skills may be as important as increasing knowledge itself.

The uneven pattern across respondents is also better understood within a broader ecological frame. Children's nutritional outcomes are shaped not only by what parents know, but

also by sanitation, food affordability, household caregiving arrangements, and the cleanliness of the surrounding environment. This is important because nutrition does not operate in isolation: food intake, infection risk, hygiene, and caregiving consistency interact with each other in ways that influence growth. The original discussion was right to draw attention to environmental cleanliness, because nutrient absorption and child health can be undermined when household conditions expose children to repeated illness or contamination (Lemieux & Surampudi, 2019; Shahrajabian et al., 2019). Differences in who provides care also matter, since decisions about children's meals are often shaped by mothers, fathers, grandparents, or other relatives rather than by one actor alone. For that reason, the present findings fit more convincingly within a social-ecological reading of stunting prevention than within a narrow model that assumes knowledge will automatically produce proper practice.

The measurement evidence should also be interpreted with care, not because the instrument failed, but because respondent variation still remains part of the empirical picture. The original text drew attention to contrast, response bias, and acceptable measurement error, and those points remain useful so long as they are discussed cautiously rather than overstated (Loukatari et al., 2019; Maureen et al., 2021; Lange, 2017). What the data suggest is not that the findings are invalid, but that a small degree of variation in response behavior should temper overly strong conclusions about parental practice. This is especially important because the study relies on reported behavior and measured tendencies rather than on direct observation of household feeding over time. Even so, the overall pattern remains substantively meaningful: parents appear more able to affirm general nutritional concern than to sustain structured feeding practices that demand regular monitoring, planning, and household discipline. The main implication, therefore, is not that literacy is unimportant, but that literacy becomes effective only when supported by behavioral capability, resource investment, and enabling care environments.

4.1. Research Contribution

This study contributes to the stunting literature by preserving an important distinction between parental literacy and parental practice, two dimensions that are often treated as though they were interchangeable. The findings indicate that the more difficult domain of prevention lies not in general acknowledgment of nutrition, but in sustaining structured feeding rules and regular care under everyday household constraints. At the conceptual level, the analysis shows that knowledge, confidence, and caregiving investment need to be read together rather than separated into isolated explanatory factors. This contribution is also relevant to Muslim society because child nutrition, caregiving responsibility, and the protection of child well-being are closely tied to everyday moral and familial obligations within Muslim family life. In a broader sense, the study also speaks to global efforts to reduce stunting by showing that prevention depends not only on information provision, but also on the social and practical conditions that enable families to translate knowledge into stable care. Methodologically, the use of Rasch analysis and the item-person map helps identify more precisely where preventive practice becomes difficult for caregivers.

4.2. Limitations

Several limitations need to be acknowledged when interpreting these findings. The study relies on self-reported responses, so the possibility of socially desirable answers cannot be fully excluded. In addition, the design is cross-sectional and does not include longitudinal anthropometric verification, which means the analysis cannot determine whether stronger parental literacy or reported practice leads to measurable reductions in stunting over time. The findings should therefore be read as evidence about the structure of parental literacy and reported nutritional practice within this sample, not as direct causal proof of intervention effectiveness.

4.3. Suggestions

The practical implication of these findings is that intervention programs should move beyond general nutrition messaging and focus more directly on the household routines that parents appear to find hardest to sustain. Guidance on portioning, meal scheduling, affordable menu

planning, and the management of children's food refusal would likely be more useful than information-only counselling, especially for families dealing with time pressure and unstable routines. Community-based programs would also benefit from involving fathers, grandparents, and other caregivers, because nutritional decisions are often distributed across the household rather than handled by mothers alone. Future research should combine survey data with observation, anthropometric measures, and longitudinal follow-up so that the relationship between parental literacy, behavioral practice, and child growth can be examined more convincingly.

5. Conclusion

This study shows that the challenge of early childhood stunting prevention does not lie only in whether parents recognize the importance of nutrition, but in whether that recognition can be translated into stable daily feeding practices. The Rasch analysis indicates that parents more easily affirmed general acts of care, such as encouraging children to eat or recognizing varied foods, than practices requiring consistent regulation of meal portions and meal times. This pattern suggests that parental health literacy should not be understood as a sufficient condition for effective prevention, because practical implementation remains uneven across households. The findings therefore support a more careful conclusion: awareness of children's nutritional needs matters, but its preventive value depends on how far it can be sustained through routine, discipline, and everyday caregiving capacity. In this sense, the study identifies a meaningful gap between nutritional understanding and structured household practice, and it is within that gap that the risk of ineffective prevention becomes more visible.

The contribution of this study lies in showing that the household difficulty of stunting prevention is concentrated less in basic acknowledgment of nutrition than in the regulation of feeding practices under ordinary family constraints. Rather than presenting parents as simply informed or uninformed, the findings point to a more layered picture in which knowledge, caregiving investment, confidence, and environmental support interact in shaping child nutrition. This conclusion is especially relevant for Muslim family and community contexts, where child care, food provision, and responsibility for children's well-being are embedded in everyday moral and relational obligations, yet remain subject to material and practical limitations. At the same time, the study speaks to broader global concerns about stunting by indicating that prevention efforts will remain limited if they rely on information delivery without addressing the household conditions required to translate knowledge into regular care. The study therefore does not claim to offer a final solution, but it does provide a clearer empirical basis for understanding where preventive efforts are most likely to falter and where support for families needs to be made more practical and context-sensitive.

Declarations

Author contribution statement

Lia Kurniawaty: Conceptualization, Methodology, Supervision, Project Administration, Investigation, Data Curation, Formal Analysis, Writing - Original Draft, Visualization, and Writing - Review & Editing.

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Data availability statement

The datasets generated and analysed during this study are not publicly available due to ethical restrictions concerning participant confidentiality, but are available from the corresponding author upon reasonable request.

Declaration of interests statement

All authors declare that they have no financial or personal interests that could influence the work presented in this manuscript.

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