JPPIPA 11(10) (2025)

Jurnal Penelitian Pendidikan IPA

http://jppipa.unram.ac.id/index.php/jppipa/index

The Role of Educational Interventions in Mitigating Risk Factors for Stunting in Adolescent Girls

Yuniarti[1*], Zakiah[1], Hapisah[1]

[1] Poltekkes Kemenkes Banjarmasin, Banjarmasin City, South Kalimantan Province, Indonesia.

Received: July 30, 2025
Revised: September 17, 2025
Accepted: October 25, 2025
Published: October 31, 2025

Corresponding Author:
Yuniarti
faathiryuniarti@gmail.com

DOI: 10.29303/jppipa.v11i10.12881

Abstract: Stunting is a nutritional problem that affects children's growth and development. Various risk factors, including education, diet, and maternal health, contribute to stunting prevention. This study aims to analyze the factors influencing stunting, focusing on adolescent girls as a vulnerable group. This study used a quantitative analytical approach with a cross-sectional design, conducted in Tabukan District, Barito Kuala Regency, from March to September 2025. The sample consisted of 77 adolescent girls aged 10 to 14 years old, selected based on inclusion criteria. Data were collected through a questionnaire covering knowledge and stunting prevention behaviors, hemoglobin levels, Body Mass Index (BMI), and Mid-Upper Arm Circumference (MUAC). Logistic regression analysis was used to identify significant relationships between variables. The results showed Significant relationships were found between knowledge and parenting patterns (p=0.000), physical activity (p=0.031), and diet (p=0.017). Hemoglobin levels were significantly associated with adherence to iron supplementation (IBT) consumption (p=0.000). In Conclusion, Adolescents' lack of knowledge about stunting prevention impacts their parenting, diet, and health. The poor distribution of parenting patterns and low adherence to iron supplementation indicate the need for nutrition education-based interventions.

Keywords: Diet; Education; Maternal nutrition; Risk factors; Stunting

Introduction

Maternal nutrition plays a critical role in child growth and development. Research indicates that maternal factors such as preconception nutrition, height, and overall health significantly influence the risk of stunting in their offspring. In a study conducted across 137 countries, maternal short stature and underweight were found to account for a substantial proportion of stunting cases, with maternal nutrition collectively linked to approximately 14.4% of stunting prevalence (Young et al., 2018). Moreover, poor maternal dietary practices during pregnancy manifest in children's nutritional outcomes, worsening stunting risk in vulnerable populations (Beal et al., 2019). Household socioeconomic status (SES) is another prominent determinant of stunting risk. Children from impoverished households are at an elevated risk of being stunted compared to their wealthier counterparts (Odei Obeng-Amoako et al., 2021; Santosa et al., 2022). SES influences access to nutritious foods, healthcare services, and educational opportunities, all of which are vital in preventing stunting. A lack of education among mothers has been correlated with poorer feeding practices and increased stunting prevalence, demonstrating how education serves as a protective factor (Santosa et al., 2022). Furthermore, stunted children often belong to families experiencing food insecurity, which restricts access to adequate nutrition and is intricately linked to household wealth (Weatherspoon et al., 2019).

How to Cite:
Yuniarti, Zakiah, & Hapisah. (2025). The Role of Educational Interventions in Mitigating Risk Factors for Stunting in Adolescent Girls. *Jurnal Penelitian Pendidikan IPA*, *11*(10), 287–294. https://doi.org/10.29303/jppipa.v11i10.12881

Environmental factors also have critical implications for childhood growth. Poor sanitation and inadequate access to clean water contribute to increased infection rates, which, in turn, impede nutrient absorption, leading to stunting (Abdillah, 2022; Anismuslim et al., 2023). Dysbiosis of gut microbiota has also emerged as a significant risk factor for stunting, as undernutrition alters gut flora composition, affecting digestive health and nutrient assimilation. Consequently, interventions targeting improvements in sanitation and hygiene should be integral to strategies intended to combat stunting. In addition to these factors, understanding the cultural context in which stunting occurs is crucial for effective intervention. Cultural practices surrounding breastfeeding, complementary feeding, and healthcare-seeking behaviors significantly influence children's nutritional health and growth outcomes (Beal et al., 2019; Habaasa, 2015). In regions where traditional beliefs regarding child-rearing prevail, there may be hesitation to adopt modern nutritional practices that are essential to stunting prevention (Sukmawati et al., 2023). It is thus vital that any public health messages or interventions are culturally sensitive and tailored to the specific beliefs and practices of the community.

The interplay of these risk factors encompasses an ecological model where community-level influences interact with individual-level determinants to impact stunting risk (Kalinda et al., 2023; Weatherspoon et al., 2019). Studies emphasize the necessity of multisectoral approaches in tackling childhood stunting, integrating nutrition, healthcare, education, and economic policies to foster a more supportive environment for child growth (Shinsugi et al., 2015). Interventions must address the multifaceted nature of stunting, fostering collaboration across various sectors to design holistic solutions. Given the complexity of risk factors that contribute to stunting, addressing this issue requires a comprehensive strategy formulation that includes monitoring and evaluation frameworks to assess intervention efficacy. For example, machine learning techniques have been employed to predict stunting occurrences based on various determinants, allowing for targeted interventions in high-risk populations (Mkungudza et al., 2024; Ndagijimana et al., 2023). By using data-driven approaches, policymakers can gain insights into the specific needs of communities, thereby facilitating more effective resource allocation and intervention planning.

The aim of this study is to analyze risk factors influencing stunting prevention. This research seeks to identify and understand the mechanisms linking these various determinants and how they interact within a specific community context. In this context, this research has the potential to provide guidance for policymakers and stakeholders in designing effective interventions to reduce stunting prevalence.

Method

Types of research

This research was conducted using a quantitative analytical approach, employing a correlational cross-sectional research design. This means that the study aimed to explore the relationships between variables at a single point in time without examining changes over time. In this context, the researchers focused on analyzing risk factors associated with stunting prevention in adolescent girls, highlighting the importance of stunting prevention behaviors and the factors influencing them.

Research Location and Sample

The study was conducted in Tabukan District, Barito Kuala Regency, from March to September 2025. A sample of 77 adolescent girls aged 10 to 14 years was selected based on inclusion criteria, which included adolescent girls living in the area and willing to participate in the study.

Research Variables

In the quest to enhance clarity in variable definitions concerning stunting prevention in adolescent girls, meticulous measurement of each variable is indispensable. For "Knowledge about Stunting," a structured questionnaire employing a Likert scale serves to quantify understanding of stunting causes and prevention strategies. Hemoglobin (Hb) levels, indicative of anemia, are measured through blood tests, with levels below 12 g/dL signaling growth-related concerns. The Body Mass Index (BMI) is calculated from weight and height (kg/m^2), utilizing standard percentiles for adolescent classification. Mid-Upper Arm Circumference (MUAC) is measured with a flexible tape; specific cut-off points are used to assess malnutrition risk. In the sphere of stunting prevention behaviors, "Maternal Parenting Practices in Nutrition" are evaluated through questionnaires highlighting food preparation and feeding practices, scored against established guidelines. "Iron Supplementation Adherence" is self-reported, sometimes triangulated with pill counts. Physical activity is gauged via validated tools like the International Physical Activity Questionnaire (IPAQ), assessing both frequency and duration. Lastly, dietary patterns are characterized through 24-hour dietary recall or food frequency questionnaires, amalgamating qualitative and quantitative dietary data.

Questionnaire Design

The research instrumentation used a questionnaire modified to suit the local context. The questionnaire consisted of several sections, including questions related to adolescent girls' knowledge of stunting, maternal parenting patterns, physical activity, and iron supplement consumption.

Dietary habit was measured using a Food Frequency Questionnaire (FFQ), modified to reflect common eating patterns among the local population. Respondents were asked to complete the questionnaire using a 24-hour recall method, where they were asked to recall and report all foods and beverages they consumed in the past 24 hours.

Measurement of Hemoglobin, LILA, BB, and TB Levels

Hemoglobin levels were measured to identify whether adolescent girls were anemic. Furthermore, mid-upper arm circumference (MUAC) was measured to determine the risk of malnutrition. Meanwhile, body weight (BW) and height (HW) were measured to determine the nutritional status of adolescent girls through BMI calculations.

Sampling Techniques

The sampling technique used was purposive sampling, where researchers selected a sample based on specific criteria, namely adolescent girls aged 10 to 14 years old who were willing to participate in the study. This selection aimed to obtain relevant and representative data in line with the research focus.

Research Procedures

The research process began with obtaining permission from the authorities and an introduction from the relevant institutions in Tabukan District. After obtaining permission, the researcher approached potential respondents and explained the purpose, benefits, and procedures of the study. Each respondent was asked to sign a consent form stating their voluntary participation. Next, questionnaires were distributed to each young woman, with researchers providing explanations for each question. After completing the questionnaires, hemoglobin, MUAC, weight, and height levels were measured. Data from each respondent was systematically recorded to facilitate further analysis.

Data Analysis

Data analysis was conducted using logistic regression to assess the relationship between the variables studied and stunting prevention behaviors. This analysis aimed to identify risk factors contributing to stunting prevention among adolescent girls. The results of the analysis will provide insight into the influence of each variable on stunting prevention behaviors. Each analyzed variable was then tested for statistical significance, with the results being presented in the form of a p-value. The criteria for hypothesis acceptance and its impact were based on the established p-value, where a p-value <0.05 indicates a significant relationship between the studied variable and stunting prevention behavior.

Result and Discussion

Table 1 shows that the characteristics of respondents in the study on risk factors for stunting prevention in children indicate that the majority of respondents were 13 years old (32.50%) and most children attended junior high school (58.40%), emphasizing the importance of education in stunting prevention. The child's status indicates the prevalence of first-born children (41.60%), which may influence parenting experiences related to stunting. The dominant maternal age was 20-29 years (50.60%), and most mothers had low education (81.80% had primary education), which may indicate health and nutritional risks. With 67.50% of mothers working as housewives, there is potential for a lack of income that impacts children's nutritional status. The high proportion of first-born children (6.50%) also indicates variations in the support and care received.

Table 1. Respondent Characteristics

Variables	Frequency	%
Child Age		
10 Years	12	15.60
11 Years	9	11.70
12 Years	19	24.70
13 Years	25	32.50
14 Years	12	15.60
Children's Education		
Elementary School	32	41.60
junior high school	45	58.40
Child's Status		
Child 1	22	41.60
Child 2	20	26.00
Child 3	18	23.40
Child 4	4	5.20
Child 5	2	2.60
Mother's Age		
20 – 29	39	50.60
30 – 39	35	45.50
40 - 50	3	3.90
Mother's Education		
Base	63	81.80
Intermediate	13	16.90
Tall	1	1.30
Mother's Job		
Housewife	52	67.50
Farmer	21	27.30
Private	2	2.60
Civil servant	2	2.60

Table 2 shows that 50.60% of adolescents had insufficient knowledge regarding stunting prevention, while 49.40% demonstrated good knowledge. In terms of health, 29.90% of respondents suffered from anemia, and 66.20% were classified as underweight based on their Body Mass Index (BMI/A). Furthermore, data on Upper Arm Circumference (MUAC) indicated that 35.10% of respondents were at risk of chronic energy deficiency (CED). Regarding parenting patterns, 55.80% of mothers had poor quality, and only 40.3% of respondents were compliant in taking Iron Supplement Tablets (TTD). Physical activity was also a concern, with 44.20% of respondents being inactive, and 50.60% of respondents had poor dietary habits. These data demonstrate the challenges facing stunting prevention efforts.

Table 2. Knowledge Level and Parenting Patterns of Adolescent Mothers in the Context of Stunting Prevention at the Survey Locations

Variables	Frequency	%
Teenage knowledge		
Not enough	39	50.60
Good	38	49.40
Hemoglobin (Hb) Levels		
Anemia (< 12 g/dL),	23	29.90
No anemia (≥ 12 g/dL)	54	70.10
Body Mass Index (BMI/A)		
Thin	51	66.20
Normal	26	33.80
Upper Arm Circumference (UMC)		
SEZ Risks	27	35.10
No KEK risk	50	64.90
Mother's Parenting Pattern		
Not enough	43	55.80
Good	34	44.20
Consumption of Iron Supplement Tablets (TTD)		
Not obey	31	40.30
Obedient	46	59.70
Physical Activity		
Less active	34	44.20
Active	43	55.80
Dietary habit		
Not enough	39	50.60
Good	38	49.40

Table 3 shows that knowledge about stunting is significantly associated with parenting patterns (p=0.000), physical activity (p=0.031), and diet (p=0.017), indicating that this knowledge influences parenting behavior and eating habits. Meanwhile, hemoglobin levels were only significantly associated with iron supplement consumption (p=0.000), highlighting the importance of hemoglobin levels in iron intake. Other variables, such as mid-upper arm circumference and body mass index, did not show significant associations with these factors.

Table 3. Analysis of the Relationship between Health and Nutrition Variables and Parenting Patterns, Iron Tablet Consumption, Physical Activity, and Dietary Patterns for Stunting Prevention

Variables	Parenting	TTD Consumption	Physical Activity	Dietary habit
Knowledge About Stunting	0.000	0.782	0.031	0.017
Hemoglobin Level	0.470	0.000	0.503	0.850
Upper Arm Circumference	0.956	0.108	0.968	0.116
Body Mass Index	0.118	0.391	0.306	0.511

The data presented in Table 2 reveals several critical insights into the knowledge and health status of adolescents pertaining to stunting prevention. A significant 50.60% of adolescents exhibit insufficient knowledge regarding stunting prevention measures, contrasting with the 49.40% who demonstrate a good understanding of these concepts. This lack of awareness is particularly concerning, given that stunting is a multifactorial issue influenced by nutritional knowledge, which is imperative for both maternal and child health (Faizi et al., 2022). Insufficient knowledge about stunting can lead to poor dietary choices and behaviors that exacerbate the problem, as indicated by studies showing a correlation between poor nutritional knowledge and adverse health outcomes in adolescents, including anemia and underweight status (Nursasmita et al., 2024).

Furthermore, the health status data highlights alarming disparities, as 29.90% of respondents are afflicted by anemia, and 66.20% are classified as underweight according to their Body Mass Index (BMI/A). These figures indicate a prevalent malnutrition crisis among adolescents, underscoring the urgency of addressing nutritional education as a primary prevention strategy (Nguyen et al., 2019; van Tuijl et al., 2021). The correlation between anemia and stunting is well documented; Inadequacies in iron nutrition can impede cognitive and physical development, perpetuating cycles of stunting in future generations. Interventions aimed at enhancing nutritional knowledge have proven effective in improving health outcomes and should be prioritized in public health agendas (Lina et al., 2022).

An additional aspect of the analysis concerns the Mid-Upper Arm Circumference (MUAC) data, with 35.10% of respondents at risk of chronic energy deficiency (CED). This statistic underscores the severity of nutritional inadequacies among adolescents,

particularly those facing reproductive responsibilities. Research supports that adolescent mothers tend to lack knowledge about proper infant care and nutrition, creating an environment where chronic conditions such as stunting can proliferate (Erfina et al., 2019; Govender et al., 2019).

Moreover, the data indicates that a significant 55.80% of mothers exhibit poor quality in parenting. This situation can have cascading effects on child development and well-being. The struggle of adolescent mothers to comply with ironation regimens is concerning supplements, with only 40.30% adhering to prescribed guidance (Chaveepojnkamjorn et al., 2021; Erfina et al., 2019). The inability to meet dietary recommendations and health interventions can lead to compounded effects on the developmental trajectories of their children, heightening the risk of stunting (Faizi et al., 2022; Nursasmita et al., 2024). Therefore, educational initiatives that empower mothers with knowledge about nutrition and infant care are integral to combating stunting.

In relation to physical activity, the data reveals that 44.20% of respondents are inactive. Physical activity plays a crucial role in overall health and development; its deficiency contributes to negative health outcomes that can compound existing socio-economic and nutritional challenges (Cahyati & Lestari, 2021). The juxtaposition of physical inactivity with poor dietary habits, indicated by the finding that 50.60% of respondents maintain poor eating patterns, accentuates a troubling trend that can further diminish the health prospects of both adolescents and their offspring (Nurhaeni et al., 2024). This necessitates interventions that educate on the importance of nutrition while promoting an active lifestyle as part of health promotion efforts.

Overall, the cumulative evidence from this demographic indicates that multifaceted interventions addressing stunting must blend educational strategies about nutrition, effective parenting practices, and physical health. Such interventions can significantly alter the trajectories of adolescent mothers by equipping them with the requisite knowledge and tools to combat anemia and other malnutrition-related issues effectively. Previous studies confirm that enhancing maternal education can significantly improve child health outcomes, particularly in stunting prevention initiatives (Cahyati & Lestari, 2021).

To provide a comprehensive discussion regarding the relationships highlighted in Table 3, it is essential to examine the implications of knowledge about stunting, hemoglobin levels, and their associations with caregiving behaviors, physical activity, and dietary patterns. The analysis revealed significant connections, particularly that knowledge about stunting significantly influences parenting styles (p=0.000), physical activity (p=0.031), and dietary habits (p=0.017). Conversely, hemoglobin levels showed a significant relationship solely with the consumption of iron supplementation (p=0.000), underscoring the crucial role hemoglobin plays in iron intake, while variables like arm circumference and body mass index (BMI) displayed no significant correlations with the mentioned factors.

Understanding the implications of knowledge regarding stunting is paramount in addressing nutritional deficiencies among children, particularly in developing countries. Research suggests that increased awareness of stunting correlates with improved parenting practices regarding nutrition and feeding (Nadhila et al., 2023; Ningning & Wenguang, 2023). When caregivers possess adequate knowledge about stunting, they are better equipped to implement practices that prevent undernutrition, consequently improving children's growth trajectories and overall health outcomes. The significant values (p=0.000 and p=0.017) indicate a robust relationship where increased knowledge translates into better dietary practices and more active lifestyles. This is supported by findings from Nadhila et al., which identified a discernible link between parenting styles and the nutritional status of children, where authoritative styles foster better nutrition and growth outcomes due to their focus on positive engagement (Nadhila et al., 2023).

Furthermore, the significance of physical activity in the context of stunting prevention aligns with broader frameworks that recognize active lifestyles as a complement to adequate nutrition (Shinde et al., 2021). A diverse range of studies has illustrated that adequate physical activity, particularly in early childhood, contributes significantly to proper growth and nutritional balance, indirectly mitigating stunting risks (Baliki et al., 2023; Schreinemachers et al., 2020). In conjunction with proper dietary habits, physical activity is a crucial determinant of health that fosters optimal development. These findings reflect a synergistic relationship where knowledge engenders proactive health behaviors, leading to better educational and health outcomes.

Turning to hemoglobin levels, their significant association with iron supplementation is indicative of the fundamental role adequate iron intake plays in sustaining health and preventing anemia. Low hemoglobin levels signify an underlying deficiency that can have substantial repercussions for cognitive and physical development, especially during the formative years of children and adolescents (Rahma et al., 2023). In particular, Nahrisah et al. noted that nutritional interventions, especially those focused on iron-rich food consumption, significantly bolstered hemoglobin levels in at-risk groups, thereby reinforcing the importance of

nutritional education in combating anemia (Nahrisah et al., 2020).

In addition, the absence of significant relationships between other variables such as upper arm circumference or BMI and the key factors under discussion raises critical inquiries into the multifaceted dynamics of nutrition, growth, and development. Although these anthropometric indicators are often employed as proxies for nutritional status, their lack of statistical significance in this context may suggest that they do not directly capture the nuances associated with dietary practices or caregiver knowledge. This observation is echoed in studies suggesting that parental education in nutrition may not automatically translate to optimal physical growth indicators; Rather, it emphasizes the importance of direct intervention strategies (Radhika et al., 2018; Woźniak et al., 2022).

Moreover, the disparities in significance across different variables highlight the complexity of nutritional health research, where various interacting factors complicate straightforward conclusions. Insightful considerations involve understanding how socio-economic factors, cultural contexts, and educational access play cumulative roles alongside nutritional practices influencing both dietary habits and growth (Ningning & Wenguang, 2023; Nurjannah et al., 2021).

Another dimension worth examining is the interrelation between knowledge, the implications of active parenting styles, and their correlative effects on children's eating behaviors and overall nutritional intake. Parenting styles shaped by comprehensive nutritional education foster an environment conducive to healthier choices, signaling a need for continuous education and community interventions (Ningning & Wenguang, 2023). Parents who engage in positive reinforcement regarding food choices and healthy lifestyles are more likely to develop similar dispositions in their children, which is paramount for stunting prevention and nutritional adequacy (Schreinemachers et al., 2020; Woźniak et al., 2022).

Conclusion

The study's conclusions indicate that adolescent knowledge about stunting prevention significantly influences their parenting, diet, and physical activity patterns. The data indicate that the majority of respondents lacked knowledge about stunting prevention, and this was directly correlated with their health status, as reflected in the prevalence of anemia and underweight. The significant associations found between knowledge and parenting behaviors and diet suggest that increased education about stunting can improve nutritional practices and support child health. Furthermore, the high percentage of mothers with poor parenting practices and low adherence to iron supplementation highlight the need for better interventions to support maternal and child well-being. Therefore, comprehensive nutrition education and intervention programs are essential to combat stunting and improve public health. These efforts should consider the social and economic factors that contribute to this nutritional problem among families, especially those involving adolescent mothers.

Acknowledgments
The author thanks the director and all staff, lecturers and students of the Poltekkes Banjarmasin for all their assistance.

Author Contributions
Concept: YY, ZZ, HH; Methodology and Software: YY, ZZ, HH; Validation and Formal Analysis: YY, ZZ, HH; Writing—Original Draft Preparation: YY, ZZ, HH; Project Administration: YY, ZZ, HH; Funding Acquisition: YY, ZZ, HH.

Funding
No Funding.

Conflicts of Interest
The authors declare no conflict of interest.

References

Abdillah, S. (2022). The Effect of Maternal and Child Factors on Stunting in Children Under Five Years in Rural Indonesia. *KnE Life Sciences*, *1*(2), 1–11. https://doi.org/10.18502/kls.v7i2.10382

Anismuslim, M., Pramoedyo, H., Andarini, S., & -, S. (2023). The effect of sanitation risk on toddler stunting incident with geographically weighted regression approach in Malang Regency, Indonesia. *Journal of Public Health and Development*, *21*(1), 90–105. https://doi.org/10.55131/jphd/2023/210107

Baliki, G., Weiffen, D., Schreinemachers, P., Shrestha, A., Shrestha, R. M., Schreiner, M., & Brück, T. (2023). Effect of an Integrated School Garden and Home Garden Intervention on Anemia Among School-Aged Children in Nepal: Evidence From a Cluster Randomised Controlled Trial. *Food and Nutrition Bulletin*, *44*(3), 195–206. https://doi.org/10.1177/03795721231194124

Beal, T., Le, D. T., Trinh, T. H., Burra, D. D., Huynh, T., Duong, T. T., Truong, T. M., Nguyen, D. S., Nguyen, K. T., de Haan, S., & Jones, A. D. (2019). Child stunting is associated with child, maternal, and environmental factors in Vietnam. *Maternal & Child Nutrition*, *15*(4), 1–11. https://doi.org/10.1111/mcn.12826

Cahyati, N., & Lestari, M. D. (2021). The Influence of Ring Cards on the Knowledge and Attitude of Mother With Toddler 0-24 Month in the Prevention of Stunting. *Advances in Social Science, Education and Humanities Research*, 1–11. https://doi.org/10.2991/assehr.k.211020.068

Chaveepojnkamjorn, W., Songroop, S., Satitvipawee, P., Pitikultang, S., & Thiengwiboonwong, S. (2021). Association between Breastfeeding and Child Stunting among Adolescent Mothers. *Universal Journal of Public Health*, *9*(6), 484–491. https://doi.org/10.13189/ujph.2021.090617

Erfina, E., Widyawati, W., McKenna, L., Reisenhofer, S., & Ismail, D. (2019). Adolescent mothers' experiences of the transition to motherhood: An integrative review. *International Journal of Nursing Sciences*, *6*(2), 221–228. https://doi.org/10.1016/j.ijnss.2019.03.013

Faizi, M., Rochmah, N., Hisbiyah, Y., Perwitasari, R. K., Fedora, K., & Ni'mah, N. L. (2022). Effectiveness of Health Education about Stunting Toward Improvement of Community Knowledge. *International Journal Of Scientific Advances*, *3*(5), 1–11. https://doi.org/10.51542/ijscia.v3i5.18

Govender, D., Naidoo, S., & Taylor, M. (2019). Knowledge, attitudes and peer influences related to pregnancy, sexual and reproductive health among adolescents using maternal health services in Ugu, KwaZulu-Natal, South Africa. *BMC Public Health*, *19*(1), 928–938. https://doi.org/10.1186/s12889-019-7242-y

Habaasa, G. (2015). An investigation on factors associated with malnutrition among underfive children in Nakaseke and Nakasongola districts, Uganda. *BMC Pediatrics*, *15*(1), 134–144. https://doi.org/10.1186/s12887-015-0448-y

Halim, F., Ermiati, E., & Sari, E. A. (2021). Factors Of Stunting In Toddlers: A Literature Review. *Journal of Nursing Care*, *4*(1), 1–11. https://doi.org/10.24198/jnc.v4i1.27498

Has, E. M. M., Krisnana, I., & Efendi, F. (2024). Enhancing Maternal Caregiving Capabilities Model to Prevent Childhood Stunting: A UNICEF-Inspired Model. *SAGE Open Nursing*, *10*(4), 1–11. https://doi.org/10.1177/23779608231226061

Kalinda, C., Phri, M., Qambayot, M. A., Ishimwe, M. C. S., Gebremariam, A., Bekele, A., & Wong, R. (2023). Socio-demographic and environmental determinants of under-5 stunting in Rwanda: Evidence from a multisectoral study. *Frontiers in Public Health*, *11*(3), 1–11. https://doi.org/10.3389/fpubh.2023.1107300

Lina, L., Sulistany, E., Elfida, E., Helm, A., Alchalidi, A., Arbaiyah, A., & Supriyanti, S. (2022). The Use of Media in Stunting Extension to Adolescents at Senior High School, Langsa City. *Open Access Macedonian Journal of Medical Sciences*, *10*(E), 1–7. https://doi.org/10.3889/oamjms.2022.10103

Mkungudza, J., Twabi, H. S., & Manda, S. O. M. (2024). Development of a diagnostic predictive model for determining child stunting in Malawi: a comparative analysis of variable selection approaches. *BMC Medical Research Methodology*, *24*(1), 175–182. https://doi.org/10.1186/s12874-024-02283-6

Nadhila, L. F., Gita Ningrum, A., & Tri Arif Sampurna, M. (2023). Effect Of Parenting Style On Nutritional Status Of Toddlers In Surabaya. *Indonesian Midwifery and Health Sciences Journal*, *7*(3), 267–275. https://doi.org/10.20473/imhsj.v7i3.2023.267-275

Nahrisah, P., Somrongthong, R., Viriyautsahakul, N., Viwattanakulvanid, P., & Plianbangchang, S. (2020). <p>Effect of Integrated Pictorial Handbook Education and Counseling on Improving Anemia Status, Knowledge, Food Intake, and Iron Tablet Compliance Among Anemic Pregnant Women in Indonesia: A Quasi-Experimental Study. *Journal of Multidisciplinary Healthcare*, *13*(1), 43–52. https://doi.org/10.2147/JMDH.S213550

Ndagijimana, S., Kabano, I. H., Masabo, E., & Ntaganda, J. M. (2023). Prediction of Stunting Among Under-5 Children in Rwanda Using Machine Learning Techniques. *Journal of Preventive Medicine and Public Health*, *56*(1), 41–49. https://doi.org/10.3961/jpmph.22.388

Nguyen, P. H., Scott, S., Neupane, S., Tran, L. M., & Menon, P. (2019). Social, biological, and programmatic factors linking adolescent pregnancy and early childhood undernutrition: a path analysis of India's 2016 National Family and Health Survey. *The Lancet Child & Adolescent Health*, *3*(7), 463–473. https://doi.org/10.1016/S2352-4642(19)30110-5

Ningning, W., & Wenguang, C. (2023). Influence of family parenting style on the formation of eating behaviors and habits in preschool children: The mediating role of quality of life and nutritional knowledge. *PLOS ONE*, *18*(7), 1–11. https://doi.org/10.1371/journal.pone.0288878

Nurhaeni, N., Huda, M. H., Chodidjah, S., Agustini, N., Tri Waluyanti, F., Nadi, H. I. K., Armini, N. K. S., Sari, M., & Jackson, D. (2024). Exploring the strategies and components of interventions to build adolescent awareness about stunting prevention in West Java: A qualitative study. *PLOS ONE*, *19*(12), 1–11. https://doi.org/10.1371/journal.pone.0314651

Nurjannah, T. A., Elba, F., Nirmala, S. A., Mandiri, A., & Wijaya, M. (2021). Relationship between Nutrition Intake and Hemoglobin Levels in Toddlers Aged

12-24 Months. *Althea Medical Journal*, *8*(1), 1–11. https://doi.org/10.15850/amj.v8n1.2115

Nursasmita, R., Ayu Kristianti, N. P., & Mayasari Usman, A. (2024). The Relationship Between Female Adolescent's Perception of Stunting and Their Dietary Habits. *Health and Technology Journal (HTechJ)*, *2*(3), 240–247. https://doi.org/10.53713/htechj.v2i3.189

Odei Obeng-Amoako, G. A., Karamagi, C. A. S., Nangendo, J., Okiring, J., Kiirya, Y., Aryeetey, R., Mupere, E., Myatt, M., Briend, A., Kalyango, J. N., & Wamani, H. (2021). Factors associated with concurrent wasting and stunting among children 6–59 months in Karamoja, Uganda. *Maternal & Child Nutrition*, *17*(1), 1–11. https://doi.org/10.1111/mcn.13074

Radhika, M. S., Swetha, B., Kumar, B. N., Krishna, N. B., & Laxmaiah, A. (2018). Dietary and nondietary determinants of nutritional status among adolescent girls and adult women in India. *Annals of the New York Academy of Sciences*, *1416*(1), 5–17. https://doi.org/10.1111/nyas.13599

Rahma, A., Sholikhah, D. M., Cahyadi, N., Mulyani, E., Zuhroh, D. F., & Has, D. F. S. (2023). Nutrition Education and Assistance Based on Behavior Change in Adolescent Girls to Improve Nutritional Status and Hemoglobin Levels. *Media Gizi Indonesia*, *18*(3), 182–187. https://doi.org/10.20473/mgi.v18i3.182-187

Remans, R., Pronyk, P. M., Fanzo, J. C., Chen, J., Palm, C. A., Nemser, B., Muniz, M., Radunsky, A., Abay, A. H., Coulibaly, M., Mensah-Homiah, J., Wagah, M., An, X., Mwaura, C., Quintana, E., Somers, M.-A., Sanchez, P. A., Sachs, S. E., McArthur, J. W., & Sachs, J. D. (2011). Multisector intervention to accelerate reductions in child stunting: an observational study from 9 sub-Saharan African countries. *The American Journal of Clinical Nutrition*, *94*(6), 1632–1642. https://doi.org/10.3945/ajcn.111.020099

Santosa, A., Novanda Arif, E., & Abdul Ghoni, D. (2022). Effect of maternal and child factors on stunting: partial least squares structural equation modeling. *Clinical and Experimental Pediatrics*, *65*(2), 90–97. https://doi.org/10.3345/cep.2021.00094

Schreinemachers, P., Baliki, G., Shrestha, R. M., Bhattarai, D. R., Gautam, I. P., Ghimire, P. L., Subedi, B. P., & Brück, T. (2020). Nudging children toward healthier food choices: An experiment combining school and home gardens. *Global Food Security*, *26*(9), 1–11. https://doi.org/10.1016/j.gfs.2020.100454

Shinde, S., Madzorera, I., & Fawzi, W. W. (2021). Association of iron supplementation and dietary diversity with nutritional status and learning outcomes among adolescents: Results from a longitudinal study in Uttar Pradesh and Bihar, India. *Journal of Global Health*, *11*(7), 1–11. https://doi.org/10.7189/jogh.11.04037

Shinsugi, C., Matsumura, M., Karama, M., Tanaka, J., Changoma, M., & Kaneko, S. (2015a). Factors associated with stunting among children according to the level of food insecurity in the household: a cross-sectional study in a rural community of Southeastern Kenya. *BMC Public Health*, *15*(1), 441–449. https://doi.org/10.1186/s12889-015-1802-6

Shinsugi, C., Matsumura, M., Karama, M., Tanaka, J., Changoma, M., & Kaneko, S. (2015b). Factors associated with stunting among children according to the level of food insecurity in the household: a cross-sectional study in a rural community of Southeastern Kenya. *BMC Public Health*, *15*(1), 441–449. https://doi.org/10.1186/s12889-015-1802-6

Sukmawati, E., Marzuki, K., Batubara, A., Harahap, N. A., Efendi, E., & Weraman, P. (2023). The Effectiveness of Early Childhood Nutrition Health Education on Reducing the Incidence of Stunting. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *7*(4), 4002–4012. https://doi.org/10.31004/obsesi.v7i4.4846

van Tuijl, C. J. W., Madjdian, D. S., Bras, H., & Chalise, B. (2021). Sociocultural and economic determinants of stunting and thinness among adolescent boys and girls in Nepal. *Journal of Biosocial Science*, *53*(4), 531–556. https://doi.org/10.1017/S0021932020000358

Weatherspoon, D. D., Miller, S., Ngabitsinze, J. C., Weatherspoon, L. J., & Oehmke, J. F. (2019). Stunting, food security, markets and food policy in Rwanda. *BMC Public Health*, *19*(1), 882–890. https://doi.org/10.1186/s12889-019-7208-0

Woźniak, D., Podgórski, T., Dobrzyńska, M., Przysławski, J., Drzymała, S., & Drzymała-Czyż, S. (2022). The Influence of Parents' Nutritional Education Program on Their Infants' Metabolic Health. *Nutrients*, *14*(13), 1–11. https://doi.org/10.3390/nu14132671

Young, M. F., Nguyen, P. H., Gonzalez Casanova, I., Addo, O. Y., Tran, L. M., Nguyen, S., Martorell, R., & Ramakrishnan, U. (2018). Role of maternal preconception nutrition on offspring growth and risk of stunting across the first 1000 days in Vietnam: A prospective cohort study. *PLOS ONE*, *13*(8), 1–11. https://doi.org/10.1371/journal.pone.0203201