Journal of Health and Nutrition Research

Volume 3 No 2 (2024): 164-171
E-ISSN: 2829-9760 (Online)
Published by Media Publikasi Cendekia Indonesia
Journal homepage: https://www.journalmpci.com/index.php/jhnr
DOI: https://doi.org/10.56303/jhnresearch.v3i2.268

The Relationship Between Macro-Nutrient Intake, Food Security, and Nutrition-Related Knowledge with The Incidence of Stunting in Toddlers

Khansa Nabilah[1], Izna Nurdianty Muhdar*[1], Widya Asih Lestari[1], Sarina Sariman[2]

Correspondence e-mail: iznanurdianty@uhamka.ac.id

[1] Faculty of Health Sciences, Prof. Dr. Hamka Muhammadiyah University, Indonesia
[2] Faculty of Health and Life Sciences, Management and Science University, Malaysia

ABSTRACT

Stunting is a condition of impaired growth in toddlers due to prolonged nutritional deficiencies. This issue is a significant global nutritional problem, particularly in poor and developing countries, including Indonesia. This study aims to examine the relationship between macronutrient intake, food security at the household level, and nutrition-related knowledge on the incidence of stunting among toddlers in the working area of Cimarga Health Center. This study employed a cross-sectional design. The sample size consisted of 99 toddlers from 11 villages within the Cimarga Health Center's jurisdiction. Analysis was conducted using the Chi-Square test. The findings reveal a stunting prevalence of 34.3% among toddlers. There is a significant relationship between household food security (p=0.014) and the incidence of stunting (OR=1.630; 95% CI=1.381-1.923). However, no significant relationships were found between energy intake (p=0.140), carbohydrate intake (p=0.544), protein intake (p=0.607), fat intake (p=0.439), and maternal nutrition knowledge (p=0.411) with the incidence of stunting in toddlers in the Cimarga Health Center area. This study underscores the importance of enhancing household food security as a primary strategy to reduce stunting despite the lack of significant relationships between macro-nutrient intake and maternal nutrition knowledge.

ARTICLE INFO

ORIGINAL RESEARCH

Submitted: 10 August 2024
Accepted: 26 August 2024

Keywords:
Macro-Nutrient Intake, Food Security, and Nutrition-Related Knowledge, Stunting, Toddlers

Access this article online

Quick Response Code

Key Messages:

- Household Food Security as a Critical Determinant of Stunting: The research conducted at Cimarga Health Center indicates a significant correlation between household food security and the incidence of stunting among toddlers, with findings showing that improved food security could substantially reduce the risk of stunting. This underscores the need for targeted interventions to enhance food availability and accessibility at the household level as a primary strategy to combat this persistent global nutritional issue.

Introduction

Stunting is a condition of impaired growth in toddlers due to prolonged nutritional deficiencies. This issue has become one of the primary nutritional challenges globally, particularly in impoverished and developing nations, including Indonesia. According to data from UNICEF, WHO, and the World Bank Group (2021), approximately 149.2 million toddlers worldwide were affected by stunting in 2020 (1). Around 79 million toddlers in Asia experienced stunting, with Southeast Asia ranking second with a prevalence rate of 27.4 percent (2). In Indonesia, based on the 2018 Riskesdas survey, about 30.4 percent of children were stunted. Although the 2019 SSGBI data indicated a reduction in stunting prevalence to 27.7 percent, which further decreased to 24.4 percent in 2021 and 21.6 percent in 2022, these figures still exceed the RPJMN 2020-2024 target of 14 percent. The 2022 Indonesian Nutritional Status Survey (SSGI) reported that the stunting prevalence in Lebak Regency reached 26.2 percent, placing it third highest in Banten Province, and this figure remains above the regional prevalence of 20.0 percent (3,4). A variety of factors, both direct and indirect, cause stunting. Direct causes include

inadequate nutritional intake and infectious diseases. Indirect causes encompass social environments related to infant and child feeding practices, access to healthcare services, environmental conditions, including water and sanitation availability, and food security, particularly access to nutritious food (5).

Recent meta-analyses and literature reviews on factors associated with stunting in toddlers in developing countries indicate that low birth weight (LBW), toddler age, gender, household socioeconomic status (parental income/food security), maternal education (nutrition-related knowledge), and healthcare services, including caregiving practices and exclusive breastfeeding, are consistently influential risk factors for stunting in toddlers (6,7). The impact of stunting on children is profound, particularly on brain and cognitive development during the first 1,000 days of life. Children who experience stunting are at a higher risk of suboptimal intelligence, increased susceptibility to illnesses, and, later in life, a decline in productivity. In the long term, stunting can hinder a country's economic growth, elevate poverty levels, and widen economic disparities (8).

The Indonesian government has established various policies to accelerate the reduction of stunting, as outlined in the Presidential Regulation of the Republic of Indonesia Number 72 of 2021. These policies include Specific Interventions (addressing direct causes) and Sensitive Interventions (addressing indirect causes), implemented in a convergent, holistic, integrative, and high-quality manner through multisectoral cooperation at the central, regional, and village levels. In Lebak Regency, efforts to reduce stunting also involve forming a stunting reduction acceleration team and developing the innovative "Data Penting" program (Detection and Action for Stunting Concerned Children). However, data from the 2021 electronic Community-Based Nutrition Recording and Reporting (EPPGBM) in Lebak indicates that the working area of Cimarga Health Center is among the top five with the highest stunting prevalence, at 14.42 percent, with 302 cases of stunted children (9).

This study aims to examine the relationship between macronutrient intake, food security at the household level, and nutrition-related knowledge on the incidence of stunting among toddlers in the working area of Cimarga Health Center.

Methods

The type and design of this research employed a cross-sectional approach. The research was conducted within the working area of the Cimarga Community Health Center, located in Margajaya Village, Cimarga District, Lebak Regency. This health center was selected due to the presence of 302 children identified with stunting, a nutritional deficiency. The research was carried out from June to August 2023. Based on prior research and utilizing sample size software calculations, the minimum required sample size for this study was determined to be 45 respondents, with the socioeconomic status of parents being the variable requiring the largest minimum sample size. To achieve the same precision as simple random sampling, the design effect for the sample necessitates a sample size twice as large. Therefore, the calculated sample size was multiplied by a design effect of 2, resulting in 90 samples. To account for potential dropouts, an additional 10% was added to the sample size, bringing the final sample size to 99 respondents.

In this study, primary data was obtained from measurements of weight, length or height, and interviews with mothers.

1. Child Characteristics Data. Household identification data included: mother's name, mother's age, mother's highest education level, mother's occupation, father's occupation, child's name, child's gender, child's age, child's date of birth, number of family members, exclusive breastfeeding practices, and parental income.
2. Anthropometric Data. Anthropometric data included measurements of weight and height.
3. Child Intake Data. Child intake data was obtained through interviews using the SQ-FFQ (Semi Quantitative Food Frequency Questionnaire).
4. Food Security Data. Food security data was gathered through interviews using the SQ-FFQ (Semi Quantitative Food Frequency Questionnaire), then categorized into 9 food groups based on the FCS (Food Consumption Score) table and assigned weighted scores.
5. Maternal Knowledge on Nutrition Data. Data on maternal knowledge regarding nutrition was collected through a questionnaire consisting of 20 questions about child nutrition knowledge, administered through interviews.

Nutritional Status, following the measurement of the child's weight and height, the results are categorized into nutritional statuses based on the Height-for-Age index. The following categories are used for univariate analysis based on the Height-for-Age index: 0 = Severely Stunted (z-score < -3 SD), 1 = Stunted (z-score -3 SD to <-2 SD), 2 = Normal (z-score -2 SD to +3 SD), 3 = Tall (z-score > +3 SD). Energy and Macronutrient Intake, the average intake of energy, carbohydrates, protein, and fat is calculated using the SQ-FFQ (Semi Food Frequency Questionnaire) consumption survey method. The data is then

input into Nutrisurvey to determine the total energy intake. The categories for energy intake are as follows: 0 = Severe Deficit (<70%), 1 = Moderate Deficit (70-79%), 2 = Mild Deficit (80-89%), 3 = Normal (90-119%), 4 = Excess (if intake >120%). Food Security Data, food security data is derived from the FCS (Food Consumption Score) obtained from respondent answers, with the following categories: 0 = Poor <28, 1 = Adequate >28. Maternal Knowledge on Nutrition Data, data on maternal knowledge regarding nutrition is obtained from the questionnaire scores provided by respondents, categorized as follows: 0 = Poor (if questionnaire score <60%), 1 = Moderate (if questionnaire score 60-80%), 2 = Good (if questionnaire score >80%). The data analysis in this study employed both univariate and bivariate analyses. Bivariate analysis was conducted using the Chi-Square test with a significance level of $p < 0.05$, utilizing SPSS software.

Code of Health Ethics

Ethics Approval Letter with number 03/23.08/02802 from the Chairperson of the Health Research Ethics Committee (Non-Medical) of Muhammadiyah University Prof. DR. HAMKA dated August 7, 2023.

Results

The characteristics of the respondents include gender, number of family members, exclusive breastfeeding, and nutritional status based on height-for-age (H/A). The majority of the sample was male, accounting for 55.5%. Most toddlers were in the early childhood age group, representing 57.6%. Families with four members were the most common, comprising 27.2% of the sample. A significant 89.9% of children had a history of exclusive breastfeeding. The nutritional status based on height-for-age was predominantly normal, with 65.7% of the toddlers falling into this category, as shown in Table 1.

Table 1 Characteristics of Toddlers and Parents

Characteristics	n	%
Gender		
Male	55	55.5
Female	44	44.4
Age of Toddlers		
Early childhood (2-3 years)	57	57.6
Preschool (4-5 years)	42	42.4
Number of Household Members		
Small	53	53.5
Large	46	46.5
Exclusive Breastfeeding		
Not exclusively breastfed	10	10.1
Exclusively breastfed	89	89.9
Nutritional Status (Height-for-Age)		
Short	34	34.3
Normal	65	65.7
Father's Occupation		
Blue collar	85	85.8
White collar	14	14.1
Mother's Occupation		
Housewife	97	97.8
Working	2	2.0
Parental Income		
< Minimum Wage	63	63.6
> Minimum Wage	36	36.4
Total	**99**	**100**

Table 1 reveals that the majority of fathers were employed in blue-collar jobs, making up 85.8%, while most mothers were homemakers, accounting for 97.8%. The monthly income of parents was predominantly below the minimum wage of Lebak Regency, which is Rp. 2,944,655.46, with 63.6% of families falling into this category. Table 2 shows that the respondents' dietary intake was deficient only in carbohydrates, with a deficiency rate of 50.5%. In contrast, the intake of other macronutrients was adequate, with energy intake at 73.7%, protein intake at 98%, and fat intake at 73.7%. Table 2 indicates that the food security subsystem of dietary diversity was predominantly in the adequate category, with 88.9% of respondents falling into this category. This variable includes nine categorized food groups. Table 2 reveals that maternal nutrition-related knowledge was predominantly in the low knowledge

category, with 81.8% of mothers falling into this category. This variable was assessed using 20 questions to determine maternal nutrition knowledge.

Table 2 Dietary Intake, Food Security, Distribution of Food Security Responses, and Nutrition-Related Knowledge of Mothers

Variable	n	%
Dietary Intake		
Energy		
Insufficient	26	26.3
Sufficient	73	73.7
Protein		
Insufficient	2	2.0
Sufficient	97	98.0
Fat		
Insufficient	26	26.3
Sufficient	73	73.7
Carbohydrate		
Insufficient	50	50.5
Sufficient	49	49.5
Food Security		
Insufficient	11	11.1
Sufficient	88	88.9
Frequency Distribution of Food Security Responses		
Cereals and Tubers		
No Consumption	0	0
Consumption	99	100
Legumes		
No Consumption	7	7.1
Consumption	92	92.9
Vegetables		
No Consumption	6	6.1
Consumption	93	93.9
Fruits		
No Consumption	12	12.1
Consumption	87	87.9
Animal Protein		
No Consumption	12	12.1
Consumption	87	87.9
Milk		
No Consumption	76	76.8
Consumption	23	23.2
Sugar		
No Consumption	0	0
Consumption	99	100
Oil		
No Consumption	0	0
Consumption	99	100
Spices		
No Consumption	0	0
Consumption	99	100
Nutrition-Related Knowledge of Mothers		
Poor	81	81.8
Good	18	18.2
Total	**99**	**100**

Table 3 show that energy Intake, while there's a trend towards higher stunting prevalence with insufficient energy intake (46.2% vs. 30.1%), the difference is not statistically significant (p=0.140). Protein & Fat Intake, the sample sizes for insufficient protein and fat intake are very small, limiting any meaningful conclusions. Carbohydrate Intake, no significant association is observed between

carbohydrate intake and stunting (p=0.439). Food Security Subsystem Diversity, a significant association exists between food security subsystem diversity and stunting (p=0.014). Children with insufficient diversity in their food security subsystem have a higher likelihood of stunting (RR=1.630). Nutrition-Related Knowledge, no significant relationship is found between maternal nutrition-related knowledge and stunting in their children (p=0.411).

Table 3 Relationship Between Intake, Food Security, and Nutrition Knowledge on Stunting Incidence in Toddlers in the Cimarga Health Center Work Area

Variable	Stunting		Not Stunting		Total		P Value
	n	%	n	%	n	%	
Energy Intake							
Insufficient	12	46.2	14	53.8	26	100.0	0.140
Sufficient	22	30.1	51	69.9	73	100.0	
Protein Intake							
Insufficient	0	00.0	2	100.0	2	100.0	0.544
Sufficient	34	35.1	63	64.9	97	100.0	
Fat Intake							
Insufficient	10	38.5	16	61.5	26	100.0	0.607
Sufficient	24	32.9	49	67.1	73	100.0	
Carbohydrate Intake							
Insufficient	19	38.0	31	62.0	50	100.0	0.439
Sufficient	15	30.6	34	69.4	49	100.0	
Food Security Subsystem Diversity							
Insufficient	0	00.0	11	7.2	11	100.0	0.014
Sufficient	34	38.6	54	61.4	18	100.0	RR=1.630 (1.381-1.923)
Nutrition-Related Knowledge							
Poor	26	32.1	55	67.9	81	100.0	0.411
Good	8	44.4	10	55.6	18	100.0	

Discussion

The research findings indicate that the majority of subjects were male, both in the stunting category and with normal nutritional status. Most subjects (65.7%) had normal nutritional status, with 89.9% having a history of exclusive breastfeeding. The majority of respondents' parents had incomes below the minimum wage in Lebak Regency. An analysis of the characteristics of toddlers and their parents revealed that most fathers worked as laborers (85.8%), while most mothers were housewives (97.8%). Parental occupation influences family income, which impacts childcare practices and the fulfillment of toddlers' nutritional needs (10). Housewives tend to have more time to pay attention to toddlers' nutritional intake compared to working mothers, leading to a higher incidence of poor nutritional status among children of working mothers (11). However, working mothers can improve the family's economic condition, reducing economic dependence on the head of the household (12).

The relationship between energy intake and stunting incidence among toddlers aged 24-59 months in the working area of Cimarga Health Center shows no significant correlation between energy intake and stunting (P value 0.140 > α = 0.05). This is because 73.7% of toddlers have met their energy adequacy levels; even in the stunting group, the average energy intake exceeded 100% of the Recommended Dietary Allowance (RDA). This finding aligns with the research by Astutik et al. (2018), which also showed no relationship between energy intake levels and stunting in toddlers (p = 0.620) (13). Guidelines for toddler energy consumption vary by age; according to the Indonesian Ministry of Health Regulation No. 28 of 2019, the recommended daily energy intake for toddlers aged 1-3 years is 1350 kcal, and for those aged 4-6 years, it is 1400 kcal. Meeting nutritional needs, such as carbohydrates, proteins, and vitamins/minerals, is crucial to prevent diseases that hinder the growth and development of children, especially during the critical phase of 0-60 months. This study also shows that the proportion of toddlers with energy intake less than 100% of the RDA is higher among stunted toddlers (46.2%) compared to non-stunted toddlers with adequate energy intake (30.1%). The lowest recorded energy intake was 563.17 kcal per day (41% of the RDA), while the maximum intake reached 2108.40 kcal (153% of the RDA). Addressing the issue of inadequate energy intake in toddlers requires

collaboration between relevant agencies and mothers of toddlers, including regular education by posyandu cadres regarding the nutritional adequacy levels for toddlers above and below 24 months.

Research on the relationship between protein intake and stunting incidence among toddlers in the working area of Cimarga Health Center shows no significant correlation between protein intake and stunting. This is because the protein intake of toddlers in the area is generally sufficient, with parents regularly providing eggs or fish to their children. Stunting is likely a long-term process, so current protein intake is not a direct cause. This finding aligns with the research by Prandindita & Cahyati (2022), with a p-value of 0.089 (>0.05), both indicating no relationship between protein intake and stunting in toddlers (14). According to the Indonesian Ministry of Health Regulation No. 28 of 2019, the daily protein adequacy levels vary by age: 20 grams for toddlers aged 1-3 years and 25 grams for those aged 4-6 years. Protein is essential for growth, tissue maintenance, and immune function and can be obtained from animal sources (meat, chicken, eggs) and plant sources (tempeh, tofu, legumes). The study also shows that the lowest protein intake among toddlers was 16 grams per day (71% of the RDA), while the maximum intake reached 86.91 grams per day (3x the RDA). To address the issue of inadequate protein intake, health cadres should educate mothers of toddlers about nutritional adequacy levels, particularly protein, and the importance of providing high-protein foods such as fish, chicken, and legumes.

Bivariate analysis results indicate a significant relationship between household food security and the incidence of stunting among toddlers (P-value = 0.014). Toddlers from households with adequate food security have a 1.630 times lower risk of stunting compared to those from households with poor food security (95% CI 1.381-1.923). The proportion of stunting among toddlers from households with poor food security is 0%, while it is 38.6% among those from households with adequate food security. These findings are consistent with research conducted in Bayat Subdistrict, Klaten Regency (2018), which showed a relationship between food security, measured by the HDDS score, and stunting incidence (p-value = 0.024). The study noted that 85.4% of stunted toddlers had low dietary diversity or poor food security (15). In the working area of Puskesmas Cimarga, 88.9% of households with adequate food security utilize their yard to grow local vegetables or fruits, facilitating the fulfillment of food needs. Households with normal toddlers have a more diverse nutrient intake than those with stunted toddlers, who primarily consume energy-dense foods such as rice and noodles and carbohydrates like potatoes. Foods such as meat, poultry, offal, vegetables, fruits, eggs, legumes, and milk are less frequently consumed by households with stunted toddlers. However, stunted toddlers consume seafood and eggs at a higher percentage (12.1% difference) compared to those with normal nutritional status.

Bivariate analysis results indicate that there is no significant relationship between maternal nutrition knowledge and the incidence of stunting among toddlers in the working area of Puskesmas Cimarga (P-value = 0.514). This finding is consistent with the studies by Salman et al. (2017) (16) and Mutingah & Rokhaidah (2021)(17), which also showed no significant relationship between maternal nutrition knowledge and stunting (p = 0.877 and p = 0.100, respectively). Although some parents may not fully understand nutrition, they are aware of the types of food that their children should consume. Maternal nutrition knowledge can influence nutritional status, where higher maternal nutrition knowledge correlates with better child nutritional status. Nutrition knowledge affects attitudes and behaviors in food selection, ultimately impacting individual nutritional status (18). A lack of nutrition knowledge or the inability to apply it can lead to nutritional problems (19).

The analysis found that mothers with high nutrition knowledge had a lower proportion of stunting incidence (32.9%) compared to mothers with low nutrition knowledge (41.2%). This indicates that maternal nutrition knowledge influences the selection and variety of foods for toddlers, which is crucial in preventing stunting. Low maternal education can affect their nutrition knowledge, especially among those who did not continue their studies beyond elementary school. Data from BPS Kabupaten Lebak (2020) shows that many women did not complete elementary school (44.02%), which can affect their understanding of nutrition. According to Uliyanti et al. (2018), nutrition knowledge contributes 9.61% to the incidence of stunting, both directly and indirectly, through nutritional intake(20). Maternal nutrition knowledge plays a crucial role in determining toddlers' nutritional intake, which ultimately affects the incidence of stunting (21).

Conclusion

The present study found no significant association between macronutrient intake (energy, protein, fat, and carbohydrates) and the incidence of stunting among toddlers in the working area of Puskesmas Cimarga. However, household food security emerged as a critical factor influencing stunting risk. While maternal nutrition knowledge did not show a direct significant relationship with stunting in

this study, it remains an important area for further investigation. These findings underscore the need for comprehensive interventions to address stunting. Prioritizing strategies to enhance household food security, such as promoting diversified diets, home gardening, and social safety nets, is essential. Additionally, strengthening nutrition education programs for mothers and caregivers can contribute to improved child feeding practices.

Further research is warranted to explore the complex interplay between macronutrient intake, food security, maternal nutrition knowledge, and other potential determinants of stunting. Longitudinal studies can provide valuable insights into the long-term impact of these factors on child growth and development.

Conflicts of Interest: This research does not contain any elements of conflict of interest that are unprofessional as academics.

References

1. UNICEF, WHO, World Bank. Levels and trends in child malnutrition, UNICEF/WHO/World Bank Group – Joint Child Malnutrition Estimates 2021 edition. UNICEF; 2021.
2. FAO. Asia and the Pacific Regional Overview of Food Security and Nutrition 2018 – Accelerating progress towards the SDGs. Bangkok: Food and Agriculture Organization; 2018. 96 p.
3. Kementerian Kesehatan Republik Indonesia. Laporan Riset Kesehatan Dasar Tahun 2018 (Indonesian National Basic Health Survey in 2018). Jakarta: Kementerian Kesehatan Republik Indonesia; 2018.
4. Kementerian Kesehatan Republik Indonesia. Laporan Survei Status Gizi Indonesia (Indonesian Nutrition Survey Status Report). Jakarta: Kementerian Kesehatan Republik Indonesia; 2021.
5. Permatasari TAE, Chadirin Y, Ernirita, Elvira F, Putri BA. The association of sociodemographic, nutrition, and sanitation on stunting in children under five in rural area of West Java Province in Indonesia. J Public Health Res. 2023 Aug 30;12(3):22799036231197169.
6. Falmuariat Q, Febrianti T, Mustakim M. Risk Factors for Stunting in Toddlers in Developing Countries. Jurnal Ilmiah Kesehatan Sandi Husada. 2022 Dec 1;11(2):308–15.
7. Tebi, Dahlia, Wello EA, Safei I, Rahmawati, Juniarty S, et al. Literature Review Faktor-Faktor yang Mempengaruhi Terjadinya Stunting pada Anak Balita. Fakumi Medical Journal: Jurnal Mahasiswa Kedokteran. 2021;1(3):234–40.
8. Prendergast AJ, Humphrey JH. The stunting syndrome in developing countries. Paediatr Int Child Health. 2014 Apr;34(4):250–65.
9. Pemerintah Provinsi Banten. Laporan Penyelenggaraan Percepatan Penurunan Stunting Semester I Di Provinsi Banten [Internet]. Pemerintah Provinsi Banten; 2023. Available from: https://aksi.bangda.kemendagri.go.id/emonev/assets/uploads/laporan_pro/laporan_pro_36_periode_5_1689944093.pdf
10. Rahayuwati L, Komariah M, Sari CWM, Yani DI, Hermayanti Y, Setiawan A, et al. The Influence of Mother's Employment, Family Income, and Expenditure on Stunting Among Children Under Five: A Cross-Sectional Study in Indonesia. J Multidiscip Healthc. 2023 Aug 14;16:2271–8.
11. Butarbutar MC, Alza Y, Atasasih H. Mother's Knowledge Level, Eating Habits and Nutritional Status of Children (3-5 years). INCH : Journal of Infant And Child Healthcare. 2022;1(1):1–6.
12. Cerrato J, Cifre E. Gender Inequality in Household Chores and Work-Family Conflict. Front Psychol [Internet]. 2018 Aug 3 [cited 2024 Aug 22];9. Available from: https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2018.01330/full
13. Astutik A, Rahfiludin MZ, Aruben R. Faktor Risiko Kejadian Stunting Pada Anak Balita Usia 24-59 Bulan (Studi Kasus Di Wilayah Kerja Puskesmas Gabus Di Kabupaten Pati Tahun 2017). Jurnal Kesehatan Masyarakat. 2018 Jan 2;6(1):409–18.
14. Pranindita SK, Cahyati WH. Stunting pada Balita Usia 24-59 Bulan. HIGEIA. 2022;6(4):191–202.
15. Widyaningsih NN, Kusnandar K, Anantanyu S. Keragaman pangan, pola asuh makan dan kejadian stunting pada balita usia 24-59 bulan. JGI. 2018 Dec 30;7(1):22–9.
16. Lukman S, Arbie FY, Humolungo Y. Hubungan Pengetahuan Gizi Ibu Dengan Kejadian Stunting Pada Anak Balita Di Desa Buhu Kecamatan Talaga Jaya Kabupaten Gorontalo. Journal Health and Nutritions. 2018 Mar 19;3(1):42–53.
17. Mutingah Z, Rokhaidah R. Hubungan Pengetahuan Dan Sikap Ibu Dengan Perilaku Pencegahan Stunting Pada Balita. Jurnal Keperawatan Widya Gantari Indonesia. 2021 Sep 27;5(2):49.
18. Nizmah N, Reski S, Wahyunigrum DR, Cahyono J. The Relationship of Balanced Nutrition Knowledge with the Attitudes and Behaviors of Young Women. J Health Nutr Res. 2024 Apr 10;3(1):91–8.

19. Spronk I, Kullen C, Burdon C, O'Connor H. Relationship between nutrition knowledge and dietary intake. British Journal of Nutrition. 2014 May;111(10):1713–26.
20. Uliyanti U, Tamtomo DG, Anantanyu S. Faktor Langsung dan Tidak Langsung Yang Berhubungan Dengan Kejadian Stunting Pada Anak Usia 24–59 Bulan Di Kecamatan Matan Hilir Selatan. JVK. 2017 Jul 31;3(2):67.
21. Saleh A, Syahrul S, Hadju V, Andriani I, Restika I. Role of Maternal in Preventing Stunting: a Systematic Review. Gaceta Sanitaria. 2021 Jan 1;35:S576–82.