APGHN
Archives of Pediatric Gastroenterology, Hepatology, and Nutrition

Original Article

Risk Factors of Stunted Children Aged 0-23 Months at Jatibaru Public Health Center Bima, West Nusa Tenggara: A Case Control Study

Khafifah Puja Atmalia[1,2], Rania Reiza Faris Balfas[1], Nurfathonah Aryana[1], Wulandari Hidayat[3], Nina Dwi Putri[2]

[1]Jatibaru Public Health Center, Bima, West Nusa Tenggara

[2]Department of Child Health, Faculty of Medicine, Universitas Indonesia, Cipto Mangunkusumo Hospital, Jakarta, Indonesia

[3]Bima Regional Public Hospital, Bima, West Nusa Tenggara

e-ISSN: 2830-5442

Corresponding author:
Khafifah Puja Atmalia
khafifahpuja08@gmail.com

Published:
31st May 2025

DOI:
https://doi.org/10.58427/apghn.4.2.2025.51-61

Citation:
Atmalia KP, Balfas RRF, Aryana N,Hidayat W, Putri ND. Risk factors of stunted children aged 0-23 months at Jatibaru Public Health Center, Bima, West Nusa Tenggara: a case-control study. *Arch Pediatr Gastr Hepatol Nutr.* 2025;4(2).51-61

Abstract:

Background: Nutritional status in children under-five profoundly affects linear growth, cognitive development, and long-term disease. Stunting, defined as a child being too short for their age, results from prolonged malnutrition, particularly in the first 1000 days. In West Nusa Tenggara (NTB), stunting prevalence is the fourth highest at 32.7%, with 31.2% affected in Bima. This study aims to compare previous exposure between stunted children and non - stunted children in primary health care settings in Bima.

Methods: A case-control study was conducted involving children aged 0–23 months who accessed integrated health services, bring a Maternal and Child Health Book (MCH), and had recorded health data at the Jatibaru Primary Health Center. Children with congenital anomalies were excluded. Maternal and child-related risk factors were assessed through anthropometric measurements (WHO standards) and structured interviews with validated questionnaire. Bivariate analysis (Chi-square, $p < 0.25$) was followed by multivariate logistic regression ($p < 0.05$).

Result: A total of 124 participants were included (62 cases, 62 controls). Multivariate analysis revealed that maternal factors significantly associated with stunted growth in children were poor nutritional status (AOR 7.519, $p = 0.000$) and low nutrition knowledge (AOR 6.930, $p = 0.000$). Among child-related factors, stunted children were significantly associated with low birth weight (AOR 17.013, $p = 0.000$) and inadequate breastfeeding (AOR 7.434, $p = 0.006$).

Conclusion: The mother's nutritional status and children's birth weight are the main risk factors of stunted children. Targeted interventions addressing maternal education and perinatal care are recommended to reduce stunting prevalence.

Keyword: children, mothers, risk factors, stunting

Introduction

Stunting is a condition of failure to thrive in children under five years of age due to chronic malnutrition and recurrent infections, especially in the first 1,000 days of life, from fetus to 23 months of age.[1] One of the most critical risk factor is maternal nutritional status during pregnancy; mothers suffering from chronic energy deficiency or micronutrient deficiencies (such as iron, folate, and iodine) are more likely to give birth to low birth weight (LBW) infants, who are at significantly higher risk of experiencing linear growth faltering.[2] This risk is further compounded by inadequate exclusive breastfeeding, suboptimal complementary feeding practices, recurrent infections, poor parental knowledge on nutrition, limited access to health services, and insufficient sanitation. The synergistic effects of these factors often create a vicious cycle of undernutrition and illness, making it difficult for affected children to achieve optimal growth without targeted and sustained interventions.[3]

The national prevalence of stunting in 34 provinces in Indonesia from 2021 to 2022 decreased from 24.4% to 21.6%. However, according to World Health Organization (WHO), this incidence rate is still classified as high (>20%).[4] West Nusa Tenggara (NTB) Province in 2022 ranks fourth highest in Indonesia for the prevalence of stunting toddlers at 32.7%. In 2022, there were 9 clinically diagnosed cases of severe malnutrition with comorbidities requiring hospitalization, and 23 cases (1.12%) of severe malnutrition based on weight-for-height (WHZ), along with 173 children (8.62%) categorized as moderately undernourished. According to data from the 2022 EPPGBM (Electronic Community-Based Nutrition Recording and Reporting System), 253 children under five (12.34%) were identified as stunting out of 2,051 children assessed. Jatibaru Health Center serves the largest population among all primary health care facilities in Bima. Based on the latest data from May 2024, Jatibaru Health Centre has 243 (14.86%) stunting children under five.[4] This highlights stunting as a health problem in Jatibaru that still requires close attention.

The government is targeting 14% reduction in stunting rates by 2024 through the National Strategy (Stranas) program. The program is divided into two, namely specific and sensitive nutrition services. Specific nutrition services are nutrition interventions across health programs that target the direct causes of stunting, including lack of food and nutrient intake and infectious diseases. While sensitive nutrition interventions are interventions implemented by cross-sectoral non-governmental organization (NGO) health programs.[5]

Diagnosis of stunting was confirmed by history taking, physical examination, and anthropometric measurements (based on the index of body length or height according to age and sex (PB/U or TB/U) <-2 SD according to the WHO 2006 growth chart for children aged 0-5 years).[6] The purpose of this study was to determine the risk factors that influence the occurrence of stunting in toddlers in the Jatibaru Health

Centre working area. In order to support the achievement of the Stranas for the Acceleration of Stunting Prevention 2018-2024 and National Medium-Term Development Plan 2020-2024, Puskesmas Jatibaru as a primary healthcare facility must know the factors that cause stunting in toddlers in the working area in order to prepare quality and specific nutrition intervention programs and in accordance with the problems that occur.[5] This study identified several maternal and child-related factors that were significantly associated with the incidence of stunted growth, which is key factor of stunting.

Method

This analytical study used a case control approach that examines the relationship between certain effects (stunted and non-stunted) and certain risk factors (with risk factor and without risk factor). Data collection was carried out at the Jatibaru Health Centre Hall from 1 to 26 June 2024 and has received approval from from Jatibaru Public Health Center. Inclusion of this study were all infants aged 0 - 23 months who took anthropometric measurements, had data recorded at Health Centre Hall Jatibaru, Bima City, had a maternal and child health book (MCH), lived in the study area, and parents were willing to participate by filling out informed consent. Toddlers whose parents were not willing to participate or had congenital abnormalities were excluded. The data was aggregated to be in case with stunted and control group without stunted. Stunted definition based on Z-score of PB/U or TB/U <-2 SD on the WHO growth chart.

The sample size and sampling technique used total sampling, with case-to-control ratio of 1:1. Risk factors were categorized into two groups: maternal and child-related factors. Maternal risk factors included maternal education, socioeconomic status, pregnancy nutritional status, nutritional knowledge, and employment status. Child-related risk factors comprised birth weight, breastfeeding practices, history of infections, and immunization status. All of data was obtained directly from the field by taking anthropometric measurements who were conducted by trained health personnel using calibrated equipment following WHO standards. The Health Department supplied the GEA brand anthropometric tools. Maternal nutritional knowledge was evaluated using a questionnaire consisting of 14 yes-or-no questions. Participants who answered "no" to more than 7 questions were classified as having poor nutritional knowledge.[7] Pregnancy nutritional status was determined from data recorded in the MCH book. Mothers are classified as having chronic energy deficiency (CED) if their mid-upper arm circumference (MUAC) is less than 23.5 cm. For child-related risk factors, birth weight and immunization status were also obtained from the MCH book. Other risk factor data was gathered through structured interviews.

Data analysis used univariate, bivariate (Chi-square), and multivariate (Multivariate logistic regression analysis) methods. Before analysis, a completeness check was carried out on the collected data, coding, and data tabulation with the SPSS v.26.0.

Result

Study Characteristic

This study involved 124 pairs of mother and child, consisting of 62 cases and 62 controls. From the analysis of the characteristics of mothers and children in this study, 41.9% of mothers had Chronic Energy Deficiency (CED). Most mothers (84.7%) were unemployed, which may affect social and economic support in child care. 73.4% of mothers had a high level of education. However, 74.2% came from low socio-economic backgrounds, which risks hindering access to health and nutrition services. 29.8% of children were born with low birth weight (LBW), 75.8% were breastfed, but 62.9% had infections, and 33.1% were not fully immunized.

Maternal and Child-Related Risk Factors of Stunted

In the bivariate analysis, maternal factors such as nutrition knowledge, nutritional status, and employment status showed significant differences between the two groups. In the stunted group, chronic energy deficiency (CED) was more common (67.7%) compared to the non-stunted group (16.1). Additionally, employed mothers were more frequently found in the stunted group (14% vs 5%).

Regarding child-related factors, birth weight, breastfeeding status, and history of infections also showed significant differences between the groups. Low birth weight was more prevalent in the stunted group (51.6) than in the non-stunted group (8%). Furthermore, children in the stunted group were less likely to be breastfed (59.6%) compared to those in the non-stunted group (91.9%). The results of the bivariate analysis are presented in **Table 1**.

Based on the multivariate analysis, several maternal factors were significantly associated with the outcome. The most influential was the nutritional status of the mother **(**AOR = 7.519; 95% CI: 2.728–20.729; p = 0.000), indicating that poor maternal nutrition greatly increases the risk. This was followed by maternal knowledge (AOR = 6.930; 95% CI: 2.375–20.216; p = 0.000), showing that mothers with better knowledge had a significantly lower risk. Meanwhile, maternal employment (AOR = 0.303; 95% CI: 0.046–2.005; p = 0.216), education (AOR = 0.957; 95% CI: 0.298–3.081; p = 0.942), and socioeconomic status (AOR = 0.580; 95% CI: 0.161–2.094; p = 0.406) were not significantly associated with the outcome.

Among child-related factors, the most significant was birth weight (AOR = 17.013; 95% CI: 3.318–29.112; p = 0.000), where low birth weight dramatically increased the risk. Breastfeeding also showed a significant association (AOR = 7.434; 95% CI:

0.063–0.637; p = 0.006), suggesting a strong protective effect. However, infection (AOR = 0.825; 95% CI: 0.264–1.630; p = 0.364) and immunization (AOR = 0.912; 95% CI: 0.253–1.605; p = 0.340) were not found to be significantly associated. The multivariate analysis is summarized in **Table 2.**

Table 1. Association Between Maternal and Child Characteristics with Stunted Children Prevalence

Characteristics	Stunted (Yes) n (%)	Stunted (No) n (%)	P-value
Mother			
Maternal Education			
- Low	17 (27.4)	16 (25.8)	0.825
- High	45 (72.5.3)	46 (74.1)	
Socioeconomic Status			
- Low Income	41 (66.1)	51 (82.2)	0.149
- Middle Income	21 (33.8)	11 (17.7)	
Maternal Nutrition Knowledge			
- Poor Knowledge	40 (64.5)	62 (100.0)	0.000
- Good Knowledge	22 (35.4)	0 (0.0)	
Maternal Nutrition			
- Chronic Energy Deficiency	42 (67.7)	10 (16.1)	0.000
- Normal	20 (32.2)	52 (83.8)	
Maternal Employment			
- Unemployed	48 (77.4)	57 (91.9)	0.007
- Employed	14 (22.5)	5 (8.0)	
Child			
Birth Weight			
- Low Birth Weight (LBW)	32 (51.68)	5 (8.0)	0.000
- Normal Birth Weight	30 (48.3)	57 (91.9)	
Breastfeeding			
- Not Breastfed	25 (40.3)	5 (8.0)	0.000
- Breastfed	37 (59.6)	57 (91.9)	
Infections			
- Yes	33 (53.2)	45 (72.5)	0.026
- No	29 (46.7)	17 (27.4)	
Immunization Status			
- Incomplete	25 (40.3)	16 (25.8)	0.086
- Complete	37 (59.6)	46 (74.1)	

Table 2. Multivariate analysis of risk factors of stunted children

Variable	AOR	Confidence Interval		p-value
		under 95%	above 95%	
Mother				
Nutritional status	7.519	2.728	20.729	0.000
Nutrition knowledge	6.930	2.375	20.21	0.000
Maternal education	0.957	0.298	3.081	0.942
Employment status	0.303	0.046	2.005	0.216
Socioeconomic Status	0.580	0.160	2.094	0.406
Child				
Birth weight	17.013	3.318	29.11	0.000
Breastfeeding	7.434	0.063	0.067	0.006
History of infection	0.825	0.264	1.630	0.364
Immunization status	0.912	0.253	1.605	0.340

Discussion

Stunting in children under-five is a complex and multidimensional chronic nutritional problem, involving various interacting factors that affect children's growth and development. Key factors contributing to stunting include maternal nutritional status, exclusive breastfeeding and complementary feeding, recurrent infections, family socio-economic conditions, and access to adequate health and sanitation services. Each of these factors can exacerbate the child's condition, creating a cycle that is difficult to break without effective intervention.[8]

This study identified several maternal and child-related factors that were significantly associated with the incidence of stunted. The most dominant maternal factor was nutritional status (AOR = 7.519; 95% CI: 2.728–20.729; p = 0.000), confirming that inadequate maternal nutrition significantly increases the risk of stunted children. Poor intake of macronutrients (protein, fat, total energy) and essential micronutrients (iron, folic acid, zinc, calcium) during pregnancy can impair intrauterine growth, leading to low birth weight (LBW), stunting, and higher perinatal mortality rates. Nutritional status can be assessed through mid-upper arm circumference (MUAC), where values below 23.5 cm indicate chronic energy deficiency (CED), increasing the risk of fetal growth restriction and poor postnatal development.[9, 10] A study in Ethiopia also reported that maternal undernutrition was a key determinant of stunting, highlighting the intergenerational cycle of malnutrition.[11]

The second strongest maternal factor was nutritional knowledge (AOR = 6.930; 95% CI: 2.375–20.216; p = 0.000), showing that mothers with better knowledge of nutrition were significantly less likely to have stunted children. Similarly, research in Indonesia found that lack of knowledge on child feeding practices increased the likelihood of stunting in children.[12] Interestingly, this study found no significant

association between maternal education and stunted children (AOR = 0.957; p = 0.942), contrasting with studies that link lower education to higher risk.[13] This may suggest that knowledge-based interventions may be more effective than solely improving educational attainment.[14] This supports previous findings that adequate maternal knowledge—regardless of formal education level—improves child-feeding practices and care behaviors, ultimately reducing stunting risk.[14, 15]

Additionally, in multivariate analysis maternal employment did not show a significant association (AOR = 0.303; p = 0.216), differing from earlier research that suggested employment, particularly in low-income or rural settings, reduces time available for child care, increasing stunting risk.[15] Socioeconomic status significantly affects a family's capacity to meet the nutritional needs of children under five. It also influences decisions regarding supplementary food choices, meal schedules, and adherence to healthy lifestyle practices. Children from low-income households with working mothers have a higher risk of stunting compared to those from high-income households.[16, 17] However, this study showed no significant correlation between socioeconomic status and the occurrence of stunted growth in children (AOR = 0.580; p = 0.406), in line with the study by Aida et al.,[18] which found that there was no correlation between socioeconomic status and the occurrence of stunting. Socioeconomic status was not significantly associated with stunted in this study, potentially due to sample homogeneity or stronger effects from biological and behavioral factors.[19]

From the child-related variables, low birth weight was the strongest predictor of stunted growth in children (AOR = 17.013; 95% CI: 3.318–29.112; p = 0.000). Inadequate fetal growth due to maternal malnutrition is a primary contributor to LBW, which significantly impairs early linear growth.[9, 10] Exclusive breastfeeding was also significantly associated with reduced stunted growth in children (AOR = 7.434; 95% CI: 0.063–0.637; p = 0.006), reinforcing global recommendations for optimal infant feeding during the first six months of life.[20] In contrast, infection and immunization were not significantly associated with stunted children in this study, although both factors remain important for overall child health and resilience.

This study revealed that birth weight is the most significant factor associated with stunted growth in children (AOR = 17.013; 95% CI: 3.318–29.112; p = 0.000). Aryastami et al.[21] revealed that infants born with low birth weight are highly vulnerable and face increased health risks, including morbidity, mortality, infectious diseases, underweight status, and are 1.74 times more likely to be stunting during the neonatal period and early childhood compared to infants born with normal weight, which is in line with the results of this study. Child stunting is often the result of growth delays that occur in utero, known as intrauterine growth retardation (IUGR).[9] Study

conducted in India, indicated that children with low birth weight were almost four times more likely to be stunted. [22]

This study showed a breastfeeding practice as a significant risk factor (AOR = 7.434; 95% CI: 0.063–0.637; p = 0.006). Low nutrient density and poor-quality complementary foods contribute to nutrient deficiencies and illness in children, leading to early malnutrition. The results of this study are consistent with those of Wicaksono[13] that non-exclusive breastfeeding is associated with higher rates of stunting. Some studies have suggested that exclusive breastfeeding for the first six months of life may have a protective effect against stunting, as breast milk provides essential nutrients, antibodies and bioactive components that support optimal growth and development, and early initiation of breastfeeding may contribute to this protective effect.[23, 24] However, other studies have found no direct association or even a positive correlation between prolonged breastfeeding and increased risk of stunting.[8] These contradictory findings may be influenced by factors such as maternal nutritional status, complementary feeding, and the presence of underlying health conditions or environmental factors that may affect child growth.[25]

During the first 1000 days of life, the absence of immunization is known to increase the risk of stunting; however, in this study, no significant association was found (p-value = 0.086), which is consistent with findings from studies conducted in West Sumatra and by Sutriyawan et al.[26, 27] As the child does not gain passive immunity, is more susceptible to infections, has a decreased appetite, and may have impaired nutrient absorption leading to stunting. There is also a reciprocal relationship between infection and malnutrition. Children with frequent infections are more likely to be malnourished, while malnourished children are more susceptible to infections. These findings are consistent with previous studies conducted in Bangladesh,[28] which showed that inadequate sanitation leads to excess bacterial proliferation in the gut, decreasing probiotic levels, thus causing inflammation and malabsorption of nutrients, ultimately contributing to stunting.[16, 17] Similarly, this study found a significant association between infections and stunted growth (p = 0.026). In the multivariate analysis, interestingly the presence of childhood infections (OR 0.825; 95% CI 0.264–1.630; P = 0.364) was not a significant risk factor for stunted growth in this study, although other literature often points to recurrent infections—particularly diarrheal diseases—as contributors to poor nutrient absorption and growth delays.[29] Likewise, immunization history (OR 0.912; 95% CI 0.253–1.605; P = 0.340) showed no significant association with stunted children, contrasting with evidence from other studies where complete immunization was correlated with improved child health outcomes and reduced stunting prevalence.[30] These differences may be attributed to variations in population characteristics, sample sizes, or public health infrastructure between study areas. Nonetheless, the current findings underscore the critical role of

maternal factors in preventing child stunting and support ongoing efforts to improve maternal nutrition, knowledge, and support for early childcare practices.

Although the analysis of risk factors of stunted growth has been widely conducted in various regions, such data remain unavailable specifically for the Bima region. Nevertheless, such data are essential to guide targeted and effective stunting prevention interventions for children in Bima. In summary, maternal nutritional status, maternal knowledge, birth weight, and exclusive breastfeeding were the most significant determinants of stunted growth in this population. These findings emphasize the urgent need to enhance maternal nutritional support and health literacy —especially during the preconception and pregnancy periods—through integrated public health programs.[9, 14, 15] Future studies are recommended to explore a broader range of risk factors with larger sample sizes. Additionally, implementing intervention studies that assess outcomes before and after the intervention would provide valuable evidence on the effectiveness of specific strategies to prevent stunting.

Conclusion

This study identified several significant maternal and child-related factors associated with stunted. Poor maternal nutrition knowledge, chronic energy deficiency, and maternal status employment were significant risk factors, with poor maternal nutritional presenting the highest risk. Among child-related factors, low birth weight, inadequate breastfeeding, and a history of infections were significantly associated with increased stunted prevalence, with low birth weight emerging as the strongest predictor. These findings underscore the need for targeted maternal nutritional support and preventive child health strategies to reduce the risk of stunted, which, if not addressed early, can result in stunting.

Acknowledgement

Thank you for the participant and community health volunteers from the primary health center who assisted with data collection in the field.

Conflict of Interest

None declared

Funding Statement

The authors received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

References

1. Tim Nasional Percepatan Penanggulangan Kemiskinan. Strategi nasional percepatan pencegahan anak kerdil (stunting) periode 2018–2024. Jakarta: Kemeterian Koordinator Bidang Pembangunan Manusai dan Kebudayaan; 2018.
2. Sana, Sajid I, Khan SA, Hussain S, Masood Ur R, Adnan MS. Maternal nutrition and its impact on low birth weight in newborns. Indus Journal of Bioscience Research. 2025;3(1):236-44. https://doi.org/10.70749/ijbr.v3i1.482
3. Saaka M, Saapiire FN, Dogoli RN. Independent and joint contribution of inappropriate complementary feeding and poor water, sanitation and hygiene (wash) practices to stunted child growth. J Nutr Sci. 2021;10:e109. https://doi.org/10.1017/jns.2021.103
4. Kementrian Kesehatan Republik Indonesia. Buku saku hasil survei status gizi Indonesia (SSGI) 2022. Jakarta: Kemenkes RI; 2022.
5. Kementrian Kesehatan Republik Indonesia. Pedoman manajemen pelayanan gizi spesifik di Puskesmas untuk percepatan penurunan stunting di Indonesia. Jakarta: Kemenkes RI; 2021.
6. Kementrian Kesehatan Republik Indonesia. Keputusan Menteri Kesehatan Republik Indonesia Nomor HK.01.07/Menkes/1928/2022 tentang Pedoman Nasional Pelayanan Kedokteran Tata Laksana Stunting. Jakarta: Kemenkes RI; 2022.
7. Sukiman M, Bamahry A, Irwan A, Laddo N, Arifin A. Faktor-faktor risiko terjadinya stunting pada balita di Puskesmas Kassi-Kassi Kota Makassar periode Januari 2022. Fakumi Medical Journal: Jurnal Mahasiswa Kedokteran. 2022;2:656-67. https://doi.org/10.33096/fmj.v2i9.121
8. Alifariki L, Haryati H, Rahmawati R, Sukurni S, Salma W. Risk factors of stunting in children age 24-59 months old. Media Keperawatan Indonesia. 2020;3:10. https://doi.org/10.26714/mki.3.1.2020.10-16
9. Sjarif DR, Yuliarti K. Petunjuk teknis berbasis bukti: diagnosis dan tata laksana stunting secara komprehensif untuk dokter spesialis anak. Jakarta: Ikatan Dokter Anak Indonesia; 2024.
10. Young MF, Nguyen PH, Gonzalez Casanova I, Addo OY, Tran LM, Nguyen S, et al. 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. 2018;13(8):e0203201. https://doi.org/10.1371/journal.pone.0203201
11. Anato A, Baye K, Tafese Z, Stoecker BJ. Maternal depression is associated with child undernutrition: a cross-sectional study in Ethiopia. Matern Child Nutr. 2020;16(3):e12934. https://doi.org/10.1111/mcn.12934
12. Sari M, Pee S, Bloem M, Sun K, Thorne-Lyman A, Moench-Pfanner R, et al. Higher household expenditure on animal-source and nongrain foods lowers the risk of stunting among children 0-59 months old in Indonesia: implications of rising food prices. The Journal of nutrition. 2009;140:195S-200S. https://doi.org/10.3945/jn.109.110858
13. Wicaksono RA, Arto KS, Mutiara E, Deliana M, Lubis M, Batubara JRL. Risk factors of stunting in Indonesian children aged 1 to 60 months. Paediatrica Indonesiana. 2021;61(1):12-9. https://doi.org/10.14238/pi61.1.2021.12-9
14. Nirmalasari NO. Stunting pada anak: penyebab dan faktor risiko stunting di Indonesia. QAWWAM : Journal for gender mainstreaming. 2020;14(1):19-28. https://doi.org/10.20414/qawwam.v14i1.2372
15. Rufaida F, Raharjo A, Handoko A. The correlation of family and household factors on the incidence of stunting on toddlers in three villages Sumberbaru Health Center Work Area of Jember. Journal of Agromedicine and Medical Sciences. 2020;6:1. https://doi.org/10.19184/ams.v6i1.9541
16. Nurkomala S, Nuryanto N, Panunggal B. Praktik pemberian mpasi (makanan pendamping air susu ibu) pada anak stunting dan tidak stunting usia 6-24 bulan. Journal of Nutrition College. 2018;7:45. https://doi.org/10.14710/jnc.v7i2.20822
17. Nurdin SS, Katili D, Fikar Z. Faktor ibu, pola asuh anak, dan mpasi terhadap kejadian stunting di Kabupaten Gorontalo. Jurnal Riset Kebidanan Indonesia. 2019;3:19. https://doi.org/10.32536/jrki.v3i2.57
18. Aida AN. Pengaruh kondisi sosial ekonomi terhadap kejadian stunting di Indonesia. Jurnal Budget: Isu dan Masalah Keuangan Negara. 2019;4(2):1250140.
19. Suhaerudin S, Sumardi A, juliane C. Linear regression analysis to measure the correlation between poverty rate and stunting rate. sinkron. 2023;8:2635-40. https://doi.org/10.33395/sinkron.v8i4.13007
20. Purwaningsih D, Sudarmi S. Analysis of determinants of exclusive breastfeeding in breastfeeding mothers. Jurnal Kesehatan. 2024;15:472-8. https://doi.org/10.26630/jk.v15i3.4799
21. Aryastami NK, Shankar A, Kusumawardani N, Besral B, Jahari AB, Achadi E. Low birth weight was the most dominant predictor associated with stunting among children aged 12–23 months in Indonesia. BMC Nutrition. 2017;3(1):16. https://doi.org/10.1186/s40795-017-0130-x
22. Halli SS, Biradar RA, Prasad JB. Low birth weight, the differentiating risk factor for stunting among preschool children in India. Int J Environ Res Public Health. 2022;19(7). https://doi.org/10.3390/ijerph19073751

23. Utami AR, Nurhaeni N. Factors contributing to catch-up growth of child with stunting: a literature review. STRADA: Jurnal Ilmiah Kesehatan. 2021;10(1):350-9. https://doi.org/https://doi.org/10.30994/sjik.v10i1.638
24. Scheffler C, Bogin B, Hermanussen M. Catch-up growth is a better indicator of undernutrition than thresholds for stunting. Public Health Nutr. 2021;24(1):52-61. https://doi.org/10.1017/s1368980020003067
25. Saadah N, Yumni H, Mugianti S, Yulianto B. Analysis of stunting risk factors in children in the Magetan district. Jurnal Berkala Epidemiologi. 2022;10:265-73. https://doi.org/10.20473/jbe.V10I32022.265-273
26. Vasera RA, Kurniawan B. Hubungan pemberian imunisasi dengan kejadian anak stunting di Puskesmas Sungai Aur Pasaman Barat tahun 2021. Jurnal Kedokteran STM (Sains dan Teknologi Medik). 2023;6(1):82-90. https://doi.org/10.30743/stm.v6i1.376
27. Sutriyawan A, Kurniawati RD, Rahayu S, Habibi J. Hubungan status imunisasi dan riwayat penyakit infeksi dengan kejadian stunting pada balita: studi retrospektif. Journal of Midwifery. 2020;8(2):1-9. https://doi.org/10.37676/jm.v8i2.1197
28. Tjandrawinata RR, Amalia N, Tandi YYP, Athallah AF, Afif Wibowo C, Aditya MR, et al. The forgotten link: how the oral microbiome shapes childhood growth and development. Frontiers in Oral Health. 2025;Volume 6 - 2025. https://doi.org/10.3389/froh.2025.1547099
29. Checkley W, Buckley G, Gilman RH, Assis AM, Guerrant RL, Morris SS, et al. Multi-country analysis of the effects of diarrhoea on childhood stunting. Int J Epidemiol. 2008;37(4):816-30. https://doi.org/10.1093/ije/dyn099
30. Machado AA, Edwards SA, Mueller M, Saini V. Effective interventions to increase routine childhood immunization coverage in low socioeconomic status communities in developed countries: a systematic review and critical appraisal of peer-reviewed literature. Vaccine. 2021;39(22):2938-64. https://doi.org/10.1016/j.vaccine.2021.03.088