ORIGINAL ARTICLE

Risk Factors of Stunting Among Children Aged 0-24 Months in Coastal Families of Gresik District, 2023

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ABSTRACT

Introduction: Stunting cases in Gresik Regency are predominantly concentrated in coastal villages. Among 23 villages across 9 sub-districts in coastal areas, these villages report the highest stunting rates compared to those in urban areas. This study aims to analyze the risk factors for stunting in children aged 0-24 months living in coastal regions. **Materials and methods:** This study utilizes a quantitative approach with a cross-sectional design, conducted in 23 coastal villages in East Java. The research targeted mothers of children aged 0-24 months living in the coastal areas of Gresik. A total of 140 mothers were selected as participants from these villages using a simple random sampling method. The inclusion criteria required that the mothers had children within the 0-24 month age range residing in the coastal region of Gresik. **Results:** Factors significantly associated with stunting ($p < 0.05$) include infectious diseases ($p = 0.037$, Odds Ratio [OR]: 1.751, 95% CI: 1.039-4.118), breastfeeding practices ($p < 0.001$, OR: 3.637, 95% CI: 2.025-8.497), protein intake ($p < 0.001$, OR: 3.395, 95% CI: 1.789-7.623), maternal knowledge of nutrition ($p = 0.001$, OR: 0.919, 95% CI: 1.616-6.612), and water sanitation ($p = 0.036$, OR: 2.897, 95% CI: 0.239-0.959). **Conclusion:** The results indicate that stunting among children aged 0-24 months is significantly influenced by several factors. Additionally, limited maternal knowledge about nutrition is associated with a higher likelihood of stunting, and poor water sanitation nearly triples the risk.
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Keywords: Risk stunting factors, Children 0-24 month, Coastal area, Breastfeeding, Water sanitation

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INTRODUCTION

Stunting is a growth disorder in children characterized by a height that is lower than age and gender standards, which is caused by chronic malnutrition, repeated infections, or poor environmental factors. Stunting usually occurs in the first 1,000 days of life (from pregnancy to 2 years of age), an important period for a child's physical growth and brain development (1) Medically, stunting is measured by comparing a child's height with international growth standards set by the World Health Organization (WHO). Southeast Asia experiences the burden of undernutrition in children under the age of 5. The rate of stunting in Southeast Asia reached 24.7%, which exceeds the global average of stunting cases, namely 21.3% (2). There are countries that have a high prevalence of stunting, including: Indonesia, Myanmar and Cambodia (3). The prevalence of stunting in Indonesia is the second highest (21,6%) compared to other sub-regions in Asia (4). According to data from the Indonesian Toddler Nutrition Status Survey (SSGBI) outlines the goals and achievements related to stunting prevalence in East Java. have consistently decreased from 2018 to 2022. Gresik The Regency is one of the 260 districts/cities identified as priority focus areas for stunting prevention efforts in East Java. Data on stunting cases in Gresik Regency, (5) based on the majority are found in villages or sub-districts located in coastal areas. A total of 23 villages, from 9 sub-districts located in coastal areas Regency Gresik, is the village with the highest stunting from villages or sub-districts in urban areas.

According to Nurrizka, et al (6) the problem of malnutrition among children living in coastal areas is common. Coastal areas that are rich in potential marine catches can optimize consumption of protein products to meet children's protein needs to reduce the prevalence of stunting(7). Several factors related to malnutrition are poverty, education, food intake, health services and the environment (8) (9). Dependence on natural conditions

and limited funds make it difficult for communities in coastal areas to provide nutritious food for their families (10). The consequences of stunting in children between 0 and 23 months old can be short and long term(11), and are associated with higher rates of illness and death, impaired child development and learning abilities, and an elevated risk of infections and chronic diseases (12). A key factor contributing to stunting is inappropriate food intake (13). The abundance of fishery products in the coastal areas of Gresik Regency should be an advantage for the community in fulfilling nutrition, especially protein sources(14). Good food intake and optimal intake of protein sources can control the risk of stunting in children aged 0-24 months (15). Individual risk factors in toddlers are described in the 2016 WHO theoretical framework(16), as the factors closest to toddlers to the occurrence of stunting. This theory states that congenital diseases and infections in toddlers, poor food intake and individual conditions (genetics) of mothers and toddlers as well as low knowledge of mothers during pregnancy, can trigger an increased risk of stunting in toddlers (9) Optimal maternal nutrition is an important component for fetal and infant development, closely related to the supply of essential nutrients for the mother, including vitamins and minerals. In addition, maternal anemia, tobacco use, and indoor air pollution can inhibit fetal growth and result in low birth weight. The still high number of LBW in Gresik district will be a bad manifestation for the growth and development of toddlers aged 0-23 months (17).

Dietary factors are also risk factors for stunting(5), (18). Diets containing low-quality protein that are associated with stunting lead to a substantial decrease in the levels of essential amino acids in circulation compared to children who are not stunted. Growth failure during the first two years of life due to amino acid deficiency is linked to shorter adult height (19). Amino acid intake can be found in meat, eggs and milk, nuts, fish, shrimp, shellfish, squid and whole grains. The importance of consuming food sources that contain amino acids can be a preventive measure to reduce cases of stunting in Gresik. Research by Rathnayake et all (20) In Sri Lanka, food consumption diversity has been demonstrated to serve as a useful indicator of the community's overall nutritional adequacy. Previous research conducted by Capanzana et al (21) in coastal households in the Philippines, the prevalence of wasting among children aged 0 to 60 months was found to be 7.9%.

Coastal regions hold significant potential due to the abundant natural resources found in these areas (22). However, a previous study (23) indicates that the nutritional status of children under five in fishing families is 80% worse than in farming families. The occurrence of stunting among fishing families is notably prevalent in those with low economic status (6). Coastal communities rely on marine resources, making their diet primarily consist of animal protein in addition to rice as a staple food. Research by Baculu and Jufri (14) the study revealed that 96.43% of toddlers in coastal areas of Donggala Regency have sufficient protein intake. However, the primary factor contributing to stunting in these coastal regions is inadequate protein intake (24). By focusing on the coastal regions, this study aims to identify the specific risk factors contributing to stunting in children aged 0-24 months at coastal areas family in Gresik Regency 2023, providing evidence-based recommendations for targeted interventions and sustainable solutions.

MATERIALS AND METHODS

Samples

Coastal villages in Gresik District have reported higher rates of stunting compared to urban areas, making them critical areas for targeted research and interventions. This disparity highlights the need to explore the underlying risk factors specific to these communities. Population children 0-24 months in 2023 in Gresik distric are 987 children. This research is a quantitative study utilizing a cross-sectional design. It was carried out in 23 villages located in the coastal region of Gresik, East Java. The study population comprised mothers of toddlers aged 0 to 24 months and their children living in the coastal areas of Gresik. The sample consisted of 140 mothers of toddlers from these 23 villages, chosen through a simple random sampling method. A simple random sampling method was used to ensure that each eligible participant had an equal chance of being included in the study. The inclusion criteria required mothers to have children aged 0 to 24 months in the coastal area of Gresik district, while the exclusion criteria applied to toddlers who were not documented, those not living with their families, or those not cared for by their families. Within the selected sample, the study aimed to identify stunted children based on their height-for-age z-scores (HAZ), following the WHO Child Growth Standards. By examining this sample, the study aimed to understand the prevalence and risk factors of stunting in this specific population, providing insights into interventions for improving child nutrition and health in coastal communities. Validity and reliability test, result that >R table 0,1396, shows that the questionnaire used is valid and reliable. The approval and ethical clearance from the Ethics Committee Universitas Muhammadiyah Gresik was attained upon commencement of the study [Reference No: 097/KET/II.3.UMG/KEP/A/2023}.

Data Analysis

The independent variables are infection, disease of children, breastfeeding, low birth weight, mother's deficiency nutrition, knowledge, protein intake, policy support, hygiene sanitation, and adequate water sanitation concerning the occurrence of stunting. The tool utilized to create the Health-Promoting Family components has been updated to include 22 yes-or-no questions. The data gathered were analyzed descriptively

through a frequency table. Logistic Regression analysis was conducted to identify the factors influencing stunting prevention. SPSS was employed for statistical analysis, with a 95% Confidence Interval and p-value < 0.05 was considered statistically significant Associations among variables with numerical data were assessed using a non-parametric test due to their non-normal distribution. To clearly present descriptive statistics, bivariate, and multivariate results. Subsequently, all potential variables were examined using Simple Logistic Regression (SLR) and Multiple Logistic Regression (MLR) to identify significant predictors and calculate the adjusted odds ratio (OR) at 95% Confidence Intervals (CI). Results were interpreted to propose targeted interventions and policy recommendations for stunting prevention in coastal communities.

RESULTS

Frequency stunting in this research is 83 children, 59,3% from totally sampling. So, the majority of respondents are stunted.

Table I: Prevalence stunting in Gresik district

Stunting/ Non Stunting		Frequency	Percent	Valid Percent	Cumulative percent
Valid	Non stunting	57	40.7	40.7	40.7
	Stunting	83	59.3	59.3	100
	Summary	140	100	100	

Association between stunting and risk factors of stunting

According to the research findings, it was determined that the majority of stunted children aged 0 to 24 months had experienced infectious diseases (n = 54, 65%, p value: 0.037), were born with low birth weight (n = 44, 53.1%, p value: 0.967), and were breastfed by their mothers (n = 27, 32.5%, p value: 0.000). Additionally, these stunted children had inadequate protein intake (n = 49, 59.03%, p value: 0.000).

Table II: Association between stunting and risk factors of stunting

Variable	n (%)	Stunting		*p Value*
		Yes	No	
Infectious diseases				
Yes	81 (57.8)	54	27	0.037
No	59 (42.1)	29	30	
Low Birth Weight				
Yes	74 (52.9)	44	30	0.965
No	66 (47.1)	39	27	
Breastfeeding				
Yes	57 (40.7)	19	38	0.000
No	83 (59.3)	56	27	

CONTINUE

Table II: Association between stunting and risk factors of stunting (CONT.)

Variable	n (%)	Stunting		*p Value*
		Yes	No	
Protein Intake				
Good intake	75 (53.6)	34	41	0.000
Poor intake	65 (46.4)	49	16	
Knowledge				
Good knowledge	67 (47.9)	30	37	0.001
Poor knowledge	73 (52.1)	53	20	
Pregnancy history				
Good history	60 (42.9)	41	19	0.060
Poor history	80 (57.1)	42	38	
Policy support				
Full support	65 (46.4)	39	26	0.874
No support	75 (53.6)	44	31	
Water sanitation				
Good	64 (45.7)	44	20	0.037
Poor	76 (54.3)	39	37	
Home sanitation				
Good	69 (49.3)	44	25	0.291
Poor	71 (50.7)	39	32	

Children aged 0-24 months who had poor maternal knowledge (n = 53, 63.9%, p value: 0,001), had poor pregnancy history (n = 42, 50.6%, p value: 0,060), were in environments that lacked support from village leaders to overcome stunting problems (n = 44, 53.01%, p value: 0,874), in an environment that lacked clean water facilities so they experienced stunting problems (n = 39, 47%, p value: 0,037), and the majority of stunted children aged 0-24 months were in an environment that was less clean and therefore experienced stunting problems (n = 39, 47%, p value: 0,291).

SLR analysis between stunting and risk factor of stunting

Based on Table I.2, it is known that infectious disease has an OR (B): 1.751, which means that children aged 0-24 months who have infectious disease will have a risk 1.751 of stunting rather than children aged 0-24 months without infectious diseases. The following is the Breastfeeding factor, where children aged 0-24 months children who do not receive breast milk are 3.637 times more likely to experience stunting compared to those children aged 0-24 months who are breastfed. In the protein intake factor, children 0-24 months who do not get good protein intake will experience stunting, 3.395 times more than children 0-24 months who have good protein intake. Poor Home Sanitation Factor: Children aged 0-24 months have a risk of stunting that is 2.897 times greater than children aged 0-24 months whose

home hygiene and sanitation are good.

Table III: Simple Logistik Regression (SLR) analysis between stunting and risk factors of stunting

Factors	Unajusted coefficient	Simple Logistik Regression (SLR)			
		SE	Crude OR	95% CI (lower, upper)	P value
Infectious diseases					
Yes	0.560	0.431	1.751	0.752-4.077	0.194
No					
Low Birth Weight					
Yes	-0.036	0.413	0.965	0.429-2.169	0.931
No					
Breastfeeding					
Yes					
No	1.291	0.420	3.637	1.598-8.278	0.002
Protein Intake					
Good intake					
Poor intake	1.222	0.765	3.395	0.758-15.203	0.110
Knowledge					
Good knowledge					
Poor knowledge	-0.084	0.785	0.919	0.198-4.279	0.915
Pregnancy history					
Good history					
Poor history	-0.625	0.418	0.535	0.236-1.214	0.135
Policy support					
Full support					
No support	-0.337	0.436	0.714	0.304-1.678	0.440
Water sanitation					
Good					
Poor	-1.831	0.726	0.160	0.039-0.665	0.012
Home sanitation					
Good					
Poor	1.064	0.725	2.897	0.700-11.996	0.142

MLR analysis between stunting and risk factor of stunting

Based on the result, we know that breastfeeding has an OR (B): 4.229, which means that children aged 0-24 months who do not receive breast milk will have a risk of stunting that is 4.299 of stunting. And water sanitation has an OR (B): 0.449, which means that children aged 0-24 months who have poor water sanitation will have a risk of stunting that is 0.449 of stunting.

Table IV: Multiple Logistik Regression (MLR) analysis between stunting and risk factors of stunting

Factors	Unajusted coefficient	Multiple Logistik Regression (MLR)			
		SE	Crude OR	95% CI (lower, upper)	P value
Breastfeeding					
Yes					
No	1.458	0.374	4.299	2.064-8.952	0.000
Water sanitation					
Good					
Poor	-0.800	0.378	0.449	0.214-0.943	0.034

DISCUSSION

Previous research, the analysis identifies three interrelated factors that collectively impact stunting in children aged six to 36 months: infectious diseases, access to food, and environmental hygiene. Among these, the most prevalent infectious diseases affecting this age group are acute respiratory infections (ARI) and diarrhea (25). Infectious diseases are a significant contributing factor to stunting in children, particularly in the first few years of life. When children suffer from frequent or prolonged infections, their bodies expend energy fighting the illness, which can lead to malnutrition and impaired growth. These infections disrupt the body's ability to absorb nutrients and may also lead to loss of appetite, dehydration, and increased metabolic demands (10). Based on the findings from the multivariate analysis and related to the 1990 UNICEF framework and the multilevel promotion model with the MATCH approach, a model for controlling risk factors for stunting incidents is proposed by empowering families, especially mothers of toddlers, regarding preventing infectious diseases by using the yard as a source of family nutrition and environmental sanitation (26). At the community level, by increasing the role and function of posyandu and at the health service level, it is necessary to intervene to improve nutritional status through policy advocacy related to efforts to prevent stunting in toddlers (27).

Breastfeeding plays a crucial role in preventing stunting, particularly during the first two years of life, which is a critical period for a child's growth and development. Exclusive breastfeeding for the first six months, followed by continued breastfeeding with appropriate complementary foods, provides essential nutrients that support optimal growth, immune function, and development (28). In coastal areas, where access to health services and nutritious foods may be limited due to geographical and economic factors, breastfeeding plays an even more critical role in preventing stunting.

Stunting is a serious public health issue in many coastal communities, where children face challenges such as poor nutrition, high rates of infectious diseases, and limited access to diverse food sources. Breastfeeding, especially in the early years of life, can serve as a protective factor against stunting by providing essential nutrients and improving immunity(29).

Research indicates that stunting in early childhood is linked to a low intake of animal source foods (ASF). The study identified a significant correlation between stunting and overall ASF consumption, including milk, meat, fish, and eggs (30). Additionally, it suggested that consuming a variety of ASFs is more beneficial than relying on a single type. In several low-income countries, protein-rich foods like fresh milk and eggs are often expensive. This aligns with findings that highlight the importance of food diversity, which includes sufficient intake of both macronutrients and micronutrients. Incorporating animal source foods into the diet can help prevent various nutritional deficiencies and their associated consequences, such as stunted linear growth. In the Gresik Regency, low consumption of foods high in amino acids is identified as one of the risk factors for stunting.

Gresik Regency is one of the districts with the largest seafood catch and fish cultivation production in East Java in 2020-2022, namely 162,492,654.25 kg, and the number of residents who work as fish farmers is 20,576 (14% of the total type of work in Gresik Regency). Areas with fishery and marine product commodities in Gresik Regency include Manyar, Cerme and Driyorejo Districts (31). However, the gap is that these 3 sub-districts are the areas that contribute the largest number of stunting cases in Gresik Regency, as well as being priority areas with a high increase in stunting cases.Research shows that incorporating high-protein foods can enhance the linear growth of stunted children. A study conducted in Zambia revealed that the nutritional status of children aged 6 to 23 months was associated with fish consumption, as those who included fish in their diet were less likely to suffer from stunting (32). Cultural norms influence dietary choices, determining what foods are acceptable, how they should be prepared, when they should be consumed, and with whom. Factors contributing to stunting, particularly regarding beliefs and food taboos among pregnant, postpartum, and breastfeeding mothers, have been investigated (33). Some taboo foods include animal products (such as milk, meat, fish, seafood, and liver) and specific plant foods (like sweet potatoes, yams, avocados, kale, fried rice, durian, jackfruit, pineapple, eggplant, sugar cane, chili, and bananas), which are thought to be harmful during pregnancy(34).

Maternal knowledge plays a significant role in determining the nutritional and health outcomes of children, including their risk of stunting (35). Stunting, which refers to low height-for-age, is a result of chronic malnutrition often caused by inadequate diet, poor feeding practices, and exposure to infections during critical growth periods in early childhood (36). A mother's understanding of nutrition, health, and child development directly influences her ability to provide proper care, nutrition, and protection against the factors contributing to stunting(35). In coastal areas, where families often rely on fishing and local resources for sustenance, mothers' understanding of child nutrition, health practices, and environmental factors can significantly impact child growth and development(37). Poor water sanitation is a significant driver of stunting in children, especially in regions with limited access to clean water and proper sanitation facilities(38). Addressing this issue requires coordinated efforts that improve water quality, sanitation infrastructure, and hygiene practices while integrating these efforts with broader nutritional and health programs (39). By breaking the cycle of infection and malnutrition, effective water sanitation interventions can significantly reduce stunting and improve the overall health and well-being of children worldwide(40). Addressing the issue requires a multifaceted approach that combines improved access to clean water, better sanitation infrastructure, hygiene education, and integration with nutritional programs (41). Empowering families and communities with knowledge and resources to maintain safe water and sanitation practices is essential to reducing stunting and improving child health outcomes in these vulnerable regions (42).

CONCLUSION

Preventive behaviors refer to the actions families take to address health issues. To prevent stunting, families can take several steps, including conducting regular health check-ups for toddlers at health service centers, ensuring prompt care when they are ill, providing age-appropriate nutrition, and supporting maternal health during pregnancy. The study revealed that coastal families frequently face challenges in implementing these preventive measures due to time constraints and insufficient knowledge about caring for sick children. Many of these families perceive toddlers who refuse to eat and fail to gain weight as a common situation.They typically only recognize that their child is unwell when a health worker informs them of a developmental issue. Prevention measures are often implemented only after a diagnosis of malnutrition, at which point families may also seek information to help prevent stunting in their children.

The Gresik district government prioritizes reducing stunting risk factors with effective and efficient programs. Dietary guidelines refer to food choices, breastfeeding, eating patterns that meet essential nutrient requirements and protect against the development of lifestyle-related chronic diseases (stunting) with water sources with clean

and hygienic sanitation. The results of this research can be used in developing a model of nutritional behavior assistance to families at risk of stunting carried out by effective cadres who are expected to prevent the occurrence of stunting in the coastal areas of Gresik Regency.

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REFERENCES

1. WHO. WHO. 2020. Health of mothers, newborns, children and adolescents. Available from: https://www.who.int/maternal_child_adolescent/topics/child/nutrition/en/
2. Amusa LB, Bengesai AV, Khan HTA. Childhood stunting and subsequent educational outcomes: a marginal structural model analysis from a South African longitudinal study. Public Health Nutr. 2022;25(11):3016–24. doi: 10.1017/S1368980022001823.
3. Mahmudiono T, Sumarmi S, Rosenkranz RR. Household dietary diversity and child stunting in East Java, Indonesia. Asia Pac J Clin Nutr. 2017;26(2):317–25. doi: 10.6133/apjcn.012016.01
4. UNICEF. UNICEF Conceptual Framework on Maternal and Child Nutrition. Nutr Child Dev Sect Program Gr 3 United Nations Plaza New York, NY 10017, USA [Internet]. 2021;2–3. Available from: www.unicef.org/nutrition
5. Has EMM, Nursalam, Efendi F, Has YS, Has DFS. Pre-schoolers' eating behavior in urban communities: An overview. Indian J Public Heal Res Dev. 2019. doi: 10.5958/0976-5506.2019.02254.X
6. Nurrizka RH, Ammar MI, Buntara A, Makkiyah FA. Indonesian Under Five Years of Age Children's Malnutrition: A Case Study of Fisherman Community in Jakarta Bay. 2020;30(Ichd):202–8. doi: 10.2991/ahsr.k.201125.034
7. Sin MP, Forsberg BC, Peterson SS, Alfvйn T. Assessment of Childhood Stunting Prevalence over Time and Risk Factors of Stunting in the Healthy Village Programme Areas in Bangladesh. Children. 2024;11(6):650. doi: 10.3390/children11060650
8. Li Z, Kim R, Vollmer S, Subramanian S V. Factors Associated With Child Stunting, Wasting, and Underweight in 35 Low- and Middle-Income Countries. JAMA Netw open. 2020 Apr;3(4):e203386.doi: 10.1001/jamanetworkopen.2020.3386
9. Nomura K, Bhandari AKC, Matsumoto-Takahashi ELA, Takahashi O. Risk Factors Associated with Stunting among Children Under Five in Timor-Leste. Ann Glob Heal. 2023;89(1):63. doi: 10.5334/aogh.4199
10. Nurrizma D, Sulatri D, Muhammad S. Analysis of Factors Related to the Incidence of Stunting in Fishermen's Children Aged 12-24 Months. Contag Sci Period J Public Health Coast Heal. 2023;5(3):1026.
11. Elni E, Julianti E. The Correlation between Feeding Habit Factor and The Incidence of Stunting in Children Under Five Years. J Keperawatan Padjadjaran. 2020;8(3):283–91. doi: 10.24198/jkp.v8i3.1554
12. Soliman A, De Sanctis V, Alaaraj N, Ahmed S, Alyafei F, Hamed N, et al. Early and long-term consequences of nutritional stunting: From childhood to adulthood. Acta Biomed. 2021;92(1):1–12. doi: 10.23750/abm.v92i1.11346.
13. Ball L, Leveritt M, Cass S, Chaboyer W. Effect of nutrition care provided by primary health professionals on adults' dietary behaviours: A systematic review. Fam Pract. 2015;32(6):605–17. doi: 10.1093/fampra/cmv067.
14. Anjaswarni T, Winarni S, Hardy S, Kuswulandari S. Youth Empowerment in the Integration Program of Stunting Prevalence Reduction in East Java during Covid-19 Pandemic: A Document Review. J Public Heal Trop Coast Reg. 2022;5(1):32–41.doi : 10.14710/jphtcr.v5i1.13748
15. Endrinikapoulos A, Afifah DN, Mexitalia M, Andoyo R, Hatimah I, Nuryanto N. Study of the importance of protein needs for catch-up growth in Indonesian stunted children: a narrative review. SAGE Open Med. 2023;11. doi: 10.1177/20503121231165562
16. WHO-conceptual-framework-on-Childhood-Stunting-Context-Causes-and-Consequences (1).
17. Haque MA, Choudhury N, Wahid BZ, Ahmed ST, Farzana FD, Ali M, et al. A predictive modelling approach to illustrate factors correlating with stunting among children aged 12-23 months: a cluster randomised pre-post study. BMJ Open. 2023;13(4):1–15. doi: 10.1136/bmjopen-2022-067961.
18. Darajat A, Sansuwito T, Amir MD, Hadiyanto H, Abdullah D, Dewi NP, et al. Social Behavior Changes Communication Intervention for Stunting Prevention: A Systematic Review. Open Access Maced J Med Sci. 2022;10(G):209–17. doi: 10.3889/oamjms.2022.7875.
19. Coly AN, Milet J, Diallo A, Ndiaye T, Вйпйfice E, Simondon F, et al. Preschool stunting, adolescent migration, catch-up growth, and adult height in young Senegalese men and women of rural origin. J Nutr. 2006;136(9):2412–20. doi: 10.1093/jn/136.9.2412
20. Mirzaei A, Esmaeili FP, Jalilian M. Predictors of complementary feeding in infants aged 6 to 18 months: An application of Health Belief Model. Sri Lanka J Child Heal. 2020;49(1):48–53. doi: 10.4038/sljch.v49i1.8898
21. Semba RD, Shardell M, Sakr Ashour FA, Moaddel

R, Trehan I, Maleta KM, et al. Child Stunting is Associated with Low Circulating Essential Amino Acids. EBioMedicine [Internet]. 2016;6:246–52. Available from: http://dx.doi.org/10.1016/j.ebiom.2016.02.030
22. Beal T, Tumilowicz A, Sutrisna A, Izwardy D, Neufeld LM. A review of child stunting determinants in Indonesia. Matern Child Nutr. 2018;14(4):1–10. doi: 10.1111/mcn.12617
23. Flores ME, Rivera-Pasquel M, Macнas N, Sбnchez-Zamorano LM, Rodrнguez-Ramнrez S, Contreras-Manzano A, et al. Dietary patterns in Mexican preschool children are associated with stunting and overweight. Rev Saude Publica. 2021;55:1–13. doi: 10.11606/s1518-8787.2021055002350
24. Safitri E, Basriati S, Mulyani S. Faktor-Faktor yang Mempengaruhi Kejadian Stunting terhadap Balita menggunakan Analisis Regresi Logistik. Zeta - Math J. 2022;7(2):47–52. doi: 10.31102/zeta.2022.7.2.47-52
25. Danaei G, Andrews KG, Sudfeld CR, Fink G, McCoy DC, Peet E, et al. Risk Factors for Childhood Stunting in 137 Developing Countries: A Comparative Risk Assessment Analysis at Global, Regional, and Country Levels. PLoS Med. 2016;13(11):1–18. doi: 10.1371/journal.pmed.1002164
26. USAID. Save the Children, Safely Fed Canada (2020). Infant and Child Feeding Recommendations When COVID-19 Is Suspected or Confirmed. USA.
27. Sutarto, Dewi Puspita Sari R, Zakiah Oktarlina R, Indriyani R. Qualitative Study of Local Cultural Wisdom and Health Services on Stunting Events. Int J Adv Res. 2022;10(02):1109–18.doi: 10.32734/ijma.v3i1.7569
28. Mirasa YA, Umami A, Arifatul Mu'awanah S, Sunardi S. Faktor-Faktor yang Berhubungan dengan Kejadian Stunting di Kabupaten Nganjuk. J Sehat Mandiri. 2023;18(2):119–31. doi: 10.33761/jsm.v18i2.1071
29. Setiawan MI, Yulidasari F, Rahayu A, Ferdina AR. Nutritional Intake Differences of Children Aged 6-23 Months in Coastal and Non-Coastal Stunting Areas. J Berk Kesehat. 2023;9(1):72. doi: 10.20527/jbk.v9i1.16212
30. Muslimatun S, Ari Wiradnyani LA. Dietary diversity, animal source food consumption and linear growth among children aged 1–5 years in Bandung, Indonesia: A longitudinal observational study. Br J Nutr. 2016;116:S27–35. doi: 10.1017/S0007114515005395.
31. Badan Pusat Statistik Gresik. Kabupaten Gresik Dalam Angka 2023. Badan Pus Stat Kabupaten Gresik. 2023;1–414.
32. Jonah CMP, Sambu WC, May JD. A comparative analysis of socioeconomic inequities in stunting: A case of three middle-income African countries. Arch Public Heal. 2018;76(1):1–15. doi: 10.1186/s13690-018-0320-2.
33. Diana R, Rachmayanti RD, Khomsan A, Riyadi H. Influence of eating concept on eating behavior and stunting in Indonesian Madurese ethnic group. J Ethn Foods [Internet]. 2022;9(1). Available from: https://doi.org/10.1186/s42779-022-00162-3.
34. Bertalina B, Rahmadi A. Pendampingan Ibu Hamil Di Desa Fokus Stunting Kabupaten Lampung Timur. Gizi Indonesia. 2021;44(1):97–108. doi: 10.36457/gizindo.v44i1.491
35. Mistry SK, Hossain MB, Arora A. Maternal nutrition counselling is associated with reduced stunting prevalence and improved feeding practices in early childhood: A post-program comparison study. Nutr J. 2019;18(1):1–9. doi: 10.1186/s12937-019-0473-z
36. Habimana S, Biracyaza E. Risk Factors Of Stunting Among Children Under 5 Years Of Age In The Eastern And Western Provinces Of Rwanda: Analysis Of Rwanda Demographic And Health Survey 2014/2015. Pediatr Heal Med Ther. 2019;Volume 10:115–30. doi: 10.2147/PHMT.S222198
37. Yuliantini E, Sukiyono K, Sulistyo B, Yuliarso MZ. Household Characteristics and Nutritional Status of Children to Children in Coastal Family in Bengkulu Province. Media Gizi Indonesia. 2023;18(1SP):61–71. doi: 10.20473/mgi.v18i1SP.61-71
38. Gusnedi G, Nindrea RD, Purnakarya I, Umar HB, Andrafikar, Syafrawati, et al. Risk factors associated with childhood stunting in Indonesia: A systematic review and meta-analysis. Asia Pac J Clin Nutr. 2023;32(2):184–95. doi:10.6133/apjcn.202306_32(2.0001
39. Matariya Z, Lodhiya K, Mahajan R. Environmental correlates of undernutrition among children of 3–6 years of age, Rajkot, Gujarat, India. J Fam Med Prim Care. 2016;5(4):834. doi: 10.4103/2249-4863.201152
40. Arriola KRJ, Ellis A, Webb-Girard A, Ogutu EA, McClintic E, Caruso B, et al. Designing integrated interventions to improve nutrition and WASH behaviors in Kenya. Pilot Feasibility Stud. 2020;6(1):1–16. doi: 10.1186/s40814-020-0555-x
41. Haque MA, Choudhury N, Wahid BZ, Ahmed ST, Farzana FD, Ali M, et al. A predictive modelling approach to illustrate factors correlating with stunting among children aged 12-23 months: a cluster randomised pre-post study. BMJ Open. 2023;13(4):1–16. doi: 10.1136/bmjopen-2022-067961.
42. Carlson GJ, Kordas K, Murray-Kolb LE. Associations between women's autonomy and child nutritional status: A review of the literature. Matern Child Nutr. 2015;11(4):452–82. doi: 10.1111/mcn.12113