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Stunting in Toddlers: Exploring Multiple Factors Through a Case Control Study

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ABSTRACT

Introduction: Stunting is a serious concern for children globally, including in Indonesia, often caused by ongoing malnutrition problems. There are numerous factors associated with stunting. This research aims to analysed multiple factors related to stunting in toddlers.
Methods: This research utilized a case-control approach. The research was conducted in the Marawola District from Juni to August 2024. A group of 128 toddlers were part of the study, with half of them classified as cases and the remaining half as controls. Variables in this research included maternal characteristics (education, occupation), toilet ownership, exclusive breastfeeding practice, complete immunization, and stunting. Data was collected using questionnaires and direct measurements (anthropometry). Data analysis involved univariate and bivariate analysis using the chi-square test, as well as multivariate analysis using linear regression with 95% confidence interval (CI).
Results: The results from the research were indicated a strong correlation between education ($p = 0.038$), exclusive breastfeeding ($p = 0.012$), and complete immunization ($p = 0.008$) with the occurrence of stunting. In particular, it was identified that complete immunization has the highest impact on stunting compared to the others variables studied.
Conclusion: A significant association was observed between education, exclusive breastfeeding, complete immunization, and the likelihood of stunting in toddlers. It is crucial to introduce targeted interventions that prioritize the provorsion of proper nutrition, education, and enhanced healthcare accessibility to reduce the prevalence of stunting among toddlers.

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INTRODUCTION

Concerns over maternal and child health issues such as high maternal mortality rates, infant mortality rates, and widespread malnutrition remain at the forefront of challenges in the realm of community nutrition (1,2). Stunting remains a pressing issue in the field of public health. It refers to a condition where children under the age of five fail to grow and develop properly due to prolonged malnutrition, particularly during the first 1,000 days of their life. Stunting is a result of both inadequate nutrition and frequent infections, leading to children falling below the standard body length or height for their age group (3,4,5).

The occurrence of stunting in Indonesia, as reported by the Basic Health Research (Riskesdas) in 2018, stood at 30.8%. However, there was a decrease in the prevalence to 26.92% in 2020. Despite the improvement, this rate still falls short of the World Health Organization's target of 20% (6,7). According to the 2022 Indonesian Nutrition Status Survey (SSGI), Central Sulawesi has a stunting prevalence of 28.2%, indicating that stunting remains a pressing public health concern. Specific measures need to be taken to address and reduce stunting in the region (8). In Sigi Regency, the prevalence of stunting was 14.4% in 2021. Nevertheless, there is a worrying upward trend in certain sub-districts such as Pipikoro, South Kulawi, Dolo, Tanambulawa, Biromaru, Marawola, and Kinovaro (9).

Stunted growth remains a prevalent issue among children under the age of 5 worldwide, often stemming from malnutrition. This can lead to physical and cognitive developmental delays in toddlers, impacting their overall intelligence levels (3,4,5). Various factors contribute to stunting, including inadequate antenatal care, insufficient intake of iron tablets, low Upper Arm Circumference measurements, and lack of exclusive breastfeeding (6,10). Breast milk is crucial for infant nutrition as it promotes intelligence, boosts the immune system, and reduces the risk of infectious diseases. Additionally, environmental influences such as limited access to clean water and proper sanitation can exacerbate stunted growth. It is essential to address these factors to ensure the healthy growth and development of young children (3,4,10,11,12).

Stunting is a serious public health concern that can be analyzed by looking at various risk factors. Factors such as environmental conditions, including access to clean water and sanitary facilities, have been shown to be closely linked to stunting rates. Additionally, behaviors such as consistent handwashing with soap and water have been found to play a significant role in the prevalence of stunting (13,14). Access to quality healthcare services, such as antenatal care, and factors like distance, travel time, and financial costs associated with seeking medical assistance also contribute to the risk of stunting (15,16). Furthermore, stunting has been found to be influenced by individual characteristics, family dynamics, and societal factors. Genetic predisposition from parents can also influence a child's height and likelihood of developing stunting (17).

Preventing stunting in toddlers requires proactive identification of risk factors or variables that may impact growth and development (18). By detecting these factors early, we can identify any abnormalities in growth and development at an early stage (19). The current research delves into the potential causes of stunted growth by incorporating various factors through the HL Blum theory method, which considers behavioral, environmental, health service, and genetic factors. The research focused on various factors related to mothers, such as their age, level of education, occupation, as well as whether they practiced exclusive breastfeeding, ensured complete immunization for their children, and owned a toilet. This is crucial as many mothers in the region tend to marry young, have limited education, and are not employed. Mothers who do not exclusively breastfeed, fail to attend child health check-ups, and do not have access to a family toilet may contribute to an increased risk of stunting among toddlers in the Marawola District.

METHOD

This study was designed as a case-control study and took place in the Marawola District from June to August 2024. This district was selected due to its high prevalence of stunting cases that have been on the rise. A total of 128 toddlers were involved in this study, with half of them (64 toddlers) being classified as stunted and the other half (64 toddlers) as non stunted. The participants were selected using a method of proportional random sampling. Various factors were considered in this study as independent variables, such as maternal characteristics (age, education, and occupation), exclusive breastfeeding, complete immunization, and toilet ownership. The primary focus on the research was on determining the relationship between these independent variables and the presence of stunting in toddlers, which served as the dependent variable. The variable for maternal age is classified into two categories; < 20 or > 35 Years and 20 – 35 years. Maternal Education is divided into two categories; elementary and middle high.

Maternal occupation falls into two categories; unemployed and employed. Exclusive breastfeeding is categorized as No and Yes. Complete immunization is separated into two categories; No and Yes. Toilet ownership is classified into two categories; not have and have.

This survey questionnaire gathered data on maternal characteristics such as age, education, occupation, and toilet ownership. Information on exclusive berastfeeding and complete immunization was retrieved from the KIA book. Data analysis was conducted using IBM SPSS Version 22, including univariate analysis to examine the frequency distribution of each variable. Bivariate analysis with the chi-square test was used to assess the relationship between independent variables and stunting. Multivariate analysis, utilizing logistic regression, indentified the main predictors of stunting. This research had a confidence interval (CI) of 95%, with the odds ratio (OR) determining whether a factor is arisk or protective factor based on values greater or less than 1, respectively.

The process of conducting the research involves sharing details about the objectives of this study. All participants who received an explanation and agrred to take part were required to complete and sign an informed consent form. Researchers ensure that the information provided by the participants is kept confidential and that their identities remain anonymity. Throughout this study, participants were not subjected to any treatments that could pose a risk to their well-being.

Ethical Approval

This Research has been formally approved as ethically compliant in accordance with the seven WHO criteria by the Resesearch Ethics Committee of the Chakra Brahmanda Lentera Institute, under approval number. 103/018/I/EC/KEP/Lemb.Candle/2024.

RESULTS

The study findings were derived from univariate, bivariate, and multivariate analyses. Univariate analysis focused on individual variables such as maternal age, education, occupation exclusive breastfeeding, complete immunization, and toilet ownership. Bivariate analysis, using the chi-square test, examined the relationship between the independent and dependent variables. Multivariate analysis was then conducted to indentify the most influential independent variable on the dependent variable using the logistic regression test.

Table 1. Participants Demographics (n = 128)

No	Demographics Variable	N	%
	Maternal Age		
1	< 20 or > 35 Years	32	25.0
2	20-35 Years	96	75.0
	Education		
1	Elementary	42	32.8
2	Middle-High	86	67.2
	Occupation		
1	Unemployed	118	92.2
2	Employed	10	7.8
	Exclusive Breastfeeding		
1	No	53	41.4
2	Yes	75	58.6
	Complete Immunization		
1	No	32	25.0
2	Yes	96	75.0
	Toilet Ownership		
1	Not Have	57	44.5
2	Have	71	55.5

The findings from the study, as illustrated in Table 1, reveal that most mothers with fall within the age range of 20-30 years (75%). Additionally, a significant proportion of these mother posses a level of education that is

considered to be middle-high (67.2%), are not currently employed (58.6%), ensure that their toddlers receive all necessary immunizations (75%), and have acces to a toilet facility in their households (55.5%).

Table 2. Cross-tabulation of Variables in the Stunting (n = 128)

No	Variables	Stunting				*p* Value	OR (95% CI)
		Cases		Control			
		n	%	n	%		
	Maternal Age						
1	< 20 or > 35 Years	17	53.1	15	46.9	0.838	1.182
2	20-35 Years	47	49.0	49	51.0		(0.530 – 2.633)
	Education						
1	Elementary	27	54.3	15	35.7	0.038	2.384
2	Middle-High	37	43.0	49	57.0		(1.113 - 5.107)
	Occupation						
1	Unemployed	58	49.2	60	50.8	0.742	0.644
2	Employed	6	60.0	4	40.0		(0.173 – 2.402)
	Exclusive Breastfeeding						
1	No	34	64.2	19	35.8	0.012	2.684
2	Yes	30	40.0	45	60.0		(1.297 – 5.553)
	Complete Immunization						
1	No	23	71.9	9	28.1	0.008	3.428
2	Yes	41	42.7	55	57.3		(1.436 – 8.185)
	Toilet Ownership						
1	Not Have	30	52.6	27	47.4	0.722	1.209
2	Have	34	47.9	37	52.1		(0.602 – 2.430)

The findings from the bivariate analysis conducted with the chi-square test at a 95% confidence interval (Table 2) reveal a notable association between education (p = 0.038), exclusive breastfeeding (p = 0.012), and complete immunization (p = 0.008) with stunting (p-value < 0.05). on the other hand, factors such as maternal age (p = 0.838), occupation (0.742). and toilet ownership (0.722) did not demonstrate any significant relationship with stunting. The chances of experiencing stunting are higher for individuals with increasing maternal age (OR = 1.182), education (OR = 2.384), exclusive breastfeeding (OR = 2.684), complete immunization (OR = 3.428), and toilet ownership (OR = 1.209). this suggests that these factors are associated with an increased risk of stunting.

Table 3. Multivariate Predictors for Stunting

Variable	B	Wald	*p-Value*	OR	95% CI	
					Lower	Upper
Maternal Age	-0.117	0.062	0.803	0.890	0.356	2.225
Education	0.923	4.515	0.034	2.516	1.074	5.895
Occupation	-0.440	0.346	0.556	0.644	0.149	2.790
Exclusive Breastfeeding	0.867	4.842	0.028	2.380	1.099	5.151
Complete Immunization	1.127	5.833	0.016	3.087	1.237	7.706
Toilet Ownership	-0.051	0.016	0.900	0.950	0.429	2.105

The findings from the multivariate analysis conducted with the logistic regression test reveal that the variable for complete immunization is the strongest predictor, with a partial test value (wald) of 5.833 (p-value < 0.05). this suggests that when these variables are present simultaneously, they significantly raise the likehood of stunting in the Marawola District.

DISCUSSION

The findings from the study indicate that the factors of age, occupation, and toilet ownership do not have a significant impact on the likelihood of stunting in young children (p-value > 0.05). On the other hand, factors such as education level, exclusive breastfeeding, and complete immunization have shown a significant correlation with stunting (p value < 0.05). Among these six factors, complete immunization emerges as the most influential predictor affecting the occurrence of stunting in toddlers (wald = 5.833). Various research also suggests that the age of the mother is not associated with stunted growth in children. This is because a mother's age does not directly influence stunting, and there are other factors that could potentially have a greater impact on the prevalence of stunting in young children (20,21,22). Other studies suggest that younger mothers, particularly those under the age of 20, are more likely to have children who are stunted. These results contradict previous studies and point to the increased risk faced by adolescent mothers (23,24).

Research in Muara Satu Health Center has shown that there is no significant link between mothers who work outside the home and the likelihood of their toddlers experiencing stunted growth. In other words, the employment status of mothers does not impact the occurrence of stunting in children (25). Research indicates a correlation between a mother's employment status and the prevalence of stunting in children. Typically, mothers who work tend to have higher household incomes, enabling them to access improved nutrition and healthcare services that play a crucial role in reducing the risk of stunting (26). Research conducted in the Noemuti Community Health Center working area revealed that the presence of latrines does not directly impact the growth of toddlers (27). On the contrary, a study conducted in the Pantai Labu District suggested that the ownership of toilets is correlated with the prevalence of stunted growth in young children (28).

Mothers with lower levels of education are more likely to have children who experience stunting. Studies have found that mothers with only primary education or less are at a greater risk of having stunted children compared to mothers with higher levels of education(29,30). A mother's education level plays a crucial role in shaping her knowledge and beliefs about the significance of providing proper nutrition for toddlers to prevent malnutrition, such as stunting (31). Mothers who have received a higher level of education generally possess greater understanding of nutrition and child care, leading to improved ability to ensure proper food consumption during pregnancy and early childhood. This understanding subsequently impacts the nutritional well-being of children, ultimately lowering the likelihood of stunted growth (30,32).

Breastfeeding exclusively offers important nutrients that are crucial for healthy growth in the crucial first months of life. This is particularly significant because chronic malnutrition and poor feeding habits can lead to stunted growth(33,34). It has been well-established that exclusive breastfeeding plays a crucial role in preventing stunting in young children. Stunting is a condition where a child's growth and development are hindered due to ongoing malnutrition. Opting for exclusive breastfeeding leads to a decreased likelihood of stunting. Children who are exclusively breastfed are less likely to experience stunting compared to those who are not. Studies indicate that the majority of stunted toddlers were not exclusively breastfed, underscoring the importance of promoting exclusive breastfeeding to combat stunting (33,34,35). Therefore, it is imperative to continually encourage the practice of exclusive breastfeeding as it is instrumental in lowering the prevalence of stunting in children. Numerous factors can impede or be associated with exclusive breastfeeding, including a mother's knowledge, attitudes, beliefs, family support, and cultural traditions (36)

Breast milk's special blend of nutrients is critical in safeguarding infants against stunted growth. This is due to the presence of key components like macronutrients, including protein and fat, which are essential for brain development(37,38). Additionally, micronutrients such as calcium, zinc, and iron also play a vital role (39,40). Breast milk is also rich in antibodies and other immune-boosting elements that shield the baby from infections (41). Breast milk contains a perfect balance of nutrients that are easily absorbed by the baby. This exceptional bioavailability guarantees that the baby gets the most out of the nutrients ingested, which is crucial in the crucial first six months of life when exclusive breastfeeding is advised (38,39).

Undernutrition leads to stunting, a condition characterized by impaired growth, which is a significant public health concern. Immunization plays a vital role in preventing infectious diseases and reducing the risk of stunting in children aged 12-59 months. A recent study revealed a strong link between incomplete immunization and stunting in children. Those who are not fully vaccinated face a higher likelihood of experiencing impaired growth than those

who have received all recommended vaccinations. Vaccination not only protects children from preventable diseases but also helps in reducing malnutrition and promoting healthy growth (42).

By preventing illnesses, vaccination lowers the chances of infections that could lead to stunted growth. Moreover, immunization programs often incorporate measures to enhance maternal health and nutrition, indirectly benefiting child growth. The relationship between immunization and stunting may work both ways, as stunted children tend to have weaker immune systems, making them more susceptible to infection that can compromise their immunization status. Thus, achieving high immunization rates becomes crucial in combating stunting and promoting overall child well-being (42,43). In addition to immunization, addressing factors such as poverty, access to healthcare services, and sanitation is essential in improving vaccination rates and nutritional outcomes. These holistic approaches can contribute to reducing the prevalence of stunting and ensuring the healthy development of children. Challenges in implementing immunization programs persist due to the issue of work factors, as many mothers of young children are employed outside the home. While the families of these mothers are generally supportive of immunization efforts, there is a lack of support from health workers who do not often provide guidance or reminders about vaccination schedules (44).

CONCLUSION

The conclusion of this study suggests a significant relationship between education, exclusive breastfeeding, and complete immunization in realtion to the prevalence of stunting among toddlers. Complete immunization appears to play the most prominent role in influencing stunting rates. It is recommended that stakeholders, particularly healthcare professionals, actively engage with communities to prioritize nutrition education interventions, enhance nutritional support, and improve access to healthcare services in order to effectively reduce the incidence of stunted growth in toddlers. Local authorities must continually engage diverse stakeholders to carry out initiatives aimed at hastening the reduction of stunting through education for mothers, advocacy for breastfeeding, and the implementation of immunization programs to combat stunting.

AUTHOR'S CONTRIBUTION STATEMENT

I Kadek Wartana was responsible for developing the research, conceptualizing the idea, choosing the appropriate methodology, gathering and evaluating data, crafting the manuscript, reviewing it, approving the final version, and submitting it to the OJS system. Veni Mornalita Kolupe was responsible for developing the research, gathering and evaluating data, reviewing it, approval the final version. Riskya Mutohharoh played a part in gathering and evaluating data and making revisions to the manuscript. Sitti Fajrah conducted data processing and analysis, reviewing the article, and approval the final version.

CONFLICTS OF INTEREST

The authors affirms that all written content and illustrations in the submitted manuscript are original creations of the author. The authors also confirms that there are no conflicts of interest, such as personal connections or financial concerns, that could potentially impact the findings of this research.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors affirm that no form of generative AI was utilized in the preparation of this manuscript.

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