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Factors Associated with the Incidence of Post-Disaster Stunting in Toddlers Aged 25-59 Months in Posyandu Biromaru Health Centre Working Area

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Abstract

Stunting is a major problem in Central Sulawesi Province, with Sigi District having the highest prevalence at 40.7%. Stunting is a condition where children under five years of age fail to thrive due to chronic malnutrition, resulting in stunted growth. This condition hinders human development and has a negative impact on the future. The study aimed to identify the factors related to post-disaster stunting in toddlers aged 25-59 months in the Biromaru Health Centre working area. The research design used a quantitative approach with a case-control design, with a sample size of 150 mothers who had babies aged 25-59 months. The results showed that the mother's education level was significantly associated with the incidence of stunting, with mothers who have a low level of education being 2.82 times more likely to have stunted children than mothers with a high level of education. Other factors, such as maternal height, family income, exclusive breastfeeding history, birth weight, gender, and access to health services, did not show a significant relationship with stunting. The study suggests that improving maternal education levels may help reduce the incidence of stunting in toddlers, highlighting the importance of education in preventing child malnutrition.

Keywords: Stunting, Post-Disaster, Risk Factors, Maternal Education

Key Messages:

- The study found that the mother's education level has a significant relationship with the incidence of stunting in toddlers aged 25-59 months at the Posyandu of the Biromaru Health Centre working area in Sigi Regency, Central Sulawesi Province.
- Mothers with a low level of education are 2.82 times more likely to have stunted children compared to mothers with a high level of education.

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1. Introduction

The World Health Organization (WHO) defines stunting as a developmental disorder in children caused by poor nutrition, recurrent infections, and inadequate psychosocial simulation. Stunting is the most common form of child malnutrition with an estimated 161 million children worldwide stunted in 2013 according to the WHO (1). Stunting is a condition of growth failure in children under five due to chronic malnutrition so that

children become too short for their age (2) (3).

Data on the prevalence of stunting among children under five years old collected by the World Health Organization (WHO) released in 2018 states that Indonesia is the third country with the highest prevalence in the South-East Asian Region after Timor Leste (50.5%) and India (38.4%) at 36.4% (4). Data from the Indonesian Nutrition Status Study in 2021 shows that the prevalence of stunting (TB / Age) by province among toddlers in Central Sulawesi Province is still quite high. Central Sulawesi is one of the 10 provinces that has the highest stunting prevalence rate in Indonesia, where Central Sulawesi ranks 8th with a stunting prevalence of 29.7%, quite far from the national prevalence of 24.4% (5). In comparison to the previous two years, Central Sulawesi ranks 10th as the province with the highest stunting prevalence (6). This shows that the decline in stunting in Central Sulawesi is less significant when compared to other provinces in Indonesia. The prevalence of stunting by district/city in Central Sulawesi Province in 2021 shows that out of a total of 13 districts/cities in Central Sulawesi, Sigi Regency has the highest prevalence of stunting at 40.7% while the average prevalence of districts/cities in Central Sulawesi is only 29.7% (6). This prevalence is very high and is a serious problem that needs to be addressed quickly and appropriately.

Many factors can cause stunting among toddlers, including maternal factors, fetus, home environment, economy, breastfeeding factors, health service factors and so on. Maternal factors can be in the form of maternal education and maternal height. Where mothers with lower education have a risk of being stunted 1.67 times compared to children with mothers who have higher education (7). Mothers with pre- pregnancy conditions both body posture (weight and height) and nutrition are one of the factors that influence the occurrence of stunting (8). In addition, family economic status also affects the incidence of stunting in children, where families with lower income are 2.1 times more at risk of causing stunting in children (7). This is because the family's economic condition affects the family's ability to fulfill children's nutrition. Fulfillment of child nutrition through exclusive breastfeeding also affects the incidence of stunting because it helps prevent children from failing to grow (9). In addition, from infant or child factors, the incidence of stunting can be influenced by LBW and child gender. Children who are born LBW will experience obstacles in their growth and development (10). Male children are also more at risk of stunting than female children (11). Health services are also one of the factors that influence the incidence of stunting (12).

Under normal conditions, these factors can greatly influence the incidence of stunting, especially in post-disaster conditions. Central Sulawesi experienced a 7.4 magnitude earthquake in 2018 which caused a tsunami and liquefaction, and many casualties and huge material losses were experienced. Sigi Regency is one of the areas that was severely affected by the disaster, the liquefaction phenomenon also hit the area, namely Jono'oge Village which is the working area of Biromaru Health Centre working area. The impact of the disaster is still being felt today, especially the impact on the community's economy. The post-disaster drought resulted in the community having to switch professions from farmers to odd jobs. Not yet over the impact of the natural disaster, a non-natural disaster occurred in the form of the Covid-19 pandemic. Post-disaster 28 September 2018 has passed for more than 3 years, which means that many toddlers have grown up in this situation and in a pandemic that is still ongoing. This makes researchers interested in examining the factors associated with the incidence of post-disaster stunting in toddlers aged 25-59 months at the Posyandu of the Biromaru Health Centre working area, Sigi Regency.

2. Methods

The type of research used is quantitative research with a case control research design. The study began by measuring the dependent variable, namely the effect while the independent variable was studied retrospectively. The place and time of the study was in June-July 2022 in the Biromaru Health Centre working area. The population of all mothers aged 25-59 months in the Biromaru Health Centre working area of Sigi Regency was 1,322 people and the total number of mothers who had stunted toddlers was 243 people. The sample size was 75 mothers of stunted toddlers in the case group and 75 mothers of normal toddlers aged 25-59 months in the control group. Simple random sampling technique. Data analysis in the form of respondent characteristics as the distribution of respondents of child gender, mother's education, mother's work, father's work, family income. Bivariate analysis looked at the relationship between variables of gender, birth weight, exclusive breastfeeding, maternal height, family income, access to health services with the incidence of stunting in the Biromaru working area with the chi-

square statistical test.

3. Results

Table 1. Distribution of Respondents Based on the Characteristics of Children and Parents of Children at Work Area of the Biromaru Health Center, Sigi Regency

Characteristics			Stunting		Total
			Control	Cases	
Sex	Male	n	40	42	82
		%	53.3	56.0	54.7
	Female	n	35	33	68
		%	46.7	44.0	45.3
Mother's education	High	n	46	27	73
		%	61.3	36.0	48.7
	Low	n	29	48	77
		%	38.7	64.0	51.3
Mother's occupation	Honorary	n	0	1	1
		%	0.0	1.3	0.7
	Student	n	0	1	1
		%	0.0	1.3	0.7
	Trader	n	0	3	3
		%	0.0	4.0	2.0
	Employee	n	5	0	5
		%	6.7	0.0	3.3
	Farmer	n	6	15	21
		%	8.0	20.0	14.0
	Housewife	n	64	55	119
		%	85.3	73.3	79.3
Father's occupation	Laborer	n	4	9	13
		%	5.3	12.0	8.7
	Teacher	n	0	1	1
		%	0.0	1.3	0.7
	Trader	n	2	0	2
		%	2.7	0.0	1.3
	Employee	n	9	3	12
		%	12.0	4.0	8.0
	Farmer	n	55	52	107
		%	73.3	69.3	71.3
	Driver	n	0	1	1
		%	0.0	1.3	0.7
	Self-employed	n	5	9	14
		%	6.7	12.0	9.3
Income	≥ Rp. 2.390.739	n	11	5	16
		%	14.7	6.7	10.7
	< Rp. 2.390.739	n	64	70	134
		%	85.3	93.3	89.3
Total			**75 (100%)**	**75 (100%)**	**150 (100%)**

The data in Table 1 shows that the respondents' children were mostly male, 82 (54.7%) while 68 (45.3%) were female. The mothers of toddlers who were research respondents were more likely to have low education, totaling 77 people (51.3%) with a higher number in the case group (64.0%) while those with higher education totaled 73 people (48.7%) with more in the control group (46%). most of the mothers who were research respondents had a job taking care of Housewife, namely 119 people (79.3%). most of the fathers who

became research respondents had jobs as farmers, namely 107 people (71.3%). most respondents had a family income of <Rp. 2,390,739, namely 134 families (89.3%).

Table 2 Risk Factors for Stunting in the Work Area of the Biromaru Health Center, Sigi Regency

Risk Factors			Stunting		Total	*p*	OR (95% Confidence Interval Lower – Upper)
			Control	Cases			
Sex	Male	n	40	42	82	0.743	0.89 (0.47 - 1.71)
		%	53.3	56.0	54.7		
	Female	n	35	33	68		
		%	46.7	44.0	45.3		
Birth Weight	No Risk	n	66	65	131	0.806	1.12 (0.43 - 2.95)
		%	88.0	86.7	87.3		
	risky	n	9	10	19		
		%	12.0	13.3	12.7		
Exclusive breastfeeding	Exclusive breastfeeding	n	35	37	72	0.744	0.89 (0.43 - 1.71)
		%	46.7	49.3	48.0		
	Not Exclusive Breastfeeding	n	40	38	78		
		%	53.3	50.7	52.0		
Mother's Height	No Risk	n	71	71	144	0.659	1(0.195 - 5.12)
		%	96.0	96.0	96.0		
	risky	n	3	3	6		
		%	4.0	4.0	4.0		
Mother's Education	High	n	46	27	73	0.002	2.82 (1.45 - 5.46)
		%	61.3	36.0	48.7		
	Low	n	29	48	77		
		%	38.7	64.0	51.3		
Family Income	≥ Rp. 2.390.739	n	11	5	16	0.113	2.41 (0.79 - 7.30)
		%	14.7	6.7	10.7		
	< Rp. 2.390.739	n	64	70	134		
		%	85.3	93.3	89.3		
Access to Health Services	Good	n	52	52	104	1.000	1 (0.50 - 2.00)
		%	69.3	69.3	69.3		
	Bad	n	23	23	46		
		%	30.7	30.7	30.7		
Total			**75 (100%)**	**75 (100%)**	**150 (100%)**		

Table 2 shows that in the variable fetal factor, namely gender in both the case and control groups, the toddlers who were the study respondents were mostly male with a total of 54.7% and most of the toddlers had birth weights that were not at risk with a total of 87.3%. The breastfeeding factor variable shows that more mothers do not give exclusive breastfeeding (52%). As for the maternal factor in the form of the mother's height, most of the mothers have a height that is not at risk of 96%. In the home environment factor variable, there were more mothers with low education, namely 77 mothers (51.3%) but in the control group, namely mothers who had normal children/not stunting, most of the mothers had a higher educational background (61.3%) while in In the case group, namely mothers who have stunted children, the majority of mothers have a low educational background (64%). Furthermore, on the family economic factor variable, most families have an income below the Sigi Regency Minimum Wage, namely <Rp. 2,390,739 as many as 89.3% of the total families who were respondents. The variable factor of health services shows that the majority of respondents stated that access to health services was good, namely 69.3%, access to health services was related to distance and travel time

to health facilities. Statistical tests showed that the home environment factor in the form of the mother's education level had a significant relationship with the incidence of stunting with a value of p=0.002 (p<0.05). Mothers who have a low level of education are 2.82 times more at risk of having a child with stunting (OR=2.82). Meanwhile, the factors of maternal height, family income, history of exclusive breastfeeding, birth weight, gender and access to health services did not have a significant relationship with the incidence of stunting with a p<0.05.

4. Discussion

Relationship between Gender and Stunting Incidents

The results of the research analysis showed that in the relationship between fetal factors in the form of gender and the incidence of stunting in the work area of the Biromaru Public Health Center, Sigi Regency, children with male sex experienced more stunting as many as 42 people (56%) compared to those who were not stunted, while children with male sex many women do not experience stunting as many as 35 people (46.7%) compared to those who are stunted. Statistical test analysis showed a p-value = 0.743 (> 0.05), which indicated that there was no relationship between gender and the incidence of post-disaster stunting. The value of OR = 0.89 (95% CI: 0.47-1.71) was obtained, meaning that boys are 1 time more at risk of experiencing stunting than girls. The results of this study are in line with Savita's research (2020) which obtained p-value = 0.874 (>0.05) which concluded that there was no significant relationship between the sex of toddlers and the incidence of stunting (13). The results of this study also showed a value of OR=0.905 (95% CI: 0.487–1.682), which means that stunting is 1 times more likely to be at risk for male toddlers than female toddlers. However, the gender of the toddler does not affect the incidence of stunting. Stunting can occur due to various factors, one of which is the intake factor, because in feces growth requires sufficient intake of energy, protein and fat. Because in children, both boys and girls, will experience growth disorders if energy and protein intake is reduced. This study is also in line with Leo et al., (2018) with the results of the chi square analysis showing that there was no difference in the proportion of sex between the case group and the control group in the mountain and coastal areas (p> 0.05) (14).

Relationship between birth weight and stunting

In the analysis of the relationship between fetal factors in the form of birth weight and the incidence of stunting in the working area of the Biromaru Public Health Center, Sigi Regency, children with birth weight who were not at high risk of experiencing stunting in the control group were 66 people (88%) compared to those with stunting, while children with at birth are at greater risk of experiencing stunting by 66 people (88%) compared to those who are not stunted. The statistical test analysis showed that the p-value = 0.806> 0.05 means that there is no relationship between birth weight and the incidence of post-disaster stunting. The value of OR = 1.12 (95% CI: 0.43-2.95) is obtained, which means that children with low birth weight or at risk (<2500 grams) have a 1.12 times chance of experiencing stunting compared to children whose birth weight is not at risk (≥ 2500 grams).

This research is in line with research from Yuniarti et al., (2019) that a history of low birth weight is not a risk factor for stunting because most children do not have a history of LBW where there are 94.6% of children in the stunting group and 97.3% of children in the non-stunting group who do not have a history of LBW. not a risk factor for stunting. OR = 2.05 indicates that children with a history of LBW are 2.05 times at risk of stunting. However, that does not mean that children with LBW cannot catch up with growth (15). The effect of birth weight on height growth is greatest in the first 6 months of age. If in the first 6 months a toddler can improve his nutritional status, then there is a possibility that the toddler's height can grow normally and prevent stunting at a later age.

This research is not in line according to Imelda et al., (2018) the results obtained that low birth weight is a risk factor for stunting, in the case group the number of children who experience low birth weight is 73.3% compared to children who do not experience weight low birth weight (26.7%), whereas in the control group the number of children who did not experience low birth weight was 71.7% compared to children who experienced low birth weight (28.3%) with a statistical value of OR = 6.956 (95% CI:4.445-14.104) (16). Other studies that are inconsistent show that toddlers born with low birth weight are a risk factor for stunting in toddlers (17). Birth weight is one indicator of health in newborns. Babies with low birth weight will be more vulnerable to unfavorable environmental influences in the future (18).

Relationship between exclusive breastfeeding and stunting

The results showed that the breastfeeding factor in the form of exclusive breastfeeding with the incidence of stunting in the working area of the Biromaru Public Health Center, Sigi Regency, children who were exclusively breastfed experienced a lot of stunting as many as 37 people (49.3%) compared to those who were not stunted, while children who were not exclusively breastfed did not experience as much stunting. 40 people (53.3%) compared to stunting. Statistical test analysis showed a p-value = 0.744> 0.05, indicating that there was no relationship between exclusive breastfeeding and the incidence of post-disaster stunting. The value of OR = 0.89 (95% CI: 0.43-1.71) was obtained, so that it can be concluded that children with exclusive breastfeeding have one

more chance of experiencing stunting compared to children who are not exclusively breastfed. This study is in accordance with the results of the study of Hadi et al., (2019) which showed that exclusive breastfeeding did not affect the incidence of stunting where other factors that were more dominant causing stunting were mother's education, income, average duration of illness (especially diarrhea and ARI), birth weight and level of energy intake. This is also supported by theories which show that breastfeeding alone is not enough to reduce stunting but needs to be supported by improving socio-economic conditions, education levels, infectious disease problems and women's empowerment (19) (20). Exclusive breastfeeding is not the only nutrition that needs attention in preventing stunting, but proper complementary feeding (MPASI) also supports the fulfillment of nutrition in children (21). Exclusive breastfeeding for too long, which is more than 6 months, will delay the provision of complementary foods so that children do not receive appropriate nutritional intake for their growth and development (22).

This is different from research in the Rob area of Pekalongan City which shows that exclusive breastfeeding is a risk factor for stunting. Most of the children in the stunting group were not given exclusive breastfeeding. Children who are not exclusively breastfed are 19.5 times at risk of becoming stunted (15). Research in Southern Ethiopia shows that toddlers who are not exclusively breastfed for the first 6 months have a greater risk of stunting (23). Different results were also obtained from research results which proved that there was a relationship between exclusive breastfeeding and the incidence of stunting (p=0.004) where toddlers who did not get exclusive breastfeeding had a tendency of 2.6 times more at risk of experiencing stunting than toddlers who got exclusive breastfeeding (OR=2.634) (13).

Relationship between Mother's Height and Stunting Incidence

The results of the study on the relationship between maternal factors in the form of mother's height and the incidence of stunting in the working area of the Biromaru Public Health Center, Sigi Regency showed that respondents with non-risk maternal height had the same number of stunted and non-stunted children, namely 72 people (96.0%) while respondents with maternal height also at risk of having stunted and non-stunted children, namely 3 people (4.0%). Statistical test analysis showed a p-value = 0.659> 0.05 which showed that there was no relationship between maternal height and the incidence of post-disaster stunting. The value of OR = 1 (95% CI: 0.195-5.12) is obtained, so that it can be concluded that respondents with a mother's height in the risk category (<145 cm) are 1 times more likely to have a child who is stunted compared to respondents with a mother's height in the category not at risk (> 145cm).

This is in line with the results of a study by Andari et al., (2020), mothers with short height (<150 cm) have a 2.7 times greater risk of having stunted children compared to mothers with normal height (>150 cm) (24). Mamabolo et. al., (2005) explained that parents who are short because of genes in chromosomes that carry short traits will most likely pass on these short traits to their children, but if parents have short traits caused by nutritional or pathological problems then these short traits will not be passed on to them (25). Their children so as to enable children to grow to normal height as long as they are not exposed to other risk factors. In addition to genetic factors, environmental factors also greatly influence the growth and development of children, especially the nutritional state of the mother which greatly influences the health status and growth of the fetus in the womb to adulthood (26). In a study conducted in Sigi which aimed to analyze post-earthquake toddler nutritional problems in Palu City, Sigi Regency and Donggala Regency, it was found that the prevalence of stunting was 48.5% (27), quite far from the national prevalence namely 24.4% (28). Research on the impact of the earthquake on nutritional status has also been carried out in Haiti. Most children in Haiti experience food insecurity and malnutrition after the 2010 earthquake (23). Another study, different from that conducted in Gianyar Regency, Bali, showed that mothers with short height (<150 cm) tend to have stunted children (29).

Relationship between Family Income and Stunting Incidence

The results of the study on the relationship between family economic factors in the form of family income and the incidence of stunting in the working area of the Biromaru Public Health Center, Sigi Regency, respondents with high family income (≥Rp.2,390,739) had more children who were not stunted, 11 people (14.7%) compared to experienced stunting while respondents with low family income (<Rp. 2,390,739) had more of their children experiencing stunting as many as 70 people (93.3%) compared to those who did not experience stunting. The relatively low family income in Sigi Regency is closely related to the occupation of parents who are predominantly farmers and housewives. The post-disaster situation also exacerbated the situation where the disaster caused most of the agricultural land to become dry.

Statistical test analysis shows p-value = 0.113> 0.05, this shows that there is no relationship between family income and the incidence of post-disaster stunting. The value of OR = 2.41 (95% CI: 0.79-7.30) is obtained, so that it can be concluded that respondents with family income that is below the District Minimum Wage (<Rp.2,390,739) are 2.41 times more likely to have stunted children compared to respondents with high family income (≥Rp.2,390,739).

This is in line with research by Pertiwi et al., (2019) that the proportion of toddlers with low family income who experience stunting is greater (51.2%) compared to toddlers with high family income of 50.0%. However, there was no significant relationship between family income and the incidence of stunting (p=0.965). OR=1.048 (90% CI: 0.135-8.131) indicates that toddlers with low family income have a 1.048 chance of experiencing stunting compared to toddlers with high family income (30). Nursalam (2005) stated that the growth of babies is not too much influenced by family income, even though the income is low if the family is able to manage simple and cheap ingredients into nutritious food then the baby will grow well (31). Families with high incomes also do not always mean they are able to meet the nutritional needs of children for nutritious foods. The higher the income of a person or family, the more desires and needs to be fulfilled and the more diverse, not only regarding food needs. This is different from research that reports a significant relationship between low household income and malnutrition (7).

Relationship between Mother's Education and Stunting Incidence

The results of the study on the relationship between home environmental factors in the form of mother's education and the incidence of stunting in the work area of the Biromaru Public Health Center, Sigi Regency, respondents with higher maternal education had more children who did not experience stunting as many as 46 people (61.3%) compared to those who experienced stunting while respondents with low maternal education 48 people (64.0%) had more children who were stunted than those who were not stunted. Statistical test analysis has a p-value = 0.002 <0.05. This shows that there is a relationship between mother's education and the incidence of post-disaster stunting. The value of OR = 2.82 (95% CI: 1.45-5.46) was obtained, so that it can be concluded that respondents with a low level of maternal education (not attending school, elementary, junior high) have a 2.82 times chance of experiencing stunting compared to respondents with a high level of maternal education (High School and College).

The results of this study are in accordance with the research of Paramashanti et al., (2015) which showed that a high level of mother's knowledge, namely a minimum of high school graduation, was positively related to a significantly reduced risk of stunting in children (32). Mothers with low education have a 1.38 times greater risk of having stunted children than mothers with higher education. Mothers with higher education are more likely to make decisions to improve their child's nutrition and health such as exclusive breastfeeding, therapeutic immunization and so on (33). Astari (2008) states that a mother's knowledge of nutrition will influence the mother's behavior in providing the right type and amount of food for the growth and development of her child (34). This plays a very important role in preventing stunting in children. This is in contrast to Kamal's research (2011) which obtained results that mother's education was not significantly related to the incidence of stunting where mothers with higher education usually have jobs that cause a lack of time in caring for children resulting in reduced attention of mothers to fulfilling children's nutrition which will affect their growth and development (35).

Relationship between Access to Health Services and Incidence of Stunting

The results of the study on the relationship between health service factors in the form of access to health services and the incidence of stunting in the work area of the Biromaru Public Health Center, Sigi Regency, the number of respondents who had good access to health services showed that respondents with good access to health services had the same number of stunted and non-stunted children, namely 52 people (69.3%) while respondents with poor access to health services also had stunted and non-stunted children in the same number, namely 23 people (30.7%). The statistical test analysis shows that the p-value = 1.000> 0.05 means that there is no relationship between access to health services and the incidence of post-disaster stunting. The value of OR=1.00 was obtained (95% CI: 0.50-2.00), so that it can be concluded that respondents with poor access to health services (mileage to the Puskesmas >3 km and travel time >30 minutes) are 1 times more likely to experience stunted children compared to respondents with good access to health services (distance to Puskesmas ≤3 km and travel time ≤30 minutes).

This is influenced by the health services available to the community, not only services at the Basic Health Center (Puskesmas). Even though the location of the Puskesmas is quite far and requires quite a long time to reach it, the Puskesmas has provided various health services that are closer to the community such as the provision of Pustu, Polindes, Poskesdes, Posbindu, Posyandu and so on. In relation to stunting prevention, Posyandu plays a very important role in monitoring the growth and development of children from the womb to toddlers. Posyandu is also implemented in several locations that are very close to the community so that it is easy to reach even though the Puskesmas is far away. In addition, if they experience health problems, the community can immediately get treatment with the help of the local village midwife.

This research is in contrast to research which states that access to health services has a significant relationship to the incidence of stunting, because only 2% of children under five who are not stunted have far access to health service facilities while more toddlers are stunted (32.8%) where they live far away and access to health services is far away, so that people who have family members who are pregnant, postpartum, infants and toddlers do not

get services as needed (7). Another study describes antenatal care, that stunting is more common in mothers who receive antenatal care at the health center (47.5%) when compared to mothers who receive antenatal care at the clinic. However, in general, the distribution of mothers who receive antenatal care at the puskesmas is higher than that of mothers who receive antenatal care at the clinic (36). Dewi's research in Central Buton found that there was a significant relationship between the incidence of stunting and the utilization of health services as indicated by toddlers who experienced stunting were toddlers who did not take advantage of health services, while toddlers who were not stunted were toddlers who used health services sufficiently (37).

5. Conclusion

There is no correlation between gender, birth weight, exclusive breastfeeding, mother's height, family income, and access to health services with stunting incidents in children in the working area of the Biromaru Health Center after the disaster. However, research shows that there is a relationship between the education level of the mother and the incidence of stunting in children under five after the disaster in the working area of the Biromaru Health Center.

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