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MATERNAL FACTORS ON STUNTING AT SASI COMMUNITY HEALTH CENTER, TIMOR TENGAH UTARA REGENCY

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Abstract

Stunting, defined as height-for-age more than two standard deviations below the WHO's child growth standards median has many long-term consequences. With a high prevalence of stunting in the *Kelurahan* Sasi (10% in August 2023), we aim to determine whether identified maternal risk factors align with the local context, offering insights for effecting interventions in Timor Tengah Utara Regency. This is a case-control study with a sample size of 103 children aged 6 to 59 months participating in three *Posyandu* in Sasi Community Health Center. Maternal risk factors impacting stunting occurrence are assessed through bivariate using chi-square test and multivariate analysis using multiple logistic regression methods. Of the 103 children who attended *Posyandu* in Kelurahan Sasi, 28,1% of children exhibited stunting, with statistically significant risk factors namely low maternal education, low knowledge about stunting, low household wealth index, gestational age, and short maternal height. Maternal education emerged as the primary risk factor for stunting in Sasi Community Health Center (OR 6.0; 95% CI 2,3 to 4.5; P=0.0029). Maternal education emerged as the primary risk factor on stunting in Sasi Community Health Center, as indicated by both bivariate and multivariate analysis. Furthermore, low household index and short maternal height were linked to a higher likelihood of stunting, emphasizing the influence of economic factors. Maternal age and iron supplementation did not emerge as statistically significant contributors to stunting, contrary to previous findings, suggesting the need for further investigation despite the study's limitations. This study shows that several factors like maternal knowledge, household wealth index, maternal education, maternal height, and maternal gestation have a significant impact on the incidence of stunting. However, maternal age and iron supplementation did not show any significant impact.

Keywords: Stunting, maternal education, household wealth index, gestational age, gestational age

INTRODUCTION

Stunting in children, defined as a height-for-age measurement that is more than two standard deviations below the World Health Organization's child growth standards median, is a significant public health issue, particularly in developing countries (De Onis & Branca, 2016). Epidemiologically, stunting is not merely a reflection of poor nutrition, but also a marker of persistent socio-economic problems (Ssentongo et al., 2021). It is closely linked to maternal health factors, including maternal nutrition, education, and health behaviors during and after pregnancy (Martorell & Young, 2012). Therefore, studying about stunting requires an epidemiological approach involving a detailed analysis of maternal health records, child growth charts, and socio-economic data to understand the correlations and causative factors leading to stunting (Manggala et al., 2018).

Stunting is not merely a temporary physical condition but has long-term health implications, including increased susceptibility to chronic diseases and impaired cognitive development (Prendergast & Humphrey, 2014). From a socio-economic perspective, stunting perpetuates a cycle of poverty and poor health, with stunted children often facing reduced productivity and earning potential in adulthood (Rizal & van Doorslaer, 2019).

The Global Nutrition Report 2016 reported that the prevalence of stunting in Indonesia ranks 108th out of 132 countries, with the second-highest prevalence of stunting in the Southeast Asia region, following Cambodia (World Health Organization, 2020). According to Studi Status Gizi Indonesia (SSGI) in 2019, the predicted prevalence of stunting in Indonesia is 27,7%, 26,9%, and 24,4% for the year 2019, 2020, and 2021 respectively, with Nusa Tenggara Timur as the province with the highest prevalence (Kementerian Kesehatan RI., 2015). According to Laksono et al, the proportion of stunting in Indonesia is 20.1%, while Beal et al report a national prevalence of approximately 37%. After routine weighings in February and August 2023, it was discovered that in Timor Tengah Utara Regency, Kota Kefamenanu, specifically in the Kelurahan Sasi, the stunting rate was 12.9% (39 children under-five years old) in February 2023, and in August 2023, it was 10% (32 children under-five) years old. Considering our high prevalence of stunting and its long-term consequences, we aim to investigate whether the maternal risk factors identified in the current literature align with those prevalent in our area (Hanjahanja-Phiri, 2018) (Bago et al., 2022).

To our knowledge, this is the first study conducted in the Sasi Community Health Center which aims to determine the impact of maternal factors on the incidence of stunting in children aged 6 to 59 months. Sasi Community Health Center was chosen due to its location in the capital, and thus serves as a benchmark for other health centers in Timor Tengah Utara regency. This study is an epidemiological study to explore the relationship between maternal health and child growth, guided by medical knowledge and public health principles. By adopting an epidemiological approach, it seeks to unravel the multifaceted causes of stunting, with a particular focus on maternal influences. The findings are expected to provide actionable insights for healthcare providers, policymakers, and public health

practitioners, paving the way for effective strategies to combat stunting and improve child health outcomes in Timor Tengah Utara Regency and beyond.

RESEARCH METHODS

This study is analytical observational research with a case-control study design. The inclusion criteria in this study includes children aged 6 to 59 months, both experiencing stunting and those who are not, participating in the Posyandu, and receiving the questionnaire. The sample size was determined using the minimal sample size formula for case-control studies, resulting in a total sample of 103 children, consisting of 29 case samples (stunting) and 74 control samples (non-stunting). The determination of nutritional status (stunted/non-stunted) in respondents refers to the results of the Bulan Timbang in August 2023. The sampling technique used in this study is consecutive sampling (Mann, 2012).

We selected three Integrated Healthcare Centers (Posyandu) in the Sasi Community Health Center's working area for data collection, namely Sasi 1, Sasi 2, and Upkasen. The data collection was conducted simultaneously at the three Posyandu on Tuesday, October 11th, 2023. On that day, we delivered educational materials on stunting to the Posyandu's participants, followed by a brief discussion, and lastly, the administration of questionnaires through individual interviews with the parents.

A total of 207 parents attended those Posyandu, and 103 parents completed the questionnaires. The filled questionnaires will be summarized and processed for comparative analysis, which are bivariate with chi-square test, and multivariate with multiple logistic regression method, using the SPSS 27 application. In this study, seven variables were identified as maternal risk factors to be assessed for their impact on the occurrence of stunting in our working area, namely maternal education, household wealth index, stunting knowledge, maternal height, gestational age, maternal age, and iron supplementation.

RESULTS AND DISCUSSION

Of the 103 children aged 6 to 59 months who attended Integrated Healthcare Centers (*Posyandu*), 28.1% exhibited stunting based on height-for-age measurements, while 71.9% did not display such growth impediments. Within this study, 15.5% identified as having low birth weight, defined as being below 2500 grams. The mean age of the participants' mothers at their initial childbirth ranged from 20 to 35 years. Additionally, an assessment of the household wealth index for each child was classified as delineated in Table 1. Comprehensive baseline characteristics of the subjects and their parents are shown in Table 1.

Table 1. Socio-demographic characteristics of parents and children in Sasi Community Health Center.

Characteristics	n	%
Parents		
Maternal age		
20-35	82	79.6%
>35	21	20.4%
Parental education		
Low (Uneducated/Elementary School/Junior High School)	33	32.0%
High (Senior High School/Bachelor)	70	68.0%
Household Wealth Index		
<UMR	58	56.3%
>UMR	45	43.7%
Maternal Height		
<150cm	29	28.2%
>150cm	74	71.8%
Children		
Birth Weight		
≥2500gr	87	84.5%
<2500gr	16	15.5%
Height-for-age		
Stunted	29	28.1%
Non-Stunted	74	71.9%
Age		
6-23 month		
24-35 month		
36-59 month		

Bivariate analysis was used to compare nutritional status (stunted and non-stunted) and the possible risk factor. It revealed that low parental education (OR 2.1; 95% CI 1.22 to 5.68; P=0.001), low income (OR 3.0; 95% CI 2.1 to 4.6; P=0.039), Gestational age (OR 3.6; 95% CI 1 to 12; P= 0.039), stunting knowledge (OR 6.0; 95% CI 2,3 to 4.5; P=0.0029), and short maternal height (OR 5.7; 95% CI 2.2 to 14.8; P= 0.001), were statistically significant associated with stunting (Table 2). However, variables such as maternal age and iron supplement consumption were not associated with stunting in Sasi Community Health Center.

Table 2. Possible risk factors of stunting based on bivariate analysis.

Variables	Height-per-age		p-value	OR	CI
	Stunted, n(%)	Non-stunted, n(%)			
Parental Education					
Low	19 (65.5%)	14 (18.9%)	0.001	8,1	3,113 – 21,301
High	10 (34.5%)	60 (81.1%)			
Household Wealth Index			0.039	2,6	1,032-6,674
<UMR	21 (72.4%)	37 (50.0%)			
>UMR	8 (27.6%)	37 (50.0%)			
Stunting Knowledge					
Poor	21 (65.5%)	36 (18.9%)	0.029	0.3	0,142-0,918
Enough	8 (34.5%)	38 (81.1%)			
Maternal Height					
Short (<150cm)	16 (55.2%)	13 (17.6%)	0.001	5,775	2,243-14,867
Normal (>150cm)	13 (44.8%)	61 (82.4%)			
Gestational Age					
<37 week	6 (20.7%)	5 (6.8%)	0.039	3,600	1,004-12,912
>37 week	23 (79.3%)	69 (93.2%)			
Maternal Age					
High Risk	9 (31%)	12 (16.2%)	0.093	2,325	0,855-6,323
Low Risk	20 (69%)	62 (83.8%)			
Iron Supplementation					
Yes	26 (89.7%)	69 (93.2%)	0.541	0.628	0,140-2,817
No	3 (10.3%)	5 (6.8%)			

The significant risk factors were analyzed further with double logistic regression model analysis, as shown in Table 3. Maternal education was the main risk factor for stunting in Sasi Community Health Center.

Table 3. Multivariate Analysis of Risk Factors of Stunting

Variables	OR	95% CI	P-value
Maternal Education	6,1	1,9-19,2	0,002
Household Wealth Index	1,4	0,4-4,9	0,551
Maternal Height	1,9	0,6-5,9	0,238
Gestational Age	2,1	0,4-9,9	0,306
Stunting Knowledge	1,0	0,2-3,7	0,965

This paper examines maternal factors associated with stunting among children 6 – 59 months at the urban village of Sasi in the Timor Tengah Utara regency using the data from the Public Health Office.

Maternal Education and Knowledge about Stunting

The average duration of schooling in Indonesia for girls is about 8 years, equivalent to junior high school (SMP) (Badan Pusat Statistik, 2023). Therefore, maternal education below junior high school level is considered low, and vice versa. The result of our study suggests an association between low maternal education and an increased likelihood of stunting, as evidenced by both the bivariate analysis (OR 2.1; 95% CI 1.22 to 5.68; P=0.001) and multivariate analysis. From the multivariate analysis, maternal education emerged as the primary risk factor for stunting among all variables (P=0.002). This finding was consistent with existing research, conducted in Indonesia (Semba et al., 2008), Bangladesh (Rahman & Chowdhury, 2007), Iran (Emamian et al., 2014), Cambodia (Ikeda et al., 2013), Nepal (Tiwari et al., 2014). One study in Iran revealed that 70% of the socioeconomic disparities contributing to childhood stunting are attributed to mother's education (Emamian, 2013). This can be associated with several reasons. Educated mothers are more likely to adopt healthier lifestyles, understand the importance of child nutrition, access healthcare services, therefore have more positive caregiving behaviors and effective feeding practices, foster optimal child growth, improve socioeconomic status and overall well-being (Akombi et al., 2017; Emamian et al., 2014; Wachs, 2008).

This study demonstrated a statistically significant association between the knowledge about stunting among parents and the probability of stunting (OR 6.0; 95% CI 2,3 to 4.5; P=0.0029). This finding aligns with the preceding paragraph regarding mother's education level. Additionally, it may be associated with the lack of awareness of stunting and appropriate feeding practices. Mothers may encounter issues such as inadequate child appetite, a preference for outside snacks over home-cooked meals, and reluctance to eat fruits and vegetables. In these circumstances, some uneducated parents may choose not to insist on their children's food intake to avoid crying and resistance (Candra, 2020).

Household Wealth Index

This study also revealed that low Household Wealth Index is significantly linked to higher likelihood of stunting (OR 3.0; 95% CI 2.1 to 4.6; P=0.039). Household Wealth Index is defined as a score of household assets, such as means of

transport, durable goods, and household facilities (Tiwari et al., 2014). In this paper, we used UMR or *regional minimum wage* as a cutoff to determine whether their household wealth index is high or low. Low parental wages is associated with low purchasing power, resulting in typically reduced variety and quantity in food choices, infrequent provision of eggs, meat, fish on a daily basis, thus leading to insufficient intake of crucial nutrients, such as protein, vitamins, and minerals (Candra, 2020; Marsaoly et al., 2021).

Furthermore, as we stated previously, educated mothers who are more conscious about their children's nutritional needs and health are typically associated with wealthier households (Tiwari et al., 2014). Previous studies in Peruvian, Cambodian, Bangladeshi children also identified household wealth index as a key predictor for stunting in children under five years of age (Ikeda et al., 2013; Urke et al., 2011).

Maternal Height

The final height achieved in adulthood is a product of the combined influence of genetics and environmental factors throughout the growth period. In developing countries, the failure of growth during the first 1000 days (conception to 2 years) significantly influences the eventual adult height (Addo et al., 2013). Maternal height was classified as 'at risk' when it fell below 150 cm (Kemenkes RI, 2015). Numerous studies have investigated the immediate connection between maternal height and the size of the child at birth and during specific postnatal stages. However, there is limited information regarding the correlation between maternal height and the long-term growth trajectory of offspring. Specifically, there is a gap in research exploring the link between maternal height and linear growth in offspring during specific and potentially crucial developmental periods postnatally (Addo et al., 2013).

The connection between maternal height and the linear growth of children results from a combination of genetic factors and maternal environmental influences. Shorter mothers often possess lower protein and energy reserves, smaller reproductive organs, and a more confined space for fetal development, influencing fetal growth through the placenta and infant growth through the quantity and quality of breast milk. This situation may lead to intrauterine growth restriction, which is also associated with short stature in children (Addo et al., 2013; Manggala et al., 2018). A cycle of intergenerational malnutrition is anticipated in the future, wherein children affected by stunting are likely to grow into short mothers who, in turn, may give birth to stunted children (Utami et al., 2018).

In our study, short maternal height (OR 5.7; 95% CI 2.2 to 14.8; P= 0.001), were statisctically significant associated with stunting. Our findings align with the outcomes of a study done by Qurani et al. indicating a notable correlation between genetic factors, represented by the mother's height, and stunting in the children, Children born to mothers with a height below 150 cm had a 2.3 times greater risk of experiencing stunting compared to those born to mothers with a height of 150 cm or more. (p=0,044; OR=2,3; 95% CI).

This outcome aligns with research done in Yogyakarta in the case of children aged 6-23 months, it was revealed that maternal height is significantly linked to the occurrence of stunting. (Amin & Julia, 2016) Another study by Utami et al. similarly, found that children between 0-23 months old, born to mothers with a height less than 150 cm, are 1.4 times more prone to developing stunting compared to those with mothers who are 150 cm or taller. Addo et al. indicated that mothers with a height below 150.1 cm were more prone to having a child who experienced stunting at 2 years (prevalence ratio = 3.20 (95% CI: 2.80-3.60) and as an adult (prevalence ratio = 4.74, (95% CI: 4.13-5.44).

This outcome contrasts with the findings of a study conducted in Cianjur, among children aged under five (6-59 months), indicating no correlation ($p > 0.05$, $r = 0.562$) with maternal height and the nutritional status of children (height/age). This outcome likely occurred due to the prevalence of nutritional and pathological issues among the majority of short mothers in the study. Consequently, stunting did not necessarily manifest in their children (Hanum et al., 2014).

Gestational Age

The gestational age at delivery was classified into three categories: preterm (<37 weeks), term (37-42 weeks), and post-term (>42 weeks). Preterm birth and intrauterine growth restriction (IUGR) are the two fundamental biological factors that contribute to low birth weight (LBW). Infants experiencing intrauterine growth restriction (IUGR) during fetal development are essentially born malnourished. The growth deficits observed from birth appear to significantly elevate the likelihood of stunting up to the age of 2, contributing to short stature and an increased risk of developing chronic diseases in later life (Sartika et al., 2021).

Research conducted in Banjarmasin demonstrated a noteworthy correlation between gestational age at delivery and the occurrence of stunting in toddlers, similar to our result. The study categorized gestational age at delivery into two groups: preterm and term. According to the findings, preterm infants exhibited a 3.7 times higher risk of developing short stature. The growth of preterm toddlers may be impeded by the premature birth and the occurrence of linear growth retardation in the uterus (Febriana & Sari, 2021)

In contrast to the findings of our study, Qurani et al discovered there is no significant association between gestational age at delivery and the incidence of stunting ($p = 0.338$). This aligns with the findings of other studies conducted by Manggala et al. and Warsini et al.

Maternal Age

The incidence of stunting can also be influenced by maternal age. Younger maternal age at childbirth correlates with an increased risk of intrauterine growth restriction (IUGR), preterm birth, and undernutrition. Generally, younger mothers exhibit lower nutritional statuses than their older counterparts, owing to their own ongoing growth stage, potentially leading to competition for nutrients between the mother and fetus, thereby limiting adequate nutritional intake for the child

(Habimana, 2019). Consequently, this may elevate the risk of low birth weight, rendering infants more susceptible to stunting (Kathren G, 2016). Conversely, advanced maternal age poses its own set of pregnancy risks, including increased occurrences of preterm birth, IUGR, and various maternal health conditions that can affect offspring (Fall D et al., 2015).

In our study conducted at the Sasi Community Health Center, maternal age did not emerge as a significant contributing factor to stunting. Surprisingly, mothers categorized as low-risk in terms of maternal age exhibited a higher likelihood of experiencing stunting compared to those considered high-risk. These findings align with prior research indicating that mothers within the middle age bracket (25-34 years) exhibited a higher propensity for stunting compared to their younger counterparts (Habimana, 2019). While maternal age appeared as a predictive factor, its direct impact on stunting may be indirect, possibly mediated through socioeconomic, psychological, and educational factors, which in turn, influence the growth and development of children (Akpinar and Teneler, 2022).

Iron Supplementation

Administration of iron supplementation among expectant mothers is imperative in mitigating the occurrences of anemia, puerperal sepsis, low birth weight, and stunting (Sari Kencana, 2023). Research indicates a notable threefold increase in the likelihood of stunting among offspring born to mothers who did not receive iron supplementation during pregnancy compared to those whose mothers received such supplementation (Sari Kencana, 2023). In a retrospective cohort study spanning seven South Asian countries, antenatal iron supplementation exhibited an 8% reduction in stunting risk, whereas the consumption of 120 iron supplementation tablets demonstrated a 14% reduction (Nisar Y Bin, 2016).

In contrast, our study revealed no significant association between iron supplementation and stunting, aligning with previous observations in China and Nepal (Wang W, 2012; Stewart CP, 2009) where iron and folic acid supplementation during pregnancy did not diminish the risk of infant stunting (Stanislav, 2023). It is plausible that the lack of significance in our study stemmed from limited sample size and insufficient statistical power. Despite our study's outcome suggesting no direct link between iron supplementation and stunting, proactive measures should be undertaken to minimize associated risks.

CONCLUSION

This study shows that several factors like maternal knowledge, household wealth index, maternal education, maternal height, and maternal gestation have a significant impact on the incidence of stunting. However, maternal age and iron supplementation did not show any significant impact. It can be concluded that maternal factors and the incidence of stunting have a significant relationship. Therefore the Health Department including the Community Health Center and The Public Health Office need to pay more attention not only to cases of stunting but also to maternal factors that can influence the incidence of stunting in the future.

This study has several limitations due to the remote area where it was conducted. Including the participant's illiteracy, inaccurate height measurement, and a wide coverage area that was not accessible

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