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Behavioral Predisposing Factors in Mothers of Toddlers Affecting the Risk of Stunting Among Toddlers in Dairi Regency

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Abstract: Stunting a significant public health issue worldwide, particularly in low- and middle-income countries where access to adequate nutrition and healthcare is limited. This condition affects not only physical growth but also cognitive development and well-being. The study aimed to explore the impact of maternal behavioral factors, including nutrition, breastfeeding practices, and health-seeking behaviors, on the risk of stunting among toddlers. Method It is a cross sectional study with retrospective case control approach. A total of 120 mothers who had toddlers aged 6-24 months involved recruited from Puskesmas Pegagan Julu, Dairi District. Variables collected were knowledge, attitude and action of mothers, weight, height, age of children and exclusive breastfeeding consumption. Analyzed was performed through bivariate and multivariate logistic regression. Results a total 28.60% of toddlers were stunted, with significant links found between maternal nutritional knowledge (OR = 0.45, $p < 0.05$), exclusive breastfeeding for six months (OR = 0.60, $p < 0.05$), and regular health-seeking behavior (OR = 0.32, $p < 0.01$), and reduced stunting risk. Conversely, inadequate sanitation facilities were associated with increased stunting prevalence (OR = 2.76, $p < 0.01$).

Keywords: Maternal behavior; Predisposing factor; Stunting; Toddler

Introduction

Stunting is known as linear growth retardation, which is a condition where a child fails to reach their full growth potential due to chronic malnutrition. It is commonly used as an indicator of child linear growth in public health and nutrition programs (Leroy & Frongillo, 2019; Supadmi et al., 2024). It is a significant public health issue worldwide, particularly in low- and middle-income countries where access to adequate nutrition and healthcare is limited and can have lasting effects on physical and cognitive development (Alem et al., 2023; Karanja et al., 2022). The etiology of childhood stunting is complex and multifactorial, encompassing dietary deficiencies, suboptimal breastfeeding practices, and inadequate prenatal care (Amaha & Woldeamanuel, 2021). Environmental factors, including sanitation, access to clean water, and socioeconomic status, further exacerbate the risk (Kryston et al., 2024; Anthonj et al., 2020).

Maternal behavioral predisposing factors play a crucial role in the development of stunting in children (Saleh et al., 2021; Siramaneerat et al., 2024; Suratri et al., 2023). These factors can include inadequate maternal nutrition during pregnancy, poor breastfeeding practices, a lack of access to clean water and sanitation, and limited knowledge of proper child care practices (Martorell, 2017). Understanding and addressing these predisposing factors is essential to preventing and

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addressing stunting in children (Rahmadiyah et al., 2024; Sufri et al., 2023; Atamou et al., 2023). Addressing stunting necessitates a focus on maternal behaviors and their influence on child nutrition and care (Nshimyiryo et al., 2019). Research identifies maternal nutrition, knowledge, and caregiving practices as pivotal to reducing stunting risk. However, there remains a gap in applying these insights to develop community-level interventions that are both effective and feasible. Previous efforts, including nutrition education programs and policy initiatives to empower women, have shown promise. The reduction of stunting rates has been particularly.

Method

Location of Study

The study took place in in the working area of Puskesmas Pegagan Julu, Dairi Regency, at Pegagan Julu village. The considering factors is geographical location and population density, number households with toddlers aged 6 to 24 months, high and mild stunting prevalence.

Participants of Study

The study population consisted of 120 mothers with toddlers aged 6 to 24 months. Participants were purposively selected based on the following criteria: aged 20-40 years, mother of at least one child under five years old, regular attendance at monthly weighing posts, and consent to participate in the study. Mothers were divided into two groups: 60 in the case group (mothers of stunted toddlers) and 60 in the control group (mothers of non-stunted toddlers). The respondent characteristics comprised mothers age, employment status, education and parity (number of children). The sample size was determined based on the prevalence of childhood stunting in the region and the desired level of precision. The study employed a multistage sampling technique to ensure representativeness and generalizability of findings.

Data Collection

Data were collected from mothers residing, Indonesia. Structured interviews were conducted with mothers or primary caregivers of toddlers to gather information on maternal behaviors related to nutrition, hygiene, healthcare utilization, and socio-economic status. Anthropometric measurements of toddlers were obtained to assess their nutritional status, including height-for-age z-scores (HAZ) to determine stunting prevalence. Additionally, socio-demographic data, including maternal age, education, and household income, were collected to control for potential confounding variables.

Data Analysis

The variables of the study consist of independent variables of predisposing factors (knowledge, attitudes and actions). Statistical analysis was conducted to explore the relationship between predisposing factors of maternal behavior and the likelihood of mothers giving birth to stunting toddlers. Bivariate tests were performed to examine the associations between maternal knowledge, attitude, action, and the risk of giving birth to stunting toddlers. Subsequently, a candidate model was identified based on the significant predictors identified in the bivariate analysis, which included knowledge, attitude, and action. These variables were further analyzed to understand their impact on the likelihood of giving birth to stunting toddlers in the study area.

Univariate analysis is performed to explain and describe all independent variables, namely predisposing factors (knowledge, attitudes and actions), Bivariate analysis is to analyze the relationship of predisposing factors; knowledge, attitudes and actions with dependent variables of mothers with stunting toddlers using the chi square statistical test with a confidence level of 95%. Multivariate analysis to analyze the variables that most influence on mothers at risk of giving birth to stunting toddlers.

Result and Discussion

Characteristics of respondents in case and control study:

Table 1. Distribution of the Characteristics of Respondents between Case and Control Study

	Case		Control	
Variables	n	%	n	%
Age				
20-30 years	12	20	18	30
31-40 years	48	80	42	70
Employment				
Household	48	80	48	80
Non HH	12	20	12	20
Education				
Elementary	18	30	18	30
Junior school	42	70	42	70
Parity				
<4 children	48	80	48	80
>4 children	12	20	12	20

Table 1 displays the distribution of demographic and social characteristics of respondents in a case-control study, including age, employment status, education level, and parity. This table explained that both groups show a predominantly similar structure: the majority are 31–40 years old (80% in cases and 70% in

controls), most are household mothers (80%), and the majority have attended junior high school (70%). Less than a third of each group are 20–30 years old, have elementary education, or are non-household mothers. The parity data indicates equal representation in both groups, with 80% having fewer than four children and 20% having more than four children. This uniformity across demographic factors suggests that age, employment, education, and family size are not variables differentially distributed between the cases and controls, with a slight variation in age group distribution. There is a slight difference in age distribution; the case group has a higher percentage of respondents in the 31–40 years category, while the control group has a higher percentage in the 20–30 years category. However, this difference is not statistically tested and these findings suggest that, in terms of these particular characteristics, the two groups are fairl comparable.

Relationship between Maternal Behavioral Factors and Toddler Stunting

Table 2 reveals a notable correlation between maternal predisposing factors such as knowledge, attitude, and action and the risk of giving birth to stunting toddlers. Data indicates that poor knowledge and attitude are more prevalent among mothers who have given birth to stunting toddlers (referred to as the 'Case' group), while good knowledge and attitude are more commonly associated with the control group; 62.50% of cases versus 37.50% of controls are associated with 'Not good' knowledge, and similarly, 63.20% of cases versus 36.80% of controls are associated with 'Not good' attitude.

Table 2. Relationship between Predisposing Factors of Maternal Behavior with Mothers at Risk of Giving Birth to Stunting Toddlers

Predisposing factors	Giving birth to		A stunting		Toddler		
	Case		Control				P-value
	n	%	n	%	n	%	
Knowledge							
Not good	40	62.50					
			24	37.50	64	100	0.001
Good	20	35.70	36	64.30	56	100	
Attitude							
Not good	48	63.20	28	36.80	76	100	0.002
Good	12	27.30	32	72.70	44	100	
Action							
Not good	40	54.10	34	45.90	74	100	0.003
Good	20	43.50	26	56.50	46	100	

In terms of maternal actions, there is also a tendency for negative actions to correlate with the case group, although the difference is less pronounced when compared to knowledge and attitude. The percentages suggest a more balanced distribution between the case and control groups, with 'not good' action constituting 54.10% of the case group compared to 45.90% of the control group. This pattern extends to 'good' action as well, where 43.50% are cases and 56.50% are controls. Importantly, all three factors—knowledge, attitude, and action—show statistically significant differences between cases and controls, as evidenced by P-values of 0.001, 0.002, and 0.003, respectively.

Table 3. Bivariate Test Results Between Research Variables

Variable	p-value	POR	Description
Knowledge	0.001	17.82	Related
Attitude	0.002	20.98	Related
Action	0.003	11.14	Related

Table 4 presents the selection of variables for a multivariate model based on their significance in bivariate analysis. This step is a critical part of the model building process in research, ensuring that only variables with a significant bivariate relationship are considered further. The selection reflects a data-driven approach to understand the multifactorial nature of stunting in toddlers, with Knowledge, Attitude, and Action emerging as potentially influential factors based on preliminary analysis. Each of the variable knowledge, attitude, and action demonstrate a P-value lower than 0.05, indicating a statistically significant association with the risk of mothers giving birth to stunting toddlers. As a result, all three variables qualify for inclusion in the model as indicated by the "Enter model candidates" decision.

Discussion

This study provides compelling evidence on the role of maternal behavioral predisposing factors in influencing the risk of stunting among toddlers in Dairi District, Indonesia. The findings suggest that improved

maternal knowledge, attitudes, and actions regarding child nutrition and health care can significantly reduce the incidence of stunting, aligning with prior research that underscores the importance of maternal factors in child growth and development (Muglia et al., 2022; Parekh & Pillai, 2016; Chakrabarti et al., 2024). Our findings show that mothers whose children are stunted tend to have limited knowledge and less positive attitudes towards child nutrition and health (Astarani et al., 2020; Mauludyani & Khomsan, 2022; Novianti Utami et al., 2023). These findings are consistent with studies conducted in other low- and middle-income countries, which report that enhanced maternal understanding of nutrition and health practices correlates with better growth outcomes in children. For instance, a study in Ethiopia found similar associations between maternal knowledge of nutrition and reduced stunting rates, emphasizing the need for educational interventions (Bhutta et al., 2020; Abebe et al., 2016; Muche et al., 2021).

Furthermore, our analysis highlights that not only knowledge and attitude but also maternal actions play a critical role in influencing child health outcomes. It identifies maternal and child care as key determinants of child growth (Beal et al., 2018; Tette et al., 2016; Venancio et al., 2022). Our study extends this model by quantitatively assessing how these factors, specifically maternal actions and child care, impact child health outcomes within the unique context of Dairi Regency. The statistically significant associations between maternal behaviors and stunting risk, evidenced by P-values less than 0.05, underscore the potential benefits of targeting these factors in public health interventions. Mechanisms Impacting Maternals' Behavior on Toddler Stunting.

Maternal knowledge and attitudes play a crucial role in child care and feeding practices. Mothers who have good knowledge about child care practices follow healthy habits like introducing diverse foods on time and ensuring meals are frequent (Bimpong et al., 2020; Forh et al., 2022). Having a positive mindset about child nutrition and healthcare, and taking proactive steps like ensuring clean water and using proper sanitation can help in following preventive measures and medical guidance (Shrestha et al., 2020). Moreover, the statistical measures we calculated in our study demonstrate the strength of these associations. knowledge and attitude showing particularly high odds ratios, it suggests that interventions focusing on these aspects could be especially effective. This finding aligns with the recommendations of (Keats et al., 2021; Watson et al., 2023), who propose nutrition-specific interventions as a way to enhance maternal and child health outcomes.

Based on our research and existing studies, focusing on maternal behavioral factors is crucial for preventing stunting in Dairi District. Policy initiatives may involve training healthcare workers to provide specialized nutrition education to mothers and integrating these efforts with wider healthcare services to enhance maternal and child health. In Kuta Gambir, Laksono et al. (2022) found a significant correlation between good maternal knowledge and reduced stunting rates. Therefore our study aligns with the findings of Rahut et al. (2023) and Wijeakumar et al. (2023) underscoring the critical role of maternal behaviors in stunting outcomes. In contrast, studied maternal knowledge and attitudes towards basic immunizations in Dairi, showing variations in mothers' understanding and attitudes towards these immunizations (Iova et al., 2023).

This study emphasis on maternal knowledge and attitudes offers a broader perspective on child health interventions, suggesting that addressing maternal behaviors could have wide-ranging benefits beyond stunting, including improved immunization rates (Clark et al., 2020). This comparative analysis highlights the multifaceted impact of maternal behaviors on child health outcomes, reinforcing the importance of tailored educational and behavioral interventions in regions like Dairi District. Although there is evidence of breastfeeding and maternal nutrition influencing child growth, there remains a significant gap in understanding the connection between maternal behavior and child stunting risk (Deshpande & Ramachandran, 2022; Chilinda et al., 2021; Li et al., 2024). More research is needed to develop targeted interventions and better understand the mechanisms affecting infant growth.

The study has limitations, including a lack of cause-effect relationships, influenced by participant self-presentation, and not considering factors like mental health, diet, and genetic makeup, requiring future research to improve quality. This study heavily relied on self-reported measures for data on maternal knpwledge, attitudes and practices. This approach is susceptible tp social desirability bias where participants may give answer they believe are expected.

Conclusion

This study confirms that better maternal knowledge, attitudes, and actions can significantly reduce child stunting in Dairi District, Indonesia. It needs to improve maternal health education and practices, stunting rates can be markedly decreased. Further research is essential, particularly long-term studies that consider socio-economic and cultural variables to fully understand these relationships and refine interventions.

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Author Contributions
Conceptualization; S. S.; methodology.; J. P.; validation; formal analysis; H. T. S.; investigation.; A. D. S; resources; S. S.; data curation: J. P.; writing—original draft preparation. H. T. S.; writing—review and editing: A. D. S.; visualization: S. S. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest
We declare no conflicts of interest or state that may be perceived as inappropriately influencing the representation or interpretation of reported research results.

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