Journal of Nutrition Explorations
Vol. 3, No. 1, February 2025, pp. 27~37
e-ISSN: 2987-761X
DOI: https://doi.org/10.36568/jone.v3i1.485

Birth Length, History of Exclusive Breastfeeding and Complementary Feeding as Risk Factors for Stunting in Childrens Aged 12–24 Months in Tambakrejo, Sidoarjo

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ARTICLE INFO

Article History:
Received August, 7th 2024
Accepted June, 10th 2025
Published online June, 11th 2025

Keywords:
Birth Lenght;
History of Exclusive Breastfeeding;
History of Giving MP-ASI;
Stunting;

ABSTRACT

Stunting is a chronic nutritional problem that remains highly prevalent in Indonesia and significantly impacts children's growth and development. Factors such as birth length, exclusive breastfeeding, and complementary feeding practices are known contributors to stunting. This study aimed to investigate the association between these factors and the incidence of stunting among children aged 12–24 months in the Tambakrejo area. An analytical observational study with a case-control design was conducted on 60 children at the Tambakrejo Health Center in Sidoarjo. Data were collected through structured questionnaires and anthropometric measurements. Variables assessed included birth length, history of exclusive breastfeeding, and complementary feeding, with instruments validated by public health experts (Cronbach's alpha > 0.70). Data analysis was performed using Chi-square tests and presented with odds ratios (OR) and p-values. The results showed that children with low birth length had a significantly higher risk of being stunted (p = 0.001; OR = 14). In contrast, no significant association was found between exclusive breastfeeding and stunting (p = 0.567; OR = 0.609). Children with poor complementary feeding practices had a significantly higher risk of stunting compared to those with adequate feeding (p = 0.004; OR = 0.060). In conclusion, birth length and complementary feeding practices are significant risk factors for stunting in children aged 12–24 months in Tambakrejo, while exclusive breastfeeding alone was not associated. These findings suggest the need for targeted nutritional interventions and improved caregiver education to prevent stunting.

INTRODUCTION

In Indonesia, the problem of chronic malnutrition still exists and has a negative impact on the quality of human resources (HR). One of the many problems of malnutrition that persists in Indonesia is stunting. Stunting is a disorder of child growth and development caused by inadequate nutrition, recurrent infections, and lack of stimulation[1]. Stunting is a condition of failure to grow identified through the measurement of height by age (TB/U), with a threshold below -2 standard deviation (SD) based on the WHO growth curve[2].

Developmental delays can be affected by a variety of factors, including parental education, occupation, socioeconomic status, duration of pregnancy, child's educational environment, and medical history. For example, the length of a baby's birth can indicate its growth trajectory in the early months of life. Mother's inadequate nutrition during pregnancy can lead to fetal growth disorders and potentially result in premature birth. Typically, babies with a birth length between 48-

52 cm are considered in the normal range, while babies with a birth length of less than 48 cm can be categorized as small for gestational age[3].

Child stunting in Indonesia is associated with several main factors: lack of breastfeeding during the first six months of a baby's life, poor financial conditions, premature birth, short gestation, short maternal stature, low parental education levels, and children living in remote or poor urban areas. These issues collectively contribute to the widespread occurrence of stunting, which hinders children's physical and cognitive development. The complexity of these factors highlights the need for multifaceted interventions to effectively address the root causes of stunting[4].

In response to the high prevalence of stunting, the Indonesian government has set the First 1000 Days of Life (1000 HPK) as a top priority in efforts to improve children's nutrition and health[5]. This period, which covers the gestation period to the first two years of life, is considered a golden window of growth because it is the most rapid phase of development and determines the future of the child[6]. Optimal fulfillment of nutritional needs, both in terms of quantity and quality of food, during this period is very important to prevent growth disorders such as stunting and support the overall physical, cognitive, and emotional development of children[7].

Factors contributing to growth retardation in children are categorized into four main groups according to WHO guidelines: "household and family conditions, lack of supplements, breastfeeding practices, and infectious factors." One of the significant factors is inadequate breastfeeding and complementary feeding. When babies do not receive enough nutrients, especially during critical periods, delayed introduction of complementary foods can lead to iron deficiency anemia. Nutritional deficiencies during these early stages of development can have long-term effects, resulting in stunted growth and development[8].

Prolonged inadequate nutritional intake is a major cause of stunted growth in children. Ensuring that babies receive proper breast milk, as well as timely introduction of nutrient-rich complementary foods is essential[9]. Addressing this issue requires a comprehensive approach that includes educating families on proper feeding practices, improving access to nutritious food, and preventing and managing infections. By addressing these factors, it is possible to reduce the incidence of growth retardation and promote healthier development in children[10].

"Exclusive breastfeeding" is the practice of giving newborns only breast milk without food or other liquids until they are six months old. This practice offers many benefits, including optimal physical and cognitive development for babies. Breast milk provides all the necessary nutrients in the right proportions, strengthens the baby's immune system, and promotes healthy growth[11]. In contrast, the absence of exclusive breastfeeding can significantly increase the risk of stunting, especially in the early stages of life, as it deprives the baby of essential nutrients that the baby needs for proper growth and development. Ensuring that babies receive exclusive breastfeeding

during this critical period is essential to prevent stunting and foster overall health and development[12].

Exclusive breastfeeding coverage for babies under six months in Sidoarjo Regency reached 71.4% according to the District Health Profile in 2022. This is a significant increase from the previous year, with coverage increasing by 70.80% since 2021. This positive trend points to an increase in maternal and child health practices in the county, highlighting successful efforts in promoting the benefits of exclusive breastfeeding among new mothers.

According to the 2022 Sidoarjo district health profile, of the 85,114 children measured, 4,906 were reported to be sick, resulting in a prevalence rate of 5.8%. However, the health profile does not have specific data for the Tambakrejo Health Center, as it is a new facility in Sidoarjo District. The absence of this data highlights gaps in health records that need to be addressed to better understand, as well as manage the health problems faced by the communities served by these new centers.

Given this context, the researcher was motivated to conduct a study entitled "Birth Length, Exclusive Breastfeeding History, and History of Complementary Foods as Stunting Risk Factors in Infants Aged 12 to 24 Months in the Working Area of the Tambakrejo Sidoarjo Health Center." This study aims to investigate critical factors such as length of birth, exclusive breastfeeding practices, and history of complementary foods to determine their impact on the prevalence of stunting in infants aged 12 to 24 months in the Tambakrejo area. By addressing these variables, this study seeks to fill in existing data gaps and provide insights that can inform targeted interventions to reduce stunting rates in this particular community.

MATERIALS AND METHODS

This descriptive analytical case-control study was conducted from October 2023 to May 2024 at the Tambakrejo Sidoarjo Health Center, aiming to examine the relationship between birth length, exclusive breastfeeding, and complementary feeding history as risk factors for stunting in children aged 12–24 months. From a population of 150 registered children, 60 were selected using purposive sampling to ensure relevance to the study objectives. Data collected included children's anthropometric measurements, feeding history, and parental information, obtained through questionnaires and informed consent. The study provides insights into how early-life nutritional factors contribute to stunting, supporting more targeted interventions in the Tambakrejo community.

The data collection process involved several stages. First, participants completed questionnaires detailing the history of exclusive breastfeeding, also complementary feeding. The exclusive breastfeeding history questionnaire contained two questions, while the complementary feeding history questionnaire included ten questions. Following this, the children's height was

measured using a stadiometer to ensure accurate and consistent data. These comprehensive data collection methods aimed to gather detailed information necessary for analyzing the risk factors associated with stunting in children aged 12-24 months in the Tambakrejo Sidoarjo Health Center area.

Testing was carried out using a one-variable analysis technique used to explain or describe the characteristics of each variable. The data for each variable is displayed in tabular form so that it can be seen the outcomes of the questionnaire collected through the creation of percentages and division by dangers based on each category using SPSS. Also known as bivariate analysis, or analysis to ascertain the correlation between two or more variables. The variables used in this study were duration of birth, number of stillbirths in the past, complementary feeding, and prevalence of growth regression in young children aged 12 to 24 months. This was achieved by calculating the odds ratio (OR).

RESULTS

Characteristics of Mothers and Children

Table 1 Frequency Distribution of Characteristics of Mothers and Stunted and Non-Stunted Children in the Tambakrejo Sidoarjo Health Centre Working Area

Characteristics	Case		Control		Amount	
	(n)	(%)	(n)	(%)	(n)	(%)
Children Age						
12-15 Months	2	6.7	13	43.3	15	25
16-19 Months	9	30	8	26.7	17	28.3
20-24 Months	19	64.3	9	30	28	46.7
Amount	**30**	**100**	**30**	**100**	**60**	**100**
Gender						
Male	17	56.7	12	40	29	48.3
Female	13	43.3	18	60	31	51.7
Amount	**30**	**100**	**30**	**100**	**60**	**100**
Mother's Age						
<20 Years and >35 Years	9	30	7	23.3	16	26.7
20-35Years	21	70	23	76.7	44	73.3
Amount	**30**	**100**	**30**	**100**	**60**	**100**
Mother's Education						
Elementary School	6	20	5	16.7	11	18.3
Junior High School	13	43.3	9	30	22	36.7
Senior High School	9	30	13	43.3	22	36.7
Higher Education	2	6.7	3	10	5	8.3
Amount	**30**	**100**	**30**	**100**	**60**	**100**
Mother's Occupation						
Not Working	15	50	16	53.3	31	51.7
Working	15	50	14	46.7	29	48.3
Amount	**30**	**100**	**30**	**100**	**60**	**100**

Source : Primary Data 2024

Table 1 shows that in the stunting group, most children 64.3% were aged 20–24 months, while in the non-stunting group, the majority 43.3% were aged 12–15 months. This suggests a trend of increasing stunting risk with age. Regarding gender, 56.7% of children with stunting were male, whereas 60% of non-stunted children were female, indicating a possible gender difference in vulnerability to stunting.

The maternal age distribution shows that 70% of mothers in the stunting group were aged 20–35 years, compared to 76.7% in the control group. A slightly higher proportion of mothers aged <20 or >35 years was seen in the stunting group 30% and 23.3% in the control. Educational background reveals that most mothers in the stunting group had only completed junior high school 43.3%, while in the control group, most had completed high school 43.3%. Employment status was similar between groups, with approximately half of mothers in each group working.

Cross-tabulation of Birth Length As a Risk Factor for Stunting Among 12-24 Month Olds

Table 2 Cross-tabulation of Birth Length As a Risk Factor for Stunting Among 12-24 Month Olds

Birth Length	Stunting		Normal		Amount		OR 95%	P value
	(n)	(%)	(n)	(%)	(n)	(%)		
PBLR (< 48 cm)	15	50	2	6.7	17	28.3	**14**	**0.001**
PBLN (≥ 48 cm)	15	50	28	93.3	43	71.7		
Amount	**30**	**100**	**30**	**100**	**60**	**100**		

Source : Primary Data 2024

Table 2 presents the correlation between birth length and stunting. Children with a birth length under 48 cm (PBLR) were significantly more likely to experience stunting, with 50% in the case group versus only 6.7% in the control group. In contrast, children with normal birth length (≥48 cm) dominated the control group (93.3%). The association was statistically significant (p = 0.001), and the odds ratio (OR) was 14.0, indicating that children born with low birth length had a 14 times higher risk of stunting.

Cross-tabulation of Exclusive Breastfeeding History As a Risk Factor for Stunting Among 12-24 Month Olds

Table 3 Cross-tabulation of Exclusive Breastfeeding History As a Risk Factor for Stunting Among 12-24 Month Olds

Exclusive Breastfeeding History	Stunting		Normal		Amount		OR 95%	P value
	(n)	(%)	(n)	(%)	(n)	(%)		
Not exclusively breastfeeding	10	33.3	7	23.3	17	28.3	**0.609**	**0.567**
Exclusive Breastfeeding	20	66.7	23	76.7	43	71.7		
Amount	**30**	**100**	**30**	**100**	**60**	**100**		

Source : Primary Data 2024

Table 3 evaluates exclusive breastfeeding as a risk factor. Among children with stunting, 66.7% were exclusively breastfed, while 76.7% of non-stunted children had been exclusively breastfed. Non-exclusive breastfeeding was more common in the stunting group (33.3%) than in the

control (23.3%). However, statistical analysis showed no significant association between exclusive breastfeeding and stunting (p = 0.567; OR = 0.609). This implies that exclusive breastfeeding alone may not strongly influence stunting in this population.

Cross-tabulation of Complementary Feeding History As a Risk Factor for Stunting Among 12-24 Month Olds

Table 4 Cross-tabulation of Complementary Feeding History As a Risk Factor for Stunting Among 12-24 Month Olds

History of Complementary Feeding	Stunting		Normal		Amount		OR 95%	P value
	(n)	(%)	(n)	(%)	(n)	(%)		
Less	11	36.7	1	3.3	12	20	**0.060**	**0.004**
Good	19	63.3	29	96.7	48	80		
Amount	**30**	**100**	**30**	**100**	**60**	**100**		

Source : Primary Data 2024

Table 4 e xplores the role of complementary feeding. Inadequate complementary feeding was much more common in the stunting group (36.7%) compared to the control group (3.3%). Conversely, good complementary feeding was reported in 96.7% of the control group and only 63.3% of the stunting group. This association was statistically significant (p = 0.004), with an OR of 0.060, indicating that children with inadequate complementary feeding had a substantially higher risk of stunting.

DISCUSSION

Characteristics of Mothers and Children

Based on the table, the age distribution is as follows: 19 children (64.3%) belonged to the case group (stunted) aged of 20-24 months, and 13 children (43.3%) belonged to the control group (normal) aged 12-15 months. Children aged 12-24 months is a major risk factor for stunting[13]. Based on the gender distribution of children, there were 17 boys (56.7%) and the majority (60%) were girls. The incidence of stunting is influenced by gender, with boys at higher risk[14].

The majority of mothers in the stunting group had completed high school (43.3%), based on the distribution of maternal education characteristics. Educational attainment influences a mother's ability to access, comprehend, and apply health and nutrition-related information. Mothers with higher education levels are generally more capable of acquiring and utilizing external information compared to those with lower education[15]. Additionally, 50% of mothers in the stunting group were not employed, indicating a potential link between maternal employment and child growth outcomes. However, employment alone may not be sufficient; adequate maternal education and nutritional knowledge are essential to support effective caregiving and prevent growth retardation in children.

The Relationship of Exclusive Breastfeeding History as a Risk Factor for the Incidence of Stunting in Children 12-24 Months of Age

Based on the exclusive breastfeeding history study, the stunting group numbered 20 children (66.7%), while the normal group numbered 23 children (76.7%). Currently, there are 10 children (33.3%) in the stunting group, also 7 children (23.3%) in the normal group. Indirect factors such as motherhood, family income, and medical history, especially acute respiratory infections and diarrhoea, are the dominant growth-related issues. However, breast milk is an essential food that cannot be replaced in the first six months of a child's diet[16]. Exclusive breastfeeding is not a reliable indicator of stunting in this age group. Instead, consideration should be given to other variables such as complementary foods, parenting, health services, socio-cultural aspects and economic issues[17].

The results of the Chi-square test indicated no statistically significant association between the history of exclusive breastfeeding and the incidence of stunting in early childhood ($p = 0.567$; OR = 0.609). This suggests that children who were not exclusively breastfed had a 0.60 times lower likelihood of experiencing stunting compared to those who were exclusively breastfed. These findings imply that exclusive breastfeeding alone may not be a determining factor for stunting at the age of 12–24 months, and that other contributing variables may play a more influential role.

The findings of this study are correlated with previous research[17] which showed a p-value of 0.121. Historical dwell periods were not associated with the likelihood of stunting because, in the absence of appropriate complementary foods and appropriate dwell periods, optimal dwell periods continue to enhance the risk of stunting-related diseases[18].

In addition, WHO and UNICEF recommend adequate breastfeeding (complementary feeding) and continued until the child is two years old or older. Ultimately, breastfeeding alone is not enough to analyse it as a risk factor for stunting in young children; other factors such as complementary feeding, education programmes, health services, and socio-cultural and economic factors must also be considered[19]. Early childhood growth retardation is a public health problem caused by various factors[20].

Relationship Between History of Complementary Feeding As a Risk Factor for Stunting Among 12-24 Month Olds

The normal group consisted of 2 children (6.7%) and the stunting group consisted of 15 children (50%) based on the research conducted with a birth length of less than 48 cm. There were 15 children (50%) in the stunting group who had less than 48 cm birth length, and 28 children (93.3%) in the normal group. Birth length is a measure of the baby's linear growth in the mother's womb.

It is important to focus on a healthy diet to maintain the child's developmental stage. One of the most important aspects of child development is good maternal parenting[21]. Babies who are born short are the center of attention of parents because they need to ensure good nutrition and care during the child's growth process so that the child can catch up with the rest of the growth phase. To

monitor the child's growth, as well as development, it is necessary to support parents to detect pregnancy early and bring the child for routine check-up[7].

The outcomes of the Chi-Square Test indicated a substantial association between the birth length of children and the incidence of stunting, with a p-value of 0.01 also an OR of 14, and other findings show that compared to children with normal birth length, the probability of growth regression is 14 times higher in children with low birth length.

The statistical test outcomes displayed a p-value of 0.003 indicating an association between low birth length and the possibility of growth delay[22]. Monthly assessment of nutritional status at the posyandu is based on observations made by researchers while working with young children at Tambakrejo Sidoarjo Health Centre. This allows parents to get basic health services, health education, and regular exercise, so that children do not experience nutritional difficulties[23].

The outcomes of the Chi-square test based on the research findings show that there is a substantial correlation between the history of complementary feeding with the occurence of stunting children with a p value of 0.004 with an OR of 0.060, which means that children with a history of complementary feeding are less at risk of 0.060 times not having an effect or not experiencing stunting than children who have a good history of complementary feeding.

In line with the research of[24], this resulted in a p-value of 0.004. Since breast milk alone cannot meet an infant's nutritional demands, supplementary feeding provides extra nutrients, which is why it is associated to child growth and development. Only 2/3 of the nutritional needs of infants aged 6 to 9 months, also 50% of the nutritional needs of infants aged 9 to 12 months are met through breast milk. This means that additional sources of nitrogen, particularly complementary foods, are required. Some mothers of young children are given unvaried complementary foods, such as only bananas and instant porridge, based on the findings of scientists' research[25].

This study has several limitations that should be acknowledged. First, the use of a case-control design limits the ability to establish causality between the identified risk factors and the incidence of stunting. Second, data on feeding practices, including exclusive breastfeeding and complementary feeding, were collected through self-reported questionnaires, which are subject to recall bias, especially when mothers are asked to recall events from the first year of their child’s life. Third, the study did not account for several potential confounding variables such as maternal nutritional status during pregnancy, household income, sanitation conditions, and history of infectious diseases—all of which may influence child growth outcomes. Additionally, the relatively small sample size and single-site study setting may limit the generalizability of the findings to broader populations. Future research using longitudinal designs and more comprehensive variables is recommended to validate and expand upon these results.

CONCLUSION

Based on the analysis of birth length, exclusive breastfeeding history, and complementary feeding history as risk factors for stunting in children aged 12–24 months at Tambakrejo Sidoarjo Health Centre, several conclusions can be drawn. There is a statistically significant association between birth length and stunting incidence (p=0.001; OR=14), indicating that childrens with shorter birth length are 14 times more likely to experience stunting. Similarly, there is a significant relationship between the history of complementary feeding and stunting (p=0.004; OR=0.060), suggesting that childrens with poor complementary feeding practices are at a much higher risk. However, no significant correlation was found between exclusive breastfeeding history and stunting (p=0.567; OR=0.609).

SUGGESTION

Health practitioners at Tambakrejo Sidoarjo Health Centre are encouraged to implement specific and practical interventions, such as ensuring regular birth length screening and early identification of at-risk infants. Additionally, education and counseling programs targeting mothers on the importance of timely and appropriate complementary feeding should be strengthened. Posyandu activities must be optimized to routinely monitor infant growth and provide household-level nutritional guidance. For future research, it is recommended to involve a larger sample and explore additional variables such as maternal nutrition during pregnancy, sanitation, and household income, to gain a more comprehensive understanding of stunting risk factors.

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