



Factors Influencing the Incidence of Underweight in Toddlers Aged 12-23 Months in the Working Area of Cibeureum Public Health Center (PHC): A Cross-Sectional Study

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A B S T R A C T

Underweight is one of the health problems in children. Data from the Ministry of Health Republic of Indonesia in 2022 stated that children under two years old who suffer from underweight in Indonesia amounted to 6.2%, while those who experience severe underweight were 1.1%. This study determines the factors influencing the incidence of underweight in children aged 12-23 months in the working area of Cibeureum PHC. The study employed a quantitative approach with an analytical design, utilizing a cross-sectional design. There were 95 respondents with purposive sampling. The instruments used were a questionnaire and nutritional status measurements, as assessed by the anthropometric weight-for-age index. Data analysis used the Chi-Square test with an $\alpha < 0.05$. The results showed an influence of maternal education ($p = 0.000$), family income ($p = 0.000$), maternal knowledge regarding feeding ($p = 0.000$), and feeding practices ($p = 0.000$) on the incidence of underweight. However, the history of exclusive breastfeeding did not influence the incidence ($p = 0.471$). In conclusion, the factors affecting the incidence of underweight in children aged 12-23 months in the working area of Cibeureum PHC include maternal education, family income, maternal knowledge, and feeding practices. Meanwhile, the history of exclusive breastfeeding did not influence the incidence.

INTRODUCTION

Adequate nutrition is one of the standards for achieving successful health, welfare, and development in a country (Kemenkes RI, 2023). Malnutrition, also known as undernutrition, is a significant threat to human health. Currently, the world, remarkably low- and middle-income countries, faces a double burden of malnutrition, including wasting, stunting, anemia, vitamin A deficiency, iodine deficiency disorders (IDD), underweight, overweight, and obesity (Laswati, 2019).

Underweight, or low birth weight, is a health issue that can affect children. According to the World Health Organization (WHO), toddlers are classified as underweight if their Z-score is ≥ -3 SD to < -2 SD (Fitriyah and Setyaningtyas, 2021). The first 1,000 days of a child's life are crucial for their growth and development, particularly in terms of lifelong neurological and mental health. Therefore, if factors contributing to underweight are detected before the age of 2, treatment can be initiated more quickly, and other nutritional problems can be prevented (South *et al.*, 2022).

According to Minister of Health Regulation No. 2 of 2020, the weight-for-age index is divided into four categories: severely underweight, underweight, normal, and overweight (Kementerian Kesehatan Republik Indonesia, 2020). According to data from the Ministry of Health of the Republic of Indonesia in 2022, the percentage of children under two years old who are underweight was 6.2%, and those who are

severely underweight accounted for 1.1% (Kemenkes RI, 2022). The results of the West Java Health Office's records in 2022 also showed that 5.1% of toddlers were underweight, and 0.8% were severely underweight (Kemenkes RI, 2022). According to a 2023 report from the Tasikmalaya City Health Office, 8.43% of the 15,804 toddlers were underweight. Furthermore, the Cibeureum Public Health Center (PHC) had the highest number of underweight toddlers, at 11.77%.

The short-term impact on underweight children is that they become less active, which can, in the long term, increase the risk of cardiovascular disease, delayed brain development, and susceptibility to diseases such as the flu due to a weakened immune system (Vilcins, Sly,. If underweight is not promptly addressed, it can lead to more serious nutritional problems and even death in toddlers. Preventing this issue is a shared responsibility, particularly for midwives. Therefore, midwives also have the role of identifying factors that contribute to underweight so they can screen and provide prompt treatment (Borbon, 2020).

Both direct and indirect factors can cause nutritional problems in children aged 12-23 months. Direct causes of dietary problems include the quantity and quality of food consumed, as well as illnesses. Indirect causes that can impact access to nutritious food and healthcare include poor parenting, inadequate knowledge of nutritional needs for toddlers, complex or inaccessible healthcare systems, and socioeconomic conditions (Fatmawati, Mumthi'ah Al-Kautsar,. Many studies on underweight in Indonesia that have been conducted show that various factors can influence underweight, including age, gender, history of diarrhea (Irawan *et al.*, 2022), diet, parents' income (Tafese *et al.*, 2020), maternal education, and maternal Body Mass Index (BMI) (Li *et al.*, 2020). However, feeding practices and a history of exclusive breastfeeding were factors that are rarely studied because parents paid little attention to the nutrition contained in their child's food. This study determines the factors influencing the incidence of underweight in children aged 12-23 months in the working area of Cibeureum PHC, Tasikmalaya. It potentially addresses or reduces the incidence of underweight by providing follow-up care to families with underweight toddlers who have these factors.

METHOD

This research employed a quantitative study with an analytical approach, utilizing a cross-sectional design. The sample size was determined using a sample calculation formula, and 95 mothers with children aged 12-23 months were recruited from the working area of the Cibeureum PHC. The sample determination employed purposive sampling, using the following criteria: mothers with children aged 12-23 months, who did not have comorbid diseases or infections, were domiciled in the working area of the Cibeureum PHC, and were willing to participate as respondents. The instruments used were a

questionnaire and nutritional status measurements, as assessed by the anthropometric weight-for-age index. The research questionnaire was tested for validity and reliability. Data analysis used to determine the factors influencing the incidence of underweight in children aged 12-23 months was the Chi-Square test with an $\alpha < 0.05$. The ethical approval certificate number was No. 0341/EA/KEPK/2024.

RESULT

Table 1 shows that 51 children (53.7%) are in the normal nutritional status, while 44 children (46.3%) are underweight. Additionally, 41 mothers (43.2%) hold a secondary education, 34 mothers (35.8%) have a primary education, and 20 mothers (21.1%) have a higher education. Moreover, 60 families (63.2%) have low incomes, while 35 families (36.8%) have high incomes. Besides, 64 mothers (67.4%) have a history of exclusive breastfeeding, while 31 mothers (32.6%) do not. Forty-three mothers (45.3%) also have good knowledge regarding feeding, 35 mothers (36.8%) have moderate knowledge, and 17 mothers (17.9%) have less knowledge. Furthermore, 60 mothers (63.2%) implemented appropriate feeding practices, while 35 mothers (36.8%) implemented inappropriate feeding practices.

Table 1. Nutritional Status, Maternal Education, Family Income, The History of Exclusive Breastfeeding, Maternal Knowledge Regarding Feeding, and Feeding Practice in Children Aged 12-23 Months in the working area of Cibeureum PHC in 2024

	Frequency (n)	Percentage (%)
Nutritional Status		
Underweight	44	46.3
Normal	51	53.7
Maternal Education		
Primary School	34	35.8
Secondary School	41	43.2
High School	20	21.1
Family Income		
Low	60	63.2
high	35	36.8
The History of Exclusive Breastfeeding		
Yes	64	67.4
No	31	32.6
Maternal Knowledge Regarding Feeding		
Good	43	45.3
Moderate	35	36.8
Less	17	17.9
Feeding Practice		
Not appropriate	35	36.8
Appropriate	60	63.2

The results of the statistical test using Chi-Square between maternal education and the incidence of underweight in Children Aged 12-23 Months obtained $p = 0.0001$, $\alpha < 0.05$, so $p < \alpha$, indicating that there was an influence between maternal education and the incidence of underweight in children aged 12-23 months (Table 2). The higher a mother's education, the greater the chance her child will avoid being underweight.

Table 2. The Influence of Maternal Education on the Incidence of Underweight in Children aged 12-23 months in the working area of Cibeureum PHC in 2024

Maternal Education	Nutritional Status				Total		<i>p</i>
	Underweight		Normal				
	n	%	n	%	n	%	
Primary School	25	26.3	9	9.5	34	35.8	0.0001
Secondary School	17	17.9	24	25.3	41	43.2	
High School	2	2.1	18	18.9	20	21	
	44	46.3	51	53.7	95	100	

The results of the Chi-Square test between family income and the incidence of underweight in children aged 12-23 months obtained a $p = 0.0001$, $\alpha < 0.05$, so $p < \alpha$, meaning that there was an influence between family income and the incidence of underweight in children aged 12-23 months (Table 3). A high family income can ensure a balanced nutritional intake for children.

Table 3. The Influence of Family Income on the Incidence of Underweight in Children Aged 12-23 Months in the working area of Cibeureum PHC in 2024

Family Income	Nutritional Status				Total		<i>p</i>
	Underweight		Normal				
	n	%	n	%	n	%	
Low	39	41	21	22.1	60	63.2	0.0001
High	5	5.3	30	31.6	35	36.8	
	44	46.3	51	53.7	95	100	

The results of the Chi-Square test between the history of exclusive breastfeeding and the incidence of underweight in Children Aged 12-23 Months yielded $p = 0.471$, $\alpha > 0.05$, $p < \alpha$, suggesting that there was no significant influence between the history of exclusive breastfeeding and the incidence of underweight (Table 4). It may occur because the lack of quality and quantity of breast milk causes exclusive breastfeeding not to affect the incidence of underweight.

Table 4. The Influence of Exclusive Breastfeeding History on the Incidence of Underweight in Children Aged 12-23 Months in the working area of Cibeureum PHC in 2024

Children Aged 12-23 Months in the Working Area of Cirebon City in 2021							
The History of Exclusive Breastfeeding	Nutritional Status				Total		p
	Underweight		Normal				
	n	%	n	%	n	%	
Yes	28	29.5	36	37.9	64	67.4	0.471
No	16	16.8	15	15.8	31	32.6	
	44	46.3	51	53.7	95	100	

The results of the Chi-Square test between maternal knowledge regarding feeding and the incidence of underweight in children aged 12-23 months yielded a p-value of 0.000, $\alpha < 0.05$, $p < \alpha$, suggesting a significant influence between maternal knowledge and the incidence of underweight (Table 5). It is because good maternal knowledge can support providing good food for her child.

Table 5. The Influence of Maternal Knowledge Regarding Feeding on the Incidence of Underweight Children Aged 12-23 Months in the working area of Cibeureum PHC in 2024

Children Aged 12-23 Months in the Working area of Cirebon City in 2017							
Maternal Knowledge	Nutritional Status				Total		p
	Underweight		Normal				
	n	%	n	%	n	%	
Good	16	16.8	27	28.4	43	45.3	0.000
Moderate	12	12.6	23	24.2	35	36.8	
Less	16	16.8	1	1	17	17.9	
	44	46.3	51	53.7	95	100	

The results of the Chi-Square test between feeding practices and the incidence of underweight in children aged 12-23 months yielded a p-value of 0.000, $\alpha < 0.05$, $p < \alpha$, suggesting a significant influence between maternal knowledge and the incidence of underweight in children aged 12-23 months (Table 6). Feeding children according to the guidelines on the contents of my plate can help them grow at a normal rate for their age.

Table 6. The Influence of Feeding Practices on the Incidence of Underweight in Children Aged 12-23 Months in the working area of Cibeureum PHC in 2024

Nutritional Status							
Feeding Practices	Underweight		Normal		Total		p
	n	%	n	%	n	%	
Not appropriate	35	36.8	0	0	35	36.8	0.0001
Appropriate	9	9.5	51	53.7	60	63.2	
	44	46.3	51	53.7	95	100	

DISCUSSION

The Incidence of Underweight in Children Aged 12-23 Months

This paper revealed that 44 children (46.3%) aged 12-23 months experienced underweight, while 51 (53.7%) had a normal weight (Table 1). Underweight in children is defined as a weight-for-age that is less than two standard deviations (SD) below the median of the WHO child growth standards (Li *et al.*, 2020). According to researchers' assumptions, underweight in children aged 12-23 months is caused by various factors, including maternal education, feeding practices, and family income. Those can cause children to lack nutrition during the golden period of their growth and development, resulting in underweight children.

A study by Tefase (2020) found that children aged 12–23 months were four times more likely to experience malnutrition than infants aged 6–11 months. Malnutrition worsens as children's nutritional needs for complementary foods increase, and breast milk is insufficient to meet their needs, particularly in children aged 1 year and older. Additionally, toddlers start exploring the environment and tend to put everything they encounter in their mouths. This behavior increases the risk of recurrent infections, particularly in areas with inadequate sanitation, and can significantly impact intestinal absorption, thereby impairing growth and development (Tafese *et al.*, 2020). Even if parents are always paying attention to

their children, it's still possible for foreign objects to enter their children's mouths when they're not paying attention, leading to bacteria entering the mouth that can interfere with the child's nutrient absorption.

Research conducted by Zhihui Li (2020) found that significant factors associated with the incidence of underweight in children included short maternal height, which had the strongest association with underweight, followed by low maternal body mass index (BMI) and low household income. In a fully adjusted model, the study found that maternal education deficit and low family income were significantly associated with a higher incidence of underweight in children (Li *et al.*, 2020). It is because maternal education and family income may influence the provision of nutritious food to children. Parents with higher levels of education and higher incomes tend to pay more attention to their children's diets.

The Influence of Maternal Education on the Incidence of Underweight in Children Aged 12-23 Months

This investigation revealed that mothers who had children aged 12-23 with underweight comprised 25 individuals (26.3%). Of those mothers, 17 individuals (17.9%) had primary education, two individuals (2.1%) had secondary education, and the remaining individuals had higher education. The statistical analysis found an influence between maternal education and the incidence of underweight in children; most mothers who had a primary education had a greater chance of having children who were underweight compared to mothers who had higher levels of education (Table 2). This result aligns with the research of Li Zhihui *et al.* (2020), which found a significant correlation between maternal education and the incidence of underweight, with a *p*-value of 0.001 (Li *et al.*, 2020).

Several parental factors may help prevent underweight in children, one of which is a higher level of education. It is supported by previous studies showing that parents with low levels of education were more likely to have children with nutritional problems than parents with higher levels of education. Education level may influence the prevalence of underweight, but the effect is not significant. The more influential factor is each parent's ability to access information, as some parents have access to good sources of information from health services regarding their children's nutritional needs, but have limited educational backgrounds (Kementerian Kesehatan Republik Indonesia, 2021). Parents with higher education tend to be more aware of their children's needs, especially regarding their nutrition, because they want their children to experience normal growth and development.

The Influence of Family Income on the Incidence of Underweight in Children Aged 12-23 Months

Based on this study, the number of low-income families with children aged 12-23 months who were underweight was 35 people (41%), while five families (5.3%) had a high income. The statistical tests revealed a significant relationship between family income and the incidence of underweight. Low-income families had a higher incidence of underweight children compared to those with high incomes (Table 3).

This result aligns with Sari's research (2023), which indicates that family income was associated with the incidence of underweight, with a p -value of 0.021 (World Health Organization, 2023).

Low household income potentially affects the quantity and quality of food that families consume. Low-income levels and limited purchasing power can lead to specific dietary habits that hinder nutritional improvement, particularly in children. Available foods tend to be less diverse and contain fewer components that include the protein, vitamins, and minerals children need for growth and development, thereby increasing the risk of malnutrition in children (Rahmawati, S and Rasni, 2019). Family income depends on the household's ability to meet its primary, secondary, and tertiary needs. A high household income makes it easier for a family to meet its basic needs, while a low household income makes it more challenging to do so (Sari, Ibnu and Herlambang, 2023).

Low-income families often overlook the nutritional content of their children's food due to difficulties in meeting their daily needs, resulting in erratic eating patterns and a lack of attention to nutritional content, which can lead to limited menu options. Meanwhile, high-income families can meet their daily needs and enjoy a variety of meals to suit their dietary preferences.

The Influence of Exclusive Breastfeeding History on the Incidence of Underweight in Children Aged 12-23 Months

This paper indicated that among mothers who had children aged 12-23 months who are underweight, as many as 28 people (29.5%) were given exclusive breastfeeding, while 16 people (16.8%) were not given exclusive breastfeeding. The results of statistical tests using Chi-Square showed that the history of exclusive breastfeeding did not affect the incidence of underweight in children aged 12-23 months (Table 4). This result aligns with Selvina's (2021) research, which found no significant relationship between the history of exclusive breastfeeding and the nutritional status of toddlers, with a p -value of 0.458 (Fajriani, Aritonang and Nasution, 2020).

In several studies, a history of exclusive breastfeeding was significantly associated with the nutritional status of toddlers. For example, Iqbal's (2020) study demonstrated that both malnutrition and overnutrition in children can be prevented by providing exclusive breastfeeding during the first six months of life. It is because breast milk fulfills the nutritional needs of infants for the first 4 to 6 months of life. It is a fat emulsion in a solution of protein, lactose, and organic salts secreted by two mammary glands. The WHO and UNICEF recommend that, in addition to providing additional food and drink after 6 months of age, breast milk should continue to be given to infants until the age of 2 years (Kurniawati and Yulianto, 2022).

However, this study showed that a history of exclusive breastfeeding did not affect the incidence of underweight. This study aligns with research conducted by Selvina (2021), which found that exclusive

breastfeeding had no significant relationship with the nutritional status of toddlers. Many factors influence a toddler's nutritional status. One factor is the mother's nutritional status and dietary intake, which will affect the quality of breast milk. The quantity and quality of breast milk will affect the growth and nutritional status of the baby. The quality and frequency of breastfeeding must be maintained. Health education is crucial for providing mothers with information about the benefits of exclusive breastfeeding and the nutritional status of their babies (Hidayati, 2023). Exclusive breastfeeding may not be accompanied by knowledge about breastfeeding frequency. Mothers tend to breastfeed only when the baby cries and for less than 10 minutes, while the recommended exclusive breastfeeding schedule is every 1.5-3 hours for 10-15 minutes each feeding.

Youwe (2020) states that children who are exclusively or non-exclusively breastfed have the same energy allowance. Although the nutrients in breast milk and complementary foods differ, the amount of energy expended remains the same. Exclusive breastfeeding is not the only factor influencing nutritional intake; other factors include the type of family, which typically refers to the extended family structure for most people. Extended family members tend to pay closer attention to a child's nutritional intake. Mothers in extended families can purchase nutritious complementary foods, such as formula milk, fish, and eggs, thereby meeting the recommended protein requirements optimally (Selvina, Fadlyana and Arisanti, 2021). Thus, the history of exclusive breastfeeding has no relationship with nutritional adequacy in children aged 12-23 months, because if the child's nutrition is sufficient through the provision of complementary foods and nutritious food, the history of exclusive breastfeeding does not significantly affect the child's growth and development.

The Influence of Maternal Knowledge Regarding Feeding on the Incidence of Underweight in Children Aged 12-23 Months

Based on this research, mothers with children aged 12-23 months who had underweight children and good knowledge regarding feeding were 16 people (16.8%), 12 (12.6%) had moderate knowledge, and 16 people (16.8%) had less knowledge. The results of statistical tests using the Chi-Square method revealed an influence between maternal knowledge and the incidence of underweight in children aged 12-23 months. Specifically, mothers with insufficient knowledge were more likely to have underweight children compared to mothers with good and sufficient knowledge (Table 5). This result aligns with Sari's research (2022), which indicated a significant relationship between maternal knowledge and the incidence of underweight, with a p -value of 0.005 (Sari *et al.*, 2022).

Nutritional knowledge refers to the understanding of food and its nutrients. It can influence mothers' food choices for their children, particularly regarding dietary needs, which can impact a child's nutritional status (Iqbal and Suharmanto, 2020). Mothers with low knowledge are likely to have toddlers with poor

nutritional status. It is because mothers do not receive good and correct information on how to care for the children, making mothers indifferent to their children's condition, so that their nutritional status becomes poor. To improve the nutritional status of children under 5 years of age, mothers should be informed and proactively consulted with health professionals to help them recognize good dietary practices for their children (Tridiyawati and Handoko, 2019).

Improving mothers' knowledge about the children's nutritional status is crucial. A well-informed mother will monitor their children's nutritional status by regularly checking their growth and development at the Integrated Health Service Post (*Posyandu*) and monitoring their diets, ensuring their children's growth and development are healthy and age-appropriate.

The Influence of Feeding Practices on the Incidence of Underweight in Children Aged 12-23 Months

This research revealed that as many as 35 people (36.8%) had inappropriate feeding practices, while nine (9.5%) had appropriate ones. The statistical tests yielded a p -value of 0.0001, indicating a significant influence between feeding practices and the incidence of underweight in children aged 12-23 months. Mothers with inappropriate feeding practices were more likely to have children aged 12-23 months underweight compared to mothers with appropriate feeding practices (Table 6). This result aligns with Samino's research (2020), which found that feeding practice was related to the incidence of underweight, with a p -value of 0.001 (Samino, Angelina Febriani and Atmasari, 2020).

In this study, some mothers fed their children properly but still experienced underweight. It happened because their children ate 3 times a day, but sometimes the food was not finished by the child. As in the study conducted by Fajriani (2020), toddlers were given three meals per day, but sometimes two meals were served twice a day. The mothers did not provide their children with three meals a day. When the child did not finish his food, the mother did not try to get the child to finish his food because there was an assumption that eating 3 times a day was not important so that the toddler experienced malnutrition even though based on the message of balanced nutrition for toddlers, mainly children aged 12-23 months, children should be accustomed to eating 3 times a day, namely morning, afternoon and night because in children aged 12-23 months who are in a period of growth and brain development will be very dependent on food intake consumed regularly (Fajriani, Aritonang and Nasution, 2020). Children aged 12-23 months should not be introduced to sweet foods initially, as their appetite will naturally decrease and they may develop a craving for sweet foods. Therefore, parents play a crucial role in feeding their children. Providing bland, natural foods during the complementary feeding phase, until age 5, will help children become familiar with various tastes and develop a good appetite, thereby reducing the likelihood of picky eating.

The energy required by children aged 12-24 months, based on the Nutritional Adequacy Intake (Ministry of Health, 2014), is 1125 kcal/day. The total energy is obtained from protein, namely 26 g/day, fat as much as 44 g/day, and carbohydrates as much as 155 g/day. Mineral nutrients such as calcium, as much as 650 mg/day, phosphorus, as much as 500 mg/day, and iron, as much as 8.0 mg/day. Additionally, vitamins are crucial in meeting the nutritional needs of children aged 12-23 months. Vitamins needed by babies aged 12-24 months include vitamin A, with adequacy based on the Recommended Dietary Allowance (RDA) of 400 RE/day, and vitamin C as much as 40 mg/day (Kementerian Kesehatan RI, 2014).

The feeding practices are significantly related to a toddler's nutritional status. The better the feeding practices, the better the toddler's nutritional status. Conversely, if mothers provide poor parenting practices in feeding the toddlers, their nutritional status will also be affected. Toddlers rely on their parents/caregivers to meet their basic needs, including food, hygiene, affection, and a sense of security. A toddler's nutritional intake depends on how parents or caregivers care for and feed their child. A mother's lack of involvement in providing food or regular meals can lead to unmet nutritional needs, which can result in malnutrition (Natasya, 2020).

CONCLUSION

In conclusion, the factors influencing the incidence of underweight in children aged 12-23 months in the working area of Cibeureum PHC include maternal education, family income, maternal knowledge, and feeding practices. Meanwhile, the history of exclusive breastfeeding did not influence the incidence. This research could serve as a basis for developing more targeted health education programs tailored to community characteristics. It can be utilized as a resource for enhancing the capacity of cadres to identify and support high-risk families. Future researchers could develop and analyze educational intervention programs, such as cadre training, to enhance knowledge and improve cadre capacity regarding underweight conditions.

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