

## RESEARCH ARTICLE

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# Prevalence of Undernutrition and Associated Factors: A Cross-sectional Study among Rural Toddlers in Bangka Belitung, Indonesia

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**ABSTRACT** Malnutrition in toddlers is known to cause disturbances for growth and development. The impact on poor mental development and school achievement and disorders. Conventional tools are often used to predict this risk. On the other hand, the classification of nutritional disorders using the Composite Index of Anthropometric Failure (CIAF) can predict this risk better. The CIAF method is an anthropometric index that combines the three indices of weight/age, height/age, and weight/height to determine the nutritional status of toddlers. Based on Riskesdas data in 2018, the prevalence of stunting under five in Indonesia reaches 30.8% or around 7 million children under five suffer from stunting. This situation is greater than the maximum stunting prevalence limit set by WHO, which is 20%. The prevalence of stunting under five in the Province of the Bangka Belitung Islands is 23.37% where the highest cases occur in West Bangka Regency. However, West Bangka Regency in particular and the Province of the Bangka Belitung Islands in general have not classified malnutrition that occurs based on CIAF. The purpose of this study was to determine the prevalence of undernutrition and the factors that influence it in West Bangka. This study aims to determine the prevalence of undernutrition based on the Composite Index of Anthropometric Failure (CIAF) and the factors that influence it. This research is a descriptive analytic study with a cross sectional design which was conducted for 10 (ten) months in West Bangka Regency. A sample of 155 toddlers was taken by using multistage random sampling technique. The instruments used include a questionnaire about the characteristics, characteristics of parents, and family economy. The measurement tools used to assess nutritional status are in the form of calibrated digital weight and height scales. The results show that 48.4% or almost half of the respondents experience growth and development failure. Most failure to thrive was in the stunting and underweight category (21.3%) and the least was in the wasting only category (1.3%). Type, age of the child, mother's age, mother's education and household income are not variables that affect the nutritional status of children. Further research is needed with a wider scope of variables so that it can be found what are the factors that influence the occurrence of malnutrition

**INDEX TERMS** Composite Index of Anthropometric Failure (CIAF), Development, Growth, Malnutrition.

## I. INTRODUCTION

Malnutrition is a global problem that impacts both individuals and society in the aspects of acute and chronic diseases, health development and economic productivity [2]. More than 900 million people are affected by cases of malnutrition worldwide, making malnutrition the most important public health problem. Malnutrition is a condition where there is insufficient food intake both quantitatively and qualitatively. Consuming a lot in quantity but having less quality can lead to malnutrition [3].

Malnutrition in toddlers contributes to high mortality rates in children. It causes long-term effects on the body that can interfere with the growth and development of children. Malnutrition can also lead to susceptibility to fat accumulation, insulin resistance in adulthood, hypertension

and dyslipidemia. Some of these conditions can be passed on to offspring. In addition, malnutrition can also cause children to have poor mental development and behavioral disorders. Some argue that this condition is permanent, and others think that it is reversible. Children with stunting, for example, can recover their height, have normal body composition, good bone density, good insulin production and sensitivity when hospitalized before they are 6 years old [3].

According to the graph presented by the United Nations Children's Fund (UNICEF), the factors that play the most important role as the basic cause of malnutrition are environmental, economic, sociopolitical and poverty. These conditions will make households unable to meet their needs in caring for mothers and babies and cause a shortage of health services that families receive [4].

Stunting in toddlers in Indonesia, based on the results of a national health survey in 2018, reached 30% or around 7 million children. This figure is higher than the standard of the World Health Organization (WHO), which is 20%. Meanwhile, in the Bangka Belitung Islands province, the stunting rate reached 23.37%, which has decreased compared to the 2013 survey, which was 28.66%. Apart from stunting, wasting has also decreased, from 10-14% to 9.87% [5].

The Bangka Belitung Archipelago Province is an archipelago consisting of 8 regencies. One of the districts that has high cases of malnutrition is West Bangka Regency. Data from the Bangka Belitung Provincial Health Office (2020) shows 15.12% of severely malnourished toddlers (W/A), 16.96% of short (height/U) toddlers, and 5.69% of underweight toddlers (BB/TB) in two districts West Bangka. [6].

This study aims to determine the prevalence of undernutrition based on Composite Index of Anthropometric Failure (CIAF) and the factors that influence it. The difference between this study and previous research is the classification using the CIAF method. CIAF is an anthropometric index that combines three measurements, namely weight/age, height/age, and weight/height (Rahmadini et al., 2013). It is important to classify nutritional disorders using the CIAF method because it can predict risk better than conventional methods. The classification of nutritional status in West Bangka district still uses conventional methods. In order to prevent morbidity and mortality in children, it is necessary to assess the nutritional status of children using the CIAF method. Therefore we are interested in conducting a study on "The Composite Index Prevalence of Anthropometric Failure (CIAF) in West Bangka".

## II. METHODOLOGY

This research is a descriptive analytic study with a cross sectional design which was conducted for 10 (ten) months in West Bangka Regency, Bangka Belitung Islands Province. The population in this study were all families with toddlers from the age of 6 to 59 months in West Bangka Regency.

A sample of 155 toddlers was taken by using multistage random sampling technique. The sample was selected based on the inclusion criteria, namely willing to become research respondents. Respondents will be excluded if it turns out that the toddler was born prematurely, has a history of LBW and has congenital abnormalities. Sampling was carried out in two stages, first selecting Puskesmas in West Bangka Regency, then selecting Posyandu and PAUD in the working area of the Puskesmas.

The instruments used include a questionnaire about the characteristics of respondents, characteristics of parents, and family economy. The measurement tools used to assess nutritional status are in the form of calibrated digital weight and height scales. The results obtained were then edited, coded and tabulated and then analyzed using the SPSS

program. This research has passed the ethical review by the Health Research Ethics Commission of the Ministry of health, Pangkalpinang with the number 01/EC/KEPK-PKP/V/2022.

## III. RESULT

**TABLE 1.**  
Characteristics of Respondents and Their Relationship with Nutritional Status

	Mean ± SD Frequency (%) n=155	p
<b>Child Gender</b>		0,050*
- Female	66 (42,6)	
- Male	89 (57,4)	
<b>Child Age (months)</b>	<b>35,49 ± 14,794</b>	0,094**
- 6 – 11	12 (7,7)	
- 12 – 23	25 (16,1)	
- 24 – 35	30 (19,4)	
- 35 – 47	46 (29,7)	
- 48 – 59	42 (27,1)	
<b>Mother age (years)</b>	<b>28,35 ± 5,781</b>	0,077**
- < 20	3 (1,9)	
- 20 – 35	135 (87,1)	
- > 35	17 (11)	
<b>Mother's education</b>		0,585**
- No School	11 (7,1)	
- Basic education	100 (64,5)	
- Further Education	44 (28,4)	
<b>Household Income</b>		0,644*
- < Rp.3.264.884	82 (52,9)	
- ≥ Rp.3.264.884	73 (47,1)	

Exp:

\*Mann-Whitney

\*\*Kruskal-Wallis

**TABLE 2.**  
Malnutrition prevalence based on CIAF in children under five in West Bangka

Group	CIAF category	Frequency (%)
<b>I</b>	Normal	80 (51,6)
<b>II</b>	Wasting only	2 (1,3)
<b>III</b>	Stunting only	19 (12,3)
<b>IV</b>	Underweight	5 (3,2)
<b>V</b>	Stunting and Underweight	33 (21,3)
<b>VI</b>	Wasting and Underweight	5 (3,2)
<b>VII</b>	Wasting, Stunting and Underweight	11 (7,1)
<b>Total</b>		155 (100)

CIAF (II + III + IV + V + VI + VII) = 48,4%.

## IV. DISCUSSION

Based on the results of the study obtained (TABLE 1), it can be seen that the gender of the children in this study was more boys (57.4%) than girls (42.6%). Statistical tests show that gender does not affect the nutritional status experienced by these toddlers. This contradicts research conducted in India and in sub-Saharan Africa where boys are more at risk for malnutrition although further research is needed on these findings. The possible cause is due to the non-fulfillment of children's nutritional needs in line with increasing age.

The average age of the children in the study was 35.49 ± 14,794 months (TABLE 1). The most children's age categories are in the age range of 35-47 months (29.7%) and 48-59 months (27.1%). There was no significant difference between the age of the child and the nutritional status of the child. The results of this study contradict research conducted

in remote areas of Ethiopia, and the Oromia region [9], [10], [12], [13]. These studies show that there is a significant relationship between age and malnutrition. It is further stated that age and gender are closely related. Gender that previously had an influence on nutritional status may change with age [14], [15]. Research in the Philippines found that boys do experience a higher risk of experiencing malnutrition in the first year of life. However, in the following year it is the girls who have a higher risk [16].

In theory, maternal age plays a significant factor in the nutritional status of children. This is because mothers are the main actors in raising children at home. The average age of the mother in this study was  $28.35 \pm 5.781$  years. Statistical results show that there is no significant difference between the age of the mother and the nutritional status of the child (TABLE 1). This could be due to the fact that most of the respondents, namely 87.1%, were aged 20-35 years, so it could not be proportionally compared with the incidence of malnutrition based on the age category of the mother. This result contradicts the results of a study conducted in Russia where it was found that the mother's age is very influential in the baby's first year of life [17]. The prevalence of malnutrition in children was found to be three times higher in adolescent mothers than in adult mothers in Ghana. The main causes of malnutrition are inadequate dietary intake and infection in children of young mothers. Young mothers find it more difficult to ensure adequate child nutrition, access to clean water and sanitation conditions. In addition, this young mother is also considered psychologically unprepared in the process of parenting [18].

Mother's education was found to be more in the basic age category in this study (TABLE 1). Statistical results show that there is no significant relationship between mother's education and child's nutritional status. This is in line with Bernardus' research [19] which states that higher formal education does not necessarily affect health or nutrition knowledge, and vice versa. So that posyandu cadres are obliged to continuously increase mothers' knowledge about health. This contradicts research conducted in India. Children whose mothers have low education or no education at all, are not exposed to mass media and have high parity are at higher risk of malnutrition [7]. In another study, it was mentioned how low education and exposure to mass media made mothers have limited knowledge. As a result, mothers' awareness of nutrition programs and good feeding practices for children is reduced. In the end, this will lead to malnutrition in children [20].

The economic situation of the family is a factor that is no less important to the nutritional status of children. In this study, it was found that more respondents had incomes below the minimum wage for the Province of Bangka Belitung Islands or less than Rp. 3264,884 even though statistically it was seen that there was no relationship between income and the nutritional status of children. This could be due to the main occupations in the Bangka Belitung archipelago province being the agricultural, forestry, hunting and fishing sectors, namely 36% [1]. Fulfillment of nutrition in children

does not only depend on income, but also from direct work results such as agricultural crops, fisheries, and others. This result contradicts the study obtained by a study conducted in India where there is an accumulation of stunting and malnutrition in children in less developed districts [21]. This accumulation also occurs in the poor as measured by income [22].

From the various characteristics of the respondents in TABLE 1, there is not a single variable that has a significant relationship with the nutritional status of children. This may be due to other factors that play a role that were not examined in this study. Further research is needed with a wider scope of variables so that it can be assessed what causes malnutrition in Bangka Belitung Province.

TABLE 2 shows the prevalence of malnutrition based on CIAF. As many as 48.4% or almost half of the respondents experienced growth and development failure. These data are similar to those obtained by a study conducted in Ethiopia where the CIAF malnutrition rate was 48.5% [12]. Most failure to thrive was in the stunting and underweight category (21.3%) and the least was in the wasting only category (1.3%)

This growth failure rate cannot be compared nationally because in Indonesia the measurement of nutritional problems in children still uses a single measurement index. Although some literature has suggested that conventional methods for assessing nutritional disorders in a population underestimate the prevalence of nutrition compared to CIAF [23], [24]. It needs to be done on a more varied number of respondents so that the factors influencing malnutrition are clearer

## V. CONCLUSION

Gender, child's age, mother's age, mother's education and household income are not variables that affect the nutritional status of children. There were 48.4% of cases of failure to thrive from all cases of malnutrition found based on CIAF. Failure to thrive is mostly stunting and underweight (21,3%). Further research is needed with a wider scope of variables so that it can be found what are the factors that influence the occurrence of malnutrition in Bangka Belitung. In addition, a more massive data collection on malnutrition nationally based on the CIAF is needed, not only based on a single index measurement, so that it can provide a better picture of malnutrition cases that occur in Indonesia.

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