

**Analysis of Risk Factors for the Nutritional Status of Toddlers Below the Red Line (BGM): A Case Study in Sungai Kakap Village, Kubu Raya Regency, West Kalimantan, Indonesia**

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**ABSTRAK**

**Background:** Body weight below the red line (BGM) is a condition of malnutrition caused by low energy and protein intake from daily food for a long period of time. Based on data from the Kubu Raya Health Office in 2020, there were 216 cases of toddlers below the red line with the highest case of Sungai Kakap Health Center with a total of 43 cases. **Objective:** The purpose of this study was to analyze the risk factors for nutritional status in under-fives below the red line (BGM) (case study of Sungai Kakap Village, Kubu Raya Regency, West Kalimantan, Indonesia) in 2019. **Methods:** This is a quantitative study with a *case-control* design. The population in this study was the entire number of toddlers recorded in Sungai Kakap Village as many as 661 toddlers. The sample in this study were all BGM cases in Sungai Kakap Village as many as 15 cases and 30 controls. Data analysis using Chi-square test. **Results:** Research results of factors associated with the incidence of BGM are exclusive breastfeeding ( $p = 0.032$ ; OR = 7, CI = 1.167 - 42), family income ( $p = 0.000$ ; OR = 24.75 CI = 4.739 - 129.258), LBW ( $p = 0.006$ ; OR = 9.33 CI = 1.593 - 54.672). The unrelated factors were education level, posyandu service, history of infectious disease and sanitation. **Conclusion:** Exclusive breastfeeding, family income and LBW are the main factors causing the incidence of LBW in Sungai Kakap village, Kuburaya district, West Kalimantan, Indonesia. It is important to continue and intensify education about exclusive breastfeeding through posyandu and health workers, conduct economic interventions such as direct assistance and job training to help low-income families who are at high risk of BGM and intensive monitoring and care of low birth weight infants is needed to prevent future malnutrition.

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## 1. INTRODUCTION

The nutrition problem in children under five years old that Indonesia is currently facing is the problem of growth of children under five years old, namely with Body Weight (BB) below the Red Line (BGM). Weight below the Red Line is a state of severe malnutrition caused by low consumption of energy and protein from daily food and occurs for a long time<sup>1</sup>. The toddler indicator is said to be below the red line if the toddler has not gained weight for 3 months according to his age on the toddler's KMS<sup>2</sup>.

The nutritional status of toddlers is an important thing that every parent should know. Malnutrition in this golden period is irreversible (not quickly recovered). Malnutrition can affect a child's brain development. Malnutrition in toddlers in Indonesia seems to increase from year to year. Infectious diseases experienced by toddlers based on research results are tuberculosis, diarrhea and ispa<sup>3</sup>.

BGM is the first cause of death for children under five, accounting for 54% of child deaths<sup>4</sup>. The total number of BGM cases in children under five years of age nationally in 2015 was found to be 26,518 cases. The highest province was found in East Java Province with 6,019 cases and the lowest was found in North Sulawesi Province with 40 cases<sup>5</sup>. As for undernutrition status, based on the results of Riskesdas in 2018 there was only a decrease of about 0.1 from the results of Riskesdas in 2013<sup>6</sup>.

Based on data from the Kubu Raya Health Office in 2020, there were 216 cases of toddlers below the red line from 20 existing health centers. The highest case is in Puskesmas Kakap<sup>7</sup>. The incidence of BGM in toddlers in the Sungai Kakap Health Center working area was 43 cases throughout 2020, with the distribution of cases, namely Sungai Kakap village 16 cases, Sungai Itik 2 cases, Pal IX 3 cases, Kalimas 8 cases, Sungai Belidak 11 cases, Sepok laut 0 cases and Tanjung Saleh 3 cases<sup>8</sup>. Based on what has been conveyed above, this study aims to analyze the risk factors for nutritional status of toddlers below the red line (bgm) (case study in Sungai Kakap village, Kubu Raya District, West Kalimantan, Indonesia) in 2019.

## 2. METHODS

This research is a quantitative study with a *case-control* design. The research location was in Sungai Kakap Village, with a research time span from February to July 2021. The population in this study consisted of all toddlers registered in Sungai Kakap Village, totaling 661 toddlers in 2019.

The sample was taken using purposive sampling, which is a sampling technique based on certain considerations and criteria set by the researcher. Samples were taken according to the research objectives, where the case group consisted of all toddlers who were below the red line (undernourished) in Sungai Kakap Village, which identified 15 cases from 7 posyandu. For the control group, a 1:2 ratio was selected, bringing the total to 30 healthy toddlers. Thus, the total number of samples analyzed in this study was 45 toddlers (15 cases and 30 controls).

Data collection techniques in this study were carried out in two ways, namely through primary data and secondary data. Primary data was obtained through the collection of questionnaires specially prepared to explore information related to risk factors. Meanwhile, secondary data included information obtained from the Kubu Raya District Health Office and Sungai Kakap Health Center.

Data were analyzed using univariate and bivariate analysis. Univariate analysis was used to describe the characteristics of each variable, while bivariate analysis was

used to examine the relationship between risk factors and the nutritional status of children under five.

### 3. RESULTS

Univariate data analysis aims to present a description of the characteristics of the variables studied, namely education level, exclusive breastfeeding, family income, visits to posyandu, history of infectious diseases, low birth weight, and environmental sanitation.

Bivariate analysis is intended to determine the relationship between the independent variable and the dependent variable individually. The statistical test used is the square test for nominal scale data using a confidence interval (CI of 95% ( $\alpha = 0.05$ )). The *chi-square* statistical test was used to analyze the variables studied. In the table below it is known that there are 3 variable factors associated with the incidence of BGM in toddlers.

**Table 1.**  
**Respondent Characteristics**

<b>Characteristics</b>	<b>n = (45)</b>	<b>%</b>
<b>Mother's age</b>		
17-25 Years	13	28,8
26-35	20	44,6
36-45	11	24,4
≥46	1	2,2
<b>Mother's Education</b>		
Not in school	2	4,4
SD	14	31,1
SMP	11	2
HIGH SCHOOL	17	37,8
College	1	2,2
<b>Toddler Age</b>		
0-2 Years	22	48,4
2-3 Years	9	20,3
>3-5 Years	14	31,3
<b>Gender of Toddlers</b>		
Male	18	40
Female	27	60

Source: Primary Data, 2021

Based on the data above, it can be seen that the age group 17-25 years was 13 with a percentage of 28.8%, the age group 26-35 years was 20 with a percentage of 44.6%, the age group 36-45 years was 11 with a percentage of 24.4% and the age group ≥ 46 years was 1 with a percentage of 2.2%.

Based on the data above, it can be seen that the last level of education of the respondents, from the results of interviews with 45 respondents, it was found that respondents with the last education graduated from college were 1 person with a percentage of 2.2% and respondents did not go to school as many as 2 with a percentage of 4.4%, respondents with the last elementary education were 14 people with a percentage of 31.1%, junior high school were 11 people with a percentage of 24.4% and

respondents with the last high school education were 17 people with a percentage of 37.7%.

Based on the data above, from the results of interviews with 45 respondents, the results of gender in toddlers were obtained. Toddlers with male gender amounted to 18 people with a percentage of 40% and toddlers with female gender amounted to 27 people with a percentage of 60%.

Based on the data above, it can be seen that the age group of toddlers 0-2 years is 22 with a percentage of 48.4%, the age group of 2-3 years is 9 with a percentage of 20.3%, and the age group >3-5 years is 14 with a percentage of 31.3%.

**Table 2.**  
**Univariate Analysis**

<b>Variables</b>	<b>n = (45)</b>	<b>%</b>
<b>Exclusive breastfeeding</b>		
No	7	15,6
Yes	38	84,4
<b>Family Income</b>		
< Rp. 2,000,000,-	14	31,1
≥ Rp. 2,000,000,-	31	68,9
<b>Posyandu visits</b>		
No	0	0
Yes	45	100
<b>History of Infectious Disease</b>		
History.	1	2,2
No history	44	97,8
<b>LBW</b>		
No	37	82,2
Yes	8	17,8
<b>Sanitation</b>		
Bad	8	17,8
Good	37	82,2

Source: Primary Data, 2021

Based on the data above, it can be seen that those who provide exclusive breastfeeding to children are 38 (84.4%) and do not provide exclusive breastfeeding as many as 7 (15.6%). Based on the data above, it can be seen that the average family income of respondents is below Rp.2,000,000, - as many as 14 (31.1%) and above Rp. 2,000,000, - as many as 31 respondents (68.9%). Based on the data above, it can be seen that the average respondent visits the posyandu as many as 45 (100%).

Based on the data above, it can be seen that the average toddler does not have a history of infectious disease as many as 44 toddlers (97.8%) and who has a history of infectious disease as many as 1 toddler (2.2%). Based on the data above, it can be seen that toddlers are not LBW as many as 37 with a percentage (82.2%) and LBW toddlers as many as 8 with a percentage (17.8%). Based on the data above, it can be seen that the average respondent has good sanitation as many as 37 with a percentage (82.2%) and those with poor sanitation as many as 8 with a percentage (17.8%).

**Table 3.**  
**Bivariate Analysis**

Variables	Incidence of BGM				p-value	Value OR (95%CI)
	BGM		No BGM			
	n	%	n	%		
<b>Exclusive breastfeeding</b>						
No	5	33,3	2	6,7	0,032	7 (1,167-42)
Yes	10	66,7	28	93,3		
<b>Education Level</b>						
Low	15	100	29	96,7	1,000	-
High	0	0	1	3,3		
<b>Family Income</b>						
<Rp.2,000,000	11	73,3	3	10	0,000	24,750 (4,739-129,258)
≥Rp.2,000,000	4	26,7	27	90		
<b>Posyandu Services</b>						
Incomplete	0	0	1	3,3	0,475	-
Complete	15	100	29	96,7		
<b>History of Infectious Disease</b>						
History.	1	6,7	0	0		
No history	14	93,3	30	100	0,333	-
<b>LBW</b>						
LBW	6	40	2	6,7	0,011	9,333 (1,593-54,672)
Not LBW	9	60	28	93,3		
<b>Sanitation</b>						
Bad	5	33,3	3	10	0,095	4,5 (0,904-22,395)
Good	10	66,7	27	90		

Source: Primary Data, 2021

The three independent variables associated with BGM are as follows Not exclusive breastfeeding (P= Value = 0.032 OR = 7), family income (P Value = 0.000 OR = 24.750) and low birth weight (P Value = 0.011 OR = 9.333). While variables that are not associated with the incidence of BGM are education level, posyandu services, history of infectious diseases and sanitation.

## 4. DISCUSSION

### 1. Not exclusively breastfed

This study shows statistical results using the Chi - Square test obtained a value of P - value = 0.032 (<0.05), it can be concluded that there is a significant relationship between exclusive breastfeeding and the incidence of BGM. Based on the results of the analysis, the proportion of respondents not exclusively breastfed who experienced BGM was 5 people (33.3%), while in the non-BGM group who were not exclusively breastfed were 2 people (6.7%).

The results of this study are in line with Rusmilawaty's research, the results of statistical tests showed that there was a significant relationship between the history of exclusive breastfeeding and the incidence of BGM in toddlers in the Karang Intan 1 Puskesmas working area of Banjar Regency in 2019 with a p-value of 0.001 with an OR value showing a value of 2.5. This result means that mothers who do not provide

exclusive breastfeeding have a 2 times greater risk of experiencing BGM in children under five compared to mothers who provide exclusive breastfeeding to their toddlers<sup>9</sup>.

The results of this study are in line with the theory that the weight of infants who received exclusive breastfeeding increased more slowly than infants who received formula milk. This does not mean that infants with formula milk gain more weight than infants with breast milk. Excess weight in formula-fed infants may indicate obesity. Because with exclusive breastfeeding, the nutritional status of infants will be good and achieve growth according to their age while infants who do not get breast milk tend to grow below normal or below the red line.

Babies who get exclusive breastfeeding will get all the immunity and fulfill their nutritional needs to the maximum so that babies are healthier, more resistant to infection, less prone to allergies, and less often get sick because breast milk contains antibodies. Thus, babies who get exclusive breastfeeding will experience optimal growth. For health workers to provide information to mothers about nutrition for pregnant women and exclusive breastfeeding and for mothers to breastfeed as often as possible and increase consumption of nutritious foods.

## **2. Education Level**

Based on the table above, it shows that the proportion of low education levels that experience BGM is 15 people (100%), while more respondents who do not have BGM have low education as many as 29 (96.7%). The results of statistical analysis using the Chi - Square test obtained a value of P - value = 1.000 ( $>0.05$ ) then  $H_0$  is accepted so it can be concluded that there is no significant relationship between education level and the incidence of BGM.

The results of this study are in line with research conducted by Wulandari & Arum (2022), showing statistical results of P-value = 0.301  $>0.05$  so that there is no significant relationship between maternal education and the incidence of BGM<sup>10</sup>.

The results of the study are not in line with research conducted by Tuhinur Rahman Chowdhury (2018), Children of mothers who did not finish high school and mothers who finished high school were less likely to be thin than children of uneducated mothers who did not attend formal school<sup>11</sup>.

The results of this study are in line with the theory that low education causes a person to pay good attention to health programs, so they do not recognize the dangers that may occur. Even though there are good facilities, they do not necessarily know how to use them. They will not pay attention to the information available because there is no curiosity<sup>12</sup>.

The level of education of mothers of toddlers in Sungai Kakap Village is mostly medium, namely high school while the nutritional status of toddlers is mostly good, this can be influenced by routine activities to the posyandu where there is regular delivery of health information. So it is very helpful for mothers in increasing knowledge related to the growth and development of toddlers so that toddlers can grow optimally.

## **3. Family Income**

This study shows statistical results using the Chi - Square test obtained a value of P - value = 0.000 ( $>0.05$ ), it can be concluded that there is a significant relationship between family income and the incidence of BGM. Based on the table above, it shows that the proportion of respondents whose income is  $< \text{Rp.}2,000,000$ , - experienced BGM as many as 11 people (73.3%), while the respondents who did not have BGM earned  $\geq \text{Rp.}2,000,000$ , - as many as 3 (10%).

This research is in line with the research of Nurul Budi Lestari (2014) obtained the results of statistical analysis using the Chi-square test at a confidence level of 5%. Resulting in a p-value of 0.000 ( $<0.05$ ) there is a relationship between family income level and the incidence of BGM toddlers in Karang Pasar Village, Tegowanu Health Center working area, Grobogan Regency<sup>13</sup>. This study is not in line with research conducted by Marelda (2014). In the study obtained a p-value of 0.934 which means there is no relationship between family income and nutritional status in toddlers<sup>14</sup>.

The results of this study are not in line with research conducted by Chintya Dewi Prastica Putri 2020. From the analysis, the P-value = 0.09 ( $>0.05$ ) means that there is no relationship between family income and the status of BGM toddlers in the Halmahera Puskesmas work area<sup>15</sup>.

The results are in line with research conducted by Maurice Mutisya in 2015. The risk of stunting increased by 12% among children from food insecure households. When the combined effect of food security and wealth status was assessed, the risk of stunting increased significantly by 19 and 22% among children from moderately food-insecure and severely food-insecure households ranked in the middle to lower wealth status. Among the poorest and poorest households, food security was statistically unrelated to nutrition<sup>16</sup>.

The results of this study are in line with the theory that family income is the main determinant related to food quality. If family income increases, the provision of side dishes will also increase in quality. It cannot be denied that family income will also determine the dishes served to the family daily, both the quality and quantity of food<sup>17</sup>.

Low income is a hurdle that prevents people from buying the necessary amount of food. So that high and low income greatly affects the family's purchasing power for food which ultimately affects nutritional status. Under-fives need nutrients for growth and development. In this case, even though respondents have low income, they can still meet the nutritional needs of toddlers optimally so that children grow and develop properly.

#### **4. Posyandu Services**

Based on the table above, the proportion of respondents with incomplete posyandu services who experienced BGM was 0 people (0%), while those who were not BGM with incomplete posyandu services were 1 person (3.3%). The results of statistical analysis using the Chi - Square test obtained a value of P - value = 0.475 ( $>0.05$ ) then ho is accepted so it can be concluded that there is no significant relationship between posyandu services on the incidence of BGM.

This study is in line with research conducted by Dhina Septria Wahyunigtyas 2015, in her research on the participation of mothers of toddlers to posyandu in the working area of Puskesmas Gilingan Surakarta, that there is no significant relationship between the utilization of health services with the incidence of BGM toddlers. from the results of the analysis obtained a value of  $p = 0.183$  ( $p \text{ value} > 0.05$ ) means that the utilization of health services with the incidence of BGM toddlers shows no significant relationship<sup>18</sup>.

This study is in line with the theory that mothers who routinely go to the posyandu can be monitored for the nutritional status of their toddlers and get encouragement from health workers in improving the nutritional status of toddlers and vice versa mothers who are not routine to the posyandu then the nutritional status of their toddlers will be difficult to monitor<sup>19</sup>.

Respondents in this study have utilized posyandu services well, namely getting vitamin A, immunization and MP-Asi and attending posyandu regularly so that there is no relationship with the incidence of BGM in Sungai Kakap Village. It is hoped that the community will continue to make the best use of the health facilities that have been provided, so that the community can gain good knowledge.

## 5. History of Infectious Disease

Based on the table above, the proportion of respondents who have a history of infectious disease experiencing BGM is 1 person (6.7%), while those who have a history of not BGM are 0 (100%). The results of statistical analysis using the Chi - Square test obtained a value of P - value = 0.333 ( $>0.05$ ) then  $H_0$  is accepted so it can be concluded that there is no significant relationship between the history of infectious diseases to the incidence of BGM.

This study is not in line with Novitasari's research in 2016 with the results of the chi-square test analysis on the infectious disease variable with the nutritional status of children under five obtained a p-value = 0.024 ( $<0.05$ ) this states that there is a relationship between infectious diseases and the nutritional status of children under five where children under five who suffer from infectious diseases are at risk 5.688 times suffering from BGM compared to children under five who do not suffer from infectious diseases<sup>19</sup>.

This study is not in line with the theory that infectious diseases can worsen nutritional conditions and poor nutrition can make it easier to get infectious diseases, so infectious diseases and nutritional conditions are a reciprocal relationship<sup>20</sup>.

In this case, the condition of toddlers in Sungai Kakap can be said to be good because most children do not experience infectious diseases and mothers should pay more attention to the condition of their toddlers to avoid infectious diseases such as diarrhea, worms, pneumonia or skin diseases and ispa by maintaining personal hygiene and environment.

## 6. Low Birth Weight

This study shows the statistical results using the Chi-square test obtained a value of P - value = 0.011 ( $<0.05$ ) then  $H_0$  is accepted so it can be concluded that there is a significant relationship between LBW to the incidence of BGM. Based on the results of the analysis, the proportion of respondents who were LBW experienced BGM as many as 6 people (40%), while those who were LBW did not have BGM were 2 (6.7%).

The results of this study are in line with the research of Woldeamanuel et al (2019) that low birth weight ( $<2.5$  kg) is 2 times more likely to experience low weight, lower child age, and 3 toddlers in one household are significantly associated with stunting, wasting, and low weight<sup>21</sup>.

The results of the study are in line with the theory that low birth weight in the long term can cause malnutrition. In infants with low birth weight, anti-immune substances are less perfect so that they are more susceptible to infectious diseases. This disease causes toddlers to lack appetite so that food intake into the body is reduced and can cause nutrition<sup>22</sup>.

There is a relationship between birth weight and the incidence of BGM in toddlers, so efforts that need to be made by health workers are to increase counseling to mothers to maintain health by eating healthy foods, especially for pregnant women so that they give birth to children with normal birth weight. For mothers since pregnancy to do routine checks so that the growth and development of the fetus grows normally.



## 7. Sanitation

Based on the results of the study, it was found that the proportion of children who experienced Below the Red Line (BGM) with poor sanitation conditions was 5 children (33.3%), while children who did not experience BGM but had poor sanitation conditions were 3 children (10%). Statistical tests using Chi-square resulted in a p-value of 0.095 ( $>0.05$ ), indicating that there was no significant relationship between sanitation and the history of infectious diseases in children.

The results of this study are not in line with research conducted by Putri (2020), where it was found that children with poor environmental sanitation were more in the BGM nutritional status group (65.5%) compared to children who were not BGM. Statistical analysis in the study resulted in a p-value of 0.001 ( $<0.05$ ), indicating a significant relationship between environmental sanitation and the nutritional status of BGM children. Children with poor environmental sanitation were found to have a 7.2 times greater risk of BGM status<sup>15</sup>.

The absence of a significant association between environmental sanitation and child nutritional status in this study does not mean that poor sanitation has no effect on child health. Some environmental health literature and theories still emphasize that poor sanitation can lead to an increased risk of infection, which in turn can affect children's nutritional status, especially in areas with truly inadequate sanitation<sup>23</sup>. However, in the context of the Sungai Kakap area, where sanitation conditions are considered generally good, these results suggest that sanitation may not be the main factor affecting children's nutritional status.

This study provides important implications that while improved environmental sanitation should remain a priority, other factors such as diet, nutrition education, and access to health services may play a greater role in determining the nutritional status of children in this area. Therefore, public health interventions in this area need to incorporate a more comprehensive approach, focusing not only on improving sanitation but also on improving the quality of nutritional intake and more equitable access to health services.

## 5. CONCLUSIONS

Based on the results of bivariate analysis, three factors were found to be significantly associated with the incidence of BGM, namely Not Exclusive Breastfeeding (P Value = 0.032 OR = 7), Family Income (P Value = 0.000 OR = 24.750) and Low birth weight (P Value = 0.011 OR = 9.333).

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## Author Contribution

WS: collect and analyze data

IA: reviewing empirical studies

LS: reviewing empirical studies

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