

ANALYSIS OF STUNTING FACTORS IN CHILDREN AGED 24-59 MONTHS DURING THE COVID-19 PANDEMIC

Ezalina*, Ulfa Hasanah, Eka Malfasari

Study Program of Nursing, Stikes Payung Negeri Pekanbaru Riau Province, Indonesia

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*Corresponding Author

Ezalina
ezalin44@gmail.com

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ABSTRACT

The COVID-19 pandemic has caused many parents to lose their jobs and impacted their ability to purchase healthy food, affecting their children's development. This study aims to determine the factors that influence stunting in children during the COVID-19 pandemic. This was a cross-sectional study. The population was mothers who had toddlers aged 24-59 months (n=145). The sample was chosen through simple random sampling. The data were collected through height tests, interviews, and questionnaires. A univariate analysis was used to obtain a picture of each variable. The bivariate analysis was conducted with the chi-square test, and the multivariate analysis was performed using binary logistic regression. The results showed that 25.5% of children were experiencing stunting. There was a significant relationship between the eating habits of toddlers, childcare, history of infectious disease, mothers' visitation to health services, mothers' education level, and family income level with the prevalence of stunting. The level of family income has the most dominant relationship with stunting prevalence. Therefore, during the COVID-19 pandemic, it is essential to lower the prevalence of stunting through cross-sectoral collaborations regarding health service modifications according to the socio-economic level of the community and the incidence of COVID-19 cases.

Keywords: *Children; COVID-19; stunting*



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INTRODUCTION

The COVID-19 pandemic has hindered mothers and children from accessing appropriate healthcare services (Kenney et al., 2021). The pandemic has also instigated changes in service methods, i.e., the postponement of integrated services post (*posyandu*) activities and limiting healthcare services in public health centers (*puskesmas*) due to social distancing, thereby resulting in fewer health check visits. Furthermore, the decrease in visits related to nutritional care and maternal and child health during the COVID-19 pandemic has raised nutritional and mental health issues (Saputri et al., 2020). The conditions arising from the pandemic have caused malnourishment issues across the world, especially in low- and middle-income countries (LMICs) (Laborde et al., 2020).

According to UNICEF, around 30% of children worldwide experienced a drop in nourishment at COVID-19, and almost 70% (2.4 billion) of them were found in LMICs (UNICEF, 2020). Moreover, there was a 14.3% increase in the

prevalence of malnourishment in children under five during the COVID-19 pandemic, and out of the 6.7 million malnourished children around the world, 57.6% of them were found in South Asia and 21.8% in Sub-Saharan Africa (Headey et al., 2020).

Since the first case of COVID-19 in Indonesia in March 2020, the government has made various efforts to stop the spread of COVID-19 by implementing large-scale social distancing. This policy negatively affected the economy as many workers were put on unpaid leave to reduce the workforce, and some companies also went to the extent of firing their workers. Therefore, many families' capabilities of procuring good quality foods were affected (Carroll et al., 2020). These conditions may lead to an increased risk of acute and chronic malnutrition in children. Children who suffer from acute malnutrition are more vulnerable to stunting (Indonesia Ministry of Health, 2018).

Some factors that affect stunting are infection and inadequate nutrition (both quality and quantity) (Connery et al., 2021), the improper practice of caring for children, limited access to public healthcare for maternal and children, poor sanitation, and low food security in the family (Indonesia Ministry of Health, 2018). As the family's economic level is also linked to securing nutritious food, this also triggers the family's susceptibility to infectious diseases (Sharma et al., 2020). These conditions could cause irreversible disruption of physical growth, which is further related to poor academic achievement and earning less when these children become adults (Fore et al., 2020).

The government has conducted various programs, e.g., prioritizing the decrease of stunting cases by 40% by 2025 as one of the Sustainable Development Goals (SDGs) (Indonesia Ministry of health, 2018). However, since the COVID-19 pandemic, the number of stunting cases might increase as children suffer from a lack of nourishment. The government prioritized stunting through pre and post maternal observation (Ministry of Health Indonesia, 2021).

The COVID-19 pandemic has caused disturbance to public healthcare facilities and services through general mobility restrictions set to prevent the COVID-19 transmission (Osendarp et al., 2021). A study conducted by the Health Research and Development Department regarding the impact of the pandemic on healthcare services showed that only 19.2% of integrated services posts (*posyandu*) remained operational (Ministry of Health Indonesia, 2021).

This caused a low visit count of mothers for healthcare services. Several global studies showed the correlation between pandemics and the healthcare services (Robertson et al., 2020). In Sierra Leone, there were indications of reluctance from the public to be immunized and weigh their children in health facilities due to the fear of contracting a viral infection from being in a crowd (Saputri et al., 2020). In Indonesia, there have been declining observation counts of children's growth observed through regular weighing in public health centers (Saputri et al., 2020). The government's responsive policy supported by the Directorate General of Public Health number: HK.02.02/V/393/2020 concerning nutrition services during the COVID-19 pandemic provided a reference for local nutritionists to modify nutrition services during the pandemic (Ministry of Health Indonesia, 2021). The nutritional service modifications made were creating online social media groups, conducting home visits for at-risk targets, and providing education and counseling services via WhatsApp.

According to Basic Health Research in 2018, Riau province is one of the provinces in Indonesia with a high stunting prevalence (27.4%), where approximately 3 out of 10 children experience stunting (Indonesia Ministry of health, 2019).

According to an annual report from the public health office of Pekanbaru City regarding child nutrition status, the stunting case count in Sidomulyo Public Inpatient Healthcare was 22.8% in 2020. According to an interview with the nutrition program department in the RI Sidomulyo Public Health Center, integrated service posts (*posyandu*) cannot be opened regularly to prevent COVID-19 spread. However, they can still be held only if the district head orders a special direction. Health workers must also limit their daily visit count, reduce their service duration, and implement COVID-19 prevention protocols. To maintain services and prevent COVID-19 transmission, surveillance was conducted through the mobile application (WhatsApp). However, this has its

limitations as not everyone has sufficient access to an internet network.

Therefore, it is necessary to conduct a study to determine whether family income in the pandemic era influences stunting, along with other factors such as infection disease history, child feeding pattern, childcaring, mothers' visits to healthcare services, and their relation to stunting cases in children aged 24-59 months at the RI Sidomulyo Integrated Service Posts' working area in 2021.

METHOD

Study Design

This is a cross-sectional study, and the population of this study consists of mothers with children aged 24-59 months old who reside in the RI Sidomulyo's Public Health Center working area, Tampan District, Pekanbaru City, Riau Province, as one of the areas with high stunting cases. The sample size was calculated using the formula of one proportion hypothesis test.

Sample

The sampling strategy implemented was a simple random sampling technique. A total of 145 participants matched the inclusion criteria: mothers with 24-59 months old children who do not suffer from a severe disease that affects nutritional status such as thalassemia or hydrocephalus, mothers who were willing to participate in the study, and mothers who adhere to health protocols (wear masks, socially distance, and washes their hands).

Data Collection

Data were collected by measuring the children using a microtoise, conducting interviews, and distributing parent questionnaires. Stunting was determined by measuring a child's length or height index based on their age. The results would be categorized as severely stunted, stunted, and normal. They would also be categorized based on their height and the passing grade (Z-score) (Indonesia Ministry of Health, 2020). According to the WHO (2005), a child is categorized as normal if their height per age is $\geq -2SD + 3SD$, and they are classified as stunted if their height per age is $< -2SD$ (WHO, 2018).

Child caring and feeding behavior were obtained from direct interviews and a questionnaire of 100 questions (Indonesia Ministry of Health, 2018). The scores for positive childcaring and feeding behavior variables are as follows: 3 for answering yes or frequently; 2 for answering occasionally; 1 for answering no, and vice versa for unsupportive claims (unfavorable). At the same time, child feeding behavior is categorized into 2: good and poor.

The questionnaire was tested using Pearson's product-moment to determine the validity and reliability of the data. Based on the results, every question could be declared valid with a validity score of 0.889 and a reliability score of 0.949 (r table 0.468). The parent's characteristic data consist of the mothers' level of education and the parent's income level (according to the regional minimum wage in Pekanbaru), which was obtained through interviews and questionnaires. The secondary data used were the children's infectious disease history (diarrhea and Upper Respiratory Tract Infection), records of mothers' visitation to integrated service posts, and a maternal and child booklet.

Data Analysis

The data collected were analyzed using a univariate analysis to get an overview of a frequency distribution; the bivariate

analysis with the Chi-square test was also conducted to obtain the correlation of the two variables. The multivariate analysis also used a regression binary logistic test to determine which independent variable (stunting in children) has the most dominant relationship with the dependent variable (mother's level of education, income level, child

feeding behavior, childcaring behavior, infectious disease history, and mother's visit to the health center).

Ethical Consideration

This research has been approved by the ethics commission of Stikes Payung Negeri no: 0061/STIKES PN/KEPK/2021.

RESULTS

Table 1. Distribution frequency of children's characteristics aged 24-59 months during the COVID-19 pandemic (n = 145)

Variable		f	%
Stunting growth		37	25.5
Normal growth		108	74.5
Mothers' level of education	Low (junior high school and below)	62	42.8
	High (senior high school and above)	83	57.2
Family income	Under minimum regional wage (< Rp2,997,971)	82	56.6
	Equal to or higher than minimum regional wage (≥ Rp2,997,971)	63	43.4
Child feeding behavior	Poor	81	55.9
Mean (x) = 18.6; SD=5.2	Good	64	44.1
Child caring	Poor	76	52.4
Mean (x) = 18.6; SD=5.2	Good	69	47.6
Infectious disease history	< 6 times in a year	75	51.7
	≥ 6 times in a year	70	48.3
Mothers' visitation to healthcare service posts	< 8 times in a year	80	51.7
	≥ 8 times in a year	65	48.3

Table 1 shows that 25.5% of children experience stunting, 55.9% of children have poor eating behavior, and more than half of the mothers sampled care for their children poorly (52.4%). Moreover, most of the children tested (51.7%) have a history of experiencing infectious diseases more than six times a year. More than half of the mothers (57.2%) also have a higher education level, and more than half of the family's (56.6%) income level is lower than the regional minimum wage of Pekanbaru.

Table 2. Analysis of child feeding behavior questionnaire

Questionnaire item	f	%
Administering colostrum to the newborn	64	44.1
Exclusive breastfeeding	115	80.0
Introducing weaning food starting from 6 months old	69	47.6
Child skipping breakfast	81	55.9
Child eating without parents' accompaniment	103	71.0
Variation in meals is infrequent	75	51.7
Children eat corresponding to what they wish	45	31.0
The provided meal is rarely finished by the child	51	35.2
Rare consumption of vegetables and fruits	66	45.5
The child never consumes milk	81	55.9

Table 2 shows that most mothers (80%) provided exclusive breastfeeding.

Table 3. Analysis of child-caring questionnaire

Questionnaire item	f	%
Frequent late bedtime	76	51.7
Frequent oversleeping in the morning	76	57.1
Frequent late morning shower	76	51.7
The child never brushes their teeth	86	59.3
The child never brushes their teeth before bedtime	124	85.5
Irregular nail clipping	106	72.1
The child rarely goes out wearing footwear	106	72.1
The child does proper handwashing with soap	115	79.3
The child rarely does proper handwashing post defecation	20	13.6
The child never takes a daytime nap	126	85.7

Table 3 shows that most mothers care for their children's hygiene, particularly washing their hands with soap and clean water (79.3%).

Table 4. Risk factors for stunted growth in children aged 24-59 months during the COVID-19 pandemic (n = 145)

Variable	Stunted f	Nutritional status Growth %	Normal f	Growth %	OR (95% CI)	p-value
Child eating behavior						
Poor	30	37.0	51	63.0	4.7 (1.9-11.8)	0.001
Good	7	10.9	57	89.1		
Child caring						
Poor	25	33.3	50	75.0	2.3 (1.0-5.1)	0.051
Good	12	17.1	58	70.0		
Infectious disease history						
< 6 times in a year	25	33.3	50	66.7	2.4 (1.1-5.3)	0.041
≥ 6 times in a year	12	17.1	58	82.9		
Mothers' visitation to a health center						
< 8 times in a year	29	36.3	51	63.7	4.0 (1.6-9.6)	0.002
≥ 8 times in a year	8	12.3	57	87.0		

Variable	Stunted f	Nutritional status Growth %	Normal f	Growth %	OR (95% CI)	p-value
Mothers' level of education						
Low	23	37.1	39	62.9	2.9	0.010
High	14	16.9	69	83.1	(1.3-6.2)	
Family income						
Under minimum regional wage	32	39.0	50	61.0	7.4	0.000
Equal or higher than the minimum regional wage	5	7.9	58	92.1	(2.6-20.4)	

Table 4 shows the results of the bivariate analysis, which indicates that every independent variable has a significant correlation with stunting ($p < 0.05$), where the biggest OR is family income (OR = 7.4). This suggests that families with

economic levels under the regional minimum wage are 7.4 times more likely to have children suffering from stunting than those with an income level equal to or higher than the regional wage.

Table 5. The result of the multivariate analysis

Step 1a	Variable	Wald	df	Sig	Exp (B)	95% CI for Lower	EXP(B) Upper
	Eating behavior	1.769	1	0.184	4.839	0.474	49.431
	Child caring	.000	1	0.999	.000	.000	
	Health center visitation	.000	1	0.999	15	.000	
	Infectious disease history	1.010	1	0.315	0.532	0.155	1.822
	Education level	0.807	1	0.369	0.581	0.177	1.901
	Family income	4.665	1	0.031	8.617	1.221	60.833
	Constant	7.563	1	0.006	2.312		

Table 5 exhibits the results of the multivariate analysis using binary logistic regression, which found that the family income level has a p -value of 0.031 with an AOR of 8.6 (95% CI: 1.2-60.8). Thus, it can be concluded that family income level has the most dominant correlation with stunting cases in children aged 24-59 months during the COVID-19 pandemic.

DISCUSSION

One of the impacts of the COVID-19 pandemic is changes in the community's socio-economic life, which increase the risk of nutritional problems in children (Zemrani et al., 2021). Several factors that increased the prevalence of stunting during the pandemic were decreased income and expenditure, purchasing power, and policies limiting social activities and activities. This causes obstacles to the supply of nutrients for toddlers and reduces the family's access to health services (Akseer et al., 2020).

The reduced access during the pandemic due to health services and the limitation of nutrition services led to an increased risk of stunting in children under five (Simbolon et al., 2021). On average, parents of children at risk for stunting have low levels of education and below-average income. Mothers' level of education and visitation to health services can also affect their ability to perform early detection of stunting in toddlers (Soekatri et al., 2020). Lack of access to health facilities and education for children and adults affects the prevalence of stunting (Yanti & Fauziah, 2021). There was also a decrease in the measurement of toddlers' growth during the COVID-19 pandemic. Inadequate nutritional intake was also found to be the main leading cause of the decrease in the nutritional status of toddlers (Jawaldeh et al., 2020). A previous study stated that socio-economic factors and family food insecurity during the pandemic are related to the prevalence of stunting in toddlers (Faqihatus et al., 2021). Furthermore, the mother's education level can also affect the health degree of a family member. This is related to the mother's role in establishing a child's eating behavior, starting from meal preparation. This includes organizing a meal plan, doing groceries, preparing and processing the ingredients, cooking the meal, and distributing food to their children.

Educated mothers have better access to information regarding nutrition status and child well-being, which they would then put into practice in their care for the child and result in better nutritional status (Ringoringo et al., 2021).

Education level also corresponds with income, as income level tends to increase along with education level (Baye et al., 2020). Based on the bivariate analysis results, there is a correlation between family income and stunting in children. An earlier study showed an increase in stunting cases in children during the COVID-19 pandemic (Jawaldeh et al., 2020). A survey was done by Hana & Olken in 2020 also found that 36% of respondents claimed to reduce their meal portions due to financial difficulties (UNICEF, 2020). This is supported by this study's questionnaire analysis which found that 51.7% of the parents provided infrequent meal variation, and 55.9% of children skipped breakfast and never consumed milk. Sufficient income supported with adequate education could make better life quality achievable as the family can respond swiftly to recognize health problems, take appropriate action, and properly care for any sick family members (UNICEF, 2021).

This study found that the parents' earnings are insufficient, as 56.6% of the respondents earn under the regional minimum wage of Pekanbaru. Family income becomes an important factor in achieving a good nutritional status (Sadhu & Gandhi, 2020). During the COVID-19 pandemic, many parents complained of decreasing earnings, delayed salaries for months, and inability to make a living due to losing their jobs (Akseer et al., 2020). The low family economic status will affect the quantity and quality of meals consumed in the family; meals will have minimum variation and a small portion, which will influence the behavior of applying a balanced diet for optimum child growth (Service, 2020). According to the results of the questionnaire analysis, the percentage of parents who rarely provide varied meals for their children is 51.7%.

One way to maintain baby and child health is by correct feeding (Ban et al., 2017). Two correlations were found between child feeding behavior and child stunting based on

the study results. Breastfeeding is the safest choice for babies in situations where access to food and healthcare services is limited (Brar et al., 2020). The questionnaire analysis found that 80% of mothers breastfed their children, and 47.6% of them were introducing weaning food to their children. Breastfeeding can shave some family expenses, especially during the pandemic when the government imposes large-scale social distancing and when many workers experience a financial drop due to layoffs (Yanti & Fauziah, 2021).

The bivariate analysis results found a correlation between childcaring and stunting cases. The questionnaire analysis found that 51.7% of children frequently have late bedtime. Theoretically, the growth hormone is excreted from the brain, specifically from the pituitary gland or hypophysis gland, during sound and sufficient sleep at night. Therefore, good quality sleep will impact a child's cognitive ability and growth. If their rest is frequently disturbed, there will be abnormal growth due to the growth hormone Field's low or lack of excretion (Bhutta et al., 2020).

Optimal child growth can be initiated by adopting a clean lifestyle. The questionnaire analysis found that 72.1% of the children rarely wear footwear, 72.1% irregularly clipped their nails, and 13.6% rarely do proper handwashing with soap post defecation. According to the government's recommendation, the habit of adequate handwashing for children is 79.3%. A previous study has also found that caretakers and children who have good personal hygiene practices, such as washing their hands with soap after defecation and before having a meal, can reduce the risk of stunting by 14% (Permatasari, 2021).

The bivariate analysis found a correlation between infectious diseases and childcaring with stunting cases. The sampled children's infection history throughout the COVID-19 pandemic were influenza, coughing, and diarrhea. Epidemiologic evidence proved that malnourished children are more vulnerable to infection, thus putting them in danger and suffering from further malnutrition (Walson & Berkley, 2018).

Next, mothers' visitation to healthcare was 55.2%, and there is a correlation between mothers' visitation to healthcare and stunting. This is in line with a study conducted in Bangladesh, which saw a dramatic drop in healthcare visitation due to the COVID-19 pandemic (Ahmmed et al., 2021). Changes in healthcare procedures, such as postponing integrated service post visits and limiting the services provided in public health centers, affect the number of mothers visiting to check their child's growth and health. Nutritional services and maternal and child health services are difficult to provide due to the high COVID-19 cases in Pekanbaru. The fear of getting infected by COVID-19 from visiting health facilities worsens things. An attempt to solve this is by having health workers do home visitations.

Table 5 shows a multivariate analysis of family income factors, the most dominant connection with stunting cases. It is different from previous studies, which found that the most dominant factors based on multivariate analysis of stunting in toddlers were the mother's education, exclusive breastfeeding, and history of infection (Susilowati et al., 2019). Before the pandemic, Integrated Service Posts could still overcome the stunting issue by distributing supplementary food to children, providing immunization services to prevent infectious diseases, and educating mothers on stunting prevention practices. Nevertheless, during the pandemic, 89.3% of integrated service post

services and alike in Indonesia could not operate at their maximum (Ministry of Health Indonesia, 2021).

Moreover, a drop in a family's economic level would affect their ability to procure better meal ingredients in terms of quality and quantity. This will impact the children's nutrition intake that is needed to sustain their lives, maintain their health, and grow. When communities experience economic issues due to loss of income and limited access to healthy food, the number of malnourished children will increase. A study in Canada mentioned that communities tend to consume snacks when parents lose their jobs or shut down their businesses (Carroll et al., 2020). This is worrying as a healthy meal is critical for increasing immunity to prevent and fight COVID-19 (Bhutta et al., 2020).

Job loss and social activity restrictions have forced families to stay at home and caused food consumption to be less varied, with fewer vegetables and fruit. According to the questionnaire analysis, 45.5% of children rarely consume fruit and vegetables. This worsens the family's situation, which already has difficulty procuring affordable and decent food (Laborde et al., 2020).

CONCLUSION AND RECOMMENDATION

This study found several factors that significantly affect stunting in children aged 24-59 months old in the RI Sidomulyo Public Health Center area: mother's education level, family's income level, child-eating behavior, infection disease history, and mothers' visitation to healthcare services. Family income was found to have the most dominant correlation in triggering stunting during the COVID-19 pandemic.

Multi-sectoral cooperation is required to countermeasure stunting during the COVID-19 pandemic. This could be done by modifying healthcare services according to a community's socioeconomic level and COVID-19 case severity and considering the importance of internet access in maintaining nutrition services and maternal and child health. Therefore, future policies should ensure the even distribution of access to online-based healthcare services during the COVID-19 pandemic.

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