Risk Factors Analysis for Under Five Children with Stunting in Urban and Rural of East Java Province Post Covid-19

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Abstract. Stunting is a major threat to Indonesia's human quality and the nation's competitiveness. The prevalence of stunting in rural and urban remain the same, but the cause could be different especially post covid-19. The aim of the study is to determine the risk factors for under five children with stunting in urban and rural of East Java Province post-covid-19. This study used analytic observational with case control study design with 63 samples for rural in Sidoarjo and 50 samples for urban in Surabaya. Bivariate analysis performed was chi square test and Odds Ratio. Results: Based on the results of the risk factors analysis of stunting in urban were low birthweight (p=0,01 OR : 11, exclusive breastfeeding (p:0,02 OR:3,2) and parenting food pattern (p=0,04 OR : 2,1), whereas in rural were exclusive breastfeeding (p: 0.03 OR: 3.15), energy intake (p. 0.019 OR: 4.150), protein (p:0.046 OR:2.841), fat (p:0.032 OR:3.193), carbohydrate (p:0.005 OR:4.941), parenting food pattern (p:0.043 OR:3.143), and maternal height (p:0.022 OR:4.368). In conclusion, the risk factors for stunting in urban are exclusive breastfeeding practice and parenting pattern, whereas in rural are exclusive breastfeeding, food intake (energy, protein, fat, carbohydrates), parenting patterns, and maternal height. Suggestion: It is expected more optimal struggle in optimizing the infant and young child feeding to reduce risk of stunting.

Keywords: Stunting, Risk Factors, Rural, Urban, Under Five Children.

1 Background

Health problems in Indonesia are still relatively high, especially in the under five children. Under Five children is characterized by rapid growth and development. The "golden period" or "critical period" begins on the first day of pregnancy and continues until the baby is two years old. Failure to deliver essential nutrients during this crucial period of brain development may result in lifetime deficiencies in brain function, even if future nutritional replenishment is provided [19].

Stunting is a condition in toddlers where growth is not up to standard and is caused by chronic malnutrition. The prevalence of stunting is a major risk to Indonesia's human quality as well as a risk to the nation's competitiveness. This is due to the fact that stunting has both short-term and long-term effects.

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According to WHO data, an estimated 149.2 million children worldwide could be stunted by 2020 [24]. In Indonesia, stunting is at 24.4%, affecting nearly a quarter of all young children, as mentioned by Ministry of Health's 2021 study [10]. Indonesia Health Basic Survey in 2018 stated that stunting at 30.8% nationally, while in East Java, it's 19.9%, surpassing the 19.3% national average [1].

Recently, result from Indonesia Nutrition Status Survey held at 2022 showed that East Java had stunting prevalence of under five children are 24,2% which are more than 20% of WHO cut off point as community health problem. Surabaya as the capital city of East Java Province had the highest reduction in stunting prevalence, whereas Sidoarjo as represent of district was reduce also but the reduction is had not optimal as expected. Sidoarjo District had stunting prevalence is 26.91% for children aged 0-59 months in 2021. During the Covid-19 pandemic for approximately 2 years, the posyandu (growth monitoring post) activities were not running, so a closer approach to stunting prevention was decreased, namely at the under-five children's stunting prevention [3]. The condition post covid-19 in Indonesia including East Java Province has pushed all sector including health and non-health sector to do the best management in stunting reduction. The study was conducted in these two-area prioritized for stunting prevention and management.

The purpose of this study was to analyze the risk factors for stunting in under five children lived in urban (Surabaya) and rural (Sidoarjo) post covid-19 in East Java Province

2 Research Method

This study used observational research with a case control research design that compares respondents with certain diseases (case group which are stunting children) and a group of respondents without cases (control which are non-stunting children) to determine the proportion of the prevalence of risk factors with a retrospective design. The sample of this study had two groups is a case (26 stunted under-five children) and controls (37 non-stunted children) in rural (Sidoarjo District- Larangan Village) chosen through proportional random sampling. Likewise, in the city represented by the City of Surabaya, proportional random sampling was selected in one of the Wonokromo subdistricts as many as 14 stunted toddlers and 36 non-stunted toddlers.

Preparation and data collection are conducted in September – December 2022. Data collection by interviewed in term of respondent's characteristic, history of low-birthweight status of the babies, history of exclusive breastfeeding practice and parenting food practice. To know the nutrient intake of the respondents, we interviewed mothers by using semi quantitative food frequency questionnaires (SQ-FFQ) in the past 2 weeks. Children's nutritional status was measured using height/length tools with 0.1 cm precision. Children categorized as stunted if the height for age z-score below -2.00 SD. We also measured the middle upper arms circumference of the mothers to know the nutritional status of the mothers.

Baby with the birth weight less than 2500 gram was categorized as low birth weight, and children under 6 months who got only breastmilk were categorized as exclusively

breastfeeding. Children under 2 years who got appropriate type, texture, portion and frequency of meals were categorized as an appropriate parenting feeding practice.

Univariate analysis showed variable characteristics, while bivariate analysis used Chi-Square for relationships between independent and dependent variables, using Odds Ratio (OR) to interpret risk. Data was presented through frequency distribution, cross tabulation, and percentages. This research has approved by the Health Research Ethics Committee of the Surabaya Health Polytechnic, Ministry of Health number EA/827/KEPK-Poltekkes-Sby/V/2022

3 Result

The results showed on Table 1 that most of the respondents in the study were toddlers aged 25 - 59 months, each of which had a percentage of 58% in the urban area while in the rural area it was 74.6%. With the most gender in the urban area is female with 28 toddlers (56%), while in the rural area is male with a percentage of 57.1%. The majority of respondents in urban and in the rural area's had mothers aged more than 25 years with a percentage of 76% in the urban area and 95.2% in the rural area.

Table 1. Frequency Distribution of Respondent Characteristics

Variable	Urban		Rural	
	n	(%)	n	(%)
Age(month)				
0 – 24	29	58.0	16	25.4
25 – 59	21	42.0	47	74.6
Gender				
Male	22	44.0	36	57.1
Female	28	56.0	27	42.9
Age of mother (years)				
<25 tahun	12	24.0	3	4.8
≥25 tahun	38	76.0	60	95.2
Total	50	100	63	100

Based on Table 2 above shows that most respondents did not experience Low Birth Weight in urban or in rural area with a percentage of 80% and 93.7%. Exclusive breast-feeding history in toddlers is more exclusive breastfeeding in urban and rural areas. It can be seen that mothers who give exclusive breastfeeding with a percentage of 56% in urban areas, while in rural areas it is 61.9%. Meanwhile, for food intake, the energy intake of toddlers is mostly categorized as less with a percentage of 68% in urban areas, while in rural areas it is 68.3%, the protein intake of toddlers is more than half categorized as sufficient with a percentage of 82% in urban areas and 57.1% in rural areas, fat intake of toddlers in urban areas is balanced in the category of sufficient and less, which is 50%, while in rural areas more than half are categorized as less with a percentage of

57.1%, while the carbohydrate intake of the highest percentage is categorized as less, which is 84% in urban areas and 60.3% in rural areas. Parenting food practice in toddlers who are in urban areas mostly got not appropriate food parenting with a percentage of 66%, while for rural areas most get appropriate food parenting by 71.4%. And the nutritional status of the mother showed that most of the Mother's MUAC is categorized as sufficient with a percentage of 80% in urban areas and 79.4% in rural areas.

Table 2. Frequency Distribution of Respondents

Variable	Urban		Rural	
	n	(%)	n	(%)
Low Birth Weight (LBW)				
LBW	10	20.0	4	6.3
Not LBW	40	80.0	59	93.7
Exclusive Breastfeeding				
Not Exclusive Breastfeeding	22	44.0	24	38.1
Exclusive Breastfeeding	28	56.0	39	61.9
Energy Intake				
Less	34	68.0	43	68.3
Enough	16	32.0	20	31.7
Protein Intake				
Less	9	18.0	27	42.9
Enough	41	82.0	36	57.1
Fat Intake				
Less	25	50.0	36	57.1
Enough	5	50.0	27	42.9
Carbohydrate Intake				
Less	42	84.0	38	60.3
Enough	8	16.0	25	39.7
Parenting Food Practice				
Not Appropriate	33	66.0	18	28.6
Appropriate	17	34.0	45	71.4
Mother Nutritional Status				
Under	10	20.0	13	20.6
Normal	40	80.0	50	79.4
Total	50	100	63	100

Based on Table 3, it can be seen that the risk factors that have a significant relationship with the prevalence of stunting have a p-value of less than 0.05, namely in urban areas there is LBW (Low Birth Weight), exclusive breastfeeding history, and parenting food practice, while in rural areas there is exclusive breastfeeding, food intake (Energy, Protein, Fat, and Carbohydrates), parenting food practice, and mother's nutritional status (Middle Upper Arms Circumferences) . Meanwhile, factors that did not have a significant relationship in urban areas were Energy Intake, Protein Intake, carbohydrate intake and Mother MUAC, while in rural areas it was LBW (Low Birth Weight) with a p-value of more than 0.05. It is found that there was a significant risk of stunted children between exclusive breastfeeding and not exclusive breastfeeding. The children was not

exclusively breastfed had risk to get stunting more likely 3 times hinger in rural and 8 timer higher in urban to get stunting.

Table 3. The Risk Factors of Stunting in Urban and Rural

Variable	The Prevelance Of Stunting (Urban)		*p (*)*	OR Value (95% CI)	The Prevalence Of Stunting (Rural)		*p (*)*	OR Value (95% CI)
	Yes n (%)	No n (%)			Yes n (%)	No n (%)		
Low Birth Weight (LBW)								
LBW	7 (70)	3 (30)	0.001	11,0 (2.26 – 53.3)	1 (25)	3 (75)	0.495	0.45 (0.04 – 4.6)
Not LBW	7 (17.5)	33 (82.5)			25 (42.4)	34 (57.6)		
Exclusive Breastfeeding								
Not Exclusive Breastfeeding	11 (50)	11 (50)	0.002	8.33 (1.93 – 35.9)	14 (58.3)	10 (41.7)	0.031	3.15 (1.1 – 9.08)
Exclusive Breastfeeding	3 (10.7)	25 (89.3)			12 (30.8)	27 (69.2)		
Energy Intake								
Less	12 (35.3)	22 (64.7)	0.094	3.81 (0.74-19.68)	22 (51.2)	21 (48.8)	0.019	4.19 (1.2 – 14.6)
Enough	2 (12.5)	14 (87.5)			4 (20)	16 (80)		
Protein Intake								
Less	2 (22.2)	7 (77.8)	0.670	690 (12 – 3.18)	15 (55.6)	12 (44.4)	0.046	2.84 (1.0 – 8.02)
Enough	12 (29.3)	29 (70.7)			12 (30.6)	25 (69.4)		
Fat Intake								
Less	8 (32)	17 (68)	0.754	6.7 (2.0-102.2	19 (52.8)	17 (47.2)	0.032	3.19 (1.0-9.4)
Enough	6 (24)	19 (76)			7 (25.9)	20 (74.1)		
Carbohydrate Intake								
Less	14 (33.3)	28 (66.7)	0.054	667 (538 – 826)	21 (55.3)	17 (44.7)	0.005	4.94 (1.53-15.92)
Enough	0 (0)	8 (100)			5 (20)	20 (80)		
Parenting Food Practice								
Not Appropriate	14 (42.4)	19 (57.6)	0.002	1.73 (1.296 – 2.328)	11 (61.1)	7 (38.9)	0.043	3.14 (1.01-9.75)
Appropriate	0 (0)	17 (100)			15 (33.3)	30 (66.7)		
Mother nutritional status								
Under	9 (36)	16 (64)	0.42	3.8 (1.2 – 8.3)	9 (69.2)	4 (30.8)	0.022	4.36 (1.17-16.27)
Normal	5 (20)	20 (80)			17 (34)	33 (66)		

*) significant known as $p < 0.05$ (chi-square test)

4 Discussion

4.1 Risk Analysis of Low Birth Weight (LBW) with the Prevalence of Stunting in Toddlers

Babies with history of low birth weight had risk to get stunting more likely 11 timer higher than those babies with normal birth weight in urban area while it was different in rural. The prevalence of babies with history of low birth weight was not different between stunted and not stunted toddlers in rural. The results of the analysis of low birth weight with the prevalence of stunting was 70% occurred in urban. It is showed that the low birth weight had high risk to get stunted in the toddler in urban area.

Previous study showed toddlers born with low birth weight had risk to get stunted due to the presence of infectious diseases. The study from Mulyaningsih T, et.al, 2021 also included neonatal weight as one of the predictors of stunting, besides the gender, and an unappropriated child feeding [13, 21]. According to the World Health Organization, a newborn baby weighing fewer than 2.5 kg is considered a small baby had risk to failure in growth and became chronic malnutrition such as stunting in the early life[6].

It was different with the condition in rural, it was obtained that of the toddlers whose birth was normal, it turned out that the percentage to become a normal toddler was slightly greater, namely 57.6% compared to being stunted. The results of the calculation of the p value = 0.495 OR 95% CI =0.453 (0.044 - 4.619) which means that toddlers born with low birth weight have no risk of stunting.

The baby's birth weight is one indicator of how healthy they are. The word "birth weight" refers to a measurement that is frequently used to show the growth of the fetal body throughout pregnancy[18]. This study supports Sartina, et.al (2022) research showing there was no association found between low birth weight and the prevalence of stunting in children under the age of five; however, this could be due to a variety of other factors that had a greater influence on the prevalence of stunting in children under the age of five, such as nutritional deficiencies or infections. The findings of this study contradict the findings of Putri et.al (2022) that LBW can increase the incidence of stunting in children aged 0-60 months as much as 6.95 times compared to non-LBW (aOR= 6.95; 95% CI= 4.02 to 12.04; p<0.001). Children also have digestive difficulties after the birth, where children with low birth weight are unable to absorb fat and digest protein, resulting in a deficiency of reserve nutrients in the body, which, if not handled quickly, can lead to chronic nutritional problems, specifically stunting[27].

4.2 Risk Analysis of Exclusive Breastfeeding History with the Prevalence of Stunting in Toddlers

Based on the results of the analysis of exclusive breastfeeding history with the prevalence of stunting, it is known that exclusive breastfeeding is a factor that provides a significant relationship with the prevalence of stunting in children under five who are both in rural and urban areas as indicated by the p-value in each variable < α (0.05). The calculated value in urban areas is OR 95% CI = 8.33 (1.93 - 35.9) and in rural areas

OR 95% CI = 3.150 (1.093 - 9.081) which means that toddlers who do not get exclusive breastfeeding have a risk of 8.33 and 3.150 greater to be stunted compared to toddlers who get exclusive breastfeeding.

The WHO framework for inadequate breastfeeding practices includes late breastfeeding initiation, nonexclusive breastfeeding, and early breastfeeding cessation[2]. Exclusive breastfeeding is crucial for newborns, providing essential nutrition and boosting immunity, lowering the risk of infections. This study aligns Aureliyana et.al. (2022) research, shows that there is a significant relationship (p = 0.012) history of exclusive breastfeeding on the incidence of stunting under five in Cemara Wetan Village, Indramayu Regency with a risk factor of 0.304 times[23]. Children who were exclusively breastfed were 25% less likely to be stunted than those who were not exclusively was breastfeeding[8]. Breast milk provides a number of essential nutrients that are specially created in the mother's body to ensure the baby's growth and development. Breast milk not only offers adequate nutrition for babies, but it also protects the baby from infections and infant diseases, especially for the first six months[20].

4.3 Risk Analysis of Food Intake with Prevalence of Stunting in Under Five Children

Based on the results of the analysis of energy intake with the prevalence of stunting, it is known that energy intake is a risk factor that provides a significant relationship with the prevalence of stunting in children under five years of age in rural areas as indicated by the p-value < α (0.019). This study supports by Laili et al.'s (2018) there was influence noted significantly between energy intake and incidence of stunting children under five years (p = 0.000). All physical, mental, and other activity in the body will be impacted by a lack of energy[14]. Lack of energy intake will result in stunted growth in children due to a lack of nutrients in diet. An irregular eating pattern and a lack of dietary diversity can both contribute to a lack of energy intake[9]. It was different phenomena in urban. In urban areas energy intake does not have a significant relationship with the prevalence of stunting as shown in the p-value> α (0.094), the energy intake were lower than in rural and it showed did not correlate with the risk of stunted in toddler. Study from Fikawati, S, 2021 found several factors associated with stunting were energy intake (AOR=6.0; 95% CI=1.0-35.0) and protein intake (AOR=4.0; 95% CI=1.1-15.5) after controlling for fat, carbohydrate, vitamin C, iron, and zinc intakes. But int this study, our limitation is that we could control the energy intake from fat and several minerals due the limit data. But the same trend that the percentage of children with energy intake below the recommendation was much higher in stunted children (86.1%) compared to normal children (43.5%)[5].

It was a similar trend in protein intake with the prevalence of stunting, it is known that protein intake is a risk factor that provides a significant relationship with the prevalence of stunting in children under five years of age in rural areas as indicated by the p-value < α (0.046). Whereas in urban areas protein intake does not have a significant relationship with the prevalence of stunting as shown in the p-value> α (0.670).The OR 95% CI = 2.841 (1.005 - 8.028), indicating a connection between protein intake and stunting. Toddlers with inadequate protein intake face a 2.841 times higher stunting

risk than those with sufficient intake. Its supports by Fikawati et.al (2021) founding, that that children who consumed less protein than recommended had a fourfold higher risk of stunting than children who consumed enough calories (AOR=4.0; 95% CI=1.1-15.5) [5] Most cases found that many children are stunted in developing countries because their diet offers appropriate calories but inadequate protein consumption. Protein intake has to meet the daily total protein requirement in order to achieve healthy, optimal growth, and development [12].

Animal protein is preferred due to its higher nutritional adequacy for children's growth and development, as low protein intake threatens stunting. Meanwhile, intake of protein was not one of the risk factor of stunting prevalence in urban, it might be caused by the differences in social economic and infection condition of the family's toddlers as well as the household expenditure in protein food source priorities. Mean Study from Widyaningsih V, 2022 showed that there were slight differences in stunting determinants by household expenditure and rural-urban status in Indonesia. Stunting disparities were attributed to differences in characteristics and responses between the less and more advantaged populations[25].

The analysis of fat intake's influence on stunting found that among 36 toddlers with insufficient intake, 52.8% were stunted, while 27 toddlers with sufficient intake had a higher non-stunting rate at 74.1%. The p-value was 0.032, OR 95% CI = 3.193 (1.0083 - 9.415), indicating a link between fat intake and stunting. Toddlers with inadequate fat intake face a 3.193 times higher stunting risk than those with sufficient intake in urban area. Fat provides 9 kcal per gram of energy and is a major energy store in the body, stored under the skin and around organs. This in line with by Ermawati et.al (2019) research, showing that from 33 toddlers are Stunting 24 (57%) Children have less fat intake and 9 (20.5%) Children have good fat intake, This means that children with less than risk of fat intake have stunted 5 times[4].

It was found that carbohydrate intake is a risk factor that provides a significant relationship with the prevalence of stunting in children under five years of age in rural areas as indicated by the p-value < α (0.054). Carbohydrates are crucial in baby nutrition because they provide energy for development, bodily processes, and activities; produce new body tissues with protein; serve as building blocks for critical body components; and serve as the primary source of energy for activities[26]. Whereas in urban areas carbohydrate intake does not have a significant relationship with the prevalence of stunting as shown in the p-value> α (0.005).The OR 95% CI = 4.941 (1.533 - 15.923), indicating a link between carbohydrate intake and stunting. Toddlers with inadequate carbohydrate intake face a 4.941 times higher stunting risk than those with sufficient intake. Carbohydrates are essential for energy at every life stage, crucial for active play and childhood growth. A lack of carbohydrates increases stunting risk by 1.7 times.

This study found a different finding with other research commonly, which are fat and carbohydrate as well as energy and protein intake were not one of the risk factors of stunting in urban. It is seemed is one of the limitations of the nutrient survey we used not more than 1 week that could not see the variabilities of diet with the small study samples. But the trends that most stunted toddlers have higher percentage in lower nutrient intake compare to non-stunted toddlers. Fikawati S, et.al, 2021 study showed that

protein, fat, vitamin A and zinc intake of stunted toddlers are below the 80% of recommendation in Central Jakarta[5].

4.4 Risk Analysis of Parenting Food Practice with the Prevalence of Stunting in Under Five Children

The analysis of parenting patterns with the prevalence of stunting, it is known that parenting is a factor that provides a significant relationship with the prevalence of stunting in toddlers both in rural and urban areas as indicated by the p-value of each variable < α (0.05). The calculation value in urban areas is OR 95% CI = 1.73 (1.296 - 2.328) and in rural areas is OR 95% CI = 3.14 (1.01-9.75) which means that toddlers who do not get good parenting have a risk of 1.73 - 3.14 times greater to experience stunting compared to toddlers who get good parenting. A child's need for growth and development, including social skills, attitude development, and a knowledge of morals and values, is met by a mother's parenting. Feeding patterns include eating behaviors, meal preparation, and markers of food safety and hygiene[15].

Good eating habits can be created in children by parents who use positive parenting techniques when it comes to feeding. Parents who impose limitations and pressure on their kids' eating habits are linked to an authoritarian parenting style[7]. This study concurs with Gustina et.al (2020) research that there was a significant relationship between parenting food and stunting in children under five children in Yogyakarta with p value : <0.001 2.02 (1.65-2.47). Mothers, as caregivers, have all decisions about healthy feeding practices, including breastfeeding, imitation of complementary food with appropriate frequency, texture and portion which could prevent the children under two years from stunting [6]. Rofiqoh et.al (2021) found that mothers with negative eating patterns, 76.5% of them were stunted, with a value of p = 0.000 (p <0.05)[17]. Laksono, AD, et.al, 2022 did secondary analysis frin 2017 Indonesian Nutritional Status Survey also found the same findings which feeding care of mothers was influenced to nutritional status of children under two years old, and its caring capacity are influenced by the educational background of the mothers. The lower mother's level of education, the higher chances of a mother having stunted children under two years[11].

4.5 Risk Analysis of Maternal Height with the Prevalence of Stunting in Under Five Children

The analysis of Mother MUAC influence on stunting found that among 13 toddlers with shorter mothers, 69.2% were half-stunted, while the percentage of toddlers with sufficient maternal height experiencing stunting was lower at 66%. The p-value was 0.005, OR 95% CI = 4.941 (1.533 - 15.923), indicating a relationship between maternal height and stunting. One measure of potential malnutrition in children is the height of the mother. The height of the mother and the early situations that would influence her child's height are also reflected in her posture. During the growth phase, both hereditary and environmental influences will affect height[22]. Toddlers with shorter maternal height face a 3.143 times higher stunting risk than those with sufficient maternal height.

Parental height variation is influenced by genetics, nutrition, and health factors. Maternal height, linked to family traits, is a stunting influencer. Genetic disorders can also impact development. This study aligns with Qurani et.al (2022) research, confirming that there is a significant relationship between maternal height and the incidence of stunting in children (p= 0.044)[16].

5 Conclusion

The results of the study on the analysis of risk factors for stunting prevalence were different between urban and rural. The risk factors for stunting in urban are low birth weight, exclusive breastfeeding practice and parenting pattern, whereas in rural are exclusive breastfeeding, food intake (energy, protein, fat, carbohydrates), parenting patterns, and maternal height. However, the study has limitations as it was conducted for not more than one week and with small study samples, which could not see the variabilities of diet.

In summary, birth weight, breastfeeding, energy and protein consumption, fat and carbohydrate intake, parenting methods, and mother height all impact the occurrence of stunting in children under the age of five. These findings emphasize the significance of addressing these factors in order to lower the risk of stunting and promote healthy child growth and development. It is crucial to emphasize that the influence of these characteristics varies across urban and rural contexts, emphasizing the importance of context-specific interventions. Suggestion: It is expected more optimal struggle in optimizing the infant and young child feeding to reduce risk of stunting.

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