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Utilization of E-PPGBM for analysing the relation between Posyandu visits post-covid-19 adaptation and low body weight history with stunting among toddlers in semarang city

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ABSTRACT

Background: Stunting is a failure in growth and development among children, influenced by various factors such as birth condition and health services. After the Covid-19 pandemic in Indonesia, mothers' perspectives on Posyandu have changed, and data entry in the e-PPGBM, an application for recording and reporting community-based nutrition, has increased, particularly in Semarang City.

Objective: The study aimed to utilize e-PPGBM to analyze the relationship between Posyandu visits post-Covid-19 adaptation and low birth weight (LBW) with stunting among toddlers in Semarang City.

Materials and Methods: This case-control study used secondary data from e-PPGBM in Semarang City. The case and control groups each included 1,153 gender-matched toddlers aged 12-59 months as of December 2022. The independent variables were Posyandu visits post-Covid-19 adaptation and low birth weight (LBW). The confounding variables included vitamin A supplementation, birth length, early initiation of breastfeeding (EIBF), birth order, and age. Analysis was conducted for bivariate with chi squares and multivariate with logistic regression.

Results: Posyandu visits post-Covid-19 adaptation, LBW and EIBF were not associated with stunting. However, incomplete vitamin A supplementation (OR=0.66, 95% CI=0.54-0.81), short birth length (OR=2.39, 95% CI=1.74-3.27), third or higher birth order (OR=1.52, 95% CI=1.15-2.01), children aged 24-35 months (OR=1.85, 95% CI=1.36-2.53), and children aged 36-47 months (OR=1.58, 95% CI=1.16-2.16) were associated with stunting.

Conclusion: Non-routine visits to Posyandu post-Covid-19 adaptation and LBW were higher among toddlers with stunting than normal toddlers. However, this relationship was not significantly related to stunting in Semarang City in December 2022.

***Keywords** : e-PPGBM; LBW; Posyandu visits; stunting; Covid-19 pandemic*

BACKGROUND

Stunting is a growth and development failure in children that can be caused by insufficient nutritional intake, repeated infections during the first 1,000 days of life, and lack of psychosocial stimulation. Stunting is characterized by a length- or height-for-age z-score (LAZs or HAZs) below -2 standard deviations (SD). Stunting is a nutritional problem that is still often found in toddlers in Indonesia.[1-4] The prevalence of stunting in Indonesia decreased from 30.8% in the 2018 Indonesia Basic Health Research, known as *Riset Kesehatan Dasar* (Riskesdas), to 18.3% in the 2023 Indonesian Health Profile, known as *Survei Kesehetan Indonesia* (SKI).[5-7] However, this reduction in prevalence has not yet met the national target of 14%.[8]

There have been various impacts on society due to the Covid-19 pandemic in Indonesia since the beginning of 2020. Posyandu, translated as Integrated Service Post, which serves as the front guard in providing basic health services for toddlers, was disrupted in providing services during the Covid-19 pandemic. A study showed that almost 50% of children under five years did not visit health service facilities during the Covid-19 pandemic.[9] In Semarang City, Posyandu activities were suspended from March 2020 and resumed in August 2020, though with various restrictions.[10, 11] In 2020, in areas implementing large-scale social restrictions (PSBB), such as Community Activity Restrictions (PKM) in Semarang, Posyandu services were delivered primarily through home visits and online services.[12-14] By the end of 2021, only a few Posyandu have carried out activities until the end of 2021, based on the Covid-19 zoning in each area. In green zones, Posyandu activities focused on the five-table system with strict adherence to health protocols. In yellow, orange, and red zones, priority was given to mobile Posyandu or door-to-door services, where cadres visited homes or guardians scheduled appointments with healthcare personnel.[15] Posyandu services in Semarang City gradually resumed in 2022.[10]

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In 2022, the implementation of Community Activity Restrictions (PPKM) at Levels 3, 2, and 1 for Covid-19 in the regions of Java and Bali allowed Posyandu to operate at 100% capacity without any exceptions.[16] The post-Covid-19 period, referring to the phase during which PPKM was applied, was characterized by relaxed restrictions while health precautions remained in place. However, the public has become more aware of the importance of implementing health protocols to avoid a recurrence of the Covid-19 pandemic. Therefore, the enthusiasm of mothers of toddlers shifted, and they become more careful about visiting Posyandu due to fear of contracting Covid-19, especially for toddlers who are more vulnerable to infectious diseases. Moreover, most mothers of toddlers during the post-Covid-19 pandemic stated that they preferred Posyandu services during the pandemic in the form of home visits by Posyandu cadres rather than visiting Posyandu themselves.[17]

Health services, such as Posyandu, which are carried out every month, can be useful for monitoring the nutritional status of toddlers so that they can immediately deal with nutritional problems that occur. Monitoring growth and development at Posyandu plays a role in ensuring that children do not experience nutritional problems, such as measuring height, which can be useful for finding out stunting cases. Besides, Posyandu visits by toddlers can be an indicator of the reachability of health services.[18-20]

Another risk factor for stunting, apart from Posyandu visits, is low birth weight (LBW). Based on the 2018 Riskesdas and the 2023 SKI, the prevalence of LBW in Indonesia saw only a marginal reduction, from 6,2% to 6,1%.[5, 6] LBW refers to babies born weighting less than 2,500 grams, which is affected by chronic malnutrition in the first 1000 days of life, such as pregnant women with chronic energy deficiency that lead to fetal growth restriction.[21-24] Therefore, LBW can cause toddlers to experience growth and development disorders such as stunting in the following period.[25, 26]

Stunting has negative impacts on children, such as reduced cognitive and physical development, increased risk of degenerative diseases, as well as low productivity and work capacity.[1] One of the government's programs to monitor nutritional status in the community is a nutritional surveillance program based on the E-PPGBM (Electronic Community-Based Nutrition Reporting Recording, known as *Elektronik Pencatatan Pelaporan Gizi Berbasis Masyarakat*).[27] The E-PPGBM was developed with the aim of obtaining information on nutritional status and performance of nutrition programs which can be used to identify nutritional problems and as consideration for decision making and formulating policies to improve community nutrition.[28]

Toddler data on e-PPGBM namely identity, nutritional status, Posyandu visits, vitamin A supplementation, birth weight, birth length, Early Initiation of Breastfeeding (EIBF), and birth order were obtained from Posyandu activities. However, Posyandu services in Semarang only resumed their operation in 2022, causing many new data entries to only be carried out in 2022. In addition, based on an interview with the Semarang City Health Service in 2023, it is known that data entry for toddlers in the Semarang City e-PPGBM in 2022 is already relatively high if compared to other cities. Even though e-PPGBM data entry in 2022 has been high, the utilization of e-PPGBM to analyse the causes of stunting is still rarely done, and researchers believe this study is the first to analyse Semarang City e-PPGBM data. Therefore, this research was conducted to analyse the relation between Posyandu visits post-Covid-19 adaptation and LBW history with stunting among toddlers in Semarang City using Semarang City e-PPGBM data.

MATERIALS AND METHODS

The research is a case control study with e-PPGBM as secondary data that was obtained with approval from the Semarang City Health Service. The e-PPGBM data used is data on the nutritional status of toddlers in Semarang City as of December 2022. This research has been stated as ethically appropriate by the Health Research Ethics Committee, Faculty of Medicine, Diponegoro University No.350/EC/KEPK/FK-UNDIP/VII/2023.

The research subjects were toddlers in Semarang City as of December 2022 who were recorded in the Semarang City e-PPGBM. The control group was determined using purposive sampling, while the case group was determined using total sampling of 1,153 toddlers with stunting. The control group was matched (1:1) according to gender matching with the case group. The inclusion criteria are toddlers aged 12-59 months in December 2022 with a LAZs or HAZs <-2 SD for cases and ≥-2 SD for control that recorded in the Semarang City e-PPGBM.[3] Apart from that, toddlers that have complete data such as identity, gender, domicile, number of Posyandu visits post-Covid-19 adaptation, birth weight, vitamin A supplementation, birth length, EIBF, birth

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order, and age in the Semarang City e-PPGBM in December 2022. The exclusion criteria include toddlers with outlier data, such as extreme values in height and birth weight.

The dependent variable of this study is stunting, which is categorized as stunting if the LAZs or HAZs are <-2 SD and normal as if the LAZs or HAZs are ≥-2 SD.[29, 30] The independent variable of the study is Posyandu visits post-Covid-19 adaptation and the history of LBW. Posyandu visits post-Covid-19 adaptation is the number of visits by toddlers to Posyandu in January – December 2022. Toddlers with Posyandu visits ≥8 times per year are considered routinely visit to Posyandu and <8 times per year are considered non-routinely visit to Posyandu.[31] Toddlers are categorized as LBW when babies born weighting less than 2500 grams and normal birth weight if babies born weighting 2500 grams or more.[32]

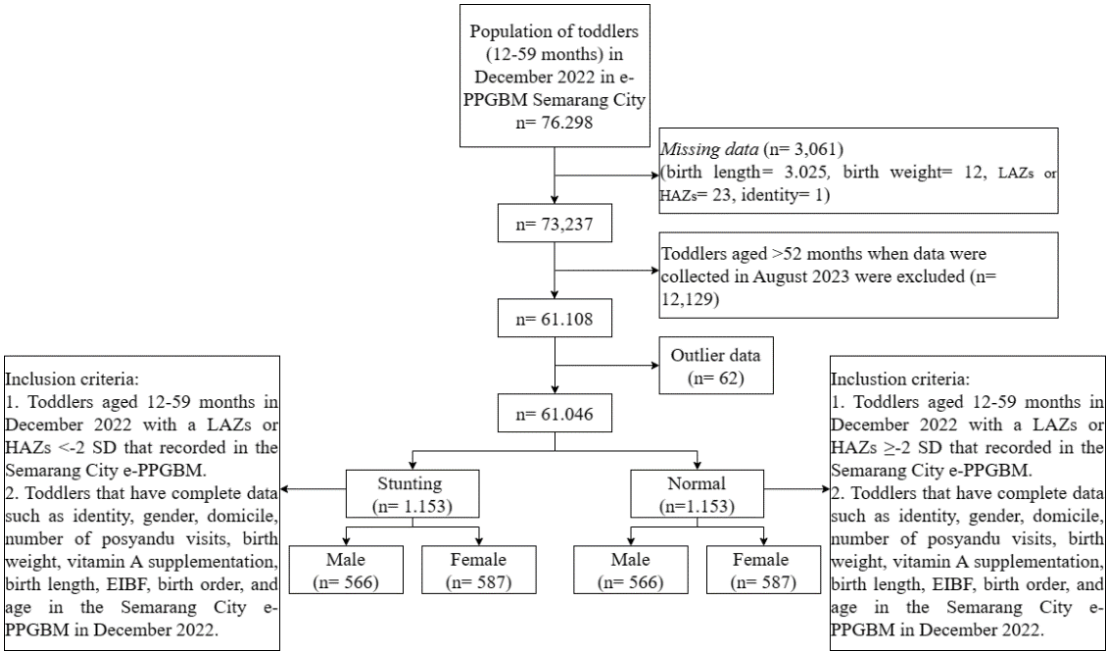

Figure 1. Flowchart for Selection of Research Subjects

The confounding variables were vitamin A supplementation, birth length, EIBF, birth order, and age. Vitamin A supplementation refers to the amount of vitamin A supplementation consumed by toddlers within a year, specifically in February and August. Vitamin A supplementation is classified as complete if the toddler consumes it twice a year in February and August, and incomplete if the toddler consumes it less than two times per year.[33] The birth length classified as short when the child's birth length is <48 cm and classified as normal if the child's birth length is ≥48 cm.[32, 34, 35] EIBF is placing the newborn on the mother's chest to do skin-to-skin contact between mother and the newborn for 40 minutes to 1 hour.[36] Birth order is the order in which the toddler is born compared to siblings who are categorized be the first or second child as well as the third child or more.[37] The age refers to the toddler's age in months as of December 2022.[38, 39]

Univariate, bivariate and multivariate analyses were conducted by using SPSS IBM 25. The variables of Posyandu visits post-Covid-19 adaptation, history of LBW, vitamin A supplementation, birth length, EIBF, birth order and age were carried out in univariate analysis to see the distribution of each variable, while bivariate analysis was carried out to determine the relationship between the dependent and independent variables by looking at the crude odds ratio (cOR) value using chi-square. Variables with a p value <0.25 in bivariate analysis were further analysed using the backward method of multivariate logistic regression. The results of the Hosmer-Lemeshow test have a significance value of 0.103, thus indicating that the statistical test model is good.[40]

RESULTS

Table 1 shows the characteristics of subjects in this study, while Tables 2 and 3 are the results of bivariate and multivariate analysis, which show the factors associated with toddler stunting in Semarang City.

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Table 1. Characteristics of Toddler Subjects in Semarang City.

Variables	Stunting		Normal	
	n=1,153	%	n=1,153	%
Posyandu visits post-Covid-19 adaptation				
Routinely visit to Posyandu	167	14.5	163	14.1
Non-routinely visit to Posyandu	986	85.5	990	85.9
Low birth weight				
Low birth weight	89	7.7	37	3.2
Normal birth weight	1,064	92.3	1,116	96.8
Vitamin A supplementation				
Incomplete	474	41.1	563	48.8
Complete	679	58.9	590	51.2
Birth length				
Short	214	18.6	94	8.2
Normal	939	81.4	1,059	91.8
Early initiation of breastfeeding				
No	14	1.2	11	1.0
Yes	1,139	98.8	1,142	99.0
Birth order				
Third or more	219	19.0	145	12.6
First or second	934	81.0	1,008	87.4
Age				
12-23 months	263	22.8	326	28.3
24-35 months	425	36.9	343	29.7
36-47 months	375	32.5	354	30.7
48-59 months	90	7.8	130	11.3

Table 1 shows that the largest number of toddlers in the stunting (85.5%) and normal (85.9%) groups reported that they routinely visited Posyandu post-Covid-19 adaptation. The majority of toddlers in the stunting (92.3%) and normal (96.8%) groups were born with a normal birth weight. Additionally, toddlers with normal birth length were found in the stunting (81.4%) and normal (91.8%) groups. Toddlers who were the first or second child in the stunting group were 81%, while those in the normal group were 87.4%. In addition, the majority of toddlers received EIBF in the stunting (98.8%) and normal (99%) groups. More than half of the toddlers consumed complete vitamin A supplementation in the stunting (58.9%) and normal (51.2%) groups. Most cases of stunting were found in toddlers aged 24-35 months (36.9%), while normal toddlers were more often found in toddlers aged 36-47 months (30.7%).

Table 2. Bivariate Analysis of Factors Related to Toddler with Stunting in Semarang City.

Variables	Stunting	Normal	cOR (95% CI)	p-value
	n (%)	n (%)		
Posyandu visits post-Covid-19 adaptation				
Routinely visit to Posyandu	167 (14.5)	163 (14.1)	1.03 (0.82-1.30)	0.858
Non-routinely visit to Posyandu	986 (85.5)	990 (85.9)	1	
Low birth weight				
Low birth weight	89 (7.7)	37 (3.2)	2.52 (1.70-3.74)	<0.001*
Normal birth weight	1,064 (92.3)	1,116 (96.8)	1	
Vitamin A supplementation				
Incomplete	474 (41.1)	563 (48.8)	0.73 (0.62-0.86)	<0.001*
Complete	679 (58.9)	590 (51.2)	1	
Birth length				
Short	214 (18.6)	94 (8.2)	2.57 (1.98-3.32)	<0.001*
Normal	939 (81.4)	1,059 (91.8)	1	
Early initiation of breastfeeding				
No	14 (1.2)	11 (1.0)	1.28 (0.58-2.82)	0.688
Yes	1,139 (98.8)	1,142 (99.0)	1	

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Variables	Stunting	Normal	cOR (95% CI)	p-value
	n (%)	n (%)		
Birth order				
Third or more	219 (19.0)	145 (12.6)	1.63 (1.30-2.05)	<0.001*
First or second	934 (81.0)	1,008 (87.4)	1	
Age				
12-23 months	263 (22.8)	326 (28.3)	1	
24-35 months	425 (36.9)	343 (29.7)	1.54 (1.24-1.91)	<0.001*
36-47 months	375 (32.5)	354 (30.7)	1.31 (1.06-1.63)	0.017*
48-59 months	90 (7.8)	130 (11.3)	0.86 (0.63-1.18)	0.381

Table 2 shows there was significant relationship between LBW, vitamin A supplementation, birth length, birth order, and age with stunting. However, no significant relationship was found between Posyandu visits post-Covid-19 adaptation and EIBF (p>0.05) with stunting.

The results in Table 3 show that only vitamin A supplementation, birth length, birth order and age had a significant relationship with stunting after carrying out a multivariate test. It is known that the coverage of vitamin A supplementation in toddlers with stunting is higher than in normal toddlers. However, incomplete vitamin A supplementation has OR=0.76 (95% CI=0.64-0.90). Toddlers with short birth length have a 2.46 times greater risk of experiencing stunting than toddlers with normal birth length. In addition, toddlers who are the third child or older have a 1.54 times greater risk of experiencing stunting than toddlers who are the first or second child. Toddlers aged 24-35 months and 36-47 months are 1.51 and 1.30 times more likely to be stunting, respectively. However, the age category 48-59 months was not significantly associated with stunting.

Table 3. The Factors Most Associated with Toddler Stunting in Semarang City.

Variables	Stunting	Normal	B	aOR (95% CI)	*p value*
	n (%)	n (%)			
Vitamin A supplementation					
Incomplete	474 (41.1)	563 (48.8)	-0.275	0.76 (0.64-0.90)	0.002*
Complete	679 (58.9)	590 (51.2)		1	
Birth length					
Short	214 (18.6)	94 (8.2)	0.899	2.46 (1.90-3.19)	<0.001*
Normal	939 (81.4)	1,059 (91.8)		1	
Birth order					
Third or more	219 (19.0)	145 (12.6)	0.429	1.54 (1.22-1.94)	<0.001*
First or second	934 (81.0)	1,008 (87.4)		1	
Age					
12-23 months	263 (22.8)	326 (28.3)		1	
24-35 months	425 (36.9)	343 (29.7)	0.409	1.51 (1.21-1.88)	<0.001*
36-47 months	375 (32.5)	354 (30.7)	0.260	1.30 (1.03-1.63)	0.025*
48-59 months	90 (7.8)	130 (11.3)	-0.181	0.83 (0.60-1.15)	0.255
Constant			-0.258	0.77	0.013

The probability of stunting in toddlers with risk factors is calculated using the available equations.[41] Toddlers who did not receive complete vitamin A supplementation, were born with a short birth length, were their third child or older, and were 24-35 months old have a risk of stunting of 15 times. On the other hand, toddlers who did not receive complete vitamin A supplementation, were born with a short birth length, were their third child or older, and were 36-47 months old have a risk of stunting of 17 times.

DISCUSSION

The prevalence of toddlers with stunting in December 2022 in the Semarang City e-PPGBM was 1.8%. These results were higher compared to the prevalence of toddlers with stunting from the weighing operation survey in August 2022 (1.55%) and the prevalence of stunting in December 2022 in the Semarang City Health Profile (1.66%). According to interviews with the Semarang City Health Service, it is known that data entry in

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the Semarang City e-PPGBM in 2022 is very high. This is evident from the complete recording of data for 61,046 out of 76,298 toddlers in Semarang City, representing the total research population in the Semarang City e-PPGBM in 2022.[42]

The results in Table 1 show that the majority of both stunting and normal toddler subjects routinely visited Posyandu post-Covid-19 adaptation. This trend can be influenced by the recording of nutritional statuses, such as stunting, on e-PPGBM. This process helps Posyandu cadres and community health center nutritionists identify toddlers with nutritional problems. This, in turn, facilitates in-depth monitoring through assistance from the community health center, ultimately classifying toddlers with stunting as routinely visit to Posyandu.[43, 44] In addition, the high number of toddlers routinely visiting Posyandu in Semarang City can be influenced by the quality of Posyandu services in Semarang in 2022, which is already good. There are 1,295 Posyandu *mandiri*, 262 Posyandu *purnama*, 57 Posyandu *madya*, and 12 Posyandu *pratama*.[42] The high number of Posyandu *mandiri,* or independent Posyandu, in Semarang City shows that many Posyandu in Semarang have carried out more than 50% of the main Posyandu activities, held activities more than 8 times per year, have a cadre of more than 5 people, receive independent funding managed by the community, have more than 50% of head of family members, and have additional programs.[45]

Based on the research results, Posyandu visits post-Covid-19 adaptation were not significantly related to the incidence of toddler stunting. However, non-routinely visit to Posyandu post-Covid-19 adaptation was higher in stunting than in normal toddlers. This result is in line with research in Banjarmasin which stated that there was no significant relationship between the history of Posyandu visits and stunting.[18] This could be because Posyandu visits only describe the participation of toddlers in Posyandu activities (the D/S indicator) but are unable to reflect the success rate of the Posyandu program, which can be observed through the number of weight increases in toddlers who visited the Posyandu (the N/D indicator).[42, 46] Therefore, Posyandu is still recommended in providing basic health services for toddlers because it has programs that are beneficial for toddlers such as monitoring child growth and development, providing vitamin A supplementation, immunization, deworming, as well as nutritional education and counselling which is beneficial for the health and nutritional status of toddlers.[47]

Increased knowledge from nutritional education at Posyandu about exclusive breastfeeding, complementary foods, and infant and young child feeding (IYCF) is expected to be able to change attitudes and practices in child feeding which have a strong influence on meeting nutritional needs for children's growth and development.[48-52] However, the increase in knowledge that occurs does not always lead to changes in attitudes and practices due to mothers of toddlers disobey recommendations that have been given or there are other factors that make it impossible for mothers to meet the nutritional needs of toddlers, such as the economic status and food security of the family. Low economic status causes limited food supplies and purchasing power, which can lead to children's nutritional needs not being met, causing nutritional problems such as stunting.[47, 52, 53] Synergy between Posyandu activities and family food security is needed in order to improve toddlers stunting conditions by meeting balanced nutritional needs.[18]

LBW was found to have no significant relationship with stunting in this study. This is in line with another study conducted in Batu City. The unrelated results could be due to the fact that almost all of the toddlers with stunting and normal toddler subjects in this study were born with a normal birth weight, but the number of toddlers born with LBW was greater among stunting than normal toddler. Birth weight influences stunting if it occurs in the first 6 months of life, then decreases until the age of 1 year. If the baby can catch up with its growth during the first 6 months after birth, then it is likely to grow normally again and not experience nutritional problems.[54] Apart from that, there are other factors that influence stunting besides LBW, namely inadequate nutritional intake, experiencing recurrent infections, inadequate health services, and low family economic level. Insufficient nutritional intake and exposure to infection can result in toddlers born with normal birth weight or LBW experiencing worse growth disorders such as stunting.[26, 55] Therefore, providing adequate nutritional intake after birth can promote healthy growth in babies with LBW.[56]

Coverage of vitamin A supplementation is higher in toddlers with stunting than in normal toddlers. These results are in line with cross-sectional research in Bali in 2018.[57] By recording nutritional status in e-PPGBM, toddlers with nutritional problems such as stunting receive intensive treatment so that they are prioritized to receive assistance in the form of counseling from community health center nutritionists.[44] Increased parental awareness after nutrition counseling has been proven to increase compliance with toddlers' consumption of vitamin A supplementation.[58]

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Vitamin A supplementation is recommended to be given to the population of toddlers with high vitamin A deficiency (VAD) or at high risk of VAD to reduce subclinical and clinical VAD and ensure the vitamin A status.[59, 60] However, the latest research conducted by SEANUTS on 2013 showed that the prevalence of VAD in children aged 2-4.9 years in Indonesia was 1.4%, which is classified as a low level of public health problem according to the WHO classification.[61, 62] Apart from the low prevalence of VAD, the high prevalence of stunting in Indonesia can increase the possibility of VAD in toddlers, thus vitamin A supplementation is still needed to ensure vitamin A status.[59, 60] Furthermore, it is necessary to check the vitamin A status of toddlers at least once every 10 years for toddlers who receive vitamin A supplementation to monitor existing vitamin A supplementation programs.[63] In addition to vitamin A levels in the body, the response to vitamin A supplementation in the body is also influenced by infectious diseases, nutritional status, and nutritional intake such as fat and zinc which affect the bioavailability of vitamin A.[64]

Short birth length increases the risk of toddlers experiencing stunting. These results are in line with case control research in Indonesia and Bangladesh.[54, 65, 66] Insufficient maternal nutritional intake such as chronic energy deficiency during pregnancy can result in impaired fetal growth and babies born with short birth length or stunting at birth.[54] Therefore, babies with short birth length has a higher risk of experiencing stunting in the following period compared to babies with normal birth length.[67] Children with short birth length need more nutrients to keep up with growth and if this is not met, it will cause the child to be vulnerable to experiencing malnutrition such as stunting.[68] Short birth length babies who fail to thrive and catch up at an early age are at risk of failure to thrive later in life.[54] Additionally, research in sub-Saharan African countries suggests that smaller body length deficiencies at birth are associated with a beneficial impact on linear growth.[67]

The results of this study are in line with other case control and cross-sectional studies which stated that there was no significant relationship between EIBF and stunting.[36, 40, 69] These results could be influenced by the high number of stunting and normal subjects in this study who had received EIBF. The high number of toddlers who receive EIBF can be caused by the high coverage of birth assistance by health workers in Semarang City in 2018-2022, which is 100%.[42, 70, 71] A meta-analysis of 19 studies (2012–2022) analyzed EIBF and exclusive breastfeeding as factors for stunting and found that the risk factor is not EIBF but exclusive breastfeeding, which can be influenced by EIBF.[72] However, the success of exclusive breastfeeding is not only influenced by EIBF, but also by antenatal visits, prenatal, multiparity, parenting experience, and the role of the father.[73, 74] Apart from exclusive breastfeeding, other factors that can cause EIBF were not related to stunting in toddlers age >6 months is the level of nutritional intake and history of recurrent infectious diseases.[75] Proper feeding of infants and toddlers is useful in helping toddlers get optimal nutrition and preventing infectious diseases and nutritional problems including stunting.[56, 72]

The risk of stunting increases in toddlers who are the third child or older. Other researches show that children with lower birth orders are at an advantage compared to children with higher birth orders.[37, 76, 77] Higher birth orders are associated with stunting and receiving inadequate nutritional intake.[37] The increase in the number of children causes an increased burden on parents to meet nutritional needs and care for children, thereby increasing inequality in nutritional fulfilment and childcare patterns.[78] The decrease in food allocation in the household due to the increase in family members causes children with a higher birth order to be at risk of suffering from stunting.[77] In addition, children with a higher birth order are associated with higher parity which causes malnutrition.[37]

There was a significant relation between the ages 24-35 months and 36-47 months with stunting. The age of 24-47 months is a transition period from infant to toddler phase so that the child begins to be weaned.[78-81] Children at this age experience stable growth, but it decreases compared to the infant age, making it more difficult to improve the stunting condition.[66, 79] Despite a decrease in growth, this age is a period of significant development in the social, cognitive and emotional aspects of children.[82] Increasing children's social and gross motor skills levels may lead to a higher likelihood of increased activity, as they spend more time outside the home to socialize. This increased activity might result in children refusing to eat due to excessive energy expenditure or fatigue from playing. Furthermore, as children are exposed to environments outside the home, they may adopt eating habits and preferences from those around them, influencing their food intake and nutritional status.[82, 83]

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Typical growth at a slower but steady rate is often accompanied by poor eating habits and decreased appetite. When children are 24 months old, 50% of toddlers are picky eaters, and the percentage of snack consumption increases with age. Children's social and motor development can increase their independence in eating. Often, picky eating is an attempt to show independence, not a statement of likes and dislikes about food. Then, children prefer snacks and foods that are easy to consume to show their independence in consuming food and adjust to their chewing ability, which is not very good.[82] However, continuously consuming snacks with low nutrient density can cause toddlers to feel full before mealtime, resulting in toddlers not receiving sufficient nutritional intake every day. This unstructured and repeated eating pattern in small amounts that happened over an extended period can lead to the toddler's stomach not expanding and resulting in failure to grow.[82, 83] In addition, consuming snacks without paying attention to food hygiene can increase toddlers' chances of being exposed to infections, thereby increasing the risk of stunting in toddlers.[78]

The age category of 48-59 months was not significantly associated with stunting because it had the fewest stunting and normal subjects. The age of subjects who met the study inclusion criteria was 12 to 52 months. Based on the completeness of EIBF and birth order data obtained from e-PPGBM in August 2023, there is no data for toddlers aged more than 52 months in December 2022 because they are no longer classified as toddlers in August 2023.

This research has limitations, namely that there was no matching of Posyandu which could influence the research results because of the differences in each region. Besides that, research variables were limited according to the availability of data obtained from e-PPGBM. Therefore, there is no historical data on food intake to determine the level of adequacy of toddlers' nutritional intake.

CONCLUSIONS

Toddlers born with LBW, experiencing EIBF, and who did not routinely visit Posyandu post-Covid-19 adaptation were higher in stunting subject compare to normal subject, but this relationship was not significantly related to stunting in Semarang City. However, toddlers with short birth lengths, were third children or more and aged 24-47 months were found to be at risk of stunting. The coverage of vitamin A supplementation for toddlers with stunting is higher than that of normal toddlers in Semarang City.

Future researchers can consider other indicators in Posyandu evaluation besides using the number of visits (the D/S indicator), namely the success rate of the Posyandu program (the N/D indicator). Policymakers can optimize education about preconception nutrition for women of childbearing age and antenatal care for pregnant women to better monitor pregnant women's nutrition and prevent babies born with short birth lengths. The family planning program, also called *Keluarga Berencana* (KB), can be promoted more intensively to prospective mothers to prevent stunting in the third or more children. The scope of providing vitamin A supplementation should not only focus on toddlers with stunting, but also on toddlers in general so that the coverage of vitamin A supplementation can increase. Apart from that, it is also necessary to analyse e-PPGBM data related to toddler nutrition problems regularly so that problems that occur can be immediately handled based on the causes found.

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