



## *Factors Associated with Stunting in Posyandu in an Underdeveloped Area of Indonesia: A Cross-Sectional Study in Papua*

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### ABSTRACT

**Background:** Studies have shown that numerous variables were significantly associated with stunting including knowledge of mothers and level of education. However, the study on nutrition knowledge and nutrition benefits among mothers was limited in Papua. This study aims to explore the prevalence of stunted children in this area and to determine whether the knowledge on healthy nutrition and taking iron supplements are associated with stunted children among mothers who have children under 5 years. **Methods:** This study as a cross-sectional study was done in 2022. It involved mothers who brought their children under 5 years old to integrated health posts and signed informed consent. Data on balanced nutrition and nutritional benefits for children were collected through a questionnaire consisting of 26 questions with true/false answers. While mothers completed questionnaires on nutrition knowledge, nutrition benefits, and sociodemographic data, height and weight of their children were measured. **Results:** A total of 496 mothers participated in this study, the mean age of mothers was  $30.42 \pm 6.40$  years. Based on mothers' characteristics, the majority of mothers went to high school, were unpaid, and consumed iron supplements during pregnancy (98.2%). There was a 10% stunting incidence in this study. After adjusting for potential confounding factors, having children aged 1 to 20 months old (odds ratio (OR)=0.11; 95% confidence interval (CI)=0.03–0.64) and knowledge of nutritional benefits (OR=0.62; 95% CI=0.40–0.95) decreased the odds of stunting. **Conclusion:** A comprehensive program about nutrition should be available, particularly for mothers. This study also suggests that interventions to increase nutrition knowledge among mothers with children aged under 2 years should be prioritized.

### Introduction

High prevalence of stunted children has been reported in 40% of children worldwide (Saleh *et al.*, 2021). This may be slightly less common in Indonesia compared to the worldwide occurrence (Beal *et al.*, 2018). Some wealthy regions in Indonesia were reported to have

reduced the number of stunting cases, while Papua may be one of the regions still coping with it (Anonim, 2021). Stunting is a health problem that can be seen as the condition of being underweight based on weight for age, short or very short based on height for age, and thin or

wasting based on weight according to height (Rinawan *et al.*, 2022). This condition increases the risk of illness, irreversible body damage, the risk of sub-optimal brain development and affects cognitive ability and mortality in children (Grantham-McGregor *et al.*, 2007) particularly children aged under 5 years. The latest study on effective stunting prevention showed that improvement in nutrition knowledge among mothers was effective to reduce the number of stunted children (Wulandari *et al.*, 2022).

Some studies have found that complex factors have affected stunting prevalence (Danaei *et al.*, 2016). In addition to socioeconomic factors, parental education level can affect the probability of stunting among children. Moreover, some variables related to stunted children were sufficient knowledge of feeding children with nutritious food (Saleh *et al.*, 2021), and taking iron (Fe) and folic acid supplements (Nisar *et al.*, 2020). In addition, multiple micronutrient supplements on childhood growth will add effects on child development. For example, Fe supplements may help with the formation of bones, teeth, joints, muscles, and skin. Hence, Fe deficiency can cause short stature in children (Prendergast *et al.*, 2019).

Indonesia launched Posyandu, abbreviated from Pos Pelayanan Terpadu or integrated service posts as a mother-child health (MCH) community program in mid 1980s (Rinawan *et al.*, 2022). The programs are run by Public Health Centers in every village in Indonesia. Nurses and midwives come monthly to examine child development. Children who attend Posyandu will be weighed by nurses and midwives and regularly provided with supplementary feeding.

According to a prior study, Papua has a higher stunting rate than stunting rate in Indonesia (Wulandari *et al.*, 2022). However, there is limited evidence to support the idea that knowledge of mothers on nutrition is related to the prevalence of stunted children. This study aimed to explore the prevalence of stunted children and to determine whether the knowledge on healthy nutrition and taking Fe supplements

are associated with stunted children among mothers who have children aged under 5 years.

## Materials and Methods

### Study design

This was a cross-sectional study using questionnaires to assess sociodemographic factors, knowledge of mothers on nutrition, and stunted children. The participants were recruited from multi-integrated health posts in rural areas of Papua Province, Indonesia. Inclusion criteria were female subjects, at least 18 years old, mothers who brought their children aged under 5 years for developmental screenings, and subjects who signed informed consent. Those women who brought the children with relationships as caregivers were excluded. The researchers explained the aim of the study while women were having their children checked at Posyandu in Jayapura. The researchers consisted of one pharmacist, one nurse, and an undergraduate pharmacy student. After signing the informed consent, the questionnaire was distributed and completed by the subjects. Data collection was conducted between September and December 2022.

### Instruments

The selected questionnaire to assess the knowledge of mothers consisted of 26 questions in 2 domains, balanced nutrition and nutrition benefits for children (Herlianawati, 2017). Balanced nutrition domain has 17 items and 9 items were included to benefits of the nutrition domain. The response was binary (false/true), with correct answers scoring 1 and incorrect answers scoring 0. A total score for each domain score was calculated as the sum of all items.

### Data collection

During attending Posyandu, researchers distributed paper-based questionnaires and the questionnaires consisted of women sociodemographic information (age, education level, employment status, whether having Fe supplements during pregnancy, and balanced nutrition and nutrition benefits knowledge and children information (age and gender). Data on balanced nutrition and nutritional benefits for

children were collected through a questionnaire consisting of 26 questions with true/false answers. They completed the questionnaires during attending Posyandu while their children were weighing. The z-score values for height-for-age and BMI-for-age were calculated using the World Health Organization (WHO) anthropometrics. The limit for the nutritional status category according to the height index/age is (Characteristics of Mother as Predictors of Stunting in Toddler) (Laksono *et al.*, 2019):

- Stunted:  $<-3.0$  SD to  $-2.0$  SD
- Normal:  $\geq -2.0$  SD.

The results were dichotomized into stunting and normal growth. Data were collected between November and December 2021.

#### **Ethical considerations**

The study was approved by the Ethics Commission, Universitas Muhammadiyah Magelang, Indonesia (number: 116/KEPK-FIKES/II.3.AU/F/2022).

#### **Data analysis**

The sociodemographic variables were analyzed using descriptive statistics. The outcome variable was binary coded as stunting and normal category. The Chi-square test and Mann-Whitney U test were used to analyze the association between independent variables and stunted children. Independent variables included age of children, gender, education level, employment status, consuming Fe supplements during pregnancy, and knowledge on nutrition.

All independent variables with a P-value of  $< 0.20$  in the descriptive analysis were included in the multivariate logistic regression analysis (Bursac *et al.*, 2008). In the multivariate logistic regression analysis, all independent variables were significant with a P-value of  $\leq 0.05$ . Finally, the odds ratios of independent variables and their 95% confidence interval were presented. All analyses were done using two-tailed tests at a significance level of 0.05. The statistical analyses were performed using the Statistical Program for Social Sciences (SPSS) version 24.0 for Windows.

## **Results**

**Sociodemographic characteristics of participants:** This study involved 496 women who brought their children aged under 5 years to Posyandu and signed informed consent. **Table 1** shows that more than half of the children (55.4%) were 1-20 months and were boys (55.4%). In addition, the prevalence of stunted children was 10.3%.

**Table 1.** Socio-demographic characteristics of children based on age, gender, and stunting status.

Variables	n	%
Age (months)		
1-20	275	55.40
21-40	144	29.00
41-60	77	15.50
Sex		
Boy	275	55.40
Girl	221	44.60
Status of stunting		
Yes	51	10.30
No	445	89.70

Table 2 shows that the mean age of mothers was 30.42 years (SD = 6.40). The majority of mothers (86.5 %) were unpaid, and consumed Fe supplements during pregnancy (98.2%). More than half of mothers graduated from high school (59.5 %).

**Table 2.** Socio-demographic characteristics of women based on age, education, occupation, and iron supplement consumption.

Variables	Mean $\pm$ SD	
Age of mother (y)	30.42 $\pm$ 6.40	
Knowledge score		
Balanced nutrition domain	12.73 $\pm$ 1.11	
Nutritional benefit domain	3.85 $\pm$ 0.723	
Education level	n	%
Basic education	146	29.40
High school	294	59.30
University	56	11.30
Employment		
Unpaid	429	86.50
Paid	67	13.50
Iron supplementation		
Yes	487	98.20
No	9	1.80

**Table 3** shows there is a significant difference between the age of mothers and children, and balanced nutrition domain compared to stunting.

*Multivariate logistic regression:* Having children aged 1 to 20 months (odds ratio

(OR)=0.11; 95% confidence interval (CI)=0.03–0.64), and having knowledge on nutritional benefits (OR=0.62; 95% CI=0.40–0.95) decreased the odds of being stunting. These factors were protective factors (**Table 4**).

**Table 3.** Result of correlation characteristic test based on children and women with stunting .

Variables	Stunting (n=51)	Normal (n=445)	P-value <sup>a</sup>
Age of mothers (y)	29.00±6.30 <sup>b</sup>	30.58±6.39	0.08
Knowledge score			
Balanced nutrition domain	12.76±1.07	12.72±1.12	0.04
Nutritional benefit domain	4.06±0.65	3.88±0.73	0.51
Education level			
Nine years education	12 (23.50) <sup>c</sup>	134 (30.10)	0.02
High school	38 (74.50)	256 (57.50)	
Universities	1 (2.00)	55 (12.40)	
Working status			
Unpaid	44 (86.30)	385 (86.50)	0.56
Paid	7 (13.70)	60 (13.50)	
Iron supplementation			
Yes	51 (10.50)	436 (89.50)	0.37
No	0 (0.00)	9 (100)	
Sex			
Girl	27 (12.20)	194 (87.80)	0.13
Boy	24 (8.70)	251 (91.30)	
Age of children (months)			
1-20	28 (10.20)	247 (89.80)	0.02
21-40	21 (14.60)	123 (85.40)	
41-60	2 (2.60)	75 (97.40)	

<sup>a</sup>: Independent t-test used for quantitative and Chi-square for categorical variables; <sup>b</sup>: Mean± SD; <sup>c</sup>: n (%).

**Table 4.** Univariate and multivariate analyses on the association of variables with stunting.

Variables	Univariate OR (95% CI)	P-value	Multivariate OR (95% CI)	P-value
Sex				
Girl	Ref	0.13		
Boy	0.67 (0.38-1.22)			
Age of children (months)				
1-20	Ref	0.00	0.11 (0.03-0.64)	0.02
21-40	0.23 (0.05-1.01)		0.25 (0.05-1.08)	
41-60	0.15 (0.03-0.68)		Ref	
Education level of mothers				
Nine years education	Ref	0.00	Ref	0.10
High school	0.20 (0.02-1.59)		0.687 (0.33-1.39)	
Bachelor	0.12 (0.01-0.91)		5.09 (0.63-40.59)	
Knowledge score				
Knowledge of balanced nutrition	Ref		Ref	
Knowledge of nutritional benefits	0.63 (0.41-0.96)	0.06	0.62 (0.40-0.95)	0.03
Age of mothers (y)	1.04 (0.99-1.09)	0.08		



## Discussion

This study showed that based on self-reporting, more than ten percent of children brought to Posyandu were stunted. This was lower than the results of a prior study that used secondary data (Laksono and Kusri, 2020), but it is difficult to compare the results because of differences in methods and instruments used. The results showed that having children aged 1 to 20 months, and the knowledge of nutritional benefits decreased the odds of stunting, which were protective factors.

In line with a prior study, growth disorders may occur from the moment the baby was born until the age of two (Nasrul *et al.*, 2015) and stunting that occurred in the first 36 months will be usually accompanied by long-term effects (Wahdah *et al.*, 2015). It may be related to the weaning phase and a period of high activity when children explore their surrounding environment (Fadzila and Tertiyus, 2019). In addition, this time relates to the period of gross motor skills development for children. At this stage, some children will face several possible circumstances that cause malnutrition, namely decreased appetite, low nutritional intake, decreased sleep hours, and susceptibility to infection when mothers/caregivers pay less attention to hygiene and sanitation. It may occur particularly for women who are still classified as teenagers when they got pregnant. Relatively young maternal age was closely related to growth failure in infants and the age of a mother had a significant relationship with the occurrence of stunting (Yu *et al.*, 2016). Mothers who were too young were likely to have stunted offspring compared to mothers who were from 20 to 35 years old (Manggala *et al.*, 2018). In addition, there is a need to provide nutrition counseling for mothers of those ages. However, there is a need to adjust the implementation of the counselling based on local culture to receive more acceptance among mothers in this area (Sianturi *et al.*, 2022).

Knowledge of nutritional benefits was significantly associated with stunting. A previous

study showed that mothers play a substantial role in taking care of feeding children (Wanjihia *et al.*, 2021). Mothers with low knowledge will encounter higher risks of having stunted children since they may not be able to measure their children nutritional needs and to decide which food should be given to children (Rashid *et al.*, 2020). The socio-cultural belief and practices of feeding may relate to how mother commonly feed their children. Mothers usually erroneously provide complimentary food to their children. The existence of negative views also prohibits immunization and exclusive breastfeeding. This is contrary to secondary data that have been used in another study. In their study, education level was insignificant with behavior pattern of mothers in preparing and providing nutritious food for children was related to their educational background (Grantham-McGregor *et al.*, 2007).

The reduction of stunting requires the continuation of current efforts while engaging with macro policy. The government need to engage not only health care providers but also the community. The presence of policies that focus on stunting prevention by improving nutrition and sanitation among mothers and families and collaboration between government and all stakeholders including health sectors and the community is recommended.

This was the first study to examine the prevalence of stunted children and the knowledge of nutrition benefits and taking Fe supplements associated with stunted children in Papua area as one of underdeveloped provinces in Indonesia and where data is scarce. The study had limitations that may affect its generalizability and representativeness, since the study area was one location in a district closest to the capital. It may be more developed with better health and other social demographic infrastructure. Moreover, results from other areas with narrow health facility gaps between urban and rural areas within Papua may be different.

## Conclusion

The prevalence of stunting in this study was

lower than other areas, but certain improvements were noted. Mothers play a significant role in preventing stunting in children. A comprehensive program about nutrition should be available, particularly for mothers. This study also suggests that interventions to increase nutrition knowledge among mothers whose children were under 2 years should be prioritized by regular counselling. The intervention should also acknowledge cultural practices to increase acceptance among mothers.

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### Authors' contributions

Conceived and designed the study: R Rusnaeni, R Howay, EI Sianturi. Analyzed the data: EI Sianturi, R Rusnaeni, R Howay, D Napitupulu. Wrote the paper: EI Sianturi, R Howay, R Rusnaeni, E Gunawan, RD Pratiwi, D Napitupulu All authors read and approved the final manuscript.

### Conflict of Interest

The authors have indicated that they have no competing interests.

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