Poor Dietary Diversity Is Associated with Stunting among Children 6–23 Months in Area of Mergangsan Public Health Center, Yogyakarta

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Summary The period of pregnancy and the first two years of children are called the golden period so that the adequacy intake of macro and micronutrients must be fulfilled. Stunting is a chronic undernutrition condition as a result of inadequate quality and quantity of complementary foods with or without infectious diseases. Quality and quantity of complementary foods can affect linear growth. To analyzed the association between dietary diversity and stunting among children aged 6–23 mo in the area of Mergangsan public health center, Yogyakarta. Method: Study was an analytic observational study with a cross-sectional design. The population was children aged 6–23 mo from 60 integrated health service centers in the area of Mergangsan public health center with a total population of 343 children. The sample size was 135 children. Samples were selected using simple random sampling. Data were analyzed using univariate (descriptive), bivariate (chi-square test), and multivariate analysis (multiple logistic regression). The result of bivariate analysis showed that there was a significant association between dietary diversity of complementary foods (p=0.012; RP=2.87; CI: 1.23–6.68) and father's height (p=0.03; RP=2.58; CI: 1.06–6.30) with stunting. The result of the multivariate analysis showed that there was a significant association between dietary diversity of complementary foods and stunting while there was no association between the father's height and stunting. Poor dietary diversity of complementary foods was a risk factor of stunting among children aged 6–23 mo.
Key Words minimum dietary diversity, minimum meal frequency, complementary foods, stunting, children

Stunting describes a condition of growth failure in terms of length or height indicated by the value of z-scores for length-for-age (LAZ) or height-for-age (HAZ) below −2 standard deviation (−2SD) from the World Health Organization (WHO) growth chart as a result of poor health and insufficient energy and nutrient intake during in the womb and continue until the first of 2 y (*1–3*). Stunting increased morbidity and mortality, elevated risk of metabolic disease, decreased learning ability and economic capacity into adulthood (*1*, *3*, *4*).

Inadequate dietary intake is one of the immediate causes of stunting in children other than infectious diseases (*1*, *3*). Complementary food is a source of macronutrient and micronutrient intake for children aged 6–23 mo besides breast milk. Children can experience failure to grow during the period of complementary feeding administration if the quantity and quality of complementary food are low. The low quantity and quality of complementary food cause children to experience deficiencies of macronutrients and micronutrients that play an essential role on child's growth and development (*2*, *5–7*). Therefore, the provision of complementary feeding prepared by the family must pay attention to the diversity and portion of complementary food to meet child's nutritional requirements (*2*, *8*). Previous study found that there was a significant relationship between dietary diversity and stunting (*9–11*).

Prevalence of stunting in children under 5 y has decreased during the past two decades, but it is higher in Asia and Africa than elsewhere and globally affected at least 165 million children in 2011 (*12–14*). Prevalence of stunting in Indonesia in 2013 was 37.2% (*15*). Based on the results of Nutritional Assessment in 2017, the prevalence of stunting in children under-five-years in Special Region of Yogyakarta is 19.8%. The prevalence of stunting among children under-five-years in each district being 23.65% in Kulon Progo District, 22.9% in Bantul District, 27.9% in Gunung Kidul District, 10.6% in Sleman District, and 23% in Yogyakarta City (*16*). The results of the assessment of nutritional status in August 2017 in Yogyakarta City showed the prevalence of stunting children in 14 public health centres in the Yogyakarta City area. Mergangsan Public Health Center has the highest prevalence of stunting in children under-five-years by 20.55% (*17*).

Considering the prevalence of stunting more than

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20.0% so that stunting is a public health problem in the region, stunting impacts, and the importance of complementary food to meet children's nutrients adequacy during periods of rapid growth and development, the present study was conducted with objective to analyze the relationship between dietary diversity of complementary food and the incidence of stunting in children aged 6–23 mo in the working area of the Mergangsan Public Health Center.

MATERIALS AND METHODS

Design, place and time. This study was an analytic observational study with cross-sectional design. The study was conducted in the working area of Mergangsan Public Health Center, Yogyakarta City from March 2018 to October 2018.

Population, sample size calculation and sampling technique. The source population was children aged 6–23 mo who came to 60 integrated health post (*Posyandu*) in the Mergangsan Public Health Center working area. *Posyandu* is an integrated service post which is one form of Community-based Health Efforts (UKBM) in Indonesia that is managed and organized from, by, for and with the community in the implementation of health development, to empower the community and provide facilities to the community in obtaining basic health services, especially to accelerate the reduction of maternal and infant mortality (*18*).

A total populations of children aged 6–23 mo in August *Posyandu* period was 343 children. A required sample size of 135 children was estimated by using hypothesis testing of relative risk formula. The prevalence of stunting proportion based on previous study (*19*) considering a power of 80%, a significance level of 0.05, and a relative risk (RR) considered clinically significant of 1.9. Of 343 children, there were 41 children who stunted. All of them were taken as subject and children who not-stunted were selected by simple random sampling.

Subjects of study. The subjects were children aged 6–23 mo with their mothers as respondent. If mothers were not available because of working outside, other caregivers were enrolled. Inclusion criteria were as follows: lives for at least 6 mo in the study area, respondents were willing to sign an informed consent, older children if in one family there were more than one child aged between 6–23 mo, and children were not physically disabled (paralyzed). Exclusion criteria as follows: children who had severe acute malnutrion, mothers were not able to respond the interviews, one of the children's parents or both of them has passed away.

Outcome, exposure, and confounding factors (covariates). Stunting was the main outcome of the study. Stunting was assed by calculating an age and gender adjusted with z-score for length-for-age (LAZ) of each child according to the WHO (2006) child growth standards. Child was categorized as stunted if z-score <-2 standard deviation and not stunted if z score ≥-2 standard deviation.

The main exposure was dietary diversity. In this study, dietary diversity was defined as the consumption of minimum dietary diversity and minimum meal frequency. It means the present study measured the diversity of complementary food by taking into the quality and quantity of daily consumption of complementary food. It based on one of messages of Balanced Nutrition Guidelines (Pedoman Gizi Seimbang) for infants and children aged 6–24 mo (*2*).

Minimum dietary diversity and minimum meal frequency are defined using the recommended WHO infant and young child feeding (IYCF) indicators. Minimum dietary diversity indicator is the proportion of children 6–23 mo of age who receive foods from 4 or more food groups from a total of 7 food groups namely-grains, roots & tubers; legumes & nuts; dairy products; meat/fish/seafood; eggs; vitamin A rich fruits & vegetables; other fruits & vegetables. Minimum meal frequency indicator is the proportion of breastfed and non-breastfed children 6–23 mo of age who receive solid, semi-solid, or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more. For breastfed children, the minimum number of times varies with age (2 times if 6–8 mo and 3 times if 9–23 mo). For non-breastfed children the minimum number of times does not vary by age (4 times for all children 6–23 mo) (*20*). Dietary diversity is categorized as diverse if children consumed the minimum dietary diversity and minimum meal frequency and not-diverse if not consumed minimum dietary diversity and or minimum meal frequency.

Covariates is known as risk factors for child stunting. These variables was considered as counfounding factors (potential confounders). They included child's sex, child'age, parents' employments and education level, family income, household members, breastfeeding status, child past illness (infectious diseases), parents' height, and child's birth weight. The cut-off points of parents' height were 162 cm (*21*) and 150 cm (*19*) for children's father and mother respectively. Low birthweight is defined as weight at birth of less than 2,500 grams (*22*).

Data collection. Types of data are primary and secondary derived from the results of measuring of the child's length in the *Posyandus* by enumerators and health volunteers (cadres) and interviewing respondents by enumerators. Data collection was carried out by researchers with 6 enumerators, namely students of the Bachelor of Nutrition Study Program School of Health Sciences Panti Rapih Yogyakarta. The enumerators have received training in using household questionnaire and Food Frequency Questionnaire and measuring length and height.

The household questionnaire was adapted from the validated quetionairre. It consists of questions on the sociodemographic characteristics of mother and child, household characteristics, breastfeeding and complementary feeding practices, birth weight, and child's past illness. Sociodemographic characteristics included child's age and sex, education and employment of parents. Parents' education levels were categorized as high if children's mother and father had completed a minimum education of senior high school and as low if they completed junior high school or lower. Household characteristics included household size and income category. Household income based on regional minimum wage of Yogyakarta City. Family income categorized as high if it was Rp 1.709.150 or more and low if less than Rp1.709.150. Birth weight were obtained from mothers recall or "*Buku KIA*". Child illness included the presence of fever, diarrhea, cough, and flu, pneumonia in the previous 2 wk until the day before the interview.

The Food Frequency Questionaire (FFQ) was used to record information regarding minimum dietary diversity and minimum meal frequency in the previous 3 mo period (3 mo can describe the usual diet of child) which included the type of food items of the each food groups and the number of times they had consumed meal.

Dietary diversity score is obtained by summing the food groups consumed a day from the seven types of food groups. Interval of dietary diversity score starts with a minimum of 0 if no food group is consumed up to 7 if all food groups are consumed. Consumption of each food group was defined as "yes" when the child had consumed at least one food item within the food group and "no" when the child had not consumed any food item within the food group (*20*). Frequency of consumption of each food item within one food group is converted in a day (for example, consumption of eggs 1 time per day is equal to daily consumption, consumption of eggs and meat 6 times per week converted for a day to 0.85 (6:7); consumed eggs and meat 10 time in a month converted for a day to 0.33 (10:30), consumed eggs and meat 12 times converted for a day to 0.13 (12:90). Considering daily consumption if the sum frequency of food items within food group was equal to 1 or more.

The minimum meal frequency was estimated by using household questionnairre and rechecked by using FFQ. Mothers of children were requested to count their children's meal frequency in one day.

Anthropometric measures of children and their parents were recorded. The length of children was measured in lying down position using a infantometer and was recorded to the nearest 0.1 cm. The height of parents was measured in the standing position without shoes to the nearest 0.1 cm using a microtoise (when there were a condition that did not allow direct measurement, the height of parents was obtained by asking the respondents). Length-for-age was calculated according to the WHO standard reference 2006. The length-for-age indicator was expressed as z score.

Data processing and analysis. Data analysis used univariate analysis, bivariate analysis, and multivariate analysis. Univariate analysis is carried out to describe the research variables in frequency and percentage. Bivariate analysis was conducted to examine the assocoation of exposure and outcome using the chi-square test. Multivariate analysis was carried out to analyze the association of independent and dependent variables by controlling for covariates that had a p-value <0.25 in the bivariate analysis using the multiple logistic regression test. The final logistic regression model was determined through stepwise backward selection. For all the analyses, p-value <0.05 indicated statistical significance in two-sided test. Data analysis used the SPSS version 21.

Ethical approval. Permission to collect data in work area of Mergangsan Public Health Center was obtained from local authorities. They are National Unity and Politics Office Yogyakarta, Yogyakarta City Health Service Office, Investment Service and Permission Office Yogyakarta, and Mergangsan Public Health Center. Enumerator explained the research objectives and requested respondents to sign an informed consent form before begining the interview and taking anthropometri measurements.

Table 1. Distribution of subject's characteristics.

Characteristics of subject	Frequency	Percentage (%)
Child's sex		
Male	74	54.8
Female	61	45.2
Child's age (months)		
6–12	49	36.3
13–23	86	63.7
Mother's education level		
Low	16	11.9
High	119	88.1
Father's education level		
Low	14	10.4
High	121	89.6
Employment status of the mother		
Working	59	43.7
Non-working	76	56.3
Family income		
Low(<Rp 1.709.150)	54	40.0
High (≥Rp 1.709.150)	81	60.0
Household family size		
>4	53	39.3
≤4	82	60.7
Continued Breast feeding		
No	34	25.2
Yes	101	74.8
Child illness in the past 2 wk		
Yes	55	40.7
No	80	59.3
Mother's height		
Low (<150 cm)	16	11.9
Normal (≥150 cm)	119	88.1
Father's height		
Low (<162 cm)	25	18.5
Normal (≥162 cm)	110	81.5
Birth Weight		
Low (<2,500 g)	13	9.6
Normal (≥2,500 g)	122	90.4
Total	135	100.0%

Table 2. Bivariate analysis of factors associated with stunting in children aged 6–23 mo.

Characteristics of subject	Stunted (n=41)		Non-stunted (n=94)		p-value	RP** (95%CI)
	f	%	f	%		
Child's sex						
Male	27	36.5	47	63.5	0.09	1.93
Female	14	23.0	47	77.0		(0.90–4.31)
Child's age (months)						
6–12	15	30.6	34	69.4	0.96	1.02
13–23	26	30.2	60	69.8		(0.48–2.18
Mother's education level						
Low	7	43.7	9	56.3	0.21	1.94
High	34	28.6	85	71.4		(0.67–5.64)
Father's education level						
Low	4	28.6	10	71.4	0.88	0.91
High	37	30.6	84	69.4		(0.27–3.08)
Employment status of the mother						
Working	16	27.1	43	72.9	0.47	0.76
Non-working	25	32.9	51	67.1		(0.36–1.60)
Family income						
Low(<Rp 1.709.150)	17	31.5	37	68.5	0.90	1.09
High (≥Rp 1.709.150)	24	29.6	57	70.4		(0.52–2.30)
Household family size						
>4	15	28.3	38	71.7	0.67	0.85
≤4	26	31.7	56	68.3		(0.40–1.81)
Continued Breastfeeding						
No	11	32.4	23	67.6	0.77	1.33
Yes	30	29.7	71	70.3		(0.49–2.61)
Child illness in the past 2 wk						
Yes	19	34.6	36	65.4	0.77	1.13
No	22	27.5	58	72.5		(0.49–2.61)
Mother's height						
Low (<150 cm)	7	43.8	9	56.2	0.21	1.94
Normal (≥150 cm)	34	28.6	85	71.4		(0.67–5.64)
Father's height						
Low (<162 cm)	12	48.0	13	52.0	0.03*	2.58*
Normal (≥162 cm)	29	26.4	81	73.6		(1.06–6.30)
Birth Weight						
Low (<2,500 g)	6	46.2	7	53.8	0.19	2.13
Normal (≥2,500 g)	35	28.7	87	71.3		(0.67–6.79)

* Significant (p<0,05); ** RP=Ratio prevalence.

RESULTS

Characteristics of subjects

A total of 135 children aged 6–23 mo and their mothers participated in the study. There were 41 (30.37%) children who were stunted and 94 (69.63%) not stunted. Characteristics of the subjects are shown in Table 1. Mean and standard deviation of length-for-age z-score (LAZ) for all children were −1.01±1.83.

Based on Table 1, most of the subjects were male (54.8%) and belonged to 13–23 mo age group (63.7%). Both mother and father education level were high (88.1% and 89.6%, respectively). More than 50.0% of children mothers were non-working mothers. Most of children came from families with high income (60.0%) and had less than 4 family members (60.7%). More than 70.0% of children were still breastfeeding. The majority of subjects had not illness in the past 2 wk until the day before the interview. Most of children had mothers and fathers with normal height (88.1% and 81.5%, respectively) and normal birth weight (90.4%).

Table 2 shows association between subject characteristics and stunting. The charactersitics was considered as determinants factor of stunting. This study found that there were not association between child's sex, child's age, parents' education level, employment status of mother, family income, household family size, child's illness, mother's height, and child's birth weight with stunting (p>0.05), whereas there was a significant association between father's height and stunting in children aged 6–23 mo (p<0.05). Children who had shorter father (<162 cm) were more likely to be stunted

Table 3. The differences of food group consumption between stunted and non-stunted children.

Consumption of Food Group	Stunted (n=41)		Non-stunted (n=94)		p-value
	f	%	f	%	
Grains, roots & tubers					
No	2	66.7	1	33.3	0.17
Yes	39	29.6	93	70.4	
Meat/fish/seafood					
No	27	37.5	45	62.5	0.54
Yes	14	22.2	49	77.8	
Egg					
No	36	34	70	66	0.08
Yes	5	17.2	24	82.8	
Legumes & nuts					
No	22	33.8	43	66.2	0.40
Yes	19	27.1	51	72.9	
Fruits and vegetables rich in vitamin A					
No	7	33.3	14	66.7	0.75
Yes	34	29.8	80	70.2	
Other Fruits and vegetable					
No	34	36.6	59	63.4	0.02*
Yes	7	16.7	35	83.3	
Dairy products					
No	22	30.6	50	69.4	0.96
Yes	19	30.2	44	69.8	

* Significant ($p<0.05$).

Table 4. Bivariate analysis of the association between child feeding indicators and stunting in children aged 6–23 mo.

Child Feeding Indicators	Stunted (n=41)		Non-stunted (n=94)		Total		p	RP** (95%CI)
	f	%	f	%	f	%		
Minimum Dietary Diversity:								
Inadequate	25	43.9	32	56.1	57	100.0	0.04	3.03 (1.42–6.47)
Adequate	16	20.5	62	79.5	78	100.0		
Minimum Meal Frequency:								
Inadequate	14	34.1	27	65.9	41	100.0	0.53	1.29 (0.59–2.82)
Adequate	27	28.7	67	71.3	94	100.0		

* Significant ($p<0,05$), ** Ratio prevalence.

than children who had taller fathers (≥162 cm).

Table 3 shows the difference of daily consumption of 7 food groups among stunted and not-stunted children. In this study, there were no differences of grains, roots & tubers; legumes & nuts; meat/fish/seafood; eggs; dairy products; vitamin A rich fruits & vegetables consumptions between stunted and not-stunted children ($p>0.05$), whereas there was difference other fruits and vegetables consumption between stunted and not-stunted children ($p<0.05$).

Table 4 shows the association between child feeding indicators and stunting. This present study found that minimum dietary diversity was associated with stunting. Children who consumed inadequate dietary diversity (consumed <4 food groups) had a 3.03 times higher odds of being stunted (95% CI (1.42–6.47)) than those who consumed adequate dietary diversity (consumed ≥4 food groups). This study also found that minimum meal frequency was not associated with stunting.

Table 5 showed the analysis of main variables of this study. The result of bivariate analysis indicated that not diverse diet was significantly associated with a higher likelihood of stunting in children aged 6–23 mo (RP: 2.87; 95%CI: 1.23–6.68). Children who consumed not diverse diet were 2.87 more likely to be stunted than those who consumed diverse diet.

Covariates with p-value <0.25 were included in multivariable analysis for futher analysis. Based on Table 6, the results of the final multivariable model revealed that

Table 5. Association between dietary diversity and stunting in children Aged 6–23 mo.

Dietary Diversity	Stunted (n=41)		Non-stunted (n=94)		Total		p	RP** (95%CI)
	f	%	f	%	f	%		
Not diverse	32	38.1	52	61.9	84	100	0.012*	2.87*
Diverse	9	17.6	42	82.4	51	100		(1.23–6.68)
Total	41	30.4	94	69.6	135	100		

* Significant at α=0,05 (p value<0,05), ** RP=Ratio prevalence.

Table 6. Multivariate analysis of logistic regression (final model).

Variable	OR (95% CI)	p*
Dietary Diversity		
Not Diverse	2.91 (1.21–7.02)	0.017
Diverse	1	

* Significant at α=0,05.

dietary diversity were the only factor associated with stunting in children aged 6–23 mo after controlling for covariates (child's sex, mother's education level, parents' height, and child'birth weight). Children who consumed not diverse diet were associated with a 2.91-fold increased likelihood of stunting (relative to those who consumed diverse diet).

DISCUSSION

Bivariate analysis showed minimum dietary diversity was significantly associated with stunting in children aged 6–23 mo. This finding supported previous studies that indicated inadequate minimum dietary diversity can increase the risk of stunting (*10*, *11*). A previous study showed the number of food groups consumed on the previous day was associated with stunting. Children who consumed food from five or more food groups were less likely to be stunted than those who consumed fewer food groups (*23*). The present study also found that minimum meal frequency was not related to stunting.

This study examined the relation between dietary diversity and stunting. We found that a not diverse diet was a risk factor of stunting. In this study, dietary diversity was measured by considering minimum dietary diversity and minimum meal frequency which according to WHO IYCF indicators. It did not only measure quality but also quantity of complementary food that child consumed in the previous 3 mo before survey. The present study found that dietary diversity was associated with stunting in children aged 6–23 mo.

Provision of local complementary food which is processed in households and made from food ingredients available in the local area is recommended considering to the frequency and variation of complementary feeding. The frequency of breastfeeding is adjusted to the child's age and status of breasfeeding (*2*). The UNICEF recommended to feed 4 stars to meet the variety of foods at each meal. They are animal-source foods (flesh meats, eggs and dairy products) 1 star; staples (grains, roots and tubers) 2 stars; legumes and seeds 3 stars; vitamin A rich fruits and vegetables and other fruits and vegetables 4 stars (*8*).

Previous study stated that 4 of 7 food groups are defined as a minimum dietary diversity because the cut-off is effective for predicting the adequacy of micronutrients and ensuring at least one of the animal source foods (meat or eggs or milk) is consumed by child (*24*) which have key nutrients of zinc, protein, and calcium associated with linear growth (*23*). A study was conducted by Krasevec et al (*23*) recommended a cutoff of five or more food groups ensures that at least one type of animal souces was consumed. Some studies reported a strong association between consumption of animal source foods with a decreased risk of stunting (*9*, *24*). A study conducted in Province of Rwanda found that although most of the children were still breastfed, their complementary diet often was low in essential nutrients for growth and development because of a predominantly plant-based diet (*25*).

Stunting is a chronic malnutrition as a result of the cumulative low intake of both macronutrients and micronutrients and or the presence of chronic infections. The quality and quantity of complementary food can affect linear growth (*5*–*7*).

Animal source foods are rich in macronutrients and micronutrients that are useful for children's growth and development. Meat, fish and eggs are high-quality sources of protein. These foods also contain micronutrients that are important for linear growth including vitamin A, vitamin B-12, riboflavin, calcium, iron and zinc that are difficult to obtain in adequate quantities from plant source foods alone (*2*, *7*, *8*). Previous studies have shown a significant relationship between the level of iron and zinc adequacy with stunting in children aged 6–23 mo (*26*, *27*). A randomized controlled trial study demonstarted that 1 egg per day, starting early in complementary feeding from 6–9 mo and continuing for 6 mo, significantly improved linear growth and reduced stunting (*28*). Iron and zinc play an essential role in bone metabolism that are required for growth and also support the immune system. Zinc plays a role in the production of growth hormone. It is needed to increase Insulin Growth Factor I (IGF I) which will accelerate bone growth (*9*, *27*).

The present study indicated a significant difference in the daily consumption of other fruits and vegetable between stunted and non-stunted children. Proportion of stunted children who consumed other fruits and vegetables per day (17.1%) was two times lower than proportion of non-stunted children (37.2%). This different is thought to further strengthen the low absorption of micronutrients. Vegetables and fruits contain many essential vitamins and minerals that are important for health and metabolic processes in the body. Vegetables and fruits are food sources of vitamin C, vitamin B, and vitamin A. Consuming food sources of vitamin C along with food sources of iron can increase the absorption of iron in the body. In addition, vegetables and fruits contain antioxidants which are important to counteract free radicals (*2*). The daily consumption of meat/fish and eggs in stunted children was lower than not stunted children, whereas daily consumption of milk products in stunted children is similar to not-stunted children, although the differences of consumption were not significant.

In this study, dietary diversity also measured frequency complementary food of children in one day. The minimum meal frequency shows the quantity of complementary feeding to meet energy adequacy in breastfeed and non-breastfeed children aged 6–23 mo. Breastmilk is the most hygiene food and it contains important nutrients for children's growth. However, the amount of some micronutrients in breastmilk is insufficient for children's growth like iron and zinc (*2*).

Bivariate analysis showed there was association between father's height and stunting but in multivariate analysis there was not association after controlling for main variables (dietary diversity) and other covariates (child's age; education level of mother, parents' height, child's birth weight). The results of bivariate analysis support a study by Miko & Al-Rahmad (*29*) in the Aceh Besar District which found that there was a significant relationship between father's height and nutritional status of children based on height-for-age index. This study is differ from previous studies which found the father's height was not associated with stunting (*30*). The relationship may be related to genetic factors.

Linear growth is the result of an interaction of genetic factors (genes) and environmental factors. Length or height is hereditary from generation to generation. However, inheritance of gene height cannot be determined precisely because height can changes caused by environmental factors such as parenting, children's physical activity, family income, employment and education level of parents (*31*). If the parents are short due to lack of nutrients or disease, it is likely that the child can grow to normal height as long as the child is not exposed to other risk factors (*29*).

The present study found clearly highlights the importance of diversity and frequency for meal per day. A diverse diet was considered quality and quantity of complementary food. Daily consumption of food groups was measured by FFQ for past 3 mo period so that it can describe habit eating of child that related to chronic malnutrition like stunting.

The design of this study used a cross-sectional design that can not prove the causal relationship. Daily consumption information which was obtained from respondents, has potential source of recall bias. In addition, the determination of daily consumption for each type of food from each food group does not take into account the weight/portion of food to be considered as food consumed in one day. The portion of food that is considered "consumed" is a minimum of 15 g/d (*10*).

CONCLUSION

There was a significant association between dietary diversity and stunting. Poor dietary diversity is a risk factor for stunting in children aged 6–23 mo in the working area of the Mergangsan Health Center. Complementary feeding that consider minimum dietary diversity and minimum meal frequency is recommended. The Mergangsan Public Health Center can hold training for *cadres* about infant and young children feeding practices so that they can educate mothers during *Posyandu* or home visiting. The next study can conduct research about dietary diversity by considering the portion of complementary food.

Disclosure of state of COI

None of authors has a conflict of interest to report.

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