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Low dietary diversity is associated with stunting among children aged 8-23 months in stunting locus area, Yogyakarta

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ABSTRAK

Latar Belakang: *Stunting adalah kondisi balita mengalami gagal tumbuh dan kembang yang disebabkan oleh kekurangan gizi kronis dan penyakit infeksi berulang terutama pada 1.000 hari pertama kehidupan sehingga anak lebih pendek. Keanekaragaman pangan diartikan sebagai konsumsi berbagai jenis kelompok bahan makanan yang dapat memenuhi kebutuhan zat gizi bagi kesehatan yang optimal. Pola konsumsi makanan yang beranekaragam pada anak usia 6–23 bulan masih rendah*

Tujuan: *Mengetahui hubungan keanekaragaman pangan individu dengan kejadian stunting pada anak usia 8-23 bulan di Kecamatan Pajangan Kabupaten Bantul Yogyakarta.*

Metode: *Jenis penelitian ini adalah penelitian kuantitatif observasional dengan desain cross sectional. Variabel independen keanekaragaman pangan dan variabel dependen yaitu stunting. Teknik pengambilan sampel menggunakan purposive random sampling dengan total sampel sebanyak 167 anak usia 8-23 bulan dengan ibu/pengasuh sebagai responden. Pengambilan data dilakukan dengan cara obeservasi dan wawancara terstruktur menggunakan kuesioner. Pengambilan data meliputi pengukuran antropometri, food recall 24jam, dan kuesioner Individual Dietary Diversity Score (IDDS). Uji statistik bivariat menggunakan chi-square.*

Hasil: *Hasil penelitian menunjukkan bahwa prevalensi stunting adalah 32,3% dan 54,5% anak tidak memenuhi keberagaman makanan minimum. Terdapat hubungan yang signifikan antara keberagaman makanan pada pemberian makanan pendamping dan stunting (p=0,005, OR=2,558; 95%CI= 1,422-4,142). Selain itu, faktor lain yang berhubungan dengan keberagaman makanan adalah usia anak, status pekerjaan ibu, pendidikan ayah, pekerjaan ayah, dan pendapatan keluarga.*

Kesimpulan: *Terdapat hubungan antara keberagaman pangan dengan kejadian stunting pada anak usia 8-23 bulan di Kecamatan Pajangan, Kabupaten Bantul, Yogyakarta. Strategi peningkatan keberagaman pangan pada pemberian makanan pendamping ASI diperlukan untuk mencegah terjadinya malnutrisi pada anak.*

KATA KUNCI: *IDDS; MP-ASI; stunting*

ABSTRACT

Background: *Stunting is impaired growth and development that children experience, caused by poor nutrition during 1000 days of life. Dietary diversity is one of the core indicators for assessing diet quality and adequacy of complementary feeding.*
Objectives: *This study aimed to analyzed the relationship between dietary diversity and stunting among children aged 8-23 months in Pajangan District, Bantul Regency, Yogyakarta.*
Methods: *This was a quantitative observational cross-sectional study. Purposive random sampling was used to recruit a total of 167 children aged 8-23 months with their mothers/ caregivers as respondents. Individual dietary diversity was assessed by minimum dietary diversity with the consumption of 5 or more food groups of the total 7 food groups. Logistic regression, chi-square test, and descriptive statistics were used for data analysis.*
Results: *Results showed that prevalence of stunting was 32.3% and 54.5% of children did not meet the minimum dietary diversity. There was a significant relationship between dietary diversity on complementary feeding and stunting (p=0.005, OR=2.558; 95%CI= 1.422-4.142). Furthermore, other factors related to dietary diversity were child's age, mother's employment status, father's education, father's employment, and family income.*
Conclusions: *There was a relationship between dietary diversity and stunting among children aged 8-23 months in Pajangan District, Bantul Regency, Yogyakarta. Strategy to improve dietary diversity on complementary feeding are needed to prevent child malnutrition.*

KEYWORD*: dietary diversity; complementary feeding; stunting*

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INTRODUCTION

Stunting is a condition of children experiencing growth and development failure caused by chronic malnutrition, especially in the first 1,000 days of life, where children become shorter(1). According to the World Health Organisation (WHO), a child is considered stunted when the height-for-age z-score is less than minus two standard deviations based on growth standards(2). Stunting can have serious impacts, including short-term related to morbidity and mortality in toddlers, medium-term related to low intelligence and cognitive abilities, and long-term related to the quality of human resources and degenerative disease problems in adulthood(3,4). Globally, about one in four children under the age of five are stunted, and Indonesia is ranked fifth among southeast Asian countries with highest stunting prevalence (5). Indonesian nutritional status survey in 2022 showed that the prevalence of stunting in Indonesia was 21.6%. Meanwhile, the prevalence of stunting in Yogyakarta Province was 16.4% and Bantul Regency was the second highest stunting prevalence from five district in Yogyakarta Province with stunting prevalence 14.9% (6).

Stunting is caused by two direct causes: low nutrient intake and health status(7). Research shows that stunting is strongly associated with Individual dietary diversity in children. A child's dietary diversity score of less than four is 16.76 times more likely to be stunted than a child with a good dietary diversity score(8). There is no single food that contains complete nutrition for children older than six months, therefore consuming a variety of foods is expected to meet these nutrient needs(9). Based on the Basic Health Research 2018, the proportion of diverse food consumption in children 6-23 months in Indonesia was 46.6% with diverse food is measured based on 4 of the 7 types of food groups(10).

Parents play an important role in development child feeding practice(11). Research shows that unresponsive feeding practices such as pressuring children to eat and using food as a reward are associated with children refusing to eatand higher levels of picky eater behavior and

lower food attraction and food intake(12,13). There is a few research exists on the impact of picky eating on dietary diversity, but picky eaters have been shown to have less diversity and variety at 24-36 months or eat less of different types of food(14). Dietary diversity is also reflected in people's ability to buy food. Low economic conditions have a risk of stunting because it can illustrate the family's ability to fulfil nutritious food intake(15). Research shows that children from severely and moderately food insecure households have a higher risk of stunting than children living in food secure households(16).

According to the Food and Agriculture Organization of the United Nations (FAO), the Dietary Diversity Score (DDS) method is a simple method that is easy to implement and very effective in measuring differences in food consumption at the household and individual levels(17). Diversity of individual food consumption is assessed using the IDDS instrument. Results of the Food and Nutrition Vigilance System in Bantul District 2020 showed that one of the villages in Pajangan District, Guwosari Village was categorized as moderate risk in food insecurity areas(18,19). This study aimed to analyzed the relationship between dietary diversity and stunting among children aged 8-23 months in Pajangan District, Bantul Regency, Yogyakarta.

MATERIALS AND METHODS

This study was an observational quantitative research with a cross-sectional design. Data collection was conducted in Pajangan District, Bantul Regency, Yogyakarta on children aged 6-23 months from December 2022 to March 2023. Totally, 167 children aged 8-23 months were included in this study. The sampling technique used was purposive random sampling. Inclusion criteria were healthy children aged 8-23 months, had lived more than 3 months in the research area, and the children's mothers or caregivers who were willing to be research respondents in this study. Respondents who did not complete the questionnaire were excluded from the study.

Stunting was defined based on children's height at a specific age or height for age. Z-score was used to calculate the height for age indicator based on WHO growth guidelines. Stunting consists of two categories: not stunted (-2.0 SD) and stunting (< -3.0 SD to -2.0 SD). Height was taken using infant length board (Seca 417 infantometer) to the nearest 1 mm. Respondents were asked to report their children consumption in previous a day using multiple-pass 24-hours recall that adapted from Newcastle 85+ study, along with food photo book published by Ministry of Health in 2014 to help respondents in estimating the food portion (20,21). The IDDS form adapted from WHO and UNICEF in 2021 for were used for dietary diversity score measurement. Dietary diversity scores were taken from eight food groups, consisting of cereals and tubers; vitamin A-rich plant foods; other fruits and vegetables; animal meat; eggs; nuts; milk and its products; and breast milk. A score of 1 was given if the food group was consumed with a minimum food weight of 10 grams. Furthermore, the dietary diversity score was categorized high if the score of IDDS ≥5 and low if <5 (22,23).

Relationship between dietary diversity and stunting was analyzed by bivariate analysis with chi-square test using 95% confidence level. Ethical clearance was taken from Institutional Review Board of Research Ethics Commission of Alma Ata University Yogyakarta with number: KE/AA/XII/10982/EC/2022.

RESULTS AND DISCUSSIONS

Characteristics of Respondents

Based on **Table 1**, most of the children are aged 13-23 months (60.5%) , more than half of them were male (53.3%), majority of them (92.8%) were born with normal weight and 84.4% of the children were exclusively breastfed. Based on height-for-age, 32.3% of children were categorized as stunting. The age of most parents ranged from 30-39 years old. Most of the fathers' and mothers' education level was high school graduates. Most mothers' employment status was categorized as not working (69.5%), while most fathers worked as private employees (26.3%). Household monthly income was mostly below the Bantul Regency Regional Minimum Wage of IDR 2,066,438.82(24). There were 54 (32.3%) stunted children in Pajangan Sub-district, Bantul Regency, this prevalence was higher than national prevalence of stunting (21.6%)(6). Fulfillment of minimum dietary diversity (MDD) is one of the

priority programs to prevent stunting in children aged 6-23 months.

Results showed that 54.5% of children aged 8-23 months had diverse dietary diversity consumption, this proportion was higher than dietary diversity score in Indonesia (46.6%) (10). Similar research results in Bogor in 2020 stated that more than half of children aged 6-23 months (61.1%) had consumed 5 out of 9 types of food groups(25). Another study in Sedayu Sub-district, also showed that 62.4% of children consumed a diverse diet (8).

Table 1. Characteristics of Children (N=167)

Characteristics	Frequency (n)	%
Children's characteristic		
Age of Child		
8-12 months	66	39.5
13-23 months	101	60.5
Gender		
Male	89	53.3
Female	78	46.7
Birth Weight		
<2500 gram	12	7.2
≥2500 gram	155	92.8
Exclusive Breastfeeding		
Yes	141	84.4
No	26	15.6
Stunting		
Stunting	54	32.3
Not stunting	113	67.7
Minimum Dietary Diversity		
Diverse (IDDS ≥5)	91	54.5
Not diverse (IDDS <5)	76	45.5
Maternal characteristic		
Mother's age		
<20 years	1	0.6
20-29 years	72	43.1
30-39 years	79	47.3
40-49 years	15	9.0
Mother's Education		
Did not complete elementary school	3	1.8
Elementary school	10	6.0
Junior high school	27	16.2
High school	95	56.9
Diploma	15	9.0
Undergraduate/ higher	17	10.2
Mother's Occupation		
Farmer	1	0.6
Laborer	10	6.0
Private employee	18	10.8
Civil servant / military / police	2	1.2
Self-employed	20	12.0
Housewife	116	69.5
Paternal characteristic		
Father's age		
20-29 years	54	32.8
30-39 years	67	40.6
40-49 years	39	23.6
≥50 years	5	3.0
Father's education		
Did not complete elementary school	2	1.2

Characteristics	Frequency (n)	%
Elementary school	15	9.1
Junior high school	47	28.5
High school	84	50.9
Diploma	3	1.8
Undergraduate/ higher	14	8.5
Father's Occupation		
Farmer	4	2.4
Factory laborer	35	21.0
Daily Laborer	22	13.2
Farm laborer	15	9.0
Private employee	44	26.3
Public Servant / Army/ Police	5	3.0
Entrepreneur	39	23.4
Not working	2	1.2
Monthly Household Income		
<Regional Minimum Wages	94	56.3
≥Regional Minimum Wages	73	43.7

Source: Primary Data

In this study (**Figure 1**), non-stunting children had the highest percentage of meet minimum dietary diversity (DDS=5) with an average score of 4.73. The results of previous research on children aged 6-23 months showed a significant linear trend between the level of dietary diversity scores in complementary feeding and risk of stunting. Increasing daily consumption of various food groups can reduce the risk of stunting in children (26). Research in East Java also showed an association between high dietary diversity scores and low probability of stunting (27).

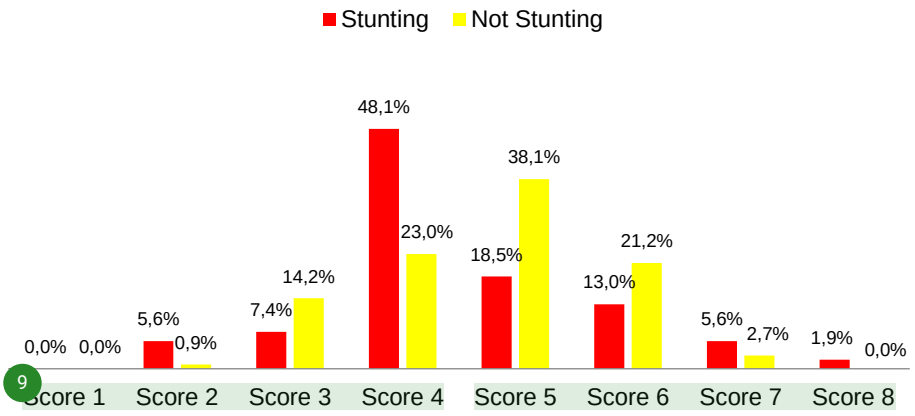

Figure 1. Percentage of stunting by dietary diversity score

Figure 2 showed that the highest percentage of food group consumption was cereals and tubers food group, this was due to rice was main commodity and staple food in Bantul District(28). The results of this analysis was similar to several previous studies which state that the types of food most consumed by toddlers in Indonesia are cereals, roots, and tubers, where almost all children consume these food groups (15,29,30). In this study, most children consumed instant baby porridge. Continuous feeding of instant baby porridge should be avoided due to preservatives contained (31). This study showed that the difference in the percentage meat consumption between stunted and non-sunting children was only 5.7%, but the difference in egg and milk consumption was quite far, at 13.2% and 13.6%, respectively. This could be because stunting children received information from health workers to consume more animal protein. In addition, one of the weaknesses in using DDS is that it only calculates the number of types of food

groups consumed without considering the portion and amount eaten, so there is a possibility that the children consumed diverse foods but not in sufficient quantity(32). Commercial infant formula is usually available as a milk powder that has to be reconstituted with water. The instructions on the tin or carton for preparing the formula should be followed exactly to ensure that it is not too concentrated or diluted. Overconcentration can overload the infant with salts and protein, which can be dangerous, and overdilution can lead to malnutrition(33). For example, children often drink milk but the consistency is not measured by this questionnaire. Perhaps stunted children consume milk that's too watery, resulting in lower protein intake.

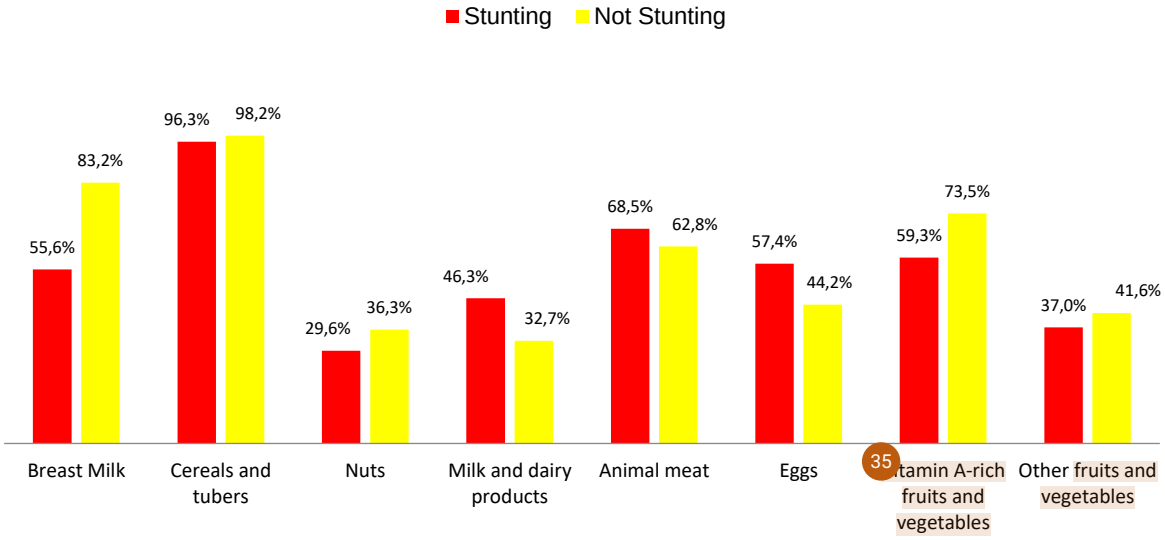

Figure 1. Percentage of stunting by food group

Based on the results of chi-square analysis, there was a significant relationship between individual dietary diversity and stunting in Pajangan District. Children who were not stunting had 2.55 odds consumed consumed diverse diet. This was similar to previous research where children who had non-diverse consumption patterns are at risk of stunting 3 times greater than children with diverse consumption patterns (34,35). Table 2 showed an association between child age and dietary diversity. Children aged 13-23 months ate a more diverse diet (p=0.004, OR=2.498). In accordance with Sarait and Achadi's research, MDD achievement was better in older children. Children aged 18-23 months had a 5.7 times chance of achieving MDD and children aged 12-17 months 1.3 times, compared to infants aged 6-11 months(36). As children get older, the food provided should be more diverse, nutritious and balanced, thus supporting the nutritional status and growth and development of children. Proper nutrition management is associated with quality child nutrition, which in turn improves nutritional adequacy(37). The results of the chi-square test showed an association between maternal employment status and children's dietary diversity (p-value = 0.036, OR = 2.070). Mothers who do not work tend to have children who consume non-diverse foods (50.9%), while working mothers tend to have children who consume diverse foods (66.7%). The results of this study are in line with research in the Philippines which states that more children have adequate MDD in working mothers (38). Hardinsyah mentioned that one of the impacts when mothers work is an increase in the food consumed quality by households (39). The results of chi-square analysis showed that there was a relationship between father's education level and children's dietary diversity (P=value 0.0001, OR= 4.087). Fathers with less than 9 years of education are 4 times more likely to have children who consume non-diverse foods. The results of this study are in line with Sirait and Achadi's research that fathers who have high education had a 1.6 times chance of their children consumed

diverse foods (36). A high school educational background is a relatively high education, so fathers can fulfil their role as head of the family. The activities carried out are related to meeting the food and non-food needs of the family through income (40).

Table 2. Factors related to children's dietary diversity on complementary feeding (N=167)

Characteristics	Not diverse		Diverse		p-value	OR	95% CI
	N	%	n	%			
Children's characteristic							
Age							
8-12 months	39	59.1	27	40.9		1	
13-23 months	37	36.6	64	63.4	0.004*	2.498	1.222-2.912
Gender							
Male	42	47.2	47	52.8		1	
Famale	34	43.6	44	56.4	0.641	1.156	0.231-1.432
Nutritional status (Height for Age)							
Stunting	33	43.4	21	23.1		1	
Not stunting	43	56.6	70	76.9	0.005*	2.558	1.422-4.142
Mother's characteristic							
Mother's Age							
<20 years	1	0.6	0	0	0.115	2.484	0.111-3.011
20-29 years	72	43.1				1	
Mother's Education							
Low	9	69.2	4	30.8	0.074	2.922	0.055-4.214
High	67	43.5	87	56.5		1	
Mother's Occupation							
Not working	59	50.9	57	49.1		1	
Working	17	33.3	34	66.7	0.036*	2.070	1.347-3.268
Father's Age							
<33 years	30	39.5	46	60.5	0.154	0.638	0.145-2.467
≥33 years	45	50.6	44	49.4		1	
Fathers Education							
Low	43	66.2	22	33.8		1	
High	33	32.4	69	67.6	0.0001*	4.087	2.559-6.123
Father Occupation							
Not working / farm laborer / factory / daily / self-employed / farmer	61	51.7	57	48.3		1	
Private employee / civil servant / military / police officer	15	30.6	34	69.4	0.013*	2.426	1.946-3.782
Household Income							
<Regional Minimum Wages	52	55.3	42	44.7		1	
≥Regional Minimum Wages	24	32.9	49	67.1	0.004*	2.528	2.111-4.681

In this study, fathers' occupations such as laborers, farmers and self-employed were expected to earn irregular income, which will affect the purchasing power of food and will affect children's growth. Chi-square analysis showed that there was an association between father's occupation and children's dietary diversity. Based on **Table 2**, it was known that fathers who had a fixed income such as private employees, civil servants, military and police tend to had 2.4 times odd their children consumed diverse foods (69.4%). The results showed that there was a relationship between household income and children's dietary diversity. Families with high

income level had a 2.5 times odds of their children consumed diverse diet. The high household income can meet household needs, especially diverse food needs, so that toddler food intake is sufficient. Household who have economic access and fulfillment of sufficient needs will affect the improvement in the quality of food consumption of household members which is a picture of good nutritional behavior (41).

LIMITATIONS OF STUDY

The study used purposive sampling due to poor road access to the research area. This might cause less representative of the population studied. Furthermore, dietary diversity score only counts the number of types of food groups consumed without considering the portion and amount eaten, so there is a possibility that the children consume a variety of foods but not in sufficient quantity.

CONCLUSIONS AND RECOMMENDATIONS

The prevalence of stunting in Pajangan District, Bantul Regency, Yogyakarta Province was 32.3% and 54.5% children consumed diverse diet. The results of the analysis showed that there was a significant relationship between dietary diversity and stunting (p=0.005, OR=2.558; 95%CI= 1.422-4.142). Strategy to improve dietary diversity on complementary feeding are needed to prevent malnutrition. However, maternal and paternal employment status played important role to increase dietary diversity by ensuring household income level. High household income level will increase purchasing power and accessibility to diverse foods on complementary feeding.

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