

Correlation Between Diet History and Nutritional Status of Children Aged 24–59 Months in Tarumajaya, Bekasi in 2019

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ABSTRACT

This study aimed to analyze the correlation between diet history and the nutritional status of pre-school children. This was an analytical observational study using a cross-sectional design. Samples were 96 children aged 24–59 months in Tarumajaya, Bekasi, West Java. Diet history was obtained from questionnaires containing history of breastfeeding and diet since the infancy period. The children's heights were measured using a microtoise stature meter. Subjects were considered stunted if their Height-for-Age Z-score was minus 2 or lower according to WHO Child Growth Standard. Data was analyzed using Fisher's exact test. Out of the 96 children, 16 (16.7%) were stunted. There were 80 (83.3%) children who received exclusive breastfeeding, 51 (53.1%) who received an appropriate frequency of meals, 78 (81.3%) who met the minimum dietary diversity, and 29 (30.2%) who had a minimum acceptable diet. Fisher's exact test showed that dietary diversity was a significant factor for stunted children ($p < 0.001$).

Keywords: child nutrition, exclusive breastfeeding, stunted growth, dietary diversity, minimum acceptable diet

INTRODUCTION

Stunting is a complex condition that impaired growth and development of children due to poor nutrition, repeated infection, and inadequate psychosocial stimulation that happened in their first 1,000 days of life. Studies show there is a strong association between stunting and non-communicable diseases later in life, low learning capacity, low productivity, higher morbidity and mortality risks (Leroy & Frongillo 2019).

Children are defined as stunted if their height-for-age is more than two standard deviations below the WHO Child Growth Standards median (WHO 2017). The incidence of stunting is related to many factors, including the inadequacy of the quality and quantity of the child's diet chronically (Aguayo & Menon 2016).

The World Health Organization (WHO) and the Indonesian Paediatric Society (IDAI) recommend giving a child exclusive breastfeeding for the first 6 months of life, which means no other food or drink except breast milk, with the exception of rehydration solutions, drops and

syrups (vitamins, minerals and medicines). Breast milk contains all the nutrients that a growing infant needs, and also increase its immune system (WHO 2017; IDAI 2018).

After the infant reaches the age of 6 months, their nutrient requirements start to go beyond what breast milk contains. At this point, parents need to start introducing food and drink that is nutritionally adequate and safe, while still feeding them breastmilk up to the age of two years or beyond. Supplementary foods should be added to the diet and there is a gradual progression in the variety, quantity, and the consistency of foods (Bégin & Aguayo 2017). At the age of 6–8 months, infants should be given these additional meals 2–3 times a day. As they get older up to 24 months, they should be fed 3–4 times a day, supplemented with healthy snacks once or twice a day as needed. These meals need to be nutritious enough to meet their daily requirements (WHO 2003).

Foods can be grouped into 7 standard groups, those are: 1) grains, roots and tubers; 2) legumes and nuts; 3) dairy products; 4) flesh foods, 5) eggs; 6) vitamin-A rich fruits and

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vegetables; 7) other fruits and vegetables. A diverse diet is important for children to meet their dietary requirements. Dietary diversity ensures adequate nutrient intakes that could reflect the children's nutritional status (Sealey-Potts & Potts 2014). A "minimum dietary diversity" of the complementary feeding should contain 4 or more food groups (WHO 2003; IDAI 2018).

Children are considered to receive a Minimum Acceptable Diet (MAD) if they meet both the minimum meal frequency and minimum dietary diversity. The prevalence of MAD is still concerningly low in low and middle income countries, such as in North West Ethiopia (12.6%) (Birie *et al.* 2021), Nepal, India (30.1%) (Sapkota *et al.* 2022) and Indonesia (61.8%) (Pranita *et al.* 2023).

The 6–23 months of age period is very important for long-term health. Inappropriate feeding can affect growth, organ development, and metabolism, which can have long-term programming effects on development and health (Bégin & Aguayo 2017). There is now broad agreement that most stunting happens from conception through the first two years of life, although additional linear growth faltering may still happen after the first two years of life (Aguayo & Menon 2016). Complementary feeding plays a major role in this period, so it is a critical opportunity to prevent all forms of malnutrition, including stunting, by improving the quality of complementary feeding (Beal *et al.* 2018). Because of this rapid growth period, these first 2 years of life are more vulnerable to nutritional inadequacies than other age groups. Chronic or persistent nutritional deprivation in this period causes a disruption in a child's linear growth, which will become clearly visible as the child reaches 2 years of age. That is why in this study we used height-for-age z-score to assess the nutritional status of children aged 24–59 months.

Apart from being clearly visible manifesting in the form of a short stature, stunting can be formally detected using the height-for-age z-score. This parameter allows us to detect nutritional deprivation in a way that is applicable for chronic or persistent nutritional deprivation.

The prevalence of stunting among children under five years old has declined gradually from 33.0% in 2000 to 22.3% in 2022 (UNICEF 2022). However, even if the current trend continues, there would be 30 million stunted children above

the global WHO target by 2025 (WHO 2017). According to recent data published by Indonesian Health Status Survey (*Survei Status Gizi Indonesia*, SSGI), the number of stunted children in Indonesia is 21.6%, while the prevalence in the province of West Java is 20.2% (SSGI 2022). Nowadays, Indonesia is the country with the third highest prevalence of child stunting in Southeast Asia (Aditianti *et al.* 2020).

Identifying a child's diet history and investigating its relation to the child's nutritional status is crucial and can play a big role in improving the child's quality of health and avoid incidences of malnutrition, including stunting.

This study aimed to investigate the diet history, including the breastfeeding practices, meals frequency, dietary diversity, and minimum acceptable diet, and their relation to the nutritional status of children aged 24–59 months in Tarumajaya, Bekasi, West Java, Indonesia.

METHODS

Design, location, and time

This was an analytical observational study with a cross-sectional design. It was carried out in Tarumajaya subdistrict, Bekasi Regency, West Java in December 2019. Children aged 24–59 months and their mothers or guardians were involved in this study. The study was approved by the institutional Ethics Committee of the Faculty of Medicine and Health, Universitas Muhammadiyah Jakarta letter number 139A/PE/KE/FKK-UMJ/XI/2019.

Sampling

Using the cluster sampling technique, children aged 24–59 months old with their mothers/guardians who lived in 4 (out of 8) villages in Tarumajaya subdistrict, Bekasi Regency, West Java, were chosen. Sample size was determined using the Lemeshow formulation (Sastroasmoro 2022). The sample size was 96 children. The inclusion criteria were children 24–59 months of age residing in the area, without physical and mental disorders, with mothers or guardians who were willing to participate in the study and sign the informed consent form. Respondents are excluded if they didn't follow through the entire study, such as not filling in the questionnaire completely or not participating in the anthropometric measurements.

Data collection

The materials and tools involved in this study are: 1) Microtoise Stature Meter to measure the children's height; 2) Questionnaire on the identity of the mother and child, their history of breastfeeding practices, the earliest age of complementary feeding to breast milk; 3) The Food Frequency Questionnaire (FFQ) consisting of a list of foods from 7 standard food groups and a scale indicating the frequency of consumption of that food, that is never, less than once per month, 1–3 times per month, 1–2 times per week, 3–4 times per week, 1–2 times per day, and 3 times per day; 4) The WHO Child Growth Standard for girls/ boys: birth to 5 years (Z-scores).

Height measurement for each participant was determined using standardized techniques. The subject should stand erect, without shoes, with weight equally distributed on both feet and heels together and touching the vertical board. The subject should stand up as straight as possible with the heels, back, shoulders, and head all touching the wall. Their arms should hang freely at the sides of the trunk with palms facing the thighs. Looking straight ahead so that the line of vision is perpendicular to the body, the subject should take a deep breath and hold that position while the horizontal headboard is brought down firmly on the top of the head. Their stature is recorded to the nearest 0.1 cm (Mitchell 2003). Their height was compared to age using WHO Child Growth Standard to determine nutritional status of children. A child was considered stunted when their Height-for-Age Z-score is minus 2 or lower (WHO 2009).

The history of the participant's breastfeeding practices and their earliest age of complementary feeding were retrieved through a questionnaire given to the mother. The frequency and diversity of the supplementary feeding were retrieved through a Food Frequency Questionnaire (FFQ).

The child is considered to have had exclusive breastfeeding if they had consumed only breast milk for their first 6 months of life. The child is considered to have received the Minimum Meal Frequency (MMF) if they had a minimum number of meals as recommended by WHO and IDAI, according to the child's age. The child is considered to have had the Minimum Dietary Diversity (MDD) if the complementary feeding contained 4 out of 7 standard food groups. The child

is considered to have had a Minimum Acceptable Diet (MAD) if they had both minimum meal frequency and minimum dietary diversity.

Data analysis

Univariate analyses were conducted to obtain an overview of the frequency distribution of each variable studied. The correlations between variables were analysed with Fisher's exact test. Results were presented in tables. Statistical analyses were conducted using R version 3.2.1. The differences were considered significant when $p < 0.05$.

RESULTS AND DISCUSSION

Characteristics from the study participants can be seen in Table 1 and the characteristics of children based on the nutritional status can be seen in Table 2.

There were 96 children who participated in this study consisting of 49 boys (51%) and 47 girls (49%). They ranged between 30–50 months of age. The majority of the respondents (83.3%) were not stunted and 16.7% were stunted. Amongst the stunted children there were 9 boys and 7 girls and there were no difference between the genders ($p = 0.648$) and there is no difference. This prevalence rate is higher than the one included in Bekasi Health Profile in 2021, which is 4.2% (DKK Bekasi 2022). However, this value is close to the published prevalence rate of stunting children in West Java in 2022, 20.2%, and the national rate of 21.6% (SSGI 2022). According to the WHO, a child stunting prevalence of over 20% qualifies it as a health problem in a particular region (WHO 2017)

Out of 96 respondents, 80 children (83.3%) were claimed to have had exclusive breastfeeding. This achievement was beyond WHO's Global Nutrition Monitoring Framework target of over 50% of under-6-month infants receiving exclusive breastfeeding (WHO 2017). Out of the 80 children, 13 (16.7%) children were stunted. Meanwhile, 15 from 18 (83.3%) children that did not have exclusive breastfeeding were not stunted. Based on Fisher's exact test, there was not a significant correlation between exclusive breastfeeding history and nutritional status of children aged 24–59 months old ($p = 1.000$). Children who were not exclusively breastfed were 3.1 times more at risk of stunting than those

Table 1. Characteristics of the study participants (n=96)

Variable	n (%)
Sex of the child	
Male	49 (51)
Female	47 (49)
Age (months) (median [IQR])	38.5 [30–50]
Nutritional status	
Stunted	16 (16.7)
Not-stunted	80 (83.3)
Exclusive breastfeeding history	
Yes	80 (83.3)
No	16 (16.7)
Minimum meal frequency	
Yes	51 (53.1)
No	45 (46.9)
Minimum dietary diversity	
Yes	78 (81.2)
No	18 (18.2)
Minimum acceptable diet	
Yes	29 (30.2)
No	67 (69.8)

exclusively breastfed (Sari *et al.* 2021). Exclusive breastfeeding is one of the frameworks for action to reduce stunting (WHO 2014).

Out of 96 respondents, 51 (53.1%) children met the minimum meal frequency. Data published by WHO shows that half of all children in low and middle-income countries are not receiving the minimum meal frequency (WHO 2003). Meeting the nutrient demands for an infant in this complementary feeding period requires some strategizing, because while their nutrient needs reach a lifetime peak, their small stature can only ingest a small amount (WHO 2003). Out of the 51 children that met the minimum meal frequency, 5 (9.8%) were stunted. Meanwhile, 34 from 45 (75.5%) children who did not meet the minimum meal frequency were not stunted. We found that there was no significant correlation between children who met the minimum meal frequency to the incidence of stunting ($p=0.403$).

Most of the children (81.2%) consumed food items from 4 food groups from 6 until 24 months old, indicating that they met the minimum dietary diversity. This result is in line with a previous study conducted in Trinidad and Tobago in which the majority (80.38%) of their respondents met a minimum dietary diversity by consuming a minimum of 4 food groups. Fruits, vegetables and legumes were the food groups least consumed by the children, while the most consumed by the participants were staples, dairy

Table 2. Characteristics of children aged 24–59 months who were stunted based on nutritional status (n=96)

Variable	Stunted (n=16)	Not-stunted (n=80)	<i>p</i>
	n (%)	n (%)	
Total			
Sex			0.648
Male	9 (18.4)	40 (81.6)	
Female	7 (14.9)	40 (85.1)	
Exclusive breastfeeding history			1.000
Yes	13 (16.7)	65 (83.3)	
No	3 (16.7)	15 (83.3)	
Minimum meal frequency			0.403
Yes	5 (9.8)	46 (90.2)	
No	11 (24.4)	34 (75.6)	
Minimum dietary diversity			0.001*
Yes	7 (9.0)	71 (91.0)	
No	9 (50.0)	9 (50.0)	
Minimum acceptable diet			0.136
Yes	2 (6.9)	27 (93.1)	
No	14 (20.9)	53 (79.1)	

* $p<0.05$

and meat products (Sealey-Potts & Potts 2014). Within the 78 children that meet the minimum dietary diversity, 7 were stunted. Meanwhile, 9 out of 18 children that did not meet the minimum dietary diversity were not stunted. We found a significant correlation between these two variables ($p < 0.001$). A higher variety of food being consumed leads to a more complete set of nutrients being ingested.

Out of 96 respondents, only 29 (30.2%) children met both the minimum meal frequency and the minimum dietary diversity (minimum acceptable diet). However, 2 out of 29 (6.9%) children that met the minimum acceptable diet and 53 out of 67 children (79.1%) that did not meet the minimum acceptable diet were found to be in good nutritional status. We did not find a significant correlation between these two variables ($p = 0.136$).

A study carried out in Central Jakarta in 2019 found the prevalence of stunting children aged 6–23 months to be 26.0% and a minimum acceptable diet was only met by 31.6% of samples. This study revealed that minimum acceptable diet and family income were significant factors for stunting among children aged 6–23 months. (Andina & Achadi 2021). Another study conducted in Odisha, India, found only 8.4% children aged 6–23 months were fed MAD, and children whose mother was exposed to any mass media had a higher chance of MAD feeding (Acharya *et al.* 2021).

Recently published data showed that five out of six children are not receiving a minimum acceptable diet. The quality of the diet is so closely associated with children's nutritional status that children who are fed at least a minimum acceptable diet are less likely to be stunted or underweight (UNICEF 2022). That being said, nutrition is not the only factor that might affect the growth of a child. Hereditary factors, hormones, and a child's environment are also important factors to analyse.

There were some limitations to this study. This is a descriptive study, meaning it does not analyse cause and effect. The usage of FFQ heavily relies on each respondent's memory on what kind of diet was given to the child. Finally, the sample is children of 24–59 months of age, which is a large range. This might cause the respondents to have forgotten what kind of diet they provided during the infant's earlier stages.

CONCLUSION

The number of children who received exclusive breastfeeding is high but only a small number of children received a minimum acceptable diet. From bivariate analysis, dietary diversity is a significant factor in the prevalence of stunting.

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DECLARATION OF CONFLICT OF INTERESTS

The authors declare no conflict of interest.

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