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# Quality of Complementary Food for Child Growth in Limo District, Depok City, West Java, Indonesia

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# Abstract:

Background:

Stunting is a form of growth faltering due to accumulation of nutrient insufficiency that lasts from pregnancy to 24 months of age. This situation is getting worse if the child does not achieve catch-up growth (catch up growth) is adequate. Stunting can be caused by a lack of awareness of the mother in the regulation and quality of food provided to the baby. Research shows that parents who have poor nutritionally-conscious behaviors have the opportunity to increase the risk of stunting in toddlers 1.22 times compared to parents who have good nutritional awareness behaviors.

Objective:

The purpose of this study was to determine the relation between quality of complementary food with child growth. The research hypothesis is that food quality that meets nutrients can avoid the risk of stunting in infants. Method:

The study took place in Limo Districk, Depok City. The research design is a case control study. The inclusion criteria were having an apparently healthy young child (12-23 months of age), didn't have any chronic disease, and living in the study area with no intention to leave until the study ends. Cases were under-aged 12-23 months with a TB / U index with z scores <-2 SD, while controls were under-two with TB / U index with z scores of -2 SD to + 2SD. The sample size was calculated from power analyses calculated to detect a medium effect size (0.5 standard deviation difference between means (1-tailed), with  $\alpha = 0.05$  and power of 0.80 to allow comparison of 2 groups in one or more of the outcomes considered (e.g. stunting). This resulted in a sample size of 99 that was augmented to 110 to allow 10% nonresponse rate The length/height and weight of the children were measured using length board or microtoise with a capacity of 200 cm and a level of accuracy of 0.1 cm while measurements of body weight using dacin, then the z height score according to age (TB / U) was calculated using WHO antro 2005 software. Data analysis was performed univariate, bivariate and multivariate with multiple logistic regression by using of Nutrsurvey application to process food recall and Stata 16 results for data analysis.

Result:

Bivariate test results showed that there was a relation between the quality of the complementary food with child growth.

Conclusion:

The quality of complementary food is associated with child growth.

Recommendation:

It is suggested to provide clear information about the types of food that toddlers need to consume to prevent stunting

Keyword: Complementary food, child growth, stunting

# 1. Background

Children are the nation's assets that will become leaders in the future. Therefore, children need to be prepared so that they can grow and develop optimally. Growth and development in infancy determines subsequent growth and development into adulthood (World Health Organization, 2001).

The 6-24 month age period is one of the most critical periods for children's growth and development (Victora, De Onis, Hallal, Blössner, & Shrimpton, 2010), due to the high demand for nutrition coupled with limited quality and quantity of complementary foods. Complementary feeding refers to the timely, safe and nutritious introduction of food while continuing to provide breast milk (WHO, 2003). After a child is two years old, it will be very difficult to correct the

impact of malnutrition on children because some of the disorders that arise can be permanent (Dewey & Adu-afarwuah, 2008).

Growth disorders in infants are measured by the weight and length of infants that are not suitable for their age when compared to the standard WHO-MGRS (Multicentre Growth Reference Study) 2006. These growth disorders are classified as stunting (length or height less than age), underweight (less weight compared to age), and wasting (less weight compared to height). Indicators used to identify stunting toddlers are based on the TB / U index according to the standard WHO child growth standard with stunting criteria if the z score is TB score / U <-2 Standard Deviation (Picauly & Toy, 2013).

The 2013 Riskesdas report shows an increase in the prevalence of stunting under five from 36.8% in 2010 to 37.2% in 2013. The prevalence of stunting events is higher compared to other nutritional problems such as malnutrition (19.6%), thin (6.8) %) and overweight (11.9%). Compared to ASEAN countries, the prevalence of stunting in Indonesia is in the high prevalence group, as is Cambodia and Myanmar (Bloem et al., 2013). Of the 556 million children under five in developing countries 178 million children (32%) short stature and 19 million very thin children (<-3SD) and 3.5 million children die every year.

Stunting is a form of growth faltering due to accumulation of nutrient insufficiency that starts from pregnancy to 24 months of age (Bloem et al., 2013; Hoffman, Sawaya, Verreschi, Tucker, & Roberts, 2000). This situation is even worse if the child does not reach an adequate catch-up growth. (Kusharisupeni, n.d.; Picauly & Toy, 2013)Stunting is a problem because it can cause a slowdown in improving cognitive abilities on an ongoing basis (Kar, Rao, & Chandramouli, 2008). This will have an impact on their intellectual abilities and productivity as adults later (Heckman, 2006; Perkins et al., 2017; Pradhan, Sahn, & Younger, 2003; Walker, Chang, Powell, & Grantham-McGregor, 2005). Stunting weight gain and height of children especially aged 6-18 months are closely related to cognitive development scores at 24 months of age (Georgiadis et al., 2017; Scharf et al., 2018).

Many factors cause the high incidence of stunting in toddlers in Indonesia, including the problem of short children being ignored and recognized by Indonesian people (Unicef, 2012). The community does not realize that short children are a problem, because short children in the community are seen as children with normal activities, unlike thin children (malnutrition) that must be addressed immediately. In addition, stunting can also be caused by a lack of awareness of the mother in the regulation and quality of food provided to the baby. Research shows that parents who have poor nutritionally-conscious behaviors have the opportunity to increase the risk of stunting in toddlers 1.22 times compared to parents who have good nutritional awareness behaviors (Hariyadi & Ekayanti, 2011). The results of the East Nusa Tenggara study show that the role of mothers as "gate keepers" in maintaining household consumption and nutritional status is very prominent. The role can be seen from the influence of maternal nutrition knowledge, access to nutrition and health information, nutrition practices and maternal health and allocation of food and non-food expenditure (income) (Picauly & Toy, 2013; Riyadi, Martianto, Hastuti, Damayanthi, & Murtilaksono, 2011).

After more than 6 (six) months of age, the fulfillment of energy from breast milk has decreased to 70% in infants aged 6-12 months and 30% in children aged 12-23 months. Based on 2014 Total Diet Survey (SDT) data, it is known that more than half of children under five (55.7%) have less energy intake than the Recommended Dietary Allowances(Kemenkes, 2017). Therefore, after more than 6 (six) months of infants and children should be given appropriate complementary feeding (MP-ASI) to meet the needs of adequate nutrients both macro and micro nutrients to avoid or minimize the risk of stunting in children.

Complementary foods (MP-ASI) are foods that are given to infants after the age of 6 months or based on medical indications, until the child is 24 months old to achieve adequate nutrition. Complementary foods are not the main food, but supplementary foods besides breast milk, at least until the baby is 24 months old (Corkins et al., 2016). Good quality and quantity of MP-ASI is an important component in food because they contain sources of macro and micro nutrients that play a role in linear growth. WHO suggest to increase the frequency of feeding: 2-3 meals a day for infants aged 6-8 months and 3-4 times a day for infants aged 9-23 months, with 1-2 additional snacks (WHO, 2009). Feeding high in Protein, Calcium, Vitamin A and Zinc can spur children's height. The provision of adequate nutrition in this group affects the normal growth patterns so that they can catch up (Dewey & Adu-afarwuah, 2008).

The purpose of this study was to determine the quality of complementary foods in increasing height growth in infants. The research hypothesis is that quality of complementary food is associated with child growth.

#### 2. Subjects and Methods

#### 2.1. Study Area and Participants

The study took place in Limo Districk, Depok City. The research design is a case control study. The inclusion criteria were having an apparently healthy young child (12-23 months of age), didn't have any chronic disease, and living in the study area with no intention to leave until the study ends. Cases were under-aged 12-23 months with a TB / U index with z scores <-2 SD, while controls were under-two with TB / U index with z scores of -2 SD to + 2SD. The sample size was calculated from power analyses calculated to detect a medium effect size (0.5 standard deviation difference between means (1-tailed), with  $\alpha$  = 0.05 and power of 0.80 to allow comparison of 2 groups in one or more of the outcomes considered (e.g. stunting). This resulted in a sample size of 99 that was augmented to 110 to allow 10% nonresponse rate.

# 2.2. Socio-Demographic Characteristics

Questions on the socio-demographic characteristics of the caregivers were asked through face-to-face interviews. The questionnaire included questions on characteristics of the child (age, birth weight, length of birth, and gender), history of disease, age, income, number of family members, exclusive breastfeeding, and parents' education.

#### 2.3. The Quality and Quantity of Complementary Feeding

Food consumption using 24-hour food recall is processed with a nutrition survey program. Food consumption was used to determine the quality and quantity of complementary feeding. The quality and quantity of complementary feeding were coded into ten categories: intake of macronutrient (energy and protein), intake of micronutrients (vitamin A, vitamin C, zinc, iron, calcium), frequency of complementary feeding, dietary diversity, and timely introduction to complementary feeding and negative that it was aversive, intrusive or interrupted feeding. Data collection was obtained through interviews, observations of mothers and families.

#### 2.4. Anthropometric Measurements

The length/height and weight of the children were measured using length board or microtoise with a capacity of 200 cm and a level of accuracy of 0.1 cm while measurements of body weight using dacin. All anthropometric measurements were made by the same person to avoid inter-examiner errors. For the children, Z-scores for length-for-age (LAZ), weight-for-age (WAZ) and weight-for-length (WLZ) were calculated using WHO child growth standards using the software WHO Anthro 2007.

# 2.5. Statistical Analysis

Independent t test and Mann-Whitey non-parametric tests were performed to detect differences in mean values between groups. Categorical data were analyzed using Fisher's Exact test. Bivariate correlation tests between predictor variables and outcome (growth and LAZ) were performed. Differences between two means were considered statistically significant for p values < 0.05. Multivariate analysis was used multiple logistic regression to find out the main determinants of child growth.

#### 3. Result

# 3.1. Socio-demographics Characteristics

More than 50% of the study participants were giving exclusive breastfeeding and most of them were giving breastfeeding initiation (> 75%). The proportion of family with good income was higher than the low-income family (58%). The average years of mothers' schooling were eleven years. The proportion of female children was higher than male (57%).

Variables	Mean±SD/(%)			
Mother's year of schooling	11.34±3.075			
Mother age (years)	30.54±6.074			
Good income	58.2			
Number of family numbers	4.16±1.082			
Exclusive breastfeeding	65			
Early breastfeeding initiation	82			
Child age (months)	17.52±3.604			
Birth weight	3023.77±385.577			
Birth length	48.177±2.0783			
Proportion of female children	57%			

Table 1: Socio-Demographic Characteristics (N = 110) in Limo District Depok, West Java

# 3.2. The Quality of Complementary Feeding

Timely introduction of complementary foods (6 months) was 59% and 66% of the children were consuming at least four food groups. Sixty seven percent were fed at least three times a day. In general, children who consume macronutrient and micronutrient in appropriate amount, were less than 50%.

Complementary Feeding	(%)
Timely introduction to CF (6 months)	59
Dietary diversity	66
Intake of micronutrients	
Vitamin A	39
Zinc	39
Iron	24
Vitamin C	35
Calcium	27
Intake of macronutrients	
Energy	25
Protein	62
Frequency of complementary feeding	67

Table 2: The Quality of Complementary Feeding (N = 110) in Limo District Depok, West Java

#### 3.3. Bivariate Analysis

The analysis showed that dietary diversity, frequency of complementary feeding, energy intake, protein intake, vitamin A intake, iron intake, calcium intake, zinc intake, and vitamin C intake were related to child growth. Only timely introduction to CF (6 months) is not related to the growth of children under five

Variable	Stunting	Normal	p-value	
Dietary diversity				
1. Less than 4 groups of food	30	7	0.000	
2. $\geq$ 4 groups of food	27	46		
Fed ≥ 3 times a day				
1. Less than 3 times a day	28	8	0.000	
2. 3-4 times a day	29	45		
Timely introduction to CF (6 months)				
1. < sixth month	13	9	0.445	
2. $\geq$ sixth month	44	44		
Intake of energy				
1. inadequate	49	36	0.024	
2. adequate	8	17		
Intake of protein				
1. inadequate	30	18	0.049	
2. adequate	27	35		
Intake of vitamin A				
1. inadequate	41	26	0.014	
2. adequate	16	27		
Intake of iron				
1. inadequate	51	35	0.003	
2. adequate	6	18		
Intake of calcium				
1. inadequate	48	35	0.027	
2. adequate	9	18		
Intake of zinc				
1. inadequate	44	27	0.004	
2. adequate	13	26		
Intake vitamin C				
1. inadequate	43	32	0.090	
2. adequate	14	21		

Table 3: The Quality of Complementary Feeding (N = 110) in Limo District Depok, West Java

The result showed that family income, sex, early breastfeeding initiation, exclusive breastfeeding, birth lenght, mother's year of schooling, number of family members, child age, maternal age and birth weight were not related to the growth of children under five.

Variable	All	Stunting	Normal	p-value
	(n = 110)	C		-
Family income		32	33	0.464
Sex				
1. Male	53	30	23	0.333
2. Female	57	27	30	
Early breastfeeding initiation				
1. No	28	15	13	0.830
2. Yes	82	42	40	
Exclusive breastfeeding				
1. Nonexclusive breastfeeding	45	26	19	0.509
2. Exclusive breastfeeding	65	31	34	
Birth length			0.151	
Mother's year of schooling			0.363	
Number of family numbers			0.418	
Child age			0.439	
Mother age			0.668	
Birth weight		0.931		

Table 4: Analisis Bivariat Antara Variabel Kovariat Dengan Pertumbuhan Balita

#### 3.4. Multivariate Analysis

The results of multivariate analysis showed that feeding frequency and dietary diversity were important factors in stunting prevention in child. Frequency of feeding 3-4 times 0.317 times can prevent stunting in children.

Variables in the Equation									
		В	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1 <sup>a</sup>	diversity(1)	-1.590	.515	9.548	1	.002	.204	.074	.559
	frequency(1)	-1.149	.509	5.089	1	.024	.317	.117	.860
	Constant	.752	.267	7.912	1	.005	2.121		

Table 5: Logistic Regression Result

a. Variable(s) entered on Step 1: diversity, frequency

#### 4. Discussion

This study characterized of complementary feeding and child growth in Limo district Depok city. Feeding frequency and dietary diversity were related with child growth. The most common cause of faltering growth is inadequate intake relative to a child's specific energy requirements (Pritchard, 2015). A child's diet directly impacts on their growth and development, and also on their adult health. Achieving optimal intake will reduces the risk of a number of common childhood conditions such as micronutrient deficiency and faltering growth (Bartleman, 2019). Therefore, health program may involve advice about; feeding behaviour, frequency duration and volume of feeds/meals, the ideal composition of food offered and sign-posting family to other resources e.g. breast-feeding support, websites, parenting courses or health visitors. Some children require more intensive advice and support from a dietician, psychologist or social care teams. Overall, mothers/caregivers of stunted children had poorer complementary- and breast-feeding practices. Positive responsive feeding behaviors were associated with children's number of mouthful accepted and linear growth. In line with previous reports, the prevalence of stunting and inadequate breast- and complementary-feeding practices is high and can be, at least in part, due to inadequate knowledge about optimal infant and young child feeding (Abebe, Desse, & Baye, 2017).Reinforcing nutrition education provided by the health worker may improve infant and young child feeding practices. The low food intake is certainly related to previous reports of inadequate energy and nutrient intakes among young children living in rural Ethiopia (Baye, Guyot, Icard-Vernière, & Mouquet-Rivier, 2013).

Age at the introduction of complementary food does not seem related with body weight during infancy and in the second year of life either in breastfed or formula-fed infants in developed countries; however, in developing countries, it may prevent growth faltering related to the transition of exclusive breastfeeding to mixed feeding, provided that breastfeeding is continued and hygiene and composition of the complementary food are adequate (Przyrembel, 2012).

#### **5.** Conclusion and Recommendation

The quality of complementary food is associated with child growth. Nutrition interventions that reinforce messages of optimal infant and young child feeding are needed.

A framework is suggested to provide clear information about the types of food that toddlers need to consume to prevent stunting.

#### 6. References

- i. Abebe, Z., Desse, G., & Baye, K. (2017). Child feeding style is associated with food intake and linear growth in rural Ethiopia. Appetite, 116, 132–138.https://doi.org/10.1016/j.appet.2017.04.033
- ii. Bartleman, J. (2019). Infant and child nutrition. Medicine (United Kingdom). https://doi.org/10.1016/j.mpmed.2018.12.002
- Baye, K., Guyot, J. P., Icard-Vernière, C., & Mouquet-Rivier, C. (2013). Nutrient intakes from complementary foods consumed by young children (aged 12-23 months) from North Wollo, northern Ethiopia: the need for agro-ecologically adapted interventions. Public Health Nutrition, 16(10), 1741–1750. https://doi.org/10.1017/S1368980012005277
- iv. Bloem, M. W., de Pee, S., Hop, L. T., Khan, N. C., Laillou, A., Minarto, ... Wasantwisut, E. (2013). Key strategies to further reduce stunting in Southeast Asia: lessons from the ASEAN countries workshop. Food and Nutrition Bulletin, 34(2 Suppl). https://doi.org/10.1177/15648265130342s103
- v. Corkins, M. R., Daniels, S. R., de Ferranti, S. D., Golden, N. H., Kim, J. H., Magge, S. N., & Schwarzenberg, S. J. (2016). Nutrition in Children and Adolescents. Medical Clinics of North America, 100(6), 1217–1235. https://doi.org/10.1016/j.mcna.2016.06.005
- vi. Dewey, K. G., & Adu-afarwuah, S. (2008). Systematic review of the efficacy and effectiveness of complementary feeding interventions in developing countries. Maternal and Child Nutrition, 4, 24–85.
- vii. Georgiadis, A., Benny, L., Duc, L. T., Galab, S., Reddy, P., & Woldehanna, T. (2017). Growth recovery and faltering though early adolescence in low- and middle-income countries: Determinants and implications for cognitive development. Social Science and Medicine, 179, 81–90. https://doi.org/10.1016/j.socscimed.2017.02.031
- viii. Hariyadi, D., & Ekayanti, I. (2011). Analisis Pengaruh Perilaku Keluarga Sadar Gizi Terhadap Stunting Di Propinsi Kalimantan Barat. Teknologi Dan Kejujuran, 34(1), 71–80.
- ix. Heckman, J. J. (2006). Skill formation and the economics of investing in disadvantaged children. Science, 312(5782), 1900–1902. https://doi.org/10.1126/science.1128898
- x. Hoffman, D. J., Sawaya, A. L., Verreschi, I., Tucker, K. L., & Roberts, S. B. (2000). Why are nutritionally stunted children at increased risk of obesity? Studies of metabolic rate and fat oxidation in shantytown children from Sao Paulo, Brazil. American Journal of Clinical Nutrition, 72(3), 702–707. https://doi.org/10.1093/ajcn/72.3.702
- xi. Kar, B. R., Rao, S. L., & Chandramouli, B. A. (2008). Cognitive development in children with chronic protein energy malnutrition. Behavioral and Brain Functions, 4, 1–12. https://doi.org/10.1186/1744-9081-4-31
- xii. Kemenkes. (2017). Profil Kesehatan Indonesia Tahun 2017.
- xiii. Kusharisupeni. (n.d.). Peran status kelahiran terhadap stunting pada bayi : sebuah studi prospektif, 23(3), 73–80.
- xiv. Perkins, J. M., Kim, R., Krishna, A., McGovern, M., Aguayo, V. M., & Subramanian, S. V. (2017). Understanding the association between stunting and child development in low- and middle-income countries: Next steps for research and intervention. Social Science and Medicine, 193, 101–109. https://doi.org/10.1016/j.socscimed.2017.09.039
- Picauly, I., & Toy, S. M. (2013). Analisis Determinan Dan Pengaruh Stunting Terhadap Prestasi Belajar Anak XV. Sekolah Di Kupang Dan Sumba Timur, Ntt. Jurnal Gizi Dan Pangan. 8(1). 55. https://doi.org/10.25182/jgp.2013.8.1.55-62
- xvi. Pradhan, M., Sahn, D. E., & Younger, S. D. (2003). Decomposing world health inequality. Journal of Health Economics, 22(2), 271–293. https://doi.org/10.1016/S0167-6296(02)00123-6
- xvii. Pritchard, N. (2015). A practical approach to the assessment of faltering growth in the infant and toddler. Paediatrics and Child Health (United Kingdom). https://doi.org/10.1016/j.paed.2015.04.004
- xviii. Przyrembel, H. (2012). Despite the large literature on the eff ect of early diet in infancy and young childhood on health outcomes in childhood / adulthood , little evidence is available on the strength of the relationship between the timing of introduction Timing of Introducti. https://doi.org/10.1159/000336287
- xix. Riyadi, H., Martianto, D., Hastuti, D., Damayanthi, E., & Murtilaksono, K. (2011). Faktor-Faktor Yang Mempengaruhi Status Gizi Anak Balita Di Kabupaten Timor Tengah Utara, Provinsi Nusa Tenggara Timur. Jurnal Gizi Dan Pangan, 6(1), 66. https://doi.org/10.25182/jgp.2011.6.1.66-73
- xx. Scharf, R. J., Rogawski, E. T., Murray-Kolb, L. E., Maphula, A., Svensen, E., Tofail, F., ... DeBoer, M. D. (2018). Early childhood growth and cognitive outcomes: Findings from the MAL-ED study. Maternal and Child Nutrition, 14(3). https://doi.org/10.1111/mcn.12584
- xxi. Unicef. (2012). Ringkasan Kajian Gizi Ibu & Anak.
- xxii. Victora, C. G., De Onis, M., Hallal, P. C., Blössner, M., & Shrimpton, R. (2010). Worldwide timing of growth faltering: Revisiting implications for interventions. Pediatrics, 125(3). https://doi.org/10.1542/peds.2009-1519
- xxiii. Walker, S. P., Chang, S. M., Powell, C. A., & Grantham-McGregor, S. M. (2005). Effects of early childhood psychosocial stimulation and nutritional supplementation on cognition and education in growth-stunted Jamaican children: Prospective cohort study. Lancet, 366(9499), 1804–1807. https://doi.org/10.1016/S0140-6736(05)67574-5
- xxiv. WHO. (2003). Implementing The Global Strategy For Infant and Young Child Feeding. WHO, (3), 208–210. https://doi.org/10.1157/13043548
- xxv. WHO. (2009). Infant and young child feeding.
- xxvi. WHO: World Health Organization. (2001). Report of the expert consultation of the optimal duration of exclusive breastfeeding, Geneva, Switzerland, 28-30 March 2001, (March).