Available online: http://journal.ipb.ac.id/index.php/jgizipangan **J. Gizi Pangan, February 2021, 16(Supp.1):99-108**
Accredited based on DGHE, Republic of Indonesia No. 28/E/KPT/2019
ISSN 1978-1059 EISSN 2407-0920

Birth Weight and Length Associated with Stunting among Children Under-Five in Indonesia

Try Nur Ekawati Lukman[1,2*], Faisal Anwar[2], Hadi Riyadi[2], Hartrisari Harjomidjojo[3], Drajat Martianto[2]
[1]Nutrition Science of Public Health Tadulako University, Palu 94148, Indonesia
[2]Department of Community Nutrition, Faculty of Human Ecology, IPB University, Bogor 16680, Indonesia
[3]Department of Agricultural Industry Technology, IPB University, Bogor 16680, Indonesia

ABSTRACT

The purpose of this study was to analyze the relationship of various factors relating to stunting. The study was a cross-sectional study conducted in Gowa district from January to July 2019 which involved 90 children aged 12–59 months. The variables of this study were age, social-economic status, hygiene and sanitation, access and utilization of health care services, history of infectious diseases, birth weight, birth length, and mother's height. Child's nutrition status was measured using the WHO AntroPlus2010, while the inferential statistics used were Chi-Square and Logistic regression. The results showed that out of the 90 children included in the analysis, 47 children were found to be stunted. In the multivariate analysis, the significant variables associated with the incidence of stunting were inadequate access and utilization to healthcare (OR=4.52; 95% CI: 0.90–22.59; p=0.011), birth weight <2,500 g (OR=5.96; 95% CI: 0.93–37.87; p=0.000), birth length <48 cm (OR=5.06; 95% CI: 2.58–87.97; p=0.000), and age of children 12–36 months (OR=0.80; 95%CI: 0.15–0.89; p=0.000). Most importantly, children with a birth weight less than <2,500 g had a significantly higher risk (5.96 times) for stunting compared to children with a birth length ≥2,500 g. As a conclusion, birth weight, birth length, and age were significantly associated with stunting. Therefore, nutrition during pregnancy is key for the prevention of stunting.

Keywords: birth weight, birth length, social-economic, stunting

INTRODUCTION

Stunting is chronic undernutrition indicated by short stature. The World Health Organization/ National Center for Health Statistics (WHO) defines stunting as a late growth where the child's height is less than -2 SD of height/length-for-age z score (HAZ). The critical period for stunting is the first 1,000 days of life, and chronic undernutrition during this period will lead to stunting. In addition, data from UNICEF (2016) shows that children of low social-economic status have double the risk for stunting compared to children from prosperous families.

Around 7.8 million children under five years old are stunted. UNICEF (2018) reported that Indonesia is one of five countries with the highest stunting prevalence. MoH RI (2018) found that the latest prevalence of stunting was 30.8% nationwide. South Sulawesi Province ranked the fourth in stunting prevalence among the 34 provinces with a score of 37%, which was above the national average. Within the South Sulawesi province, Gowa district was one of the five regencies with the highest stunting prevalence (The South Sulawesi Provincial Health 2018).

The first five years of life is the golden period for cognitive and physical development; growth and development during this age will provide the foundation for future development. Within this window of opportunity, optimal nutrition, growth stimulation, and other early life intervention is required to reach optimal physical and cognitive development (Black 2008). Failure of growth due to undernutrition during this golden period will cause a long term permanent effect on the individual. For example, children who are severely stunted had an 11 point lower IQ compared to children of normal height

[*]**Corresponding Author:** tel: +6281281215545, email: trynurekawatil@yahoo.com

(UNICEF 2016). Moreover, stunting has also been associated with a higher risk of morbidity and mortality, in addition to delayed motor and cognitive development (de Onis & Branca 2016). Therefore, stunting is a sensitive indicator of the lack of social-economic growth as well as a predictor for long term morbidity and mortality (TNP2K 2017). Hence, this research aims to analyze the associations of various factors relating to stunting to provide information for stakeholders to reduce stunting prevalence in Indonesia.

METHODS

Design, location, and time

This study is a cross-sectional study. It was conducted in Pattappang village, Gowa Regency, South Sulawesi from January to July 2019.

Sampling

The sampling method used was purposive sampling involving 90 children aged 12–59 months. The inclusion criteria were children aged 12–59 months, living with their mothers, registered at the *Posyandu*, have a health card (KMS), residing in Pattappang Village, and the respondent (mothers) was willing to be interviewed. The exclusion criteria were children who have congenital disease.

Data collection

Primary data were collected through in-depth interviews, observation and questionnaires by visiting households with children under five to obtain information about the characteristics of respondents, which included the social-economic characteristics and health status of the family. Interviews were conducted using a structured questionnaire that had been tested for feasibility with the mother or other household members who were familiar with the condition of the household. At the time of the interview, a thermo-hygrometer device was placed inside the house to measure the humidity and the result was displayed on the screen at the end of the interview.

Covariates. The children's age, birth length, immunization completeness records, and birth weight were obtained from secondary data at the local *Posyandu*. Data of infectious diseases during the last two months were obtained through interviews with the parents. Data on sanitation, health care access, health care quality, and hygiene of the house were obtained through in-depth interviews as well as observation using the humidity gauge. The children's and mothers' height measurements were performed at the *Posyandu*. The measurement of mothers' height was done using a microtoice, while the child's height was measured in a standing position using a height board. Before used for measurement, the height board was assembled and placed on a flat floor. During the measurement, shoes, socks, slippers, and all hair accessories were removed. The child stood vertically on the center of the board with their head following the 'horizontal Frankfurt plane' position. The feet were placed in the center of the surface to make sure their legs were straight, while their heels, buttocks, and shoulders were attached to the board. Measurements were done with level of accuracy of 0.1 cm. Each child was measured twice. The result was the average of the measurements. All the equipment used in data collection were checked and calibrated every day.

Data analysis

The statistical analysis was done using the SPSS 22 for Windows software. The independent variables investigated were age, social-economic status, hygiene and sanitation, access and utilization of health services, history of infectious diseases, birth weight, birth length, and genetics represented by the mother's height. The children's nutritional status was determined using the WHO AntroPlus2010 software. The inferential statistics were the Chi-Square test and logistic regression. The Spearman Rank was used for the variables of age, mother's height, hygiene and sanitation, while Pearson correlation was used for birth length, birth weight, access and utilization of healthcare and housing condition in association with the children's nutrition status. Furthermore, a logistic regression analysis was done to identify the strongest factors associated with stunting with $p<0.05$ as a cutoff of significance.

Data were processed in several steps: 1) preparation of the code to simplify the process of data entry; 2) data cleaning to avoid errors in data entry; 3) scoring of health services, sanitation, and physical quality of the home; 4) categorization of the data score; and 6) descriptive analysis, correlation analysis and logistic regression analysis using Microsoft Office Excel 2018 and SPSS version 22.0. Scoring of environmental sanitation, access and utilization of health services and clean and healthy lifestyle (PHBS) were obtained from several questions to the two categories of answers. Each correct answer to the question of the three variables was scored as 1, while the others were scored 0. Environmental sanitation, access and utilization of health services and PHBS were measured in terms of the percentage of actual score to maximum score multiplied by 100%.

Access and utilization of health services and environmental sanitation were grouped into the categories low (the percentage of correct answers <80%) and high (the percentage of correct answers ≥80%) (MoH RI 2018). Similarily, PHBS was grouped into good (percentage of correct answers ≥80%) and poor (percentage of correct answers <80%) (Suwono *et al.* 2018). Infectious diseases were defined as suffering from one or more infectious diseases (diarrhea and ARI) in the last one month. Immunization completeness was categorized as complete (five compulsory immunizations of BCG, hepatitis B, Polio, DPT, and measles given according to the child's age) and incomplete.

Parental education was measured using the number of years of formal schooling, categorized into primary school (SD), junior high school (SMP), senior high school (SMA), and college. Family size was measured by the number of family members living in the shared financial management, which were then categorized as large and small (The Family Planning Coordinating Board (BKKBN 2003)). Occupation was obtained from the type of work of the father and mother. It was categorized into seven groups of work, namely unemployed, gardeners, other laborers, traders, farmers, entrepreneurs, and teachers. Family income was measured by summing the incomes of all family members of the main occupation, additional occupation, or other sources which was calculated for one year. Family income was divided by family size to determine per capita income of the family. A family was classified as poor if the per capita family income was below the poverty line (IDR 352,456 for South Sulawesi in 2019). Mother's height was divided into two categories, namely short (height <145 cm) and normal (height of ≥145 cm) (Chaudry & Wimer 2016). Children's nutritional status was measured by indicators of HAZ and divided into stunted (<-2 SD) and normal (≥-2 SD).

$$\pi(\chi) = \frac{\varrho\beta 0 + \beta 1 \times 1 + \beta 2 \times 2 + \beta 3 \times 3 + \cdots + \beta n \times n}{1 + \varrho\beta 0 + \beta 1 \times 1 + \beta 2 \times 2 + \beta 3 \times 3 + \cdots + \beta n \times n}$$

Note:
π(x): Probability of *stunting* (0: Normal; 1: *Stunting*/z-score Height/Age <-2 SD)
e: Exponential
β0–β1: Regression coefficient

X1: Age (0: Under three years old; 1: Preschool)
X2: Sex (0: Male; 1: Female)
X3: Birth weight (0: Normal; 1: Low birth weight)
X4: Birth length (0: Normal; 1: Short)
X5: History of infectious disease (0: No; 1: Yes)
X6: Vaccination (0: Complete; 1: Incomplete)
X7: Mother's height (0: Normal; 1: Short)
X8: Hygiene and sanitation (0: Adequate; 1: Inadequate)
X9: Access and utilization of health service (0: Adequate; 1: Inadequate)
X10: Quality of the house (0: Standardized; 1: Not standardized)
X10: Father's education (0: High; 1: Low)
X11: Mother's education (0: High; 1: Low)
X12: Father's occupation (0: Working; 1: Unemployed)
X13: Mother's occupation (0: Working; 1: Unemployed)
X14: Income (0: Not poor; 1: Poor)
X15: Family size (0: ≤4 residents; 1: >4 residents)

RESULTS AND DISCUSSION

Social-economic status, birth weight and birth length

The family characteristics identified in the study include the father's and mother's education, where the highest percentage of the distribution of the father's and mother's education was primary school/equivalent at 64.4% and 74.5%, respectively. Garcia *et al.* (2015) argues that education is necessary to obtain information, such as things that support health, that can to improve quality of life. Statistical test results conducted on the two variables (educational level of father and mother) and the incidence of stunting among children under five did not show a significant relationship (p>0.05). This is probably due to the uneven distribution of the parents' education; most had only graduated from elementary school, while a more diverse sample is needed in order to obtain more variable results.

For the distribution of work, the majority of the fathers worked as laborers/gardeners (65.5%); this is because most people do not have their own land for cultivation. Farm workers do not have a fixed income and regular work hours because they expect a job call from the owner of the field. The dominant occupation of the mothers were as a housewives at 79.1%; this is due to not having their own land to cultivate, as well as having a lack of education so that they cannot work in the private or public sectors. The results of statistical tests conducted between education variables and the incidence of stunting in children under five showed no significant relationship (p>0.05), however, families that fall into the low education category have more stunted children.

The size of the family is divided into two categories; a large family if the residents of the house are >4 people, and a small family if the residents of the house are ≤4 people. The sample families that fall into the big family category amounted to 48.9%, while sample families that fall into small families comprised 51.1%. A large number of household members will have an impact on the distribution of food within the family, which is supported by the per capita income of the family. The more the number of household members, the smaller the food distribution will be. Poor families have a greater chance of food shortages because of the slight food rations consumed (Damayanti 2018).

The results of statistical tests conducted between the family size variable and the incidence of stunting in children under five shows no significant relationship (p>0.05). The Family Planning Coordinating Board (BKKBN) recommends that there should only be one child under five in one family, while the total number of children in one family should be two children. The number of family members must be reckoned with the per capita income of a family in order to avoid food disparities for each family member.

Per capita income is divided into two categories: poor and non-poor. Most of the sample families fall into the poor category at 65.0%; education and employment are inseparable aspects that impact family income. The high prevalence of stunted children under five in Pattapang Village is related to the quality of human resources available in the area. It was found that there was no significant relationship between the income variable and stunting in children under five (p>0.05). Low income is influenced by several factors, such as education and work productivity. It will also have an impact on access to food, the quality of the residential environment, and access to health services, which can all impact the health status and nutritional status of children. Poverty not only can contribute to the health and growth relating to stunting disorder, but it can also lead to decreased nutritional status, physical capacity, and work productivity, which are all impacts of a low income. It is concluded that family income has a relationship with children's outcomes.

The highest category of income per capita is the poor category with a percentage of 65.0. Linver *et al.* (2002) also concluded that family income has a relationship with children's outcomes. The low income is influenced by several factors, including education and work productivity (Hasibuan 2014). This will also have an impact on food access, the quality of the residential environment, and access to health services. All of these factors can have an impact on the health status and nutritional status of children. However, the direction of the relationship that occurs between poverty and health status including stunting are both ways (World Bank 2016).

The results of the correlation test show that several variables have a relationship with the nutritional status of stunted children, namely the age of the child, the length at birth, environmental sanitation, access to health services, birth weight, and health services. The results showed a significant negative correlation between the age of the child with the Z score (p<0.05). As children get older, they have a greater chance being stunted. This is in line with the research by Hayati *et al.* (2013) that stated that the increasing prevalence of stunting correlates with age. According to Black *et al.* (2008), children who experience stunting can catch up if given appropriate stimulation and care to catch up with growth and development if the interventions are done before the child reaches the age of five. Children under the age of five are susceptible to malnutrition because during this age there is a process of rapid growth and development that requires attention from their parents and environment.

Mother’s height is the genetic proxy to predict children's height. The average height of the mothers in our study was 148.43±4.6, and statistical analysis showed that there was no significant relationship between mother's height and stunting in children. This is in contrast to the research by Ozaltin *et al.* (2010) which stated that an increase in the mother's height will reduce the risk of stunting in their children. However, it should be noted that genetic factors

Table 1. Bivariate analyses on factors associated with stunting among children under-five

Variable	Nutritional status				p
	Stunting		Normal		
	n	%	n	%	
Age					
Under three years	23	48.7	32	74.4	<0.001
Pre-school	24	51.1	11	25.6	
Gender					
Boys	21	44.7	25	58.1	0.143
Girls	26	55.3	18	41.9	
Birth weight					
<2,500 g	10	21.3	40	93.0	<0.001
≥2,500 g	37	78.7	3	7.0	
Birth length					
<48 cm	5	10.6	39	90.7	<0.001
≥48 cm	42	89.4	4	9.3	
Mother's height					
<145 cm	18	38.3	21	48.6	0.162
≥145 cm	29	61.7	23	51.4	
Vaccination					
Complete	40	85.1	34	79.1	0.318
Incomplete	7	14.9	9	20.9	
Environment sanitation					
Adequate	28	59.6	34	79.0	0.293
Inadequate	19	40.4	9	21.0	
Access and utilization of health services					
Inadequate	39	82.9	29	64.4	<0.001
Adequate	8	17.0	14	35.6	
Hygiene					
Inadequate	20	42.5	21	48.8	0.423
Adequate	27	47.5	22	52.2	
Quality of the house					
Not standardized	26	55.3	22	51.1	0.170
Standardized	21	44.7	21	48.9	
Father's occupation					
Working	31	66.0	33	76.7	0.199
Unemployed	16	44.0	10	23.3	
Mother's occupation					
Working	16	34.0	13	30.2	0.231
Unemployed	31	66.0	30	69.8	
Father's education					
High	17	36.1	21	48.8	0.119
Low	30	63.9	23	51.2	
Mother's education					
High	22	46.8	13	33.3	0.215
Low	25	53.2	30	56.7	
Family size					
>4 residents	16	34.0	21	48.8	0.198
≤4 residents	31	66.0	23	51.2	
Income					
Poor	30	63.8	33	76.7	0.211
Non-poor	17	36.2	10	23.3	

Chi square test p<0.005

only have a 30% role in children's height, while 70% is due to external factors. This includes the nutritional intake and health of children, such as environmental factors, parenting, and children's eating patterns, which all have an impact on the nutritional status of children. Statistical test results in Table 2 show a significant relationship (p<0.05) between children born with a body length of <48 cm with the occurrence of stunting, with an average birth body length of 46.49±5.13. This is similar to the research by Prendergast and Humphrey (2014), which concluded that children born with an equivalent length of <46 cm have a shorter height than their peers when they reach two years old. Birth weight also has an impact on a child's growth. Kusharisupeni (2010) concluded that mothers suffering from malnutrition from the early trimester to the end of their pregnancy led to a child with LBW (Low Birth Weight), which will later develop into stunting. Statistical test results in Table 2 show that LBW has a significant relationship with stunting. This is in line with Abuya *et al.* (2012) who argued that the risk of stunting in children born with LBW is 1.18 times higher than children who were not born with LBW (p<0.01; 95% Cl: 1.26–2.60). LBW children signify a lack of nutrition consumed by the mother which impacts fetal growth.

Then children LBW normal have 2.4 times the risk of experiencing stunting at age 695%12 months times compared to babies born with normal body length. Children with a bodyweight of <2,500 g have a significant relationship with the prevalence of stunting in children (Abuya *et al.* 2012).

Multivariate analysis showed that infants born with LBW were 1.74 times more likely to be stunted (95% CI: 1.38–2.19) than those born with normal weight (Aryastami 2017). Abdulaziz *et al.* (2019) also concluded that there is a relationship between body mass and bone density. Birth weight is inseparable from the health services received by the mother during pregnancy (Kerber *et al.* 2007). In Table 2, mothers who use health services during pregnancy that include actively conducting health checks, consuming vitamins from midwives, and births assisted by health workers are related to a low number of stunted children. Conversely, households that fall into the category of those who do not utilize health services have a significant relationship with an increase in the prevalence of stunting in children under five (p<0.05)

Statistical tests conducted on the variables of hygiene and sanitation, hygienic behavior, and physical quality of the house did not show any significant relationship with the prevalence of stunting in children under five (p>0.05). The average households were in the good category with values of (11.4±2.5), (70.3±32.8), (82.9±18.7).

Table 2. Multivariate analysis on factors associated with stunting among children under-five

Variable	Stunting (%)	Normal (%)	OR (95% C1)	p
Access and utilization to health care				
Inadequate	76.6	23.3	4.52 (0.90-22.59)	0.011
Adequate	23.4	76.6		
Birth Weight				
<2,500 g	78.7	7.0	5.96 (0.93-37.87)	0.000
≥2,500 g	21.3	93.0		
Age				
Under three years	48.9	74.4	0.80 (0.15-0.89)	0.000
Preschool	51.1	25.6		
Birth Length				
<48 cm	89.4	9.3	5.06 (2.58-87.97)	0.000
≥48 cm	10.6	90.7		

Logistic regression p=0.005

This shows that the quality of sanitation and housing condition of the household samples were already in the good category. Based on logistic regression analysis, children below three years of age had a 20% lower stunting risk than children of preschool age ($p<0.05$; 95% CI: 1.15–4.17). This is in line with the study of Alive & Thrive (2010), who concluded that children under three years of age are more likely to experience stunting so that appropriate interventions are needed to support their growth and development. Older children have a greater chance to experience stunting compared to younger children due to their different consumption patterns (UNICEF 2016). Children under the age of three is also a group prone to experience nutritional problems (Kusharisupeni 2010). Breastfeeding and complementary feeding are given to the children depending on the parenting style (Lestari *et al.* 2014).

In our study, children with a birth weight lower than 2,500 g have a 5.9 times risk of stunting compared to children who have a birth weight of ≥2,500 g ($p<0.05$; 95% Cl: 0.93–37.8). This is in line with Fitri's study (2012) where LBW increases the risk of stunting by 1.6 times compared to children born with normal weight in Sumatra. Children's birth weight cannot be separated from the health status and nutritional status of the mother before and during pregnancy. Adolescent nutrition before pregnancy needs to be considered to prepare the nutritional needs needed during pregnancy; a balanced diet will have a good impact on health. High rates of anemia in adolescents and pregnant women have an impact on increased maternal and child mortality rates. Supplementation of the micronutrients Fe and Zn is currently one of the ways to overcome anemia in pregnant women. However, there are still many mothers who are reluctant to consume it because of its unpleasant taste and smell. A balanced consumption pattern is needed to support one's health status.

Children with a birth length of below 48 cm (short) have a 15.0 times higher risk of experiencing stunting ($p<0.05$; 95% Cl: 2.58–87.9) compared to children born with a body length ≥48 cm (normal). The length of a child's body is inseparable from the growth and development of the fetus during the neonatal period. At present, birth length has not received special attention from the government, although many studies have found that there is an association between birth length and the prevalence of stunting in children under five. On the Card For Health (KMS) which is used as an indicator to monitor children's growth, there is no measurement of the length of the child's body and there are still many health workers who do not understand what stunting is and its impact. Thus this issue needs special attention from the relevant governments.

Stunting occurs because of a failure in achieving linear bone growth. Stunted growth reflects a failure to reach linear growth potential (WHO 2010). The food consumed is the supplier of nutrition for bone growth. Bones consist of 35% minerals (mainly Ca and P), 20% of an organic matter of collagen, and 45% water (Eastwood 2006). Anderson (2004) also states that 60% of genetic factors influence bone development, while 40% is influenced by the environment. According to several studies, the prevalence of stunting in children is a cumulative process since pregnancy, childhood, and throughout life (BAPPENAS 2012). In the period of 1,000 HPK, there is a high chance of a child to become stunted if they are not supported by good parenting and diet patterns. Maternal nutritional factors before and during pregnancy are indirect causes that contribute to fetal growth and development. Pregnant women with poor nutrition leads to intrauterine growth retardation (IUGR), so the baby will be born with malnutrition and experience growth and development disorders (Kusherisupeni 2010).

Based on logistic regression analysis, toddlers have a 20% lower risk of stunting compared to children of preschool age ($p<0.05$; 95% CI: 1:15–4:17). These results are in line with the research Alive & Thrive (2010) which stated that the low average value of the Z-score has occurred since birth and decreased significantly at the age of 23 months; there is chance of children to experience stunting when they are older if they do not receive the right intervention to support growth and development. Older children have a higher chance to experience stunting compared to younger children due to their different consumption patterns (UNICEF 2011). Children in this age group are prone to nutritional problems (Kusharisupeni 2010). Breastfeeding and complementary feeding are given depending on the parents' parenting. In the village Batulawang, many toddlers are cared for by a grandparent or other family members, resulting in the child's nutritional status to be compromised. Parenting and diet plays a substantial role in the growth and development of children under five (Black 2008).

Toddlers who experience growth barriers due to the lack of adequate food intake and repeated infectious diseases will encounter an increased metabolic demand and a reduced appetite, thus increasing malnutrition in children under five. This situation is more difficult to cope with that growth disorders and it is probable that that the children in these cases will eventually experience stunting.

Research limitation

This study used a cross-sectional design, thus the relationship or differences found between the dependent and independent variables were not cause and effect. This is due to two variables that were measured at the same time.

CONCLUSION

The results showed that 45 children experienced stunting. Children with inadequate access and utilization to health care have 4.52 times the risk of stunting compared to children with adequate access and utilization to health care. Those with a birth length of <48 cm also have a 5.06 times higher risk of stunting compared to children born with a body length ≥ of 48 cm. Moreover, children under 3 years old have 0.8 times a higher risk of stunting compared to children in preschool. Most importantly, children with a birth weight less than <2,500 g have a significantly higher risk (5.96 times) of stunting compared to children with a birth length <2,500 g. The conclusion of this study is that birth weight, birth length, and age were significantly associated with stunting; therefore nutrition during pregnancy is key to the prevention of stunting. Family social-economic conditions did not show any significant association with the prevalence of stunting; however, low social-economic factors support the cause of stunting as well as an unhealthy living environment that can lead to a higher prevalence of infectious diseases as a trigger for stunting.

ACKNOWLEDGEMENT

The author wishes to thank the *Lembaga Pengelola Dana Pendidikan* (LPDP) for fully funding this study.

AUTHOR DISCLOSURES

The authors declare that this manuscript does not have any conflicts of interest with other persons or institution.

REFERENCES

Abdulaziz FH, Mohammad NA, Aws B Z, Abdullah SB, Tariq MF, Omar HA, Amre SH. 2019. Relationship between body mass index and t-scores of bone mineral density in the hip and spine regions among older adults with diabetes: A retrospective review. J Obes 2019:9827403. doi: 10.1155/2019/9827403.

Abuya BA, Ciera J, Kimangi-Muragi E. 2012. Effect of mather's education on child's nutritional status in the slums of nairobi. BMC Pediatrics 12(1):1–10. https://doi.org/10.1186/1471-2431-12-80.

Alive & Thrive. 2010. Practices, IYCF Practices, Beliefs, and Influences in SNNP Region, Ethiopia. Addis Ababa (ET): Alive & Thrive.

Anderson. 2004. Theory and Process of Public Policy. Yogyakarta (ID): Medpress.

Aryastami NK. 2017. Kajian kebiijakan dan penanggulangan masalah gizi stunting di Indonesia. Indonesian Bulletin of Health Research 45(4):233–240. doi: 10.22435/bpk.v45i4.7465.233-240.

[BAPPENAS] Badan Perencanaan Pembangunan Nasional. 2012. Rencana Aksi Nasional Pangan dan Gizi 2011–2015. Jakarta (ID): BAPPENAS.

[BKKBN] Badan Kependudukan dan Keluarga Berencana Nasional. 2003. Buku Panduan Praktis Pelayanan Keluarga Berencana. Jakarta (ID): BKKBN.

Black RE, Allen LH, Bhutta ZA, Caulfield LE, De Onis M, Ezzati M, Mathers C, Rivera J, Maternal and child undernutrition study group. 2008. Maternal and child undernutrition: Global and regional exposures and health consequences. The Lancet 371(9608):243–260. https://doi.org/10.1016/S0140-6736(07)61690-0.

Chaudry A, Wimer C. 2016. Poverty is not just an indicator: The relationship between income, poverty, and child well-being. Acad Pediatr 16(3 Suppl):S23–9. doi: 10.1016/j.acap.2015.12.010.

Damayanti HO. 2018. Tingkat ketahanan pagan pada rumah tangga miskin di daerah Rawan banjir (Studi di Desa Tanjang dan Desa Kosekan kecamatan Gabus kabupaten Pati). Jurnal Litbang: Media Informasi Penelitian, Pengembangan dan IPTEK 14(1):15–26. https://doi.org/10.33658/jl.v14i1.105.

de Onis M, Branca F. 2016. Childhood stunting: A global perspective. Matern Child Nutr 12(Suppl 1):12–26. doi: 10.1111/mcn.12231.

Eastwood M. 2006. Principles of Human Nutrition. Second Edition. Edinburgh(EH): Chapman & Hall.

Fitri. 2012. Berat lahir sebagai faktor dominan terjadinya stunting pada balita (12–59 bulan) di Sumatera (Analisis data riskesdas 2010). Photon-Jurnal Sain dan Kesehatan 4(1):77–88. https://doi.org/10.37859/jp.v4i1.173.

Garcia DA, Andersson Arntén A-C, Archer T. 2015. Character, responsibility, well-being: Influences on mental health and constructive behavior patterns. Front Psychol 6:1079. https://doi.org/10.3389/fpsyg.2015.01079.

Hasibuan LS. 2014. Analisis pola pengeluaran rumah tangga miskin di Kabupaten Simalungun. Jurnal Ekonomikawan 16(1):78382.

Hayati AW, Jalal F, Madanijah S, Briawan D. 2013. Protein density, body weight, economic status and mothers height are risk factors of stunting among indonesian young children. Annals of Nutrition and Metabolism 63:1028–1029.

Kerber KJ, de Graft-Johnson JE, Bhutta ZA, Okong P, Starrs A, Lawn JE. 2007. Continuum of care for maternal, newborn, and child health: From slogan to service delivery. The Lancet 370(9595):1358–1369. doi:10.1016/S0140-6736(07)61578-5.

Kusharisupeni. 2010. Gizi dan Kesehatan Masyarakat. Departemen Gizi dan Kesehatan Masyarakat Universitas Indonesia (UI). Jakarta (ID): Raja Grafindo Persada.

Lestari W, Margawati A, Rahfiludin MZ. 2014. Faktor risiko stunting pada anak umur 6–24 bulan di kecamatan Penaggalan kota Subulussalam provinsi Aceh. J Nutr Indonesia 3(1):37–45. https://doi.org/10.14710/jgi.3.1.126-134.

Linver, MR. Davis-Kean PE, Eccles JS. 2002. Influences of Gender on Academic Achievement. Proceeding of the Biennial Meetings of the Society for Research on Adolescence, (BMSRS' 02), (page 1–14), New Orleans (USA): Society for Research on Adolescence.

[MoH RI] Ministry of Health Republic of Indonesia. 2018. Pemerintahan fokus cegah stunting di 100 kabupaten/kota. https://www.kemkes.go.id/article/view/18040700003/pemerintah-fokus-cegah-stunting-di-100-kabupaten-kota.html [Accessed 10th July 2020].

Ozaltin ME, Hill K, and Subramanian SV. 2010. Association of maternal stature with offspring mortality, underweight, and stunting in low- to middle-income countries. JAMA 303(15):1507–1516. doi:10.1001/jama.2010.450.

Prendergast AJ, Humphrey JH. 2014.The stunting syndrome in developing countries. Paediatr Int Child Health 34(4):250–265. doi: 10.1179/2046905514Y.0000000158.

Suwono I, Kamaluddin MT, Sriati S, Priadi DP. 2018. The effect of health community behavior (PHBS), health service quality to diare's disease in sub-division karang jaya palembang sub-district. Sriwijaya Journal of Environment 3(1):19–26. http://dx.doi.org/10.22135/sje.2018.3.1.19-26.

[TNP2K] Tim Nasional Percepatan Penanggulangan Kemiskinan. 2017. 100 Kabupaten/Kota Prioritas untuk Intervensi Anak Kerdil (Stunting). Jakarta (ID): TNP2K.

The South Sulawesi Provincial Health. 2018. Profile Kesehatan Provinsi Sulawesi Selatan 2018. South Sulawesi (ID): Dinas Kesehatan Sulawesi Selatan.

[UNICEF] United Nations Children Funds. 2011. Tracking Progress on Child and Maternal Nutrition. New York (USA): UNICEF

[UNICEF] United Nations Children Funds. 2016. The State Of The World's Children. World Bank Group. New York (USA): UNICEF

[UNICEF] United Nations Children Funds. 2018. Undernutrition contributes to nearly half of all deaths in children under 5 and is widespread in Asia and Africa. https://data.

unicef.org/topic/nutrition/malnutrition/ [Accessed 11th July 2020].
[WHO] World Health Organization. Global data on visual impairements 2010. http://www.who.int/blindness/GLOBALDATAFINALforweb.pdf [Accessed 11th July 2020].
World Bank Group. 2016. Brief FAQs: Global Poverty Line Update. Washington DC (USA): World Bank.