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RESEARCH ARTICLE

Stunting Determinants Among Indonesian Children Aged 0-59 Month: Evidence From Indonesian Family Life Survey (IFLS) 2014/2015

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Abstract

This study aimed to analyze the determinants of stunting among children aged 0-59 months old in Indonesia. A cross-sectional survey by using data from the Indonesian Family Life Survey period 2014/2015 (IFLS-5) was conducted, which focused on the household with children aged 0-59 months old (n=3623). Ordinal regression test showed that determinants of stunting among children aged 0-59 months old, consist of children aged <6 and 6-23 months old; male; low birth weight; underweight mother; normal height mother; poor household; and ever had antenatal care. Integrated intervention address children, mother, and health service factors associated with stunting is needed.

Keywords: *Children, Indonesian family life survey, Stunting.*

Introduction

Stunting is a condition of malnutrition with the highest prevalence in the world (161 million children in 2013), where more than half lived in Asia [1].Stunting is a poor linear growth (height-for-age-Z score ≤−2 for the same age and sex by using WHO Child Growth Standards median)[2]. Nutrition in the first thousand days of children's life is vital to ensure their growth and development is optimally achieved [3].

Children with inadequate nutrition in that period are more at risk of stunting[4]. Globally, childhood stunting's trend is decreased [5]. However, it did not achieve the Sustainable Development Goals which targeted that by 2030 there is no single type of malnutrition in the world[6]. In the period of 2000-2017, the prevalence of stunting in the world decline from 32.6% to 22.2%. The number of children under 5 years suffer from stunting also decline from 198 million to 151 million. In 2017, the prevalence of stunting in Asia, especially South Asia reached 35%[7].

The prevalence of stunting for under five years old children in Indonesia is fluctuating. Basic Health Research 2013 reported that 30-39% under five years old children experience stunting[8].

By 2015 and 2016, the prevalence decline into 29 % [9] and 27.5% [10]. But, by 2017 the prevalence incline to 29.6% [11]. However, it is still higher than World Health Organization target's (only 20 % in each country).Stunting illustrates the condition of malnutrition that occurs in the long term [2]. Directly, stunting is caused by inadequate nutrition and infectious diseases. Indirectly, it caused by careless parenting, food insecurity, poverty and low education, poor sanitation conditions and health services, and political and cultural conditions [12]. Stunting must be prevented as early as possible, because it has an irreversible effect.

Stunting increases morbidity and mortality, loses the potential for physical growth (short in adulthood), decreases the development of cognitive and neurological function (stunted brain), and increases the risk of chronic disease in adulthood [1]. Previous studies in Indonesia have identified several common determinants of stunting, including child sex, age, birth weight, prelacteal food intake, history of breastfeeding, mother's education, mother's age, mother's work status, marital status, number of siblings, type of family, wealth index, nutritional parenting, health sanitation, immunization, and less attended antenatal care services [13, 17].

The Indonesian government already conduct various program to reduce the prevalence of stunting in children under five years of age. However, appropriate, effective, and efficient interventions is still needed [18], to ensure 40% reduction by 2025 [2]. Nowadays, Indonesia government's program is focused on the family and community empowerment approach [19]. To design an intervention, the determinant factors should be identified. The conceptual framework for analysis was modified from The Family Ecological Model which assess contextual and family system factors affecting parental practice specific in health[20]. Based on this framework, the potential risk factor were divided into child-, family-, organization-, media and politics-, and community factors. This framework has been used to assess the risk factors of obesity and overweight in children [21].

However, it rarely used in stunting. This study, therefore, aimed to analyzed the determinants of stunting among children aged 0-59 months old in Indonesia using nationally representative data from The Indonesian Family Life Survey (IFLS) 2014/2015, based on The Family Ecological Model approach.

Methods

Research Design

This was a cross-sectional study. Data derived from the fifth wave of The Indonesian Family Life Survey conducted in 2014-2015 (IFLS-5). Data are available for public by registering on Rand Corporation website[22]. Details of the IFLS-5 has been described in several previously published field reports[23], [24]. In brief, IFLS is an on-going longitudinal survey in Indonesia, by using a stratified random sample of households involving both questionnaires and anthropometric measurements.

Participant

We analyzed data from the household with children aged 0-59 months' old. Inclusion criteria were children aged 0-59 months old who had the complete record for child information (age, sex, birth weight, history of breastfeeding, and height) and matching parental-, household-, and community-level

data. Sample used in this study were 3623 respondents.

Data Collection

This study uses secondary data from the fifth period of the Indonesian Family Life Survey (IFLS-5) conducted in 2014-2015 by RAND Labor and Population, in collaboration with the Indonesian SurveyMETER Institute. IFLS-5 data can be accessed by the public by registering on the study site (www.rand.org/labor/FLS/IFLS/ifls5.html).

Stunting was defined as height-for-age Z-score ≤-2 for the same age and sex by using WHO Child Growth Standards median [2]. For the purposes of the present study, the classification were divided into severe stunting (height-for-age Z-score ≤-3), stunting (height-for-age Z-score ≤-2), and normal (height-for-age Z-score >-2).

The potential determinant of stunting based on The Family Ecological Model were divided into four categories: child-, family-, media-, and community factors. Child factors. These consisted of the child's age, sex, birth weight, and history of breastfeeding (whether they were ever-breastfed). Age was divided into three groups: <6, 6-23, and 24-59 months old. Birth weight was classified as low birth weight (<2.5kg) and normal (≥2.5kg). Family factors. These included maternal, paternal, and household factors.

Maternal and paternal factors consisted of: age, level of education, height, and Body Mass Index (BMI). Age was categorized as: ≤24, 25-34, 35-49, and ≥50 years old. The level of education were divided into five groups: never attended any formal education, attended primary school, junior high school, senior high school, and university or higher.

Because of the lack of reference about the classification of stunting for men and women in the previous published study, for the purposes of the current analysis, height was categorized as short stature if <152 cm for mother and if <163cm for father [25]. BMI was divided on three categories: underweight (<18.5), normal (18.5-24.9), overweight/obesity (>24.9) [26].

While household factor consisted of the household's wealth index which define the economic status of a household. It is assessed by calculation of a score involving the ownership of eleven household assets by using weights. The household's wealth index were ranked into five quintiles: poorest, poorer, middle, richer, and richest. However, for the current analysis, this index were divided into three categories. The bottom 40% of households was classified as poor households, the next 40% as the middle households, and the top 20% as rich households [23, 27]. Media factors.

These included access to the internet (yes/no), without classifying where they get internet access. Community factors. These included the access to health care services, such as check-up during pregnancy, which categorized as ever or never had check-up (yes/no) and children's visit on integrated health care services for under five years old children (Posyandu) in the last four weeks, which categorized as ever or never had visit (yes/no).

Ethical Considerations

The IFLS survey and its procedures were reviewed correctly and ethically approved by the Institutional Review Boards in the United States of America (at Rand Corporation,

Santa Monica, California) and in Indonesia (at Ethics Committees, Universitas Gadjah Mada, Yogyakarta). Written informed consent was obtained from all participants. For children, written consent also obtained from their closest sibling, caregiver, or guardian.

Data Analysis

In the fifth IFLS survey, each household completed several separate questionnaires, each with a different type of information (included the household economy, adult information, ever-married women information, child information, and anthropometry). These different files were merged to build the data set for analysis. Then, data cleaning is performed.

Incomplete data was not used. So, a valid result can be obtained. Bivariate analysis with chi-square (level of significance 95%) will be performed to analyze the correlation between risk factors and stunting, as well as the Odds Ratio (OR). Multivariate analysis was performed by using the ordinal regression test.

Results

The frequency distribution and percentage of sociodemographic characteristics of respondents and their parent are shown in Table 1. There were a total of 3623 children aged 0-59 months. As many as 29.1% of children were stunted, which divided as stunting and severe stunting. Children characteristics revealed that as many as 58.6% of them were aged 24-59 months. A little more than half of the children were male (52.4%). Mostly (92.8%), had a normal birth weight (≥2.5kg).

The vast majorities of children (>96%) were ever breastfed. Just over half (59%) of mothers and fathers were aged 25-34 years during the data collection. As many as 35.3% of mothers and 38.3% of fathers were attended senior high school. Over than fifty per cent of mothers and fathers were classified as having normal stature (54.1%) and BMI (62.9%). More than a half household (60.7%) had wealth index in the poor category.

Table 1: The sociodemographic characteristics of children aged 0-59 months and their parent (n = 3623)

Characteristics		n	Percentage
Child's factors			
Stunting	Normal	2569	70.9
	Stunting	720	19.9
	Severe stunting	334	9.2
Age	<6 months old	359	9.9
	6-23 months old	1141	31.5
	24-59 months old	2123	58.6
Sex	Male	1900	52.4
	Female	1723	47.6
Birth weight	Low birth weight	261	7.2
	Normal	3362	92.8
Ever breast-fed	Yes	3509	96.9
	No	114	3.1

Family's factors			
Mother's age	<=24 years old	223	6.2
	25-34 years old	1920	53.0
	35-49 years old	1415	39.1
	>50 years old	65	1.8
Father's age	<=24 years old	223	6.2
	25-34 years old	1920	53.0
	35-49 years old	1415	39.1
	>50 years old	65	1.8
Mother's education	No education	249	6.9
	Primary school	706	19.5
	Junior high school	872	24.1
	Senior high school	1278	35.3
	University	518	14.3
Father's education	No education	318	8.8
	Primary school	751	20.7
	Junior high school	711	19.6
	Senior high school	1387	38.3
	University	456	12.6
Mother's height	Normal	1864	51.4
	Short	1759	48.6
Father's height	Normal	1864	51.4
	Short	1759	48.6
Mother's BMI	Underweight	418	11.5
	Normal	2280	62.9
	Overweight/Obesity	925	25.5
Father's BMI	Underweight	418	11.5
	Normal	2280	62.9
	Overweight/Obesity	925	25.5
Household's wealth index	Poor	2198	60.7
	Rich	1425	39.3
Media's factor			
Internet access	Yes	2041	56.3
	No	1582	43.7
Community's factors			
Check-up during pregnancy	Yes	3575	98.7
	No	48	1.3
Posyandu's visit	Yes	1644	45.4
	No	1979	54.6

Table 1 also shown that as many as 56.3% of households had internet access. Almost all (98.7%) have ever had check-up during pregnancies. However, more than half never bring their children to visit *posyandu* in the last four weeks (54.6%)

Table 2: The odds ratio of stunting among children aged 0-59 months (n = 3623)

Parameter Estimates	Estimate	Std. Error	Wald	df	Sig.	95% CI	
						Lower	Upper
Child's age : <6 months old	-1,297	,240	29,139	1	,000	-1,768	-,826
Child's age : 6-23 months old	-,230	,084	7,422	1	,006	-,396	-,065
Child's sex : Male	-,427	,075	32,276	1	,000	-,575	-,280
Child's birth weight : Low birth weight	,712	,120	35,125	1	,000	,476	,947
Mother's height : Normal	-,626	,079	62,249	1	,000	-,782	-,471
Mother's BMI : Underweight	,262	,131	3,988	1	,046	,005	,519
Household's wealth indeks : Poor	,254	,087	8,581	1	,003	,084	,424
Check-up during pregnancy : Yes	-,831	,277	8,991	1	,003	-1,375	-,288

Ordinal logistic regression analysis showed that children aged <6 months and 24-59 months, and a male was less likely to be stunting ($p<0.05$). Children with a history of low birth weight were 0.712 times to be stunting ($p<0.05$). Mother's with normal stature was less likely to have stunted children rather than a mother with short stature ($p<0.05$). However, underweight mother was 0.262 times to have children with stunting ($p<0.05$). The poor household also increases the possibility to have children with stunting. Mother who ever check-up during pregnancy (antenatal care) was less likely to have children with stunting ($p<0.05$)

Discussion

The present study was designed to analyze the determinants of stunting among children aged 0-59 months old in Indonesia. The results revealed that child's age, sex of the child, and child's birth weight, mother's height, mother's BMI, household wealth index, and history of check-up during pregnancy significantly associated with stunting. Study found that children aged 0-23 months were less likely to experience stunting.

Previous study also found that infant (0-23 months old) had lower risk of being stunted compare to those in the older age. This might be caused by the effect of breastfeeding in the first six months of children's life. As most of respondents ever breast-fed by their mother, they got adequate nutrition to grow optimally [28].

Other study also indicated that increasing age of the child significantly associated with stunting. It is due to inappropriate food supplementation during the weaning period [29].Impaired child's linear growth might occur if continued breastfeeding is not accompanied by appropriate complementary feeding according to their age [30]. Male were less likely to be stunted than female children. This was congruent with the study from Ethiopia, were female children had higher odds of stunting than male [31].

Another study from India also found increased stunting among the female children[32]. This may happen because boys tend to have higher birth weights and grow faster than girls[33]. Furthermore, previous study also reported that female children have the lowest duration of breastfeeding than male, while breastfeeding can prevent children from being stunted [32, 34].

Regarding to our findings, low birth weight children had an increased likelihood of being stunted. It is similar with the most of previous literature [13, 23, 28, 29, 35]. Stunting as a growth failure often begins in utero, caused by maternal undernutrition before and during pregnancy [1].

Poor intrauterine growth will lead to sub-optimal growth in postnatal period. Low birth weight also related to the length of the baby born, which will affect children's length in the future [36]. In addition, children with low birth weight also more likely to be frequently exposed to infection which lead to malabsorption of nutrients in their body [31]. So that, the growth of low birth children was reported always to be behind the growth of those with normal weight at birth [37].

Mother's height was significantly associated with stunting among children aged 0-59 years old, as children whose mothers had normal stature (≥152cm) were less likely to be stunted. Similar findings were obtained in Myammar [38] and Pakistan [39]. Maternal height is an indicator of intergenerational linkages between mother and child nutrition. Short stature mothers with inadequate health are unable to provide adequate nutrition for the fetus during pregnancy.

It caused epigenetic modification (i.e., DNA methylation) to alter fetal programming, that results in fetal growth faltering, and delivery of small-for-gestational-age (SGA) child[40]. This study revealed a significant association between mother's BMI and the risk of stunting. Children born to underweight mothers were more likely to be stunted. It is similar with the previous research findings[28, 36]. Study conducted in Bangladesh also found that children of both normal weight and overweight mothers have a lower probability of being stunted[41]. Maternal and child under-nutrition are interrelated. Mother's poor nutritional status before conception and insufficient weight gain during pregnancy can lead to fetal growth deprivation.Children from poor households were found to have a significantly a higher risk of being stunted compared to those from rich households.

The effect of wealth on stunting can be explained by its importance in the purchase of food and consumer goods that promote and protect the health of children[28]. Previous study revealed that poor household were unable to provide good quality food and meet children's dietary needs[13, 42]. Low income households also have an inadequate access for health care services, as well as proper sanitation facilities and safe drinking water[29].

Poverty plays a big role in various forms of malnutrition among under-five years old children, including stunting. Children whose mothers ever had a check-up during pregnancy were less likely to be stunted than children whose mothers never had a check-up at all, even only for once visit. The finding is supported by the previous study[13], [31], [43].

Pregnant mother should do check-up/antenatal care to health care center regularly. During antenatal visit, mother will have an opportunity to get health education from health professionals. Mothers would be able to enhance their knowledge about pregnancy, delivery, and infant care, such as: breastfeeding, complementary feeding practice, and the prevention of childhood illness and infections. As their knowledge increase, they will have a good attitude in

providing adequate care for their children, resulting in optimum child growth and well-being. The strength of this study is the use of nationally representative data with a large sample size that is adequate to analyze the association between different factors of variables and stunting among children aged 0-59 months old.

One limitation of the study is the cross-sectional design, which is limiting the ability to explore causation. In summary, our findings indicate the need for intervention at the individual, family, and community levels, as it significantly associated with stunting among children aged 0-59 months old in Indonesia. An integrated intervention to prevent stunting should be directed as early as possible, starting from conception, through the first two years of children's life.

Mother played an important role in it. They should achieve a healthy weight before getting pregnant. During pregnancy, they should get adequate nutrition and antenatal care. After delivery, they should provide appropriate feeding practice for their children (includes: exclusive breastfeeding, complementary food, and micronutrient supplementation) which is essential for optimum child growth and development, and also to prevent infections and diseases that can eventually affect their children's growth. Furthermore, the improvement of household wealth index is needed to ensure the availability and accessibility of resources to promote and protect the health of their children.

Conclusions

In summary, our findings indicate the need for intervention at the individual, family, and community levels, as it significantly associated with stunting among children aged 0-59 months old in Indonesia. An integrated intervention to prevent stunting should be directed as early as possible, starting from conception, through the first two years of children's life. Mother played an important role in it. They should achieve a healthy weight before getting pregnant. During pregnancy, they should get adequate nutrition and antenatal care.

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