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Stunting trends and associated factors among Indonesian children aged 0-23 months: Evidence from Indonesian Family Life Surveys (IFLS) 2000, 2007 and 2014

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ABSTRACT

Introduction: Stunting in childhood affects cognitive development and may increase the risk of non-communicable diseases in adulthood. Indonesia is the fifth largest contributor of stunting in the world, with a prevalence of 32.90% in children aged 0-2 years in 2013. This study aimed to determine the stunting trend and associated factors between 2000 and 2014. **Methods:** This study used data from Indonesia Family Life Surveys (IFLS) that have been conducted periodically since 1993. This study focused on households with children aged 0-23 months. Trend analysis used the IFLS data collected in 2000, 2007 and 2014, while bivariate analysis for determination of the different factors associated with stunting used IFLS data in 2000 and 2014. **Results:** Based on data from 1,263 children in 2000, 1,805 children in 2007, and 1,609 children in 2014, stunting prevalence slightly increased from 29.7% in 2000 to 32.6% in 2014. Significant associations between stunting and children's age, birth weight, mother's education, antenatal care, health sanitation and immunisation status were recorded in 2000. In 2014, stunting was significantly associated with children's age, birth weight, prelacteal food intake, ownership of Mother and Child Health Book and health sanitation status. **Conclusion:** Stunting in children below 2 years in Indonesia remains high, exceeding 30%. This study identified several contributing factors to stunting. Interventions to address these factors should be undertaken toward reducing stunting among young children in Indonesia.

Keywords: Stunting, stunting trend in Indonesia, undernutrition, IFLS

INTRODUCTION

Stunting remains one of the main nutritional problems in the world. It reflects the cumulative effects of chronic malnutrition during the 1,000 first days of life, and is also associated with lack of education, poverty, less healthy, and more vulnerable to non-communicable diseases and is indicative of a poor quality of life that negatively affects the nation's human resources, thus degrading its future productive capacity (Gluckman *et al.,* 2009). Barker's (1997) paper regarding *The Developmental Origins of Health and Disease* conceptualised life and health, starting from fertilisation through the foetal stage, to infancy and early childhood, as well as how

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environmental of conditions may cause health problems in adulthood.

The immediate causes of stunting can be divided in two; inadequate dietary intake and disease (particularly infectious disease). While the basic causes are lack of education, poverty, and socio-cultural reasons, other underlying causes include inadequate care and feeding practices, household food insecurity, unhealthy household environment and inadequate health services (UNICEF, 2013; Stewart *et al.*, 2013). Globally, Indonesia ranks fifth in terms of stunting. According to the Global Nutrition Report 2014 (based on data from 117 countries), Indonesia is one of the 17 countries with three major malnutrition problems: stunting, wasting and obesity. Indonesia is also one of the 47 countries with a high prevalence of stunting among children, and anaemia in women of reproductive age (International Food Policy Research Institute, 2014). The prevalence of stunting among children 0-2 years in 2013 at the national level was 32.9% (Balitbangkes, 2013).

Several studies on stunting in Indonesia have reported the following associated factors: birth weight, breastfeeding, complementary food, mother's education, health sanitation, antenatal care and immunisation (Aryastami *et al.* 2017; Rahman *et al.* 2015; Kusumawati *et al.* 2015; Hildagardis *et al.* 2014 and Nadiyah *et al.* 2014).

This study included the ownership of Mother and Child Health Book or Health Card as an additional factor of stunting. The health book/card includes reproductive health education such as pregnancy preparation and care during pregnancy for a healthy baby and how to monitor children's growth and development. This health book provides mother and family with information on maternal and child health issues. With this, it is aimed at empowering the community to lead a healthy life and to improve their access to health facilities and monitoring system (Kemenkes, 2015). However, the association between stunting and the ownership of Mother and Child Health Book has not been previously studied before.

The aim of this study was to record the trend and associated factors related to stunting among children aged 0-23 months in Indonesia based on Indonesia Family Life Survey (IFLS) data collected in 2000, 2007 and 2014.

MATERIALS AND METHODS

This study used data from Indonesian Family Life Survey (IFLS), which is conducted periodically in collaboration with the Research And Development (RAND) Corporation United States and other research institutions, for example Demographic Institute Universitas Indonesia, Centre for Health Policy Studies Universitas Gadjah Mada and SurveyMeter. Multistage random sampling was applied in the IFLS followed by simple random sampling. The IFLS randomly selected 321 areas in 13 provinces with intentional oversampling of smaller provinces by including villages and urban-villages. In the selected areas, a total of 20 households were randomly selected from each village enumeration area, and 30 households from the city enumeration area. The population of this study consisted of mothers with children aged 0-23 months. A total of 1,263 children in 2000, 1,805 children in 2007, and 1,609 children in 2014 were included in this study.

The year 2000 was taken as the first point of reporting on the stunting trend to avoid biases from the Asian Economic crisis that affected Indonesia in 1997.

This study included several associated factors of stunting: the age of children, birth weight, provision of prelacteal food, exclusive breastfeeding, provision of

complementary food, mother's education, mother's occupation, health sanitation, ownership of Mother and Child Health Book, antenatal care and complete immunisation. The chi-square test with $p<0.05$ and 95% confidence interval was applied to test for association between prevalence of stunting with those factors.

RESULTS

As shown in Figure 1, the stunting trend among children aged 0-23 month showed narrow fluctuations in 2000, 2007 and 2014. The prevalence of stunting was 29.7% in 2000, which increased to 34.4% in 2007, but slightly decreased to 32.6% in 2014.

In 2000, the proportion of stunting was significantly higher in older children aged 12-23 months (41.5%) compared to those aged 6-12 months (19.5%) (Table 1). In 2014, a similar result was found (42.3% for aged 12-23 months versus 25.3% aged 6-12 months). The proportion of stunted children with low birth weight under 2,500 gm (LBW) was significantly higher compared to non-low birth weight infants (41.4% versus 28.8% in 2000 and 50.0% versus 31.5% in 2014).

Another risk factor of stunting was provision of prelacteal food and beverages. While there was no significant association between stunting and the provision of prelacteal food in 2000, in 2014, the proportion of stunted children who received prelacteal food and drinks was significantly associated with stunting.

The maternal characteristic associated with stunting was low mother's education level, in which the proportion of stunted children more commonly occurred in mothers with lower education level (elementary school graduated) compared to the higher education level (junior high school or higher graduated) 32.8% versus 24.5% in 2000 and 34.8% versus 30.6% in 2014. However, only in 2000 was a

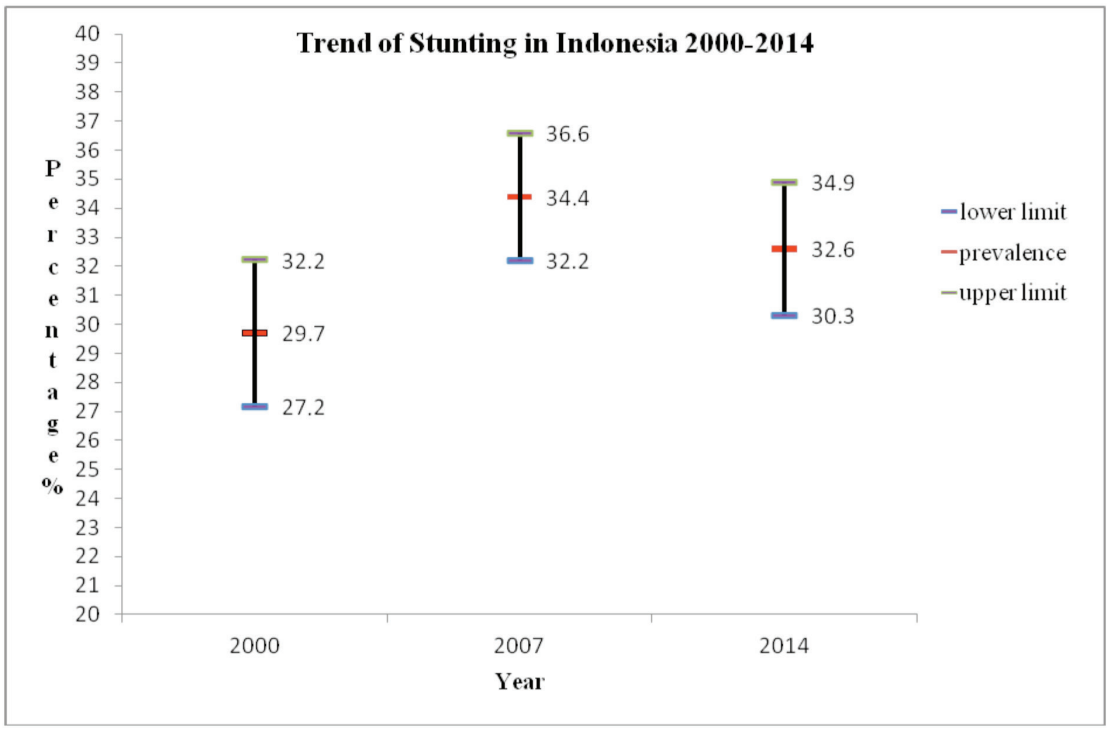

Figure 1. Trend of stunting in Indonesia, 2000-2014

Table 1. Variables associated with stunting

Variable	Year 2000				p	95% CI	Year 2014				p	95% CI
	Stunting		Not stunting				Stunting		Not stunting			
	n	%	n	%			N	%	N	%		
Age of children (months)					0.000	2.08-4.12					0.000	1.64-2.87
0-6	81	19.9	327	80.1			94	20.8	358	79.2		
6-12	54	19.5	223	80.5			87	25.3	257	74.7		
12-23	240	41.5	338	58.5			344	42.3	469	57.7		
Birth weight (g)					0.013	1.12-2.72					0.000	1.44-3.26
<2500	36	41.4	51	58.6			51	50.0	51	50.0		
≥2500	339	28.8	837	71.2			474	31.5	1033	68.5		
Provision of prelacteal					0.190	0.92-1.50					0.000	0.53-0.81
Not provided	184	31.5	400	68.5			312	29.4	749	70.6		
Provided	191	28.1	488	71.9			213	38.9	335	61.1		
Exclusive breastfeeding					0.225	0.36-1.28					0.709	0.79-1.41
Not provided	359	29.4	862	70.6			445	32.8	911	67.2		
Provided	16	38.1	26	61.9			80	31.6	173	68.4		
Provision of complementary food					0.945	0.59-1.78					0.489	0.86-1.35
Not on time	319	31.1	708	68.9			266	36.1	471	63.9		
Not yet on time	37	21.3	137	78.7			53	19.6	218	80.4		
On time	19	30.7	43	69.3			206	34.3	395	65.7		
Mother's education					0.002	1.16-1.94					0.068	0.99-1.50
<Junior high school	260	32.8	534	67.2			272	34.8	509	65.2		
≥Junior high school	115	24.5	354	75.5			253	30.6	575	69.4		
Mother's occupation					0.652	0.81-1.40					0.714	0.82-1.34
Employed	103	30.7	233	69.3			406	32.8	831	67.2		
Unemployed	272	29.3	655	70.7			118	31.8	253	68.2		
Health sanitation					0.001	1.40-3.61					0.022	1.05-1.83
Poor	353	31.2	779	68.8			443	33.9	863	66.1		
Good	22	16.8	109	83.2			82	27.1	221	72.9		
Ownership of Mother and Child Health Book/Health Card					0.062	0.99-1.61					0.001	1.16-1.79
Not own	217	31.9	463	68.1			298	36.5	518	63.5		
Own	158	27.1	425	72.9			227	28.6	566	71.4		
Antenatal care					0.009	1.10-1.96					0.091	0.96-1.69
Incomplete	94	36.3	165	63.7			91	37.3	153	62.7		
Complete	281	28.0	723	72.0			434	31.8	931	68.2		
Complete immunisation					0.020						0.210	0.88-1.75
No	358	29.2	869	70.8		0.21-0.90	474	33.1	956	66.9		
Yes	17	47.2	19	52.8			51	28.5	128	71.5		

significant association between stunting and mother's education shown. Besides education, prevalence of stunted children was significantly associated with poor health sanitation in 2000 and 2014.

Similarly, the proportion of stunted children whose mothers did not have complete antenatal care was higher than those whose mothers did complete (36.3% versus 28.0% in 2000 and 37.3% versus 31.8% in 2014). However, significant association was found in 2000 but not in 2014. Other variables such as exclusive breastfeeding, mother's occupation, and the provision of complementary food were not found to show a significant association with stunting both in 2000 and 2014.

DISCUSSION

The trend of stunting prevalence in Indonesia among children aged 0-23 months during the past 14 years appear to vary over a narrow range between 29.7% in 2000 and 32.5% in 2014. In using IFLS data, Rachmi *et al.* (2016) found stunting among children aged 2.0-4.9 years decreased from 50.8% in 1993 to 48.6% in 1997, 44.8% in 2000 and 36.7% in 2007. Their age groups and the periods differed from this study. This study found that in 2000, stunting prevalence was significantly related to the children's age, low birth weight, low mother's education, incomplete antenatal care, incomplete immunisation, and poor health sanitation. Meanwhile, in 2014, stunting prevalence was significantly associated with children's age, provision of prelacteal food, the absence of Mother and Child Health Book or Health Card as well as low birth weight. In both years, these associated factors of stunting can be attributed to low socio-economic and environmental health status.

This study's finding of a higher proportion of stunted children in the range of 12-23 months is in line with that from a study in Guatemala in 2008-2009, where it was found that the prevalence of stunting began to increase at the age of 6 months to 48 months (Martorell & Young, 2012). The period from 6 months onwards is critical for children as this is when they begin to show growth faltering and become stunted. Breastmilk alone is no longer enough to fulfil their nutritional need and they need appropriate dietary intake to support their growth and development. Another factor related to stunting found in this study is low birth weight, which is known to increase infant morbidity and mortality in infants (Maryunani, 2013). Low birth weight is generally caused by premature birth (pregnancy lasting less than 37 weeks) or poor foetal growth due to intra uterine growth retardation (IUGR) (Fikawati, Syafiq & Karima, 2016). Causes of low birth weight include chronic maternal malnutrition, stunted mothers, young age of mothers (under the age of 20 years) and infections (Kramer in Aryastami *et al.* 2017). LBW infants tend to have growth faltering compared with babies born with normal weight (Barker, Bergman & Ogra, 2008). Children with low birth weight are at a higher risk of stunting (Aryastami *et al.* 2017; Hildagardis *et al.* 2014; Nadiyah *et al.* 2014; Seedhom *et al.* 2014). The results of a systematic review of five countries (Brazil, Guatemala, India, The Phillipines, and South Africa) reported that malnutrition in pregnant mothers leads to risk of having stunted children, who grow into stunted adults having low economic productivity, and in a vicious cycle, have children with LBW (Victora *et al.,* 2008).

Another factor found in this study associated with stunting is incomplete immunisation, which puts the child at increased risks of infectious diseases. Recurrent infectious diseases lead to reduction in weight and body height (Stephensen, 1999 in Aryastami *et al.,* 2017). A study in Palu, Sulawesi, Indonesia by Rahman *et al.* (2015) found association between infectious disease

and stunting, in which children aged under 3 years old with poor immunisation records were at three times higher risk for stunting compared to those with good immunisation records.

This study found young children receiving prelacteal foods and beverages were more likely to be stunted. Children receiving prelacteal food are likely to be exposed to microbial contamination especially in households with poor sanitation conditions. Environmental sanitation is an underlying factor of stunting, and is defined by WHO (2008) as the practice of taking care of ourselves and environment to stay clean and free from risk of infection. Poor environmental sanitation related to stunting was reported by Torlesse *et al.* (2016) and Kusumawati *et al.* (2015), in which the risk of stunted children living with poor health sanitation is higher, whereby they are exposed to unhealthy house ventilation, insufficient lighting, lack of closed waste container and not having family latrine. These trigger the emergence of infectious diseases in children that can cause growth delay. Another study by Fink *et al.* (2011) in 172 countries from 1986-2007 found that the risk of stunting was lower in households with good environmental sanitation.

Although exclusive breastfeeding was not found significantly associated with stunting in 2000 and 2014, mothers should be encouraged to practice exclusive breastfeeding for at least 6 months (WHO, 2003). This recommendation is important for those living in locations with poor environmental health, owing to the likelihood of contamination of water and foods provided to young children. Coutsoudis & Bentley (2004) attributed obstacles to exclusive breastfeeding as fear that breastmilk alone was insufficient, using incorrect breastfeeding techniques, mothers not receiving support from husbands or health providers, and the promotion of formula milk.

A study in Palu, Sulawesi, Indonesia found that success of exclusive breastfeeding was possible with socio-cultural support (Rahman *et al.,* 2017). The success of exclusive breastfeeding is also related to completeness of antenatal care, at least once in the first trimester, twice in the second trimester, and twice in the third trimester. Pregnant mothers with incomplete antenatal care, followed by not having the Mother and Child Health Book or Health Card, may not obtain correct information on how to take care of their infant and proper exclusive breastfeeding. The Mother and Child Health Book and Health Card provide reproductive health education, including pregnancy preparation and care during pregnancy in order to give birth to a healthy baby. However, according to the 2013 National Basic Health Research, the percentage of mothers who have the Mother and Child Health Book is only 40.40%, and of these, only at 10.70% fully filled it up. This shows that Mother and Child Health Book has not yet been used as an adequate counselling medium (Trihono *et al.*, 2015).

CONCLUSION

Stunting remains as a public health problem in Indonesia. Its prevalence of 32.6% in 2014 has not decreased since 2000. Indonesia needs to address both the immediate and underlying factors associated with stunting.

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Authors' contributions

LH, principal investigator, settle on the concept and the design of the study, analyse and interpret the data, drafting the first article and revised based on input; RW, provide intellectual input to the analysis and its interpretation; RM, sufficient

input on the analysis of data; ELA, provide intellectual input and final approval of the article to be published.

Ethical approval

Ethical clearance was received from The Ethical Committee for Research and Community Development, Faculty of Public Health Universitas Indonesia No.573/UN2.F10/PPM.00.02/2017.

Conflict of interest

We declare that we have no conflict of interest.

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