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Wasting and associated factors among infants aged 0-23 months in 13 provinces in Indonesia: Evidence from Indonesia Family Life Surveys (IFLS) 2000, 2007 & 2014

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ABSTRACT

Introduction: Wasting is an acute form of under-nutrition. Frequent occurrence and long-term wasting can lead to stunting. Indonesia has one of the world's highest wasting prevalence of 12.1% and ranked the 4th highest for wasting globally in 2012. **Methods**: Data from Rand Corp Indonesia Family Life Survey for 2000, 2007 and 2014 were used to examine wasting trend, while data for 2000 and 2014 were used to determine the associated factors of wasting in infants aged 0-23 months. Data was analysed using SPSS. Logistic regression was used to predict the variables contributing to wasting. **Results**: Wasting prevalence in 2000, 2007 and 2014 were 12.0%, 11.2% and 10.1%, respectively. Birth weight correlated significantly with wasting prevalence in 2000 while in 2014, wasting prevalence correlated significantly with birth weight, birth length, poverty, and ownership of "Mother and Child Health Book". Logistic regression showed that birth weight was an important associated factor in 2000 and 2014, while ownership of "Mother and Child Health Book" was the only important associated factor of birth weight in 2014. **Conclusion**: The prevalence of wasting among young Indonesian children was lower in 2014 compared to 2000, but is still at a high level. Birth weight consistently remains the significant factor affecting wasting. It is important that the nutritional status of women be taken care of before and during pregnancy for optimal birth outcomes.

Keywords: Wasting, birth weight, birth length, trend, child care

INTRODUCTION

Nutrition for infants is one of the factors that determine the child's optimal growth and development. Lack of nutrition that occurs in human early life can lead to growth faltering. In addition, it may have an effect on cognitive development, morbidity and mortality of infants (Fikawati *et al.*, 2015). The period of the first 1,000 days of life is the period when development and growth of the child is progressing rapidly, both physically, cognitively and emotionally. Infants who suffer from serious malnutrition in this period showed poor brain development and low intelligence (Barker, 2009). The risk of non-communicable/chronic diseases is likely to occur in adulthood when severe malnutrition occurs in the first 1,000 days of life (Barker, 2008; Toran, 2006).

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Wasting is a serious nutritional problem suffered by infants and children in Indonesia. Based on reports by the United Nations Children's Fund (UNICEF), World Health Organization (WHO) and World Bank (2015), wasting prevalence affected 50 million children globally, or 7.4% of children under 5 years of age. The World Health Assembly Resolution in 2012 set a target to reduce wasting to less than 5.0% by 2025 (WHO, 2014). Based on 2014 Global Nutrition Report, Indonesia with 12.1% wasting was among 17 countries with high prevalence of wasting. Based on Ministry of Health, Republic of Indonesia 2013, wasting prevalence of children aged 0-59 months in 2007, 2010, and 2013 were 13.6%, 13.3%, and 12.1%, respectively. It is considered a social health problem for countries to have a prevalence of thin infants between 10.0-14.0%, and the problem is considered critical if wasting prevalence is ≥15.0% (WHO, 2010).

Multiple factors affect childhood wasting, including low birth weight (Sanders, 2013), low intensity of medical checkup during pregnancy (Saputra *et al.,* 2012), under-nutrition and poor parenting. Parenting-related factors that may affect wasting include prelacteal feeding (Nurya, 2011), exclusive breastfeeding (Nahar, 2010; Zongrone *et al.,* 2012), provision of supplementary feeding (Zongrone *et al.,* 2012), diarrhoeal infections (Yisak *et al.*, 2015; Saaka *et al.*, 2015), upper respiratory tract infections (Asfaw *et al.,* 2015), immunisation (Mishra *et al.*, 2013) and vitamin A supplementation (Hadi *et al.*, 2000). Factors that indirectly affect wasting include poor environmental sanitation, poverty, large number of family members (Yisak *et al.,* 2015), and lack of employment for people with low education (WHO, 2014; Ruel, 2008).

This study aimed at determining wasting prevalence and associated factors among infants aged 0-23 months in 13 provinces in Indonesia based on the Indonesia Family Life Surveys (IFLS) in 2000, 2007 and 2014.

MATERIALS AND METHODS

The study used secondary data obtained from Indonesia Family Life Survey (IFLS). IFLS has been conducted five times since 1993, i.e. IFLS-1 (1993), IFLS-2 (1997), IFLS-3 (2000), IFLS-4 (2007), and IFLS-5 (2014). IFLS was published by the RAND Corp (Research and Development). Data reported in this study were derived from IFLS 3, 4 and 5; covering 13 provinces, i.e. North Sumatera, West Sumatera, South Sumatera, Lampung, DKI Jakarta, Yogyakarta, West Java, Central Java, East Java, Bali, West Nusa Tenggara, South Kalimantan and South Sulawesi.

IFLS-3 (2000) included 31,000 individuals from 10,400 households; IFLS-4 (2007) included 43,500 individuals from 13,500 households; and IFLS-5 (2014) included 50,000 individuals from 15,000 households.

The subjects in this study comprised infants aged 0-23 month from 13 provinces. 1,482 people in 2000, 1,645 people in 2007, and 1,476 people in 2014, while the number of samples in this study was 1,263 people in 2000 and 1609 in 2014. Inclusion criteria included were completeness of the research variables as in Table 1, as well as biological children, while the exclusion criteria were sick children and multiple pregnancies.

Data collection of IFLS was implemented by answering the questionnaires provided by the interviewer; the questions were available in form of question books including: Book 2 on household economic level; Book 3 on individual characteristics; Book 4 on marriage, pregnancy, delivery, breastfeeding, and contraceptive records;

Book 5 on child morbidity and education; Book K on civil registration; and Book US on anthropometric measures.

Variables studied included infant's age, birth weight, pregnancy check-up, having Mother and Child Health Book, exclusive breastfeeding, prelacteal feeding, complementary feeding, vitamin A supplementation, primary immunisation records, upper respiratory tract infection (ISPA) records, records of diarrhoeal diseases, maternal education level, maternal employment status, poverty, environmental sanitation and the number of family members.

Data analysis using SPSS was conducted. The 2000 IFLS, 2007 IFLS, and 2014 IFLS data were used for trend on wasting, while 2000 IFLS and 2014 IFLS were used as required variables in this research.

The chi-square test was used to determine the correlation between dependent and independent variables; and logistic regression was used to predict the variables contributing to wasting. Ethical approval for the study was obtained from Research Ethical Committee Community Engagement, Faculty of Public Health Universitas Indonesia *No.573/UN2. F10/PPM.00.02/2017.* In addition, an informed consent letter approved by the ethics committee and signed by the respondents or the authorised representative in the presence of a witness was obtained.

RESULTS

Wasting prevalence among infants aged 0-23 month declined by 16.0% from 2000 to 2014. Wasting prevalence was 12.4% in 2007, 11.2% in 2007 and 11.0% in 2014. Table 1 shows the comparison of child characteristics in 2000 and 2014. Chi-square test was used to determine differences between these characteristics in 2000 and 2014.

Variables associated with wasting cases among infants aged 0-23 months in 2000 were mostly in the age range of 0-6 months (13.5%), mothers with low level of education (15.4%), mothers who were unemployed (12.7%), number of family members greater than 4 persons (12.3%), not poor (13.0%), incomplete pregnancy check up (14.3%), mothers did not have health card (12.8%), birth weight <2,500 gram 17.2%, birth length <48 cm (11.3%), prelacteal feeding (12.5%), mothers did not exclusively breastfeed their infants (12.0%), supplementary food was provided properly (14.5%), incomplete primary immunisation records (12.2%), existence of upper respiratory track infection (13.6%), existence of diarrhoeal disease records 11.1%, and poor environmental sanitation (11.6%).

In 2014, wasting cases were affected by almost similar socio-economic variables as in 2000: mostly in the range 6-12 months of age (11.4%), mothers with primary school education (12.3%), mothers who were unemployed (10.8%), number of family members was greater than 4 persons (10.3%), not poor (9.6%), incomplete pregnancy check up (13.1%), mothers did not have health card (12.1%), birth weight <2,500 gram (8.6%), birth length <48 cm (20.0%), prelacteal feeding (9.3%), mothers did not exclusively breastfeed their infants (11.1%), supplementary food was provided properly (10.6%), incomplete primary immunisation records (10.1%), existence of upper respiratory track infection (10.2%), existence of diarrhoeal disease records (10.2%), and bad environmental sanitation (10.5%).

Bivariate results showed that in 2000 the significant variables were birth weight (p=0.030), while in 2014, the significant the significant variables were birth weight (p=0.028), birth length (p=0.005), poverty (p=0.009), and

Table 1. Comparison of child characteristics in IFLS 2000 and 2014

Variable	*Wasting in 2000*		*p*	*Wasting in 2014*		*p*
	n	*%*		*n*	*%*	
Infant's age (month)			0.413			0.277
0-6	55	13.5		48	10.6	
6-12	35	10.3		47	11.4	
12-23	61	11.8		68	9.2	
Birth weight (g)			0.030			0.028
<2500	15	17.2		14	8.6	
≥2500-3900	128	12.0		144	8.3	
>3900	8	7.1		5	3.1	
Birth length (cm)			0.062			0.005
<48	123	11.3		131	20.0	
≥48	28	16.3		32	19.6	
Pregnancy check-up			0.196			0.095
Incomplete check-up	37	14.3		32	13.1	
Complete check-up	114	11.4		131	9.6	
Ownership of Mother and Child Health Book			0.322			0.007
Do not have the book	87	12.8		99	12.1	
Having the book	64	11.0		64	8.1	
Prelacteal feeding			0.580			0.431
Not given	78	11.5		112	10.6	
Given	73	12.5		51	9.3	
Exclusive breastfeeding			0.992			0.591
Not given	146	12.0		28	11.1	
Given	5	11.9		135	10.0	
Complementary feeding			0.472			0.152
Not proper	118	11.5		82	11.2	
Given	9	14.5		53	10.6	
Not given (yet)	24	13.8		27	10.0	
Supplementation of Vitamin A			0.822			0.281
Incomplete	95	11.3		102	10.3	
Complete	1	9.1		13	7.6	
Not given (yet)	55	13.5		48	10.6	
Primary immunisation records			0.120			0.972
Incomplete	150	12.2		145	10.1	
Complete	1	2.8		18	10.1	
Upper respiratory tract infection			0.727			0.986
Negative	145	11.9		158	10.1	
Positive	6	13.6		5	10.2	
Diarrhea disease			0.659			0.940
Negative	125	12.1		129	10.1	
Positive	26	11.1		34	10.2	
Poverty			0.618			0.009
Not poor	27	13.0		131	9.6	
Poor	124	11.8		146	9.6	
Environmental sanitation			0.219			0.322
Not good	131	11.6		137	10.5	
Good	20	15.3		26	8.6	
Maternal education level			0.454			0.243
Not school	29	15.4		4	4.8	
Primary school	38	10.9		36	12.3	
Junior high school	30	11.6		39	9.6	
Senior high school and above	54	11.5		84	10.1	
Maternal employment status			0.160			0.094
Not working	118	12.7		134	10.8	
Working	33	9.8		29	7.8	
Number of family members			0.717			0.851
1-4 persons	57	11.4		79	9.9	
>4 persons	94	12.3		84	10.3	

Table 2. Logistic regression of factors associated with wasting in infants aged 0-23 months in 2000

Variable	*OR*	*95% C.I For Exp (B)*		*p*
		Lower	*Upper*	
Birth weight (g)				
<2500	1.7	0.3	1.3	0.046
≥2500-3900	1.0			
Birth length (cm)				
<48	1.4	0.4	1.1	0.169
≥48	1.0			
Pregnancy checkup				
Incomplete check-up	1.2	0.5	1.2	0.307
Complete check-up	1.0			
Ownership of Mother and Child Health Book				
Do not have the book	1.1	0.6	1.3	0.499
Having the book	1.0			
Prelacteal feeding				
Not given	1.1	0.8	1.5	0.524
Given	1.0			
Poverty				
Not poor	1.1	0.7	1.7	0.761
Poor	1.0			
Primary immunisation record				
Incomplete	5.0	0.3	1.7	0.090
Complete	1.0			
Upper respiratory tract infection				
Negative	1.0	0.4	2.7	0.847
Positive	1.8			
Maternal employment status				
Not working	1.4	0.5	1.2	0.191
Working	1.0			

ownership of "Mother and Child Health Book" (p=0.007) (Table 1).

Multivariate results in logistic regression showed that in 2000 the significant variables were birth weight (Table 2 and 3). The statistical results showed that children born <2500 gram were likely to get wasting at the age of 0-24 months by 1.7 times greater than the children born normal birth weight ≥2500-3900 gram (p=0.046). While in 2014, the multivariate results in logistic regression showed that the significant variables were birth weight and ownership of Mother and Child Health Book. It can be concluded that children born <2500 gram were likely to get wasting at the age of 0-24 months by 2.3 times greater than normal birth weight (p=0.020). The children with do not have the book ownership of Mother and Child Health Book were likely to get wasting at the age of 0-24 months by 1.6 times greater than having the book ownership of Mother and Child Health Book (p= 0.013).

DISCUSSION

Based on the analysis of the IFLS data, wasting prevalence among ages 0-23 months showed a decreasing trend between 2000 and 2014. Nonetheless, the prevalence remains high at 11.0%.

Table 3. Logistic regression of factors associated with wasting in infants aged 0-23 months in 2014

Variable	*OR*	*95% C.I For Exp (B)*		*p*
		Lower	*Upper*	
Birth weight (g)				
<2500	2.3	0.1	1.2	0.020
≥2500-3900	1.0			
Birth length				
<48	1.6	0.4	1.0	0.079
≥48	1.0			
Pregnancy checkup				
Incomplete check-up	1.2	0.5	1.4	0.649
Complete check-up	1.0			
Ownership of Mother and Child Health Book				
Do not have the book	1.6	0.5	1.4	0.013
Having the book	1.0			
Prelacteal feeding				
Not given	1.2	0.6	1.2	0.284
Given	1.0			
Environmental sanitation				
Not good	1.4	0.4	1.3	0.316
Good	1.0			
Poverty				
Not poor	1.0	0.7	2.8	0.429
Poor	1.3			
Upper respiratory tract infection				
Negative	1.0	0.4	3.3	0.646
Positive	1.2			
Maternal employment status				
Not working	1.3	0.5	1.1	0.130
Working	1.0			

The IFLS in 2000 and 2014 showed that birth weight was the most dominant factor associated with wasting. This finding is in line with previous studies (Rayhan, 2006; Sanders, 2013; Nahar *et al.,* 2010; McDonald *et al.,* 2012). As children with low birth weight have less developed immune system, they are susceptible to diseases and infections. Moreover, it is difficult to catch up to their weight-for-age if not supported by environmental factors related to feeding patterns with nutrition intake needed by infants, which causes children to suffer from wasting (Dubois *et al.*, 2012). Birth weight may reflect the quality of health maintenance, including health care received by a mother during her pregnancy. If the foetus is undernourished during the pregnancy period, the infant growth will be short and not be proportional. Also, if the foetus is undernourished since the middle or the end period of pregnancy, the infant will be thin or short (Sanders, 2013).

The IFLS-5 (2014) showed that Health Card ownership was the most dominant factor associated with wasting, in line with studies by Muqni (2012) and Hidayat (2011). The Health Card records the growth and development

of children aged 0-60 months, and the card ownership indirectly affects nutritional status. The Health Card can be used to detect problems with their child's nutritional status early by checking their weight for age or weight to height measurement; this allows them to control the child's weight. The card is not merely a tool for health officers, but also a communication and education media for mothers (Muqni *et al.,* 2013; Hidayat, 2011).

Also associated with wasting is poverty status. However, it is not the most dominant factor associated with wasting. A similar finding was reported by Nahar *et al.* (2010), Arief *et al.* (2014) and Eme *et al.* (2013). Poverty becomes the basic cause of wasting problem as children with wasting come from the low-income families (Nahar *et al.*, 2010). Poverty will lead to insufficient food intake, and the families are less likely to have access to modern health care facilities while ill (Hong, Banta & Betancourt, 2006). Another study mentioned that poverty may change the infant's nutritional status because nutritious food availability often needs a large amount of funds, so poor families usually find it difficult (Arief *et al.*, 2014; Eme *et al.*, 2013).

Birth length was also associated with wasting although it was not the most dominant factor, in line with studies by Nurillah *et al.* (2016) and Hadi (2010). Birth length is an important parameter to figure out the linear growth of infant during in the womb. A low linear measurement usually indicates poor nutrition. Birth length is one of the determinants of, and significantly relates to, child growth and development (Nurillah *et al.*, 2016). The length may indicate nutritional problems as it is not only related to the shorter physical stature, but also to a child's cognitive functions (Hadi, 2010).

CONCLUSION

Prevalence of wasting among Indonesian young children appears to have decreased between 2000 and 2014, but wasting prevalence remains high. Birth weight was an important associated factor with wasting in Indonesia. It is recommended that nutritional and health care of women before pregnancy and during pregnancy be accorded high priority for healthy birth outcomes.

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Authors' contributions

RM, initiated the conception and determined the design of the research, analyzed and interpretated the data, wrote the first draft of manuscript and revised accordingly; RW, sufficient participation in the interpretation and analysis of data; LH, provide intellectual input to data interpretation; ELA, provide intellectual input to the first draft of the article, including the conception and design of the research and final approval of the version to be published.

Conflict of interest

There is no conflict of interest in this study.

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