Ecological Analysis of Stunted Toddler in Indonesia

Agung Dwi Laksono[1], Ina Kusrini[2]

[1]Senior Researcher, Center of Research and Development of Humanities and Health Management, Indonesia Ministry of Health, Jakarta, Indonesia, [2]Researcher, Unit of Health Research and Development Magelang, Indonesia Ministry of Health, Central Java, Indonesia

Abstract

The results of the Indonesia Basic Health Survey (Riskesdas) in 2007, 2013 and 2018 showed the stunted rate for toddlers was still above 30%. While proven poverty often comes with stunted on toddlers. The study aimed to answer whether poverty factors and the availability of health services are related to the prevalence of stunted toddlers in provinces in Indonesia. This study was a secondary data analysis "Data and Information: Indonesian Health Profile in 2017". The results showed that the high percentage of the poor population (>14.43%) was dominated by the high prevalence of stunted toddlers (22.51%-30.0%). In the category of health center ratio per 100 thousand high population (≥4) seen dominated by the prevalence of stunted toddlers in the high category (22.51%-0.0%). In the category of nutritionist ratio per 100 thousand high population (>12), it appears to be dominated by the prevalence of stunted toddler in the high category (22.51% -30.0%). In the category of midwife ratio per 100 thousand high population (>97) was dominated by the prevalence of stunted toddler (22.51%-30.0%). It was concluded that the percentage of the poor population was positively related to the prevalence of stunted toddler. While health service input factors (health center, nutritionists, and midwives) were not related to the prevalence of stunted toddlers.

Keywords: *ecological analysis, stunted toddlers, health profile, poverty.*

Background

The quality of growth in the first 1000 days of life is one of the focuses in health development. The importance of meeting nutritional needs at this time will also determine the quality of growth and development be optimal. Because this period is called a critical period because the failure of growth that occurs in this period will affect the quality of health in the future[1], including the quality of education[2].

One indicator of non-optimal growth quality is the high prevalence of stunted toddler. Stunted is a condition of malnutrition which is marked by the z score of height according to age under -2 elementary school. The high prevalence of stunting in toddlers shows the disruption of the quality of growth in the golden period. The 1000 day life period starts from the baby in the womb until the first two years of life[3,4].

According to the results of the Riskesdas in 2007, 2013 and 2018, in Indonesia still showed stunted rates in toddlers above 30%. This means that there are 3 stunted toddlers out of 10 toddlers born in Indonesia[5]. The high prevalence of stunted certainly requires serious treatment. The serious impact will threaten the quality of human resources in the continuous life chain. Stunted toddlers will grow into a stunted adult with various impacts that will be caused[4,6]. Besides giving birth to babies with the same nutritional problems, for example, the birth of stunting babies or babies with low birth weight, growth failure is also closely related to the long-term impact of increasing the prevalence of non-communicable diseases in the future[7].

Adequate nutrition during pregnancy and supervision of the health of pregnant women through antenatal care services is one of the sensitive efforts in stunted

Corresponding Author
Agung Dwi Laksono
Center of Research and Development of Humanities and Health Management, Indonesia Ministry of Health, Jakarta, Indonesia. Percetakan Negara 29 Jakarta 10560
Email: agung.dwi.laksono-2016@fkm.unair.ac.id

prevention[8,9]. This situation makes health service inputs important during pregnancy. The presence of midwives and nutritionists and health centers as institutions are expected to be able to make a positive contribution to antenatal care services to prevent stunted in toddlers.

Poverty is proven to often occur together with the occurrence of stunted in toddlers. Poverty is not only present and contributing individually to one family, but macro poverty in an area is also allegedly closely related to the high prevalence of stunting in a colony or community group. Poverty is closely related to the availability of food to the family[10,11].

The study aimed to answer whether poverty factors and the availability of health services are related to the prevalence of stunting under five in provinces in Indonesia. This research is important to do because existing studies always focus on toddlers individually. No studies have been found that ecologically analyze aggregate data at the provincial level. The results of this study are important for health policymakers at the provincial and national levels for efforts to improve the nutritional status of children under five, especially the category of height indicators per age.

Materials and Method

This research was an ecological analysis using secondary data. Secondary data sourced from "Data and Information: Indonesian Health Profile in 2017" issued by the Indonesian Ministry of Health[12]. Data were available at the link www.pusdatin.kemkes.go.id. The unit of analysis in this study was the provinces of Indonesia. In total (total sampling) 34 provinces were analyzed in this study.

The main variable to be predicted was "Prevalence of stunted toddlers", ie the percentage of children aged 0-59 months with indicators of height per age included in the very short and short categories. Predictor variables consisted of the percentage of poor population, the ratio of health center per 30 thousand population, ratio of nutritionist per 100,000 population, and the ratio of midwives per 100,000 population. The variable prevalence of stunted toddlers was categorized into 4 strata based on WHO criteria that the prevalence of 30% and above was a serious public health problem[5]. While other variables will be categorized into 4 strata with statistically the same cut of points. Data were analyzed descriptively by cross-tabulation. Because the data processed was a total sample of the entire province, it was not necessary to see the level of significance.

FINDINGS

Figure 1 showed the distribution of stunted toddler prevalence per province in Indonesia. Only 1 province (Central Kalimantan) has a prevalence rate of stunted toddlers more than 30%. Based on WHO criteria, the prevalence of stunted toddlers in Central Kalimantan falls into the category of serious public health problems[5].

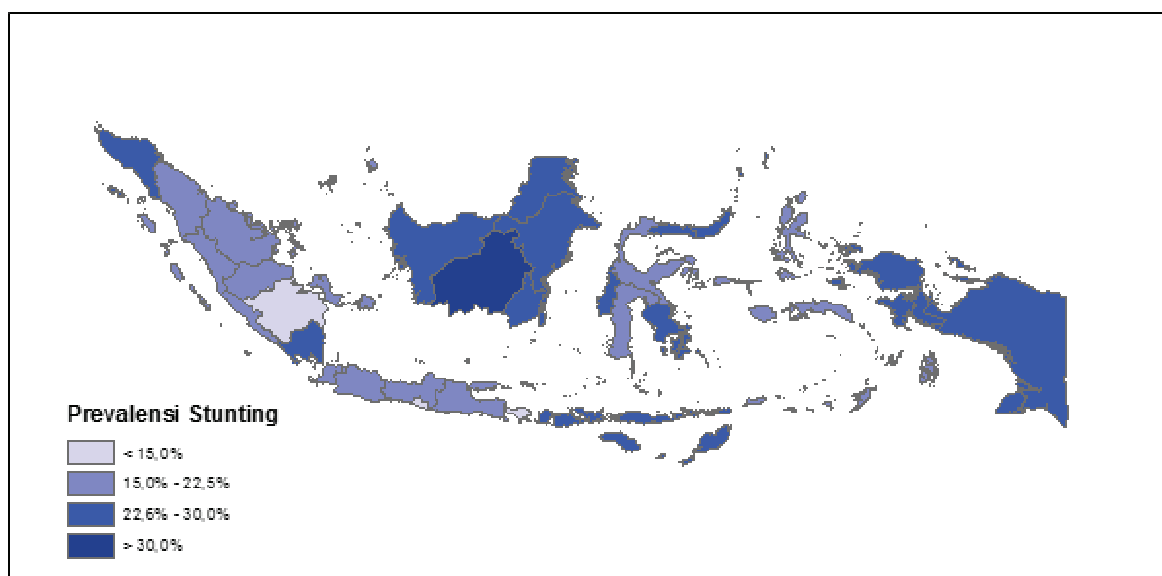

Figure 1. Stunted Toddlers Prevalence Distribution by Province in Indonesia

Source: Indonesian Health Profile 2017[12]

Table 1. Descriptive Statistics of Stunted Toddlers Prevalence and Related Factors

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Stunted Toddlers Prevalence	34	13.60%	30.40%	21.55%	4.40%
Percentage of Poor Population	34	4.00%	28.00%	10.95%	5.79%
Ratio of Health Centers/100 thousand Population	34	1	5	1.82	0.968
Ratio of Nutritionisnts/100 thousand Population	34	1	26	9.65	7.515
Ratio of Midwifes/100 thousand Population	34	18	175	74.65	34.972

Table 1 is a statistically descriptive of the 5 variables analyzed in this study. There is a very high gap in all variables. The lowest prevalence of stunted toddlers is Bali Province (13.60%), and the highest is in Central Kalimantan Province at 30.40%. The variation in the percentage of the poor population is also quite high. The lowest of 4.00% is Jakarta Province, and the highest proportion of the poor is Papua Province at 28%. While the health service input variable also shows a high gap.

Percentage of Poor Population and Prevalence of Stunted Toddlers

Table 2 is a crosstabulation between the prevalence of stunted toddlers and the percentage of the poor population. In the low percentage of the poor population category (<6.36%), it is seen that it is dominated by the prevalence of toddlers with moderately stunted toddlers (15.00%-22.5%). While in the category of the high percentage of the poor population (>14.43%) it appears to be dominated by a high prevalence of stunted toddlers (22.51%-30.0%). This means that the higher the percentage of the poor population in a province, the prevalence of stunted toddlers is also higher.

Table 2. Crosstabulation of Percentage of Poor Population and Prevalence of Stunted Toddler in Indonesia in 2017

Percentage of Poor Population	Prevalence of Stunted Toddlers N=34				Total
	Low (<15.0%)	Middle (15.00%-22.5%)	High (22.51%-30.0%)	Very High (>30.0%)	
<6.36%	1	4	2	1	8
	12.5%	50.0%	25.0%	12.5%	100.0%
6.36%-9.38%	0	6	3	0	9
	0.0%	66.7%	33.3%	0.0%	100.0%
9.39%-14.43%	2	4	3	0	9
	22.2%	44.4%	33.3%	0.0%	100.0%
>14.43%	0	2	6	0	8
	0.0%	25.0%	75.0%	0.0%	100.0%

The ratio of Health Center and Prevalence of Stunted Toddler

Table 3 is a crosstabulation between the prevalence of stunted toddlers and the Health Centers ratio per 100,000 population. In the category of low health center per population ratio (1), it appears to be dominated by the prevalence of stunted toddlers in the medium category (15.00%-22.5%). While the Health Centers ratio per 100 thousand high population (≥4) was seen to be dominated by the prevalence of stunted toddlers in the high category (22.51%-30.0%). This means that the ratio of Health Centers in a province has no effect on the prevalence of stunted toddlers.

Table 3. Crosstabulation of Health Centers Ratio and Prevalence of Toddler Stunting in Indonesia in 2017

The ratio of Health Centers per 30 thousand population	Prevalence of Stunted Toddlers N=34				Total
	Low (<15.0%)	Middle (15.00%-22.5%)	High (22.51%-30.0%)	Very High (>30.0%)	
1	3	9	3	0	15
	20.0%	60.0%	20.0%	0.0%	100.0%
2	0	4	8	1	13
	0.0%	30.8%	61.5%	7.7%	100.0%
3	0	3	1	0	4
	0.0%	75.0%	25.0%	0.0%	100.0%
≥4	0	0	2	0	2
	0.0%	0.0%	100.0%	0.0%	100.0%

The ratio of Nutritionists and Prevalence of Stunted Toddler

Table 4 is a crosstabulation between the prevalence of stunted toddlers and the ratio of nutritionists per 100,000 population. In the category of nutritionists ratio per 100 thousand low population (<4) seen dominated by the prevalence of stunted toddlers in the moderate category (15.00%-22.5%). While the ratio of nutritionists per 100,000 population is high (>12) it seems to be dominated by the prevalence of stunted toddlers in the high category (22.51%-30.0%). This means that the ratio of nutritionists in a province has no effect on the prevalence of stunted toddlers.

Table 4. Crosstabulation of Nutritionists Ratio and Prevalence of Toddler Stunting in Indonesia in 2017

The ratio of Nutritionists per 100 thousand population	Prevalence of Stunted Toddlers N=34				Total
	Low (<15.0%)	Middle (15.00%-22.5%)	High (22.51%-30.0%)	Very High (>30.0%)	
<4	1	5	0	0	6
	16.7%	83.3%	0.0%	0.0%	100.0%
4-7	1	6	4	1	12
	8.3%	50.0%	33.3%	8.3%	100.0%
8-12	1	2	6	0	9
	11.1%	22.2%	66.7%	0.0%	100.0%
>12	0	3	4	0	7
	0.0%	42.9%	57.1%	0.0%	100.0%

The ratio of Midwives and Prevalence of Stunted Toddler

Table 5 is a crosstabulation between the prevalence of stunted toddlers and the ratio of midwives per 100,000 population. In the category of midwives ratio per 100 thousand low population (<53) seen dominated by the prevalence of stunted toddlers in the moderate category (15.00%-22.5%). While in the category of midwives ratio per 100 thousand high population (>97) it appears to be dominated by the prevalence of stunted toddlers in the high category (22.51%-30.0%). This means that the ratio of midwives in a province has no effect on the prevalence of stunted toddlers.

Table 5. Crosstabulation of Midwives Ratio and Prevalence of Toddler Stunting in Indonesia in 2017

The ratio of Midwives per 100 thousand population	Prevalence of Stunted Toddlers N=34				Total
	Low (<15.0%)	Middle (15.00%-22.5%)	High (22.51%-30.0%)	Very High (>30.0%)	
<53	1	6	1	0	8
	12.5%	75.0%	12.5%	0.0%	100.0%
53-67	1	3	5	0	9
	11.1%	33.3%	55.6%	.0%	100.0%
68-97	0	4	4	1	9
	0.0%	44.4%	44.4%	11.1%	100.0%
>97	1	3	4	0	8
	12.5%	37.5%	50.0%	0.0%	100.0%

The results of this study indicate that poverty is a factor that has a major contribution to the high prevalence of stunted toddlers in Indonesia. This is in line with the basic concept of growth and development which states that socio-economic factors are variables that have an influence on the quality of growth and development[13,14]. The poverty factor is considered to be closely related to family characteristics such as education level, purchasing power so that it will affect family access in the search for health services, providing quality food and also providing a clean and healthy environment[15,16].

This study is in line with the results of an analysis of the causes of stunted between other low and high socioeconomic factors. A Guatemalan study in 2010 found a high prevalence of stunting in families with low socioeconomic status[17]. In another study, it was also mentioned that large disparities between groups with low and high socioeconomic factors were associated with meeting nutritional needs during pregnancy and alcohol use[18].

The results of studies in four states in India multivariate found that food security, toilet use, and low body mass index status of mothers were the main predictors of stunted and underweight in children. While acute respiratory infections are a major predictor of weight loss and diarrhea is a major predictor of stunted[19]. All predictors show the inherent poverty characteristics of a family.

A case study in Mexico distinguishes rural and urban factors in identifying the cause of stunted toddlers. In urban areas, stunted is mostly found in toddlers with the type of work parents are farmers and with a low level of attendance to child health services. While in rural areas, parents do not work as a contributing factor to stunted, although it is also related to other factors,

namely duration of breastfeeding and attendance in child health services[20]. A multilevel analysis of factors causing stunted in Indonesia states that the variance of stunted at the provincial level by 51.9% can be reduced to 44.1% if the provincial economic level is improved[21].

The results of this study are considered limited in terms of useful macro policy because the data processed is aggregate data at the provincial level. Further research is needed at the individual level as a basis for more detailed policy decisions at the micro-level, with more involvement in target families.

Conclusions

Based on the results of the study it could be concluded that the percentage of the poor population was positively related to the prevalence of stunted toddlers. Or the less the percentage of the poor population, the less the prevalence of stunted toddlers. While health service input factors (health centers, nutritionists, and midwives) were not related to the prevalence of stunted toddlers.

Source of Funding: Self-funding

Conflict of Interests: Nil

Ethical Clearance: This study utilized secondary data as analytical material. No ethical license was needed in its implementation.

References

1. Sumarmi S. TINJAUAN KRITIS INTERVENSI MULTI MIKRONUTRIEN PADA1000 HARI PERTAMA KEHIDUPAN. Penelit GizidanMakanan. 2017;40(1):17–28.
2. Hoang V-N, Nghiem S, Vu X-B. Stunting and academic achievement among Vietnamese children: new evidence from the young lives survey. Appl Econ. 2019;51(18):2001–9.
3. Kavle JA, Flax VL, Abdelmegeid A, Salah F, Hafez S, Ramzy M, et al. Factors associated with early growth in Egyptian infants: Implications for addressing the dual burden of malnutrition. Matern Child Nutr. 2016;12(1):139–51.
4. Da Rocha Neves K, De Souza Morais RL, Teixeira RA, Pinto PAF. Growth and development and their environmental and biological determinants. J Pediatr (Rio J). 2016;92(3):241–50.
5. National Institute of Health Research and Development of The Indonesia Ministry of Health. The 2018 Indonesia Basic Health Survey (Riskesdas): National Report [Internet]. Jakarta; 2019. Available from: http://labmandat.litbang.depkes.go.id/images/download/laporan/RKD/2018/Laporan_Nasional_RKD2018_FINAL.pdf
6. Haas JD, Murdoch S, Rivera J, Martorell R. Early nutrition and later physical work capacity. Nutr Rev. 1996;54(2):S41–8.
7. Prentice AM. The Double Burden of Malnutrition in Countries Passing through the Economic Transition. Ann Nutr Metab. 2018;72(1):47–54.
8. Symington EA, Baumgartner J, Malan L, Zandberg L, Author, Ricci C, Smuts CM. Nutrition during pregnancy and early development (NuPED) in urban South Africa: A study protocol for a prospective cohort. BMC Pregnancy Childbirth. 2018;18(1).
9. Hambidge KM, Krebs NF. Strategies for optimizing maternal nutrition to promote infant development. Reprod Health. 2018;15.
10. Vonaesch P, Tondeur L, Breurec S, Bata P, Nguyen LBL, Frank T, et al. Factors associated with stunting in healthy children aged 5 years and less living in Bangui (RCA). PLoS One. 2017;12(8).
11. Sano Y, Routh B, Lanigan J. Food parenting practices in rural poverty context. Appetite. 2019;135:115–22.
12. Kementerian Kesehatan RI. Data dan Informasi: Profil Kesehatan Indonesia tahun 2017. Jakarta: Kementerian Kesehatan RI.; 2018.
13. Mostafa I, Naila NN, Mahfuz M, Roy M, Faruque ASG. Children living in the slums of Bangladesh face risks from unsafe food and water and stunted growth is common. Acta Paediatr Int J Paediatr. 2018;107(7):1230–9.
14. Nshimyiryo A, Hedt-Gauthier B, Mutaganzwa C, Kirk CM, Beck K, Ndayisaba A, et al. Risk factors for stunting among children under five years: A cross-sectional population-based study in Rwanda using the 2015 Demographic and Health Survey. BMC Public Health. 2019;19(1).
15. Laksono AD, Ibad M, Mursita A, Kusrini I, Wulandari RD. Characteristics of mother as predictors of stunting in toddler. Pakistan J Nutr. 2019;18(12):1101–6.
16. Schlichting D, Hashemi L, Grant C. Infant food

security in New Zealand: A multidimensional index developed from cohort data. Int J Environ Res Public Health. 2019;16(2).

17. Lee J, House F, Must A, Fulladolsa P de, Bermudez A. Disentangling nutritional factors and household characteristics related to child stunting and maternal overweight in Guatemala. Econ Hum Biol. 2010;188–96.
18. Jensen RT, Richter K. Understanding the relationship between poverty and children's health. Eur Rev. 2001;45(4–6).
19. Sinha R, Dua R, Bijalwan V, Rohatgi S, Kumar P. Determinants of stunting, wasting, and underweight in five high-burden pockets of four Indian states. Indian J Community Med. 2018;43(4):279–83.
20. Reyes H, Pérez-Cuevas R, Sandoval A, Castillo R, Santos JI, Doubova S V, et al. The family as a determinant of stunting in children living in conditions of extreme poverty: a case-control study. BMC Public Health. 2004;
21. Sihadi, Djaiman SPH. Peran kontekstual terhadap kejadian balita pendek di Indonesia. Penelit Gizi Masy. 2011;34(1):29–38.