Prevalence of Stunting among 10-Year Old Children in Indonesia

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Abstract

Children are characterized as healthy when they grow and develop adequately. This is determined through age-appropriate ideal height and weight measurements. This study aimed to quantify the prevalence of stunting among 10-year old children. This observational study had a cross-sectional design. This descriptive research was conducted from October to November 2019 using a total sample of 392 children obtained through the multistage proportional sampling to select participants from the student in 19 first elementary school in the study area. The anthropometric measurements of height were taken using a microtoice. The measurement results were compared with the World Health Organization (WHO) AntroPlus 2007 standards for 10-year old children. Height was measured using standard methods and height for age and the z-score was computed to assess stunting. The hypothesis test was done using ANOVA. The prevalence of stunting among 10-year old children in central Sulawesi, Indonesia is 24.7%. Poso's district has the highest percentage at around 35.9%, Donggala district is around 35.7%, Sigi district is around 16.5% and Palu City is around 12.5%. The highest mean for height was found in Palu City at 135,7 cm and the lowest was in Donggala district at 129,9cm. ANOVA showed a significant value of <0.001 with z-scores of -0.72, -1.63, -1.45 and -1.09 in Palu City, Donggala District, Poso and Sigi respectively. The prevalence of stunting in Central Sulawesi for children aged 10 years old is 24.7%. Donggala and Poso district have the highest prevalence of stunting. Some strategies need to be executed in order to improve the level of nutrition of elementary school children. This can be done by providing safe and hygienic school canteens, promoting healthy food diversity, encouraging more fish consumption and other healthy protein ingredients.

Keywords: *Children, South Sulawesi, stunting.*

Introduction

Stunting is used to refer to a linear growth retardation of less than -2SD height compared to age according to the WHO Child Growth Standards [1]. According to the Basic Health Research, short toddlers assessed in Central Sulawesi showed that the prevalence of stunting among under 2 years old in 2007, 2011, 2013, 2016 and 2018 declined by 32.3%, 31.5%, 37.2%, 26.0% and 30.8% respectively with an average decline of 6.2% over the past 9 years which needs to be controlled [2, 3].

However, despite the decline in percentage, it is still far from the 20% standard set by the World Health Organization (WHO). Furthermore, Central Sulawesi Province ranked 11th among the places regarding the very short and short nutritional status of toddlers in Indonesia [4]. Non-exclusive breastfeeding for the first 6 months, the low socio-economic status of the household, a premature/short birth, the low height of the mother and a low level of education are the determinants associated with stunted growth. Other risk factors are untreated toilet and drinking water, poor access to health care as well as living in a rural area [5]. An open defecation free program prevents stunting in the Banggai and Sigi Regencies [6].

Since stunting is permanent in childhood, it can lead to a loss of physical work capacity in

adulthood [7]. In Vietnam, a study focused on 6-9 year old children from 8 elementary schools found that 5.1% experienced stunting [8]. In Bangladesh, the study assessed linear growth from birth to 10 years of age.

It showed that the highest stunting prevalence was found at 2 years of age (50%), which decreased to 29% at the age of 10 [9]. The study by Monyeki showed there to be a high prevalence of stunting, rising from less than 10% at the age of 7 to more than 30% at the age of 10. Increases in the mean height and weight indicate that the effects of stress can be progressively accumulated and that the children's growth increases have become increasingly poor compared to those of the reference sample [7].

In another country, the growth of children in Greenland up to 10 years of age showed no further stunting [10]. The effects of stunting is associated with the learning achievement of elementary school children. According to research conducted in East Nusa Tenggara, shorter students experienced less learning achievements [11]. Similarly, the research in Padangpanjang City concluded that there was a relationship between nutritional status and student learning achievement [12], while the research in Jakarta showed that there was a relationship between the z-score of height-for-age stunting indicator and children's learning achievement [13].

Considering the magnitude and severity of the stunting problem at the age of 10 years and the lack of research related to height variation in children aged 10 years old then this study was conducted. The aim of this study was to determine the prevalence of stunting among children who are 10 years old based on the regional differences in the province of Central Sulawesi.

Methods

A quantitative descriptive method with a cross-sectional design was used to conduct this research with a focus on the Elementary Schools in 4 Regencies in Central Sulawesi Province from October to November 2019 using 392 10-year old respondents. A multistage cluster sampling technique was used to select the participants from the students in 19 elementary schools in the study area. The data were obtained using a questionnaire. The anthropometric measurements of height were done using microtoice.

The measurement results were compared with the WHO Plus 2017 standards for 10-year old children. Height was measured using the standard methods and height for age z-score was computed to assess stunting [14]. The revised z-score calculation method is more accurate than the CDC-LMS and WHO methods used for calculating the standard cut-off points [15].

The data was cleaned and analyzed using Stata 15.1. The data was analyzed using frequency distribution as well as a oneway ANOVA test and post hoc test using LSD. These results have been further presented in a table and narrative form. Ethical clearance was obtained from the Health Polytechnic of Makassar number 1066/KEPK-PTKMKS/X/2019.

Results

Table 1: Distribution of the respondents

Variable	District/City				Total
	Palu	Donggala	Sigi	Poso	
Gender					
Male	50(41.7%)	55(42.6%)	34(43.0%)	32(50.0%)	171(43.6%)
Female	70(58.3%)	74(57.4%)	45(57.0%)	32(50.0%)	221(56.4%)
Total	120	129	79	64	392
Nutritional status (2 categories)					
Short	15(12.5%)	46(35.7%)	13(16.5%)	23(35.9%)	97(24.7%)
Normal	105(87.5%)	83(64.3%)	66(83.5%)	41(64.1%)	295(75.3%)
Total	120	129	79	64	392
Nutritional status (4 categories)					
Very Short	2 (1.7%)	12(9.3%)	3(3.8%)	4(6.3%)	21(5.4%)
Short	13(10.8%)	34(26.4%)	10(12.7%)	19(29.7%)	76(19.4)
Normal	102(85.0%)	83(64.3%)	66(83.5%)	41(64.1%)	292(74.5%)
High	3(2.5%)	0(0%)	0(0%)	0(0%)	3(0.8%)
Total	120	129	79	64	392

Based on Table 1, the highest percentage of female children was in Donggala (57.4%). The prevalence of short 10-year old children in terms of nutritional status (2 categories) was 24.7%. The highest across the 4 categories was Donggala (9.3%), followed by Poso (6.3%). Palu (1.7%) was the lowest

Table 2: Mean value of the respondent's height and the ANOVA test by district/city

District/City	Descriptive Statistics			n	Sig.
	Mean ±SD	Minimum	Maximum		
Palu	135.73±7.87	117.0	159.0	120	<0.001
Donggala	129.95±6.62	110.5	151.0	129	
Sigi	133.32±7.20	115.0	149.3	79	
Poso	131.09±8.02	112.0	148.0	64	
	132.59±7.73	110.5	159.0	392	

Based on Table 2, the highest mean for height was found in Palu (135.73±7.87) and the lowest was in Donggala (129.95±6.62). The lowest height was Donggala District (110.5 cm) and the tallest was in Palu City (159 cm). The ANOVA test showed a significance value of less than 0.001

Table 3: Difference in mean height between district/city and the post hoc test with LSD

District / City	District / City	Difference of mean	Significance
Palu	Donggala	5.78	<0.001
	Sigi	2.41	0.025
	Poso	4.64	<0.001
Donggala	Palu	-5.78	<0.001
	Sigi	-3.38	0.001
	Poso	-1.14	0.313
Sigi	Palu	-2.40	0.025
	Donggala	3.38	0.001
	Poso	2.24	0.072
Poso	Palu	-4.64	<0.001
	Donggala	1.14	0.313
	Sigi	-2.24	0.072

Based on the table above, the difference in mean height through the post hoc test with LSD showed that the comparison between Palu City and the 3 regencies was significant with a value that was less than 0.001. Sigi and Donggala had significance values of 0.001, Poso was 0.072, while Donggala and Poso had no significant value with a p-value = 0,313

Table 4: Description of the height-for-age z-score using a one way ANOVA test

District / City	Descriptive Statistics			n	Sig.
	Mean ±SD	Minimum	Maximum		
Palu	-0.72±1.23	-3.74	3.03	120	<0.001
Donggala	-1.63±0.99	-4.44	1.38	129	
Sigi	-1.09±1.13	-4.10	1.59	79	
Poso	-1.45±1.22	-4.26	1.21	64	
	-1.21±1.19	-4.44	3.03	392	

Based on Table 4, the z-score in Palu City was -0.72±1.23 which means that it was far from the short value of -2.01. In addition, Donggala almost approached the short z-score at -1.63±0.99, while Poso was -1.45±1.22 and Sigi was -1.09±1.13

Table 5: Differences in z-score for height between district/city and the post-hoc test with LSD

District / City	District / City	Z Score	Significance
Palu	Donggala	0.90	<0.001
	Sigi	0.37	0.026
	Poso	0.72	<0.001
Donggala	Palu	-0.90	<0.001
	Sigi	-0.53	0.001
	Poso	-0.18	0.307
Sigi	Palu	-0.37	0.026
	Donggala	0.53	0.001
	Poso	0.36	0.061
Poso	Palu	-0.72	<0.001
	Donggala	0.18	0.307
	Sigi	-0.36	0.061

Based on Table 5, the difference in the z-score value for height through the post-hoc tests with LSD showed that the comparison between Palu City and the three districts had a very significant value ($\rho<0,001$). Sigi, Donggala ($\rho=0.001$) and Poso ($\rho= 0.061$) regencies had very significant difference values, while the Donggala and Poso regencies had none at $\rho = 0,307$

Discussion

There was an improvement in the linear growth of the 10-year old children in Palu City, although not significantly. The difference in the mean value and z-scores of the respondents' height in Palu City, Donggala, Sigi and Poso Regencies through the post-hoc LSD test was significant. Similarly, Sigi, Dongala and Poso also had significant differences, while the mean value and z-score of height between Donggala and Poso regencies did not have significant differences. The difference occurred due to the condition of Palu City. It is an urban area where the family income, mother's education level, immunization status and other factors were better than those in the district. Aiga et al in 2015 reported that older schoolchildren were much more likely to be stunted, underweight and thin. The greater the number of members of the household, the greater the likelihood that the schoolchild will be stunted and thin [19]. In childhood,

stunting is the best indicator of a child's well-being and it accurately describes social inequality. Although its prevalence is high, it is often not recognized and it is even considered to be normal in various communities [20]. Important stunting interventions include improving women's nutrition during pregnancy and in the postpartum period, as well as the control and prevention of infections before and after childbirth. According to Dewey in 2016, the subclinical conditions that limit growth, care for women and children also need attention [21]. It is important to put preventive measures in place against the occurrence of stunting especially in the first 1000 days of life. Special attention needs to be paid to children from birth up to the age of 10 by encouraging the habit of eating fish, as adopted by the governments of the South Sumatra Province and Central Sulawesi through an increase in the consumption of Forikan and Gemarikan fish.

These efforts are in the context of increasing the level of fish consumption due to its low saturated fat content, high level of protein and richness in terms of vitamins, minerals and omega-three fatty acids. However, households headed by fishermen have been shown to be one of the occupational groups with the highest level of malnutrition among the young and school-aged children [22]. Successful interventions are characterized by a combination of political commitment, multi-sectoral collaboration, community involvement, a community-based service delivery platform, and broader program coverage and compliance. Even for identical procedures, the results can be affected if the context is different. The combination of interventions is linked to success, including health and nutrition outcomes and social security networks. The effective stunting reduction program embraced country-level commitment along with community involvement and program context, reflecting the complex nature of the exposures involved [23].

In the regional context, Palu City and Sigi are urban areas while Donggala and Poso are rural areas. In the group of children under 2 years old, the prevalence of stunting was no different but in the age group of 10 years, it was very different between the areas. This can be explained wherein the group of children under 2 years of age have a food intake that is still very much determined by their parents. Their food status is highly dependent on the parenting patterns involved. In the age group of 10 years old where they are attending school, the children's food intake depends on both parental care and the diversity of the food in their school environment. In rural schools, the number of school canteens is only 1-2 in total and the choice of food sold is also less diverse (3-5 types of food). In urban area a school, the number of school canteens is around 3-6 canteens and the food choices also vary, carrying 10-15 different types of food. An adequate availability of food and dietary diversity over a sufficient period of time (including up to 10 years of age) is needed to increase the likelihood of height-to-age and weight-to-age catch-up that is expected during adolescence. In addition to inadequate household dietary diversity practices, a school-based dietary program may require the use of more animal protein ingredients [19]. Hills' study findings from 2015 showed that the food conditions in canteens in small schools, rural schools and non-governmental schools were based around providing energy-dense and nutrient-poor food [24]. School canteens are an important part of the school atmosphere and they are an ideal place for healthy eating. Furthermore, if the school system does not have a canteen, then balanced meals may be difficult to implement. A sustainable balanced school menu relies primarily on the support and resources offered by the school system to which it belonges [25].

Conclusions

This study showed that Donggala and Poso districts have the highest prevalence of stunting for 10-year old children. Multi-stakeholder interventions among the local districts, provinces and at the central government level should be done in order to diminish the prevalence of stunting at the community level in Central Sulawesi, Indonesia.

Acknowledgments

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