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Disparity of Risk Factors Stunting on Toddlers in the Coast and the Mountain Areas of Sinjai, South Sulawesi

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Abstract

Stunting is a form of malnutrition is characterized by short stature in children. The prevalence of toddler stunting in 2017 in South Sulawesi is 34%, while in Sinjai Regency in 2016 is 34.6%, 2017 is 43.7%, and 2018 is 35.8%. The purpose of this study was to analyze the disparity of stunting risk factors in toddlers on the coast and mountain areas. This study used a case-control design. The sampling techniques are Fixed Disease Sampling and Stratified Proportional Random Sampling. The population consists of the entire toddler in Sinjai, whereas consists of 60 toddler stunting age 9-59 months and 60 normal toddler on the coast and mountain areas. The instrument used the Food Frequency Questionnaire (FFQ) sheet. The data were analyzed by univariate bivariate, Chi Square and multivariate with logistic regression. The Chi square test results showed that the risk factors stunting on the coast is energy intake (p = 0.03; OR = 2.99) and Fe (p = 0.03; OR = 2.99), while in the mountain is the protein intake (p = 0.01; OR = 6.5), Fe (p = 0.01; OR = 4) and Zn (p = 0.00; OR = 5.4). The logistic regression results indicate that stunting dominant risk factors in the coast area is the intake of proteins and in the mountain area is the intake of Fe. There is a disparity between the risk factors of stunting toddler in the coast and mountain area. Poor nutritional intake increases the risk of stunting so it is necesary to increase the consumption of food sources of nutrients for toddlers.

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INTRODUCTION

Malnutrition is one of the less common causes of child morbidity and mortality in the world. Stunting is the most common form of malnutrition. Children are said to be stunted if their height is more than two standard deviations below the median growth of the standard of the World Health Organization (WHO) for a child by age and gender (Ministry of National Development Planning & UNICEF, 2017).

In the year of 2017, more than half the world's stunting toddler came from Asia (55%) While more than a third (39%) living in Africa. When compared to the prevalence of stunting toddlers in Asian which reached 83.6 million, the largest proportion come from South Asia (58.7%) and the lowest proportion in Central Asian (0.9%). Indonesia is included in third countries with the highest prevalence in the South-East Asia Region (SEAR). The average prevalence of stunting toddler in Indonesia year 2005-2017 was 36.4% (Data Centers and Information Ministry of Health, 2018).

Based on the results of the Nutritional Status Monitoring (PSG) in the province of South Sulawesi, the prevalence of stunting in 2015 of 34.1% and in 2016 it increased 35.6% and then in 2017 has decreased but not too significantly to 34.8% and still has not meet the target set by the WHO, which is 20% (Kemenkes RI, 2018). Prevalence of stunting are still high due to several factors. The results of the research conducted in the District of Jember shows that intake of Zn and Fe was lacking influential against the occurrence of stunting in toddlers (Aridiyah et al., 2015). The research that has been conducted in East Nusa Tenggara indicate that there is a significant difference between protein intake on child stunting and not stunting. The prevalence of stunting in low protein intake groups, greater 1.87 times than enough protein intake groups (Aridiyah et al., 2015). The results of this research are almost identical to the results of a study conducted in Kupang showed difference deciding factor risk stunting on variable energy consumption, consumption of protein and a type of food. The average level of consumption of energy and protein toddlers on lowland ecosystem zones higher than plain ecosystems are zones and mountain (Cahyono & Manongga, 2016).

The geographical position has an effect on the nutritional intake of the community. Theoretically, differences in topography gives distinctiveness on the eating patterns of the community due to the availability of food in different areas. The mountain and hills areas are dominant with vegetable soup and the results of the plantation, while the community in the coast areas tends to consume animal foods sourced from the Sea (Khomsam et al., 2006). A study conducted in Jepara Regency year 2015 shows that there is a difference of protein consumption levels in toddlers who lived in the coast area and the Ridge, protein consumed by toddlers in the country coastline more dominant protein animal sourced from fish compared to mountain areas that tend to consume a plant-based protein obtained from nuts and petrol products (Auliyah, Woro, & Budiono, 2015). The experts found the protein from animal foodstuffs has higher quality than protein from plant-based food, as well as the value of vitamins and vast gardens (Adriani & Wijatmadi, 2012). Thus, possible causes of problems of nutrition in the area of mountain and coastline will be different.

Based on the results of study that has been done by some researchers point out that the level of adequacy of intake of nutrients which do not meet the needs (energy, protein, Fe, and Zn) increases the risk of stunting on toddlers. The lack of provision of foodstuffs containing nutrients to the low food intake triggers provided by mothers to their children. In addition, the quality of the food as a source of nutrients are also less of aware.

Sinjai regency is an administration area of South Sulawesi province with the topography of the area is partly mountain and partly coast areas. The prevalence of stunting in Sinjai District in 2016 (34.6%) in 2017 (43.7%) and in 2018 (35.8%) have significant decrease but still has not reach the minimum target by WHO.

The purpose of this research is to analyse the intake of energy, protein, Fe, and Zn was lacking as a risk factor stunting on toddlers in the coast and mountain areas in Sinjai Regency, South Sulawesi Province.

METHODS

This research is quantitative research using case-control design. The population in the study were all the toddlers in the coast area of the beach and the mountain; while sample were stunting toddler aged 6-59 months which selected using F*ixed Disease Sampling and Stratified Proportional Random Sampling.* Minimum number of samples obtained as many as 60 toddler stunting in the coast and mountain area as well as 60 normal toddler in the coast and mountain areas. The data were analyzed using univariate analysis, Chi Square, bivariate and multivariate analysis using logistic regression.

RESULT AND DISCUSSIONS

Table 1. The Gender Distribution of Toddlers based on the Area (n = 240)

Area	Gender		N
	Male	Female	
The Coast	63 (52.5)	57 (47.5)	120 (100%)
The Mountain	68 (56.7)	52 (43.3)	120 (100%)

Table 1 show that toddler in the coast and mountain area had more man compared to women.

Table 2. The Nutrition Intake Distribution based on the Area (n=240)

Area	The Intake of Nutrition	Category		N
		Less	Adequate	
The Coast	Energy	96 (80%)	24 (20%)	120 (100%)
The Mountain		20 (16.7%)	100 (83.3%)	120 (100%)
The Coast	Protein	14 (11.7%)	106 (88.3%)	120 (100%)
The Mountain		107 (89.2%)	13 (10.8%)	120 (100%)
The Coast	Fe	96 (80%)	24 (20%)	120 (100%)
The Mountain		99 (82.5%)	21 (17.5%)	120 (100%)
The Coast	Zn	23 (19,2%)	97 (80,8%)	120 (100%)
The Mountain		88 (73,3%)	32 (26,7%)	120 (100%)

Table 2 show that toddlers in the coast got high protein but less energy intake, whereas toddlers in the mountain get enough energy but less protein intake. Fe's intake in both areas were not rate enough, whereas Zn's intake is rate enough for the coast toddlers and less for mountain toddler.

Table 3. The Analysis of Stunting Risk Factor (Intake of Nutrients) in Toddler Based on Groups and Areas

Area	The Intake of Nutrients	Category	Groups		OR	CI (95%)		*p*
			Stunting	Normal		Min	Max	
The Coast	Energy	Less	53 (55.2%)	43 (44.8%)	2.99	1.13	7.87	0.03
		Adequate	7 (29.2%)	17 (70.8%)				
The Mountain		Less	12 (60.0%)	8 (40.0%)	1.62	0.61	4.31	0.46
		Adequate	48 (48.0%)	52 (5.2%)				
The Coast	Protein	Less	4 (28.6%)	10 (71.4%)	0.35	0.10	1.21	0.15
		Adequate	56 (52.8%)	50 (47.2%)				
The Mountain		Less	58 (54.2%)	49 (45.8%)	6.51	1.37	30.79	0.01
		Adequate	2 (15.4%)	11 (84.6%)				
The Coast	Fe	Less	53 (55.2%)	43 (44.8%)	2.99	1.13	7.87	0.03
		Adequate	7 (29.7%)	17 (70.8%)				
The Mountain		Less	55 (55.6%)	44 (44,4%)	4	1.35	11.77	0.01
		Adequate	5 (23.8%)	16 (76.2%)				
The Coast	Zn	Less	8 (34.8%)	15 (65.2%)	0.46	0.17	1.18	0.16
		Adequate	52 (53.6%)	45 (46.4%)				
The Mountain		Less	53 (60.2%)	35 (39.8%)	5.40	2.11	13.85	0.00
		Adequate	7 (21.9%)	25 (78.1%)				

* **Chi-square test**

Table 3 shows the results of chi square analysis, that less energy intake is a risk factor stunting on toddlers in the coast area with p-value 0039; OR value 2.99; CI (95%) = 1.13-7.87 which means toddlers with less energy requirement level has the risk of stunting 2.99 times. The results of the same study conducted at Brebes show that the risk factors that influence the incidence of stunting are a low level of energy sufficiency with an OR value of 7.71 (95% CI: 3.63-16.3) and p-value = 0.001 (Wellina et al., 2016). A study conducted in Ethiopia in toddler age 6-35 months also indicate that the energy intake is less related to the status of nutritional toddler (Tessema et al., 2018).

The results of the study are the same as those carried out in Banyuajuh Village and Kramat Village, Pangkalan Regency. The results of this study indicate that the lack of energy intake is related to the incidence of stunting in children aged 24-59 months with p-value = 0.015 and OR-value of 4.048 which means toddlers with less energy intake are at risk of stunting 4 times (Azmy & Mundiastuti, 2018). Research in Maluku also shows that toddlers with less energy intake are at risk of stunting (Asrar et al., 2009).

The same study was carried out in the working area of Andalas Public Health Center, Padang Timur District, Padang City in children aged 24-59 months. The results state that there is a significant relationship between energy intake and stunting (Setiawan & Machmud, 2018). Other studies that are conducted in the town of Blitar indicated that low energy intake is the cause of stunting in children aged 20-60 months (Mugianti et al., 2018)

In contrast to the coast area, in mountain areas, lack of energy intake is not a risk factor for stunting in children under five with a value of p = 0.46> 0.05. This happens because in the mountain area suitable for dominant agricultural areas with vegetables and plantation products so that most toddlers in mountain area consume more food sources of carbohydrates from agricultural products such as corn, tubers, and sources of fat from nuts. Therefore, it can be said that communities in mountain areas can fullfill the needs of energy from food crops produced in the area, whereas the majority of coast fisherman's profession as more consume animal foods are the source of the sea.

Therefore, the nutritional intake of the community will be different on different

geographic circumstances. In the coast area will be more dominant consume animal food while in the mountain area would be more dominant with vegetable food (Khomsan et al., 2006). In the coast area will be more dominant consume animal food while in the mountain area would be more dominant with vegetable food (Khomsan et al., 2006). Theoretically, the types of foods that contribute to the formation of the largest source of energy in fat and the second is the food source of carbohydrate (Almatsier, 2009). Research conducted on a toddler age 6-59 months in Cianjur showed there is no significant relationship between the level of adequacy of energy with nutritional status based on the toddler index TB/U ($p > 0.05$) (Hanum et al., 2014). The results of this research are the same as the study conducted in Pekalongan. The study showed that the protein energy deficiency is not associated with the occurrence of stunting (Latif & Istiqomah, 2017).

Table 3 shows the results of chi-square test intake of protein is lacking is not a risk factor stunting on toddlers in the Coast area of the beach with a value of p = 0.15 0.05 >. This is because in General can fullfill the needs of toddlers protein from marine resources such as fish, clams, squid and more. In theory, other than as a source of energy, proteins also function as builders and managers of substances in the body.

The main function of protein in the body that is for growth and maintain a network matrix or framework of bones and teeth where the calcium and phosphorus are stored to provide strength and rigiditas networks. The protein also serve to compound an essential body formation, the formation of antibodies and transport nutrients. The protein was instrumental to the development of every cell in the body and also to maintain the immunity of the body. Therefore, the protein is very important in the growth process. The consumption of protein is lacking for a long time can cause less energy Protein (KEP). The manifestation of the KEP is reflected in the physical form of the body when measured in Anthropometry TB/U less than raw values are recommended (Almatsier, 2009).

In contrast to coast areas, in mountain areas, lack of protein intake in infants is a risk factor for stunting with a value of p = 0.01 and an OR value of 6.51 CI (95%) = 1.37-30.79. This indicates that the level of adequacy of protein toddler have less risk of stunting due to 6.51 times because toddlers on mountain area can only meet the needs of protein substances of vegetable food protein source and not from animal food sources. Protein source used is mostly vegetable source of protein that comes from beans because it is an agricultural community. Vegetable protein content in food are lower compared to animal foodstuffs (Almatsier, 2009). This is the same research study conducted in young toddlers in Riau Province which suggests that toddlers who do not get sufficient protein intake is a risk factor stunting with a value of p = 0000 (Ernalia et al., 2018). The results of research conducted in Kelurahan Kelawan Putih Tambak, Kecamatan Mulyorejo, Kota Surabaya, showed that the level of protein sufficiency was associated with the incidence of stunting with a value of p = 0.042 with an OR value of 10.6, meaning that toddlers who did not get enough energy intake were at risk of suffering from stunting by 10.6 times (Damayanti, Lailatul & Farapti, 2016). The results of this study are the same as the research conducted on children aged 24-59 months in the working area of Puskesmas Bagus II Pati District, showing that toddlers who do not get enough protein intake are associated with stunting with a value of p = 0.026 and an OR value of 3,538 means that toddlers are at risk as much as 3,538 times suffered from stunting if they did not get enough protein (Astutik et al., 2018).

Table 3 shows the results of the chi square test that lack of Fe intake is a stunting risk factor in toddlers in the coast areas with a value of p = 0.03 and an OR value of 2.99 CI (95%) = 1.13-7.77 which means toddlers with a sufficient level of Fe less risky 2.99 times stunted in infants. Similarly in the mountain area, less intake of Fe is also a risk factor stunting on toddlers with a value of p = 0.01 and value OR = 4 CI (95%) = 1.35-11.77 which means toddlers with the Fe intake less risky of stunting 4 times. This is due to habits, the amount and type of food consumed by infants does not vary. The average toddler only has the habit of eating twice a day with a small amount of food intake. The best source of Fe is from animal foods such as meat, chicken and fish. Other sources are

eggs, crushed cereals, nuts, green vegetables and several types of fruit.

Fe intake is very necessary in the formation of collagen for the formation of bones, teeth, joints, muscles, and skin. Bone structure can be formed due to a combination of collagen and a mineral called hydroxyapatite so that the lack of iron intake can cause short stature in children (Almatsier, 2009). Research in Brebes Regency shows that the incidence of stunting is more experienced in students with a history of bone age growth delay (Kartini et al., 2016).

The results of this research are consistent with research conducted in 25 Posyandu in Desa Suci on toddler age 6-23 months indicating that the level of adequacy of Fe is lacking, there is no a significant relationship with incidence of stunting with a value of p = 0.02 (Goddess & Nindya, 2017). Research in Surakarta in infants aged 1-3 years shows that deficient Fe intake is a risk factor for stunting events with a p value of 0.009 and an OR value of 3.25 which means toddlers with less Fe intake are at risk of stunting 3.25 times (Hidayati et al. The results of research in the working area of Puskemas Bulak Banteng Surabaya shows that there is a difference between the Fe intake toddler stunting with non stunting with a value of p = 0.03 (Fatimah & Wirjatmadi, 2017).

Table 3 shows the results of the chi square test that lack of Zn intake is not a risk factor for stunting in children under five in the coast areas with a value of p = 0.16> 0.05. This is because the content of Zn which are usually consumed can be available in the source animal protein, namely seafood mainly on shellfish, while in the mountainous area is a risk factor stunting on toddlers with a value of p = 0000 and value OR = 5.40 CI (95%) = 2.11-13.85 which means toddlers with Zn intake less risky 5.40 times stuntedThis is because Zn intake cannot be fulfilled because toddlers only often get food intake that contains Zn from legumes that have a low Zn content.

Zn deficiency in children can cause stunting (short). Zn smoothen the effect of vitamin D metabolism through stimulation of bone against the synthesis of DNA in the cells of the bone. Therefore, intake of Zn very strong relation to bone formation, resulting in a positive role Zn on growth and development. About three quarters of Zn contained in the body is found in the skeleton.

The main biological functions of Zn are component or function of the enzymes, the internal part of the enzyme (metaloenzymes), and catalyze the reaction of enzymes that depend on Zn (Zn-dependent enzymes). One type of enzyme that depends on Zn for alkaline-phosphatase activities was snagged in the metabolism of Zn deficiency on bone so that by the time children can cause short stature (Anindita, 2012).

The results of the research conducted in the Provinsi Swanda pointed out that a less influential Zn intake is positively against the incidence of stunting with a value OR of 1.89 CI 95%: 0.29-3.49 (Uwiringiyimana et al., 2019). The results of research conducted on toddlers aged 24-59 months in the working area of Gabus II, Pati showed that insufficient Zn intake was a risk factor for stunting with p-value = 0.012 and OR value of 5.333 (Astutik et al., 2018). Similarly, research on children aged 4-6 years in Korea which showed that the less intake of Zn can cause stunting (Park et al., 2017).

Other studies conducted in Kupang showed that levels of Zn intake that is less a risk factor stunting on toddlers ages 2-5 years with OR = 95% CI 2,827 = 1.449-5.322) (Leo et al., 2018). The results of research conducted on the coast of Semarang shows that lack of Zn intake still contributes to Zn deficiency in the population of Coast school children. Zn status was different between stunting and normal children (Pramono et al., 2016.

Table 4. The Analysis of Multivariate of Risk Factors Stunting on Toddlers in the Coast and the Mountain Area

Variable		B	S.E.	Wald	Df	Sig.	Exp(B)	95,0%C.I.for EXP(B)	
								Lower	Upper
The Coast									
Step 1[a]	ENRG(1)	-.322	.893	.130	1	.718	.725	.126	4.169
	PRT(1)	1.013	.649	2.439	1	.118	2.755	.772	9.829
	FE(1)	-.915	.896	1.041	1	.308	.401	.069	2.322
	ZN(1)	.814	.504	2.608	1	.106	2.256	.840	6.055
	Constant	.740	.483	2.347	1	.126	2.095		
Step 2[a]	PRT(1)	1.038	.645	2.590	1	.108	2.825	.797	10.005
	FE(1)	-1.183	.507	5.430	1	.020	.306	.113	.829
	ZN(1)	.827	.502	2.710	1	.100	2.286	.854	6.116
	Constant	.690	.461	2.244	1	.134	1.994		
The Mountain									
Step 1[a]	PRT(1)	-1.120	.866	1.675	1	.196	.326	.060	1.780
	FE(1)	-1.207	.584	4.268	1	.039	.299	.095	.940
	ZN(1)	-1.407	.507	7.688	1	.006	.245	.091	.662
	Constant	3.108	.997	9.722	1	.002	22.378		
Step 2[a]	FE(1)	-1.231	.576	4.563	1	.033	.292	.094	.903
	ZN(1)	-1.599	.489	10.699	1	.001	.202	.077	.527
	Constant	2.242	.656	11.678	1	.001	9.412	0.797	

Logistic Regression.

Table 4 shows the results of the multivariate analysis in the coast area is carried out on four variables, namely the level of energy intake, protein, Fe, and Zn. The results of the logistic regression analysis showed that the risk factors stunting on toddlers are most dominant in the coast area that is the level of protein intake with the value OR 2,825 (CI 95%: 0.797-10,005). Whereas, in the mountain area were conducted on three variables, namely the level of protein intake, Fe, and Zn. The results of the logistic regression analysis showed that risk factors stunting on toddlers are most dominant in the mountain area that is the level of intake of Fe with a value OR 0292 (CI 95%: 0.094-0.90).

The results showed the existence of disparities between risk factors of stunting the area's shoreline and mountain. The risk factors of stunting in the coast area of the beach that is energy intake and Fe while risk factors stunting on toddlers in the mountainous area that is the intake of protein, Fe, and Zn.

CONCLUSIONS

The less energy intake is a risk factor stunting on toddlers in the coast area (p = 0.03 and value OR 95% CI 2.99 =: 1.13-7.87) but in the mountain area is not a risk factor stunting on toddler (p = 0463).

Less protein intake is not a risk factor stunting on toddlers in the coast area (p = 0.15) but in the mountain area is a risk factor stunting on toddler (p = 0.01 and value OR = 95% CI 6.51:1.37-30.79).

Fe intake that is less a risk factor stunting on toddlers in the coast area (p = 0.03 and value OR 95% CI 2.99 =: 1.13-7.87). The same thing on the mountain area which showed that intake of Fe is also a factor that is less risk of stunting in children (p = 0.01 and value OR 95% CI = 4:11.77-1.35).

Less intake of Zn is not a risk factor stunting on toddlers in the coast area (p = 0.16) but in the mountain areas is a risk factor stunting on toddler (p = 0.00 and value OR = 5.40 CI 95%: 2.11-13.85).

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