



## DIFFERENCES IN DIET AND NUTRITIONAL STATUS IN TODDLERS IN COASTAL AND MOUNTAINOUS AREAS

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### ABSTRACT

Malnutrition of toddlers is often referred to as the golden age, which is irreversible. One of the factors that influence nutritional status is diet. The different geographical location between the coast and the mountains causes different food sources to be obtained. The purpose of this study was to analyze the differences in diet and nutritional status of toddlers in coastal and mountainous areas. This research design used a cross-sectional with sampling technique used stratified random sampling resulted in 143 toddlers. Data were obtained from direct interviews using the Semi Quantitative-Food Frequency Questionnaire (SQ-FFQ) and nutritional status measurements using weight and height. The results showed that in coastal areas the majority of diets (energy, protein, fat, and carbohydrate) were good (90.9%), over (100%), good (67.5%) and good (85.7%). As for the majority of nutritional status in coastal areas, the weight for age (W/A) was normal (84.4%), height for age (H/A) was normal (92.2%), and weight for height (W/H) was normal (89.6%). In mountainous areas the majority of diets (energy, protein, fat, and carbohydrate) were over (57.6%), over (95.5%), over (60.6%) and good (68.2%). As for the majority of nutritional status in mountainous areas, the W/A was normal (96.96%), H/A was normal (71.21%) and W/H was normal (87.9%). The bivariate test showed there are difference energy and fat intake ( $p < 0.05$ ), but there are no difference protein dan carbohydrate intake ( $p > 0.05$ ) between coastal and mountainous areas. The nutritional status have difference in H/A, but no differences in W/A and W/H in toddlers between coastal and mountainous areas.

**Keywords:** diet, nutrition, toddlers, coastal, mountainous

## Introduction

Nutritional status in toddlers is important and be given special attention by parents. Toddlers are a vulnerable age group to experience nutritional deficiencies and excesses that will result in less than optimal growth and development.<sup>1</sup> The impact of nutritional problems on toddlers is inhibited growth, which can lead to decreased physical activity, impaired immune system that toddlers are susceptible to infectious diseases, stunted brain growth, and brain growth is inhibited and there are changes in behavior in toddlers such as being not calm, crying easily, and even become apathetic.<sup>2</sup> Based on 2022 Indonesian Nutritional Status Survey (*Survei Status Gizi Indonesia or SSGI*) data, it is known that in Central Java Province, the prevalence of nutritional status of toddlers in Semarang City was 10.4% stunting on height for age (H/A), 6.2% wasting on weight for height (W/H), 13.5% underweight on weight for age (W/A) and 4.3% overweight on weight for height (W/H). The prevalence data in Kendal Regency was 17.5% stunting on H/A, 10.1% wasting on W/H, 17.1% underweight on W/A and 4.1% overweight on W/H.<sup>3</sup>

Nutritional status in toddlers is influenced by several things including diet, family smoking status, history of exclusive breastfeeding, knowledge's parents about nutrition and physical activity carried out by the toddler.<sup>4</sup> Increasing age of a child is in line with the increasing need for nutrients. If with increasing age is not balanced with an increase in nutritional intake, it will have an impact on malnutrition. For toddlers <6 months old in normal conditions exclusive breastfeeding can meet the nutritional needs of the child, but starting when the toddler is 6 months old, their needs must be met with additional food to meet his nutritional needs.<sup>5</sup> Diet is a direct factor that can affect nutritional status. Providing varied food and the appropriate amount of calorie intake with the application of the correct feeding method will result in toddlers with good nutritional status.<sup>6</sup> Toddlers with insufficient food intake will result in a weakened immune system. This condition will make children easily susceptible to infectious diseases that can reduce appetite and cause malnutrition.<sup>7</sup>

One of the things that can affect the nutritional status of toddlers is the area where they live.<sup>8</sup> Based on the classification of residence between urban and rural areas, the prevalence of nutritional status of toddlers (W/A) for urban areas is as many as 3.27% severely underweight, 13.9% underweight, 80.02% normal and 2.74% overweight. The prevalence of nutritional status of toddlers (W/A) for rural areas was 2.86% severely underweight, 13.37% underweight, 81.16% normal and 2.60% overweight.<sup>3</sup>

Coastal and mountainous areas have different geographical locations, which makes the food sources obtained also different. Coastal areas are areas transitional area between terrestrial and marine ecosystems that are affected by changes on land and at sea. Coastal communities are a group of people who live in coastal areas and work by utilizing marine and coastal resources including fishermen, fish farmers, fish suppliers and others.<sup>9</sup> As for the mountainous area is an area

that is dominant in the production of vegetables, palawijaya and other plantation products. This type of commodity causes differences in the type and amount of food that is commonly consumed daily in the area. Consumption of foodstuffs that are carried out continuously is an eating habit that will an eating pattern.<sup>10</sup> The existence of differences in the two regions is of interest researchers to analyze whether there are differences in diet and nutritional status of toddlers in the two regions. The focus of research for coastal areas in Tapak Village (Semarang City) and mountainous areas in Gondang Village (Kendal Regency). Considering the nutritional status of toddlers is an important thing to be studied further.

The research of Satriani et al<sup>7</sup> shows that risk factors for stunting are protein intake coastal area and Fe intake in mountainous area. The research locations are coastal and mountainous areas which have different locations geographically so that food sources are easily obtained different. The purpose of this study was to analyze the differences in diet and nutritional status of toddlers in coastal and mountainous areas. Research focus in two areas are the mountainous area in Gondang Village (Kendal regency) and coastal area in Tapak Village (Semarang city). The two areas were taken as research sites has different in many aspects in providing food and sources of livelihood.

## Methods

This study used an observational method with a cross-sectional approach. The population in this study were toddlers in Tapak Village, Tugu District, Semarang City a coastal area and toddlers in Gondang Village, Limbangan District, Kendal Regency as a mountainous area. Sampling technique with stratified random sampling. Samples in this study were taken from a population that met the inclusion requirements including toddlers aged 12-60 months, living in the Tapak area (coastal area) and living in the Gondang area (mountainous area). The sample size was calculated using the Slovin formula with an estimate of 10%, obtaining a sample of 77 respondents for coastal areas and 66 respondents for mountainous areas with a total of 143 respondents. In the coastal area, the research was conducted in four posyandu and the mountainous area was conducted in four hamlets. Sample selection in four posyandu and four hamlets to provide variations data in intake and frequency also nutritional status for toddler in each location. The distribution of the number of respondents for each posyandu and hamlet uses the formula from Sugiyono<sup>11</sup> as follows:

$$n_i = \frac{N_i}{N} \cdot n$$

Information :

- Ni = population size by stratum
- N = total population
- ni = sample size by stratum

$n$  = total sample

The samples of this study is toddlers, while the variables are diet and nutritional status. The data used in this study were primary data and secondary data. Primary data were obtained from direct interviews using questionnaires, consisting of respondent characteristics questionnaires (name, age, education (primary, junior, senior, diploma, bachelor, master, and etc), occupation, income (enough and low) and toddler Semi Quantitative Food Frequency Questionnaire (SQ-FFQ) to find out the level of food intake of the toddlers. Income categories based on regional minimum salaries in both regions. The SQ-FFQ consisted of 77 food types consisting of carbohydrate sources, animal protein sources, vegetable protein sources, vegetables, fruits, milk, oil/fat, and snacks. The types of food were adjusted to the foods commonly consumed by toddlers in the two regions. Assessment of nutritional status was carried out on three indices, namely W/A, H/A and W/H. The secondary data used in this study is the number of toddlers in both regions. This research was conducted in May-September 2023. Assessment of nutritional status was carried out on three indices, namely weight for age (W/A), height for age (H/A) and weight for age (W/H) sourced from Permenkes RI number 2 of 2020. The weight index based on age (W/A) 0 - 60 months have indicators for nutritional status in deviation standard (SD) are very underweight ( $<-3SD$ ), underweight ( $-3$  to  $<-2$  SD), normal ( $-2$  to  $+1$  SD), and risk of being overweight ( $>+3SD$ ). The height index based on age (H/A) 0 - 60 months have indicators for nutritional status are very short ( $<-3SD$ ), short ( $-3$  to  $<-2$  SD), normal ( $-2$  to  $+3SD$ ), and tall ( $>+3$  SD). The weighted index based on height (W/H) for ages 0 - 60 months has indicators for nutritional status are severely wasted ( $<-3SD$ ), wasted ( $-3$  to  $<-2$  SD), normal ( $-2$  to  $+1$  SD), risk of being overweight ( $+1$  to  $+2$  SD), overweight ( $>+2$  to  $+3$  SD), and obesity ( $>+3SD$ ).

Univariate data analysis was conducted to analyze each research variable, namely dietary patterns including energy, fat, protein and carbohydrates as well as nutritional status with W/A, H/A and W/H indices in each region. Diet is classified into 3 categories in Recommended Dietary Allowances (RDA), namely low ( $<70\%$  RDA), good (80-100% RDA) and over ( $>120\%$  RDA). The assessment of nutritional status is based on the z-score value, namely the W/A and W/H indexes are categorized as deficient if the z-score value is  $<-2$  SD and more if  $>+1$  SD, while the H/A index is categorized as stunting if the z-score value is  $<-2$  SD and more if  $>+3$  SD. The bivariate analysis was used to determine differences in diet and nutritional status of toddlers in coastal and mountainous areas using the Mann Whitney test. There are two bivariate tests in this study. First, differences diet in toddlers in coastal and mountainous areas. Second, the difference between the nutritional status of toddlers in mountainous and coastal areas. This research has passed the ethical code with Ethical Clearance number 207/KEPK/EC/2023 from Universitas Negeri Semarang.

**Results**

The samples in this study were 143 respondents, 77 respondents in coastal areas and 66 respondents in mountainous areas. Based on Table 1, it is known that the majority of respondents' age is in toddlers (0 - < 3 years) in coastal areas (57.1%) and mountainous areas (59.09%). Gender was dominated by males in coastal areas (54.5%) and mountainous areas (51.5%). The incidence of Low Birth Weight (LBW) only occurred in mountainous areas (7.57%). In coastal areas the majority of father's education was high school (70.1%) and mother's education was high school (77.9%), while in mountainous areas the majority of father's education was junior high school (37.87%) and mother's education was junior high school (34.84%). The majority of parents' income in coastal areas was at a sufficient level (77.9%), while in mountainous areas it was at a low level (69.7%). As for the incidence of allergies, the majority did not allergic in coastal areas (98.7%) and mountainous areas (93.94%).

**Table 1. Characteristics of Respondents**

Variable	Coastal		Mountainous	
	n	%	n	%
<b>Age</b>				
Toddlers (0 - <3 tahun)	44	57.1	39	59.09
Pre-School (3 - 5 tahun)	33	42.9	27	40.9
<b>Gender</b>				
Male	42	54.5	34	51.5
Female	35	45.5	32	48.5
<b>Low Birth Weight</b>				
Yes	0	0	5	7.57
No	77	100	61	92.42
<b>Father's Education</b>				
Primary School	1	1.3	21	31.81
Junior School	13	16.9	25	37.87
Senior School	54	70.1	20	30.3
Diploma	2	2.6	0	0
University	7	9.1	0	0
<b>Mother's Education</b>				
Primary School	2	2.6	18	27.27
Junior School	8	10.4	23	34.84
Senior School	60	77.9	18	27.27
Diploma	1	1.3	4	6.06
University	6	7.8	3	4.54
<b>Parent's Income</b>				
Enough	60	77.9	20	30.3
Low	17	22.1	46	69.7
<b>Allergic</b>				
Yes	1	1.3	4	6.06
No	76	98.7	62	93.94

Based on table 2, low energy intake is found in mountainous regions (7.6%). While in protein, protein intake in the category is over found in coastal areas (100%). Fat intake in the category is low and over found in mountainous regions (15.2%) and (60.6%). Carbohydrate intake in the less and over categories is also found in mountainous regions (22.7%) and (9.1%). This nutritional intake assessment uses a Semi-Quantitative Food Frequency questionnaire compared to the RDA 2019.

**Table 2. Diet of Toddlers in Coastal and Mountainous Areas**

Diet	Coastal		Mountainous	
	n	%	n	%
<b>Energy</b>				
Low	1	1.3	5	7.6
Good	70	90.9	23	34.8
Over	6	7.8	38	57.6
<b>Protein</b>				
Low	0	0	1	1.5
Good	0	0	2	3
Over	77	100	63	95.5
<b>Fat</b>				
Low	4	5.2	10	15.2
Good	52	67.5	16	24.2
Over	21	27.3	40	60.6
<b>Carbohydrate</b>				
Low	5	6.5	15	22.7
Good	66	85.7	45	68.2
Over	6	7.8	6	9.1

Based on table 3, the nutritional status of toddlers with W/A index in the underweight category is mostly found in coastal areas (9.1%) and in the possible risk of overweight category is also found in coastal areas (5.2%). In the index of H/A toddlers in the stunted category are found in mountainous areas (22.72%). While in the index W/H toddlers in the wasted category are found mostly in coastal areas (5.2%) and toddlers in the obese category are also found in coastal areas (2.6%). This nutritional status assessment uses anthropometric measurements the weight of the toddlers was weighed by the researcher using a weight scale and height measurement using a microtoise and is then calculated using the Z-Score formula to categorize the nutritional status.

**Table 3. Nutritional Status of Toddlers in Coastal and Mountainous Areas**

Indicator	Coastal		Mountainous	
	n	%	n	%
<b>W/A</b>				
Severely underweight	1	1.3	0	0
Underweight	7	9.1	2	3.03
Normal	65	84.4	64	96.96
Possible risk of overweight	4	5.2	0	0
<b>H/A</b>				
Severely stunted	2	2.6	4	6.06
Stunted	4	5.2	15	22.72
Normal	71	92.2	47	71.21
Height	0	0	0	0
<b>W/H</b>				
Severely wasted	0	0	0	0
Wasted	4	5.2	1	1.51
Normal	69	89.6	58	87.9
Possible risk of overweight	0	0	5	7.6
Overweight	2	2.6	1	1.5
Obese	2	2.6	1	1.5

Based on the results of bivariate analysis of differences diet with the Mann Whitney test in Table 4 showed that in energy intake (p=0.00) there is a significant difference between coastal and mountainous areas with a value of p<0.05. Result for fat intake (p=0.004) here is a significant

difference between coastal and mountainous areas with a value of  $p < 0.05$ . As for protein intake ( $p = 0.879$ ) there is no difference between coastal and mountainous areas with a value of  $p > 0.05$ . the carbohydrates intake ( $p = 0.085$ ) shows that there is no difference between coastal and mountainous areas.

**Table. 4 Differences Diet of Toddlers in Coastal and Mountainous Areas**

Diet	Live areas	Average±SD	P*
Energy (kcal)	Coastal	1375.3 (559.6 – 2184.6)	0.000
	Mountainous	1614.5 (509 – 2806.7)	
Protein (g)	Coastal	67.6 (29.7 – 161.4)	0.879
	Mountainous	69 (19.7 – 179.6)	
Fat (g)	Coastal	55.5 (12.6 – 107.2)	0.004
	Mountainous	63.7 (13.7 – 122.4)	
Carbohydrate (g)	Coastal	207.2 (76.1 – 379.7)	0.085
	Mountainous	191.58 (56.9 – 292.8)	

\*Mann Whitney Test

Based on the results of bivariate analysis of differences in nutritional status with the Mann Whitney test in Table 5. The table showed that in the H/A index ( $p = 0.006$ ) there is a significant difference between coastal and mountainous areas with a value of  $p < 0.005$ . As for the index W/A ( $p = 0.512$ ) there is no difference between coastal and mountainous areas with a value of  $p > 0.05$ . the nutritional status index by W/H ( $p = 0.556$ ) there is no difference between coastal and mountainous areas with a value of  $p > 0.05$ .

**Table. 5 Differences Nutritional Status of Toddlers in Coastal and Mountainous Areas**

Nutritional Status	Live Areas	Average±SD	P*
W/A	Coastal	-0.59 (-3.26 – 5.81)	0.512
	Mountainous	-0.79 (-2.35 – 1.95)	
H/A	Coastal	-0.72 (-4.07 – 1.95)	0.006
	Mountainous	-1.28 (-3.8 – 2.9)	
W/H	Coastal	-0.067 (-2.62 – 6.33)	0.556
	Mountainous	-0.019 (-2.2 – 5.25)	

\*Mann Whitney Test

## Discussion

Diet is an important part for toddlers to ensure adequate intake of both energy and protein needs.<sup>12,13</sup> Diet or eating habits between families with one another have differences. Differences in energy diets in toddlers in coastal and mountainous areas are influenced by the provision of food types and mother's work. In coastal areas, the majority of mothers have jobs as factory workers and choose instant noodles as food for their toddlers. As for mountainous areas, the majority of mothers work more at home and allow their toddlers to buy snacks outside such as french fries and various types of chocolate cakes if the toddler is difficult to eat. This study is in line with research conducted by Rahman, et al<sup>14</sup> which states that there are differences in the level of energy adequacy of children in coastal and mountainous areas. This difference is due to differences in

residence, child health conditions, appetite, food availability, purchasing power and living habits.<sup>15</sup> Based on the result this study, the majority of energy in coastal areas are normal (90.9%), while in mountainous areas the majority of energy levels are over (57.6%)

Geographical conditions and water resources make coastal communities consume more animal protein from the sea, while people in mountainous areas tend to consume more vegetable protein sources from crops or fields.<sup>16</sup> In this study there were no differences in dietary patterns on protein. The results of data collection between coastal and mountainous areas, dietary patterns on protein from both regions tend to be the same because in terms of the frequency of the two regions each toddler consumes protein 2-3 times a day. The majority of protein at the level of more with coastal area (100%) and mountainous areas (95.5%). The types of protein commonly consumed by toddlers in coastal and mountainous areas are not far from chicken, eggs and fish for animal protein although the types of fish in coastal areas are more diverse. As for vegetable protein in the form of tofu and tempeh. This study is in line with the research of Hamidah, et al<sup>17</sup> which states that there is no significant difference in the frequency of consumption of food sources of vegetable protein in coastal areas, lowlands and highlands.

Another nutrient that is important and needed by toddlers is fat. Fat is the most dense source of energy, this is because every 1 gram of fat produces 9 kcal.<sup>18</sup> Fat diet in toddlers is influenced by family feeding. The results of this study indicate a difference between fat consumption patterns in coastal and mountainous areas. The majority of fat intake at the level good (67.5%) in the coastal areas and at the level over (60.6%) in mountainous areas. The average amount of fat consumption in toddlers in mountainous areas is higher than coastal areas. This occurs because the pattern of feeding toddlers in mountainous areas is more types of fried foods resulting in toddlers preferring fried foods. When viewed in terms of quality, the pattern of fat consumption of toddlers in coastal areas is mostly in the good category, while toddlers in mountainous areas are in over category. Excessive fat consumption will cause fat accumulation in the body which can result in overweight. It can be attributed that mothers who pay more attention to their children in terms of feeding will affect the nutritional status of children for the better, while mothers who pay less attention in feeding children can cause nutritional problems.<sup>19</sup>

Carbohydrates providing the main energy supply for the body, providing energy for brain growth and play activities of toddlers.<sup>20</sup> The favorite source of carbohydrates for Indonesians is rice. Rice commodities nationally have not been replaced with other carbohydrate source food commodities.<sup>21</sup> This indicates that the carbohydrate sources consumed by Indonesians have no difference. Based on the results of research it's no difference in carbohydrate diets in toddlers in coastal and mountainous areas. The majority of carbohydrate in coastal areas are normal (85.7%) and mountainous areas (68.2%). The absence of this difference is seen in terms of quality, the majority of consumption patterns of toddlers in coastal and mountainous areas are in the good



category. The body obtains energy mainly from carbohydrates and adequate intake of carbohydrates is closely related to the availability of sufficient energy. The process of glycolysis produces energy from food, related to glucose content. Excess carbohydrate intake can be stored as glycogen and fat which can then lead to increased body weight or obesity.<sup>22</sup>

Family eating patterns affect nutritional status in toddlers. Families with a diet of less than three times a day have a 2.31 times greater risk of having toddlers with poor nutritional status compared to families with a good diet of more than three times a day.<sup>23</sup> Nutritional problems in toddlers will result in inhibition of growth, making toddlers lazy to do physical activities related to energy production, disruption of the immune system which has an impact on the ease of toddlers being attacked by infectious diseases, inhibition of optimal brain growth, and changes in toddler behavior such as not calm, crying easily and continuing is apathetic behavior.<sup>24</sup>

The nutritional status indicators used in this study are W/A, H/A and W/H. The results showed no difference in the nutritional status of toddlers on the W/A index in coastal and mountainous areas. The average z-score values obtained in the two regions were -0.59 and -0.79 respectively, in which case the growth patterns of toddlers in the two regions were relatively the same. Nutritional status of toddlers on the W/A index is mostly in the normal weight category with coastal and mountainous areas. The results obtained are in line with research conducted by Nurrizky & Nurhayati<sup>25</sup> which states that there is no difference in nutritional status according to W/A in lower grade elementary school students in highland and lowland areas with a value of  $p=0.717$ . This study also showed no difference in the nutritional status of toddlers on the W/H index in coastal and mountainous areas. The average z-score values obtained from the two regions were -0.067 and -0.019 respectively, which means that the majority of the nutritional status of toddlers in the two regions are normal. Other research that has been conducted in terms of correlation related to the nutritional status of toddlers based on the area of residence shows a p-value of 0.012 which means that there is no significant relationship between the area of residence and the nutritional status of children<sup>8</sup>.

The results of the research on the nutritional status of toddlers on the H/A index showed differences in coastal and mountainous areas. The majority of nutritional status according to H/A in both areas is normal. Based on the results obtained, toddlers in mountainous areas are more in the short to very short category with a large enough ratio compared to coastal areas, this causes differences in the nutritional status of toddlers in the H/A index in coastal and mountainous areas. Lack of energy and protein intake manifests into protein energy deficiency (KEP) which is reflected in H/A values below standard. Protein plays a role in growth and development and maintains body immunity. Differences in food consumption can be influenced by differences in geographical conditions. In coastal areas food sources come from marine products, while in mountainous areas come from plantation products. Protein intake in coastal areas tends to be

sourced from animal protein in the form of seafood fish, while in mountainous areas protein tends to be sourced from vegetable protein in the form of tofu and tempeh. Animal protein is considered to have better quality than vegetable protein. Therefore, health problems that occur in coastal areas can be different from those in mountainous areas.<sup>7</sup>

Indicator of H/A is an index in determining nutritional status to identify stunting in toddlers. Stunting is a condition of inadequate nutrition over a long period of time, caused by feeding that is not in accordance with nutritional needs. The manifestation of stunting can begin since the fetus is still in the womb, but the real symptoms are only seen in children who reach the age of two years. If not followed by an adequate catch-up growth process, stunting can result in decreased growth and become a public health problem associated with increased risk of disease, death, and growth barriers both physically and mentally.<sup>26</sup> Differences in nutritional status is influenced by the level of education in mountainous areas is lower than in coastal areas. According to Yunola, the nutritional status of toddlers is influenced by several things, one of which is the knowledge and education of mothers.<sup>4</sup>

In this research there are several limitations. There are limitations in time, energy, and research abilities. There is a lack of ability respondents to understand the statements on the questionnaire and also honesting in filling the questionnaire. This research only examines the nutritional status in coastal and mountainous areas, whereas there are many factors that can differentiate the health status in both areas for toddler, which can be develop in the next research. The next research can be with more samples to get better result.

As a follow - up to research, it is necessary carried out community services activities regarding making supplementary feeding based on local food in the research area. This research can be used as a reference for readers to be more educated for mothers who have toddlers in both areas are related to fulfillment nutritional intake in accordance with balanced nutritional guidelines for optimal growth and development.

### **Conclusion**

Based on the results of research with 143 toddler respondents from coastal and mountainous areas, it was found that there were differences between energy and fat diets in coastal and mountainous areas are influenced by the provision of food types and maternal occupation, while protein and carbohydrate diets have no differences in the two regions. While protein and carbohydrate diets had no differences in the two regions. The results of the study for the nutritional status of the index W/A and W/H showed is no significant difference, while in the index H/A there is a difference between coastal and mountainous areas, there was a difference between coastal and mountainous areas, which is influenced by the level of parental education. From this research we

can compare the differences intake dan nutritional status toddlers in coastal and mountainous areas. It can be used as a reference for developing research related to intake and nutritional status of toddlers in coastal and mountainous areas with more samples to get better result.

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## Conflict of interest

The authors declare that they have no conflict of interest.

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