Original Research Article

Nutritional Intake Differences of Children Aged 6-23 Months in Coastal and Non-Coastal Stunting Areas

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ABSTRACT

Stunting is still a health concern in developing countries. The purpose of this study was to analyze the differences in nutritional intake of children in the Coastal (Co) and Non-Coastal (NCo) Stunting Areas in Tanah-Laut. The quantitative cross-sectional study design was carried out on subjects aged 6-23 months with a total of 65 Co and 66 NCo toddlers who were physically healthy and were still breastfeeding. The instruments included a questionnaire, a 24-hour recall form, a stature meter, and a digital scale. The univariate analyses to describe the frequency and median data. The Mann-Whitney test was used to see differences in intake of macro and micro nutrients in both regions. The prevalence of stunting in NCo 21.2%, while in Co 18.4%. About 7.6% NCo and 26.2% Co were malnourished. The prevalence of wasting was 13.6% and 15.4%. There was a significant difference in Energy, Carbohydrates, fat ($p<0.05$). There was no difference in protein intake between two regions. Both micronutrients were classified as deficient. There were differences of vitamin-A, vitamin-D, vitamin-K, calcium, and iron intake. Either macronutrient intake was sufficient, but neither for micronutrients. There was no significant difference in protein intake between the two groups.

Keywords: Nutritional intake, stunting, coastal areas

INTRODUCTION

Malnutrition is the basic cause of high mortality in children, mostly in developing countries.[1] Malnutrition has both short-term and long-term health consequences, including stunted growth in children, poor learning and cognitive abilities, loss of productivity and increased risk of nutrition from non-communicable diseases. Globally, 144 million children under five suffer from stunting and another 47 million suffer from wasting.[2]

Indonesia is a developing country that is still implementing health acceleration program policies. Despite the remarkable achievements in improving the nutritional status of children in the last 2 decades, malnutrition in children under five is still a major health challenge in Indonesia.[2,3] The results of the 2018 Basic Health Research showed that the national prevalence of stunting was 30.8%, malnutrition was 13.8% and wasting was 10.7% in toddlers. Only 46.6% of children aged 6-23 months have enough various intakes. In addition, only 7% of toddlers aged 6-23 months meet the minimum intake standards for the nutritional adequacy rate (RDA).[4] In fact, the age of 6-23 months is a window of opportunity and an important stage in optimizing children's growth and development. This age is also called the golden age in the First 1000 Days of Life. Therefore, it is very important to meet the needs of macro and micro nutrients.[5]

With some of the nutritional problems mentioned under five, Indonesia is also still focusing on preventing and overcoming stunting. Stunting is defined as growth failure in toddlers based on length per height per age compared to toddlers of their age.[6]

Indonesia is categorized by WHO as the third country with the highest stunting prevalence in Southeast Asia with a stunting prevalence of 36.4% from 2005 to 2017. From 2013 to 2018, the prevalence of stunting under five has decreased, and in 2021 the prevalence has decreased to 24.4%. Even though there has been a decline, stunting is still considered a serious problem in Indonesia, given its impact on physical and cognitive development. The risk of infectious and non-infectious diseases such as obesity, coronary heart disease, and diabetes mellitus also occurs in stunted children.[7]

South Kalimantan is one of the provinces in Indonesia which has a stunting prevalence of 33.1% based on the 2018 RISKESDAS.[8] Based on the 2021 Indonesian Nutritional Status Survey, the prevalence of stunting in South Kalimantan is 30.1%, where there is a 3% decrease.[9] This figure is spread across several areas of South Kalimantan, one of which is in the coastal area. Coastal areas are considered as potential areas in producing seafood sources, which are expected to meet the nutritional needs of the surrounding community through fishery products that contain high protein. On the other hand, stunting is still found in toddlers, such as in Tanah Laut Regency at 31%, which is a problem that needs to be addressed.

One of the direct causes of stunting is inadequate intake of energy, protein and nutrients. In fact, if viewed from its geographical location, coastal areas can provide sufficient fishery products that can be given as MP-ASI. Inadequate provision of food from animal sources can reduce the energy adequacy of high-quality protein, micronutrients such as iron, zinc, vitamin A, and calcium. Even though children aged 6-23 months have a high risk of lacking energy and micronutrients.[10]

South Kalimantan is a wetland and is divided into coastal and non-coastal areas. Coastal areas have an advantage in supplying fisheries resources, where this food source is rich in protein and other nutrients. On the other hand, this region also found a high prevalence of stunting in toddlers. With this superior food source, the region should be said to be food secure and able to meet daily nutritional needs, especially for toddlers. This research is expected to provide an overview of intake of energy, protein, nutrients, and food sources as well as a basis for local policy recommendations in preventing and controlling stunting based on indicators of nutritional adequacy and local food diversity. Based on this background, this study analyzes the differences in intake of nutrients from energy, protein, and micronutrients in children aged 6-23 months in coastal and non-coastal areas with high stunting.

METHOD

A cross-sectional design with a quantitative observational approach was used in this study. The population of this study were all toddlers aged 6-23 months in the coastal and non-coastal areas of Tanah Laut Regency, South Kalimantan Province. The number of samples was 130 with a ratio of 1:1, of which 60 were from coastal areas and 60 from non-coastal areas. The inclusion criteria for this study were children aged 6-23 months who were physically healthy and were still breastfeeding during the study. Aged 6-23 months who are still breastfeeding were selected as the minimum calculation criteria in nutritional intake. So, that the frequency of breastfeeding and complementary feeding can be analyzed as one of the outputs of this research. This study has received Ethics approval at the Ethics Commission of the Faculty of Medicine, University of Lambung Mangkurat with certificate number: 305/KEPK-FK ULM/EC/IX/2022.

The instruments used included a questionnaire containing gender, age, parental education, parental income, and mother's employment status. Measurements of the nutritional status of children under five were carried out including body weight for age, body length for age, and body weight for body length. A portable infantometer with an accuracy of 0.1 cm is used to measure body length, while body weight is measured using a digital scale with an accuracy of 0.1 kg for the Camry brand. Data on body length and weight of toddlers were measured by trained enumerators, where before data collection the measuring instruments were calibrated first. The results of measuring body length and weight are converted into indicators of Z-Score Height for age (HAZ), Weight for age (WAZ), and weight for height (WHZ) according to the 2020 Anthropometric measurement standards by the Ministry of Health.

Intake of energy, carbohydrates, protein, fat and micronutrients, consumption of breast milk and food diversity, were obtained through a 24-hour dietary recall. Food diversity was analyzed based on variations in staple food, animal side dishes, vegetable side dishes, vegetables, fruits, oil and sugar. The data was analyzed using the Nutrisurvey, then compared with the RDA.

Data analysis used SPSS version 21 to describe socio-demographic distribution and nutrient intake. The Mann Whitney test was used to analyze differences in nutrient intake in groups of children aged 6-23 months in coastal and non-coastal areas.

RESULT AND DISCUSSION

Socio-demographic characteristics and nutritional status of children aged 6-23 months

The results of this study indicate that the majority of the subject's mothers are unemployed or as housewives, where the percentage of working mothers in non-coastal areas is almost twice as large as in coastal areas. The highest educational level of mothers and fathers in non-coastal areas were mostly high school graduates (37.9% and 40.9%), while in coastal areas the majority had the highest educational level as elementary school graduates (41.5% and 38%). From this data, at first glance, one might surmise that there may be differences in opportunities for education and livelihoods between the two regions. Even so, income levels in both coastal and non-coastal areas in the study locations were dominated by incomes that were still below the Regional Minimum Wage (below IDR 2,906,473).

When viewed from the nutritional status based on WAZ, HAZ, and WHZ in both areas, most of them have normal nutritional status. The proportion of stunting (short and very short) in non-coastal areas was 21.2%, and 18.4% in coastal areas. Although in coastal areas the proportion of children with good HAZ is greater than in non-coastal areas, in coastal areas the proportion of children who are very short is also greater. Only children with high status for short ages have a larger percentage in non-coastal areas. This indicates that nutritional status outcomes based on HAZ do not appear to be solely influenced by residential category (coastal vs. non-coastal), but may depend on more specific factors related to childcare. In addition, access to consumption of animal protein, especially fish protein, allows coastal areas to have lower stunting rates. Almost all mothers under five in this area were categorized as unemployed, more precisely as housewives. This factor allows parenting support and nutrition fulfillment in their children

The results of WAZ showed that 7.6% of subjects in non-coastal areas and 26.2% in coastal areas were classified as malnourished. Malnutrition was also found in both regions, but only under 5%. Malnutrition is a phenomenon that reflects a child's overall nutritional health, which is usually based on one or both chronic growth disorders and acute growth disorders due to prolonged hunger, acute hunger, or frequent illness among other causes.[11]

Table 1. Socio-Demographics and Nutritional Status of Children Aged 6-23 Months in Coastal and Non-Coastal Areas

Variables	Non-coastal (n=66)		coastal (n=65)	
	n	%	n	%
Sex				
Boy	32	48,5	33	50,8
Girl	34	51,5	32	49,2
Mother's employment status				
Working	12	18,2	6	9,2
Does not work	54	81,8	59	90,8
Father's education				
Elementary school	16	24,2	27	41,5
Junior High School	17	25,8	12	18,5
Senior High School	25	37,9	21	32,3
Diploma	5	7,6	5	7,7
Bachelor degree	3	4,5	-	-
Mother's education				
Elementary school	13	19,7	25	38,5
Junior High School	21	31,8	17	26,2
Senior High School	27	40,9	22	33,8
Diploma	3	4,5	1	1,5
Bachelor degree	2	3,0	-	-
Family income				
>=RMW	26	39,4	24	36,9
<RMW	40	60,6	41	63,1
WAZ				
Normal	55	83,3	41	63,1
Undernutrition	5	7,6	17	26,2
Overnutrition	4	6,1	4	6,2

Variables	Non-coastal (n=66)		coastal (n=65)	
	n	%	n	%
Malnutrition	2	3,0	3	4,6
HAZ				
Normal	46	69,7	47	72,3
Stunted	12	18,2	9	13,8
Severe Stunted	2	3,0	3	4,6
To tall	6	9,1	6	9,2
WHZ				
Normal	54	81,8	50	76,9
Wasted	8	12,1	8	12,3
Severe Wasted	1	1,5	2	3,1
Overweight	3	4,5	5	7,7

Overnutrition status based on WAZ was found in both regions with a prevalence of less than 10% (Table 1). Even though the prevalence of overweight status among children is relatively low (<10%), the phenomenon that arises from the double burden or multiple malnutrition in developing countries requires more massive prevention efforts.[11] With high intake of carbohydrates, flour, sweet and fatty foods. Marinda et al. found that consumption of sugar-sweetened beverages as a major contributor to overweight/obesity due to high added sugar content, high energy intake and low satiety. Most children eat cheap processed foods that are high in fat and sugar, high in energy and have no nutritional value. In addition, lack of physical activity has also been shown to contribute to overweight/obesity in children.[12]

The proportion of wasting (wasted and severe wasted) was 13.6% and 15.4% for non-coastal and coastal areas respectively. Wasting reflects acute undernutrition among children. This indicator is a more useful measure in emergency situations than stunting which tends to reflect impaired growth due to prolonged lack of nutrition.[6] Wasting toddlers can increase secondary infections due to impaired immune response. Malnutrition in this condition affects several aspects of immunity, such as decreased cell-mediated immune response, cytokine production and antibody responses, which require T-cell support. Lower energy intake, unavailability of food, lack of household food security, and communicable diseases can lead to wasting. Then, there is a deficiency of micronutrients from inadequate intake or disruption of the utilization of micronutrients due to infection can occur in wasting toddlers.[13] The rate of wasting estimated in this study was sufficient to be classified as serious (10–14%) based on the WHO cut-off value of public health significance.[11]

Differences in nutritional intake of children aged 6-23 months in coastal and non-coastal areas

Nutrient intake is calculated based on a 1x24 hour intake recall on breast milk and complementary foods for breast milk. Then nutritional adequacy is referred to as the Nutrition Adequacy Rate (RDA), which is divided into sufficient categories (80-110%), less (<80%), and more (>110%). Table 2 shows that the intake of energy and carbohydrates in children aged 6-23 months in the two regions is mostly sufficient for the RDA, except for the age group 9-11 months in non-coastal areas. Significant insufficient intake of carbohydrates and fats was found in the age group 6-8 months and 9-11 months in non-coastal areas (<80% RDA). A similar deficiency was found in protein intake in the age group 6-8 months and 9-11 months in non-coastal areas and 12-23 months in coastal areas, but the difference was not significant (p=0.078). Insufficient intake of energy, carbohydrates, protein, and fat in children aged 6-23 months can have a negative impact because it reduces the energy intake needed for activities and the growth and development of children.

This study also analyzed food ingredients from complementary foods for children aged 6-23 months. The results descriptively found that both coastal and coastal areas consume the same type of staple food. Staple foodstuffs include rice, vermicelli, biscuits, crackers, pasta, corn, potatoes, macaroni, glutinous rice, noodles, bread, brown rice porridge, glutinous rice flour and sweet potatoes. All these staple foods were distributed to all subjects to meet energy and carbohydrate needs. In addition to staple foods, energy and carbohydrate needs are also supported from sugar sources such as sugar water, soy sauce, brown sugar, honey, and candy.

The subject's protein adequacy was met

from animal and vegetable side dishes apart from breast milk. Some of the animal side dishes consumed are chicken, milkfish, eel, beef, squid, snakehead fish, single fish, tilapia, bitter melon, catfish, saluang, eggplant fish, mackerel, cork, papuyu, meatballs, eggs, shrimp, formula milk, and full cream milk. In addition to providing protein needs, animal side dishes also contribute to the subject's fat intake. Fat intake was also added from margarine, palm oil, and coconut milk. Then the intake of vegetable side dishes in both groups had a smaller proportion than animal side dishes, in which both groups only consumed green beans, soybeans and tofu.

Except for children aged 12-23 months, there was a significant difference in the level of fat intake between coastal and non-coastal areas. In coastal areas, the level of adequacy of fat intake was twice the percentage of adequacy of fat intake in non-coastal areas. This may indicate that residents of coastal areas have more access to fat-rich food sources such as sea fish than residents of non-coastal areas.

The results of a study in Zambia shown that the number of fish consumed by children aged 6-23 months was significantly related to stunting. Consumption of a variety of foods and animal source foods is associated with a reduced risk of stunting, wasting and underweight in children under the age of five, as reported in studies conducted in Ethiopia, Vietnam, and Cambodia.[12] The high consumption of fish by children indicates a good nutritional status based on HAZ. Fish has been shown to have adequate levels of micronutrients, such as vitamin A, iron, and zinc, which are essential for children's growth and development. Fish is also a rich source of vitamin B12,[14] which is beneficial for growth, brain function, and maintenance of the nervous system. Fish is also a source of calcium for the growth and maintenance of children's bones and teeth.[15]

On the other hand, the results of a study in Tanzania showed that children aged 6-23 months did not consume too much animal food, such as meat and eggs. This result is probably caused by differences in harvest season, geographical location, culture, and economic factors. Consumption of animal sources is a protective factor against stunting and underweight.[16] Consumption of animal side dishes from milk is also recommended to reduce the incidence of stunting in children. Milk is one of the foods that can easily provide adequate nutrition such as protein and micronutrients when consumed regularly.[17]

Foods from animal sources such as meat, milk, eggs, and poultry have various micronutrients such as vitamin A, vitamin B 12, riboflavin, calcium, iron, and zinc which are difficult to obtain in sufficient quantities from plant foods alone, so inadequate nutritional intake can lead to inhibiting the physical development of children which leads to stunting. Interventions to increase the intake of animal side dishes can be a recommendation for both parents and the local government.[18]

Intake of micronutrients were categorized as sufficient (≥77%), and deficit (<77%) from Recommended Dietary Intake. This study found that all intakes of micronutrients in both regions were classified as deficient (<77%), both vitamin A, vitamin D, vitamin C, vitamin K, folic acid, calcium, phosphorus, iron, and zinc. Although the micro intake of the two groups was relatively low, there were significant differences in vitamin A, vitamin D, vitamin K, calcium, and iron intake ($p<0.05$). Cumulatively, the intake of vitamin A, calcium and iron was greater in the non-coastal group. On the other hand, the coastal group had greater intakes of vitamin D, vitamin K, folate, and phosphorus. Micronutrients are more likely to be obtained from fruit and vegetable consumption. Some of the fruits consumed are avocado, guava, orange, longan, longan, manga, dragon, pear, banana, salak, watermelon, and jackfruit. While the vegetables consumed are spinach, celery, long beans, cabbage, pumpkin, mustard greens, carrots, and broccoli. Micronutrients intake not only obtained from vegetables and fruit, but also animal, vegetable and staple food sources have a contribution in fulfilling it.

The research form Ghana showed there was a relationship between intake of vitamin A from fruits and vegetables with underweight children. Children who do not consume vitamin A from fruits and vegetables also tend to be thinner[19]. Vitamin A is known as an essential micronutrient for growth and immunity. Vitamin A deficiency is one of the most important causes of visual impairment in children, and a major contributor to morbidity and mortality from infectious diseases. It is important for mothers to increase their intake of foods rich in vitamin A such as spinach, mango, and papaya to be served as complementary foods.[18]

Diversity in food consumption is associated with the incidence of malnutrition. Food diversity can be seen from the complete intake of staple foods, animal, vegetable, vegetable, and fruit side dishes. Several types of food groups can be seen in the previous explanation. The results of the study stated that the incidence of stunting, wasting and underweight decreased along with an increase in the diversity of foods consumed. Children who eat a variety of foods are less likely to be malnourished than those who eat less variety.[12]

Consumption of cow's milk, meat and eggs is known to be associated with a decrease in stunting in children. Children who do not consume cow's milk, meat and eggs have a higher probability of being stunted.[17] On the other hand, children who do not consume whole grains have a higher probability of being thin. Likewise, children who did not eat nuts and legumes were more likely to be underweight in the unadjusted model. The likelihood of being thin in children who do not consume eggs is more than two times higher than in children who consume egg products. In addition, the likelihood of being thin in children who do not consume fruits and vegetables rich in vitamin A is higher than in children who do.[18]

Table 2. Differences in The Median Intake of Macro and Micro Nutrients for Children Aged 6-23 Months

Nutrient	Non-Coastal (66)			Coastal (65)			p-value
	6-8 month (n=15)	9-11 month (n=10)	12-23 month (n=41)	6-8 month (n=16)	9-11 month (n=17)	12-23 month (n=32)	
Energy (Kcal)	530,10 (110,80-772,10)	231,10 (50,20-558,30)	512,70 (109,10-859,30)	469,90 (271-853,1)	557,68 (330-779)	538,35 (244,35-1215,54)	0.005*
Estimated Need (Kcal)	531,30 (97,7%)	250,70 (47,8%)	586,50 (99,3%)	457,4 (98,2%)	545,45 (107,06%)	530,17 (101,2%)	0.013*
Cabohydrate (g)	66,60 (17,20-140,10)	43,20 (5,10-92,60)	85,5 (7,3-149,6)	70,17 (27,90-108,50)	64,17 (49,8-104,5)	86,69 (27,98-185,87)	0.006*
Estimated Need (Kcal)	230,29 (76,4%)	252,38 (63,5%)	295,46 (110,9%)	235,33 (114,5%)	265,62 (96,5%)	294,42 (110,8%)	0.018*
Protein (g)	12,70 (2,40-30,00)	7,65 (0,80-21,20)	18,60 (3,30-40,70	12,35 (5,30-34,90)	19,43 (8,30-28,50)	16,52 (5,09-31,30)	0.078
Estimated Need (Kcal)	47,33 (15,29%)	68,83 (42,71%)	80,58 (104,5%)	64,18 (92,7%)	72,44 (103,6%)	80,3 (75,8%)	0.152
Fat (g)	8,30 (2,4-43,8)	5,60 (2,7-19,50)	15 (1,3-31)	16,65 (6,50-30,80)	19,04 (7,60-27,60)	15,87 (2,33-35,14)	0.004*
Estimated Need (Kcal)	125,61 (55,6%)	137,66 (40%)	161,16 (89,4%)	128,36 (109,9%)	144,89 (117%)	160,6 (91,6%)	0.009*
Vitamin A (mcg)	40,02 (0 – 3300)	67,15 (32,2-198)	56,3 (0-2310)	114,15 (0,3-345)	148,50 (0,3-345)	41,07 (0-241,5)	0.029*
Estimated Need (mcg)	400 (24,7%)	400 (16,8%)	400 (14%)	400 (28,5%)	400 (14,9%)	400 (9,69%)	0.008*
Vitamin D (mcg)	0,02 (0-0,10)	0,02 (0-0,10)	0,06 (0-1,6)	0,25 (0-0,40)	0,13 (0-2,6)	0,05 (0-62,15)	<0.0001*
Estimated Need (mcg)	10 (0,2%)	10 (0,1%)	10 (0,6%)	10 (2,5%)	10 (1,35%)	10 (0,5%)	<0.0001*
Vitamin C (mg)	4,7 (0-105,7)	6,15 (3-16)	1,8 (0-114,1)	16,55 (1,6-41,80)	5,99 (0-32,50)	3,16 (0-29,26	0.912
Estimated Need (mg)	50 (9,4%)	50 (12,3%)	50 (3,6%)	50 (16,5%)	50 (11,9%)	50 (5,85%)	0.810
Vitamin K	0	0	2,28 (0-47)	203,67(0-72,5)	11,52 (0-36,2)	4,95 (0-32,1)	<0.0001*
Estimated Need (mg)	15 (0)	15 (0)	15	15	15	15	0.005*

Nutrient	Non-Coastal (66)			Coastal (65)			p-value
	6-8 month (n=15)	9-11 month (n=10)	12-23 month (n=41)	6-8 month (n=16)	9-11 month (n=17)	12-23 month (n=32)	
			(15,2%)	(68,8%)	(38,4%)	(25,81%)	
Folate (mcg)	5,4 (0-48,7)	7,3 (0-11,9)	4,4 (0-41,6)	25,4 (1-56,4)	24,1 (0-40)	5,83 (0-37,2)	0.057
Estimated Need (mcg)	160 (3,38%)	160 (4,6%)	160 (2,75%)	160 (15,8%)	160 (8,17%)	160 (3,64%)	0.232
Calcium (mg)	66,4 (5,5-1054,5)	54,7 (11,6-632,7)	53,6 (0-856,1)	96,45 (6,3-300)	65,7 (0-145))	21,14 (1,8-135,6)	0.003*
Estimated Need (mg)	650 (10,2%)	650 (8,4%)	650 (8,3%)	650 (14,8%)	650 (4,03%)	650 (3,07%)	<0.0001*
Fospor (mg)	12,9 (0-161,1)	20,95 (0-53,6)	36,5 (0-709,5)	96,45 (5,46-300)	65,7 (0-145)	14,36 (0-172,89)	0.503
Estimated Need (mg)	460 (2,8%)	460 (4,5%)	460 (7,9%)	460 (20,97%)	460 (5,72%)	460 (2,92%)	0.971
Iron (mg)	0,2 (0-10,5)	0,3 (0-6,3)	0,7 (0-11,1)	0,25 (0,02-2,6)	0,25 (0-1,50)	0,13 (0,02-2,40)	0.025*
Estimated Need (mg)	10 (2%)	10 (3%)	10 (7%)	10 (2,5%)	10 (1,35%)	10 (1,1%)	0.006*
Zink (mg)	0,1 (0-1,2)	0,15 (0-0,9)	0,4 (0-5)	0,7 (0,05-2,6)	0,55 (0-1,1)	0,11(0-2,2)	0.810
Estimated Need (mg)	3 (3,3%)	3 (5%)	3 (13%)	3 (23,3%)	3 (7,8%)	3 (3,3%)	0.793

*Mann Whitney test. Significance value at p<0.05

Differences in nutritional intake between the two study areas may be due to differences in food consumption patterns, income levels, and accessibility to nutritious foods. Therefore, efforts should be made to increase public knowledge and awareness about the importance of adequate nutritional intake, as well as optimizing accessibility to nutritious food, especially in areas experiencing insufficient nutritional intake.

The limitation of this study is that the difference in nutrient intake between the two regions was not seen based on the source of the food groups consumed. Food groups are expected to be calculated quantitatively based on the food diversity score. So, it is suggested that further research can assess differences in the intake of both coastal and non-coastal areas based on the food diversity score according to the Minimum Dietary Diversity instrument by WHO. This study also did not link nutritional intake and food groups to the incidence of nutritional problems. Future studies can relate causally from nutritional intake and food groups to the incidence of nutritional problems from both regions.

CONCLUSION

This study concluded that most children aged 6-23 months in the study locations had sufficient intake of energy, carbohydrates, fats and protein in both coastal and non-coastal areas. There were significant differences in energy, carbohydrate, fat intake and no significant differences in protein intake in the two regions. All intakes of micronutrients were classified as deficient in both regional groups. There were differences in intake of vitamin A, vitamin D, vitamin K, calcium, and iron. The coastal group had greater intakes of vitamin D, vitamin K, folate, and phosphorus. Future research is expected to analyze the causality relationship of nutrient intake and food groups to nutritional problems from both regions.

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