

Diet Diversity and Nutritional Status of Children 2 to 5 Years Old Situated in different Ecological Settings

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Abstract

The study was conducted to determine the diet diversity and nutritional status among two (2) to five (5) years old children residing in upland, lowland and coastal settings in Los Baños, Laguna. A total of 81 children, 40% male children and 60% female children were included in the study. Twenty-four (24) hour food recall and diet diversity scores were gathered for qualitative data on food intake while anthropometric indices such as weight for age, height for age and height for weight were used for nutritional status. Results showed that majority of the children showed medium dietary diversity scores (62 - 96%) while their nutritional statuses were mostly normal. However, a number of undernourished, stunted, wasted and over nourished children were noted among the sampled children residing in different ecological settings. Ecological settings and diet diversity scores were noted to have no associations with nutritional status. On the other hand, the dietary diversity scores of children had significant association with ecological settings.

Keywords: *Diet Diversity; Nutritional Status; Ecological Settings*

Introduction

Child malnutrition in the Philippines persists despite efforts of the government to tackle the issue through the years. Based on the Food and Nutrition Research data from 2015 [1], chronic malnutrition rate among 0 - 2 years is at its highest at 26.2%. Prevalence of stunting, wasting and vitamin A deficiency among children under 5 years old were reported at 33.5%, 7.1% and 20.4%, respectively.

Children suffering from malnutrition is of risk to acute diseases and are more likely to be unproductive in the future. During the first two years of life, children must receive proper nutrition for optimum growth and development otherwise irreversible damage on the cognitive and physiological aspects of child's growth may result.

Diet and nutrition-related behaviors are embedded in cultural and environmental contexts: adoption of new knowledge depends on how easily it can be integrated into existing knowledge systems. As dietary diversity promotion becomes an increasingly common component of nutrition education, understanding local nutrition knowledge systems and local concepts about dietary diversity is essential to formulate efficient messages. Having a rich mix of nutrients in the diet depends on the existing environmental conditions to which the person lives in.

A disparity of food security can be observed among households on different ecological settings. There are different classifications of ecological settings such as upland, lowland and coastal area. Upland area is the higher ground of a region. It is any mountainous region or elevated mountainous plateau. Lowland area is the lower ground of a region. It is a low-lying alluvial land near a river. On the other hand, coastal area is the boundary between land and sea, including large inland lakes. It is considered as the near-shore land. Furthermore, each ecological setting is important because they provide the basic needs of the residents [2,3].

Improved economic conditions, growing global population, climate and environmental change draws a huge impact on food security in the country. The disparity in food supply and how it is distributed to the population have health consequences to the people. In line with this, the study attempts to describe the diet diversity of the young children in different ecological setting such as the areas in upland, lowland and coastal. Measuring diet diversity information and the nutritional status are deemed as relevant since it can provide information in terms of access to variety of food and adequacy of intake. Such information can serve as a basis for effective planning, implementation and evaluation of nutrition and health programs by local government and non-government units towards improvement of health thus providing a platform for food security across the country.

The study aimed to generally assess the diet diversity and nutritional status of the children age 2 to 5 years old situated in different ecological settings of Los Banos, Laguna, Philippines.

Methodology

Sample population

Disproportionate stratified sample was used in the study to cover the underrepresented (upland) and represented (lowland and coastal) ecological settings in Los Banos, Laguna, Philippines. The total sample size used in the study was 81 children ages 2 - 5. Twenty-seven (27) children from each ecological setting were the participants in the study.

Research instrument

Data were collected using 24-hour food recall questionnaire, a structured interview that provides detailed information on the amount and kind of foods and beverages consumed on a given day [4] and diet diversity score (DDS) form adopted from 2008 Food and Agriculture Organization [5]. The parents of the children were interviewed and asked to fill up the questionnaire and score sheets. A 24-hour food recall kit were used as a tool to help the respondent illustrate the measurement of the food item. Anthropometric indices such as weight for height (WFH), height for age (HFA) and weight for age (WFA) from 2006 WHO Child Growth Standard [6] were used to measure the nutritional status of the children.

A descriptive table of diet diversity from FAO (2008) were used for qualitative data. Nine (9) categories were considered for the diet diversity score. Included in the list were (1) cereals and white roots and tubers (2) vitamin A rich vegetables and tubers and vitamin A rich fruits, (3) dark green leafy vegetables (4) other vegetables and fruits (5) organ meats (6) flesh meats and fish and seafood (7) eggs (8) legumes, nuts and seeds (9) milk and milk products. The qualitative interpretation of the diet diversity was as follows.

DDS Interpretation	
Lowest dietary diversity	(≤ 3 food groups)
Medium dietary diversity	(4 and 5 food groups)
High dietary diversity	(≥ 6 food groups)

Table 1: Qualitative Interpretation of Diet Diversity of FAO.

Statistical analysis

ANOVA was used for the categorical independent variables (upland, lowland, coastal) and normal dependent variable (diet quality) was used to test the means of the dependent variable broken down by the levels of independent variable. The levels of significance were set at $p \leq 0.05$. For the relationship between diet diversity and nutritional status, Pearson Product Moment Correlation Analysis test was applied. The levels of significance were set at $p \leq 0.05$ for all analyses.

Ethical considerations

A written formed consent was given to the parent’s respondents prior to the 24-hour food recall interview and anthropometry of the respondent. Verbal informed consent to participate in the study were also explained to the parents. Each eligible subject was free to opt out of the study.

Result and Discussion

The assessed children in the study were composed of 32 (40%) male children and 49 (60%) female children with age ranging from 2 - 5 years.

Degree of diet diversity among the children

Results of the diet diversity assessment showed that in upland setting, 37.02% of children had low dietary diversity score while 62.96% were assessed to have medium dietary diversity. High dietary diversity score was not noted among children sampled in the upland area.

For lowland setting, the dietary diversity scores of sampled children were measured at 18.52% (low dietary diversity), 59.26% (medium dietary diversity) and 22.22% (high dietary diversity). On the other hand, coastal setting consists of 37.04% of children were noted to have low dietary diversity score while, 59.26% of children attained medium dietary diversity score and 3.70% of children had garnered a high dietary diversity score. In all three ecological settings, score of medium dietary diversity was observed.

This may indicate that majority of the sampled children received an average distribution of food groups hence variety of food intake. The more varied the diet the higher the capacity of the individuals to meet their daily requirements for a large number of essential nutrients [7,8]. The inaccessibility to food markets in coastal and especially in upland areas may have contributed to low to zero high scores of diets of children [5].

Indicators	Upland		Lowland		Coastal	
	Frequency	%	Frequency	%	Frequency	%
Low	10	37.04	5	18.52	10	37.04
Medium	17	62.96	16	59.26	16	59.26
High	0	0.0	6	22.22	1	3.70
Total	27	100.00	27	100.00	27	100.00

Table 2: Diet Diversity Scores of Children ages 2-5 years residing different ecological setting.

Nutritional status among the children

There were three anthropometric indices used to identify the nutritional status of the children namely weight for age (WFA), height for age (HFA) and weight for height/length (WFH). Weight for age was used to assess changes in the magnitude of malnutrition over time. As shown in table 3, the upland setting consists of 11.11%, 81.48% and 7.41% of the sampled children were observed to be underweight, normal and overweight, respectively. In the lowland, 11.11% of the children were severely underweight children, 18.52% were underweight children and 59.26% had normal nutritional status. In the coastal setting, there were 7.41% severely underweight children, 18.52% were underweight, 70.37% were normal while 3.70% of the sampled children were overweight.

Indicators	Upland		Lowland		Coastal	
	Frequency	%	Frequency	%	Frequency	%
Severely Underweight	0	0.00	3	11.11	2	7.41
Underweight	3	11.11	5	18.52	5	18.52
Normal	22	81.48	16	59.26	19	70.37
Overweight	2	7.41	3	11.11	1	3.70
Total	27	100	27	100.00	27	100.00

Table 3: Percentage of underweight of children aged 2 to 5 years residing in different ecological setting.

Height for age status reflects the skeletal growth of the children. It is used to determine the occurrence of chronic malnutrition such as stunting. As shown in table 4, in the upland area, 14.81% of the children were both severely stunted and stunted, 62.96% had normal height for age and 7.41% were assessed to be tall for their age. On the other hand, in lowland, there were 7.41% severely stunted children, 18.52% stunted children, 70.37% normal and 3.70% tall children. In coastal setting, there were 7.41% severely stunted children, 18.52% stunted children, 59.26% normal and 14.81% tall children.

Indicators	Upland		Lowland		Coastal	
	Frequency	%	Frequency	%	Frequency	%
Severely Stunted	4	14.81	2	7.41	2	7.41
Stunted	4	14.81	5	18.52	5	18.52
Normal	17	62.96	19	70.37	16	59.26
Tall	2	7.41	1	3.70	4	14.81
Total	27	100.00	27	100.00	27	100.00

Table 4: Percentage of stunting of children aged 2 to 5 years residing in different ecological setting.

Weight for height/length reflects the recent weight loss or gain of a child. It is used to determine acute malnutrition. In table 5, it was shown that the upland setting consists of 14.81% severely wasted children, 3.70% wasted, 55.56% normal, 7.41% overweight and 18.52% obese children. On the other hand, in lowland, there were 14.81% severely wasted children, 7.41% wasted children, 55.56% normal children, 14.81% overweight and 7.41% of obese children. In the coastal setting, there were 22.22% severely wasted children 25.93% wasted, 40.76% normal and 11.11% of obese children.

Indicators	Upland		Lowland		Coastal	
	Frequency	%	Frequency	%	Frequency	%
Severely Wasted	4	14.81	4	14.81	6	22.22
Wasted	1	3.70	2	7.41	7	25.93
Normal	15	55.56	15	55.56	11	40.74
Overweight	2	7.41	4	14.81	0	0.00
Obese	5	18.52	2	7.41	3	11.11
Total	27	100.00	27	100.00	27	100.00

Table 5: Percentage of wasting of children aged 2 to 5 years residing in different ecological setting.

Majority of the sampled children residing in different ecological setting had normal nutritional status. However, percentages of underweight, stunted, wasted and overweight children were observed in all settings. Shortage of food, repeated illness and bad feeding practices are the general causes of malnutrition that impairs physical and cognitive growth and development. Malnutrition can lead to wasting and stunting in children depending on the severity and duration of the cause. Overnutrition on the other hand can also hamper productivity in the future because of susceptibility to cardiovascular diseases. Because of the significant impacts of malnutrition on the physical and cognitive development, malnourished children are less likely to perform well in school, less resistant to diseases and consequently be less productive as adults. Malnutrition is of public health significance because of its serious intergenerational and long-lasting social and economic implications [9-11].

Adequate nutrition is one of the key drivers to economic development. Intake of diverse variety of foods has been a recommendation that appears in the dietary guidelines of many countries to discourage monotonous diet and create a more diverse food intake that is very much associated with significant increase intakes of energy and micronutrients [12,13]

Relationship of nutritional status with ecological settings and diet diversity

Table 6 showed the relationship of the nutritional status among children 2 to 5 years old in upland, lowland and coastal settings. The probability values of weight for age, height for age and weight for height were 0.258, 0.673 and 0.166 respectively which were greater than the level of significance at 0.05. Thus, it can be concluded that there is no significant difference on the nutritional status among children 2 to 5 years old in upland, lowland and coastal areas. This may imply that nutritional status was not affected by ecological settings.

Indicators	Nutritional Status		
	Underweight	Stunted	Wasted
Ecological Setting	0.258 ^{ns}	0.673 ^{ns}	0.166 ^{ns}
Diet Diversity	0.731 ^{ns}	0.477 ^{ns}	0.286 ^{ns}

Table 6: Association between nutritional status of children 2 to 5 years old and ecological settings.
Significant main effect, P < 0.05

The diet diversity scores of the sampled children were not associated to their nutritional status. The probability values of 0.731, 0.477 and 0.286 were all greater than the level of significance. Same results were supported by the study of Gueriendol., *et al.* [14] where in no significant association was observed between DDS and stunting. The results of this study were also consistent with study reported by Darapheak., *et al.* [15] in Cambodia, wherein stunting was found to be negatively associated with dietary diversity.

In the study of Zhao., *et al.* [16], the results failed to find any significant relationship between food diversity and obesity. It was shown that older children who were overweight and obesity got lower DDS than non-obesity DDS which contradicts to other studies that older children should have more chance and better appetite to eat different kind of food. Thus, supporting the present data gathered that suggests that diet diversity has no effect to the nutritional status among children 2 to 5 years old.

Relationship of diet diversity among upland, lowland and coastal setting

Table 7 showed the comparative analysis of the dietary diversity among children below 6 years old in upland, lowland and coastal setting. The probability value of diet diversity is 0.018 which is less than the level of significance at 0.05. Thus, it can be concluded that there is significant difference on the dietary diversity among children below 6 years old in upland, lowland and coastal area.

Indicator	Ecological Setting		
	Upland	Lowland	Coastal
Diet Diversity	0.018	0.032	0.013

Table 7: Association between diet diversity scores of children 2 to 5 years old in upland, lowland and coastal setting

Significant main effect, $P < 0.05$

Residing in a lowland area provides large benefits to the households. It gives wide access to the basic needs of people to improve the diversity of their diet. A study by Larson., *et al.* [17] reported that there are benefits and consequences for people who reside near the markets and restaurants which can affect their diet. The benefit provided is that it has better access to choose the food that the family want to prepare. However, the consequences of residing near markets is that it is close to the fast food restaurants which influences their limitation on food choices.

Households who live in upland setting produce more of their own food. It provides them healthier food choice thus, giving them a diverse diet. However, it also limits their food consumption since the location is far from the market thus, they only depend on what they have. Thus, this may provide the family to have a monotonous diet. A study by Lumole [18] reported that there is an increase in dependence on market purchases on both urban and rural households. The observed high dependence on market could be due to change in livelihoods as people are looking for diverse opportunities to increase and stabilize their income to provide for family basic needs especially their food consumption.

In the study of Alva., *et al.* [19] about the marine protected areas and children’s dietary diversity in the Philippines, the result suggests that households who reside near the coastal area can derive many benefits in the coast such as fish consumption and selling of fish, resulting in a positive association with their children’s diverse diets. Families living near coastal benefit from fishing which may allow them to invest in more diverse diets for their children.

Summary and Conclusion

Medium dietary diversity was noted among the young children residing in the different ecological settings in Los Banos, Laguna, Philippines. This indicates that majority of the children receive an average distribution of food groups. Majority of the sampled children in the three different ecological settings had normal nutritional status.

Furthermore, the relationship of children’s nutritional status with ecological settings had no significance which indicates that factors which could affect the nutritional status in one setting wouldn’t affect the other settings. On the other hand, relationship of dietary diversity among children in upland, lowland and coastal settings resulted to significant differences. This imply that residing in different ecological setting can provides advantage and disadvantages to the diet of the children. Lastly, the study also found out that there was no association between nutritional status and dietary diversity among the sampled children residing in three different ecological settings.

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