Dietary Diversity as a Component of Food Security among Households with Preschool Children in a Coastal Municipality in Batangas, Philippines

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Abstract - *Food insecurity remains to be one of the most significant underlying causes of malnutrition determining diet quality. High quality diets should include a variety of food to ensure nutrient adequacy for sustenance of daily activities, growth, and development of young children. Coastal communities are one of the vulnerable areas affected by food insecurity because of seasonality of income, natural calamities and other factors influencing their socio-economic status. This study aimed to determine the relationship between household food security and dietary diversity. A two-multi-stage simple, cluster-sampling technique was used to select the two-hundred seventy-one (271) households with preschool children; whereas, Household Food Insecurity Access Scale (HFIAS) and Household Dietary Diversity Score Questionnaire (HDDSQ) were used as major tools in evaluating household food security status and household dietary diversity. Ratio, proportion, reporting of weighted mean, and regression analyses were used for data analysis. Majority of household heads were fishermen (23%), while caregivers were unemployed (60%). Majority of the parents were high school graduates (40%) and almost half (56%) had monthly income of less than Php 6,500.00. Only (23.3%) of households were food secure while others were found to be food insecure, classified as moderate (32.8%), mild (23.6%); and severe (20.3%). Generally, households consumed a diet with mean HDDS of 10.6± .1 (95%CI: 10.5; 10.8). Almost all (94.5%) of households had an acceptable food composition score while 4.43% and 1.11% of households had a borderline and poor score, respectively. The mean food composition score of food secure households was 80 (95%CI: 75.4, 84.2). Two (2) out of 10 of households were food secure while the rest experienced food insecurity for the last months. Majority of the households had an acceptable food composition score with cereals-oils-fats-fish as the usual dietary combination and lowest intake from fruits, vegetables, milk, and legumes were also recorded. It follows that, in general, when food insecurity becomes more severe, the variety of food consumed also becomes limited.Findings of this study can substantiate community-based nutrition interventions, with programs tailor fitted to the needs of particular groups, such as women and children in coastal communities. Fishing has also been threatened by the ill-effects of climate change affecting food availability and accessibility in coastal areas, warranting further research.*

Keywords: *household food security, household dietary diversity, preschool children, coastal communities***.**

INTRODUCTION

Food security is defined as the access by all people to enough food for an active and healthy life. This means that the basic human need for sustenance is met by enabling everyone to have stable access to various foods that are of good quality, safe, affordable, and in sufficient quantities; and that it is utilized well [1,2]. Globally around 821 million were affected by chronic food deprivation [3]. Although, in general, food security has been improving based on global food security index [4]. Meanwhile, in the Philippines, an increasing trend was observed in the percentage of households considered food secure from 15.6% in 2001 to 34.1% in 2013. However, a minor

decline of 0.2%, was noted in 2015 at 33.9% [5]. Hence, most households of the country's population still suffer from food insecurity. Food insecurity exists when there is limited or uncertain availability of nutritionally adequate and safe foods or the ability to acquire acceptable in socially acceptable ways [6].

The UNICEF framework of malnutrition illustrates the causality of under nutrition from the population to the individual level. Food security, being one of the most important underlying causes of malnutrition, determines diet quality and food adequacy. Consequently, inadequate dietary intake and disease are the immediate causes of child malnutrition [8],[9]. Preschool children are particularly vulnerable under general conditions of poverty and poor food access. In the study of Capanzana et al (2015) in the Philippines, it was found that if the occupation of the household head involves fishing, it increases the likelihood of having a stunted and underweight child by 1.36 and 1.44, respectively [10].At the household level, insufficient access to food leads to inadequate dietary intake. Food security determines the availability and accessibility of the food for the household [11]. Dietary intake should provide the essential nutrients to ensure that individuals can sustain their daily needs to support the growth and development of the vulnerable groups, particularly young children [12]. Dietary diversity is, therefore, an important constituent of high-quality diets. In fact, most dietary guidelines recommend increasing the variety of foods [13], because dietary diversity is assumed to guarantee adequate consumption of necessary nutrients to promote good health [14],[15].

Higher levels of food insecurity were significantly associated to food intake which is less likely to meet the requirements recommended by the Food Guide Pyramid. In the study conducted by Kaiseret al (2002), severe food insecurity is significantly associated with diet that did not meet the recommendation of Food Guide Pyramid specifically the milk and meat group [16]. In another study conducted by Kirkpatrick and Tarasuc (2008), it was found that there was a positive association between food insecurity and consumption of high energy density foods that could eventually equate to the nutritional status of the population overtime, if food insecurity was associated to chronic dietary patterns. Based on this study, children tend to consume less servings of vegetables, fruits, and milk product among food insecure households [17]. In a study conducted in South Africa, food insecure households consumed a less varied diet compared to food secure households, based on the negative association between the Household Food Insecurity Assessment Scale and the dietary diversity score of the household. Households with less diverse diet had also undergone frequent food shortages during the last year compared to their food secure counterparts [18].

While food insecurity remains to be a global health concern, there is still limited research done to explore the relationship between food security and diet diversity at the local level, more specifically, in coastal areas. Coastal communities primarily rely on fishing and agriculture-related activities, which are greatly at risk to the ill-effects of climate change and poverty [19]. Moreover, understanding food insecurity is substantial, particularly among vulnerable populations and households headed by seasonal workers like fishermen with preschool children [20],[21]. The risk of food insecurity existing among agricultural households including fishing communities and the need to conduct a methodological study are highly suggested to evaluate the impact of household food insecurity severity to household food intake in terms of dietary quality [22]. This study aimed to determine the relationship between food security and household diet diversity among households in a coastal municipality in Batangas, Philippines. Specifically, it aimed to describe the demographic characteristics of households in the coastal municipality; estimate the prevalence of household food insecurity severity and food composition score; determine the mean dietary diversity score of the participating households; and to determine the percentage distribution of households according to food group consumption in terms of intake and source.

METHOD

Study Design

Aquantitative, cross-sectional study design was used to determine whether food security predicts diet diversity. This study design was found most suitable for the targeted population and for measuring multiple variables at a specific point in time. It entailed minimal cost and participant recruitment and attrition were manageable.

Study Setting

The CALABARZON region has the largest percentage of food secure households with diverse

diets. The study site is a first-class municipality in the western part of Batangas with a total population of 93,157 people. It has a population density of about 850 inhabitants per square kilometer which primarily belongs to the Tagalog ethnolinguistic classification. Majority of the population relies on agricultural activities including crop production, poultry, and livestock. A total of thirteen (13) barangays are classified as coastal communities. These barangays are significant contributors to the local economy because of its fishing productivity and other related activities [24]-[26].

Sampling Design

A total of 271 households participated in the study. Open Epi was used to compute the sample size needed in the study. Eighty percent (80%) power of the test was utilized with ten percent (10%) level of significance. A two-multi-stage simple, cluster-sampling to meet the minimum household requirement was used. Based on the list given, all coastal barangays within the *poblacion* of the municipality were randomly selected through fishbowl technique. From ten (10) barangays, only six (6) were selected to meet the minimum sample size requirement. After the barangays were identified, the Barangay Health Workers and Barangay Nutrition Scholar assisted the researcher to identify households using cluster sampling. All urban coastal communities were included in this study wherein, households with at least one preschool child (24- 60 months) who signed the informed consent were considered. Households with more than two families, on the other hand, were excluded for homogeneity. Respondents must be the primary caregivers, who have the capacity to recall food security experiences and dietary intake of the household. In the absence of the primary caregiver, the households were excluded. Lastly, respondents who refused to answer any one of the questions were excluded in data analysis.

Data Collection Procedure

A letter was sent to the Municipal Nutrition Action Officer (MNAO) to seek approval of data collection implementation. The MNAO endorsed the researchers to the selected barangays for data collection. Barangay Nutrition Scholars (BNS) and Barangay Health Workers (BHW) assisted the researchers during the data collection to locate the households with preschool children using their prepared spot map. The survey lasted for ten to fifteen minutes from signing the informed consent form until the completion of the instrument. The first part of the tool used in this study was the questions pertaining to the general profile of the respondents. This includes the household head's age, occupation and highest educational attainment, caregiver's age, occupation and highest educational attainment, government support received by the family, household income and household size.

Household Food Insecurity Access Scale (HFIAS) was used to assess the food security level of a household. Research has shown that this tool can be used in developing countries because of its correlation with the indicator of food consumption and poverty. The Food and Nutrition Technical Assistance (FANTA) and its stakeholders identified nine statements that generally represent the dimensions of household food insecurity which can be used to evaluate food insecurity of household based on its severity according to its magnitude [27].In a study conducted in the Southern Ethiopia and Irab, it was found out that HFIAS showed a good internal consistency using Cronbach's alpha. Based on the responses, curves were conformed across the wealth status among sampled households, with a dose-response trend between food insecurity levels with the chance of food consumption during the previous day, whereas, the overall HFIAS score did not change after two rounds of data collection. [28], [29]. In relation to this, the validation and reliability studies conducted in India, it was found out that different studies conducted in the country suggested consistency in terms of ordering the item questions corresponding to anxiety and quality of food related to anxiety, food preference and variety of foods available which are at the lower end of the scale and the items relating to drastic reduction food intake related to hunger [30].

The Household Dietary Diversity Score Questionnaire (HDDSQ) as adapted from the Food Agriculture Office (FAO) evaluates the economic access of the household to food. HDDSQ used one-week as a reference period for recall. In the study conducted by Kennedy et al (2010), it was suggested that an increase in the average number of different food groups consumed provides a quantifiable measure of improved household food access. In general, any increase in household dietary diversity reflects an improvement in the household's diet [31]. As adapted from the tool used by the Food and Nutrition Research Institute (FNRI) for 2015 Updating National Nutrition Survey, household

dietary diversity was measured through Food Composition Score (FCS) by which this indicators can be used to assess the improvements in food security in a performance reporting context, the changes in HDDS must be compared to some meaningful target level of diversity [5]. Dietary diversity scores are acceptable indicators of micronutrient intake from the diet by which of an intake below four to six food groups can predict poor food intake among young children which varies on the nutrients being measured. Acceptable intake among young children was suggested to equate their nutritional status as valid outcome indicator of food adequacy [32],[33]. Meanwhile, in a study conducted in Vietnam, it was also suggested that there was a significant association between dietary diversity scores and intake of macro- and micronutrients, thus, indicates that as the number of food groups increases, likelihood of nutrient adequacy also increases [34]. In the Philippines, it was found out that dietary diversity score was a significant predictor of adequate micronutrient intake of young children [35].

Data Encoding, Editing and Analysis

A coding manual has been developed while data gathered were encoded using Microsoft Excel, while data were edited using STATA15 to ensure the accuracy of the figures before proceeding to data analysis. Tables and graphs were constructed to provide a clear overview of the data. Ratio and proportion were used to estimate food security and dietary diversity. Means were reported to estimate the average household dietary diversity score. Percentage distribution using graphs were used. Lastly, linear regression using multi-categorical predictor analysis was used to correlate household food security and household food composition score.

Ethical consideration of research

Approval was secured from the Municipal Nutrition Action Officer (MNAO) and a letter of endorsement for the selected barangay for the conduct of this study. Randomly selected households were house-to-house interviewed together with the volunteer health workers. Before data collection, informed consent written in Tagalog that includes all necessary information including the rights of respondents was explained. The informed consent includes the research objectives, risks and benefits, duration, rights of the respondents as study participants and a detailed explanation of the data collection procedure. To ensure integrity and justice, the criteria for inclusion and exclusion of participants were itemized before the researcher gathered the data to make sure that there would be no manipulation of participant recruitment to come up with desired results. The respondent's participation was voluntary, and they were informed that they can withdraw at any point in the study. Code numbers were used as identifiers in the data analysis. The researchers were not related to any of the respondents in the study.

RESULTS AND DISCUSSION

Table 1. Characteristic of households in a coastal municipality in Batangas, 2019

Characteristics	No. (n=271)	Percent (%)
Socio-Demographic		
Occupation of the household head		
Fisherman and fishing-related jobs	68	25
Driver	45	17
Skilled worker	66	24
Overseas Filipino Worker	22	8
Office-related jobs	27	10
Scrap collector	9	3
Business owner	7	3
Unemployed	20	7
Others	7	3
Occupation of caregiver/ mother		
Unemployed	162	60
Fish vendor	32	12
Sari-sari store owner	20	7
Skilled worker	26	10
Office-related worker	15	6
Overseas Filipino Worker	6	2
Others	10	4
Highest Educational Attainment		
Household head		
Elementary undergraduate	22	8
Elementary graduate	49	18
High school undergraduate	28	10
High school graduate	108	40
Vocational	6	2
College undergraduate	25	9
College graduate	33	12
Caregiver/ mother		
Elementary undergraduate	14	5
Elementary graduate	31	11
High school undergraduate	31	11
High school graduate	140	52
Vocational	4	1
College undergraduate	15	6
College graduate	36	13

Table 1 (cont.) Characteristic of households in a coastal municipality in Batangas, 2019

Characteristics	No. (n=271)	Percent (%)
Household Size		
<5 members	100	37
5 members	60	22
>5 members	111	41
Monthly Income		
< Php.6500.00	152	56
Php.6501.00- Php.15,000.00	83	31
Php.15001.00-Php.25000.00	21	8
Php.25001.00-Php.35000.00	7	3
>Php.35000.00	8	3
Recipient of Government Support		
Yes	79	29
No	192	71
Mean age of household head (years)	37.20 ± 10.79	
Mean age of caregivers (years)	33.39 ± 8.91	

Table 1 presents the demographic characteristics of the household in this study. Majority of the household heads (40%) and caregivers (52%) were high school graduates. In terms of household head's occupation, majority (25%) were fishermen, some of them were skilled workers (24%), and were drivers (17%). Overseas work (8%) was also observed as one of the leading occupations of the head of the households. Skilled workers include carpenters, electricians, welders, plumbers, mechanical technicians, *kargador* and other similar livelihoods. A high (60%) percentage of caregivers were not involved in any livelihood; they stay at home to take care of their children and the household. Household's monthly income is the sum of all income of the household from all sources per month and is found to increase household food security as it increases [42]. The average household monthly income was about less than PHP 6, 500, which is below the PHP 22,000 monthly average family income estimated by the Philippine Statistics Authority in 2015 [23].In terms of government support, almost one-third of the households was a recipient of the Conditional Cash Transfer (CCT) program called the *Pantawid Pamilyang Pilipino* Program (4Ps) which aims to address the immediate needs of the poorest of the poor households by providing cash assistance [51]. Lastly, most of the households consist of more than five members (41%).

Table 2 and 3 summarizes the severity of household food security among households in a coastal municipality in Batangas. A quarter (23.35%) of households were food secure (95%CI: 18.57, 28.68).

Table 2. Food security status of households in a coastal municipality in Batangas, 2019 (n=271)

Food Security Status	Prevalence	95%CI
Food Secure	23.25	18.57-28.68
Mild Food Insecure	20.30	15.90-25.54
Moderately Food Insecure	32.84	27.48-38.69
Severely Food Insecure	23.62	18.91-29.06

Likewise, 3 out of 10 households were classified as moderate food insecure and an alarming percentage (23.62%) were classified as severely food insecure households. Moderately food insecure means that the household sacrifices food quality and often consumed a less varied diet and/or undesirable foods, and begins to cut back on the number of foods by reducing the meal portion or the number of meals, while severely food insecure households had experienced going to bed hungry or had gone the whole day and night without taking any food for the last month. The percentage of severely food insecure households was comparable to food secure households. Whereas, the number of severely food insecure families were higher than the number of mildly food insecure households.

Results of this study revealed that food insecurity was widespread among the low income urban coastal households in the study area. Also, the observed prevalence was considered higher than the 2015 national and CALABARZON regional estimate reported by FNRI-DOST (2016). Globally, high prevalence of food insecurity and severe food insecurity was reported at Sub-Saharan Africa in 2017, followed by Latin America and the Caribbean, and South Asia. Whereas, North America and Eastern Europe, and Central Asia were reported the lowest food insecurity prevalence and severity. Food insecurity in households takes place when food intake is lessened, and normal eating pattern is not followed due to inadequate financial and food resources [54]. Specifically, severe food insecurity covers people facing utmost condition of food insecurity and is usually related to experiences associated to hunger [55].

Table 3 describes the frequency of food insecurity experience among households under study. Based on the results, the majority (63%) of the households experienced worrying about food access because of inadequate money and lack of resources or source of food for the last month.

Table 3. Percentage distribution of households by frequency of food insecurity experience in a coastal municipality in Batangas, 2019

Occurrence Questions	Frequency of Experience			
	No	Yes, Rare	Yes, Sometimes	Yes, Often
You worry that your household would not have enough food.	37	26	26	11
Any household member is not able to eat the kinds of foods you prefer because of lack of resources.	43	28	22	7
A household member has to eat a limited variety of foods due to lack of resources.	44	26	25	4
Any household member had to eat some foods that you really did not want to eat because of lack of resources to obtain other types of food.	42	33	21	5
Any household member had to eat a smaller meal than you felt you needed because there was not enough food.	53	23	20	4
Any other household member had to eat fewer meals in a day because there was not enough food.	68	16	9	7
No food of any kind in your household because of lack of resources to get food.	85	7	7	1
Any household member goes to sleep at night hungry because there was not enough food.	85	10	3	1
Any household member goes a whole day and night without eating anything because there was not enough food.	96	2	2	0

In terms of food preference, 57% of the households were not able to eat the kind of foods they want because of inadequate resources. In terms of variety, above half (56%) of the households consumed a limited variety of foods because of poor access due to lack of means. Inadequate food consumption was also experienced by nearly half (47%) of the households because they did not have enough food for the family. In addition, one (1) out of ten (10) households experienced lack of food for the family and went to sleep at night hungry. Lastly, in terms of those who are severely food insecure, 4 out of 100 households went the whole day and night without anything to eat because there was not enough food for the family. These findings are consistent with the results observed by DOST-FNRI for the 2015 Food Security Survey [5].

The UNICEF framework for the causes of malnutrition highlights household food insecurity as one of the underlying causes leading to inadequate dietary intake and infectious diseases, which in turn leads to child poor nutrition, disability, and death [56]. This is supported by several evidence that linked food insecurity with high rates of disagreeable health conditions [57] and chronic diseases [58],[59] as well as to nutrient inadequacy for individuals [60],[61].There are also reports that health consequences are intensified by the increase in the severity of food insecurity [62]-[64] and the magnitude of experiences, particularly among children [65],[66]. Hence, the prevalence of household food insecurity is an indication of serious consequences associated with poor health and malnutrition, stressing the need for interventions to improve food security among households with pre-school children particularly in the study area.

Table 4. Food composition status of households in a coastal municipality in Batangas, 2019 (n=271)

Food Composition Category	Score Prevalence	95% CI
Poor (0-28)	1.11	.03-3.40
Borderline (28-42)	4.43	2.52-7.66
Acceptable (>42)	94.45	91.00-96.65

In terms of household diet diversity, Table 4 shows that most (94.45%) of the respondents had an acceptable food composition category since they had a food composition score of greater than 42. While, one (1) in one hundred (100) households had poor food composition scores. However, the mean household dietary diversity score was 10.64 ±0.09 (95%CI: 10.48; 10.79) among households. Several studies have shown that dietary diversity is associated with the quality of diet, nutrient intake of children, and household food security [66],[67]. Thus, results of this

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study imply that most of the households were food secure in terms of dietary diversity and adequacy of their diet. In addition, most of the households have an acceptable level of food consumption, despite having lower than average monthly income, which is parallel with the findings reported by FNRI-DOST [5],[68] that the percentages of household's acceptable food consumption were not different between the poor and the rich population [5].Conversely, results of this study show inconsistencies if compared to other food security measures presented earlier. In particular, results have shown that despite the prevalence of food insecurity, households still have a high average consumption of diverse food groups.

Nevertheless, dietary diversity is considered an important component of the quality of diet because higher consumption of different foods is related to better nutritional adequacy [69].As highlighted in the UNICEF framework for the causes of malnutrition, the inadequacy of dietary intake together with illness is identified as an immediate cause of under nutrition [56]. The nutritional guidelines for the Philippines further recommend the consumption of a variety of foods daily including milk, milk products, and other calcium-rich foods [70]. Moreover, it is also encouraged to eat a greater amount of certain food groups such as fish, lean meat, poultry, dried beans, vegetables, fruits, and root crops.

Based on the results of this study, food available in the household was largely composed of cereals, oils and fats, fish and seafood and white tubers. Dietary diversity score increases with the addition of eggs, spices and condiments, meat and sweets in the diets of the respondents. In general, staples; oils and fats; fish and seafood; and white tubers and roots were the usual content of the dietary intake of households. Fruits, vegetables, milk and milk products and legumes were of least priority. At the national level, staples were also the most consumed food group. This includes rice, noodles, bread, biscuits, cookies, cereals and cereal products, rice products, and tubers such as cassava, potatoes, sweet potatoes, yam, and other starchy root crops. Also, the second most consumed food groups are meat and fish followed by vegetables, condiments, and oil. While the least consumed food groups were also milk and pulses [5].

Table 5 and 6 presents the percentage of households consuming specific food groups and the frequency of consumption in selected coastal communities. In terms of frequency of intake among households, it was clearly observed that staples (i.e. rice, cereals, bread, and other alike products) and condiments (i.e. spices, seasonings, salt, etc.) were the only food item consumed daily.

Table 5. Percentage of households consuming specific food groups in a coastal municipality in Batangas 2019

Food Groups	Frequency	Percentage
Cereals	271	100
White tubers and roots	261	96.31
Vegetables	220	81.18
Fruits	248	91.51
Meat	252	92.99
Eggs	257	94.83
Fish and other seafood	267	98.52
Legumes, nuts, and seeds	145	53.51
Milk and milk products	187	69.00
Oils and fats	268	98.89
Sweets	250	92.25
Spices, condiments, and beverages	257	94.83

Table 6. Percentage of households consuming specific food groups according to the frequency of intake in a coastal municipality in Batangas, 2019

Food Groups	Mean Score	Interpretation
Cereals	7	Everyday
White tubers and roots	2.21	Twice a week
Vegetables	2.66	Thrice a week
Fruits	2.5	Thrice a week
Meat	2.86	Thrice a week
Eggs	4.55	Five times a week
Fish and other seafood	5.33	Five times a week
Legumes, nuts, and seeds	1.21	Once a week
Milk and milk products	4.15	Four times a week
Oils and fats	6.36	Six times a week
Sweets	6.19	Six times a week
Spices, condiments, and beverages	6.56	Everyday

It was also recorded that sweets and oil were consumed for at least six times a week. Meanwhile, the source of protein particularly fish and seafood, and eggs were available in the household for consumption for at least five times a week. It was also noted that milk and milk products were served four times a week. Other food groups like fruits, vegetables, and meats were served at least three times a week. Lastly, based on the table legumes and nuts were the least frequent type of food available to the family in one week. Result of this study is consistent with the results of the National Nutrition Survey in the Philippines

which found out that the usual means of obtaining food was also through purchasing from local markets, groceries and from other suppliers [5]. It was found that almost all the food groups consumed were purchased by the household except for the fish and shellfish food group.

Meanwhile, compared to the results of this study, the top five food groups that were usually purchased in the country were spices, oils and sweets, milk, eggs, and fish. Likewise, legumes and meat were also acquired by purchasing [5]. In another study conducted by Labadarios (2000) in South Africa foods were also mostly purchased from markets and small trading across the town. In contrast with the results of this study, the most procured food items among South African households were also the most consumed food groups which include corn, brown bread, sugar, milk, tea, and brown bread [71]. This could be explained by the limited access to food due to geographical constraints among coastal communities and household income. Household income is particularly vital for food security as it directly affects household access to food that resulted to substantial shortage to a segment of the rural population that leads to the inability of the community to produce enough food [72].

Table 7. Coefficient values on the relationship of food insecurity severity and food composition score

Household food insecurity severity	Coefficient values	95% Confidence Interval	p-value
Mild food insecurity	-10.32	-16.67, -3.97	0.002
Moderate food insecurity	-7.98	-13.65, -2.32	0.006
Severe food insecurity	-14.50	-20.60, -8.39	0.000

Table 7 presents the predicted value on how the severity of food insecurity affects the food composition score of a household. The average food composition score among food secure households was 80 (95%CI: 75.4, 84.2). Whereas, mildly food insecure households had food composition score of less than ten (10) that of food secure households ($p<0.05$). However, moderately food insecure households had food composition score of less than eight (8) that of food secure households ($p<0.05$).While, the severely food insecure households had food composition score of less than fourteen (14) that of food secure households ($p<0.05$).

It was also observed that, at least two groups defined by household food security have significantly different average food composition score ($p=0.0001$).This relationship indicates that HFIAS is negatively associated with dietary variety. Therefore, the higher food insecurity severity of the households, the more likely they will experience food shortages and consume a diet of lower diversity compared to households that are food secure. In a Cambodian study conducted by McDonald et al (2015), the mean HDDS score was 4.7±1.6 by which the twenty- three percent (23. 2%) of the household was considered to have low diet diversity and eighty-six percent (86.6%) were food insecure [73]. In another study, food insecurity was positively associated with consumption of high energy density foods among Canadian households, which could eventually equate to the nutritional status of the population over time if food insecurity was associated to chronic dietary patterns [11],[60]. Based on the results, households minimally consume vegetables, fruits, and milk products. Higher levels of food insecurity were significantly associated with food intake that is less likely to meet the requirements recommended by the Food Guide Pyramid. Additionally, the severely food insecure household is significantly associated with a diet that does not meet the recommendations of the Food Pyramid, especially the meat and milk group [74]. Meanwhile, a study conducted in Ethiopia focused on the assessment of the dose-response trend between the food insecurity level and the likelihood food intake was observed. It was found out that the consumption of milk among food secure households was different from food insecure households. Moreover, consumption of egg and vegetables products were also different between groups [75].

The association of food insecurity with dietary diversity scores can also be affected by several factors such as household income, highest educational attainment of the household head, household size, and government support. In this study, majority (41%) of the respondents who were receiving government support belongs to the moderately food insecure households which can somehow alleviate the impact of household food insecurity severity ($p=.001$). Also, the majority (51%, 60%) of the household heads from mildly and moderately food insecure households were high school graduates; while 28% of the household heads from severely food insecure household were elementary graduates. Furthermore, it is also notable that the average monthly income of the respondents

falls below the estimated average monthly income reported by PSA in 2015.In a correlational study, it was reported that among urban communities there was about 0.3 correlation between socio-demographic status and diversity of diet[76]. Household size may also be a factor with food per capita being inversely related to household size [77]. After controlling for the potential confounding effect of community type, it was revealed that receiving support from the government can increase the Food Consumption Score (FCS) by 3.9 on average. The likelihood of having a satisfactory FCS is 11.8 points higherif the households were recipients of government vouchers. The increase in the FCS can be explained by economic mobility and improvement in poverty dynamics because of CCT [78].

CONCLUSION AND RECOMMENDATION

Household food security determines the quality of the diet among households with preschool children in coastal communities in a municipality in Batangas, Philippines. This study aimed to determine the relationship between food security and household diet diversity among households in a coastal municipality in Batangas, Philippines. Based on HFIAS evaluation, 23.25% of households were food secure, 20.30% of households were mildly food insecure, 32.84% were moderately food insecure, and 23.62% of households were severely food insecure. The UNICEF framework illustrates how educational attainment, income, household size, and government support determine access to food and child care practices. Majority of the household heads (40%) and caregivers (52%) were high school graduates, with an average monthly income of about P6,500.00, having a household size of more than five (41%), and almost one-third of the households are recipients of the CCT program, 4Ps. These underlying causes may contribute to dietary intake.

Based on HDDSQ evaluation, the majority (94.45%) of the households had an acceptable food composition score, while 4.43% had borderline food composition score, and 1.11% of the household had a poor food composition score. The mean household dietary diversity score was 10.64±.09. Whereas, the food groups consumed by most of the households were cereals and rice, oils and fats, fish and seafood, and white tuber and roots. Results also showed that the majority of the food groups were purchased by households. Fish was largely consumed and a main component of their diets because it was gathered. The mean food composition score among food secure households was 80 (95%CI: 75.4, 84.2). Meanwhile, as food insecurity persists, food composition also decreases: mildly food insecure households had food composition score of less than ten (10), moderately food insecure households had food composition score of less than eight (8) and severely food insecure households had food composition score of less than fourteen (14) when compared to food secure households. At least two groups defined by household food security have significantly different average food composition scores (p=0.0001). Findings suggest that the severity of food insecurity is negatively correlated with food composition scores, which indicates that food insecure households consume less diverse diets.

As literature on local coastal community remains scarce, this quantitative study provides baseline data for nutrition and health interventions, programs, and policy development. Findings may help target similarly vulnerable households with prevailing food insecurity and low dietary diversity. This study also established how food security, a complex measure of access to food and a significant determinant of nutritional status, predicts diet diversity. Reliable and validated survey instruments were used to minimize systematic errors. However, the use of self-reported questionnaires is dependent on respondent recall which may falter over time. The HFIAS was based on a one-month food security experience while HDDSQ was referenced for the immediate past week food intake experiences. A mixed methods design may be explored to minimize recall and social desirability bias. Lastly, confounders were controlled for using STATA15 software. Other confounding variables, beyond the scope of the study, which can affect the true relationship of household food insecurity severity and household dietary diversity may still exist [80], [81], [82]. Therefore, the generalizability of the result was only limited to this certain population with the same characteristics. The moderating role of the caregiver's socio-demographic characteristics such as age, gender, occupation, income, and household size on food security measures may also be further explored. Understanding economic determinants of health are vital in addressing food insecurity. Programs to improve education, livelihood and training opportunities, and income-generating activities for caregivers and household heads may also be considered.

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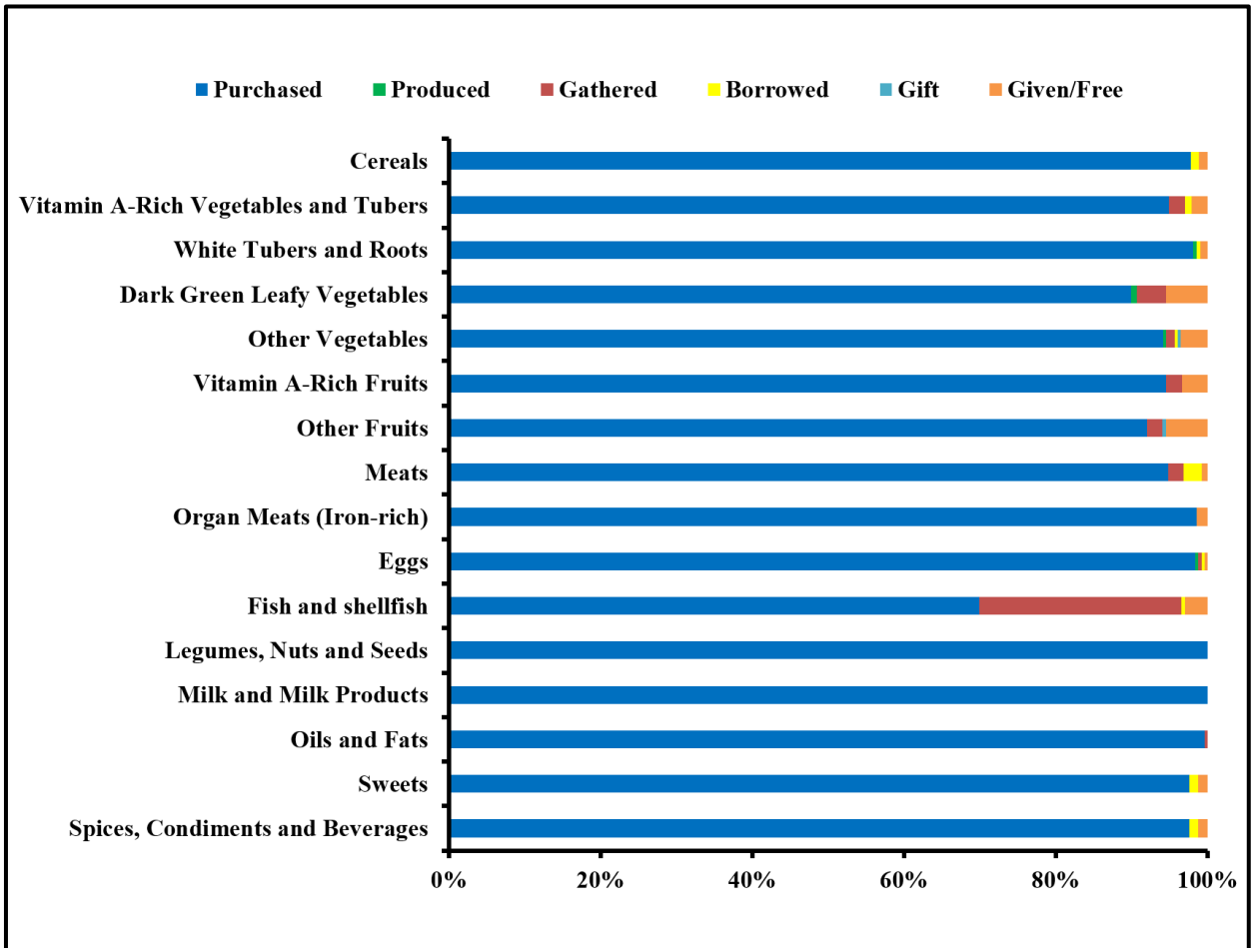

Figure 1. Percentage distribution of food sources among in a coastal municipality in Batangas, 2019