Household Food Security and with Stunting among Preschool Children in Occidental Mindoro

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RESEARCH ARTICLE

Abstract

Background and Objective: Food security is achieved when the population at all times has access to safe, sufficient, and nutritious food to sustain a healthy and active life. This study aimed to determine the significant association between household food security and the prevalence of stunting among preschool children in Occidental Mindoro.

Methods: This study utilized a cross- sectional study design and a three-level, multi-stage, stratified random sampling to answer the study objectives. A total of 480 preschool children (n=240 urban; n= 240 rural) were included in the study. The Radimer-Cornell Tool was used to determine the food security status of the household. A validated- constructed questionnaire was used to determine other factors which were controlled in this study. Multiple Logistic Regression was used to determine significant association between the exposure and the outcome variable while controlling the confounding variable simultaneously.

Results: This study revealed that the prevalence of food insecurity in the province was 51.04% (95% CI: 46.55, 55.53) while the prevalence of stunting was 36.04% (95%CI: 31.73, 40.35). Meanwhile, after controlling the confounding effect of household income and low dietary diversity score it was found that the odds of having a stunted child were 23 times higher among food insecure households (OR: 23.00, 95%CI: 12.05, 43.91).

Conclusion: Based on the results of this study, the magnitude of household food insecurity and stunting were found to be very high in the study areas. There was a significant association between household food security and stunting among preschool children.

Keywords: *stunting, preschool children, household food security*

Introduction

Food security is attained when all people at all times have access to sufficient, safe, and nutritious food to maintain a healthy and active life [1]. This concept includes both physical and economic access to food that meets dietary needs as well as food preferences. It involves the following dimensions: physical availability of food, economic and physical access to food, food utilization, and stability of the other dimensions. Stability of other dimensions must not be affected negatively by natural, social, economic, or political factors to ensure that food security will exist among the population.

At present, 842 million people or 12% of the population around the globe are food insecure [2]. Majority of food cases insecurity exists in developing and underdeveloped countries which are mostly concentrated in the Sub-Saharan Africa and South East Asian nations. Approximately 167 million people in Eastern Asia, 223 million people in Sub-Saharan Africa and 290 million in Southern Asia are food insecure [2].

In the Philippines, the 8th National Nutrition Survey (NNS) revealed that more than a quarter of Filipino adults, or 36% and 23% of children claimed to be food insecure respectively. The magnitude of the problem was persistently scattered across the 16 regions of the country [3]. According to the first quarter 2016 Social Weather Survey, 46% or 10.5 million of Filipino families classified themselves as poor. The average hunger rate last 2015 was recorded at 13% lower compared to 2014 with average

hunger rate at 18%. Two million Filipino families experienced moderate food hunger and 621,000Filipino families suffered from severe hunger [7].

Meanwhile, food security in the household level is a prerequisite of a well-nourished child. However, several studies already proved that not all food secure households have healthy children. A number of studies from longitudinal and prospective studies yielded heterogeneous results [8].

Stunting is a cumulative process that starts in utero and there is substantial evidence that intrauterine growth is a strong predictor of postnatal growth. Several studies have shown that growth faltering in infants starts from seven months upward because breastmilk is no longer enough to meet the child's nutritional requirement.

Among the regions in the Philippines, the prevalence of stunting was higher among rural areas and in the poorest quintiles. Stunting was more common among preschool children in Bicol (39.8%), ARMM (39.0%) and Zamboanga Peninsula (38.7%) [3].

Stunting and household food insecurity are problematic issues that greatly affect the developmental period of preschool children. Skeletal growth of preschool children is very vulnerable to different conditions, such as genetic predisposition, nutrition, and dietary intake among others. In the study conducted in Colombia, it was revealed that household food insecurity was significantly associated with stunting [6]. In another study conducted in the North Eastern Peninsular Malaysia [4], it was found out that children who were food insecure were three times more likely to be stunted (p=.004). In another study conducted in Pakistan, association between household food insecurity and stunting of preschool children was statistically significant [6].

Undernutrition must be addressed with appropriate and immediate intervention because this may lead to a weakened immune system, thereby increasing the susceptibility to infections, poor growth and development, and other related complications of malnutrition [3]. Thus, sufficient and appropriate intervention must be done especially in the most afflicted provinces and municipalities [3].

Even though household food insecurity and stunting had been experiencing for the last few decades, only a few studies explored the relationship and association between these two concepts. The association of household food insecurity and stunting among preschool children in the Philippines has not been studied specifically among the poorest provinces. Furthermore, the limited number of studies regarding this phenomenon, specifically how food security affects the skeletal growth of children, calls for the conduct of a methodologically sound and valid study.

The main objective of this study was to determine the significant association between household food security and the prevalence of stunting among preschool children in Occidental Mindoro.

Methodology

Study Design

The study utilized an analytic cross-sectional design to determine the association of household food security and stunting among preschool children. This was used to gather information on the exposure (household food security) and outcomes (nutritional status: stunting) simultaneously at a single point in time. The use of a cross-sectional design allowed to examination of several outcomes and evaluation of a variety of risk factors.

Study Setting and Target Population

Occidental Mindoro, an island province under Region IV-B (MIMAROPA - Mindoro, Marinduque, Romblon, and Palawan), was used as the setting of this study. This province mainly consists of agricultural lands and is surrounded by bodies of water. The agricultural landscape of the province makes it suitable for farming and fishing. Tagalog is the dialect mostly used in the whole province. The target population were preschool children currently enrolled in Barangay Day Care centers. This province was selected because the NNS results of the Food and Nutrition Research Institute (FNRI) showed that MIMAROPA is one of the regions with a high prevalence of household food insecurity in the Philippines.

Sampling Design

A total of 480 preschool children we included in this study. This was determined through the use of Open Epi software and a three level, multi-stage stratified simple random sampling was utilized. At the start of this sampling design, all municipalities of Occidental Mindoro, except island municipalities, were included in the list. Only three municipalities were drawn from the sampling frame in order to maximize the resources during data collection. After the municipalities were selected, barangays were

stratified into two: urban and rural. The stratification was based on the list of barangay classification set by the Department of Interior and Local Government [7].

According to Philippine Standard Geographic Code (PSGC), all barangays with a population density of at least 500 to 1,000 persons per square kilometer are considered urban. Furthermore, a barangay can be classified as urban if there is a street pattern or network of streets and at least six establishments within the vicinity (commercial, recreational, etc). The availability of a town hall, church, public plaza, and a building identify a barangay as urban regardless of the population density. Lastly, a barangay shall be classified as urban if at least 1,000 of the inhabitants are predominantly non-fishing or farming. Nevertheless, all of the barangays that do not fit the criteria are classified as rural [7].

From each stratum, only 11 barangays were selected through simple random sampling in order to meet the sample size requirement. It was done because the number of preschool children from each center did not exceed 35. Only center- based daycare institutions were included in the study. After the barangays have been selected, a list of pre-school children was asked from the daycare workers that served as the final sampling frame.

From the list, 21 preschool children were selected through a systematic random sampling. Thus, only 21 preschool children attending each respective day care center were included. The conduct of this study was approved by the University of the Philippines Manila, Research Ethics Board with protocol code UPMREB 2016- 315- 01.

Data Collection Procedure

A letter of intent was sent to the Provincial Social Welfare and Development Office (PSWDO) to seek approval for the data collection. Upon approval, endorsement was done through the respective Municipal Social Welfare and Development Office (MSWDO) of each municipality. A letter of endorsement was released by the MSWDO to each barangay for data collection.

The signing of informed consent written in Filipino was administered before the data collection. The collection of data lasted for 30-40 minutes from the time of signing until the completion of all components.

Data Collection Tool

The tool was composed of three parts: (1) general information, (2) anthropometric and dietary assessment, and (3) the adapted Radimer-Cornell Tool of household food security. Radimer-Cornell is originally a 6-item measure of hunger and food insecurity [8]. Food security items, in the adapted Radimer-Cornell measure, were valid indicators of food insecurity using national estimates. Even though the individual level of food insecurity showed a higher proportion of the total variance compared to household level items, this does not preclude the ability of the tool to detect food insecurity at household level. In this study, the adapted tool was based on the actual questions employed by the FNRI during the NNS [9].

General information and Radimer-Cornell Tool were employed through direct interview among mothers and caregivers of preschool children. The height of preschool children was measured through the use of height board and microtoise. The World Health Organization's Child Growth Standards WHO-CGS was used to interpret the result of the height-for-age status.

Dietary inadequacy was identified as an intermediate variable between household food security and stunting [10,11]. In this study, Individual Dietary Diversity Scores (IDDS) was used to measure the adequacy of the diet.

Studies in different age groups have shown that an increase in individual dietary diversity score was related to increased nutrient adequacy of the diet [12,13]. The DDS and its food groupings were based on the Food Agriculture Office (FAO) guidelines [14]. The reference for DDS was a 24-hour food recall answered by the mother or caregiver of the child. The result of the recall was tallied based on the set food groupings [14].

In order to assess the intake of the respondents, a cut-off of ≥5 food groups was used to determine adequacy. It was found out that the best cut-off point to maximize the specificity and sensitivity of the DDS for preschool children in the Philippines was five [14]. A score of ≥5 in the IDDS reflected the adequacy of the diet among preschool children.

Data Encoding and Data Editing

To ensure that the information gathered was complete, consistent, and suitable, data were examined during coding, encoding, and editing. The data gathered were encoded using Microsoft Excel and edited using Stata to ensure the accuracy and correctness of the figures before proceeding to data analysis.

In order to answer the objective of this study, the ratio and proportion using the point and interval estimate were used to determine the prevalence of household food insecurity and stunting among preschool children. Multiple logistic regression was used to determine the association between the exposure and outcome variable in order to control the confounder since the exposure and outcome variable of interest are in categorical type. Moreover, multiple logistic regression was utilized in order to control the effect of the confounding variable in the association of exposure and outcome.

Results

The three municipalities included in this study were: Sablayan, Mamburao, and Abra de Ilog. Six (6) barangays from Sablayan (3 rural and 3 urban) and eight barangays from both Abra de Ilog and Mamburao (4 rural and 4 urban) were included in the study.

Description of Participants

The characteristics of participating household and preschool children were summarized in Table 1. A total of 480 3-5 year-old children participated in the study, 240 from rural communities and 240 from the urban communities. The mean age of the respondents was 52.6 ± 8.15 months. Almost half (47%) were boys and the remaining 53% were girls.

Among the 480 households included in the study, majority (69%) had a monthly income of PHP < 6,000. 23% had a monthly income between PHP 6,001 to PHP 15, 000, and the remaining 8% had a monthly income greater than PHP 15, 000.

The common occupation of the fathers included the following: farmer (31%), fisherman (20%), driver (14%), contractual employee (8%), Overseas Filipino Worker (OFW) (8%), while the remaining 10% were unemployed. On the other hand, the common occupation of mothers included the following: housekeeper (76%), contractual employee (6%), vendor (5%), OFW (3%), government employee (3%), and housemaid (3%).

Majority (71%) of the preschool children belong to a household not covered by any government programs, such as the Conditional Cash Transfer (CCT) or the Pantawid Pamilyang Pilipino Program (4Ps) and the Minority Condition Cash Transfer (MCCT). Almost all (96%) of the respondents were non-Mangyan. Mangyan is the major tribe or ethno-linguistic classification in the province.

About a third (30%) of the preschool children belong to a household with a family size of four (4). The mean household size for both rural and urban communities in Occidental Mindoro was 4.83 ± 1.35 across the three municipalities. The mean household size in rural communities in the province was 4.85 ± 1.35 higher compared to the mean household size in urban communities which was 4.80 ± 1.33.

Among the 480 preschool children who participated in the study, (47%) were afflicted by diseases, such as common flu, cold and acute diarrhea for the past three months. However, this variable was controlled in the study during the statistical analysis and was found as insignificant confounding variable for both underweight and (0.055 > 0.05) stunting (0.056 > 0.05) in the full model.

Prevalence of Household Food Insecurity and Stunting in Preschool Children

Table 2 summarizes the prevalence of household food insecurity and stunting in Occidental Mindoro. The prevalence of household food insecurity across the three municipalities was 51.04% (95% CI: 46.55% to 55.53%). The mean household size of food insecure household was 5.11 ± 1.35, which was higher compared to the mean household size of food secure household which was recorded at 4.53 ± 1.27. In addition, they also belong to households with a monthly income below PHP 6,000.

In relation to this, Table 3 presents the prevalence of stunting in Occidental Mindoro; this also explains the characteristic of household with stunted children. The factors presented in Table 3 were the covariates controlled to determine the significant association between household food insecurity and stunting. The prevalence of stunting in the province was 36.04% (95%CI: 31.73% to 40.35%). Meanwhile, some (21%) of the stunted children received support from the government such as CCT and MCCT while the remaining 15% were not recipients of any government programs. Majority (29%) of the stunted children belonged to households with a monthly income of less than PHP 6,000. Meanwhile, all (100%) of Mangyan preschool children were stunted.

Ninety percent (90%) of stunted children were found in food insecure households. Furthermore, 80% of the stunted children belonged to households with monthly family income

Table 1. *The prevalence of household food insecurity and stunting in Occidental Mindoro (2016)*

Characteristics	No. n=480	Percent (%)
Demography		
Sex		
Male	226	47
Female	254	43
Socioeconomic		
Household Income		
<PHP. 6000.00	329	69
PHP. 6,001.00- PHP. 15,000.00	108	23
PHP. 15, 001.00- PHP. 25,000.00	35	7
>PHP. 25,001.00	8	2
Occupation of Father		
Construction Worker	48	10
Driver	66	14
Contractual Employee	38	8
Farmer	147	31
Fisherman	94	20
Government Employee	22	5
OFW	14	9
Unemployed	47	10
Others	4	1
Occupation of Mother		
Contractual Employee	29	6
Government Employee	16	3
Housemaid	16	3
OFW	16	3
Farmer	5	1
Vendor	26	7
Housewife	365	76
Others	7	1
Ethnolinguistic Classification		
Mangyan	21	4
Non- Mangyan	459	96
Recipient of Government Support		
Yes	138	29
No	342	71
Mean Age (in months)	52.6 months ± 8.15 months	
Household Size	4.83 ± 1.35	

The characteristics of participating household and preschool children were summarized in Table 1. A total of 480 3-5 year-old children participated in the study: 240 from rural communities and 240 from the urban communities.

Table 2. *Prevalence of food insecurity and stunting in Occidental Mindoro, 2016*

Factors	n	Prevalence %	Confidence Interval (95%)
Household Food Insecurity	245	51.04	46.55%; 55.53%
Stunting	173	36.04	31.73%; 40.35%

below PHP 6,000. Most (27%) of the stunted children belonged to families with a household size of four and five.

Association of Household Food Security Status with Nutritional Status of Preschool Children

Table 4 presents the summary of results between the association of household food security and stunting among preschool children. The Multiple Logistic Regression was used to determine if there was an association between household food security status and stunting among preschool children. This study found out that after controlling the confounding effect of low dietary diversity score and household income, it was found that the odds of being stunted among preschool children were 23 times higher if the household was food insecure (OR: 23.00, 95%CI: 12.05 to 43.91). Moreover, research findings also showed that the odds of having a stunted child were 96% lower if the household was food secure.

Table 3. *Characteristics of stunted children in terms of covariates controlled in this study*

Characteristics	Stunted n=173 n(%)	Normal n=307 n(%)	Total n=480 n(%)
Food Security			
Food Insecure	156(90)	89(29)	245(51)
Food Secure	17(10)	218(71)	235(49)
Diet Adequacy			
Less Diverse	87(50)	65(21)	152(32)
More Diverse	86(50)	24(79)	328(68)
Recipient of Government Support			
Yes			
No	101(58)	241(79)	342(71)
	72(42)	66(21)	138 (29)
NoSick for the Past 3 months			
Yes	91(53)	130(42)	221(46)
No	82(47)	177(58)	259(54)
NoSocio- economic			
Household Income			
<PHP. 6000.00	138(80)	191(62)	329(69)
PHP. 6,001.00-PHP.15,000.00	30(17)	78(25)	108(23)
PHP. 15, 001.00- PHP. 25,000.00	4(2)	31(10)	35(7)
>PHP. 25,001.00	1(1)	7(3)	8(2)
Ethno- linguistic Classification			
Mangyan	21(12)	0	21(4)
Non- Mangyan	152(88)	307(100)	459(96)
Family Size			
<5	67(39)	157	224(47)
5	46(27)	69	115(24)
>5	60(35)	81	141(29)

Table 3 presents the characteristic of the children based from the result of height-for- age status when grouped according to covariates. Covariates were based on the confounding variables controlled in the study.

Discussion

Prevalence of Household Food Insecurity in Occidental Mindoro

People suffering from hunger in the Philippines are mainly children and women. According to the latest result of NNS, the national estimate for food insecurity in the Philippines using the Radimer-Cornell was at 69.3%. Meanwhile, the estimated prevalence of food insecurity in Occidental Mindoro was 85.8% [3]. The result of NNS was higher compared to the result of this study. The estimated prevalence (51.04) of food insecurity in this study was lower in both national and provincial estimate [95% CI: 46.55, 55.53].

In relation to other studies, the fourth quarter 2015 Social Weather Survey, found an 11.7% or an estimated 2.6 million Filipino households suffering from involuntary hunger for at least once during the past three months. However, this hunger rate is the lowest average hunger rate since 2004 compared to 11.8% average of the said year [4]. If the results of this study will be compared, it recorded lower estimates since this survey reflected the hunger rate and involuntary hunger while this study focused on household food security rates. Even though the estimated prevalence in this study was lower compared to the results of NNS, the result still presented high public health significance.

Prevalence of Stunting in Occidental Mindoro

According to the OPT Plus Report (2015), the recorded prevalence of stunting (height-for-age indicator) was at 22.03% for the whole province. The municipalities of Abra de Ilog (with 45.54% prevalence), Paluan (with 42.50% prevalence), and Sta. Cruz (with 27.86% prevalence) were the top three municipalities with the highest prevalence of stunting in the province [15].

The findings of this study showed that the prevalence of stunting in the province was 36.04% (95%CI: 31.73% to 40.35%). Thirty percent (30.3%) of children under 5 years old were suffering from stunted growth in the same year which places the country ninth in the world rankings of stunted children [3]. Findings also showed that the prevalence of stunting among preschool children in Occidental Mindoro was at 36.04%, which was almost close to the national prevalence. Meanwhile, according to the result of the NNS prevalence of stunting in Occidental Mindoro was found to be at 37.42% which is the highest in the MIMAROPA region. However, the result of the Operation Timbang Plus (OPT) in 2015 indicated lower prevalence across the whole province. The prevalence of stunting in the province according to OPT+ was only recorded at 22.03%. The variation in the result of different studies might be attributed to the difference in sampling design and type of tool used during the data collection procedure [15].

Based on the result of this study, it can be determined that prevalence of stunting in the province was of high public health significance. Despite of the measures implemented by the local government unit as mandated by the Philippine Plan of Action for Nutrition, stunting was persistent across the province.

Association between Household Food Security Status and Stunting

The prevalence of stunting was lowest in food secure households and highest in severely food- insecure households in Bangladesh, Ethiopia and in moderately food-

Table 4. *Odds Ratio for the association between household food security and stunting among preschool children in Occidental Mindoro, 2016.*

Food Security Status	No. of Stunted/ No. of Preschool Children (%)	Crude OR (95% CI)	p- value	Adjusted OR (95% CI)	p-value
Insecure	156/245(64)	22.48 (12.86; 39.27)	<.001	23.00 (12.05; 43.91)	<0.001
Secure	17/235(7)				

Table 4 discusses that after controlling the confounding effect of low dietary diversity score and household income, it was found that the odds of being stunted among preschool children were twenty- three (23) times higher if the household was food insecure (OR: 23.00, 95%CI: 12.05 to 43.91).

insecure households in Vietnam. The differences in undernutrition prevalence between food secure and insecure households were highly significant in the previous study ($p<0.001$) [16].

As shown in Table 3, out of 173 preschool children who were stunted, 156 (90%) belongs to food insecure household.

Moreover, the result of this study revealed that 80% (137) of the preschool children belong to the family with household income below Php 6,000. The economic resources greatly affect the capacity of the family to purchase food supply which pertains to the food accessibility domain of food security. In order to achieve food accessibility, the household must be able to acquire or buy foods available through their resources. Children who skipped meals because of insufficient finances were significantly more likely to be wasted (OR= 4.359, CI= 1.71-11.07) and underweight (OR= 4.177, CI= 1.96- 8.86) [20].

In connection with other studies, children in food-insecure households had 1.5 greater odds of being stunted than children in food- secure households in all three countries (Bangladesh, Vietnam, and Ethiopia) [16]. There were substantial evidence indicating that household food security was among the key determinants of nutritional status of children [17] and food security may be a necessary requirement for good nutrition outcomes [18].

The association of household food security in the nutritional status of preschool children can be affected by several factors that include government support, community classification, ethnolinguistic classification, and family household size. These other determinants were controlled in this study through the use of multiple logistic regression analysis.

After controlling the confounding effect of low dietary diversity score and household income, findings indicate that the odds of having a stunted preschool child were 23 times higher if the household was food insecure. These findings were consistent using samples from Ghana children which found out that food insecure households had lower mean height-for-age [19]. Meanwhile, chronic malnutrition was stronger in the 24-36 months age group.

These findings were consistent with the findings in rural Bangladesh and Colombia that showed significant association between food insecurity and malnutrition [20,21,22]. Moreover, research findings suggested that after adjusting all hypothesized confounding factors, moderate and severe food insecurity were significantly associated with stunting in Bangladesh, Vietnam, and Ethiopia [16].

The influence of food security in the stunting of preschool children can be affected by other determinants. In this study, ethno- linguistic classification, household family size, family income, and support coming from the government were considered confounding variables, thus, these were controlled in this study. In this article, food intake adequacy and household income were found to be significant confounders [23,24].

This was consistent with the result of another study which concluded that dietary diversity was significantly associated with stunting in all age groups. Compared with low DDS, high dietary diversity was associated with a 15, 26, and 31% reduced odds of being stunted [20].

Limitation of the Study

The difference in research findings between this study and other related studies was greatly due to the methodology and type of tool used. This research used Radimer-Cornell Tool of food insecurity while other studies used the Household Food Insecurity Access Scale (HFIAS) of the US Agency for International Development (USAID) which was designed to measure household food insecurity cross-culturally [25].

The lower estimate produced by the study can be due to the difference in the sampling method used. Moreover, the generalizability of data was limited to mainland municipalities and to households with preschool children enrolled in center-based daycare centers. The prevalence of both household food insecurity and stunting provided a wider confidence interval which can be explained by the small sample size hence, the chance of having precise estimates was lowered. This could also explain the high odds ratio produced by this study.

Another limitation can be attributed to seasonal variations. This study was carried out from October to November 2016 before the harvest period in Occidental Mindoro. The research findings were affected by recall bias due to the use of the 24- hour food recall as a reference for Dietary Diversity Score Questionnaire. Radimer-Cornell Tool also relies on the memory of mothers and caregivers since it is based on past experiences. In terms of the 24-hour food recall, they might not be able to provide a complete and accurate recall of food items even probing was done.

Lastly, the answers of the respondents might have been affected by social desirability bias. The mothers or caregivers might recall or answer the survey based on their perceptions of how they were adjudicated by the survey.

Conclusion

The magnitude of household food insecurity and stunting were found to be very high in the study areas. Although it was lower compared to the national estimates, it remained as a public health significance. The association between household food security and stunting of preschool children implied that improving household food security is a potential strategy to improve the nutritional status of preschool children.

A food insecurity intervention program should be focused not only on food security but also on other nutrition programs such as home-based food production, livelihood programs for mothers, and sustainable nutrition education programs. Furthermore, local leaders must support the implemented food insecurity intervention and nutrition program in order to make them more sustainable. The government must also assess the effectiveness of the existing programs which focuses on solving hunger, health, and malnutrition among preschool children.

Acknowledgement

This study was funded by the Department of Science and Technology-Science Education Institute (DOST-SEI) ASTHRDP scholarship program and supported by the Graduate Assistance Program of the University of the Philippines Manila. The agencies involved in funding had no role in the study design, data collection and analysis, and of the manuscript.

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