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Household Food Insecurity and its Association with Nutritional Status among Preschool Children in Gambella Town, Western Ethiopia

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Abstract

Introduction: Food insecurity and malnutrition among children are common in developing countries including Ethiopia. Food insecurity is probably one of the determining factors of malnutrition in children but results are inconclusive.

Objectives: The aim of this study was to assess the magnitude of household food insecurity and its association with the nutritional status of children in Gambella town.

Method: A community based cross-sectional study was conducted on children in April 2016 in Gambella town, west Ethiopia. Data including household food insecurity were collected from 284 households having children 6-59 months by the face to face interview using structured questionnaire. Anthropometric measurements were measured using standard procedures to determine nutritional status of children. Descriptive statistics, bivariate and multivariate logistic regression analysis were performed to determine the association between household food insecurity and nutritional status of children.

Results: The overall prevalence of household food insecurity was 59.5% with 20.1%, 23.6%, and 15.8% households were mildly, moderately, and severely food insecure, respectively. Prevalence of stunting, underweight and wasting were 23.2%, 12.0% and 13.4% respectively. Household food insecurity was independently associated with stunting, but not with wasting and underweight after adjusting for possible confounders using multivariable logistic regression model. The odds of stunting were highly pronounced in those children who were from severely and moderately food insecure households.

Conclusion: The findings from this study suggest high prevalence of both household food insecurity and malnutrition among children in Gambella town. Household food insecurity was significantly associated with stunting. The finding implies nutrition interventions targeting children need to address household food security.

Keywords: Household food insecurity; Nutritional status; Children

Introduction

Food insecurity is a state or a condition in which people experienced limited or uncertain physical and economic access to safe, sufficient, and nutritious food to meet their dietary needs or food preferences for a productive, healthy and active life [1]. Food security, on the other hand, is achieved when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life [2]. Food security can be considered at national, household and individual levels. At national level, it is related to physical existence of food stocks for consumption be it from own production or from markets. Household food security is related to the ability to obtain sufficient food with sufficient quality to meet nutritional requirements of all household members. Household level food security mainly relies on household income and purchasing power of household members which again related to income distribution in the household [3].

Evidences show that the magnitude and severity of food insecurity vary across the globe with countries from developing world's having higher burden for food insecurity and its negative health consequences including malnutrition. For instance, in a study by Noreen et al. [4] undertaken to differentiate the socio-demographic risk factors between Aboriginal and non-Aboriginal households, 33% of Aboriginal households were food insecure while this was 9% for non-Aboriginal households in Canada. In Cambodia, the respective prevalences of mild, moderate and severe food insecurity were 33, 37 and 12% [5]. In Kenya the prevalence of severe food insecurity was even higher accounting for 62.5% while 11% and 8.4% were moderately and mildly food insecure, respectively [6]. Food insecurity is also common in Ethiopian households from different parts of the country. Regassa and Stoecker [7] found that the percentages of households that were mildly, moderately and severely food insecure in southern Ethiopia were 6.8%, 27.7% and 47.8%, respectively. Tamiru et al. [8] reported 59.5% of children from food insecure households were having school absenteeism in their recent study conducted on school adolescents in southwest Ethiopia. Motbainor et al. [3] also reported food insecurity to be 55.3% in households from Amhara region of Northern Ethiopia. Being one of the three underlying causes of undernutrition, household food insecurity is assumed to affect the nutritional status of children by compromising quantity and quality of dietary intake [9]. The nutritional status of preschool children is a key indicator to assess the nutritional and health status of a larger population as children are the most vulnerable to nutritional imbalances. Anthropometric indicators commonly are used to measure malnutrition in a population

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of fewer than five children [10]. The nutritional consequences of food insecurity experience include underweight, stunting and wasting, and also overweight and obesity, depending on a broad range of contextual, economic and socio cultural factors. Globally, in 2011, nearly one in four children under-five years of age (26%) were stunted while 16% were underweight. Worldwide, there has been a decline in malnutrition levels from the 1990s; however, the levels in sub Saharan Africa have remained high [11,12]. Near to 90% of stunted children in the world live in Africa and Asia, with the prevalence of stunting in Africa being 36% in 2011 [13]. According to Mini EDHS 2014, the prevalence of stunting, wasting, and underweight in Ethiopia were 40%, 8.7%, and 25.2% while these were 22.5%, 14.9%, and 18.5%, respectively in Gambella region [14]. In addition, population in Ethiopia largely dependents on an agrarian economy. However, poverty and hunger are widespread in the country despite impressive progress in agriculture in Ethiopia may be resulting in the prevalent household food insecurity [9]. On contrary to the general assumption that household food insecurity, one of the underlying causes of malnutrition in conceptual framework by UNICEF, is linked with under nutrition among children from food insecure households, some studies reported there were no associations between household food insecurity and undernutrition in children [1,5]. On top of this, no study has tried to look at the linkage between household food insecurity and nutritional status of preschool children in Gambella town despite common existence of both forms of public health problems of food insecurity and under nutrition in the same community of Gambella region. Hence, this study was aimed at assessing the association between household food insecurity and nutritionals status of children aged 6-59 months in Gambell town.

Methods and Materials

Subjects and study design

The study was conducted in Gambella Town, located at about 768 kilometers in the south west of Addis Ababa, Ethiopia. Gambella Town is the capital of the Gambella regional state. The town has been divided by five kebeles and it harbors different ethnic groups. The majority of ethnic groups residing in the town are Nuire and Agnuhak. Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia, Gambella Town has a total population of 53,022, of whom 52.6% are men. The town has a total of 11,260 households with an average of 3.8 persons to a household. The town has one hospital, one health centers, two governmental junior clinics and 15 private clinics. The livelihood of the population in the town is mainly dependent on government work and trade. The study was conducted from March 29/2016 to April 23/2016 using a community based cross-sectional study design. The study population was all children 6-59 months residing in the Gambella town.

Sample size

Sample sizes was calculated using a formula for single population proportion by considering the overall prevalence of stunting, underweight and wasting to be 22.5%, 14.5%, and 18.4%, respectively for under-five children of Gambella region that was taken from mini Ethiopian Demographic and Health Survey, 2014 [14], 5% margin of error and 95% confidence interval for each. After determining the sample size for each indicator, the largest sample size of 268 that obtained using 22.5% stunting prevalence was considered for the final sample size to have a better power in estimating population parameters. Since the overall number of study population from census was 7652 (<10,000), we used a finite population correction formula to calculate the final sample size and it became 259. Adding 10% non-response the final sample size was set to be 285.

The inclusion criteria for this study was being a child aged between 6-59-months, who dwelt in the town at least for six months, and one of the household member (either household head or caregiver) volunteer to give information. Exclusion criteria were children having severe illness and deformities which cause difficulty for anthropometric measurement during survey.

Sampling procedure

Prior to data collection, census was conducted in the all kebeles of Gambella town to get lists of household having children aged 6-59 months (census was done as part of polio campaign that was carried out by Gambella Town health office). During the census unique identification numbers were given to the households having children age 6-59 months. These identification numbers were also written on the gate of each household in order to facilitate the process of sampling technique. Then, sampling frame was prepared using these unique identification numbers given to each household having children age 6-59 months. After allocating the total sample size to each kebele of the town using population proportional to size allocation, households having children age 6-59 months were drawn using computer generated random number method using SPSS version 21.0 software. If more than one children fulfilling inclusion criteria were found in the selected household child one was selected using lottery method.

Anthropometric measurements

Anthropometric data such as body weight and length/height were collected respectively using salter scale and length board for children aged 6-24 months, and digital weighing scale that has the capacity to measure 0-140 kg (Model; SECA; 770 alpha, Hamburg, Germany) to the nearest 0.1 kg and portable height board for children aged 24-59 months. Anthropometric measurements of children were measured based on the WHO standardized procedures. Data for weight and length/height were compared to WHO standards for specific age and sex to define nutritional status of children. Accordingly, underweight, wasting, and stunting among children were defined as WAZ, WHZ, and HAZ < -2 SD and overweight as WHZ > +2 SD in the 2006 WHO growth standard [15,16]. Trained nurses did anthropometric measurements including other relevant data in the home of the selected children during day time. Height/length and weight were measured 3 times and the mean was used for analysis. Validation of instruments, and measurements and random auditing was done on a daily basis by supervisors of the study.

HFIAS measurement

Household food insecurity was measured using the Household Food Insecurity Access Scale (HFIAS) that was developed by the Food and Nutrition Technical Assistance (FANTA) project [17]. For Household Food Insecurity Access Scale (HFIAS) measurement, each of the questions was asked with a recall period of four weeks (30 days). The respondent was first asked an occurrence question-that is, whether the condition in the question happened at all in the past four weeks (yes or no). If the respondent answers "yes" to an occurrence question, a frequency-of-occurrence question was asked to determine whether the condition happened rarely (once or twice), sometimes (three to ten times) or often (more than ten times) in the past four weeks.

Household wealth index

A household wealth index was grouped by principal component analysis based on household assets and housing quality based on an earlier concept that was developed by Garenne and Hohmann to be

used as a proxy indicator for socioeconomic status of households [18]. This measurement is appropriate for urban and rural setting in low and meddle income countries. The sum of dummy variables were created from information collected on housing quality floor, walls, and roof material), availability of potable water in the compound and type of toilet facility, and ownership of household durable goods (e.g., bicycle, television, radio, motorcycle, telephone, cars, refrigerator, mattress, bed). These facilities or durable goods are often regarded as modern goods that have been shown to reflect household wealth. The scores were thus added up to give the proxy household wealth index. The index varied from 0 to 20. After checking internal consistency of each item using a Cronbach's alpha (0.79), a wealth index was rank ordered into tertiles to give low, middle and high socioeconomic status.

Data collection

Information on important child characteristics, caring practices, environmental conditions, anthropometry and socio-graphic variables were collected by face to face interview using pre-tested questionnaires adapted from related literatures. The data were collected by five data collectors (urban health extension nurses) who were supervised by two Bachelor of Science degree public health professional working in Gambella town. The supervisor provided all items necessary for data collection on each data collection day, checking filled questionnaire for completeness and consistency, and solving problems during data collection. The principal investigator did the overall supervision daily.

Data quality assurance

To insure the quality of data the questionnaires originally prepared in English was translated to Amharic and administered to respondents by local language speaking data collectors who were fluent in Amharic. The questionnaires were translated back to English to check for its conceptual equivalence. In addition, pre-test was done on 15 household having children age 6-59 months living in Itang town, which is located 38 km far from Gambella town, that wasn't included in the main study. Finally, data collection tool was refined based on the findings from the pretesting. Further, data collectors and supervisors were given a two days training to get reliable data and assure its quality. Anthropometric measurement was taken three times and the mean was taken for analysis and a difference of 100 g in weight and 0.1 cm in length was accepted as normal and also standard procedures were followed. Every morning and prior to each measurement, the weight scale was calibrated with a standard weight and instruments were calibrated according to the manufacturer's recommendations. Every day, all collected data were reviewed and checked for completeness and consistency by the supervisors. Data cleansing was done thoroughly using EpiData version 3.1 to ensure data quality for further analysis.

Data processing and analysis

Collected data were checked for completeness, consistency, and coded manually after which the data were entered into EpiData version 3.1. After this, data were exported to SPSS 21 for windows for further analysis. First univariate analysis was conducted to explore frequency distribution, central tendency, variability (dispersion) and shape of the overall distribution of different variables. Bivariate analysis was done to identify candidate variables for multivariable logistic regression model. All explanatory variables that were associated with the outcome variable at a p-value of <0.25 were considered candidates for multivariable logistic regression. Multicollinearity between different explanatory variables was checked using variable inflation factor (VIF>5) and Pearson correlation coefficient (>0.6). As food security status and food insecurity levels had collinearity with each other, they were adjusted for other explanatory variable in multivariable logistic regression model using two different models excluding one variable at a time of estimating parameter for the other variable. During each time, enter method of multivariable logistic regression model was used to identify significant predictors associated with outcome variable of interest at an Alpha level of 0.05. In multivariable analysis p-values of less than 0.05 were considered statistically significant. The results were described as Odds Ratio and 95% CI.

Anthropometric data was analyzed in WHO Anthro software. Anthropometric measurements such as height, weight, sex and age of children 6–59 months were converted into z-scores using the 2006 WHO standard growth curves. Before performing the anthropometric calculations for weight-for-height (WH), height-forage (HA), and weight-for-age (WA), the data were cleaned and the outliers were checked and they were less than 2.5 with 95% CI which is the acceptable level [16].

Ethical approval

The complete study protocol was approved by Jimma University College of Health Sciences Institutional Review Board. Permission letter to conduct the research was obtained from Gambella Regional Health Bureau and taken to each kebele admiration for their necessary support. The parent/guardian of each selected child was given brief explanations about the objectives of the study after which verbal consents were obtained from each parent guardian of a selected child. During data collection those children with acute malnutrition but didn't get appropriate care and treatment were referred to the health facilities.

Results

From the total 288 sampled households, three of them were refused to participate in the study making the response rate 98.9%. One child had missing age and height measurement. The final analysis was based on 284 study subjects. The mean (SD) ages for children from food insecure HH and food secure HH groups were 31.66 (±4.2) and 32.47 (±4.2) months, respectively. Proportions of children by their sex were almost 50% each. Nearly half of the children, 132 (46.5%) were in the age group of 36-59 months. Nuer constitute majority of the ethnic group, 78 (27.5%) followed by Agnua, 74 (26.1%). One hundred (35.2%), 55 (19.4%), 52 (18.3%) and 36 (12.7%) were Protestant, Catholic, Orthodox and Muslims, respectively. Half of mothers/caregiver attended primary education and the rest half of 143 (50.3%) had no formal education out of which, 107 (74.8%) were lived in food insecurity households and 36 (25.2%) in food secure respectively. From a total of 284 mothers/caregivers, 33 (11.6%) were not married. One hundred eighteen (41.5%) mothers/caregivers were house wife followed by governmental employee, 77 (27.1%). The mean family size was 5.7 ± 1.8. Ninety two (32.4%) households had family members with more than one under five children.

Majority, 82.7%, of households had access to high quality drinking water and latrine facility accounting for 65.8%. Almost equal proportions of households were from poor and high socioeconomic status households (Table 1).

The overall prevalence of stunting, underweight and wasting were 23.2%, 12.0% and 13.4% respectively. The prevalence of overweight was 3.5% as measured by WHZ. More than half (59.5%) of the households in our study were food insecure. Of these households, 20%, 23.6% and 15.8% were experiencing mild, moderate and severe food insecurity, respectively.

Characteristics		Food insecure N (%)	Food secure N (%)	Total N (%)
Child sex	Male	77 (55.0)	63 (45.0)	140 (49.3)
	Female	92 (63.9)	52 (36.1)	144 (50.7)
Age group of children	6-23 months	58 (59.2)	40 (40.8)	98 (34.5)
	24-35 months	33 (61.1)	21 (38.9)	54 (19.0)
	36-59 months	78 (59.1)	54 (40.9)	132 (46.5)
Age children (months)	Mean (SD)	31.66	32.47	31.99
Education (mother)	No formal education	107 (74.8)	36 (25.2)	143 (50.4)
	Formal education	62 (44.0)	79 (56.0)	141 (49.6)
Marital status (mother)	Married	137 (54.6)	114 (45.4)	251 (88.4)
	Not married	32 (97.0)	1 (3.0)	33 (11.6)
Occupation (mother)	Housewife only	84 (71.2)	34 (28.8)	118 (41.5)
	Employed	85 (51.2)	81 (48.8)	166 (58.5)
Education (father)	No formal education	55 (58.5)	39 (41.5)	94 (33.1)
	Formal education	114 (60.0)	76 (40.0)	190 (66.9)
Religion	Protestant	58 (58.0)	42 (42.0)	100 (35.2)
	Orthodox	31 (59.6)	21 (40.4)	52 (18.3)
	Catholic	40 (72.7)	15 (27.3)	55 (19.4)
	Muslim	9 (25.0)	27 (75.0)	36 (12.7)
	Other	31 (75.6)	10 (24.4)	41 (14.4)
Ethnicity	Nuer	56 (71.8)	22 (28.2)	78 (27.5)
	Agnewa	54 (73.0)	20 (27.0)	74 (26.1)
	Tigre	12 (41.4)	17 (58.6)	29 (10.2)
	Oromo	14 (40.0)	21 (60.0)	35 (12.3)
	Amhara	11 (40.7)	16 (59.3)	27 (9.5)
	Others	22 (53.7)	19 (46.3)	41 (14.4)
Family size (mean ± SD)	-	5.76	5.69	5.73
Latrine availability	No	96 (99.0)	1 (1.0)	97 (34.2)
	Yes	73 (39.0)	114 (61.0)	187 (65.8)
Water quality	Low quality	21 (100.0)	0 (.0)	21 (7.4)
	Medium quality	28 (100.0)	0 (.0)	28 (9.9)
	High quality	120 (51.1)	115 (48.9)	235 (82.7)
Socioeconomic status	Low	93 (98.9)	1 (1.1)	94 (33.1)
	Middle	61 (62.9)	36 (37.1)	97 (34.2)
	High	15 (16.1)	78 (83.9)	93 (32.7)

Table 1: Socio-demographic and economic characteristics of household having children aged 6-59 months stratified by household food insecurity status in Gambella Town, 2016.

We also assessed food allocation among household members. In 188 (66.2%) households, diets were first given for children even though the foods to be eaten were small during meal but its frequency is decreased with an increase in food insecurity level. In thirty five (12.3%) of households, foods were first given to husband and then shared among other family members. About near to one third, 91 (32.0%) children eat their diet after their father and mothers and also the percentage increase with across the food insecurity condition.

To look at the association between household food insecurity and nutritional status, bivariate analyses were done to identify candidate covariates for the multivariable model at p-value <0.25. Age of child, sex of child and household family size had p-value greater than 0.25 in bivariate analysis and thus, excluded from multivariable model. After identifying the candidate variables for multivariable analysis, we adjusted household food insecurity for all candidate covariates using multivariable logistic regression model to evaluate the association between household food insecurity and nutritional status of preschool children in Gambella Town. Accordingly, household food insecurity, duration of breast feeding for a child, household socioeconomic status, maternal educational status and access to quality of drinking water was significantly associated with stunting among study subject (Table 2). We also checked the interaction of household food allocation and household socioeconomic status with household food insecurity to look at whether the association between food insecurity and stunting is mediated by these two variables. No statistically significant interactions between food insecurity and these two variables were noted in our analyses. On bivariate analyses, wasting and underweight had *p*-value of greater than 0.25 and thus, their associations with household food insecurity were declared not significant (p=0.61 & 0.98, respectively). The findings were similar even after adjusting for potential confounders using multivariable regression models.

The present study showed that household food insecurity was found to be independent predictor significantly associated with stunting after controlling for possible confounders using multivariable analysis. Children from food insecure households were about 2.88 more likely to be stunted as compared to those children from food secure households. This association was more pronounced by the degree of severity of food insecurity; the odds of stunting was higher in children who were from severely and moderately food insecure households (AOR=9.78, 95% CI: 3.75-25.08 vs. AOR=2.92, 95% CI: 1.14-7.21, respectively).

Children who were living in households that had low quality of drinking water were 4.5 more likely to be stunted compared to children who were living in households with high quality of drinking water (AOR=4.5; 95% CI: 1.28-15.74). Those children who were breastfed for less than one year were 3 times more likely to be stunted compared

Characteristics		Nutritional status		COR (95% CI)	AOR (95% CI)
		Stunted	Normal		
		N (%)	N (%)		
Food security status*	Food insecure	57 (33.7)	112 (66.3)	5.99 (2.82, 12.70)	2.88 (1.26, 6.60)
	Food secure	9 (7.8)	106 (92.2)	Reference	Reference
Education (mother)	No formal education	49 (34.3)	94 (65.7)	3.80 (2.05, 7.02)	2.58 (1.27, 5.20)
	Formal education	17 (12.1)	124 (87.9)	Reference	Reference
Latrine	No	39 (40.2)	58 (59.8)	3.98 (2.24, 7.08)	1.45 (0.57, 3.67)
	Yes	27 (14.4)	160 (85.6)	Reference	Reference
Sick child feeding practice	Others	41 (39.8)	62 (60.2)	4.12 (2.31, 7.35)	2.32 (0.76, 7.06)
	Providing additional food	25 (13.8)	156 (86.2)	Reference	Reference
Breast feeding duration	<1year	45 (37.8)	74 (62.2)	4.17 (2.31, 7.51)	3.0 (1.56, 5.78)
	≥1year	21 (12.7)	144 (87.3)	Reference	Reference
Child seek health	After 24 h	34 (41.5)	48 (58.5)	3.76 (2.10, 6.71)	0.94 (0.30, 2.96)
	Within 24 h	32 (15.8)	170 (84.2)	Reference	Reference
Marital status (mother)	Not married	50 (19.9)	201 (80.1)	5.65 (2.86, 11.17)	1.89 (0.52, 6.82)
	Married/living married	16 (48.5)	17 (51.5)	Reference	Reference
Drinking water quality	Low quality	14 (66.7)	7 (33.3)	10.05 (3.81, 26.52)	4.51 (1.28, 15.74)
	Medium quality	13 (46.4)	15 (53.6)	4.35 (1.92, 9.87)	2.31 (0.95, 5.59)
	High quality	39 (16.6)	196 (83.4)	Reference	Reference
Food insecurity levels*	Food secure	9 (7.8)	106 (92.2)	Reference	Reference
	Mildly food insecure	10 (17.5)	47 (82.5)	2.50 (0.95, 6.57)	1.81 (0.66, 4.97)
	Moderately food insecure	21 (31.3)	46 (68.7)	5.37 (2.28, 12.63)	2.92 (1.17, 7.30)
	severely food insecure	26 (57.8)	19 (42.2)	16.11 (6.54, 39.70)	9.78 (3.80, 25.15)
Wealth Index	Low	43 (45.7)	51 (54.3)	10.35 (4.33, 24.74)	4.24 (1.48, 12.09)
	Middle	16 (16.5)	81 (83.5)	2.42 (0.94, 6.20)	2.11 (0.78, 5.65)
	High	7 (7.5)	89 (92.5)	Reference	Reference

*Estimation of parameters was done by entering both forms of the variable into the model separately to avoid collinearity between them; COR: Crude Odds Ratio; AOR: Adjusted Odds Ratio; CI: Confidence Interval

Table 2: Associations between stunting and selected variables among children aged 6-59 months in Gambella Town, 2016.

to those children who were breastfed for one year and above (AOR=3; 95% CI=1.56-5.78).

In addition, low socio economic status of households was significantly associated with child stunting. The odds of being stunted among children from low socioeconomic status was 4.2 times higher compared to those children from high socioeconomic status households (AOR=4.2; 95% CI=1.48-12.09). Further, educational status of mothers was significantly associated with stunting in this study; children from mothers who had no formal education were 2.6 more likely to be stunted compared to their counterparts (AOR=4.6; 5% CI=1.27-5.20).

Discussion

This study revealed that 23.2%, 12.0% and 13.4% of children were stunted, underweight and wasted, respectively. Only 3.5% of children were overweight. The current findings are lower than the findings from 2011 EDHS for Gambella region showing stunting, wasting, and underweight were 27.3%, 12.5%, and 20.7%, respectively [19]. On the other hand, these findings are somewhat similar to the findings from Mini EDHS 2014 for Gambella region where stunting, wasting; underweight were 22.5%, 14.9%, and 18.5%, respectively [14]. However, the overweight/obesity prevalence of 3.5% was higher than the findings from both 2011 EDHS and 2014 Mini EDHS findings in the Gambella region (0.7% and 0.4%, respectively). The higher and lower prevalence of overweight/obesity and underweight in this study as compared to the findings from EDHS could be explained by the differences in study setting as the EDHS findings included rural population while this study was based on urban population alone. Evidence shows, rapid demographic, social and economic changes ongoing in many developing countries have led to increased urbanization and changes in food systems resulting in a global nutrition transition where recent global shifts in dietary patterns towards higher intakes of saturated fats, sugars and refined foods, and lower intakes of fiber rich foods, driven by technological advances that have made energy dense, nutrient-poor foods cheaply available on global food markets which could have increased overweight/obesity and reduced underweights [20]. In this global context, while large inequalities from the burden of under nutrition persist across regions, countries and communities, a concomitant increase in rates of overweight and obesity is witnessed, often in these same communities resulting in double burden [21].

In this study household food insecurity was significantly associated with stunting where children from food insecure household in general and those severely and moderately food insecure households in particular had higher odds of being stunted. Based on these findings, it can be inferred that children's nutritional status in Gambella town is significantly associated with both household socioeconomic status and food security. Any situation that limits real incomes of families and in the accessibility of food can be expected to result in a substantial faltered growth and hence, could end in stunting. As this study was conducted in the urban setting where most households procure their food supplies through purchases, it is thus understandable that households which produce a major share of the food they consume may be less subject to insecurity than households which depend almost entirely on purchased foods. This perhaps partly explains the close links of food insecurity and stunting among children in the study area. Other studies have reported that household level poverty rather than food insecurity is predictive of malnutrition among children [22]. Although our study did not measure

poverty directly, the significant associations between wealth index and child stunting, suggests that poverty may be a major determining factor of nutritional status of children in Gambella Town.

The result of the present study is similar with that of study carried out in Tigray region of Ethiopia that shows there was statistically significant difference in stunting between food secure and food insecure households in which children from food insecure households had about 48% at higher odds to be stunted when compared to the children of food secure households [23]. Moreover, similar findings were reported from a cross-sectional study conducted on less than 5 years children from Bangladesh, Ethiopia and Vietnam where the odds of being stunted were significantly higher for children in severely food-insecure households in Bangladesh and Ethiopia while the higher odds of being stunted was higher for children in moderately food-insecure households in Vietnam [9]. In general, many findings from cross-sectional studies showed that there were significant associations between household food insecurity and adverse child growth outcomes [22,24-27]. These finding are further supported by findings from a longitudinal study on children less than 5 years from Ethiopia, India and Vietnam where children from food-insecure households had significantly lower HAZs in all countries at 5 year of follow up [28]. However, few studies show that there were no significant associations between food insecurity and stunting among preschool children [1,5].

Stunting was also significantly associated with household socioeconomic status in multivariable analysis. Children from households found in the low level of socio-economic status had increased odds of being stunted compared to those found in high socioeconomic status households. The finding from this study is similar to the finding reported by other studies in Holetta district, Oromiya region in central Ethiopia where child malnutrition (measured by stunting) is significantly lower in households with crossbred cows (i.e., better quality) than in those without [29]. In addition, there is evidence showing low household income negatively affects household food security that might have been linked with stunting [30].

The other variable that was found to be independently associated with stunting in this study was maternal educational status. Children from mothers/caregivers who had no formal education had significantly higher odds to be stunted compared to their counterparts. This finding is supported by findings from other studies conducted by Christiaensen and Alderman [29], which showed the effect of maternal education, is about twice as important as that of paternal education. Moreover, this study demonstrated that presence of at least one adult female completing primary school in a household resulted in a 6-11 percent decline in stunting, while completion of primary school by at least one male adult reduces child stunting by only 2-8 percent [29]. Further, food insecurity was negatively associated with education level mothers and fathers of Iranian children under the study that might contribute to the prevalent malnutrition in their children [30].

Furthermore, duration of breast-feeding beyond 12 months is significantly associated with child stunting. Evidences show that the early child detachment from breast-feeding significantly affects the health and nutritional status of the child through reduction of care and exposing the child to early weaning, which in turn increases the risk of diarrheal diseases and nutritional deficiencies [9]. Supporting this fact, the present study revealed that the longer the duration of breast feeding, the lesser the odds of being stunted. Similarly study undertaken in the Tigray region showed children who were breastfed for the longer duration had less odds to be stunted [23].

The current study demonstrated that household quality of drinking water was significantly associated with stunting in children where children from households with low quality of drinking water had higher odds of being stunted. This finding was supported by other study result that water and sanitation play a particularly important role in child nutrition due to their impact on diarrheal diseases and consecutive loss of appetite and growth faltering [31].

In this study, underweight and wasting were not associated with household food insecurity. This result was not expected, because of the substantial evidence that a household's access to food are among the key determinants of nutritional status of children. Nevertheless, this lack of association might be explained by several factors. In line with our analytical pathways, many studies suggest that the influence of food supply and access on nutritional status of children can be confounded by other key determinants of child nutrition, such as maternal knowledge on child nutrition and caring practices, maternal nutritional status, intra household food allocation and utilization, access to health services, and healthful environment like hygiene and sanitation [24]. However, Amaha et al., [23] reported similar finding where underweight and wasting in children had no association with household food insecurity. Other researchers also found that food insecurity had no association with wasting.

Our study has some limitations. Because of the cross-sectional nature of the study, it is impossible to establish a temporal relationship and thus, causality between food security status and nutritional status of study subjects. In addition, some important variables such as maternal nutritional status or knowledge of child nutrition, morbidity among children and dietary intake that may also contribute to the nutritional outcomes of interest were not included in this study. A further, seasonal variation in food security status that could influence the nutritional status of children was not investigated in the present study. However, our study has a number of strengths. The sampling procedure and community based natures of our study can be considered as strength for our study as these could allow us to infer our results to the general population under the study.

Conclusion

This study demonstrated that stunting, underweight and wasting were prevalent among preschool children in Gambella Town. In this study, household food insecurity was significantly associated with stunting, but not with underweight and wasting among children studied. The study also revealed emerging prevalence of overweight and/or obesity among study subjects. The finding implies nutrition interventions targeting children need to address household food security.

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Author Contributions

ZJ conceived the idea; ZJ, KH and TW designed the study; ZJ supervised data collection, ZJ and TW analyzed and interpreted the data. ZJ and TW drafted the manuscript and reviewed the drafted manuscript critically. All authors gave final approval of the paper to be published.

References

1. Motbainor A, Worku A, Kumie A (2015) Stunting is associated with food diversity while wasting with food insecurity among underfive children in East and West Gojjam zones of Amhara region, Ethiopia. PLoS ONE 10: e0133542.
2. FAO (2008) Food security information for action. Practical guides. Rome: EC-FAO Food Security Programme.
3. Motbainor A, Worku A, Kumie A (2016) Level and determinants of food insecurity in East and West Gojjam zones of Amhara Region, Ethiopia: a community based comparative cross-sectional study. BMC Public Health 16: 503.
4. Noreen DW, Paul V, Kim R, Stefan K (2008) Prevalence and Sociodemographic Risk Factors Related to Household Food Security in Aboriginal peoples in Canada. Public Health Nutr 12: 1150-1156.
5. McDonald CM, McLean J, Kroeun H, Talukder A, Lynd LD, et al. (2015) Household food insecurity and dietary diversity as correlates of maternal and child undernutrition in rural Cambodia. Eur J Clin Nutr 69: 242-246.
6. Shinsugi C, Matsumura M, Karama M, Tanaka J, Changoma M, et al. (2015) Factors associated with stunting among children according to the level of food insecurity in the household: a cross-sectional study in a rural community of Southeastern Kenya. BMC Public Health 15: 441.
7. Regassa N, Stoecker BJ (2012) Household food insecurity and hunger among households in Sidama district, southern Ethiopia. Public Health Nutr 15: 1276-1283.
8. Tamiru D, Argaw A, Gerbaba M, Ayana G, Nigussie A, et al. (2016) Household food insecurity and its association with school absenteeism among primary school adolescents in Jimma zone, Ethiopia. BMC Public Health 16: 802.
9. Ali D, Saha KK, Nguyen PH, Diressie MT, Ruel MT (2013) Household food insecurity is associated with higher child undernutrition in Bangladesh, Ethio pia, and Vietnam, but the effect is not mediated by child dietary diversity. J Nutr 143: 2015-2021.
10. Jesmin A, Yamamoto SS, Malik AA, Haque MA (2011) Prevalence and determinants of chronic malnutrition among preschool children: a cross-sectional study in Dhaka City, Bangladesh. J Health Popul Nutr 29: 494-499.
11. Andersen P, Babinard J (2001) Globalisation and human nutrition: opportunities and risks for poor in developing countries. Afr J Food Nutr Sci 1: 9-18.
12. UNDP (2013) Africa human development report 2012: towards a food Secure future.
13. UNICEF, WHO, The World Bank (2012) Child malnutrition estimates. UNICEF, New York; WHO, Geneva; The World Bank, Washington, DC.
14. MOH, CSA (2014) Ethiopia Mini Demographic and Health Survey. Central Statistical Agency. Addis Ababa, Ethiopia.
15. Demissie S (2013) Magnitude and factors associated with malnutrition in children 6-59 months of age in pastoral community of Dollo Ado District, Somali Region, Ethiopia. Nutr Food Sci 1: 175-183.
16. De Onis M (2006) WHO Child Growth Standards: Length/Height-for-Age, Weight-for-Age, Weight-for-Length, Weight-for-Height and Body Mass Index-for-Age; WHO.
17. Coates J, Swindale A Bilinsky P (2007) Household Food Insecurity Access Scale (HFIAS) for Measurement of Household Food Access: Indicator Guide (v3). Food and Nutrition Technical Assistance project, Washington, DC.
18. Garenne M, Hohmann-Garenne S (2003) A wealth index to screen high risk families: pplication to Morocco. J Health Popul Nutr 21: 235-242.
19. MOH, CSA (2011) Ethiopia Demographic and Health Survey. Central Statistical Agency, Addis Ababa, Ethiopia.
20. Popkin BM, Adair LS, Ng SW (2012) Global nutrition transition and the pandemic of obesity in developing countries. Nutr Rev 70: 3-21.
21. Anderson C, Kaufer-Horwitz M, Bode L, Emenaker NJ, Haqq AM, et al. (2007) Poverty, obesity, and malnutrition: an international perspective recognizing the paradox. J Am Diet Assoc 107: 1966-1972.
22. Reis M (2012) Food insecurity and the relationship between household income and children's health and nutrition in Brazil. Health Econ 21: 405-427.
23. Kahsay A, Mulugeta A, Seid O (2015) Nutritional status of children (6-59 months) from food secure and food insecure households in rural communitiesof Saesie Tsaeda-Emba District, Tigray, North Ethiopia: Comparative study. Int J Nut Food Sci 4: 1-65.
24. Psaki S, Bhutta ZA, Ahmed T, Ahmed S, Bessong P, et al. (2012) Household food access and child malnutrition: results from the eight-country MAL-ED study. Popul Health Metr 1: 24.
25. Gordon NH, Halileh S (2013) An analysis of cross sectional survey data of stunting among Palestinian children less than five years of age. Matern Child Health J 17: 1288-1296.
26. Sreeramareddy C, Ramakrishnareddy N, Subramaniam M (2014) Association between household food access insecurity and nutritional status indicators among children aged <5 years in Nepal: results from a national, cross-sectional household survey. Public Health Nutr 18: 2906-2914.
27. Singh A, Singh A, Ram F (2014) Household food insecurity and nutritional status of children and women in Nepal. Food Nutr Bull 35: 3-11.
28. Humphries DL, Dearden KA, Crookston BT, Fernald LC, Stein AD, et al. (2015) Cross-Sectional and Longitudinal Associations between Household Food Security and Child Anthropometry at Ages 5 and 8 Years in Ethiopia, India, Peru, and Vietnam. J Nutr 145:1924-1933.
29. Christiaensen L, Alderman H (2004) Child malnutrition in Ethiopia: can maternal knowledge augment the role of income? Economic Development and Cultural Change 52: 287-312.
30. Shahraki SH, Amirkhizi F, Amirkhizi B, Hamedi S (2016) Household food insecurity is associated with nutritional status among iranian children. Ecol Food Nutr 55: 473-490.
31. Glewwe P, Koch S, Nguyen BL (2002) Child nutrition, economic growth and the provision of healthcare services in Vietnam in the 1990s, World Bank, Washington.