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Factors Associated with Stunting among Children Aged 24-59 Months in Food Secure and Insecure Households of Kuyu District, Northern Oromia, Ethiopia: *A Comparative Cross-Sectional Study*

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Abstract

Stunting is the most challenging and prevalent public health problems particularly in low socioeconomic settings. The major aim of this study was to assess and compare factors associated with stunting among children aged 24-59 months in food secure and insecure households of Kuyu district, North Shewa Zone, central Oromia. A comparative, cross-sectional study was done on 618 children (309 children from food secure and 309 from insecure households) between February and March 2019. Multiple stages sampling method was performed to select children from each kebele. Anthropometric data were taken and nutritional statuses were generated using WHO Anthro v. 3.2.2. The data analysis was performed using SPSS version 20.0. Logistic regressions analysis was also carried out. The prevalence of stunting was 43.1% and 48.3%for children in food secure and insecure households, respectively. The multivariate analysis showed that low wealth status (AOR=7.44; 95% CI: 3.02, 18.46), a child who did not eat all food types (AOR=2.1; 95%CI:1.12, 4.24) and low dietary diversity (AOR=8.3; 95%CI:4.46, 15.5) were significantly linked with stunting in food-secure households. Whereas, in food, insecure households, poor dietary diversity(AOR=4.7; 95%CI:2.5, 8.83), low wealth status (AOR=2.5;95%CI:1.1, 5.55) and child who did not eat breakfast (AOR=2.04;95%CI:1.1, 3.78) were predictors for children stunting. The prevalence of stunting among children under five years old was very high in the study area. Therefore, ensuring food security status using the Productive Safety Net Program (PSNP) in harmony with the participation of all responsible bodies should be intensified to overcome the problem of under nutrition in the study area.

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Keywords

Under nutrition, stunting, children under five years, food insecurity, feeding patterns, dietary diversity.

Introduction

Globally, malnutrition is one of the most challenging and complex problems affecting development, particularly that of the underprivileged and poor communities (Garoma, 2013). It is a public health problem and causes morbidity and mortality among infants and young children (Jacharya *et al.*, 2015). Sub-Saharan Africa and South Asia are home to three-fourths of the world's stunted children and in Sub- Saharan Africa, 40% of children under five years of age were stunted; in South Asia, 39% were stunted (UNICEF, 2013). High malnutrition rates pose a significant obstacle to achieve better child health outcomes (Kasahun, 2013).

Despite economic growth and the government's commitment to combating poverty in general and food insecurity, in particular, Ethiopia is still highly vulnerable to seasonal food insecurity and children under nutrition. In Ethiopia, the magnitude of both under nutrition and food insecurity is very high even today in rural areas where livelihood depends on the backward farming system, Productivity Safety Net Program (Sarah *et al.,* 2013). A study done in Tigray shows that the prevalence of stunting in food secure and insecure households was 46.1% and 52.1%,respectively (Kahsay *et al.,* 2015).Another study was done in the west Oromia region (Ethiopia) reported that the prevalence of stunting among children under five years old in food-insecure and secure households was 41.8% and 15.5%, respectively (Garoma, 2020).

Besides, a study was done in south Ethiopia (Bealu *et al.,* 2017), reported that the prevalence of stunting among children under five years old was 45.6%. Besides, a study done in Ethiopia revealed that the prevalence of stunting was 50.7% (Ali *et al.,* 2013). A study was done in Ethiopia by Ahmed *et al.,* (2017) also reported that the prevalence of stunting was high at 42%. Moreover, another study in Ethiopia revealed that the prevalence of stunting among children under five years old was 43.1% (Abel *et al.,* 2019). The high prevalence of stunting (39.4%) among children under five years was also reported in northeast Ethiopia (Mengiste *et al.,* 2020).Furthermore, a study done in west Guji, Ethiopia found out that the prevalence of stunting was 31.8% (Afework *et al.,* 2021).

Several factors which are associated with stunting have also been identified; low wealth index (Das and Gulshan, 2017; Tosheno and Adinew, 2017; Endris *et al.,* 2017; Akombi *et al.,* 2017; Berhanu and Tigist, 2019; Kasaye *et al.,* 2019; Khanam *et al.,* 2019; Tekile *et al.,* 2019; Afework *et al.,* 2021). Besides, factors which associated with under nutrition (stunting) among children under five years old were child dietary diversity score (Jisha and Tamiru, 2015; Motbainor *et al.,* 2015; Ali *et al.,* 2017; Sié *et al.,* 2018; Khamis *et al.,* 2019). According to a study done by Abel *et al.,* (2019), the sex of the child, age of the child and immunization status of the child were predictors for stunting. Poverty level, education, occupation and the household food insecurity and dietary diversity were also associated with subsequent stunting (Belayneh *et al.,* 2020). Besides, being male sex, child age, diarrhea and attendance of antenatal care were significantly associated with stunting (Mengiste *et al.,* 2020).

There are also other factors, which were associated with stunting; under-five children whose fathers had a polygamous marriage, sex of children, meal frequency less than four per/day, not vaccinated, wealth status and household food insecurity (Afework *et al.,* 2021). Furthermore, a study done in Ethiopia using Bayesian multilevel analysis showed that child's age, child's sex, toilet facility, fever, education status, birth interval, maternal body mass index and wealth status were predictors of childhood stunting (Muche *et al.,* 2021). Oromia is among regions producing adequate food in the country but it is reported to have a high prevalence rate of under nutrition compared to less productive regions of Ethiopia (Ghate, 2014).The Ethiopian Mini Demographic and Health Survey reported that the prevalence of children stunted was 37.5% in the Oromia region (CSA, 2014). However, the prevalence of stunting in the food insecure area was very high 54.7% (Naser *et al.,* 2015).

In the Kuyu district, most of the kebeles are suffering from food insecurity because of late rainfall and less agricultural production. Ethiopia is striving forward to ensure food security and become food self-sufficient. However, still many households in the study district are dependent on food aid given by government and non-government organizations for survival. Food security is one of the pillars of improved nutrition status but it does not necessarily mean that food-secure households are nutritionally secured, as malnutrition is common in many rural food-secure households (Ghattas, 2014). Yet, there was no study done that assessed and compared under nutrition (stunting) of children under five years old in food secure and food insecure households of Kuyu district. Therefore, this study was designed to assess and compare the nutritional status (stunting) of children aged 24-59 months in food secure and insecure households of the study area.

Materials and Methods

Study setting, Design and Period

The current finding was done in Kuyu district, Oromia regional state Ethiopia. It located 42 km from Fitche North Shewa Administer Zone. It is bordered on the south and west by Muger River which separates it from West Shewa Zone, on the north by Wara Jarso, on the northeast by Hidabu Abote, and on the east by Degem (Population and Housing Census of Ethiopia, 2007). It also reported a total population for this district of 121,052, of whom 60,244 were men and 60,808 were women; 19,872 or 16.42% of the population were urban

dwellers(Population and Housing Census of Ethiopia, 2007. Majority of the food crops are wheat, teff, barley, bean and nug that sown during the first or second months of this major rainy season in the area. It has correspondingly 25,796 under five years of age children in which 14,340 are females and 11,456 are males (Tamiru and Agama, 2020). From the total households that found in Kuyu district, around 10,278 households are food insecure which are beneficiary of PSNP and other 12,530 households are food secure which are non-beneficiary and/or graduated from PSNP (Sarah *et al.*, 2013).

For the dedications of the Safety Net, the area is considered as constantly food insecure if it is in one of eight regions (Tigray, Oromia, Amhara, SNNP, Somali, Harare, Afar and Dire Dawa). Therefore, the study area is found in Oromia region and a recipient of food aid for many years until now. As the PSNP, households were classified as food secure households when households were inheritors and receiving supports in the practice of cash and/or food aids; and become move up from that program and waited more than one year being out of the PSNP (MoA, 2014). The remaining households are receiving assistance in the form of food aid and cash are classified as food insecure. Accordingly, this is an encoded measure used for the grouping of the households as food secure and insecure for the study.All children aged in the range of 24-59 months found in both food secure and insecure households were considered as the source population while all children aged 24-59 months who were selected from food secure and insecure households of the selected kebeles' organized as study population. A community based cross sectional study was conducted comparatively with both descriptive and inferential statistics between February and March 2019.

The following criteria were considered to select the study participants;

24-59 months aged children

Residents of the selected kebeles

Willing for participation

The following criteria were also set for ruling out the study participants;

Children who had deformities, chronically sick, and children/mothers who were not found at home after three visits.

Sample Size Determination

The following considerations were done to calculate the base sample size. Accordingly, a 95% CI, a power of 80%, P1=0.18 (poor feeding practices among children under five years in food insecure households [34] and P2= 0.08 (poor feeding practices among children under five years in food secure households), and a double proportion formula was applied and gives 392. Consequently, 5% non-response rate and 1.5 design effects were assumed to determine final sample size (618).

Sampling Procedures

Kuyu district was selected purposively since some households in district received cash money from PSNp due to shortage of foods they experienced following the scarcity of summer rainfall, which resulted in less crop production. Accordingly, twenty kebeles were involved in PSNP, and multi stages sampling method was used. Firstly, Halilu Cheri, Sombo Cheka, Wuyye Gose and Dubena Agalo were selected for by probability proportion to size (PPS) method. Afterwards, list of households available at the PSN was considered to stratify all households in the four kebeles were into food secure and insecure households. Households' food security status was applied to get data of children under five years (24-59 months) from the district's health office, the number of under five years children (24-59 months) found in each kebele. The total number of children aged 24-59 months (Sombo Cheka, Halilu Cheri, Dubena Agalo and Wuyye Gose) was 448, 712, 775 and 865, respectively. Following, proportional to size allocation method was applied to select children from each food secure and insecure households of the selected kebele. Finally, simple random sampling technique was used to select children from each kebele-using list of households in each category**.** In case there were more than one mother having 24-59 months children in a single household, only one mother was selected by lottery method and the same procedure applied if there were more than one children in a household that fulfill the selection criteria.

Data collection methods and instrument

Socio-demographic statistics such as age of the child and mothers, sex of child, head of the house, family size in the house, occupation, education status, wealth index and ethnicity were collected. The age of the child was also calculated in months from their birth date to the day of

data collection using a confined event. Mothers were asked whether the child was born before or after certain major events until accurate age is pinpointed.

Anthropometric Data: Electronic digital weight scale (to the nearest 0.1 kg) was used to take weight of the child. Minimum/lightly/clothing and no shoes were attempted while doing the measurement. Then, calibration was done before weighing every child by setting it to zero. The height of the child was also measured without shoes (to the nearest 0.1cm) by using a vertical wooden height board. Furthermore, the presence of bilateral pitting nutritional edema was diagnosed by moderately pressing with thumb both feet for three seconds. If the pitting remain shallow for few seconds and at both feet, the data collector consulted the supervisor for confirmation and referral to the nearest health facility.

Dietary Diversity Data: The 24-hour recall method was conducted with mothers regarding their child's dietary intake. Mothers were asked and requested to list foods consumed by the child in the 24 hours prior to the interview. The Seven food groups namely grains/roots/tubers; legumes and nuts; dairy products; flesh foods (meats/fish/poultry); eggs; vitamin A-rich fruits/vegetables; and other fruits/vegetables were used in this study. Finally, diet diversity score (DDS) scored as high children if the score was >= 4 and as low if < 4.

Data Quality Assurance

To reduce the introduction of bias during data collection, the following actions were taken. Accordingly, the questionnaire was translated to local language (Oromic) and back to English by different language experts to check for consistency. Then, pre-test was done on 5% of the sample in a kebele not included in the sample to pattern for its understandability, time required to complete the actual data collection. Based on the opinion from the pretest, necessary corrections and editions were taken and further formatting of the questionnaire. Training was given for three days to data collectors (ten nurses) and supervision and crosschecking were held in everyday by the principal researcher.

Data Analysis

Data editing, cleaning, coding, entering and analyzing was done using SPSS for windows version 20.0. Consistency of data, outliers and missing values were significantly checked by descriptive statistics analysis. A one-sample kolmogrov-Smirrov test was applied to determine normal distribution of the data especially for continuous variables. WHO Anthro program, version 3.2.2 was used to generate HAZ of children.

The Z scores less than-2 is considered to classify child as stunted. The mean HAZ value of the two groups was compared by independent sample T test. Logistic regression model with both bivariate and multivariate analysis was done to identify the factor associated with stunting at a P-value < 0.05. A 95% confidence level was considered to report AOR.

Ethics and Consent

The objective of the study was clarified to Kuyu district town administrative health care officials for their permission and support. The purpose of the study was explained to the study participants and written consent was taken. The responses were kept confidential by coding. At the end of the survey, the nutrition and health information about acute malnutrition was given to mothers/caregivers and severely malnourished children were recommending to health facilities for further treatment in the study area.

Results and Discussion

Socio-economic and demographic characteristics of the study participants

In this study, all respondents were Oromo in an ethnic group with a response rate of 98.4% and 99.7% in food secure and insecure households.

The majority of the respondents, (66.8 % vs. 64.9%) and (13.2% vs. 11.4%) were Orthodox and Muslim in religion in food secure and insecure households, respectively. More than half of the respondents (81.6% in food secure and 78.6% insecure households were married. Of mothers, (50.7% vs. 48.7%), (20.7 % vs. 20.3%) and (28.6% vs. 30.8%) were unable to read &write, able to read &write and had attended elementary school & above in food secure and insecure households, respectively. Of fathers, (36.8% vs. 39.6%), (20.1% vs. 23.7%) and (33.9% vs. 26.3%) of fathers had the educational status of unable to read and write, able to read and write and had attended elementary school and above in food secure and insecure households respectively (Table 1). The mean (±SD) differences in wealth status between food secure and insecure households were statistically significant (1.17±0.692 vs. 0.96±0.655).

Feeding practices of the study children

As presented in Table 2, children who did ha meal frequency/day ≤ 3 were 39.8% and 57.5% in food secure and insecure households, respectively, whereas meal frequency/day ≥ 4 were 60.2% and 42.5% in the above two types of households.

On the other hand, the frequency of meal feeding among children in food-secure households was significantly higher than food insecure ones (OR=2.04) (P< 0.05).The study also reported that the majority 72% vs. 60.7% of children did eat their breakfast while 28% vs. 39.3% did not in food secure and insecure households, respectively.

The finding also revealed that 68.1% vs. 64.9% of children did eat all types of food while the remaining (31.9% vs. 35.1%) of children did not in food secure and insecure households, respectively. On the other hand, there were significant differences in the child who did eat all food types between food secure and insecure households (OR=1.15) (P< 0.05).

Dietary Diversity Scores of the study children

Food groups were determined in the current study. Accordingly, cereals/roots/tubers were the most common food group consumed by children in food-secure (98%) and insecure (99.4%) households.

The next most commonly consumed food groups were legumes/nuts (85.5% vs.81.2%) followed by Vitamin A-rich fruits and vegetables (48.8% vs.42.2%), dairy products (42.2% vs.27%) and another vitamin A fruits and vegetables (21% vs.12%). There were significant differences (P< 0.05) in the consumption of grains/roots/tubers (OR=0.3), legumes/nuts (OR=1.4), vitamin A-rich fruits/vegetables (OR=1.3), dairy/dairy products (OR=1.9), another vitamin A-rich fruits/vegetables (OR=1.9), flesh foods (OR=1.24) and eggs (OR=1.35) between children in food secure and insecure households. On the other hand, the consumption of all food groups except cereal/tubers/roots foods among children in food-secure households was significantly higher compared to their counterparts.

In the finding of this study, more than half (54.3% vs. 68.5%) of children consumed less than four (<4) food groups, whereas (45.7% vs. 31.5%) of children consumed greater than or equal to four (≥4) food groups in food secure and insecure households, respectively (Table 3).

Stunting of children in food secure and insecure households

The current study demonstrated that the prevalence of children stunting was 48.3% and 43.1% in food insecure and secure households, respectively. There were statistically significant differences in children's height for age (P value=0.021) between food secure and insecure households (Table 4).

Contributing barriers of stunting among children in food secure and insecure households

Through bivariate and multivariate analysis of logistic regressions, exposure variables associated with the stunting of under five years age children's were identified separately in food secure and insecure households. Independent and dependent variables were included in the analysis based on the existing literature about their suspected effect.

Accordingly, wealth index, meal frequency, snack eating trends, time to meal consumption, restriction custom, any pressure, DDS, food liking behavior and leftover foods practice were included as independent variables.

As a result, candidate variables associated with stunting among children were determined using bivariate analysis from regression model (P< 0.25) (Table 5 and 6).

After adjusting for all candidate variables in the multivariate logistic analysis; wealth index, child food liking behavior and DDS were associated with stunting of children among food secure households (P<0.05) (Table 5).

Accordingly, among children who dis-liked all food items, had low DDS and from low socioeconomic households, stunting was significantly higher with AOR (95%) 2.1(1.12, 4.24), 8.3(4.46, 15.5) and 7.44(3.02, 18.46), respectively.

Furthermore, wealth index, child food dis-liking behavior and DDS were associated with stunting of children among food insecure households from multivariate logistics analysis. Accordingly, among under five age children who were not taking midmorning snack, had low DDS and from low socioeconomic households, stunting was significantly higher with AOR (95%) 2.04(1.1, 3.8), 4.7(2.5, 8.83) and 2.5(1.1, 5.55, respectively (P<0.05) (Table 6).

Table.1 Socio-economic and demographic status of study children (n=612) among food secure and food insecure households of Kuyu district North Shewa Zone, central Oromia, Ethiopia, 2019.

Variables	PSNP Classification of HHs			
	FS HHs (304)		FI HHs (308)	
	Frequency (n)	Percent (%)	Frequency (n)	Percent (%)
Age of the mothers (years)				
≤ 24	33	10.9	32	10.4
25- 29	59	19.4	71	23.1
≥ 30	212	69.7	205	66.5
The educational level of respondent				
Unable to read and write	154	50.7	150	48.7
Able to read and write	63	20.7	63	20.3
Elementary school and above	87	28.6	95	30.8
Marital status of the respondent				
Married	248	81.6	242	78.6
Divorced	19	6.3	34	11
Others (Single, widowed)	37	12.1	32	10.4
Occupational status of the respondent				
Housewife only	50	16.4	41	13.3
Farmer	171	56.3	145	47.1
Others (merchant, daily laborer)	83	27.6	122	39.6
Ethnicity of respondent				
Oromo	304	100	308	100
Others (Amhara, Tigre)	0	0	0	0
Religion of respondent				
Orthodox	203	66.8	200	64.9
Muslim	40	13.2	35	11.4
Protestant	38	12.5	45	14.6
Catholic (others)	23	7.6	28	9.1
The educational level of the father				
Unable to read and write	112	36.8	122	39.6
Able to read and write	61	20.1	73	23.7
Elementary school and above	103	33.9	81	26.3
Occupational status of the father				
Farmer	189	62.2	159	51.6
Daily laborer	27	8.9	54	17.5
Others (merchant, self)	59	19.4	63	20.5
Family size in the HH				
<5	98	32.2	101	32.8
≥5	206	67.8	207	67.2
Wealth Index				
Low	51	16.8	72	23.4
Middle	150	49.3	176	57.1
High	103	33.9	60	19.5
Sex of the study child				
Male	172	56.6	152	49.4
Female	132	43.4	156	50.6

(WHO, 2010; Saaka and Osman, 2013)

Table.2 Feeding practices of the study children (n=612) among food secure and food insecure households *Kuyu district*, North Shewa Zone, central Oromia, Ethiopia, 2019.

Variables	PSNP Classification of HHs		
	FS HHs (304)	FI HHs (308)	
	n (%)	n (%)	COR
Child meal frequency per a day			
>=4	183 (60.2)	131 (42.5)	
<=3	121 (39.8)	177 (57.5)	2.04*
Did the child eat breakfast in the past 24 hrs a day?			
Yes	219 (72)	187 (60.7)	
No	85 (28)	121 (39.3)	1.7
Did the child eat a mid-morning snack in the past 24 hrs a day?			
Yes	119 (39.1)	67 (21.8)	
No	185 (60.9)	241 (78.2)	2.3
Did the child eat afternoon snacks in the past 24 hrs a day?			
Yes	171 (57)	146 (47.4)	
No	133 (43)	162 (52.6)	1.43
Did the child eat bedtime snacks in the past 24 hrs a day?			
Yes	69 (22.7)	37 (12)	
No	235 (77.3)	271 (88)	2.2
When does the child eat his food?			
Upon the child demands	149 (49)	228 (74)	
When convenient for the mother	155 (51)	80 (26)	.34
Restrict child during his/her meal			
No	179 (58.9)	119 (38.6)	
Yes	125 (41.1)	189 (61.4)	2.27
Pressure the child to eat his food			
No	193 (63.5)	159 (51.6)	1.63
Yes	111(36.5)	149 (48.4)	
Was food leftover at your home in the past 24 hrs?			
No	146 (48)	129 (41.9)	
Yes	158 (52)	179 (58.1)	1.28
What did you do when food is leftover in your home?			
Give to the animal (discarded in garbage)	51 (16.8)	62 (20.1)	0.91
Give to the child later	106 (34.9)	117 (38)	
Does your child eat all types of food?			
Yes	207 (68.1)	200 (64.9)	1.15*
No	97 (31.9)	108 (35.1)	

COR, Crude Odds ratio of Independent T-Test.
*statistically significant differences were observed at p< 0.05.

Table.3 Dietary diversity scores of the study children (n=612) among food secure and food insecure households *Kuyu district*, North Shewa Zone, central Oromia, Ethiopia, 2019.

Variables	PSNP Classification of HHs		
	FS HHs (304)	FI HHs (308)	
	n (%)	n (%)	COR
Cereals/Root/Tubers			
Yes	298(98)	306(99.4)	
No	6(2)	2(0.6)	0.32*
Legumes/Nuts			
Yes	260(85.5)	250(81.2)	
No	44(14.5)	58(18.8)	1.4*
Dairy/dairy products			
Yes	130(42.2)	85(27.6)	
No	174(57.2)	223(72.4)	1.9*
Meat/Fish/Poultry			
Yes	61(20.1)	52(16.9)	
No	243(79.9)	256(83.1)	1.24*
Eggs			
Yes	58(19.1)	46(14.9)	
No	246(80.9)	262(85.1)	1.35*
Vitamin A Rich Fruits/Vegetables			
Yes	147(48.8)	130(42.2)	
No	157(51.6)	178(57.8)	1.3*
Other Vitamin A Fruits/Vegetables			
Yes	64(21.1)	38(12.3)	1.9*
No	240(78.9)	270(87.7)	
Dietary diversity scores			
High DDS	139(45.7)	97(31.5)	
Low DDS	165(54.3)	211(68.5)	1.8

COR, Crude Odds ratio of Independent T-Test.
*statistically significant differences were observed at p< 0.05.

Table.4 Mean ±SD of height for age scores of children (n=612) among food secure and insecure households Kuyu district, central Oromia, Ethiopia, 2019.

	PSNP		
	Food Secure HHs	Food Insecure HHs	p-value
Variable	Mean ±SD	Mean ±SD	
Height -for- Age Z Score	0.431±0.496	0.487±.5006	0.021*

*statistically significant differences were observed at p< 0.05.

Table.5 Bivariate and multivariate analysis of selected independent variables with child stunting ***(n=612) among*** food secure households of Kuyu district, central Oromia, Ethiopia, 2019.

	Stunting		
	Food secure households (304)		
Variables	**n(%)**	**Crude odds ratio**	**Adjusted odds ratio**
Wealth Status			
High			1
Medium	103(33.9)	1	1.87(.993, 3.53)
Low	150(49.3)	2.2(1.28, 3.8)*	7.44(3.02, 18.46)**
Child meal frequency/day	51(16.8)	8.2(3.82, 17.7)*	
>=4	183(60.2)		
<=3	121(39.8)	1	1
Did the child eat breakfast in the past 24 hrs a day?		2.59(1.6, 4.15)*	0.94(.34, 2.59)
Yes	219(72)	1	1
No	85(28)	2.12(1.3, 3.53)*	0.55(.239, 1.29)
Did the child eat a midmorning snack in the past 24 hrs a day?			
Yes	119(39.1)	1	1
No	185(60.9)	1.8(1.12, 2.9) *	0.90(.438, 1.86)
Did the child eat afternoon snacks in the past 24 hrs a day?			
Yes	171(56.3)	1	1
No	133(43.7)	2.24(1.4, 3.56) *	1.05(.492, 2.23)
Did the child eat bedtime snacks in the past 24 hrs a day?			
Yes	69(22.7)	1	1
No	235(77.3)	2.01(1.13, 3.6)*	1.41(.655, 3.03)
When does the child eat his food?			
When convenient for the mother	149(49)	1	1
Upon the child demands	155(51)	2.36(1.5, 3.76)*	1.43(.72, 2.56)
Did you restrict the child during his/her meal?			
No	179(58.9)	1	
Yes	125(41.1)	2.2(1.377, 3.5)*	1
Did you pressure the child to eat his food?			1.43(.708, 2.89)
No	193(63.5)	1	1
Yes	111(36.5)	2.56(1.6, 4.14)*	1.249(.61, 2.56)
Was food leftover in your home in the past 24 hrs day?			
No	146(48)	1	1
Yes	158(52)	2.0(1.27, 3.21)*	1.03(.534, 1.975)
What did you do when food is leftover in your home?			
Give to the animal (discarded in garbage)	51(16.8)	1	
Give to the child later	106(34.9)	1.66(.844, 3.25)	
Does your child eat all types of food?			
Yes	207(68.9)	1	1
No	97(32)	3.31(2, 5.48)*	2.1(1.12, 4.24)**
Dietary diversity scores			
High DDS	139(45.7)	1	1
Low DDS	165(54.3)	8.84(5.1, 15.2) *	8.3(4.46, 15.5)**

*P value < 0.25 in the bivariate analysis; ** P value <0.05 in the multivariate analysis; 1= references.

Table.6 Bivariate and multivariate analysis of selected independent variables with child stunting ***(n=612) among*** food insecure households of Kuyu district, central Oromia, Ethiopia, 2019.

Variables	Stunting		
	Food insecure households (308)		
	n (%)	Crude odds ratio	Adjusted odds ratio
Wealth Status			
High	60(19.5)	1	1
Medium	176(57.1)	1.7(0.92, 3.11)*	1.4(0.71, 2.76)
Low	72(23.4)	3.1 (1.52, 6.32)*	2.5(1.1, 5.55)**
Child meal frequency/day			
>=4	13(42.5)	1	1
<=3	177(57.5)	2.63(1.65, 4.2)*	0.75(0.31, 1.8)
Did the child eat breakfast in the past 24 hrs a day?			
Yes	187(60.7)	1	1
No	121(39.3)	3.46(2.14, 5.6) *	2.04(1.1, 3.8)**
Did the child eat a midmorning snack in the past 24 hrs a day?			
Yes	67(21.8)	1	1
No	241(78.2)	1.88(.923, 3.2)*	0.92(0.46, 1.85)
Did the child eat afternoon snacks in the past 24 hrs a day?			
Yes	146(47.4)	1	1
No	162(52.6)	2.48(1.6, 3.92) *	1.46(0.72, 2.96)
Did the child eat bedtime snacks in the past 24 hrs a day?			
Yes	37(12)	1	1
No	271(88)	1.89(0.9, 3.86)*	1.13(0.46, 2.8)
When does the child eat his food?			
Upon the child demands	228(74)	1	1
When convenient for the mother	80(26)	1.72(1.02, 2.9)*	0.73(0.37, 1.44)
Did you restrict the child during his/her meal?			
No	119(38.6)	1	1
Yes	189(61.4)	2.44(1.52, 3.9)*	1.16(0.65, 2.08)
Did you pressure the child to eat his food?			
No	159(51.6)	1	1
Yes	149(48.4)	1.82(1.16, 2.9)*	0.99(0.55, 1.77)
Was food leftover in your home in the past 24 hrs day?			
No	129(41.9)	1	1
Yes	179(58.1)	1.44 (0.91, 2.3)*	1.6(0.92, 2.8)
What did you do when food is leftover in your home?			
Give to the animal (discarded in garbage)	62(20.1)	1	
Give to the child later on	117(38)	1.06(0.57, 1.96)	
Does your child eat all types of food?			
Yes	200(64.9)	1	1
No	108(35.1)	2.17(1.35, 3.5)*	1.6(0.92, 2.8)
Dietary diversity scores			
High DDS	97(31.5)	1	1
Low DDS	211(68.5)	5.69(3.3, 9.94)*	4.7(2.5, 8.83)**

* P value < 0.25 in the bivariate analysis; ** P value <0.05 in the multivariate analysis; 1= references.

The major aim of this study was to assess and compare the nutritional status (stunting) of children aged 24-59 months in food secure and food insecure households of rural Kebeles of Kuyu district, North Shewa Zone, Oromia region, Ethiopia. The prevalence of stunting was 48.3% and43.1% in food insecure and secure households, respectively. This finding is consistent with a study result done in Tigray (Kahsay *et al.,* 2015) that shows a higher prevalence of stunting in the food insecure (52.1%) compared to the children stunting in the food secure households (46.1%). It was also largely in line with a study result done in Malaysia(Naser *et al.,* 2015) that asserts the prevalence of childhood stunting in food insecure (54.7%) households was higher than secure ones (6.7%). The finding of the current study also agreed with a study done in west Oromia (Ethiopia), which shows that the prevalence of stunting among children in food-insecure households (41.8%) was higher than those who lived in food-secure households (15.5%) (Garoma, 2020). This could be due to an indication that being food secure is a way to be less malnourished.

Besides, a study result done in Amhara, Ethiopiaby Kebede *et al.,* 2012 affirms that the prevalence of children stunting was 54.2% and comparable to children stunting in the food insecure of the current study but higher than that of the food secure households. Naser *et al.,* 2015also report the prevalence of childhood stunting in food-insecure households (54.7%) but higher than the prevalence of childhood stunting in food-insecure households of the present study. Another study shows that the prevalence of childhood stunting in food-insecure households of Bangladesh, Vietnam and Ethiopia was 47.1%, 20.7% and 50.7%, respectively (Ali *et al.,* 2013). The result was comparable with the prevalence of stunting in the current study but it reported that the prevalence of stunting in Ethiopiais higher than the prevalence of stunting in both these comparison groups.

In the present study, children in the low wealth status were 7.44and 2.5times more likely to be stunted than those children in the high wealth status in food secure and insecure households (AOR=7.44; 95%=3.02, 18.46) and (AOR=2.5; 95%CI=1.1,5.53). This was consistent with a study result done in Bangladesh that shows children in the lowest wealth quintile were 1.64 times more likely to be malnourished than those in the highest wealth quintile (AOR= 1.64; 95%CI= 1.34, 2.01) (Islam *et al.,* 2013).The finding of this study also agreed with Saaka & Galaa, 2016, which shows that children in the poorest wealth status were 2.36 times more likely to be increased the odds of stunting than who in the highest(AOR=2.36; 95%CI= 1.29, 4.30).The study result is also agreed with studies done in different parts of southern Ethiopia (Belayneh *et al.,* 2020; Bogale *et al.,* 2020; Yoseph and Beyene, 2020; Afework *et al.,* 2021), which shows that the prevalence of stunting among children in high wealth status was lower than their counterparts.

However, the finding of the present study disagrees with a study result done in Nepal that showed poor wealth status was not significantly linked with stunting (AOR= 2.55; 95%CI=0.606, 10.735) (Ruwali, 2011). According to the finding of this study, children who had low dietary diversity score were 8.3 and 4.7 times more likely to be stunted than who had high in food secure and insecure households (AOR=8.3; 95%CI= 4.46; 15.5) and (AOR= 4.7; 95%CI=2.5, 8.83).

This is supported by studies result done in Ethiopia that revealed children who were fed with a low diversified diet were more chance to be stunted than their counterparts (Tamiru and Jisha, 2015; Belayneh *et al.,* 2020). This might be because low dietary diversity may not provide all the essential nutrients required for the child's growth and development. This would, therefore, explain why long-term low dietary diversity is likely to have reflected in stunting**.**

Furthermore, the study result shows that children who did not like and eat all types of food were 2.1 times more likely to increase the odds of stunting compared to those who did like and eat all food types in food-secure households (AOR=2.1; 95%CI=1.12, 74.24). This is supported by a study result done by Vieira *et al.,* 2010 that shows children who did not eat all food types had a low height-for-age z score (23.9%). A study result is done by Mehta *et al.,* 2013 also reports that impairment of growth and nutritional deficiencies were due to the elimination of certain diets from their meal. This might be because children who did not like and eat all types of food may decrease the intake of essential nutrients required for child growth and development.

On the other hand, this might also be due to the food allergic problem or lactose intolerance that limits children to intake all food types. Children who had morning snack were 2.04 times more likely to have stunting than those who had their breakfast meal in food-insecure households (AOR=2.04; 95%CI=1.1, 3.78). This might be due to children who did not consume snack increase starvation and hunger may increase the

prevalence of stunting and also further explained by the studies done at Northeast Ethiopia (Getnet *et al.,* 2018) and Sodo Zuria District, South Ethiopia (Dake *et al.,* 2019).

The result of this study described that the prevalence of stunting among children age 24-59 months in food secure and insecure households was high. However, the prevalence of stunting among children in food-insecure households was higher than their counterparts. This could be the signal that indicated being food secure is the way which is important to address child nutritional status. The study result concluded that wealth status, dietary diversity, breakfast and children who did eat all types of food were found to be significantly associated with children's stunting. Therefore, encouraging the communities to work on income generation activities and have diversifying of agricultural products to improve household economic and dietary diversity and further to overcome chronic malnutrition.

Data Availability

The datasets used and analyzed to support the findings of this study area available from the corresponding author upon reasonable request.

Consent

The purpose of the study was explained to the study participants and written informed consent was taken.

Conflicts of Interest

The author declared that he has no conflicts of interest.

Authors' Contribution

TY developed the study, design, implementation, analysis, interpretation, and final manuscript writing**.**

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