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Prevalence of Household Food Insecurity and its Associated Factors in West Gojjam Zone, Ethiopia. A Community-based Cross Sectional Study

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ABSTRACT

Background: Food insecurity remains a global social and public health issue affecting households. Divergent trends persisted despite the shift in the frequency of food insecurity in local, regional, and global contexts which needs imitate attention for action by stakeholders. Therefore, This study aimed to determine the magnitude and identify the factors that contribute to household food insecurity in the West Gojjam zone in Northwest Ethiopia.

Methods: A community-based cross sectional study was employed among 647 from November 1 to November 20/2023 in West Gojjam Zone. multi-stage sampling technique was used; study participants were selected by using systematic sampling. Data were collected through face-to-interview by trained health worker. Factors having p-value <0.25 in bivariate analysis was fitted to in the multivariable analysis. Then, variables having p-value <0.05 at 95%CI was announced significantly associated of household food insecurity.

Results: In this study, the finding showed that nearly-half (49.2%) of the households were household food insecurity. households head who had no formal education(AOR=2.92 at 95%CI: 1.85, 6.52), had primary education(AOR=2.14; 95%CI:1.36, 4.01), highland agro-ecological zone(AOR=2.75; 95% CI: 1.95, 5.15) midland agro-ecological zone (AOR=1.65; 95% CI: 1.13, 4.02), not utilized agricultural extension services (AOR= 3.97; 95%CI: 2.22, 7.09), high dependency ratio (AOR=3.06; 95% CI: 1.82, 5.15), medium dependency ratio(AOR=1.87; 95% CI: 1.12, 3.13), had livestock less than 2.5 units(AOR=1.83; 95%CI :(1.15, 3.56), had farmland size of ≤ 1.5 hectares(AOR = 3.90, 95% CI: 1.82, 6.33) and low household dietary diversity score(AOR = 3.95, 95% CI: 1.96, 7.04), medium dietary diversity score(AOR=2.02; 95% CI: 1.23, 3.95) were significantly associated with household food insecurity.

Conclusion: The results of this study showed that there is a significant frequency of food insecurity in households in the West Gojjam zone. Household food insecurity factors were: low and medium household dietary diversity scores, low and medium farmland agro-ecological zones, low and medium livestock numbers, low and medium farmland sizes, high and medium dependency ratios, and no formal or primary education. Recommended strategies is enhancing primary health care services, particularly family planning services, Community-based education, the use of agricultural extension services, and the use of agricultural inputs.

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Keywords: Factors associated, Household, West Gojjam, Food Insecurity

Abbreviations
FAO: Food Agriculture Organization

HFIAS: Household Food Insecurity Access Scale

HDDS: Household Dietary Diversity Score

PCA: Principal Component Analysis

SPS: Statistical Package for Social Sciences

SSA: Sub-Sahara Africa

TLU: Tropical Livestock Until

WHO: World Health Organization

Introduction

Food insecurity is the state that results from people not having enough money, resources, or social connections to buy enough

food that meets their dietary needs and tastes and is safe and nourishing, all of which are essential for maintaining an active and healthy lifestyle. Poor health behaviors that impede illness prevention, management, and treatment are closely associated with limited availability to sufficient and nourishing food, or food insecurity [1,2].

Globally, moderate-to-severe food insecurity affected 2.4 billion people, or 29.6% of the world's population, in 2022, indicating they lacked access to enough food. This is a continued increase of 745 million from 2015 and 391 million from 2019. In addition, Africa the prevalence of moderate or severe food insecurity rose slightly from 2021 to 2022 which was by one percentage point in one year 60.9% (868.3 million). Regionally, 32.4% (84.3 million) in Northern Africa, 66.4% (285.1 million) in Western Africa, 25.9% (17.8 million) in Southern Africa, 78.4% (153.7

million) in Middle Africa and 69.2% (327.4 million) in Eastern Africa and 69.9 million. However, different patterns were observed at the regional level, even if the global frequency of food insecurity remained same. Improvements in some regions were offset by worsening situations in others [3,4].

Furthermore, household food insecurity showed that it has been public health concern in the developing countries. Like 87.2% in Iran, 55% in Tanzania and 31.8% in Limpopo Province of South Africa. Different pocket Studies conducted on prevalence of household food insecurity in various parts of Ethiopia were showed still critical problems and ranged with 21.7 % to 71. 6% [5-9].

A food crisis and insecurity are present in Sub-Saharan Africa as a result of low agricultural output, political unrest, rising costs, and climate change. In Ethiopia, food insecurity has decreased over the past three decades, yet it is still a serious problem. The major causes were; crop disease, prolonged drought, unstable politics and repeated conflicts made worsen for the nation's food security situation in 2023. 85 percent of Ethiopia's labor force is employed in agriculture, which provides the majority of the country's food sources. In contrast, the agricultural potential of Ethiopia is underutilized. Due to a lack of knowledge about the prevalence, intensity, and causes of food insecurity, reducing it is a significant public policy problem [10-15].

There are number of studies conducted so far identified factors associated with household food insecurity. Such as; age, educational status, marital status, Occupational status, dependency ratio; access to credit, family size, wealth index, agricultural extension services, land size, agricultural inputs, agro-ecological zone and total livestock units were significant factors of household food insecurity [5,8,16-29].

There is, to our knowledge, less documentation of food insecurity in the research area. it is critical to understand household food insecurity and its contributing factors in order to implement evidence-based interventions and carry out national and local programs. Despite this, the West Gojjam Zone has little data on household food insecurity and its causes. In addition, when compared to the other 11 zones in the Amhara regional state Ethiopia, the West Gojjam zone has one of the highest rates of agricultural productivity. Thus, the purpose of this study was to determine the magnitude of household food insecurity and its associated factors in the West Gojjam zone of Ethiopia.

Methods

Study Design, Study Period and Setting

A community-based cross sectional study was employed from November 1 to November 20/2023 in West Gojjam Zone. West Gojjam Zone is in the Northwest of Ethiopia which far from Addis Ababa 375km. The West Gojjam Zone presents in the altitude of ranges from 1800 to 3000 meters above sea level and consists of three major agro-ecological zones; 22% lowlands(Qola), 38% mid land(Woynadega) and 40% high land(Dega).The annual temperature is 9 and 27 degrees Celsius, and the rain fall varies from 1100mm in lowlands to 2100mm in high land areas during rainy season. The agricultural main activities are; cereal crop production is the means of most inhabitants. The main types of crops are Teff (*Eragrostis tef*), wheat, barely, bean, maize and cowpea and live stocks of the district's oxen, cow, sheepes, horses, mules, and goats. The district has four seasons: spring (September to November), winter (December to February), autumn

(March to May) and summer (June to August). The end of spring and the beginning of winter is the harvesting time. The collection period was during harvest season November 1-21/2023 in West Gojjam Ethiopia [30,31].

According to West Gojjam Zone Agriculture Development Office (2022) the total population of the zone was 3,259,654 and 679,094 expected households. The source and study population were all households in the West Gojjam zone [31].

Sample Size Determination and Sampling Procedures

Using the Single proportion formula, we calculated the sample size with the following assumptions: 5 percent margin of error, 95 percent confidence level ($Z_{\alpha/2}=1.96$), and prevalence of household food insecurity in the previous study, $p=51.3$ percent. using the following formula: $n = 392$ with design effect 1.5 and 10% non-response rate was taken into consideration and the final sample size was 647 [11].

A multi-phase sampling method was applied. First, based on climatic zone similarities, the districts of the west Gojjam zone were stratified into three clusters (agro-ecological zones). One district was chosen by lottery from each agro-ecological zone. Second, the district was made up of kebles, which are Ethiopia's smallest units of government, some of which were chosen by random sampling. Thirdly, the health extension worker received the family registration book from the selected kebles' houses, and during this procedure, the households' selection was proportionately assigned to each picked keble. Finally, a systematic sampling procedure was used to choose homes (the smallest study unit) that met the inclusion requirements (interval value of nth elements of sample frame). During data collection period respondents were not present in their home; repeated visits were made to avoid non-response rate.

Data Collection and Quality Control

Data were collected using structured pretested questionnaires were used to collect the information through face-to-face interviews. The socio-demographic and economic, household dietary diversity score, agricultural activities and household food insecurity access scale questionnaires were first prepared in English language, and then translated to Amharic (local language) and again back to English by language experts to maintain its consistency and accuracy. Before data collection, the purpose of the study was explained, their consents were sought, and informed participation was fully voluntary.

To determine the household food insecurity status, Household Food Insecurity Access Scale (HFIAS) questionnaires were adapted from Household Food Insecurity Access Scale (HFIAS) measurement tool of the Food and Nutrition Technical Assistance (FANTA) version 3. HFIAS is a standardized tool to assess household food insecurity status in several countries across diverse sociocultural contexts[6,11,21,32].

A supervisor with an MPH degree and seven BSc nurses collected data. Training on interviewing procedures, quality verification of data, and data collection equipment was provided over two days to supervisors and data collectors. 33 households, or 5% of the sample, that were close to non-sample kebles underwent a pre-test and its Cronbach's Alpha (α) value was found to 92.5% indicating its consistency. On a daily basis, supervisors and principal investigators verified the completeness and consistency of each questionnaire and provided ongoing feedback.

We were excluded from festive celebrations and relatives who had dined somewhere else throughout the data collection period.

Study Variables

Dependent Variable: Household food insecurity (Insecure vs Secure)

Independent Variables: Socio-demographic variables:- sex, age, marital status, religion, educational status, occupational status, family size, and dependent ratio; Socio-economic variables:- wealth index, access to credit services and safety net program benefit; Agricultural activities variables:- farm land size, agricultural inputs, agricultural extension services, number of oxen, agro-ecological zone and Household dietary diversity score: 12 food groups (cereals, vegetable, fruits, tubers and nuts, legumes, meat and poultry, milk, fish, egg, oil, sugar, miscellaneous).

Data Collection Tools

Socio-demographic and economic data were collected by pre-tested structured questionnaires which were utilized by Ethiopian Demographic and Health Survey (EDHS) [33]. Such as, household heads of sex, age, marital status, educational status, and occupational status; family size, beneficiary to safety net program and wealth index [33].

A principal component analysis method was used to create a household wealth index that would gauge each household's relative economic standing. Included in the variables were the type of roof used for housing, the availability of utilities (such as a water source, fuel, or electricity), the amount of agricultural land owned, the number of farm animals (such as cattle, horses, donkeys, camels, goats, chickens, and bee hives), the type of vehicle (car or truck), the number of household appliances (such as radios, televisions, telephones, personal computers, refrigerators, tables, chairs, and beds), and the type of roofing material. In order to create a common factor, principal component analysis (PCA) was used to reduce these variables to a single variable (wealth index). Consequently, it was assumed that the analysis would yield eight distinct factor scores, a correlation matrix greater than 0.3, and a total variance greater than 68 percent. Next, the common factor scores' cumulative score was calculated. Ultimately, the households' wealth status was divided into three categories: affluent, middle, and poor for additional examination [34,35].

Tropical Livestock Unit (TLU)

The live stock numbers of various species are quantified as a single figure that indicates the total amount of animals present using the Tropical Livestock Unit. The Tropical Animals Units are a means of expressing the total number of livestock present, regardless of their exact composition, by converting livestock numbers of various species into a single statistic. A higher ratio of animals to adults that can sustain the household suggests better resilience and food security. Food security risk can be directly determined by comparing changes to the TLU. The total livestock owned by the head of the family is denoted by a TLU, which is equal to 250 kg of live weight. Utilizing conversion factors, each animal in a family was converted to its corresponding TLU (1 cattle = 1 TLU; 1 goat = 0.15 TLU; 1 horse = 1 TLU; 1 mule = 1.15 TLU; 1 donkey = 0.65 TLU; and 1 poultry = 0.005 TLU) [36-38].

Dependency Ratio

It was computed as the ratio of producing household members (those in the age range of 18–64) to dependent household mem-

bers (those in the age range of 18–64), and it was subsequently split into three tertiles (low, medium, and high) [39].

Household Dietary Diversity Score (HDDS)

The 12-food groups:-cereals, vegetables, fruits, tubers and nuts, legumes, meat and poultry, milk, fish, eggs, oil, sugar, and miscellaneous that were consumed in the household over the course of a 24-hour recall period were added up to determine which members had consumed “yes,” coded as “1,” and which had not consumed “no,” coded as “0.” (Swindale A, 2006). Low HDDS = 5-7 food groups consumed, medium HDDS = 6-7 food groups ingested, and high HDDS = => 8 food groups [40,41].

Household Food Insecurity Access Scale (HFIAS)

Nine questions were posed to respondents as part of the HFIAS data gathering process in order to gauge the prevalence of food insecurity. The ensuing inquiries: The households that participated in the survey during the four weeks prior to the survey reported the following: 1. worrying about food; 2. not being able to eat preferred foods; 3. eating only a few kinds of foods; 4. eating foods they really do not want to eat; 5. eating a smaller meal; 6. eating fewer meals in a day; 7. having no food of any kind in the household; 8. going to bed hungry; and 9. going without eating for the entire day and night. Closed-ended questionnaires with a “yes or no” classification indicated three options for occurrence frequency: “rarely = 1, sometimes = 2, and often = 3.” The overall score of HFAIS was 27. Using these responses, households were categorized into four levels of food insecurity: food secure, mildly food insecure, moderately food insecure, and severely food insecure and finally, categorized into two categories: food insecurity and food security [32].

Operational Definitions

The HFIAS guideline explained the categories of household food insecurity levels as assessed through the HFIAS module adapted as follows[32]:-

- 1. Food Secure:** In the event that [(Q1a=0 or Q1a=1) and Q2=0 and Q3=0 and Q4=0 and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0], the household either did not encounter any instances of food insecurity or only sometimes worried about food.
- 2. Mild Food Insecurity:** If [(Q1a=2 or Q1a=3 or Q2a=1 or Q2a=2 or Q2a=3 or Q3a=1 or Q4a=1) and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0], the household worries. Includes describing occasional or infrequent meals and/or inability to eat selected foods and/or limited food choices and/or inability to eat certain foods.
- 3. Moderate Food Insecurity:** If [(Q3a=2 or Q3a=3 or Q4a=2 or Q4a=3 or Q5a=1 or Q5a=2 or Q6a=1 or Q6a=2) and Q7=0 and Q8=0 and Q9=0], the household consumes few varieties or unpalatable foods occasionally or frequently, and/or has begun to reduce the size or number of meals infrequently or occasionally but did not experience any of the three extreme food insecurity situations.
- 4. Severely Food Insecure:** If [Q5a=3 or Q6a=3 or Q7a=1 or Q7a=2 or Q7a=3 or Q8a=1 or Q8a=2 or Q8a=3 or Q9a=1 or Q9a=2 or Q9a=3], the household has moved gradually even sometimes, to cutting back on the amount of food consumed or the frequency of meals, and/or to encountering the three most severe circumstances: going without food before bed, going without food all day, or going without food altogether.

Data Management and Analysis Procedures

Data were cleaned and entered to EPI version 3.5.5 software and exported to SPSS version 28 for analysis. All descriptive

statistics were done for each variable. To examine association of a single variable with household food insecurity (outcome) was done by binary logistic regression. Variables were having p-value <0.25 were used as cut off value to enter the multivariable regression. Finally, multivariable logistic regression was carried out to identify factors associated with household food insecurity. Adjusted odds ratio (AOR) at 95% Confidence level was considered strength of association of predicting variables with fixing controlling confounders. Finally, p value <0.05 was declared as significantly affects the outcome variable. The model was checked by Hosmer–Lemeshow goodness of fit statistic value of p=0.82 which was satisfied (p>0.05) [42].

Ethical Considerations

Ethical clearance was obtained from the college of human science research ethical review committee of college of human science University of South Africa (UNISA) with CREC Reference #. 11760680_CRECHS_2023. Then, concerned officials in Amhara region and West Gojjam zone at each level were communicated through formal official letters. The zone health department provided official letter to local authorities of all selected kebeles. Prior to interview, data collectors explained

to the study participants to obtain written consent participation in the study and written informed consent was obtained from household heads. Confidentiality, privacy, and anonymity were guaranteed throughout the study’s research phase. The heads of households were informed of their right to withdraw from the study at any moment and to not give their agreement. Food insecure households were connected to the office of agricultural development.

Results

A total of 647 households participated in the study with a response rate of 98%(634). Most (85.6%) of the households were male headed. Majority of household heads (70%) were 45 years and above. The mean and median age of household heads were 52.3 and 57 years respectively. Nearly half (48.4%) of household heads were primary education. Most (89.4%) of the household heads were married. Large segments of household heads (94.3%) were farmers. 44.2% (280) of households had 5 to 7 family members and two in five (40.8%) households have medium dependency ratio. 37.1% (235) of Households presented in medium index of wealth (Table 1).

Table 1: Socio Demographic Characteristics of Households in West Gojjam Zone, Ethiopia (N=634)

Characteristics	Category	Frequency(N)	Percent(%)
Sex	Male	542	85.4
	Female	92	14.5
Age	18-35 years	43	7
	36-44 years	145	23
	45 and above years	231	70
Educational Status	No formal education	151	23.8
	Primary education	307	48.4
	Secondary education	113	17.8
	College or university	63	9.9
Marital Status	Single	49	7.7
	Married	567	89.4
	Widowed	6	0.9
	Divorced	12	1.9
Religion	Orthodox	585	92.3
	Protestant	23	3.6
	Muslim	26	4.1
Occupational status	Farmer	597	94.2
	Merchant	27	4.3
	Daily labour	10	1.6
Family size	2-4	272	42.9
	5-7	280	44.2
	≥8	82	12.9
Dependency ratio	Low	232	36.6
	Medium	259	40.8
	High	143	22.6
Wealth Index	Poor	228	36.0
	Medium	235	37.1
	Rich	171	27.0

Agricultural-Related Characteristics of Household Food Insecurity

According to this study, two thirds (64.5 percent) of the families had one ox, and twenty-seventy-four (36.9 percent) were located in the highland agro-ecological zone. 58.2% of respondents had won farmland, and over half (53.8%) did not use agricultural inputs. A total of 358 households, or 56.5 percent, did not make use of the agricultural extension service. Seventy-four households, or 71.4 percent, possess less than 1.5 hectares of farmland. 544 out of the families, or 85.6%, did not receive any services from the productive safety-net program. 473 families, or three-fourths, or 74.6 percent, had fewer than 2.5 tropical livestock units (Table 2).

Table 2: Agricultural-Related Characteristics of Household Food Insecurity in West Gojjam Zone, Ethiopia, 2023 (N = 634)

Characteristics		Frequency (N)	Percent (%)
Agro-ecological zone	Lowland	173	27.3
	Midland	227	35.8
	Highland	234	36.9
Ox ownership	No oxen	105	16.6
	One Oxen	409	64.5
	Two and above	120	18.9
Own land farm	No	265	41.8
	Yes	369	58.2
Utilize agricultural input	No	341	53.8
	Yes	293	46.2
Utilize agricultural extension service	No	358	56.5
	Yes	276	43.5
Beneficiary to safety net service	No	543	85.6
	Yes	91	14.4
Farmland size	=<1.5 hectares	454	71.6
	>=1.6 hectares	180	28.4
Ownership of livestock(TLU)	<2.5	473	74.6
	>=2.5	161	25.4

Food Groups Consumed by Households

There were 626 households that ate cereal crops (98.7 percent). In the 24 hours before this poll, almost every household reported consuming cereal items, then miscellaneous, oil, sugar, and milk. However, the lowest percentage of households reported consuming fruits and animal products. The HDDS mean (SD) for the households was determined to be 4.85 (\pm 2.15), and these mean scores were used to assign the households to three groups. More than 310 households (48.9%) fell into the category of poorly diverse dietary consumers, who only eat \leq 5 food groups; 194 households (30.6%) fell into the category of medium dietary consumers, who eat 6-7 food groups; and 130 households (20.5%) fell into the category of highly diverse dietary consumers, who eat $>$ 7 food groups (Figure 1).

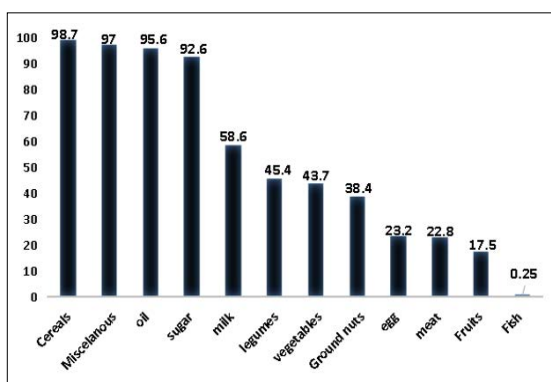


Figure 1: Household Food Dietary Diversity Consumed of Food Groups in West Gojjam zone, Ethiopia, 2023

The Household Food Insecurity Access Scale Occurrence

The percentage of households experiencing worry about not having enough food was 528 (87%). The majority of the households 456 (75%) replied affirmatively to having been unable to eat their preferred food in the 4 weeks before the interview due to a lack of resources. The number of households that had eaten a limited variety of foods in the 4 weeks before the interview due to lack of resources was 462 (76.1%). The percentage of households that consumed fewer meals or lower portions than desired during the four weeks prior to the interview was 383 (63.1 percent) and 426 (70.2 percent), respectively. Moreover, the number of households with an affirmative response to the sever conditions of going to sleep hungry or going a whole day and night without food were 219 (36.1%) and 39 (6.4%), respectively (Table 3).

Table 3: Occurrence of Respondents by Household Food Insecurity Access Scale in West Gojjam zone, Ethiopia 2023(n=634)

HFAIS Questionnaires	Occurrence		Frequency of occurrence(Yes)		
	No (%)	Yes (%)	Rarely	Sometimes	Often
	n (%)	n (%)	n (%)	n (%)	n (%)
Worried about food	273(43)	360(57)	192(53%)	97(27)	71(20)
Unable to eat preferred foods	329(52)	305(48)	245(80)	54(18)	6(3)
Ate just a few kinds of foods	392(62)	242(38)	168(69)	67(28)	7(5)
Ate foods they really do not want to eat	414(65)	220(35)	172(78)	38(17)	10(0)
Ate a smaller meal	412(65)	222(35)	186(84)	35(16)	1(0)
Ate fewer meals in a day	431(68)	202(32)	168(83)	34(17)	0(0)
No food of any kind in the household	604(95)	30(5)	30(100)	0(0)	0(0)
Went to bed hungry	603(95)	31(5)	30(97)	1(3)	0(0)
Went a whole day and night is not eating	606(95)	28(4)	28(100)	0(0)	0(0)

Prevalence of Household Food Insecurity

In this study, the prevalence of household food insecurity was 49.2 % (95% CI: 45.3%, 53.2%) in West Gojjam zone. Of which the categories of household food insecurity, 62(9.8 % (95% CI: 7.0%, 11.4%) severely food insecure, 117(18.5 % (95% CI: 15.8%, 21.6%) moderately food insecure, 133(21.0 % (95% CI: 18.0%, 23.2%) mildly food insecure (Figure 2).

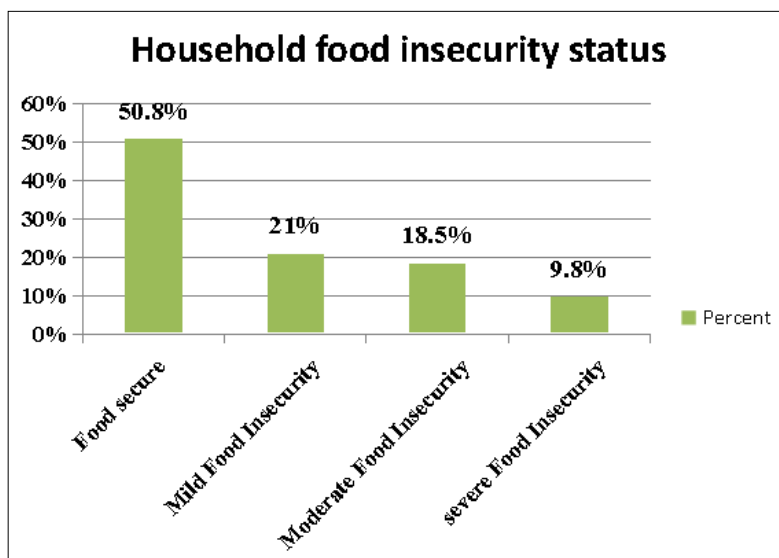


Figure 2: Distribution Of Household Food Insecurity Categories in West Gojjam Zone, Ethiopia 2023.

Factors Associated with Household Food Insecurity

For the multivariable logistic regression variables, the candidate variables were found. Agro-ecological zone, farmland size, use of agricultural extension services, high and medium dependency ratio, tropical livestock, and HDDS are a few examples. However, the following variables were not chosen to be multivariate logistic regression variables: wealth index, ox ownership, sex, age, marital status, religion, occupation, family size, and agricultural inputs.

In this study, households head who had no formal education were 2.92 times more likely to be food insecure compared with households who had secondary education and above (AOR=2.92 at 95%CI: 1.85, 6.52). household heads who had primary education were 2.14 times more likely food insecure compared with households who had secondary education and above (AOR=2.14; 95%CI:1.36, 4.01). Households who were living in highland agro-ecological zone were 2.75 times ((AOR=2.75; 95% CI: 1.95, 5.15)) more likely food insecure than households who lived in low land agrological zone. Similarly, household who lived in midland were 1.65times more likely to be food insecure when compared with low land (AOR=1.65; 95% CI: 1.13, 4.02).

Households who had not utilized agricultural extension services were 3.97 times more likely to be food insecure when compared with their counterparts (AOR= 3.97; 95%CI: 2.22, 7.09). Households with high dependency ratio were 3.06 times more likely to be food insecure than low dependency level (AOR=3.06; 95% CI: 1.82, 5.15) and households with medium dependency level were 1.87 times more likely to be food insecure than low dependency level (AOR=1.87; 95% CI: 1.12, 3.13). Households who had livestock less than 2.5 units were 1.83 times (AOR 3.03 at 95% CI: 1.15, 3.56) more likely to be food insecure than 2.5 greater and equals units in households. Furthermore, households who had farmland size of ≤ 1.5 hectares were about 3.9 times more likely to be food insecure compared with households had ≥ 1.6 hectares (AOR = 3.90, 95% CI: 1.82, 6.33). Similarly, households with household dietary diversity score (HDDS) were about 4 times (AOR = 3.95, 95% CI: 1.96, 7.04) more likely to be food insecure compared with high HDDS, and households who had medium dietary diversity score 2.02 times (AOR=2.02; 95% CI: 1.23, 3.95) more likely to be food insecure compared to high HDDS

Table 4: Multivariable Binary Logistic Regression Analysis Result of Factors Associated with Household Food Insecurity in West Gojjam Zone, Ethiopia, 2023 (N = 634).

Characteristics		Food security Status		Crude OR (95% CI)	Adjusted OR (95% CI)
		Food Insecured	Food Secured		
Sex	Male	291	251	1.04(0.76, 1.43)	
	Female	48	43	1	
Age	18-35 years	25	18	1	
	36-44 years	72	73	1.06(0.73, 1.54)	
	45-64 years	215	231	1.49(0.92, 2.81)	
Educational status	No formal education	86	65	1.87(1.20, 2.91)	2.92(1.85, 6.52)**
	Primary education	153	154	1.60(1.15, 3.54)	2.14(1.36, 4.01)*
	Secondary education and above	73	103	1	1
Marital status	Married	283	284	1	
	Unmarried	29	38	1.31(0.78, 2.18)	
Religion	Orthodox	282	303	1	
	Protestant	14	9	1.67(0.71, 3.92)	
	Muslim	16	10	1.72(0.77, 3.85)	
Occupational Status	Farmer	291	306	1	
	Merchant	13	14	0.98(0.45, 2.11)	
	Labourer	8	2	4.21(0.89, 19.97)	
Family Size	2-4	49	33	1	
	5-7	138	142	1.14(0.82, 1.59)	
	≥ 8	49	147	1.75(1.06, 2.88)	
Wealth Index	Poor	132	96	1.76(1.18, 2.63)	
	Medium	105	130	1.03(0.69, 1.54)	
	Rich	75	96	1	
Agro-ecological zone	Low land	86	87	1	1
	Mid land	134	93	1.46(1.05, 3.15)	1.65(1.13, 4.02)**
	High land	156	78	2.02(1.56, 4.04)	2.75(1.95, 5.15)***
Own land for farm	No	152	113	1.76(1.28, 2.42)	
	Yes	160	209	1	
Agricultural input	No	193	148	1.01(1.39, 2.62)	
	Yes	119	174	1	
Use agricultural extension service	No	217	95	2.93(2.12, 4.06)	3.97(2.22, 7.09)***
	Yes	141	181	1	
Benefit safety-net service	No	286	26	2.78(1.71, 4.52)	
	Yes	257	65	1	
Dependency ratio	Low	135	97	1	1

	Medium	124	135	1.56(1.03, 2.37)	1.87(1.12, 3.13)*
	High	53	90	2.36(1.54, 3.63)	3.06(1.82, 5.15)***
Tropical livestock unit	< 2.5	249	224	1.73(1.20, 2.49)	1.83(1.15, 3.56)*
	≥ 2.5	63	98	1	1
Oxen ownership	No oxen	223	186	1.86(1.23, 2.82)	
	One Oxen	42	63	1.04(0.61, 1.77)	
	Two and above	47	73	1	
Farm land size	≤ 1.5 hectares	100	80	1.43(1.01, 2.02)	3.90(1.82, 6.33)***
	≥ 1.6 hectares	212	242	1	1
HDDS	Low	242	68	3.67(2.04, 6.35)	3.96(1.92, 7.02)***
	Medium	110	84	1.35(1.05, 4.35)	2.02(1.23, 3.95) **
	High	64	66	1	1

N.B: *=0.05, **=0.01, ***=0.001, CI: Confidence Interval, AOR: adjusted odds ratio, 1= reference group

Discussion

The purpose of this study was to assess the magnitude of household food insecurity and its associated factors in West Gojjam zone, Ethiopia. Nearly-half (49.2%) of households in West Gojjam zone were food insecure. No formal and primary education, Low and medium land agro-ecological zone, not using agricultural extension service, small farmland size (<1.5 hectares), high dependency ratio, small unit (<2.5) livestock, and low and medium household dietary diversity score were contributing factors associated with household food insecurity. The ultimate impact of household food insecurity has malnutrition which leads to affecting physical and mental well beings of people; such as, dietary intake, hunger, deficient performance, and low immunity of the body as a result, food insecurity is a critical risk factor associated with malnutrition (acute, chronic), and diseases.

The result showed that the overall prevalence of household food insecurity was 49.2% in West Gojjam zone. This finding agrees with different area studies conducted in Tanzania [6] and Ethiopia. However, this study finding is lower than studies conducted in Damot Gale and Analemo districts in Ethiopia. This discrepancy might be due to differences in study settings, sample size and seasonal variation. whilst this study, prevalence of household food insecurity was higher than studies reported from East Gojjam, West Abay Southern Ethiopia and national prevalence of food insecurity. This variation might be explained as household food insecurity status varies from area to area, study periods and study season because this study conducted in high staple foods (maize, beans, pea, wheat, sugar cake and teff) and cattle (dairy products) production periods and local contextual predictors. Another possible explanation for this difference could be seasonal variation, as it is most important for the food security of a given community [6,16,19,21,23,25,43-45].

In this study, household head educational level was found to have significant association with household food insecurity. As household head educational level increases from no formal education to primary, secondary, and above education, had food insecurity of household decreases. Which mean that the higher the educational level of household head, the more food secure the household is expected to be. This result is in agreement with studies done in Punjab Pakistan, East Gojjam and Central Zone of Tigray in Ethiopia. This can be justified by the fact that educated households have knowledge about household food security and its benefit for the family and improve the physical and

mental well-being of household members. Moreover, household education can increase the health knowledge and household income that will have a positive impact on the health and nutritional status of their household members. education as a tool for gaining access to information on great agricultural manufacturing, nutrition, and sanitation progressed overall performance thru extra manufacturing and better decision-making [11,46-51].

Ecological zone discovered to be an crucial aspect related to household food insecurity.. food insecurity is a common problem in the highland areas, due to different factors, including low climate change adaptive capacity, high climate change vulnerability, human- induced land degradation, and low crop productivity. However, there was no statistically significant difference in prevalence of household food insecurity taken from in the midland plains. This study was supported by reported from East Gojjam zone, Ethiopia. This may be due to the fact that high production failures in the highland agro-ecological zone due to frequent soil erosion so that they are unable to diversify food production and food access through high dependence of food purchases. This study suggests that agricultural activities should take water conservation into account and extend irrigation practices to cope with less agricultural - productive areas, especially for the lowland agro-ecological zone [22,47,52,53]

Results of this study also demonstrated that not using agricultural extension services were significant association with household food insecurity in which a household who were not utilized agricultural service was associated higher odds of getting food insecurity than counterpart. The finding is in line with studies done in Sekela district, Ethiopia. This is since utilization of agricultural extension services may enhance the probability of a household having access to better crop production techniques, better inputs, and production incentives that increase farm productivity and production, which use agricultural inputs continuously as recommended [9,54,55].

In this study, farm land size less than and equals to 1.5 hectares had significant association with household food insecurity, that is small farm land size were more likely to be food insecurity than those who had greater than and equals to 1.6 hectares, and this in agreement with a study conducted in Ethiopia. The possible explanation can be related to the fact that, access for a large land holding leads to high opportunities for agricultural production, mixture tree cultivation practices which could function a

machine of earnings generation, and enough get entry to for farm animals grazing. The size of a land holding is thought to be a crucial production factor that affects the kinds of crops cultivated and the volume of harvests. Thus, holding size is anticipated to have a major impact on farm households' food security under subsistence agriculture [16,21,22,55,56].

This have a look at encourages that because of extraordinarily constrained land possession in Ethiopia, a combined farming system (incorporated factors of both farm animals and crop cultivation) want to be observed on the small available land to reduce the prevalence of food insecurity. This study encourages that due to extremely limited land ownership in Ethiopia, a mixed farming system (in integrated elements of each cattle and crop cultivation) must be determined at the small to be had land to reduce the superiority of meals insecurity. This study a line with to studies conducted in Ethiopia [11,21].

In this study, dependency ratio is a contributing factor for household food insecurity. Households with high dependency ratio had more than three-fold household food insecurity as compared to a household with low dependency ratio. In addition, households with a medium dependency ratio had a nearly two-fold greater risk of household food insecurity as compared to a low dependency ratio household. This finding is supported by different studies. It might be a dependent individual which was less than 15 years and above 65 years increasing in the household and It demands extra resources on the household as well as access to food [25,39,57].

Households who had livestock less than 2.5 units were 1.83 times (AOR=1.83 at 95% CI: 1.15, 3.56) more likely to be food insecure than 2.5 greater and equals units in households. The tropical livestock unit which is the aggregate number of livestock converted to a common unit (livestock owned through the top of the family) became discovered to be a massive related thing for family meals insecurity. This might result from the rising demand for animal products that exists in Ethiopia at the moment. Furthermore, animals and their by products, meat and milk, for example; scarcely needed by the growing population for both consumption and trade. The livestock are sold to make money in times of food scarcity. The findings align with the research undertaken in Ethiopia, specifically studies. Because livestock is a key component of food security, which is a crucial economic indicator that is closely linked to a household's level of food insecurity, the relevant body must therefore find highly focused strategies to boost the production of livestock in the study area. [19, 29, 37,58-60].

Furthermore, households who had farmland size of ≤ 1.5 hectares were about 3.9 times more likely to be food insecure compared with households had ≥ 1.6 hectares (AOR = 3.90, 95% CI: 1.82, 6.33). this study in agreement with other studies. The possible explanation is the households who had small farmland size (<1.5 hectares) prone to household food insecurity [21,25].

In this study, households with household dietary diversity score (HDDS) were about 4 times more likely to be food insecure compared with high HDDS, and households who had medium dietary diversity score 2.02 times more likely to be food insecure compared to high HDDS. This study in line with studies done in (12,40,53). The possible explanations household dietary diversity generally increases as income increases and household can have enough food variates and they can exchange to other [40,41].

Limitations of the Study

Household food insecurity was assessed the previous 30 days memory, and it might have recall bias and to probe with linking to local and national events and ceremonies were conducted to minimize the presence of recall bias. Additionally, since our study design was cross sectional study, it is not creating to determine cause-effect or temporal relationship. However, we utilized the higher sample size assumptions. The study period (pre-harvest) was most cereal crops produced (maize, wheat, teff, beans, and pea) and diery products which might underestimate the prevalence of household food insecurity in the study area.

Conclusion

The finding of this study revealed that the prevalence of household food insecurity in the West Gojjam zone is high. A number of variables were found to be significantly linked to household food insecurity, including: lacking formal and primary education; low and medium land agro-ecological zone; not using agricultural extension services; small farmland size; high and medium dependency ratio; few livestock; and low and medium household dietary diversity scores. Therefore, based on this, raising awareness, making use of agricultural inputs (fertilizers, better crops, and irrigation systems), and enhancing primary health care services—particularly family planning services—are all important. Also, methods for improving food security in the home through primary health care (family planning) and agricultural extension services to increase households' involvement in agricultural productivity. Scholars will investigate the consequences of household food insecurity on specific seasons.

Authors' Contributions

MB monitored data collection and was involved in analysis and report writing grossly; MM reviewed study design and data analysis and contributed to report write-up; MB reviewed data analysis and contributed to report write-up; MB* had a decisive scientific role in design, analysis, interpretation of findings and write-up. All authors read and approved the final manuscript.

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Competing Interests

The authors declare that they have no competing interests.

Availability of Data and Materials

The datasets analysed during the current study were available from the corresponding author on reasonable request.

Ethical Approval and Consent to Participate

Ethical clearance was obtained from the ethical review committee of college of human science University of South Africa with CREC Reference #. 11760680_CRECHS_2023. Then, concerned officials in Amhara region and West Gojjam zone at each level were communicated through formal official letters. The zone health department provided official letter to local authorities of all selected kebeles. Informed verbal consent was obtained from each participant before interview. To ensure confidentiality of participants, anonymous coding was used whereby the name of the participants and any participants' identifier were not written on the survey note. Even during the interview time, to keep the privacy of subject's interview was carried out at private place and alone (only interviewer and respondent listens each other). Moreover, the rights of members not to take part and not to answer the query they don't want to answer were ensured.

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