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Research Article

Household Level Determinants of Food Insecurity in Rural Ethiopia

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Introduction. Currently, Ethiopia, in particular, the rural areas of Ethiopia, faces high levels of food insecurity. In spite of the fact that there have been many studies on food security, most of them have been conducted in specific national settings. Hence, the determinants of food insecurity should be assessed at the national level. Therefore, this study was primarily aimed to identify the determinant factors of household food insecurity in rural Ethiopia. *Method*. A cross-sectional Ethiopian socioeconomic survey (ESS) data collected from September 2018 to August 2019 was utilized. A sample of 3115 households was selected from 316 clusters across rural Ethiopia using a two-stage probability sampling technique. To identify the determinants of food insecurity, logistic regression was applied. *Results*. Among 3,115 households, 50.05% of them were food insecure. Factors such as the household head being aged from 30 to 64 (AOR = 0.786, 95% CI: [0.635, 0.973]), widowed, divorced, or separated (AOR = 1.588, 95%CI: [1.001, 2.518]), literate (AOR = 0.702, 95%CI: [0.590, 0.834]), household aid (AOR = 1.339, 95%CI: [1.089, 1.648]), drought-affected (AOR = 0.640, 95%CI: [0.507, 0.808]), nonagricultural business (AOR = 0.655, 95%CI: [0.472, 0.908]), dependency ratio from 50 to 75% (AOR = 0.680, 95%CI: [0.534, 0.867]), having 6 to 10 livestock (AOR = 0.644, 95%CI: [0.496, 0.836]), and more than 10 livestock (AOR = 0.362, 95% CI: [0.284, 0.461]) were found to be significantly associated with the household's food insecurity at 5% level of significance. *Conclusion*. The household head's age from 30 to 64, being literate, drought-affected, having nonagricultural business, dependency ratio from 50 to 75%, and owning more than 10 livestock have been negatively affecting food insecurity. While supporting households, a "widowed, divorced, or separated" household head has had a positive effect on food insecurity in rural Ethiopia positively influencing food insecurity in rural Ethiopia. Policymakers need to pay special attention to very young and old-aged household heads, adult education, household self-help, livestock improvement, and entrepreneurship while implementing poverty reduction programs.

1. Introduction

Food insecurity is imminent whenever there is unreliable physical and economic access to food that is sufficient, safe, and nutritious for all [1]. Food and nutrition security can only be achieved when everyone has adequate access to nutritious food that is physically, socially, and economically safe (free from contamination), when one has dietary needs and healthy dietary choices for an active and healthy life [2]. The effects of food insecurity are felt in all age groups, however, infants and women of childbearing age face the greatest problem of food insecurity [3].

Global hunger is still serious. According to the Food and Agriculture Organization (FAO)'s 2021 report on food insecurity, nearly 811 million people around the world were hungered in 2020, which is more than 161 million people in 2019. Nearly 2.37 billion people in the world did not have access to adequate food by 2020, which represents an increase of 320 million people in just one year [4]. Compared with 2019, about more than 46 million people in Africa, 57 million people in Asia, and approximately14 million people in Latin America and the Caribbean were affected by hunger in 2020, as indicated in the corresponding report. Among regions of the world, South Asia and Sub-

Saharan Africa continue to have the highest rates of hunger [5].

Rural areas today particularly face food insecurity for a variety of reasons, including rapid population growth, low agricultural productivity, lack of sustainable food security policies, macroeconomic instability, and rapid fluctuations in the prices of agricultural products [6]. Moreover, the COVID-19 pandemic may have both direct and indirect impacts on food security and nutrition as suggestions stated in [7], with outcomes being dependent on the baseline situation of communities, countries, and regions, as well as on their resilience to shocks [8]. In 2020, the COVID-19 pandemic and the unprecedented desert locust swarm in East Africa clouded the economic outlook in ways no one expected, and the situation will only get worse unless we act urgently and take efficient action [9].

Ethiopia remains one of the poorest countries in the world with an annual per capita income of $883 as estimated by the government (MoFEC, 2019) [10], and it has a population believed to be living below the poverty line [11]. Currently, Ethiopia faces a high level of food insecurity. According to the Global Hunger Index (GHI), Ethiopia ranks 90th out of 116 countries and ranks among the world's hungriest [12]. Furthermore, according to United Nations report, around 22 million people will be in need of food aid in 2022 [13].

The Government, WFP, and other partners are struggling to alleviate the hunger crisis in the country, however, the combined effects of conflict, drought, floods, locust invasions, long-lasting combined effects of pilgrimage, market disruptions, and high food prices, and the COVID19 pandemic have left about 13.6 million people food insecure [14].

Estimating the number of people with food insecurity in a country is an important step in efforts to reduce hunger around the world. As an important part of problem assessment, we can target resources to the households we need today and provide essential information to reduce our vulnerability to future shocks [15]. Despite estimating the prevalence of food insecurity households, it is also important to identify the key factors that determine a household's food insecurity to reduce the country's vulnerability.

In several previous studies on food security in Ethiopia, factors, such as age of the household head [16–19], lack of off-farm income [17, 20], large family size [17–19, 21], lack of livestock, borrowing money from informal rural money lenders [18], rain shock/frequent droughts [20, 22], illiteracy of household head [18, 21, 23], low income level, no fertilizer use, holding low land size [18, 23], high dependency ratio, and low access to credit [21, 23] positively affected the extent of households' food insecurity, whereas farm income, access to credit [16, 17, 24], having farm land [19, 22, 24], participation in off-farm activities [24], household head's high level of education, and having livestock holdings [16, 19, 22–24] negatively affected the extent of households' food insecurity. In other study, soil fertility and the gender of household head [25] did not show a significant influence on food insecurity.

However, most of these previous studies were conducted in particular settings of a country, and hence, food security status and determinant factors at the national level were not assessed. The majority of Ethiopians (79.24%) live in rural areas [26] and are engaged in the production of crops and livestock for their own consumption and market sales. Agriculture is the primary source for Ethiopia's economy. Increasing the production of one's own farm or herd improves household food security as it is closely related to agricultural productivity. However, undernutrition is widespread throughout the country and rural areas are particularly susceptible to chronic undernutrition, irregular food supply, and high food prices, and there is even food shortage for people. Therefore, the purpose of this study is to evaluate the current status of household food security in rural Ethiopia and to identify the determinants.

2. Methods and Materials

2.1. Study Area. The study was conducted in Ethiopia. Ethiopia is located in the north eastern hemisphere, with a latitude and longitude of 9.1450° N and 40.4897° *E*, respectively (world population review). It is located in the Horn of Africa, with more than 112 million people (2019), having a rural share of 79%, the second most populous nation in Africa next to Nigeria, and the fastest growing economy in the region, however, it is still one of the poorest countries with a per capital income of $883 [10]. Currently, Ethiopia has ten regional states. Furthermore, the regions are subdivided into zone administrations.

2.2. Study Data, Design, and Sampling. In this study, a cross-sectional Ethiopian socioeconomic survey (ESS) data was utilized to investigate the factors associated with food insecurity status of households in rural Ethiopia. The data collection has been conducted by Central Statistics Agency (CSA) of Ethiopia from September 2018 through August 2019 [27]. It was the fourth ESS implemented, just two years after the third survey in 2015/16, and it was aimed to collect multitopic, household-level panel data to improve agriculture statistics and generate a clearer understanding of the link between agriculture and other sectors of the economy [27].

A two-stage stratified (rural/urban) probability sampling design was applied. In the first stage of sampling, enumeration areas (EAs) from both rural and urban areas were taken. However, the current study has considered data only from rural strata. The second stage of sampling was the selection of households to be interviewed in each EA. A sample of 3115 households was selected from 316 clusters across rural Ethiopia [27].

2.3. Study Variables. The response (dependent) variable was food insecurity status, denoted by y_i. It is a binary variable, and its classification is based on the food security index. According to [5, 28, 29], the food security index of a household is estimated as follows:

$$\mathbf{F_i} = \frac{\textbf{annual Per capita food expenditure for i}^{\textbf{th}}\textbf{ household}}{2/3\ \textbf{mean annual per capita food expenditures of all households}}, \quad (1)$$

where F_i = Food security index, $F_i \geq 1$ = food secure for the i^{th} household, and $F_i < 1$ = food insecure for the i^{th} household.

A food insecure household is that whose per capita food expenditure falls below two-thirds of the mean annual per capita food expenditure.

Therefore, the food insecurity status of the ith household (y_i) is given by the following:

$$\mathbf{y_i} = \begin{cases} 1, & \textbf{if i}^{\textbf{th}}\textbf{ household is food insecure}, \\ 0, & \textbf{if i}^{\textbf{th}}\textbf{ household is food secure}. \end{cases} \quad (2)$$

The predictor variables were selected to meet the objectives of the study. Variables were selected based on previous studies to rigorously compare the results. Those are included as follows:

Household Head characteristics: age, sex, education level, and marital status of household.

Major shocks household faced: death of the household member(s), illness of the household member(s), and drought in the community in the twelve months prior to the date of study.

Household level socioeconomic characteristics: dependency ratio, employment status, access to credit and aid assistance, land owner, total livestock, and doing nonagricultural business.

2.4. Data Analysis. This study used a logistic regression model, which is compatible with the binary response variable [30]. A logistic regression will model the chance of an outcome based on individual characteristics. As chance is a ratio, what will be actually modeled is the logarithm of the chance, given by the following:

$$\log\left(\frac{\boldsymbol{\pi}}{1-\boldsymbol{\pi}}\right) = \boldsymbol{\beta}_0 + \boldsymbol{\beta}_1\mathbf{X}_1 + \boldsymbol{\beta}_2\mathbf{X}_2 + \cdots + \boldsymbol{\beta}_\mathbf{m}\mathbf{X}_\mathbf{m}, \quad (3)$$

where π indicates the probability of an event (food insecurity in the current study), β_i', s are regression coefficients, X_i is the explanatory variable, and β_0 is the intercept [31]. To estimate the unknown coefficients (parameters), a maximum likelihood estimation method was used [32]. A bivariate analysis was performed at 25% level of significance to select candidate predictor variables to be included in the multivariable analysis [33]. Moreover, automatic variable selection was also carried out at 10% level of significance to determine variables among preselected candidates to be retained in the final model. An adjusted odds ratio (AOR) with a 95% confidence interval (CI) and $P < 0.05$ value was used to declare statistical significance. Besides model building, its overall model validation was checked using Hosmer and Lemshow's fit test. Finally, the plots of binned standardized residuals were visualized to diagnose influential observations [34].

3. Results

Of the 3,115 households included in the ESS, 1,556 households (49.95%) were food secure, and 1,559 households (50.05%) were food insecure.

3.1. Household's Food Security Status among Household Head's Demographic Characteristics. In the result of this study, households headed by women had more food insecurity prevalence. Of the 825 households headed by women, 536 (65.0%) had food insecurity. On the other hand, of the 2290 households headed by men, 1267 (55.3%) were food secured. Of all households, the majority of household heads were between the ages of 30 and 64, and 2187 households were with less food insecurity. However, 292 households (54.2%) and 226 households (58.1%) whose heads are between 15 and 29 years old and over 65 years of age are worried about food Of the rural households surveyed, 2018 household heads were illiterate, and 1066 (52.8%) of these households faced food insecurity. In contrast, out of 602 (55.0%) households that are food secure were those that have an educated household head. Of the 599 households whose heads are divorced, separated, and widowed, 428 (71.5%) are food insecure. Meanwhile, 68 (57.6%) of households are at risk of food insecurity out of 118 households whose head of household has never been married in a marital status. On the other hand, 1334 (55.7%) households with a married head of household have food security (Table 1).

3.2. Household Food Security Status among Some Socioeconomic Variables. In Table 2, of the 865 heads of households without a job, 490 households (56.6%) have food insecurity. Even among households with a working head, 1068 (47.5%) households face food insecurity. More than half or 1,487 (50.7%) rural households do not have a nonagricultural business and do not guarantee food safety, while in nonagricultural households, 109 (61.2%) of them were guaranteed food during the study period. Of the total number of households included in the study, 2629 households do not have access to credit, and out of 1321 households, 50.2% are in a state of food insecurity. In addition, almost half, i.e., 238 (49.9%), of the households, even though they have access to credit, are not guaranteed food. 1,262 (49.0%) households experienced food insecurity out of 2,576 households that are not receiving support. In addition, more than half, i.e., 297 (55.1%), of the households also suffer from food insecurity when receiving support. Among the rural households in the

Table 1: Association of households' food security status with some household head's demographic characteristics in rural Ethiopia.

Predictors (factors)	Categories	Food security status (FSS)		Total (100%)
		Secure	Insecure	
Sex of HH head	Male	1267(55.3%)	1023 (44.7%)	2290
	Female	289 (35.0%)	536 (65.0%)	825
Age of HH head	15–29	247 (45.8%)	292 (54.2%)	539
	30–64	1146(52.4%)	1041 (47.6%)	2187
	65+	163 (41.9%)	226 (58.1%)	389
HH head literacy status	Yes	602 (55.0%)	492 (45.0%)	1094
	No	952 (47.2%)	1066 (52.8%)	2018
Marital status of HH head	Never married	50 (42.4%)	68 (57.6%)	118
	Married	1334 (55.7%)	1062 (44.3%)	2396
	Others a	171 (28.5%)	428 (71.5%)	599
Overall prevalence of FSS	1,556 (49.95%)	1,559(50.05)	3115	

a Widowed, divorced, and separated.

Table 2: Association of household food security status among some socioeconomic variables in rural Ethiopia.

Predictors (factors)	Categories	Food security status (FSS)		Total (100%)
		Secure	Insecure	
Employment status of HH head	Yes	1179 (52.5%)	1068 (47.5%)	2247
	No	375 (43.4%)	490 (56.6%)	865
HH access to credit	Yes	248 (51.0%)	238 (49.0%)	486
	No	1308 (49.8%)	1321 (50.2%)	2629
AID assistance	Yes	242 (44.9%)	297 (55.1%)	539
	No	1314 (51.0%)	1262 (49.0%)	2576
Land ownership	Yes	1331 (50.1%)	1324 (49.9%)	2655
	No	223 (48.8%)	234 (51.2%)	457
HH owned a nonagricultural business	Yes	109 (61.2%)	69 (38.8%)	178
	No	1447 (49.3%)	1487 (50.7%)	2934
Remittance	Yes	217 (43.9%)	277 (56.1%)	494
	No	1339 (51.1%)	1282 (48.9%)	2621
Dependency ratio	[0–25]	319 (41.2%)	456 (58.8%)	775
	(25–50]	425 (51.1%)	406 (48.9%)	831
	(50–75]	320 (59.8%)	215 (40.2%)	535
	(75–100]	492 (50.5%)	482 (49.5%)	974
Total livestock	0	181 (34.0%)	351 (66.0%)	532
	1–5	369 (41.6%)	519 (58.4%)	888
	6–10	295 (49.9%)	296 (50.1%)	591
	>10	711 (64.4%)	393 (35.6%)	1104
Overall prevalence of FSS		1,556 (49.95%)	1,559(50.05)	

survey, 457 households have no land and 234 (51.2%) of them are likely to experience food insecurity. Furthermore, nearly fifty percent, i.e., 1324 (49.9%) of households with agricultural land also do not achieve food security.

Of the 494 households receiving remittances, 277 households (56.1%) are food insecure. In addition, 1282 (48.9%) are also food insecure out of 2,621 households that do not have remittances. Among the 775 households with a family dependency ratio from 0 to 25%, there are 456 households (58.8%) at risk of food insecurity. In addition, households with a dependency ratio of 75 to 100%, which is almost fifty percent, or 482 (49.5%), of households, have food insecurity problems. Among the total number of households included in the survey, there were 532 households that did not have livestock, of which 351 households (66.0%) had a higher risk of food insecurity. Among the households with 1 to 5 members and those with 6 to 10 people, 519 households (58.4%) and 296 households (50.1%) lacked food, respectively. However, households with 10 or more livestock, i.e., 393 households (35.6%), were less likely to be at the risk of food insecurity (Table 2).

3.3. Some Shock Variables That Households Faced. From the results of this study, drought and household member mortality are one of the main constraints on food security, with 158 (39.7%) households experiencing drought shock and 34 (61.8%) of the dead household members experiencing food insecurity. However, 1401 (51.6%) of households not affected by the drought were also affected by food insecurity. Finally, family illness also contributed to family food insecurity. Of the 527 households with sick households, 262 (49.7%) faced food security restrictions (Table 3).

Table 3: Association of household food security status among shock variables that households faced 12 months prior to the survey visit in rural Ethiopia.

Predictors (factors)	Categories	Food security status (FSS)		Total (100%)
		Secure	Insecure	
HH affected by drought shock	Yes	240 (60.3%)	158 (39.7%)	398
	No	1316 (48.4%)	1401(51.6%)	2717
HH affected by death shock	Yes	21 (38.2%)	34 (61.8%)	55
	No	1535 (50.2%)	1525(49.8%)	3060
HH Affected by illness shock	Yes	265 (50.3%)	262 (49.7%)	527
	No	1291 (49.9%)	1297 (50.1%)	2588
Overall prevalence of FSS		1,556 (49.95%)	1,559(50.05)	3115

3.4. Variable Selection. Instead of immediately accessing a multiple logistic regression model that includes all presented predictors to determine the underlying factors for food insecurity, the following procedure selected predictors for inclusion in the model. At the initial stage of model construction, bivariate analysis was performed at a significance level of 25%. Statistically insignificant variables, such as household access to credit (P value = 0.605), land ownership (P value = 0.598), and household illness shock (P value = 0.867), were removed from the model (Table 4). Next, automatic variable selection was performed at the 10% significance level to identify significant variables among the variables that were significant at the 25% significance level. At this stage, the employment status of household head, household access to credit, household remittance access, and death shock in the household were also removed from the model.

Therefore, the final fitted logistic regression model included only eight independent variables, such as the gender of the head of the household, the marital status of the head of the household, the shock of drought on the household, the dependency ratio of the head of the household, agricultural business ownership, number of livestock owned, age of household head, and the literacy status of the household head. In the final model, the gender of the head of the household is not important but was automatically retained.

3.5. Determinants of Households' Food Security. Table 4 shows estimates of the demographic, socioeconomic, and shock factors influencing households' food insecurity. Based on this result, households with heads aged 30–64 had a lower risk of food insecurity than households with heads aged 15–29 (AOR = 0.786, 95% CI: [0.635; 0.973]). However, there is a small difference in the risk of food insecurity between households with the youngest head of household (aged 15 to 29 years) and the oldest (aged 65 and older) (AOR = 0.848, 95% CI: [0.624, 1.151]). In addition, households with widowed, divorced, or separated heads had a higher risk of food insecurity than unmarried heads (AOR = 1.588, 95% CI: [1.001, 2.518]). However, there was no significant risk difference in food insecurity between married and unmarried households (AOR = 0.78, 95% CI: [0.524, 1.161]). In addition, households with educated heads were at a lower risk of food insecurity than households with illiterate heads (AOR = 0.702, 95% CI: [0.590, 0.834]).

Households with nonagricultural business had a lower risk of food insecurity compared to those of households without nonagricultural businesses (AOR = 0.655, 95% CI: [0.472, 0.908]). Families with 6 to 10 livestock have a lower risk of food insecurity than those of households without livestock (AOR = 0.644, 95% CI: [0.496, 0.836]). Moreover, households with more than 10 livestock have a much lower risk of food insecurity compared to households that did not have livestock (AOR = 0.362, 95% CI: [.284, .461]. However, households having a small number of livestock (1–5) did not show a significant difference (AOR = 0.838, 95% CI: [0.661, 1.063]) in terms of the risk of food insecurity compared to families without livestock (Table 5).

In addition, the household dependency ratio has a negative impact on the risk of food insecurity (AOR = 0.68, 95% CI: [0.534, 0.867]. As the dependency ratio increases, the likelihood of food insecurity decreases. Fortunately, households affected by drought have a lower risk of food insecurity (AOR = 0.64, 95% CI: [0.507, 0.808]) than households not affected by drought. Finally, looking at the impact of aid, households that have received aid have a higher risk of food insecurity (AOR = 1.339, 95% CI: [1,089, 1.648) compared to households that have not received aid (Table 5).

3.6. Model Adequacy. The results of Hosmer and Lemshaw's test (chi-square = 13.4, p-value = 0.09) stated that the model fits the data well. Moreover, a plot of binned standardized residuals versus predicted probabilities shows the standardized residuals ranging from -2 to 2, indicating that there are no observed potential outliers' influencing the fitted model (Figure 1).

4. Discussion

This study was aimed to evaluate households' food security status and its determinants in rural areas of Ethiopia. A cross-sectional Ethiopian socioeconomic survey (ESS) data from September 2018 to August 2019 was used. Two stage probability sampling technique was applied in the survey. According to our findings, the overall prevalence of food insecurity was 50.05%. This percentage shows a high prevalence that households were more likely to suffer from food insecurity.

Table 4: Logistic regression result of one predictor variable on household (HH) food insecurity status (bivariate analysis) at 25% level of significance.

Predictors (factors)	Category	Unadjusted odds ratio (OR)	St. Err.	[75% CI]	p-value
Sex of HH head: female (ref)	Male	0.435	0.084	[0.395 0.480]	≤0.001
Age of HH head: 65+(ref)	15–29	0.853	0.134	[0.731 0.995]	0.235
	30–64	0.655	0.111	[0.576 0.745]	≤0.001
Marital status of HH head : never married (ref)	Married	0.585	0.112	[0.403 0.851]	0.005
	Others [a]	1.840	0.381	[1.226 2.762]	0.003
Literacy status of HH head: illiterate (ref)	Literate	0.750	0.075	[0.669 0.796]	≤0.001
Employment status of HH head: no (ref)	Yes	0.693	0.081	[0.632 0.761]	≤0.001
HH access to credit: no (ref)	Yes	0.950	0.099	[0.48 1.065]	0.605
AID assistance: no (ref)	Yes	0.783	0.095	[0.701 0.873	0.010
Was HH affected by death shock: no (ref)	Yes	1.630	0.280	[1.181 2.249]	0.081
Was HH affected by drought shock: no (ref)	Yes	0.618	0.109	[0.545 0.701]	≤0.001
Was HH affected by illness shock: no (ref)	Yes	0.84	0.096	[0.882 1.098]	0.867
Land ownership: no (ref)	Yes	1.055	0.101	[0.939 1.185]	0.598
Owning nonagricultural business: no (ref)	Yes	0.616	0.158	[0.513 0.739]	0.002
Remittance: no (ref)	Yes	0.750	0.099	[0.670 0.840]	0.004
Dependency ratio: (76–100] (ref)	[0–25]	1.459	0.097	[1.305 1.632]	≤0.001
	(25–50]	0.975	0.094	[0.875 1.087]	0.790
	(50–75]	0.686	0.109	[0.605 0.777]	0.001
Total live stock owned: >10 (ref)	0	3.508	0.111	[3.088 3.986]	≤0.001
	1–5	2.545	0.093	[2.287 2.831]	≤0.001
	6–10	1.815	0.104	[1.611 2.045]	≤0.001

aWidowed, divorced, and separated.

Table 5: Estimates of binary logistic regression and determinants of household's food security in rural Ethiopia.

Factors	Category	AOR	St. Err.	p-value	95% CI
Sex of HH head	Male	.84	.099	.139	[.667 1.059]
	Female (ref)	1	.	.	.
Marital status of HH head	Married	.78	.158	.221	[.524 1.161]
	Others a	1.588	.373	.049 **	[1.001 2.518]
	Never married (ref)	1	.	.	.
AID assistance	Yes	1.339	.142	.006 ***	[1.089 1.648]
	No (ref)	1	.	.	.
HH affect by drought	Yes	.64	.076	.000 ***	[.507 .808]
	No (ref)	1	.	.	.
HH owned nonfarm business	Yes	.655	.109	.011 **	[.472 .908]
	No (ref)	1	.	.	
HH dependency ratio	[0–25] (ref)	1	.		
	(25–50]	.862	.093	.169	[.697 1.065]
	(50–75]	.68	.084	.002 ***	[.534 .867]
	(75–100]	.872	.092	.196	[.709 1.073]
Total livestock	0	(ref)	1	.	.
	1–5	.838	.102	.146	[.661 1.063]
	6–10	.644	.086	.001 ***	[.496 .836]
	>10	.362	.045	.000 ***	[.284 .461]
Age of HH head	15–29 (ref)		1		.
	30–64	.786	.086	.027 **	[.635 .973]
	65+	.848	.132	.29	[.624 1.151]
HH head literacy status	Yes	.702	.062	.000 ***	[.590 .834]
	No (ref)	1	.	.	
Constant	-	3.412	.809	0.000 **	[2.144 5.430]

a Widowed, divorced, and separated, ** p-value < 0.05, and *** p-value <0.001.

Although the descriptive results showed that households with female heads are more susceptible to food insecurity than households with male heads, the probability that the household head is female or male does not show a significant difference in food security status among households in the regression analysis results. This result is consistent with the

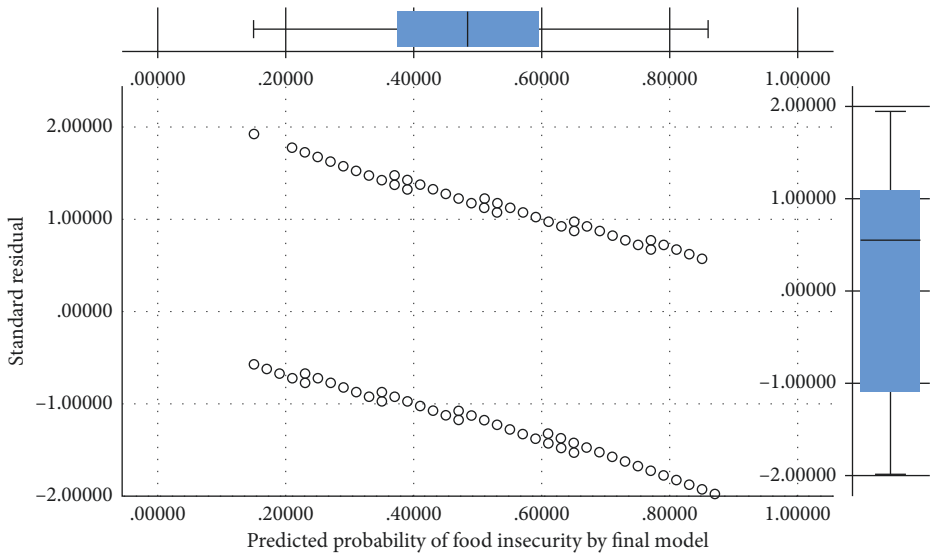

Figure 1: Binned standardized residuals versus predicted probabilities to check model adequacy.

study in Ethiopia [25], however, it is inconsistent with another study [35]. Moreover, the study done by [36] also found that gender had a negative and insignificant effect on household food security status.

However, the results of binary regression analysis have shown that households with widow, divorced, or separated heads have a negative and significant impact on household food insecurity. Households whose heads were widowed, divorced, or separated were 1.588 times more likely to face food insecurity than households who had unmarried heads. This result, however, showed no significant difference in the risk of food deficiency between married and never-married householders.

Household aid assistance or support has an impact on food security, with supported households having a 1.339 times higher risk of food insecurity than nonsupported households. Fortunately, drought-affected households had a negative impact on food insecurity, with the likelihood of food insecurity in drought-affected households being 0.36 times lower compared with unaffected households. It is inconsistent with previous studies [20, 22] that, as noted, frequent drought has a positive effect on food insecurity risk.

In our findings, households in nonagricultural businesses were 0.345 times less likely to be food insecure than households not in nonagricultural business. Other studies [17, 20, 35–37] also confirmed our results. Nonagricultural activities also improve household economies and food security by creating additional income and reducing food shortages when agricultural production declines.

As a result of our research, household dependent ratios have a negative significant impact on the risk of food insecurity. As the number of dependents increases, households are more likely to have food security. However, it was inconsistent with other studies [21, 23, 38], as they found that households are more likely to have food insecurity as the number of dependents increases. Our results may be attributed to the wealthiest households because well-off households are generally better off, and they are not food insecure despite having more dependent families.

The other important determinant of household food insecurity in this study was the age of the household head. Households whose head's age ranged from 30 to 64 had 0.214 times lower risk of food insecurity than households with heads aged 15–29. It was supported by other studies [16–19]. The findings of our study showed that owned livestock was an essential predictor to the households' food security. This finding is consistent with the results of other studies [18, 37]. There were some instances in our study, where households owning 6 to 10 livestock had 0.356 times lower risk of food insecurity than the households without livestock. Moreover, households with more than 10 livestock had 0.638 times much lower risk of food insecurity compared to households that did not have livestock. However, households having a small number of livestock (1–5) did not show significant differences in terms of the risk of food insecurity compared to families without livestock.

In our study, automatic variable selection removes the "access to credit" factor from the model. However, other studies [21, 23, 36, 38, 39] found that it was one of the important factors for household food security and stated that households with access to credit were more likely to have food security compared to households who do not have access to credit.

In this study, it was found that the education level of the household head has a statistically significant relationship with food insecurity. The disparity in food insecurity among literate household's heads was 0.298 times much lower than that of illiterate households' heads, indicating that households with illiterate heads are more likely to suffer from food insecurity than households having literate heads. Households whose heads cannot read and write are at a greater risk of food insecurity than households whose heads can read

and write. Similarly, studies [18, 21, 23, 35, 36, 38] also found a significant negative relationship between educated household heads and household food insecurity.

4.1. Limitations. However, since this study mainly focused on identifying the determinants of household food insecurity in rural Ethiopia, some variables thought to have an impact on food insecurity were not addressed, e.g., the use of improved seeds, soil fertility, irrigation survival, distance to market, climatic and weather conditions, rainfall, and temperature. Therefore, the authors are encouraged to consider these factors in future studies.

5. Conclusion

The prevalence of food insecurity in Ethiopia has been found to be very high. The age of the head of household, the marital status of the head of household, the literacy rate of the head of household, aid assistance, drought, nonagricultural business ownership, household dependency ratio, and the number of livestock owned were identified as important factors influencing food insecurity in rural Ethiopia. The findings of this study also showed that widows, divorced, and separated heads of household were more likely to make their households food hungry.

Therefore, strategies to reduce food insecurity must include measures that reduce marital breakdown. For example, educating girls, ending early marriage, reducing intimate partner violence against women, promoting sex education, reducing family interference in marriage, and supporting consensual marriage could reduce marital failure and contribute positively to household food security. Households with very young or older heads have been found to be more vulnerable to food insecurity. Hence, policymakers need to pay special attention to these age groups while implementing poverty reduction programs. There is also a need to expand adult education programs in rural Ethiopia as illiteracy rates among household heads have been found to contribute to food insecurity.

Food security in rural Ethiopia is accelerating as the number of nonagricultural enterprises and households owning livestock increases. Therefore, there is a need to raise awareness on livestock improvement and entrepreneurship programs across the country. The link between food insecurity and access to aid is one of our findings, suggesting that providing aid alone is not the right way to increase food security and other household self-help programs should be planned instead. Self-help programs could expand sustainable agriculture and increase agricultural productivity.

Abbreviations

AOR: Adjusted Odds Ratio
CI: Confidence Interval
CSA: Central Statistics Agency
EAs: Enumeration Areas
ESS: Ethiopian Socio-Economic Survey
FAO: Food and Agriculture Organization
GHI: Global Hunger Index
HH: Household
MoFEC: Ministry of Finance and Economic Cooperation
OR: Odds Ratio
WFP: World Food Program.

Data Availability

All relevant data are sources are included in the article. The dataset for this article is available upon request from the authors.

Consent

Not applicable.

Conflicts of Interest

All authors declare that they have no conflicts of interest.

Authors' Contributions

Both authors were involved equally in the design, data extraction, data management, data analysis, report writing, and editing of the final manuscript.

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