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COMPARATIVE ANALYSIS OF DETERMINANTS OF DIETARY DIVERSITY AMONG CHILDREN UNDER FIVE IN SELECTED WHEAT AND COFFEE GROWER RURAL HOUSEHOLDS OF ETHIOPIA

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Abstract

The study attempted to address a comparative analysis of children's dietary diversity between selected wheat and coffee grower households in Ethiopia. Measuring dietary diversity and its determinants were major intents of the study. The study employed a mixed research design and an ordinal probit model. From a total of 220 children, 79.6% of them consume food containing grains, nuts, and tubers followed by milk and milk products and foods cooked in oil (60.6% and 60.2%) and eggs (46.9%), respectively. The model result indicated that the Purpose of production and household food security status; maternal age, physiological status, and employment status; and sex of the child and frequency of meals had strong and significant effects on child dietary diversity. Substantial effort should be made to ensure malnutrition-free children by enhancing dietary diversity in coffee and wheat-growing rural households of the study areas and in Ethiopia at large.

Keywords: Dietary diversity, under-five children, Ethiopia, Gomma, Dodota, Arsi, Coffee growers, Wheat growers

INTRODUCTION

Globally children's health and well-being are highly affected by several factors including malnutrition mainly emanating from poor dietary diversity. Food items that are rich in essential nutrients and diverse diets are optimal for optimal complementary feeding for under the age of five children to meet their nutrient requirements and overall growth and development (Source). Child undernutrition and poor dietary diversity remain high in Ethiopia and hence poor dietary diversity among under the age of five children remains a critical public health concern (Ali et al., 2013).

According to WHO (2016) and Black et al (2013), chronic malnutrition, wasting, and other physical and mental disorders are claimed to be major causes of child morbidity in developing nations including Ethiopia. Besides, meeting the minimum dietary diversity standard has been a major challenge in developing countries including Ethiopia (Bedada Damtie et al., 2020). The importance of nutrition has been emphasized for the intellectual and physical development of children (Frempong & Annim, 2017).

Dietary diversity is defined as the number of food groups or items consumed over a reference period(Di Marcantonio et al., 2020; Ruel, 2003; Usman & Callo-Concha, 2021). Dietary diversity can be measured at different units of analysis vis-à-vis individual or household level using a standardized questionnaire. Several food groups regardless of the types of food items consumed over a period of time are used most often (Frempong & Annim, 2017; Kundu et al., 2021).

DD refers to the consumption of foods from major nutritionally significant types of food while maintaining a balance between plant and animal source meals, according to the World Health Organization. It is a predictor of children's micronutrient intake and nutritional status (Seboka et al., 2021a). Dietary diversity is a simple metric that is widely used as a proxy for dietary quality, micronutrient sufficiency, and food availability which is a useful indicator of dietary quality for infants and young children in developing countries (FANTA, 2006). Measuring under-five children's dietary diversity was calculated based on eight food groups namely: grains, roots, and tubers; Legumes and nuts; Dairy products; flesh foods such as meat, fish, and poultry; Eggs; Vitamin-rich fruits and vegetables; Other fruits and vegetables and finally, fats and oils (FANTA, 2006).

Several studies have been conducted and examined the relationship between the dietary diversity of under-five children with socioeconomic, demographic, and institutional factors. Under five children dietary diversity are determined by several factors including age of the child (Bedada Damtie et al., 2020; Dinku et al., 2020; Eshete et al., 2018; Kassahun Belew et al., n.d.; Kuche et al., 2020; N. et al., 2018; Seboka et al., 2021a; Sema et al., 2021; Woldegebriel et al., 2020); frequency of meal of under-five child in 24hours (Aemro et al., 2013; Seboka et al., 2021a; Temesgen et al., 2018); household food security status (Kuche et al., 2020); household income(Eshete et al., 2018; Kuche et al., 2020; Kundu et al., 2021; Rakotonirainy et al., 2018); sex of the child (Di Marcantonio et al., 2020; Dinku et al., 2020; Sema et al., 2021); decision making role of women ion key household resources (Di Marcantonio et al., 2020; Sema et al., 2021; Usman & Callo-Concha, 2021) and maternal employment status (Belete et al., 2022; Di Marcantonio et al., 2020; Kuche et al., 2020; Woldegebriel et al., 2020); maternal educational level (Belete et al., 2022; Cordero-Ahiman et al., 2021; Kundu et al., 2021; Seboka et al., 2021a; Sema et al., 2021). Besides,

factors like remittance (Dereje et al., 2021) and size of cultivated land (Cordero-Ahiman et al., 2021; Dereje et al., 2021; Usman & Callo-Concha, 2021) affected child dietary diversity in coffee and wheat grower rural households of both Gomma and Dodota districts. The findings of (Sema et al., 2021; Temesgen et al., 2018; and Wuneh et al., 2019) revealed that a history of post-natal care of the mother had a significant association with the attainment of higher child dietary diversity scores. Previously researchers tried to address the identification of factors that may affect child dietary diversity without relating to either with production of wheat or coffee. Coffee and wheat are major crops that are vital sources of income for coffee and wheat grower households in Ethiopia. Thus, this paper was conducted with the aim of comparative analysis of the under-five children's dietary diversity in coffee growers of the Gomma district and Wheat growers of the Dodota districts, Ethiopia. Conducting a comparative analysis will help researchers, NGOs working in the area and other stakeholders understand common and unique factors of child dietary diversity in the two production systems, i.e. coffee and wheat growers, and guide policymakers for appropriate policy options on major determinants.

RESEARCH METHODOLOGY

Description of the study areas

The study was conducted in coffee-growing rural households of Gomma and Dodota districts of Jimma and Arsi zones, respectively, in Ethiopia. The study areas have been earlier described by Mequanent and Degefa (2022).

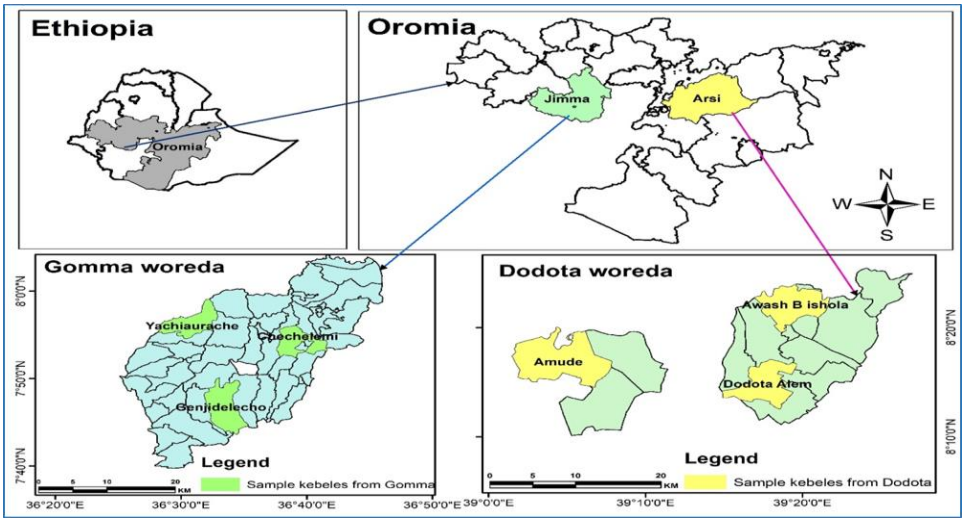

Fig.1. Map of the study areas

Study design

To assess dietary diversity and identify determinant factors among under five years children, the cross-sectional research design was applied. Such kind of research design allows the comparison of data obtained from qualitative and quantitative sources to clearly understand the research problem (Creswell et al., 2011; Morse and Niehaus, 2009). Data were collected by interviews with the primary caregivers of the children using a pretested structured questionnaire, interviews with key informants, direct

observation, and focus group discussions with mothers and/or persons responsible for preparing food and feeding under-five children in the particular household.

The questionnaire was intentionally designed to assess the types and number of food groups the child consumes 24 hours before the survey. Besides, demographic, and socio-economic characteristics of the household were also assessed. For triangulation purposes, Focus Group Discussion (FGD) and key informant discussions (KIs) along with personal observation were also been used. Moreover, this research has adopted pragmatism philosophy as a methodological underpinning to conduct a comparative study of child dietary diversity (6-59 months) between wheat growers and coffee growers' rural households.

Sampling procedure

A multistage sampling technique was employed to approach the study participants at the two research sites vis-a-vis coffee growers and wheat growers of the Jimma and Arsi zones, respectively. A non-random, purposive sampling method was used to identify the study zones primarily based on their wheat and coffee production potentials and prominent contributions of produce for income and livelihood diversification of Dodota and Goma rural households, respectively. The sampling procedure involved a stratified random sampling method to select the Gomma district from the Jimma zone and the Dodota district from the Arsi zone. Six kebeles, three per district were selected randomly using the lottery method. Accordingly, Genjidelecho, Yachiyaurache, and Chochelemi were taken from the Gomma district and Awash Bishola, Dodota-Alem, and Amude were obtained from the Dodota district. The sampling frame was rural households that have at least one under the age of five children in their household. Accordingly, households in particular mothers and/or caregivers of under-five age children living in the sample kebeles were identified using stratified random sampling followed by systematic random sampling method. When there exists more than one under-five children in the household, only the youngest under-five children will be considered for this study.

Sample size determination for sample households

The study applied Ymane's (1967) sample size determination formula to identify representative sample households and under-five children.

$n_1 = \frac{N_1}{1+N_1(e^2)}$ And $n_2 = \frac{N_2}{1+N_2(e^2)}$

Where, n is the sample size, N_1 (2928) and N_2 (2566) are population sizes of the Goma and Dodota districts, respectively and *e* is the level of precision which is 0.07, while n_1 and n_2 were sample sizes of the districts in the same order.

A total of 376 households were sampled from the two districts (188 from each district). The sampled households were further refined to obtain households that have at least one under-five children. Accordingly, a total of 226 rural households were selected for this study. A total of 122 and 104 households and respective children were obtained from Dodota district wheat grower households and Goma district rural households, respectively. The distribution of households and under-five children

at kebele level was presented as D/Xitu (57), Dodota Alem (31), and L/Sharbee (34)] from Dodota district wheat grower households and; Galcho Dalocha (48), Bulbulo (29) and Bulado Choche (27) were from Goma district of coffee growers.

Data collection methods and procedures

Face-to-face interviews using semi-structured and structured interview schedules were carried out from June to September 2020. The survey obtained various information including household demographic characteristics, socioeconomic, institutional variables, child feeding, and health-related issues. Furthermore, different aspects of qualitative data that weren't obtained using household surveys were generated using FGD and KI along with personal observations. Dietary diversity assessment of sample children was conducted using 24-hour dietary recall to obtain information on the child's food intake in the past day before the survey. Data were collected from trained health professionals working in the community and the researcher at the home of the respondents. Mothers/caregivers of sample children were asked about all foods eaten and beverages and other drinks the child has taken in the past day (24 hrs.) before the interview date.

Dietary Diversity terciles were derived from the 14 food groups into; low, medium, and high dietary diversity terciles. Individual DDS were then judged based on their position on the scale. Measuring the dietary diversity of 6-59-month-old children was emphasized in the instrument. Before data collection, necessary steps and procedures including ethical concerns and informed consent were obtained from caretakers of sample children. Enumerators who were aware of the local areas speak the local language and are well acquainted with local and cultural contexts were recruited for data collection. A pre-test on non-sample respondents was also made under the supervision of the researcher. Finally, the formal survey was conducted on 226 households and respective under five children after necessary modifications and adjustments were made from the pretest. Necessary steps and procedures including ethical concerns and informed consent were also obtained before taking data from sample children and their households.

Six focus group discussions, three from each district, were held to supplement the information *collected using the questionnaire and* still some data were applied for standalone analysis. Each group was composed of eight discussants purposively selected from among mothers or caregivers within the households with children under five years, experts from government offices and NGOs. Participants are typically selected based on criteria, such as willingness to participate in the study, knowledge of study sites, and child nutrition. Food production constraints in the area, cultural aspects of food, and causes of child malnutrition were major issues addressed by FGD.

Data that demand in-depth insight, feelings, and perceptions of respondents on various aspects of child malnutrition were collected using in-depth key informant interviews. Thus, a total of sixteen community members were engaged in key informants' interviews i.e. eight key participants per district. Willingness to participate in the study, awareness about the study sites, having explicit information about child health and nutrition, active involvement in community affairs, and being a parent of under five years age of child were some of the criteria to select the key informants. Accordingly, participants in KI involved three health extension workers, three community members one NGO expert, and one government-based expert at each study district. Checklists were developed and used to guide discussions with focus groups and individual key informants. The

participants were encouraged to use the local language that they were most familiar with. Health extension agents most familiar with the local language facilitated the group discussions. Data were collected from the study areas between April 2019 and September 2020.

The collected data were then made ready for conversion to compare with the standard to level the respective child's nutritional status as nourished malnourished and other nutritional outcomes such as underweight, stunting, and wasting standards.

Measuring diversity of children (6-59 months)

Data Analysis

A scale of eight food groups was used to assess the dietary diversity of under-five children. Child dietary score of children was analyzed using food consumption data from 24-hour recall and FAO guidelines for measuring household and individual dietary diversity (FAO, 2007). The dietary diversity of children was analyzed by counting several food groups (out of eight food groups) and each food group was given 0 and 1 values, where "1" denotes the child consumed the food group in the past 24 hours before the survey date and "0" otherwise.

Semi-structured interview schedules, questionnaires, and checklists were used as data collection instruments from different sources. Dietary data terciles were derived from the eight groups as low, medium, and high diversity terciles. The dietary diversity of sample respondents was assigned based on the number of food groups they consumed over 24 hours. Accordingly, children who consumed less than four food groups were regarded as low dietary diversity; those who consumed four to six were medium and those who consumed six and above were labeled as high dietary diversity tercile.

Method of data analysis

Data obtained from various sources were classified as socio-demographic, institutional, and child dietary diversity. The data were cleaned and entered into SPSS (version 26) and part of it was exported to STATA (Version 16.0), ENA, WHO Anthro 3.2.2, and Epi lnfo 6.04 computing software for further analysis and interpretation of key results. Descriptive statistics such as mean, minimum, maximum, frequencies, and percentage, inferential statistics such as chi-square, t-test, and other related tests and an ordered logit econometric model were applied to identify important variables that determine child dietary diversity.

Determinants of child dietary diversity

Regression models such as linear, logistic, and ordinal regression are vital to estimating the magnitude and effect of explanatory variables on dependent variables (Chen and Hughes, 2004).

The ordinal regression model is a type of logistic regression model that is used to analyze ordinal dependent variables when the outcome variable is an ordinal scale, it is a preferred modeling tool that does not assume normality or constant variance (McCullagh and Nelder, 1989). According to the same source, the model requires the assumption of parallel lines across all

levels of the outcome variable and it is rooted in the general framework of generalized linear models meant for analysis of ordinal dependent variable.

Several econometric models could applied to analyze ordinal dependent variables like child dietary diversity among under the age of five children in coffee and wheat growers can be labeled as low, medium, and high. However, after assessing several alternative models that can fit ordinal response dependent variables in the same category, the ordinal regression model was chosen to estimate the dependent variable of current research. The dependent variable, child dietary diversity has three ordered categories (low dietary diversity, medium dietary diversity, and high dietary diversity). The values attached to each category have meaningful sequential categories and it applied logit link function which is generally suitable for analyzing ordered categorical data when all categories are evenly distributed (SPSS, 2017).

When the logit link is applied, the general form of the ordinal regression model is formulated as:

$$f(\gamma j(x)) = \log\left(\frac{f(\gamma\, j(x)}{1 - f(\gamma\, j(x)}\right) = \log\left(\frac{pr(y \le jX}{pr(y > jx}\right) = \alpha j + \beta x,\ j = 1,2..k-1$$

$$\gamma j(x) = \frac{e^{\alpha j + \beta x}}{1 + e^{\alpha\, j + \beta x}}$$

According to McCullagh and Nelder, (1989), referring to this particular formula, j indicates the cut-off points for all categories (k) of the dependent variable, child dietary diversity in this case, the function f (yi(x)) is the link function that links the systematic components (i.e aj+bx) of the linear model, the alpha j a represents a separate intercept or threshold for each cumulative probability and b represents the regression coefficient.

Secondary data were obtained from pertinent non-governmental sources such as GIZ, CRS (Catholic Relief Service), Self Help Ethiopia, USAID; and Government organizations like Zonal and district-level health and agriculture offices. Data obtained from the above sources were analyzed and triangulated with other data obtained from primary sources. Besides, electronic and printed documents from various sources were collected for further analysis of subtle ideas.

RESULT AND DISCUSSION

The study has indicated that out of the total children considered for analysis, the majority (79.6%) of them consume food that contains grains, nuts, and tubers followed by milk and milk products and foods cooked in oil (60.6% and 60.2%) and eggs (46.9%). It has been observed that the consumption of vegetables and fruits, meat, poultry, fish, or seafood were food groups consumed by children in respective research sites in rare amounts and less diversified food groups(Table 1).

Table 1. Distribution of children under five of wheat and coffee grower HHs by their food group consumption

Food Group	Total(226)		Wheat grower(122)			Coffee grower(104)		
	F	%	F	% from total	% from Occupation	F	% from total	% from Occupation
Grains, nuts, or tubers	180	79.6	103	57.2	84.4	77	42.8	74
Vitamin A- Rich plant foods	89	39.4	50	56.2	41	39	43.8	37.5
Other fruits and vegetables	66	29.2	32	48.5	26.2	34	51.5	32.7
Meat, poultry, fish or seafood	47	20.8	21	44.7	17.2	26	55.3	25
Eggs	106	46.9	53	50	43.4	53	50	51
Pulses, legumes, or nuts	80	35.4	36	45	29.5	44	55	42.3
Milk and Milk products	137	60.6	68	49.6	55.7	69	50.4	66.3
Foods cooked in oil	136	60.2	65	47.8	53.3	71	52.2	68.3

Table 1. has shown that a fair number of children in wheat-growing households consume grains, nuts, or tubers (57.2%) and foods containing vitamin A-rich plant foods (56.2%). On the other hand, among all children from wheat growers, the majority (84.4%) consume grains, nuts, or tubers followed by milk and milk products (55.7%) and foods made with food oil (53.3%). Similarly, close to half of children from wheat-growing rural households consume fruits and vegetables (48.5%), eggs (50%), milk and milk products (49.6%), and foods made from food oil (47.8%).

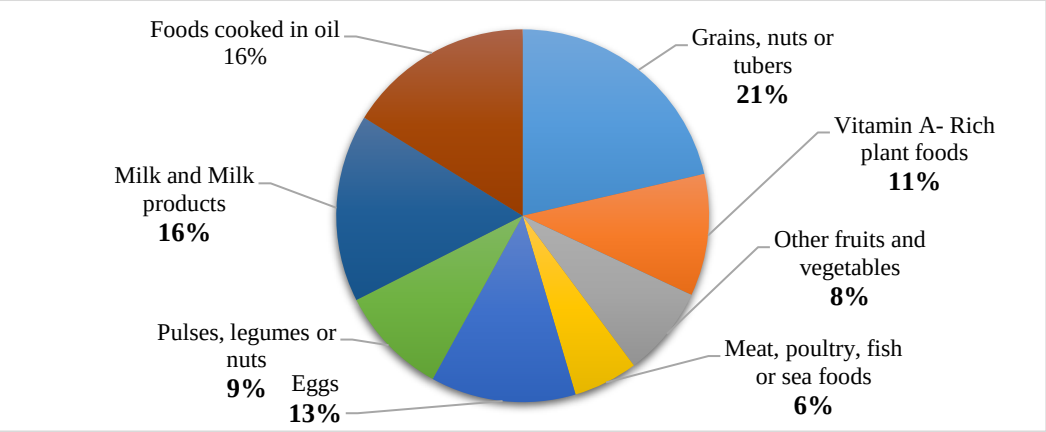

Fig 2. Major food groups consumed by under-five children in coffee and wheat grower HHs

The analysis has shown that children of both wheat and coffee grower households have shown comparable patterns of food group consumption. As you can see from Table 1, grains, nuts; milk and milk products, foods cooked in oil and eggs were major food groups consumed by a fair number of children from both research sites. On the other hand, meat, poultry, fish, seafood, and fruits and vegetables were food groups rarely used by a small number of children in both research site**s.**

Table 2. Characteristics household related variables against the household occupation

Variable	Response categories	Household Occupation					
		% of Wheat grower CDDS			% of Coffee grower CDDS		
		Low	Med.	High	Low	Med.	High
Household headship	Male Headed	93.4	100	89.5	89.8	93.8	100
	Female-headed	6.6	0	10.5	10.2	6.3	0
Sex of respondent	Male	85.2	85.7	78.9	83.7	81.3	87
	Female	14.8	14.3	21.1	16.3	18.8	13
Marital status of the respondent	Married	91.8	97.6	89.5	89.8	93.8	100
	Divorced	4.9	2.4	10.5	6.1	6.3	0
	Widow/widower	3.3	0	0	4.1	0	0
Religion of the HHH	Orthodox	14.8	9.5	5.3	10.2	18.8	13
	Muslim	80.3	85.7	78.9	85.7	81.3	87
	Protestant	4.9	4.8	5.3	4.1	0	0
	Catholic	0	0	5.3	0	0	0
	Wakefena	0	0	5.3	0	0	0
Access to drinking water	Yes	98.4	97.6	94.7	95.9	93.8	95.7
	No	1.6	2.4	10.6	4.1	9.4	4.3
Access to the nearest market	Yes	91.8	78.6	94.7	91.8	81.3	95.7
	No	8.2	21.4	0	8.2	15.6	4.3
Access to MFIs and/or banks	Yes	73.8	59.5	78.9	85.7	65.6	87
	No	26.2	40.5	16.1	14.3	34.4	13
Access to health institutions	Yes	90.2	83.3	94.7	91.8	84.4	95.7
	No	9.8	16.7	5.3	8.2	15.6	4.3
Food security status	Food secure	73.8	71.4	78.9	83.7	78.1	56.5
	Mild. food insecure	19.7	26.2	10.5	10.2	15.6	17.4
	Mod. food insecure	4.9	2.4	0	6.1	6.3	21.7
	Sev.food insecure	1.6	0	10.5	0	0	4.3

The assessment of this study revealed that most households were led by men and the respondents were dominated by male respondents. The majority of respondents who were involved in this study were married and mainly Muslim religion followers, though Orthodox Christianity, protestant, and catholic were also found in fewer numbers. From the findings, it can be depicted that the sample rural have access to basic infrastructure and services like safe drinking water, the nearest market, Financial institutions like MFIs and Banks, and health services. Likewise, most of the sample households had better off food security and the distribution of state of household food security both in coffee and wheat-growing rural households was disperse.

Table 3. Child and maternal characteristics of Coffee and wheat growers

Variable	Response categories	Household Occupation					
		% of Wheat grower DDS			% of Coffee growers DDS		
		Low	Med.	High	Low	Med.	High
Nutritional status	Severely Malnourished	19.7	19	21.1	20.4	18.8	17.4
	Mod. malnourished	27.9	23.8	52.6	34.7	18.8	52.2
	Nutritionally secure	52.5	57.1	26.3	44.9	62.5	30.4
Underweight	Underweight	13.1	23.8	21.1	24.5	15.6	34.8
	Normal weight	86.9	76.2	78.9	75.5	84.4	65.2
Stunting	Stunted	23	14.3	5.3	24.5	12.5	26.1
	Not Stunted	77	85.7	94.7	75.5	87.5	73.9
Wasting	Wasted	11.5	16.7	15.8	22.4	15.6	17.4
	Normal	88.5	83.3	84.2	77.6	84.4	82.6
Birth order of the child	1st	18	16.7	15.8	26.5	40.6	30.4
	2nd-3rd	34.5	38.1	37.1	34.7	21.9	34.8
	4th and beyond	47.5	54.8	47.4	38.8	37.5	34.7
Sex of the child	Male	60.7	45.2	47.4	57.1	50	39.1
	Female	39.3	54.8	52.6	42.9	50	60.9
Duration of EBF	< 6 months	21.7	31	63.2	42.9	46.9	30.4
	6 months	16.7	7.1	10.5	36.7	31.3	47.8
	> 6 month	61.7	61.9	26.3	20.4	21.9	21.7
Child still being breastfed?	Yes	47.5	47.6	26.3	30.6	28.1	47.8
	No	52.5	52.4	73.7	69.4	71.9	52.2
Frequency of meal	Once	3.3	9.5	5.3	4	9.4	21,7
	Twice	11.7	23.8	26.3	10.2	21.9	26.1
	Three times	48.3	35.7	31.6	34.7	12.5	8.7
	four times	36.7	31	36.8	51	56.3	43.5
Child been sick in the past 15 days?	Yes	13.1	9.5	15.8	26.5	21.9	13
	No	86.9	90.5	84.2	73.5	78.1	87
Maternal education	No formal education	31.1	26.2	31.6	6.1	15.6	17.4
	Basic education	26.2	40.5	31.6	36.7	28.1	39.1
	Primary education	41	28.6	31.6	40.8	28.1	34.8
	Secondary education	1.6	4.8	5.3	16.3	28.1	8.7
Mother's awareness on balanced diet and nutrition	Know nothing	0	9.5	0	6.1	0	0
	Heard of , little knowledge	77	61.9	52.6	36.7	46.9	52.2
	Aware but not apply	13.1	21.4	47.4	38.8	31.3	30.4
	Completely aware and apply	9.8	7.1	0	18.4	21.9	17.4
Maternal employment	Employed	88.5	90.5	78.9	75.5	75	60.9
	Unemployed	11.5	9.5	21.1	24.5	25	39.1

Econometric Model result

Household occupation/production system

The model result has shown that household occupation in the form of coffee or wheat production had an influence on the level of under-five child dietary diversity among coffee growers and wheat grower households of Goma and Dodota districts rural households, respectively. The p-value associated with this variable(0.013) confirmed statistical difference in under five child dietary diversity values along with coffee grower and wheat grower households at p<5%. The choice of crop production by a particular household is determined by several factors including, land size, fertility status, proximity to various market centers, and so forth. Engaged in either coffee or wheat production was associated with child dietary diversity both in coffee and wheat growers of Gomma and Dodota districts of Jimma zone and Arsi zones, respectively. As can be depicted from the model result, children from coffee growers households had better status of dietary diversity than their counterparts, wheat growers.

Purpose of production

As rational producers, farmers produce their major crops for consumption, market, or both for consumption. Here it should be taken into consideration that most farmers sell their produce, which is which remained not consumed by the household. In this particular study farmers in Gomma and Dodota district were engaged in the production of coffee and wheat, respectively. The model output has found that under five children dietary diversity score was highly influenced by the purpose of production of their respective major crops, i.e. wheat and coffee. The p-value associated with this variable indicated that the purpose of production has a significant contribution to the value of under-five child dietary diversity score both in coffee and wheat-growing rural households at p<5%. The model result indicated that the probability of higher dietary diversity increases with the purpose of production of either coffee or wheat. Households, producing for their consumption may target their under-five children in their production plan to enhance the dietary diversity and nutritional status of their children. On the other hand, it has been observed from the regression analysis that households whose production meant mainly for the market and both for consumption and market had low dietary diversity scores, children.

Household food security status

The model result has revealed that the level of household food security and child dietary diversity in respective study sites had strong and statistical associations. The *p-value* associated with the status of household food security (*0.029*) revealed that the status of household food security determines the status of under-five child dietary diversity at p<5%. In this particular study, it has been observed that there is a clear demarcation in the level of child dietary diversity along with household food security status. Household food insecurity, poverty, and bad livelihood outcomes were common development challenges in both groups of sample households. Children from food-secure households were found poor in their dietary diversity score mainly due to a lack of access to different food groups. The result has shown that the probability of poor dietary diversity increases across food insecure rural households. The result is consistent with studies from Ghana (*Antwi et al., 2022*) and Ethiopia (*Kuche et al., 2020*).

Sex of the child

Sex of the under-five child was one prominent variable that was hypothesized to affect the value of child dietary diversity in both coffee and wheat-growing rural households. The model output has shown that the status of the child diversity score was influenced by the sex of the child. The p-value (0.002) indicated the existence of statistical difference in the value of under-five child dietary diversity along with boys and girls under-five children in respective study sites and female Under-five age children have a higher probability of diversifying to food than their male counterparts at p< 5%. Studies conducted in Ethiopia by (Dinku et al., 2020; Sema et al., 2021; Wuneh et al., 2019), and Somalian Camp (Di Marcantonio et al., 2020) confirmed that the sex of the child is one of the key factors along with other variables which influences the level of dietary diversity of under-five children. The study find out that female under-five children had the better status of dietary diversity compared to males.

Frequency of meals of under-five children

Meal frequency was one of the prominent variables that was hypothesized to have association with under-five child dietary diversity. The model result indicated that the number of meals the child consume in 24 hour had been related with attainment of higher child dietary score. The result further confirmed that without compromising quality and quantity of food, the higher the number of meal offered to the under-five child, the higher the dietary diversity of that particular under five-child in production systems. The higher the number of meal per 24 hour increases the probability of attainment of higher dietary diversity. The p-value associated with this variable (0.055) implied increase in meal frequency of under-five child increases the likelihood of high dietary diversity among children from wheat and coffee farmers at p<10%. The finding is in line with (Seboka et al., 2021a; Temesgen et al., 2018).

Maternal Age

Mothers from various age groups had been participated in the current study. The model output regarding this variable indicated that age of mothers had strong influence on under five child dietary diversity score in respective production systems. Mothers' knowledge and skill on child raising and general house management is assumed to increases with age. The p-value associated with this variable (0.014) indicated that age of mother/care giver of under-five child had prominent role to attain higher dietary diversity and it has shown statistically significant association with under five child dietary diversity at p<5%. The odds ratio in favor of high dietary diversity increases with factor of 2.3 with unit increase of age of mother/care giver of the child. The finding is in line with (Dinku et al., 2020; Kassahun Belew et al., n.d.; Seboka et al., 2021b).

Table 4. Regression model estimates on determinants of child dietary diversity

Variables	**Response categories**	**Estimate**	**Std. Error**	**Wald**	**Sig.**
Household Category	Wheat growers	2.63	1.789	2.16	0.142
	Coffee Growers	4.507**	1.807	6.219	0.013
Family size	AE	0.208	0.143	2.102	0.147
Age of under-five child		-0.002	0.034	0.005	0.946
Age of the mother		0.083**	0.034	6.044	0.014
Purpose of production	Consumption	0.697*	0.337	4.269	0.039
	Market	0.394	0.561	0.493	0.483
Birth order of under-five child	1st	0.994	0.66	2.273	0.132
	2nd to 3rd	0.218	0.6	0.132	0.716
	4th and above	-0.174	0.506	0.118	0.732
Sex of under-five child	Male	-0.91***	0.299	9.238	0.002
Education level of the mother	No formal education	-0.096	0.621	0.024	0.877
	Basic education	-0.147	0.522	0.08	0.778
	Primary education	-0.259	0.515	0.253	0.615
Mother's awareness on child nutrition	Know nothing	-0.266	0.969	0.075	0.784
	Heard but little knowledge about it	0.419	0.474	0.781	0.377
	Aware but unable to apply	0.739	0.493	2.249	0.134
Mother's employment status	Employed	-0.6*	0.337	3.166	0.075
	Unemployed	0.301	0.408	0.543	0.461
Mother's current physiological status	Lactating	0.838**	0.395	4.511	0.034
Frequency of meal of under-five child	Once	0.658	0.62	1.126	0.289
	Twice	0.588	0.41	2.053	0.152
	Three times	0.77*	0.402	3.671	0.055
Sickness in the past two weeks	Yes	-0.409	0.42	0.95	0.33

Food security status of the household	Food secure	-0.853	0.62	1.895	0.169
	Mild food insecure	-0.831	0.639	1.693	0.193
	Moderately food insecure	-1.482**	0.677	4.793	0.029

Maternal physiological status

The study included several mothers with different physiological statuses vis-a-vis pregnant, lactating, and neither pregnant nor lactating. The model result has shown that the mother's physiological status at the time of data collection determined the status of the under-five child's dietary diversity score both in coffee and wheat growing rural households. The p-vale associated with this variable (0.034) infers the likelihood of attainment of higher under-five child dietary diversity was highly associated with the mother's physiological status at $p<5\%$. From this finding, one can understand that children nurtured and taken care of by pregnant mothers have shown higher dietary value as compared to other physiological status groups of mothers. The odds of higher under-child dietary diversity increase with a factor of 2.31 when mothers become lactating as compared to other groups of mothers. The finding was in congruent with (Di Marcantonio et al., 2020).

Maternal employment status

Data from several sources has shown that women in the study sites in general and mothers of under five children were engaged in several non-farm and off-farm activities. On one hand, farm income as the only source of family income couldn't fulfill the family's basic needs requirements, especially for the provision of diversified food for under five children in a particular household. Thus, to cope with the shortage of money in the household, mothers of under the age of five children would be forced to be involved in some sort of income-generating scheme. Employed mothers would have additional income sources to obtain the dietary diversity of their children. The study included both employed and unemployed mothers who had been engaged in non-farm and off farm sources. The model results concerning maternal employment signify that the likelihood of high dietary diversity is highly associated with maternal employment. The p-value associated with this variable (0.075) has indicated a statistically significant difference between under- five children diversity and maternal employment at $p<10$ percent Other findings like (Belete et al., 2022; Di Marcantonio et al., 2020) confirmed that children taken care by employed mother had better off in their dietary diversity than their counterparts.

CONCLUSION AND POLICY RECOMMENDATION

The current research was focused on a comparative analysis of child dietary diversity and its determinants between selected coffee and wheat farmers of the Goma and Dodota districts, respectively. These farmers have peculiar characteristics in terms of their demographic, socioeconomic, and institutional features, maternal characteristics, and child-related variables as well as the level of dietary diversity and factors determining child dietary diversity.

The majority of wheat farmers produce wheat with the prior purpose of consumption and market, indicating the crop has multiple roles among the smallholders especially to diversify food of under-five children. On the other hand, coffee farmers

applied market-oriented production to buy household food and non-food items to keep their under-five children healthy and well-diversified. The model result indicated that Children from coffee growers' households had better status of dietary diversity than their counterparts, wheat growers. Besides, households whose production was mainly for the market and both for consumption and market had low dietary diversity scores in their children. Thus, policies and strategies designed to address the needs of smallholders to enhance their production and facilitation of market would enhance underfive child dietary diversity status and hence imprve health and nutritional status of children.

Children from food-insecure households were found poor in their dietary diversity score mainly due to a lack of access resources to supply diversified foods to their under fce chi dren. The result has shown that the probability of poor dietary diversity increases across food-insecure rural households. Thus, policies and strategies designed to address foos security status of households would be important step to address under five children dietary diversity both in wheat and coffee grower zones of the country.

The study found that female under five children has shown better dietary diversity score as compared to male under five children both in wheat and coffee growing areas of Ethiopia. In this policies and strategies designed to raise awareness of mothers and/or caretakers of under-five children through health extension workers and development partners working in the area would have paramount importance in reducing malnutrition in children through food diversification.

The frequency of meals given in 24 hours determines the dietary diversity of children under five in both wheat farm households. Thus, an increase in meal frequency of under-five children increases the likelihood of high dietary diversity among children from wheat and coffee farmers. In this regard, policies and strategies designed to enhance dietary diversity in the form of alternative income sources, training, and related interventions should be designed to maintain healthy and children with highly diversified food should be implemented.

The age of the mother/caregiver of the under-five child had a prominent role in attaining higher dietary diversity and it has shown statistically significant association with under-five child dietary diversity. Besides, children nurtured and taken care of by pregnant mothers have shown higher dietary value as compared to other physiological status groups of mothers. In line with this children taken care of by employed mothers had better off in their dietary diversity than their counterparts. Policy and strategies designed to address various aspects of mothers/caretakers including creating employment schemes, and educating them should be applied to ensure the health and higher dietary diversity scores in wheat and coffee growing households of Ethiopia.

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