Determinants of Dietary Diversity of Farming Households in Chamwino District, Tanzania: A Gendered Perspective

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Abstract

Various studies based on a simpler approach of twelve food groups have reported that female-headed households are more likely to have higher dietary diversity compared to male headed households while others have reported that female headed households consume lower dietary diversity compared to male-headed households. However, there is limited empirical evidence on the relationship between dietary diversity and gender based on an advanced approach of using weighted sum dietary diversity scores. Therefore, this study was conducted to examine the determinants of dietary diversity based on weighted sum dietary diversity scores in Chamwino District in the central part of Tanzania from a gendered perspective. A cross-sectional research design was used to collect data from randomly selected 400 households. Using multiple linear regression; household size, engagement in non-farm income generating activities and size of land cultivated significantly ($p<0.05$) influenced dietary diversity in female and male headed households. It is concluded that intervention programmes may need to be tailored based on size of land cultivated, household size and engagement in income generating activities. Therefore, this will entail reducing household sizes by strengthening the use of family planning measures among female headed households. All people who are energetic must participate in farming activities in order to increase the size of the cultivated land as well as promoting engagement in income generating activities as alternative livelihood options among male headed households.

Keywords: gender, weighted sum dietary diversity, Tanzania

Introduction

Dietary diversity is the sum of the number of different foods consumed by an individual over a specified time period (Hoddinott, 2002; Ruel, 2003) and is strongly associated with diet quality (Kennedy *et al.* 2010). Dietary diversity represents a more healthy, balanced, and diverse diet which ensures nutrient adequacy (Li *et al.,* 2020). Consuming a variety of food across and within food groups is associated with adequate intake of essential nutrients and promotes good health (Waswa *et al.,* 2015). Limited dietary diversity is a major challenge and cause of malnutrition in rural and urban poor households (Arimond and Ruel, 2004). Malnutrition is a significant issue for social and economic development (Matita *et al.* 2022). The plausible explanation is that it causes poor cognition as well as poor school achievement for children, with reduced work performance for adults and related disease burdens (Matita *et al.* 2022). Globally, 767.9 million people were undernourished in 2021 (FAO *et al.,* 2022). In Africa, 278 million people were undernourished in 2021 (ibid). In Sub-Saharan Africa, 260.6 million people were undernourished in 2021 (ibid). In Eastern Africa, 136.4 million people were undernourished in 2021 (ibid). Under-nutrition is particularly high among low-income Tanzanian households, mainly because they consume carbohydrate-rich staple based diets that are low in minerals and vitamins (Kilama, 2009, cited in Ochieng *et al.,* 2017). Mbwana *et al.* (2016) found that most households in Chamwino District rely heavily on cereals and only a few consumed animal-based proteins, something which leads to increasing number of the population experiencing malnutrition. Monotonous diets based on starchy staples lack essential micronutrients thus contribute to the burden of malnutrition and micronutrient deficiencies (Kennedy, 2010). Although under-nutrition affects both urban and rural poor, those residing in rural areas face additional challenges such as social isolation, intermittent drought, limited participation of women in major economic activities, limited market access, poor rural health services, poor roads, and over-reliance on rain fed agriculture (Ochieng *et al.,* 2017). At the household level, women have a role of varying meals (dietary diversification), thus most of the income they earn is spent on buying food (Inglis *et al.,* 2005). However, women, compared to men in developing countries face several constraints which limit their ability to improve nutrition of their own and of their children. These include: low wages, less access to employment opportunities, land, education, lack of credit, tenure insecurity, little access to resources and information (Lutomia *et al.,* 2019). Several studies on determinants of dietary diversity have shown contradicting findings whereby Assenga and Kayunze (2019) found that female-headed households were consuming low dietary diversity compared to male-headed households while Grobler (2015) found that female-headed households tend to be higher in dietary diversity than male-headed households. Given this situation of inconclusive findings, it is reasonable to continue exploring gender perspectives on household dietary diversity. Establishing factors associated with dietary diversity from a gendered perspective can help inform policy formulation thus leading to more effective interventions related to improving dietary diversity, and hence nutrition situation of the people. Therefore, this paper attempts to analyze the determinants of dietary diversity from a gender perspective.

Methodology

Description of the Study Area

This study was conducted in Chamwino District, Dodoma Region in Tanzania. The district was selected because of its well-known record of food insecurity (Mbwana *et al.,* 2017). The district lies in semi–arid area where food production is predominantly rain- fed. The district receives rainfall in one season with an average of 350–500 mm per annum. The study was narrowed to three wards and six villages namely, Fufu Ward (Fufu and Suli Villages), Idifu Ward (Idifu and Miganga Villages) and Membe Ward (Membe and Mlimwa Villages).

Research Design, Sampling Procedures and Sample Size

A cross-sectional research design was used to collect the data whereby the sampling unit for this study was a household since food consumption takes place to a large extent at the household level (Maxwell, 1996). A household is a person or a group of persons, related or unrelated, who live together and share a common source of food (URT, 2010). Three wards were purposively selected due to their history of receiving food aid from the government (DAICO of Chamwino District, personal communication, 2014 cited in Assenga and Kayunze, 2021) while six villages were selected purposively. These included Fufu Ward (Fufu and Suli Villages) and Idifu Ward (Idifu and Miganga Villages) where chronic food insecurity was reported to be relatively high and Membe Ward (Membe and Mlimwa Villages) where chronic food insecurity was known to be relatively low. The respondents were selected randomly from the sampling frame which was reportedly established from the village register by listing all households headed by men and those headed by women with children aged 7 to 17 years old. The sample size was 400 households. The formula for sample size determination by Cochran (1977) was used to determine the sample size as follows: -.

$$n = \frac{Z^2 * p\,(1 - p)}{d^2} \quad \text{(Cochran (1977)}$$

n = sample size;

Z = a value on the abscissa of a standard normal distribution (from an assumption that the sample elements are normally distributed), which is 1.96 or approximately 2.0 and corresponds to 95% confidence interval;

p = estimated variance in the population from which the sample is drawn, which is normally 0.5 for a population whose size is not known;

d = acceptable margin of error (or precision), whereby the general rule is that in social research d should be 5% for categorical data and 3% for continuous data (Krejcie and Morgan, 1970), cited by Bartlett *et al.* (2001). In this research, 5% was used since substantial categorical data were collected.

Using a Z-value of 2.0, a p-value of 0.5, a q-value of 0.5, and a d-value of 0.5% (which is equivalent to 0.05), the sample size (n) was determined to be 400, i.e.

$$n = \frac{2^2 * 0.5\ (1 - 0.5)}{0.05^2} = (4 \times 0.25)/0.0025 = 1/0.0025 = 400$$

Data Collection

Primary data were collected using a questionnaire which was administered to household heads. The collected data included household size, education of household heads in years, age of household head, size of land cultivated, and the main occupation of the household head and income generating activities. Data on household dietary diversity were collected using a dietary diversity questionnaire which was adopted from Hoddinott (2002) whereby the determination of dietary diversity was done using the procedure described in section 2.4.

Determination of Dietary Diversity

A weighted sum of dietary diversity was adopted. whereby a person responsible for preparation of food was asked to indicate different foodstuffs (e.g. maize, sorghum, vegetables) the family had eaten in the previous 30 days. The foodstuffs were location specific, and food groups were developed from focused group discussions. The score was done using the following categories: 16-30 days in the previous month (score of 24), i.e. at least every other day; 4-15 days in the previous month (score of 10), i.e. once or twice a week; 1-3 days in the previous month (score of 3) and 0, i.e. not at all (score of 0). The dietary diversity index was achieved by the calculation of the weighted sum adopted from Hoddinott (2002). The following weights were assigned: J: 24; S: 10; M: 3 and R; 0. However, it is important to note that Hoddinott (2002) did not indicate the reasons for use of the letters J, S, M and R for weighting scores of dietary diversity. It is plausible that such letters were used for convenience purposes in data coding and analysis. It should be noted that there are no internationally accepted cut-off points below those cut-off points to assist in making judgments on whether households below a certain dietary diversity score have low dietary diversity or not. According to Ruel (2002, 2003), international cut-off points that are used to define high or low diversity are likely to be meaningless. Cut-off points to define varying levels of diversity have to be defined in the context where they are used, taking into account local food systems and dietary patterns. It is important to define, in each context, the set of food items and food groups that can contribute to improve dietary quality. This paper classified households into two categories: A household was said to have low dietary diversity if the weighted sum score was less than 126.54 and high dietary diversity if the weighted sum score was 126.54 and above. The cut-off point of 126.54 was chosen because it was the mean weighted sum score in the sample. These cut-off points were established by Assenga and Kayunze (2016) when measuring food security based on dietary diversity using weighted sum dietary diversity score in Chamwino District.

Data Processing and Analysis

Quantitative methods were employed to analyse the collected data. Quantitative data were analysed using IBM SPSS Statistics Version 20 Software and Microsoft Excel software to compute descriptive statistics, frequencies, percentages, statistical means, and standard deviations of individual variables. Multiple linear regression was used to determine the effects of some factors on weighted sum dietary diversity. The dependent variable, dietary diversity, was measured in terms of weighted sum dietary diversity scores. Variables were checked for normality because multiple linear regression assumes that variables have normal distribution (Jason and Waters, 2002).

Normality was checked by computing the distribution curves for all variables recorded at the ratio level which were to be included in the multiple linear regression model and observing them visually to find whether any of them was skewed. All variables which were found to be skewed (Age of the household head, education of household head in years, weighted sum dietary diversity scores) were transformed into normal distributions using log10 transformation. Variables which were found to have normal distribution (household size, size of land cultivated) were not transformed. Multicollinearity was checked by computing tolerances and variance inflation factors (VIF). According to Landau and Everitt (2004), tolerance values of more than 0.1 and VIF values of not more than 10, show that there is no multicollinearity. None of the tolerances or VIF value were less than 0.1 or greater than 10 respectively. Hence, there was no multicollinearity. The multiple linear regression model that was used to determine the impact of some factors on weighted sum dietary diversity was therefore as follows:

$Y = a + \beta 1X1 + \beta 1X2 + \beta 1X2 + \ldots + \beta 6X6 + e,$

Where:

Y = Weighted sum dietary diversity scores (continuous variable)

a = Constant or intercept of the equation

b1... b11 = Regression coefficients,

e = Error term representing the proportion of the variance in the dependent variable that was unexplained by the regression equation.

X1 = Land size cultivated (measured in hectares), X2 = Age of the household head (measured in years), X3 = Household size (number of members), X4 = Non-farm income generating activities (IGAs) (1 = Yes, 0 = No), X5 = Education of the household head (years of schooling), X6 = Occupation of the household head (1 = non-farm, 0 = crop production).

Results And Discussion

Multiple linear regression was used to determine the influence of some factors on dietary diversity in terms of weighted sum dietary diversity scores. Tables 1 and 2 show the regression estimates of the determinants of dietary diversity (weighted sum dietary diversity scores) among female and male headed households. The coefficients of determination R^2 were 0.407 and 0.23 for female and male headed-households respectively, imply that the predictor variables explained 40.7% and 23.0% of the variation in the variance respectively in the dependent variable that was dietary diversity in terms of weighted sum dietary diversity scores. The other percent was contributed by other variables which were not included in the model (Gujarati, 2004; Field, 2018). For social sciences, such levels of coefficients of determination are reasonable, unlike in natural sciences where higher levels of R^2 are expected. The results in Table 1 indicate that in female headed households, the household size had negative significant influence (β = -0.284; p < 0.038) on dietary diversity. An increase of 1 member of household with all other predictor

Table 1: Determinants of dietary diversity in female headed households

Independent variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	1.944	0.356		5.462	0.000		
Household size	-0.025	0.012	-0.284*	-2.149	0.038	0.850	1.176
Education of household head (years)	-0.149	0.186	-0.102	-0.804	0.426	0.916	1.092
Age of household head	0.191	0.190	0.130	1.005	0.321	0.888	1.126
Land cultivated in hectares	0.245	0.077	0.425***	3.180	0.003	0.829	1.206
Main occupation of household head (1 = non-farm, crop production)	0.074	0.084	0.112	0.877	0.386	0.914	1.094
Income generating activities (1 = Yes, 0 = No)	0.067	0.036	0.253	1.861	0.070	0.803	1.246

Dependent variable: weighted sum dietary diversity score, R=0.638, R^2=0.407, adjusted R^2=0.318, F statistic = 4.58, Durbin – Watson = 2.177, ***significant at 0.1%, *significant at 5%

variables held constant caused a decrease in weighted sum dietary diversity by 0.2384 score. This implies that as the household's size gets larger, dietary diversity decreases. These findings are in agreement with the findings by Assenga and Kayunze (2019) who found that larger households were consuming low dietary diversity based on weighted sum dietary diversity scores dietary in Chamwino District, Tanzania. The size of the cultivated land showed positive significant influence (β=0.425; p<0.003) on diversity in female headed households. An increase of 1 hectare of land cultivated, with all other predictor variables being held constant, caused an increase in weighted sum dietary diversity by 0.425 scores. This implies that the larger the land size cultivated, the higher the dietary diversity.

cultivated increases. This finding corroborates the findings by Assenga and Kayunze (2019) who reported that dietary diversity in terms of weighted sum dietary diversity scores increased as land cultivated increased in Chamwino District, Tanzania. In both types of the households, increasing the land cultivated could help to increase dietary diversity. According to Kiboi *et al.* (2017), households which own land could grow some food which may supplement what they acquire through purchase.

The results in Table 2 indicate that in male headed households, income generating activities had positive significant influence (β=0.242; p<0.001) on dietary diversity. Holding other predictors constant, households which were doing non-farm income generating activities were found to consume higher dietary diversity

Table 2: Determinants of dietary diversity in male headed households

Independent variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	2.075	0.200		10.371	0.000		
Household size	-0.007	0.006	-0.082	-1.359	0.175	0.940	1.063
Education of the household head (years)	0.188	0.110	0.107	1.718	0.087	0.880	1.136
Age of the household head (years)	-0.110	0.097	-0.069	-1.135	0.258	0.928	1.078
Land cultivated (hectare)	0.170	0.030	0.339***	5.652	0.000	0.944	1.059
Main occupation of the household head (1 = non-farm, 0 = crop production)	0.092	0.069	0.079	1.343	0.181	0.970	1.031
Income generating activities (1 = Yes, No = 0)	0.074	0.018	0.242***	4.009	0.000	0.929	1.076

Dependent variable: weighted sum dietary diversity score, R=0.477, R^2=0.227, adjusted R^2=0.207, F statistic = 11.184, Durbin – Watson = 1.712, ***significant at 0.1%

The results in Table 1 and 2 indicate that in both types of households, the cultivated land had positive significant influence (β=0.425; p<0.003 and β=0.339; p<0.001) on dietary diversity in female and male headed households respectively. With an increase of 1 hectare of land cultivated, all predictors' variables held constant, caused an increase in dietary diversity by 0.425 and 0.339 scores in female and male headed household respectively. This implies that dietary diversity increases as the size of the land

by 0.242 scores compared to households which were not doing non-farm income generating activities. This implies that the more a household is involved in income generating activities, the higher the dietary diversity. The findings reported in this paper are similar to those by Assenga and Kayunze (2019) who found that households which were doing income generating activities were consuming higher dietary diversity based on weighted sum dietary diversity in Chamwino District, Tanzania.

Conclusion and recommendations

This paper informs us that the important determinants of dietary diversity in female headed households are household size and size of land cultivated while in male headed households, the important determinants are size of land cultivated and engagement in income generating activities. It is concluded that intervention programmes may need to be tailored basing on the size of land cultivated, household size and engagement in income generating activities. Therefore, the following policy inferences are suggested for improving dietary diversity in Chamwino District, Tanzania: reducing household sizes by strengthening the use of family planning measures among female headed households since household size was found to influence dietary diversity negatively. All people in the household who are energetic must participate in farming activities in order to increase the size of land cultivated in both male and female headed households. Additionally, promoting engagement in income generating activities should be counted as alternative livelihood options among male headed households.

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