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Prevalence of Dietary Diversity Practice and Associated Factors among Women of Reproductive Age in Asaita Districts, Ethiopia

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ABSTRACT

Background: Both the mother and the newborn must have an adequate and healthy diet while the woman is in the reproductive stage of her life. Dietary diversity is a stand-in measure of adequate nutritional intake for women of reproductive age. **Objective:** The purpose of this study was to evaluate dietary variety practices and related variables among Ethiopian women of reproductive age in the Asaita districts of the Afar region. **Methods:** From February to March 2020, a community-based cross-sectional survey of 422 randomly chosen women of reproductive age was carried out in the Asaita districts. Using interviewer and 24-hour dietary recall techniques, data was gathered. SPSS version 25 was used to enter and evaluate the data. To evaluate the factors influencing dietary diversity, a standard logistic regression model was used, and possible factors were checked at P<0.05. **Results:** The mean score for dietary diversity was 4.17 with 1.11 SD. About 13.0%, 78.5%, and 8.5% of women in reproductive age, respectively, practiced low, medium, and high dietary diversification. At the 5% level of significance, characteristics such as marital status, education level, and window in the home, cell phone ownership, bank account, refrigerator, television, and cart were significantly connected with women's practice of dietary diversity. For each additional one-unit addition to the size of the female household's family, the odds of having a "low dietary" rather than a "high dietary" diet multiply by OR=0.665. The odds of a windowed home having poor dietary scores as opposed to high dietary scores are OR=2.793 times the odds of a windowless home. **Concussions:** Marital status, window-filled home, cell phone ownership, bank account ownership, and refrigerator all had positive associations with dietary diversity, whereas family size, education level, television ownership, and cart had negative associations with dietary diversity in women under the age of reproduction.

Keywords: odds ratio, women of reproductive age, dietary variety score, and Chi-square test

List of Abbreviations

WRA: Women Reproductive Age, DDS: Dietary Diversity Score, OLRM: Ordinary Logistic Regression Model, OR: Odds Ratio, SD: Standard Deviation, CI: Confidence Interval, SPSS: Statistical Package for Social Science, DF: Degree of Freedom

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INTRODUCTION

Dietary diversity refers to the number of distinct food items or food groups consumed during a specific period of time. It is a crucial component of diet quality; eating a range of foods from different food groups and within each food group is linked to an appropriate intake of nutrients that are necessary for optimum health [1-3]. Additionally, it refers to a wider variety of foods across and within dietary groups that can guarantee optimal nutrient intake and support both physical and mental growth and overall health [4]. Due to inadequate nutritional intakes, unequal food distribution within the household, inappropriate food storage and preparation, dietary taboos, infectious diseases, and care, women in the reproductive age range and children are particularly prone to malnutrition [5]. According to the World Health Organization, dietary diversity can assure an improvement in the quality of complementary foods, which has been highlighted as one of the most affordable methods for enhancing health and lowering morbidity and mortality among young children [6]. The health of mothers and their unborn children is improved by maternal dietary diversity, which serves as a proxy measure of maternal nutrient sufficiency. In low-income and middle-income countries (LMICs), multiple micronutrient deficiencies are still a serious public health concern, particularly for reproductive women. An increase in dietary diversity is also linked to socioeconomic level and household food security [7,8].

Due to the accessibility of agricultural products, social level, and community cultural practices, food sources varied around the world. About three-quarters of the diversity found in agricultural crops have been lost over the past century, according to a report from the Food and Agricultural Organization (FAO) in 2010, and this erosion is still going on. Only 15 plant and 8 animal species account for around 90% of the protein and energy in our food, which has serious effects on both nutrition and food security [9]. Cereals (barley, sorghum, wheat, and rice) made up the majority of household diets in Ethiopia, accounting for an estimated 90% of weekly consumption. At least one of these cereals was ingested on six of the previous seven days. Additionally, 60% of country households had poor dietary diversity and 40% had a medium diet dietary diversity scores [10,11].

While intake of high diversified foods has been associated with lower rates of malnutrition, deficits of macro and micronutrients can impose a significant health burden through lost productivity, increased susceptibility to illnesses, and poor growth and development. 15% of women of reproductive age are underweight and 35% are overweight globally, according to estimates of the prevalence of malnutrition [12-14]. The prevalence of the dietary variety scores varied across Ethiopia's regions, including the area of our study.

The most prominent potential cause of dietary diversity is malnutrition, which has a number of contributing factors. However, little has been done in regards to women under reproductive age, which is the foundation for human fertility. Several previous researchers suggested some socio-demographic factors and clinical factors that associated to dietary diversity among pregnant women [20-23], children under five years [24-30], and households [11,15-17,31,32]. However, a cross-sectional study conducted in Kenya found that family size, household gender, educational attainment, and age were all strongly related to the dietary diversity of women who were pregnant in areas with high agricultural potential [33].

In Ethiopia, the majority of women in the reproductive age range ate a variety of foods, and those subjects who scored higher on the dietary diversity scale had body mass indices that were within the normal range [34]. Due to their greater micronutrient needs, women between the ages of 15 and 49 who are planning a pregnancy are more vulnerable [35]. Low-quality, repetitive diets were the norm in resource-constrained, low-income countries like Ethiopia. Large percentage of women (98.3%) were found to consume monotonous food types, however only 10.2% were found to have high dietary diversity scores (DDS >6), which indicate eating from more than six out of ten food groups in addition to having very low intakes of foods high in vital micronutrients like vitamin A and iron [36].

Many research in Ethiopia used a cross-sectional study design, which did not include all of the administrative cities and geographical regions. There are nine administrative regions and two administrative cities in Ethiopia, each of which has its own set of norms, cultures, and ethnic groups. When examining the impact of covariates on women's nutritional diversity practices, several researchers utilized binary logistic regression and multiple regressions, which restrict the chronological order of dietary variety (low, medium, and high) among women under reproductive age when it has an ordinal nature. This study, however, used a community-based cross-sectional study design to examine the relationship between independent factors and dietary diversity score in the Asaita Districts of the Afar region. It did this by using a standard logistic regression model, which allows for the analysis of the chronological prevalence of dietary diversity practice among women under the age of childbearing.

METHODS AND MATERIALS

Study Area Description

The study was carried out in the northeastern Ethiopian region of Afar, in the Asaita woreda of zone 1 (Awsi Rasu). The zone is situated 655 kilometers to the north-east of Addis Ababa, the capital city of Ethiopia, and 65 kilometers from the region's largest town, Samara. This woreda is surrounded on the south, west, and north by the Awash, Dubti, and Afambo rivers, which divide it from Elidar of the Afar Region, and on the east by the Djibouti government. The zone is broken down into 13 kebeles, 11 of which are rural and the rest urban. The woreda is located at 11°34N and 41°26E latitude and longitude, and it is 300m above sea level. The primary mode of practice in the woreda was the production of livestock using an agro-pastoral method. The average annual temperature ranges from 30 to 45 degrees Celsius. Regional state report for Afar [37]. Figure 1 shows a map of the research area's location.

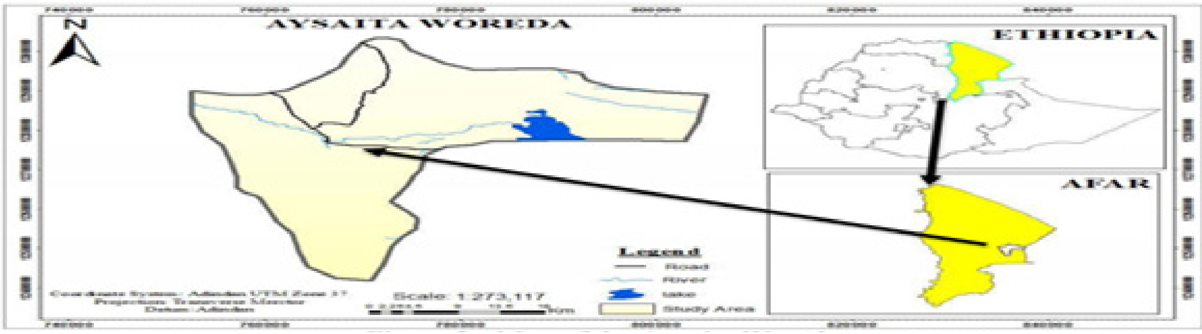

Figure 1: Location Map of study area region and Woreda in this study.

Study Design and Period

Women under the age of 45 who participated in a community-based cross-sectional study on nutritional status and its determinants from February to March 2020 were 15 to 45 years old; women under the age of 15 were excluded. As a result, the sample size for women of reproductive age was 422.

Study Population, Sample Size and Sampling Procedure

The study considered all women under reproductive age found in Asaita woreda at Afar Regional state and selects a sample following the laws of the statistical theory of sampling that help to make valid inferences about the population based on the data obtained from the sample which ascertain the degree of accuracy of the results. Single population proportion was used to compute Sample size and the total sample size required (N)= n+non-response of respondents. Assuming 95% confidence interval with 5% margin of error, $Z_{\alpha/2}$=1.96 and 10% probability for non-response rate. We obtained n= $\frac{Z_{\alpha/2}^{2}pq}{d^{2}}$ where p is the prevalence of the attribute (51.4%) taken from previous research done in Addis Ababa [38].

$$n=\frac{1.96^{2}*0.514*(1-0.514)}{0.05^{2}}=384$$

Then, the sample (n) = 384+non response rate (0.1x384)= 422. Probability type of systematic sampling technique was used to get the study participants. The researcher was divided proportionally the sample size among the two kebeles to obtain a total number of childbearing women in the woreda and simple random sampling was employed during interview to select population size in each kebeles. Finally, the sample size was 422.

Data Collection and Measurements

In order to gather primary data for this study, self-administrative questionnaires were used. In terms of procedure, we adhered to the Food and Agriculture Organization of the United Nations' definition of dietary diversity score, which was defined as a qualitative 24-hour recall of every food and beverage consumed by respondents (if measured at the individual level) or by any other household member (if measured at the household level)[39]. According to several dietary variety studies s[40], one day memory time is vulnerable to less recall inaccuracy than a week or month recall interval. Likewise, the dependent variable considered in the study was women dietary diversity score that calculated from a 24 hour recall of women's nutritional status. Based on food items consumed in the past 24 hour, women were assigned the number of food groups they used, ranging from 0 to 8 or a score of 1 was given to each food groups consumed that attained maximum values of 8 points for women dietary diversity score. Then, according to sample of Food and Agriculture Organization [39] recommendation, women were classified into three groups:- ≤ 3 Food groups as low dietary diversity, 4-5 food groups as medium dietary diversity and ≥ 6 as high dietary diversity.

Based on the reviewed literature and the aims of current study we considered socio-demographic characteristics of women under reproductive age such as gender, household head, family size of male, family size of female, age, religion, educational status, relationship with child, ever attended school, occupation, ethnicity, number of room in house, kind of house, house window, having electric power, marital status of the household head were considered as independent variables. Moreover, women were interviewed they had their own radio, mobile, bank account, refrigerator, television and cart to know they are accessible with such technological device in-lined to dietary diversity.

Operational Definitions

- Dietary diversity can be defined as the number of different food groups consumed by an individual over 24-hours.
- Food groups are a collection of foods that contain a similar mix of nutrients.
- Inadequate dietary diversity: When women have low dietary diversity related to the standard recommendations.
- Minimum dietary diversity is the consumption of four or more food groups from the seven defined food groups for higher dietary quality and to meet basic nutritional needs [41].
- Healthier consumption pattern is consumption pattern with higher factor loading for food items strongly recommended by WHO to be consumed by women, particularly all the five major food groups (vegetables, fruit, meat, milk (dairy) and egg).
- Household is an individual who comprise a family unity and who live together under the same roof.
- Household size is the number of a person living together in one house.

Statistical Data Analysis

Frequency and percentages of each variable were calculated and displayed using tables in the current study. Descriptive measures for continuous variables were calculated and their normality distributions were checked. Chi-square test of association and ordinary logistic regression were used to assess the potential determinants of dietary diversity in women and predict the dietary diversity score.

Chi-square Test of Association

The null hypothesis states, in the chi-square test, how many cases can be anticipated in each category if the null hypothesis is true. It is based on the discrepancies between each category's observed value and expected value. The chi-square statistic is defined as:

$$\chi^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i} \quad [1]$$

Where O_i is the observed number of cases in category i, and E_i is the expected number of cases in category i. The chi-square test used in this study to know the association between socio-demographic variables, food groups and dietary diversity of women. In addition, goodness of model also checked by applying chi-square test.

Logistic Regression Model

Regression is a statistical procedure which attempts to predict the values of a given variable, (termed the dependent, outcome, or response variable) based on the values of one or more variables (called independent variables, predictors, or covariates). Regression analysis is model building for the relationship between a dependent and one and/or more independent variables. In the regression if the response variable is continuous we can use the usual linear regression model whereas when the response variable is discrete, taking on two or more possible values the appropriate regression model is logistic regression which was proposed as alternative method in the late 1960s and early 1970s [42]. The problem of non-normality and heteroscadasticity lead to the model estimation method to be maximum likelihood after natural logarithm transformation of the odd ratio of the response because in logistic the relationship between the response with the set of explanatory variables is not linear hence the procedures used in the linear regression is extended to logistic regression. Logistic regression models are classified according to the type of categories of response variable as follows:-binary logistic regression model, multinomial logistic regression model and ordinal logistic regression models [43]. The binary logistic regression model is used to model the binary response variable, whereas the multinomial logistic regression is a simple extension of the binary logistic regression model where the response variable has more than two unordered categories. Ordinal logistic regression models are used to model the relationship between independent variables and an ordinal response variable when the response variable category has a natural ordering, this employed in current study.

Ordinary Logistic Regression Model

Ordinal logistic regression is an extension of binary logistic regression for analyzing ordinal response variable having more than two categories by considering the ordering of the response variable categories. This model is used to describe the relationship between an ordered categorical response (dependent) variable and one or more explanatory (independent) variables. There are different types of ordinal logistic regression models, the most commonly used are: the adjacent-category, the continuation-ratio, the proportional odds models, the unconstrained partial-proportional odds model, the constrained partial-proportional odds model [43].

Proportional Odds Model

Proportional Odds Model is used for modeling the response variable that has more than two levels with K set of explanatory variables by defining the cumulative probabilities, cumulative odds and cumulative logit for the J-1 categories of the response, this model simultaneously use all cumulative logits. A random sample is drawn from the joint distribution of (Y, X'), where Y is an ordinal response and $X'=(X_1, X_2, - - -, X_n)$ is a vector of independent variables. Let $\pi_j(X')$ denote the classification probabilities $Pr(Y=j/X')$ of response variable Y,j=1,2, - - -, k at any value $X'=(X_1, X_2, - - -, X_n)$ for a set of explanatory variables X_1, X_2, - - -, Xs. The cumulative probability can be given as:- $\pi_j(X) = p(Y \le j / X) = P_1 + P_2 + P_3 + ... + P_j$. for j=1,2, - - -,J-1. Π_j (X) is the probability of being at or below category j given that k set of predictors [43]. The odds of the cumulative probabilities of the response variable for the J-1 categories:-

$$odds\left[\pi_j(X)\right] = \frac{\pi_j(x)}{1-\pi_j(x)}, j = 1, 2, ..., J-1. \quad [2]$$

The logarithm of the odds first j-1 cumulative probabilities

$$\ln(odds\left[\pi_j(X)\right]) = \ln\left(\frac{\pi_j(x)}{1-\pi_j(x)}\right), j = 1, 2, ..., J-1. \quad [3]$$

The relationship between the response variable and the set of predictors is not linear in ordinal logistic regression model. The logistic regression function uses the logit transformation of cumulative probabilities of the response,

$$\pi_j(X) = p(Y \le j / X) = \frac{\exp(\alpha_j - (\beta_1 x_1 + \beta_2 x_2 + ... + \beta_k x_k))}{1 + \exp(\alpha_j - (\beta_1 x_1 + \beta_2 x_2 + ... + \beta_k x_k))} \quad [4]$$

Likewise the transformation of equation [4] to the logit for the matter of interpretation ordinal logistic regression result can be as follows:-

$$\log it\left[P(Y \le j / X\right] = \alpha_j - \sum_{j=1}^{J-1} \beta_j X_j, j = 1, 2, ..., J-1. \quad [5]$$

Equation [5] is called the proportional odds model (POM) to predict cumulative logits across J-1 response categories. This model estimates ln (Odds) of being at or below the j^{th} category and assume that there is a linear relationship between the logits and the parallel regression lines and hence, this model estimates simultaneously multiple equations of cumulative probability. The model is solved for each category of the dependent variable except the last category.

In the model each logit has its own α_j term called the threshold value and their values do not depend on the values of the independent variables and the β_k's are the logistic regression coefficients and the estimated values of these parameters show the direction and the strength of the relationship between the explanatory variables and the logit (log odd) of the dependent variable. The result is interpreted as the effect (more likely and less likely) of the estimated category of the independent variables relative to the reference category on the log odds being in higher levels of the categories of the dependent variable.

Wald Test for a Single Predictors

The Wald test is used to see the significance of a single explanatory variable in the model. The Wald test statistic is the square of the ratio of the estimated coefficient to its standard error and is defined as: $W=\left[\frac{\hat{\beta}}{SE(\hat{\beta})}\right]^2$ Under the null hypothesis $H_0:\beta_i = 0$, i= 1,2, - - -, k and W has a chi-square distribution with one degree of freedom.

Goodness-of-Fit Measures

In this study the goodness of fit measure was used to assess how well a model fit the data. To check the goodness of fit Pearson chi-square and deviance goodness of fit were employed which compare the observed and expected values having chi-square distribution with n-p degrees of freedom. Both goodness-of-fit statistics should be used only for models that have reasonably large expected values in each cell. The model fit the data well when the test value of Statistic is small and the observed significance level being large. The researchers fail to reject the null hypothesis that the model fits the data well when the observed significance level for the statistic is large since good models have large observed P-values.

RESULTS AND DISCUSSION

Results

Demographic and Socio-economic Characteristics of Women of Reproductive Age Factors

A total of 422 sampled women under reproductive age (WRA) of dietary diversity at Asaita districts, Afar regional state were used. Of the total about 222(52.6%) of them were lived in 01 Kebele and the remaining 200(47.4%) were lived in 02 Kebele, The summarized WRA of dietary diversity information in Table 1 reveals that the proportion of household headship with respect to their gender categories of male and female headship were 87.4% and 12.6% respectively. The distribution of WRA based on their relationship with their child shows that 401(95.0%) were biological from their mother and the rest 21(5%) child were do not give birth from their mother.

Most of the women (83.6%) were not attended school in the districts. Similarly, the distribution of women's education level revealed that 361(85.5%) had no education, 21(5.0%) primary school, 17(4.0%) secondary school and the remaining 23(5.5%) were higher education. Regarding marital status of women about 23(5.5%) single, 369(87.4%) married, 22(5.2%) divorced and the rest 8(1.9%) were widowed as indicated in Table 1.

The study revealed that there was an association between the dietary diversity practice of women and their predictors. As a result of chi-square test of association showed kebela, household head, relationship with your child, attending school, marital status, education level, current occupation, kind of house, house with window, electric power, having mobile phone, bank account number, refrigerator, Television and cart were statistically significant relationship with dietary diversity of women at 5% level of significance. This implies the presence those factors have effect to change the status of dietary diversity practice for women in the reproductive age.

Table 1: Demographic and socio-economic characteristics of women of reproductive age at Afar region, Asaita districts.

Variable	Categories	Count (%)	Chi-square (P-value)
Kebela	01 Kabela	222(52.6)	104.521(0.000)*
	02 Kabela	200(47.4)	
Household head	Male headed	369(87.4)	20.206(0.000)*
	Female headed	53(12.6)	
Relationship with your child	Biological mother	401(95.0)	11.955(0.003)*
	Did not give birth	21(5.0)	
Attended School	Yes	69(16.4)	65.921(0.000)*
	No	353(83.6)	
Marital Status	Single	23(5.5)	27.258(0.000)*
	Married	369(87.4)	
	Divorced	22(5.2)	
	Widowed	8(1.9)	
Education Level	No education	361(85.5)	71.987(0.000)*
	Primary school	21(5.0)	
	Secondary school	17(4.0)	
	Higher education	23(5.5)	
Current Occupation	Daily laborer	17(4.0)	72.553(0.000)*
	Farmer	3(0.7)	
	Government employer	18(4.3)	
	House wife	369(87.4)	
	Merchant	15(3.6)	
Religion	Orthodox	16(3.8)	9.038(0.060)
	Muslim	405(96.0)	
	Protestant	1(0.2)	
Ethnicity	Amahara	28(6.7)	8.370(0.398)
	Tigray	3(0.7)	
	Oromo	4(0.9)	
	Afar	386(91.5)	
	Welayta	1(0.2)	
Kind of House	Finished floor	84(19.9)	42.928(0.000)*
	Rudimentary	338(80.1)	
House of Window	Yes	370(87.7)	17.128(0.000)*
	No	52(12.3)	
House of Electricity	Yes	370(87.7)	17.128(0.000)*
	No	52(12.3)	
Radio	Yes	220(52.1)	7.644(0.022)*
	No	202(47.9)	
Mobile phone	Yes	257(60.9)	40.755(0.000)*
	No	165(39.1)	
Bank account	Yes	244(57.8)	50.087(0.000)*
	No	178(42.2)	
Refrigerator	Yes	109(25.8)	85.975(0.000)*
	No	313(4.2)	
Television	Yes	137(32.5)	49.603(0.000)*
	No	285(67.5)	
Cart	Yes	29(6.9)	12.999(0.002)*
	No	393(93.1)	

Measures of Central Tendency for Continuous Variables

The mean age of the women under reproductive age was 36.53±7.667 standard deviation. In regard to family size in male and female, the average size was approximately 3 people, with 2.28±1.138 SD and 2.04±0.914 SD with the range of 0-5 and 1-5 family size was presented respectively. The average number of room in house used for WRA was 1.20±0.400 SD with the range of 1-2 room(s) per household.

Table 2: Descriptive Statistics for continuous variables of WRA at Afar region, Aysaita districts.

Variable	Minimum	Maximum	Mean	SD
Age	15	49	36.53	7.667
Family size of male	0	5	2.28	1.138
Family size of female	1	5	2.04	0.914
No. of room in your house	1	2	1.20	0.400
Dietary diversity score	1	8	4.17	1.112

Distribution of 24 Hours Dietary Diversity Score of the Women Reproductive Age

Out of 14 food groups, the study found the mean of DDS was 4.17±1.112 SD with scores ranging from 1 to 8 food groups (Table 2). Based on the categories developed, about 13.0% of the participants were in the low diversity category (≤3 food groups), 78.5% of respondents had a medium dietary diversity score (4-5 food groups) and 8.5% of the participants were in the high diversity category (≥6 food groups).

The most commonly eaten food groups were grains 100% and vegetables and beans or peas were the second and the third most eaten food groups of 90.5% and 78.0% were presented respectively. Notably, the vegetables or roots and other types of meat or poultry were minimally consumed 2(0.5%) and 3(0.7%). Likewise, meat made from animal organs, fish or sea food whereas fresh or dried and nuts or seeds were totally not consumed food groups (Figure 2). As the test result revealed in Table 3, one sample t-test shows that all food groups were statistically significant (P<0.05).

Table 3: Proportion of WRA consuming items from 14 foods groups over the previous 24 hours.

Food group	Categories	Frequency (%)	Mean ± SD	One sample t- test (P-value)
Grains	Yes	422(100.0)	1.00±0.000	-
	No	-		
Vegetables or roots	Yes	2(0.5)	2.00±0.069	446.715(0.000)*
	No	420(99.5)		
White root and tubers	Yes	49(11.6)	1.88±0.321	88.634(0.000)*
	No	373(88.4)		
Dark green leafy vegetables	Yes	99(23.5)	1.77±0.424	61.272(0.000)*
	No	323(76.5)		
Fruits that are dark yellow or orange inside	Yes	98(23.2)	1.77±0.423	61.604(0.000)*
	No	324(76.8)		
Other fruits	Yes	122(28.9)	1.71±0.454	54.805(0.000)*
	No	300(71.1)		
Any other vegetables	Yes	382(90.5)	1.09±0.293	41.663(0.000)*
	No	40(9.5)		

Meat made from animal organs	Yes	-	2.00±0.000	-
	No	422(100.0)		
Other types of meat or poultry	Yes	3(0.7)	1.99±0.084	364.598(0.000)*
	No	419(99.3)		
Eggs	Yes	50(11.8)	1.88±0.324	87.711(0.000)*
	No	372(88.2)		
Fish or seafood whereas fresh or dried	Yes	-	2.00±0.000	-
	No	422(100.0)		
Beans or peas	Yes	329(78.0)	1.22±0.415	35.659(0.000)*
	No	93(22.0)		
Nuts or seeds	Yes	-	2.00±0.000	-
	No	422(100.0)		
Milk or milk products	Yes	207(49.1)	1.51±0.501	41.433(0.000)*
	No	215(50.9)		
Dietary Diversity (Dependent variable)	≤3	55(13.0)		
	4-5	331(78.5)		
	≥6	36(8.5)		

Proportion of Women Under Reproductive Age who used Food Types

Grains were every day consumed food groups among the fourteen food groups in 24 hours prior to the data collection day. Any other vegetables were the most consumed food groups among the fourteen food groups in 24 hours prior to the data collection day.

The majority of women reproductive age was 382(90.5%) responded that they ate foods prepared from any other vegetables. The minority of women reproductive age were 2(0.5%) and 3(0.7%) responded that they ate foods prepared from vegetables or roots and other types of meat or poultry. While, meat made from animal organs, fish or sea food whereas fresh or died and nuts or seeds were totally not consumed food groups.

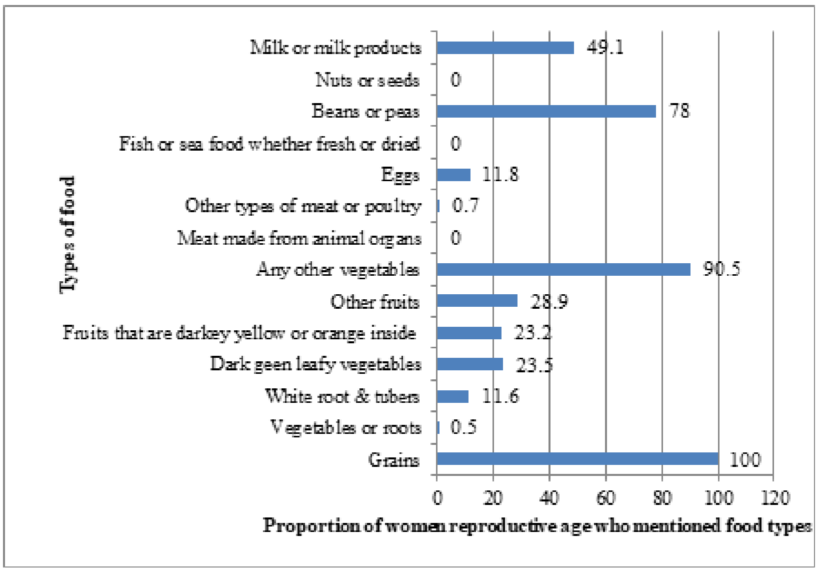

Figure 2: Proportion of types of foods they use to make their diet more diversified.

From the total of 422 dietary diversity of women reproductive age participants about 55(13.0%) were group under low diversity category (≤3 food groups), 331 (78.5%) were medium diversity category (4-5 food groups) and 36(8.5%) were high diversity category (≥6 food groups).

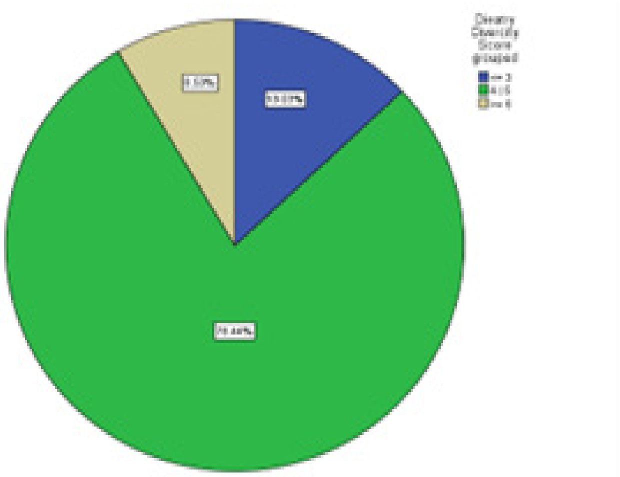

Figure 3: Proportion of dietary diversity of women reproductive age

Ordinary Multivariate Logistic Analysis

In this study, ordinary logistic regression model (OLRM) was utilized to handle the effect of the dietary diversity among women reproductive age (15-49) years. This model some time called with Base-Line Cumulative Logit (BCL) or Cumulative Logit Models (CLM), can have quantitative and qualitative predictors, intercept terms, etc. Multi-category logit models, Y has J categories, J>2. Extensions of likelihood ratio test for nominal and ordinal Y assume a multi-nominal distribution for Y.

OLRM was applied to explore the net effect of demographic and socio-economic variables on dietary diversity scores among women reproductive age committed by intimate family. The deviance Chi-square test $G^2 = (Df = 763, P = 1.000)$ depicts significance value of 1.00 which is greater than 0.05, this implies that the model adequately fits the data (Table 4). Therefore, one can conclude that there is no statistically significant difference between the observed number and the number predicted by the OLRM adopted in this study. The Cumulative Logit Model (CLM) has form: $\log it[P(Y \le j)] = \alpha_j + \beta_{ij} x_{ij}$; where, j=1,2, 3; i=1,2,3,4.

The contingency table data so can test goodness of fit. The deviance is the likelihood ratio test statistics for testing that all parameters not in the model equal to zero. Deviance= G^2 =299.617, df=763, P-value=1.000 for H_0 : model holds with linear trends for all explanatory variables.

The explanatory variables can be both qualitative and quantitative variables in this model where last categories of the qualitative variables were taken as reference category to interpret the findings of the analysis. In this analysis there were included two quantitative and eight qualitative variables were statistically significant (P<0.05), where at least one of their categories could negatively or positively influence dietary diversity among women reproductive age. The significant explanatory variables suggested by the model are family size of male, family size of female, marital status, education level, window, cell phone, bank, refrigerator, television and cart (P<0.05).

The estimated odds of being "low dietary" instead of "high dietary" multiplies by [OR=0.576, 95% CI: (0.377, 0.879)] for each 1-unit increase in family size of male household. The odds of being "low dietary" instead of "high dietary" multiplies by [OR=0.665, 95% CI: (0.448, 0.988)] for each 1-unit increase in family size of female household. The estimated odds of a married status response is in low dietary rather than high dietary diversity scores are [OR=294195.561, (CI: 1.669, 51842701505)] times estimated odds for windowed response. The odds of an education level is in low dietary rather than high dietary diversity scores are [OR1=0.065, OR2=0.026 and OR3=0.026] times estimated odds for higher education.

The estimated odds had a window's response is in low dietary rather than high dietary scores are [OR=2.793, (CI: 1.138, 6.853)] times estimated odds for had no window's response. The odds had a cell phone's is in low dietary rather than high dietary scores are [OR=20.005, (CI: 6.507, 61.503)] times estimated odds for had no cell phone's. The odds had a bank account's is in low dietary rather than high dietary scores are [OR=70.457, (CI: 16.359, 303.445)] times estimated odds for had no bank accounts. The estimated odds had a refrigerator's for household user is in low dietary rather than high dietary scores are [OR=11.752, (CI: 2.208, 62.545)] times estimated odds for had no refrigerator's for household user. The odds had a television's access is in low dietary rather than high dietary scores are [OR=0.034, (CI: 0.006, 0.185)] times estimated odds for had no television's access. The estimated odds had a cart's response is in low dietary rather than high dietary scores are [OR=0.002, (CI: 0.001, 0.006)] times estimated odds for had no cart's response.

Table 4: Multivariable analysis of dietary diversity of WRA at Afar region, Asaita districts.

Variables	Categories	$\hat{\beta}$	S.E($\hat{\beta}$)	Wald	Df	P-Value	Exp($\hat{\beta}$)	95% C.I for Exp($\hat{\beta}$)	
								Lower	Upper
F. Size Male		-0.552	0.216	6.548	1	0.011*	0.576	0.377	0.879
F. Size Female		-0.408	0.202	4.065	1	0.044*	0.665	0.448	0.988
Marital Status (Windowed (Ref.))	Single	18.203	853.490	0.000	1	0.983	80438220.46	0	0.000
	Married	12.592	6.163	4.174	1	0.041*	294195.561	1.669	51842701505
	Divorce	-2.897	1.744	2.760	1	0.097	0.055	0.002	1.684
Education (Higher ed. (Ref.))	No education	-2.736	1.365	4.018	1	0.045*	0.065	0.004	0.941
	Primary school	-3.632	1.255	8.382	1	0.004*	0.026	0.002	0.309
	Secondary school	-3.717	1.256	8.763	1	0.003*	0.024	0.002	0.285
Window	Yes (No((Ref.))	1.027	0.458	5.035	1	0.025*	2.793	1.138	6.853
Cell phone	Yes (No((Ref.))	2.996	0.573	27.370	1	0.000*	20.005	6.507	61.503
Bank account	Yes (No((Ref.))	4.255	0.745	32.604	1	0.000*	70.457	16.359	303.445
Refrigerator	Yes (No((Ref.))	2.464	0.853	8.343	1	0.004*	11.752	2.208	62.545
Television	Yes (No((Ref.))	-3.386	0.867	15.238	1	0.000*	0.034	0.006	0.185
Cart	Yes (No((Ref.))	-7.171	1.076	44.425	1	0.000*	0.002	0.001	0.006
		Chi-square		Df				Sig.	
Pearson Test		1983.645		763				0.000*	
Deviance Test		299.617		763				1.000	

Df= Degree of freedom, CI= Confidence interval, Ref.= Reference category, *= Significant at 5% level of significance, F=Family

DISCUSSION

In the current study, about 13.0% of the women reproductive age had consumed ≤3 food groups (low diversity diversity), 78.5% of WRA had consumed 4-5 food groups (medium dietary diversity) and whereas 8.5% of the WRA had consumed ≥6 food groups (high diversity diversity) in the last 24 hours. This prevalence was higher than the study done in Laikipia, Kenya (61%) [21], and higher than studies done in South Africa (25%) [44] and Gondar, Ethiopia (16.2%) [45]. This discrepancy might be due to difference in study period, geographical area, and/or socio-cultural factors.

In this study, almost all or 100% and 90.5% of the women reproductive age had consumed grains, and vegetables respectively in the previous 24 hours and 0.5% of them had not consumed vegetables or roots products in the previous 24 hours. This finding is almost consistent with the finding of other studies conducted in Laikipia, Kenya [21], and Southern Ethiopia[45]. Furthermore, many studies in developing countries have documented that their dietary sources are mainly cereal based [46].

The variables such as family size of male, family size of female, marital status, education level, window, cell phone, bank account, refrigerator, television and cart also showed a strong association in the ordinary logistic regression model analysis. This finding is also supported by studies elsewhere [20]. This might be related to personal income because dietary diversity increases as asset levels increases [45].

Reproductive age among women who had cell phones in lower dietary diversity rather than higher dietary diversity were more than twenty times more likely than their counterparts who did not have phones. This finding is supported by studies done in South Gondar, Ethiopia [20].

The odds who had a television's is in low dietary rather than high dietary are [OR=0.034, (CI: 0.006, 0.185)] times estimated odds who had not television'. This might be attributed to access to information through local broadcasting media, which broadcasts nutrition and health messages as a means of advocating. Having a bank account/savings is also significantly associated with dietary diversity. The odds who had a bank account's is in low dietary rather than high dietary diversity are [OR=70.457, (CI: 16.359, 303.445)] times estimated odds who had no bank accounts. This is consistent with a study conducted in Limpopo Province, South Africa where households with low dietary diversity were also the most impoverished, and fewer households had money in a savings account [47], and scores for dietary diversity have been shown to be linked to socioeconomic characteristics [19]. The estimated odds had a refrigerator's for household user is in low dietary rather than high dietary scores are [OR=11.752, (CI: 2.208, 62.545)] times estimated odds for had no refrigerator's for household user. The estimated odds had a window's response is in low dietary rather than high dietary scores are [OR=2.793, (CI: 1.138, 6.853)] times estimated odds for had no window's response. The estimated odds had a cart's response is in low dietary rather than high dietary scores are [OR=0.002, (CI: 0.001, 0.006)] times estimated odds for had no cart's response.

The estimated odds of being "low dietary" instead of "high dietary" multiplies by [OR=0.576, 95% CI: (0.377, 0.879)] for each 1-unit increase in family size of male household. The odds of being "low dietary" instead of "high dietary" multiplies by [OR=0.665, 95% CI: (0.448, 0.988)] for each 1-unit increase in family size of female household. The odds of an education level is in low dietary rather than high dietary diversity scores are [OR1=0.065, OR2=0.026 and OR3=0.026] times estimated odds for higher education. Note that educated and family size of women assign a significantly more substantial proportion of their household food budget to nutritious foods [48,49]. This is mainly because educated and family size of women tends to have greater awareness and understanding of nutritional health benefits [50]. Moreover, an educated and family size of women is an empowered of women.

The estimated odds of a married status response is in low dietary rather than high dietary diversity scores are [OR=294195.561, (CI: 1.669, 51842701505)] times estimated odds for windowed response. The studies of scores for dietary diversity have been shown to be linked to socioeconomic characteristics [51].

CONCLUSION

The mean dietary diversity score among women reproductive age was 36.53 and 13.0%, 78.5% and 8.5% of women reproductive age had low, medium and high dietary diversity practice was presented respectively. Almost all eaten food groups were grains 100% and vegetables and beans or peas were the most commonly eaten the second and third most eaten food groups of 90.5% and 78.0% were presented respectively. Notably, the vegetables or roots and other types of meat or poultry were minimally consumed 0.5% and 0.7%. Likewise, meat made from animal organs, fish or sea food whereas fresh or dried and nuts or seeds were totally not consumed food groups. Hence, family size of male and female, marital status, education level, having cell phone, bank account, refrigerator, television and cart were strongly associated with dietary diversity practices of women under reproductive age at Asaita district of Afar Regional state, Ethiopia.

Limitations of the Study

In this study there are some limitations. Food availability in the household might vary with the seasons which affect dietary diversity and the assessment of dietary intake depends on the 24-hour recall method, which may not accurately reflect their past feeding experience. Moreover, the nature of this study was a cross-sectional design, which does not show the cause and effect relationship.

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