

Dietary Diversity and Associated Factors Among Preschool Children in Southern Ethiopia: A Community Based Cross-Sectional Study

Tagese Yakob Barata^{1,*}, Meseret Lega Bedru², Dereje Yohannes³, Tsegaye Demissie³

¹Bele Primary Hospital, Bele Hawassa Town Administrative, Wolaita Zone, Southern Ethiopia

²Health Office of Geta Wereda, Gurage Zone, Southern Ethiopia

³School of Public Health, College of Health Science and Medicine, Wolaita Sodo University, Wolaita Sodo, Southern Ethiopia

Email address:

yitagesuj@gmail.com (Tagese Yakob Barata)

*Corresponding author

To cite this article:

Tagese Yakob Barata, Meseret Lega Bedru, Dereje Yohannes, Tsegaye Demissie. Dietary Diversity and Associated Factors Among Preschool Children in Southern Ethiopia: A Community Based Cross-Sectional Study. *Advances in Applied Sciences*. Vol. 8, No. 3, 2023, pp. 70-79. doi: 10.11648/j.aas.20230803.12

Received: May 17, 2023; **Accepted:** June 19, 2023; **Published:** July 6, 2023

Abstract: *Background:* Dietary diversity is universally recognized as a key component of healthy diets and defined as the total number of food groups consumed over a reference period. Preschool children are the most vulnerable group because of their high nutritional needs for growth and development. It highly affects their nutritional status as the reason for lack of dietary diversity. The aim of this study was to assessment the levels of dietary diversity and associated factors of Preschool Children aged 4-7 years in Southern Ethiopia. *Method and materials:* A community based cross sectional study will be conducted. A total of 487 preschool children were included in this study. Data was collected using interview guided structured questionnaire. To calculate Dietary diversity score 24 hours recall by mothers of their children's food consumption was used. A binary logistic regression was performed to examine the association of each independent variable on the outcome variable. *Results:* the prevalence of inadequate dietary diversity among preschool children in this study was 65.70% with the mean score of dietary diversity score of study was 3.27 ± 1.50 . Household who do not live near health care facility (AOR= 2.35, CI (1.50-3.69), House hold with no access to fruit (AOR=1.76 (1.11-2.80), history child illness in last two weeks (AOR=2.56, CI: (1.24-5.26) and preschool child with whose mother has counseling of child feeding at PNC (AOR=0.39; 95% CI: (0.21-0.71) were significantly associated with low dietary diversity in preschool children in study. *Conclusion:* The findings indicated that many preschool children in the study area did not get a minimum dietary diversity score. Therefore, health extension workers must organize community-based behavior change nutritional education for mothers or caregivers to create awareness of preschool child dietary diversity practices.

Keywords: Dietary Diversity Practice, Preschool, Ethiopia

1. Introduction

Dietary diversity is universally recognized as a key component of healthy diets and defined as the total number of food groups consumed over a reference period, has gained prominence as a valid and reliable indicator of dietary adequacy among children [1]. Dietary diversity also defined as a qualitative number of food groups is used extensively as a method for ascertaining variety and nutrient adequacy of

diets [2]. The diversity of foods provided to young children, particularly meat, poultry, fish, eggs, fruits and vegetables, is recommended to improve micronutrient intakes. The nutritional status for under five children is directly affected by their feeding practices [3].

Nonetheless, lack of dietary diversity is a dangerous problem among low income community from underdeveloped world, especially in Africa [4]. Great majority of their diet consist of monotonous starchy staples, and reverse is true for animal products and fresh fruit as well

as vegetables [5]. Due to plant based staple feeding status such as maize, they lack optimal diversity feeding [6].

The challenge to connect poor growth and specific nutrient deficiencies has been acknowledged, due to the need for multiple nutrients required for growth and development. Henceforth, dietary diversity has been proposed as a candidate indicator of food security and a predictor of nutritional status [7]. Malnutrition refers to an abnormal physiologic condition caused. It can be under nutrition or over nutrition as well as micronutrient deficiency usually referred to as hidden hunger. It is a major cause of morbidity and mortality in children under-5 years of age globally with approximately one-third of the nearly 8 million deaths attributed to it [8]. Under-5 children are at risk of malnutrition because at this age, they need energy and nutrient dense foods to grow and develop both physically and mentally in order to live a healthy life [9].

Great number of preschool children spends majority part of the day at childcare facilities worldwide [10]. Childcare facilities worldwide include preschools, which are learning space environments offering early childhood education to children before they begin compulsory education [11]. However, food given in such facility for children was assumed to be nutritionally poor to children, which indirectly and ultimately affects their nutritional status of children [10].

Habit such as developing a healthy habit and balanced dietary pattern is essential for preschool children as the result of such habit in this period may last for a long time [12]. Study conducted at national level showed that nearly half of preschool children (44%) have anemia and vitamin A deficiency [13]. Additionally, poor health and inadequate diet affect multidimensional including health and physical growth of preschool children, intellectual capacity, social skills, and future academic performance [14].

Lack of dietary diversity counts great portion of cause of child malnutrition [15]. There was neglecting of monitoring preschool age group currently due to the shift in public health nutrition programs from under 5 to under 2 years of age [16]. Moreover, data specific to preschool children's dietary diversity in Gurage zone, Ethiopia is lacking, if any, it is presented as under-five children. In view of this, the aim of the study was to assess dietary diversity practice and factors that associated with dietary diversity Practice among children attending preschools in Southern Ethiopia.

2. Methods and Materials

2.1. Study Area, Period and Design

This study was conducted in Geta district, Gurage zone, Southern Ethiopia. Geta wereda is one of part of Gurage zone. It borders on the south by the Silte zone, on the south east by endegagn, on the west by Enemorinaeaner, on the north by Cheha, and on the northeast by Gumer. This wereda has a total population of 98,147, 16 kebeles and 20030 households and numbers of under-5 children are 15,310 and 7145 children are age group of 4-7 among them. Moreover, it has

one primary hospital, three health centers and one private clinic. The study will be conducted from July to August 2022. A community based cross-sectional study was conducted.

2.2. Population

All preschool age children paired with their parent or caregiver's in Geta wereda was source population and all systematically selected preschool age children from randomly sampled households with their parent or caregiver's pair in the selected Keble. Only household at least one preschool age children aged between 4-7 years of age with their parent/caregiver's pair was included in this study. If more than two preschool age child, one of the child was randomly selected by a simple ballot process using folded pieces of paper with the child's name on it. The child, whose name picked by the mother, was automatically selected to be part of the study. While Study participant with sick during the past one week and who had a special ceremony one day before data collection and children who were new for that area were excluded from study.

2.3. Sample Size

The sample size was calculated based on single population formula by Epi info version 7.2.3.1 considering the following assumptions: P (proportion of dietary diversity practice among preschool-age children) = 26.5% study conduct in preschool children in Areas of Imo State, Nigeria [17] margin of error (d) = 5%, confidence level = 95%

$$n = (Za/2)^2 p (1-p)/d^2$$

Where: d = margin of error (5% = 0.05), P = prevalence of dietary diversity practice among preschool (26.5% = 0.265).

$$(1-P) = 73.5\% = 0.735$$

$$Z = \text{confidence level } (95\% = 1.96)$$

n = sample size is 299 and multiplying design effect of 1.5 it become 448 and after considering 10% non-response rate, the final sample size will be 493.

2.4. Sampling Procedure

Multistage sampling procedure was used to select the final study subjects. Out of the total 16 Keble in Geta district in Gurage zone, 5 kebeles were selected, based on the convention of the minimum number (30%) of the total cluster by simple random sampling (lottery method) methods. Then each Kebele was allocated sample size proportional to the total households according to expected number of preschool age children in respective Keble. Finally, the study participants were selected by using systematic random sampling through number of each household which children age 4-7 years live in that kebele. If over one child with a similar age group was found in the same house, then one of the children was randomly selected by a simple ballot process using folded pieces of paper with the child's name on it. The child, whose name was picked by the mother, automatically selected to be part of the study. If the eligible child was absent from the house at the time of data collection,

revisit was done again and if they was absent at the second visit it was considered to be non-respondent.

2.5. Study Variables

Socio-demographic factors (care giver): Age, Sex, Education, marital status, family size, occupation, resident, ethnicity, religion, gender, and head of house hold, *Socio-demographic factors (child):* age, sex, birth order, number of under 5 children:- *Socio economic (family):* Income level, any small animal or large animal, any farmland, use of media (radio), presence of home gardening and *Practice and health related factors:* breast-feeding practice, time of introduction of solid food, presence of near market, access to healthcare services and counseling of proper child feeding, child illness variable included in study.

2.6. Operational Definition

Dietary diversity score: was assessed using 24 h and was created by a simple count of food groups consumed by the preschool child over the past 24 h preceding the interview [18]. According to Food and Agriculture Organization (FAO), individual dietary diversity of food groups assessed will be; (a) Cereals, roots and tubers, (b) Legumes and nuts, (c) Dairy products, (d) Flesh foods, (e) Eggs, (f) Vitamin A rich fruits and vegetables, (g) Other fruits and vegetables [19]. Consumption of less than three food groups will be considered as low dietary diversity (inadequate dietary diversity) while consumption of 4 and above food groups referred to as the minimum dietary diversity score (adequate dietary diversity) [20].

Preschool age: Were those children with age category of 4 to 7 years [21].

2.7. Data Collection

Data were collected using an interview-administered questionnaire from children caregiver by allowing them freely to recall the type of food items they feed to their children within last 24hr. During data collection the caregivers were asked whether; the children had eaten foods from the seven [7] main food group last 24 hrs. Commonly consumed foods in the area were incorporated into each food group. The questionnaire was prepared in English and was translated to Amharic and checked for its consistency by translating it back to English by those who are well oriented with the stated languages.

A dietary diversity score was created based on the mother's recall of the child's food intake in the previous 24 h without consideration of a minimum quantity requirement for any food group. Any individual food item in each food group consumed by a child earns one point for their dietary diversity score, but different individual food items consumed in the same group are not be counted repeatedly. Therefore, DDS ranges from 0 to 7. Data collected from primary caregivers and gathered data was recorded accordingly from. The response option of "yes" was scored one point if at least one food items in each food group were consumed by the

child, whereas food groups not consumed at all, with a response option of "no", zero (0) points was given.

2.8. Data Quality Control

Training of data collectors was done before the data collection for two days. Close supervision was made by investigators and the assigned supervisors. Pretest was on 5% of sample, and necessary amendment was done accordingly. Feasibility of study producer, sampling, unclear question and other sampling issue was evaluated and corrected. All finalized data collection forms was examined for completeness and clarity before and during data management, storage and analysis. Double entry of first 10% of the data was done by two independent data entry and data clerk. As the two entries do not shows a significant difference, the remained data was entered by one data clerk. Some of error was corrected in comparison with the hard copy. The data was collected from the child and their caregiver in days where the days of interview and the previous consecutive days was not holidays, special days like marriage ceremony birth date or others. When there is unusual holidays or others ascertained from the respondent that respondent was not included in the survey as it can overestimate the dietary diversity.

2.9. Data Process and Analysis

Cross- checked data was entered in Epi info version 3.1 and was exported to STATA software version 14 for analysis. Binary logistic regression was performed to examine the association of each independent variable on the outcome variable. The variables which show association in the bivariate analysis were included in the final multivariate logistic regression analysis. The result was presented with crude odds ratio (COR) and Adjusted odds ratio (AOR) their respective of 95% confidence interval. Those statistical associations with a p value less than 0.05 will be declared as a statistically significant association. Model fitness was assessed using Hosmer and Lemeshow's test with P value greater than 0.05 as indicator for fitted regression model.

2.10. Ethical Reviews

Ethical clearance was obtained from the institutional review board of college of health science and medicine, Wolaita Sodo University, and permission letter was obtained from Geta Woreda Verbal and written informed consent was obtained from the respondents after explaining the purpose and objective of the study. Participant of all respondents in the study was on confidentiality of each participating respondents was taken under consideration.

3. Results

3.1. Socio-Demographic Characteristic Participants

A total of 493 planned participant, 487 participated in study; a response rate of 98.7%. The mean age of mothers

was 31 ± 7 years, with 25% aged less than 25 years. Nearly half of mother 223 (45.8%) were age category of 20-29 years. Majority, 461 (94.7%) of mother were married, 446 (92.2%) were Gurage and 442 (86.7) were from rural area. Greater than half, 260 (53.4%) participants were Muslim, nearly three fourth of mother, 365 (74.9%) were housewife and greater than half of mother, 291 (59.8%) had no formal education. About greater than two third of participant father,

301 (61.8) were farmer and about 203 (41.7%) participant father had primary level of education. Greater than three fourth of participant responded, 382 (78.4%) were father as head of household and majority of respondent, 445 (91.4%) were mother of children and Few mothers were employed (28%). Greater than half household, 272 (55.9%) have family-size of less or equal to 5 and nearly half of household, 229 (47.0%) had one under five children.

Table 1. Socio-demographic characteristic of participant of dietary diversity practice of Preschool Children in Southern Ethiopia, 2022.

Variables (n=487)	Category	Frequency	Percent (%)
Age category of mothers (Years)	15-19	27	5.5
	20-29	223	45.8
	30-39	180	37.0
	40-49	57	11.7
Marital status mothers	Married	461	94.7
	Single/separated	26	5.3
	Orthodox	133	27.3
Religion of mothers	Muslim	260	53.4
	Protestant	94	19.3
	Gurage	449	92.2
Ethnicity mothers	Hadiya	20	4.1
	Others*	18	1.6
Resident	Rural	422	86.7
	Urban	65	13.3
	Farmer	23	4.7
	Housewife	365	74.9
Occupation of mothers	Merchant	77	15.8
	Government or NGO employment	22	4.5
	Farmer	23	4.7
	No formal education	291	59.8
Educational status mothers	Primary school	125	25.7
	Secondary school	46	9.4
	Collage and above	25	5.1
	No formal education	192	39.4
Education of Father	Primary school	203	41.7
	Secondary school	67	13.8
	college and above	25	5.1
	Farmer	301	61.8
Occupation of Father	Merchant	129	26.5
	Government or NGO employment	57	11.7
Head of house hold	Father	382	78.4
	Mother	105	21.6
You are mother or caregiver	Mother	445	91.4
	Caregiver	42	8.6
Family size of household	Less than and equal to 5	272	55.9
	Greater than 5	215	44.1
Number of under five children	One	229	47.0
	Two	196	40.2
	Three	62	12.7

*Silte, Amahara, Kanabata.

3.2. Maternal, Child and Household Related Characteristics

Most of mother in study, 485 (99.6%) have history of ANC visit and majority of mother, 387 (79.5%) were Counseled for child feeding at PNC. The mean age of the children was 3.8 ± 0.7 years, greater than half of child, 258

(53%) were male, about 199 (40.9%) of children were 3 years old and about 201 (41.3%) child were middle birth order. All of children had history of breast feeding, greater than two third of the children were introduce of solid food at age of six month (68.6%) and about 68.2% of children were breast feeding up to 2 years. Most of children, 421 (86.4%) were not faced any illness in this 2 weeks.

Table 2. Maternal, child and household related characteristic of dietary diversity practice of Preschool Children in Southern Ethiopia, 2022.

Variables (n=487)	Category	Frequency	Percent (%)
ANC Visit	Yes	485	99.6
	No	2	0.4
Counseling of child feeding at PNC	Yes	387	79.5
	No	100	20.5
sex of the child	Male	258	53.0
	Female	229	47.0
	3 years old	199	40.9
Age of the child	4 years old	164	33.7
	5 years old	124	25.5
Birth order of the child	First	158	32.4
	Middle	201	41.3
	Last	128	26.3
Age at which introduce of solid food	Before six months	89	18.3
	at six months	334	68.6
	After six months	64	13.1
Length of breast feeding	Less than 2 years	72	14.8
	Up to 2 years	332	68.2
	Above 2 years	83	17.0
have the child breast feed	Yes	487	100.0
Any illness the child faced in this 2 weeks	Yes	66	13.6
	No	421	86.4

3.3. Socio-Economic and Access Related Factors

Nearly two third of the respondent (62.0%) have monthly income of >5000ETB and majority (91.4%) has their own livestock. Three-fourth of respondent (73.9%) has presence of farm land, and majority (86.2%) were access any type of media. Nearly one-quarter of the participants (22.2%) use

home gardening, and greater than one-third (35.5%) have access of fruit and vegetables. Greater one-third (41.1%) of respondent has presence of near market and nearly half (45.6%) has access near healthcare service; from them half (50%) respondent reside and access time take to reach health service was <30 minutes.

Table 3. Socio-economic and access related factors of dietary diversity practice of Preschool Children in Southern Ethiopia, 2022.

Variables (n=487)	Category	Frequency	Percent (%)
Monthly income	<=5000 EB	185	38.0
	> 5000 EB	302	62.0
Own livestock	Yes	445	91.4
	No	42	8.6
Presence of animals	Yes	64	13.1
	No	423	86.9
	Chicken only	32	7.6
List of animals	Chicken, and sheep	45	10.6
	Cow, and sheep	63	14.9
	Chicken, and cow	64	15.1
	chicken, cow, and sheep	144	34.0
	Chicken, cow, sheep, and bull	75	17.7
Presence of farm land	Yes	360	73.9
	No	127	26.1
	Enset only	12	2.9
	Enset, and bean	23	5.5
	Enset and barley	26	6.2
List of farm land harvest	Enset, and potatoes	27	6.4
	Enset, bean, and barley	103	24.6
	Enset, bean, and potatoes	66	15.8
	Enset, barley, and potatoes	32	7.6
	Enset, bean, barley, and potatoes	130	31.0
Presence of any media	Yes	420	86.2
	No	67	13.8
	Radio only	264	54.2
Lists of media presence	Radio, and Phone	90	18.5
	TV, and Radio	43	8.8
	TV, and phone	19	3.9
	Radio, TV, and phone	4	.8
Presence of home garden	Yes	107	22.0
	No	380	78.0

Variables (n=487)	Category	Frequency	Percent (%)
List of home garden access	Carrot only	55	14.5
	Cabbage only	82	21.6
	Carrot, and cabbage	68	17.9
	Cabbage, and hurt	31	8.2
	Carrot, and hurt	51	13.4
Do you have access of fruit and vegetables	Yes	173	35.5
	No	314	64.5
Presence of near market	Yes	200	41.1
	No	287	58.9
Presence of near healthcare service	Yes	222	45.6
	No	265	54.4
Time take to reach health service	<30 minutes	111	50.0
	30 minutes-1hrs	83	37.4
	> 1hrs	28	12.6

3.4. Dietary Diversity Practice

The mean score of dietary diversity score of study was 3.27 ± 1.5 . Three hundred twenty (65.7%) participants consumed up to three food groups (low dietary diversity), 31.0% consumed four to six food groups (medium dietary diversity), and 3.3% participants consumed seven or more

food groups (high dietary diversity) in their diet during the preceding 24 hours. The proportion of study participants with adequate dietary diversity in this study was 34.3%. Flesh food (10.5%) were the food groups least consumed by the preschoolers and cereals, roots and tubers (96.5%) were most consumed food group by the preschoolers.

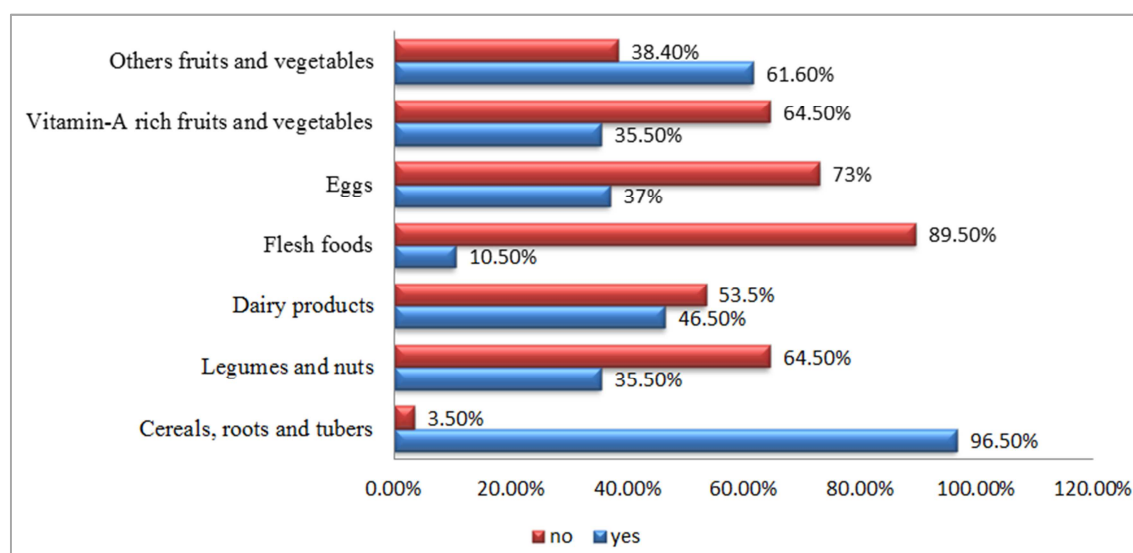


Figure 1. Seven food group dietary diversity measure using 24 hour recall method of Preschool Children in Southern Ethiopia, 2022.

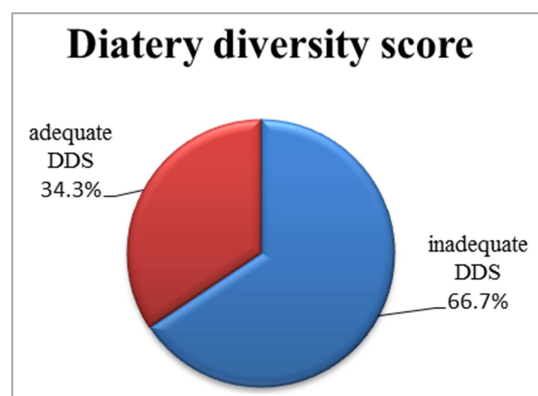


Figure 2. Measure of dietary diversity practice of Preschool Children in Southern Ethiopia, 2022.

3.5. Factors Affecting Preschool Dietary Diversity

All independent variables were analyzed in the logistic regression with the dependent variable of household dietary diversity to analyze their association. Twelve were significantly associated with preschool dietary diversity in the binary logistic regression ($p \leq 0.2$) and entered into the multiple logistic regression analysis. There was significant association between the following variables: easily access of health care, fruit access, child illness in last two weeks and PNC before 45 days of delivery.

At multivariable logistic regression analysis, household with no near health care facility were 2.35 more likely to have low dietary diversity compared to other (AOR [95%CI] = 2.35 (1.50-3.69) were independently associated with preschool dietary diversity. House hold with no access to

fruit were almost two times more likely to have low dietary diversity than compared (AOR [95% CI] =1.76 (1.11-2.80)). House hold with history child illness in last two weeks were 2.56 times more likely to have pre-school low dietary diversity as compared (AOR=2.56, CI: (1.24-5.26) and preschool child with whose mother has history of PNC

before 45 days of delivery were 61% less likely to having low dietary diversity of preschool as compared (AOR=0.39 95% CI: (0.21-0.71) were significantly associated with low dietary diversity in preschool children in study area at p-value of <0.05.

Table 4. Bi-variety and multivariable analysis of factors associated with affecting preschool Dietary Diversity in Southern Ethiopia, 2022.

Variables	Category	COR (95% CI)	AOR (95% CI)	p-value
Resident	Urban	0.11 (0.06-0.21)	0.733 (0.22-2.36)	0.604
	Rural	1.00 (reference)	1.00 (reference)	
Presence of near health care	Yes	1.00 (reference)	1.00 (reference)	<0.001*
	No	3.58 (2.42-5.31)	2.35 (1.50-3.69)	
Head of household	Mother	0.62 (0.40-0.97)	0.71 (0.41-1.20)	0.199
	Father	1.00 (reference)	1.00 (reference)	
Presence of near market	Yes	1.00 (reference)	1.00 (reference)	0.208
	No	3.03 (2.06-4.47)	1.56 (0.98-2.48)	
Number of under-five child at household	One	0.65 (0.35-1.21)	0.99 (0.48-2.03)	0.986
	Two	0.74 (0.39-1.39)	0.78 (0.38-1.61)	
	Three and above	1.00 (reference)	1.00 (reference)	
Fruit access	Yes	1.00 (reference)	1.00 (reference)	0.017*
	No	3.20 (2.16-4.74)	1.76 (1.11-2.80)	
Presence of animal	Yes	0.13 (0.07-0.23)	0.58 (0.18-1.88)	0.369
	No	1.00 (reference)	1.00 (reference)	
Home-garden	Yes	1.00 (reference)	1.00 (reference)	0.451
	No	2.94 (1.89-4.57)	1.26 (0.68-2.33)	
Child illness in last 2 weeks	Yes	4.06 (3.24-5.26)	2.56 (1.24-5.26)	0.010*
	No	1.00 (reference)	1.00 (reference)	
Family size	Less five	1.00 (reference)	1.00 (reference)	0.057
	Greater than five	5.47 (0.31-0.69)	0.64 (0.41-1.01)	
Counseling of child feeding at PNC	Yes	0.66 (0.61-0.81)	0.39 (0.21-0.71)	0.003*
	No	1.00 (reference)	1.00 (reference)	

4. Discussion

The proportion of inadequate dietary diversity in preschool children in study area was 65.7% (95% of CI (61.36-69.80)) participants consumed up to three food groups (low dietary diversity) with the mean score of dietary diversity score of study was 3.27 ± 1.5 in their diet during the preceding 24 hours. This result low with Study conducted preschool children in selected kindergarten school of Horo Guduru Wollega Zone, Oromia Region, Ethiopia [21] and study conducted [22] showed mean DDS was 4.19 ± 0.83 with prevalence of low dietary diversity was 19.2% and study conducted in India showed mean diversity of food scores calculated using 24 hour diet recall data (FS24hr) was 7 [3]. Other studies conducted at [24] was mean DDS was 5.77, in Chinese preschool Children mean DDs was 6.10 [25] and same types of study conducted on preschool children in China revealed that magnitude of overall mean score of DDs among the children was 7.40 [26]. But, this study in-line with Study conducted in south Africa on preschool children come up, with mean DDS was 4.39 with a prevalence of 61.00% for low DDS [29] and study was conducted in Sri Lanka with mean DDS was 4.56 ± 0.85 [30]. However, our study was higher than study conducted in Afambo district was 30.80% and 2.73 prevalence of DDS and mean score DDS respectively [31]. The possible explanation for these might be the economic difference and the fact that only cereals

foods are commonly consumed in those setting.

Our study revealed that the least consumed food by preschool children in study was Flesh food (10.50%) and the most consumed food by school children in study area was cereals, roots and tubers (96.50%). Similar report with study conducted on Preschool children [23] was consumed a cereal based diet, study conducted [29] was Cereals (100%) accounted for the main food group consumed and study revealed in different parts of countries (Nigeria, DRC and Burundi) the most popular food group was the roots, tubers, cereals and grains group in Gitega (Burundi) and vegetables group and legumes group in Butembo (DRC) [27]. This might be due greater than three fourth of participant reside at rural in this study and the food consumption of children in the rural area being monotype, cheap and affordable.

In multivariable analysis, household with no near health care facility were 2.35 more likely to have low dietary diversity compared to other (AOR [95%CI] = 2.35 (1.50-3.69)) were significantly associated with preschool dietary diversity. consist with the study employed the in South-West Nigeria access to healthcare services were the significant determinants of children dietary diversity either positively or negatively [32-34]. Also this study in-line with the findings from study conducted in Nepal reported that household expenditure and community infrastructure (presence of hospitals) were strongly, negatively associated with decreasing dietary diversity (lowest versus highest household

expenditure quintile, less developed (lacking hospitals) versus more developed communities) [35]. This might be due to that no access health settings there provide poor access to the selection of foods.

This study revealed that House hold with no access to any type of fruit were almost two times more likely to have low dietary diversity than compared (AOR [95% CI] =1.76 (1.11-2.80)). This might be due to in our study greater than two third of participant from rural and greater than three fourth of study participant have no permanent monthly income and rural family preschooler children farms where they can grow vegetables and raise livestock to replace or supplement purchased food.

Our study showed that House hold with history child illness in last two weeks were 2.56 times more likely to have pre-school low dietary diversity as compared (AOR=2.56, CI: (1.24-5.26). This might due be dietary diversity is influenced by food production and purchase where factors including contextual factors like illness that influence women's autonomy and income are important determinants With low income, agency and access to household financial resources coupled with norms that restrict women's income earning, women continue to be at risk for not achieving adequate dietary diversity.

In our study reveal that preschool child with whose mother has history of counseling of child feeding at PNC were 61% less likely to having low dietary diversity of preschool as compared (AOR=0.39; 95% CI: (0.21-0.71) were significantly associated with inadequate dietary diversity in preschool children in study area at p-value of <0.05. this consist with study conducted on dietary diversity Northeastern Ethiopia showed that mothers who got counseling on proper child feeding practices at postnatal checkup were independent positive predictors of meeting minimum dietary diversity [31]. This might be due to the fact that mothers who got counseling at postnatal checkup may be encouraged by health professionals to practice optimal feeding on dietary diversity practice. But the following limitation should be noted while interpreting the findings of the study. The DD was assessed on the basis of a single day recall hence it may not precisely show the usual dietary behavior of the community. Further, measurement of husbands' involvement in preschool children can be liable to social desirability bias. As the study is cross-sectional causal inference may not be strong and cross-sectional nature that did not enable collection of data across seasons.

5. Conclusion and Recommendation

Food variety or dietary diversity of preschool children in the study area was below average. Easily accesses of health care, fruit access, child illness in last two weeks and counseling of child feeding at PNC were predictors of inadequate dietary diversity. As inadequate dietary diversity is common problem in the area, there should be an awareness creation through existing Health extension platform and backyard vegetation should be improved. Enhanced behavioral

change schemes through community health agents, agricultural extension workers and volunteers there should be nutritional counseling for caregivers and the household as a whole, so as to improve and promote agricultural activities (farming variety of products) for the primary purpose of household consumptions. Should to commence the production of a variety of local fruits and vegetables for the consumption of its people. Further studies at the national level would support to understand the dietary issues of preschool children comparatively and it helps for modification of related policies and effective interventions to promote healthy diets.

Abbreviation and Acronyms

AOR: Adjusted Odd Ratio.

CI: Confidence Interval.

COR: crude odd ratio.

DDS: dietary diversity scores.

EDHS: Ethiopian Demographic Health Survey.

FAO: Food and Agriculture Organization.

SSA: Sub-Saharan Africa.

WHO: World Health Organization.

References

- [1] Marie T. Ruel; Operationalizing Dietary Diversity: A Review of Measurement Issues and Research Priorities: Food Consumption and Nutrition Division, International Food Policy Research Institute (IFPRI), Washington, D. C. 20006.
- [2] Nguyen PH, Avula R, Ruel MT, Saha KK, Ali D, Tran LM, et al. Maternal and child dietary diversity are associated in Bangladesh, Vietnam, and Ethiopia. *J Nutr.* 2013; 143: 1176-1183.
- [3] Pan American Health Organization (PAHO); World Health Organization (WHO). Guiding Principles for Complementary Feeding of the Breastfed Child; PAHO: Washington, DC, USA; WHO: Geneva, Switzerland, 2003.
- [4] Leyna, G. H.; Mmbaga, E. J.; Mnyika, K. S.; Hussain, A.; Klepp, K.-I. Food insecurity is associated with food consumption patterns and anthropometric measures but not serum micronutrient levels in adults in rural Tanzania. *Public Health Nutr.* 2010, 13, 1438–1444. [CrossRef] [PubMed].
- [5] WHO. Preparation and Use of Food-Based Dietary Guidelines; World Health Organization: Geneva, Switzerland, 1998.
- [6] Du Plessis, L. M.; Kruger, H.; Sweet, L. Complementary feeding: A critical window of opportunity from six months onwards. *S. Afr. J. Clin. Nutr.* 2013, 26, S129–S140.
- [7] Onyango, A. W. Dietary diversity, child nutrition and health in contemporary African communities. *Comp. Biochem. Physiol. Part A Mol. Integr. Physiol.* 2003, 136, 61–69. [CrossRef].
- [8] FAO/IFAD/WFP. The State of Food Insecurity in the World 2013: The Multiple Dimensions of Food Security. Rome: Food and Agriculture Organization of the United Nations. (2013).

- [9] Martin-Prevel Y BE, Taosoba S, Castan F& Coulibaly D. The 2008 food price crisis negatively affected household food security and dietary diversity in urban Burkina Faso. *J Nutr Educ Behav.* (2012); 142: 1748-55.
- [10] Ayalew: MB. Mortality and Its Predictors among HIV Infected Patients Taking Antiretroviral Treatment in Ethiopia: A Systematic Review. Hindawi Publishing Corporation. (2017).
- [11] Armel P AH, Jacques Z, Nongodo Firmin K, Bebar Euloges K, Ibrahim S, G, Abdoul-Salam O, Nicolas M, Adrien Bruno S. Mortality of HIV-Infected Patients on Antiretroviral Therapy in a Large Public Cohort in West Africa, Burkina Faso: Frequency and Associated Factors; *Advances in Infectious Diseases.* (2013).
- [12] Jarman MO, J.; Inskip, H.; Lawrence, W.; Baird, J.; Cooper, C.; Robinson, S.; Barker, M. How do Mothers Manage their Preschool Children's Eating Habits and Does this Change as Children Grow Older? A Longitudinal Analysis. *Appetite* 2015; 95, 466–474. [CrossRef] [PubMed].
- [13] Bereket D BM, and Tadesse A. Survival and determinants of mortality in adult HIV/Aids patients initiating antiretroviral therapy in Somali Region, Eastern Ethiopia. *AIDS & Clinical Research.* 2014, 5: 7.
- [14] Laxmi B EK, Keshab D, Rachana Sh, Deepak Kumar K, Anna Mia E and Luai Awad A: Survival on antiretroviral treatment among adult HIV-infected patients in Nepal: a retrospective cohort study in far-western Region, 2006–2011. Bhatta et al *BMC Infectious Diseases* (2013).
- [15] Kennedy GLP, M. R.; Seghieri, C.; Nantel, G.; Brouwer, I. Dietary Diversity Score Is a Useful Indicator of Micronutrient Intake in Non-Breast-Feeding Filipino Children. *J Nutr* 2007 137, 472–477. [CrossRef] [PubMed].
- [16] Melese ST BGaHK. PREVALENCE OF UNDERNUTRITION AND ASSOCIATED FACTORS AMONG PRESCHOOL CHILDREN IN JIMMA TOWN, SOUTH WEST ETHIOPIA. *Afr J Food Agric Nutr Dev* 20 (3): 15954-15977. 2020;
- [17] Chilezie UPOOV. Assessment of Dietary Diversity Score, Nutritional Status and Socio-demographic Characteristics of Under-5 Children in Some Rural Areas of Imo State, Nigeria. *Mal J Nutr* 2017; 23 (3): 425-35.
- [18] FAO. Guidelines for Measuring Household and Individual Dietary Diversity. In FAO Nutrition and Consumer Protection Division, with Support from the EC/FAO Food Security Information for Action Programme and the Food and Nutrition Technical Assistance (FANTA) Project; FAO: Rome, Italy, 2007.
- [19] Kennedy GB, T.; Dop, M. C. Guidelines for Measuring Household and Individual Dietary Diversity; Food and Agriculture Organization of the United Nation: Rome, Italy, 2013.
- [20] Millen AE, Dahhan R, Freudenheim JL, Hovey KM, Li L, McSkimming DI, et al. Dietary carbohydrate intake is associated with the subgingival plaque oral microbiome abundance and diversity in a cohort of postmenopausal women. *Sci Rep.* 2022; 12 (1): 2643.
- [21] Ebisa Olika Keyata ADaAO. Dietary diversity and associated factors among preschool children in selected kindergarten school of Horo Guduru Wollega Zone, Oromia Region, Ethiopia. Keyata et al *BMC Nutrition* <https://doi.org/10.1186/s40795-022-00569-w>. (2022) 8: 71.
- [22] AC2 S-PCaP. An Assessment of Dietary Diversity and Nutritional Status of Preschool Children. *Austin J Nutri Food Sci-September* 17, 2014; Volume 2 Issue 7.
- [23] Devanesan Jacinth Nithya PhD, Ramanathapuram Vaidyanathan Bhavani PhD: Factors which may limit the value of dietary diversity and its association with nutritional outcomes in preschool children in high burden districts of India; *Asia Pac J Clin Nutr* 2018; 27 (2): 413-420 413.
- [24] Jieying Bi CL, Shaoping Li, Zhenya He, Kevin Chen, Renfu Luo, ZimeiyiWang, Yanying Yu and Haiquan Xu. Dietary Diversity among Preschoolers: A Cross-Sectional Study in Poor, Rural, and Ethnic Minority Areas of Central South China. *Nutrients.* March 2019; 11, 558.
- [25] Meng LW, Y.; Li, T.; Loo-Bouwman, C.; Zhang, Y.; Szeto, I. M. Dietary Diversity and Food Variety in Chinese Children Aged 3–17 Years: Are They Negatively Associated with Dietary Micronutrient Inadequacy. *Nutrients* 2018, 1; 0, 1674. [CrossRef] [PubMed].
- [26] Jiang HZ, A.; Zhao, W.; Tan, S.; Zhang, J.; Zhang, Y.; Wang, P. Do Chinese Preschool Children Eat a Sufficiently Diverse Diet? A Cross-Sectional Study in China. *Nutrients* [CrossRef] [PubMed]. 2018, 10, 794.
- [27] Ekesa BN, Blomme G and H Garming; DIETARY DIVERSITY AND NUTRITIONAL STATUS OF PRE-SCHOOL CHILDREN FROM MUSA-DEPENDENT HOUSEHOLDS IN GITEGA (BURUNDI) AND BUTEMBO (DEMOCRATIC REPUBLIC OF CONGO). July 2011; Volume 11 No. 4.
- [28] Nivo Heritiana Rakotonirainy VR, Chitale Rabaoarisoa Remonja, Randza Rasoloarijaona, Patrice Piola, Charlotte Raharintsoa, Rindra Vatosoa Randremanana. Dietary diversity of 6- to 59-month-old children in rural areas of Moramanga and Morondava districts, Madagascar. *PLOS ONE | July* 13, 2018.
- [29] Perpetua Modjadji, Dineo Molokwane and Patricia Ogechi Ukegbu; Dietary Diversity and Nutritional Status of Preschool Children in North West Province, South Africa: A Cross Sectional Study: *Children* 2020, 7, 174; doi: 10.3390/children7100174.
- [30] Fathima Sirasa | Neil Harris. Dietary diversity and food intake of urban preschool children in North-Western Sri Lanka. *Matern Child Nutr* 16: e13006. 2020.
- [31] Misgan Legesse Liben TAaYH. Factors Associated with Dietary Diversity among Children of Agro Pastoral Households in Afar Regional State, Northeastern Ethiopia. *Acad J Ped Neonatol* July, 31, 2017; 5 (2).
- [32] Olutosin Ademola Otekunrin OAO, Idris Akanbi Ayinde, Rahman Akintayo Sanusi, Oluseye Olusegun Onabanjo, Oluwaseun Ariyo. Dietary diversity, environment and health-related factors of under-five children: evidence from cassava commercialization households in rural South- West Nigeria. *Environmental Science and Pollution Research (ESPR)* on 31 October 2021.
- [33] Torheim, L. E.; Ouattara, F.; Diarra, M. M.; Thiam, F. D.; Barikmo, I.; Hatløy, A.; Oshaug, A. Nutrient adequacy and dietary diversity in rural Mali: Association and determinants. *Eur. J. Clin. Nutr.* 2004, 58, 594–604. [CrossRef] [PubMed].

- [34] Morseth, M. S.; Grewal, N. K.; Kaasa, I. S.; Hatloy, A.; Barikmo, I.; Henjum, S. Dietary diversity is related to socioeconomic status among adult Saharawi refugees living in Algeria. *BMC Public Health* 2017, 17, 621. [CrossRef] [PubMed].
- [35] Jamie L. Dorsey, Swetha Manohar, Sumanta Neupane, Binod Shrestha, Rolf D. W. Klemm KPWJ. Individual, household, and community level risk factors of stunting in children younger than 5 years: Findings from a national surveillance system in Nepal. *Matern Child Nutr.* 2018; 14: e12434.