ASSESSMENT OF DIETARY DIVERSITY SCORE AMONG PRIMARY SCHOOL STUDENTS OF AGE 7 TO 14 YEARS OF SCHOOL FEEDING BENEFICIARY AND NON-BENEFICIARY IN ADDIS ABABA, ETHIOPIA.

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Declaration

This is to certify that the thesis prepared by Wassihun Kassaye entitled **Assessment of Dietary Diversity Score among Primary School Students of age 7 to 14 years of school feeding beneficiary and non-beneficiary in Addis Ababa, Ethiopia. Quantitative Comparative Cross-Sectional Study** is the original work of the investigator. The research complies with university norms and satisfies established standards in terms of originality and quality.

Signed by the Examining Board

_Abebe Haile_____		4/27/2023
External examiner (Name)	Signature	Date
_____	_____	_____
Internal examiner (Name)	Signature	Date
_____	_____	_____
Adviser (Name)	Signature	Date

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Acronyms

AU	African Union
DDS	Diet Diversity Score
ECA	United Nations Economic Commission for Africa
EHNRI	Ethiopian Health Nutrition Research Institution
IDD	Iodine Deficiency Disorder
IDDS	Individual Dietary Diversity Score
MoE	Ministry of Education
MoH	Ministry of Health
SFP	School Feeding Program
SHN	School Health Nutrition
SNNPR	Southern Nation Nationalities Peoples Region
UCLA	University of California, Los Angeles
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations International Children's Emergency Fund

Abstract

Background: School feeding is a program that provides food for students from lower-income households. It is a program that was introduced to increase enrolment rates, reduce absenteeism, and improve food security at primary schools. The Addis Ababa city administration implemented this program in all government-owned schools in Addis Ababa to reach out to students who demand support in the school learning process.

Objective: To analyze the diet diversity score and associated factors among children on school feeding program beneficiary and non-beneficiary from February first to March 31 in Addis Ababa Ethiopia.

Method: Quantitative comparative cross-sectional study designs were conducted with beneficiary to non-beneficiary ratio of one to one among 228 beneficiaries and 228 non beneficiaries. Data were collected using structured self-administered questionnaire, entered to Epi data version 3.1, and exported to SPSS version 23 for analysis. Multiple logistic regression was used for the analysis. Odds ratio with its 95% confidence intervals was used to determine the strength of association. Variables with P-value < 0.25 in the bivariate analysis were included in the multivariate logistic regression model and statistical significance was determined as p-value less than 0.05.

Result: A total of 456 who were 228 school feeding beneficiary and 228 school feeding non beneficiary students were enrolled with 100% respondent rate. 65.4% 0f School feeding beneficiary and 61.4% of school feeding non beneficiary students had poor dietary diversity score where as 34.6% 0f school feeding beneficiary and 38.6% of school feeding non beneficiary students had good dietary diversity score.

Conclusion: Generally our finding showed that both school feeding beneficiaries and non-beneficiary students had poor dietary diversity scores and sex, having separate room for kitchen and school latrine having hand washing were determinant factors identified.

Keywords: School feeding, Non-school feeding, Diet diversity score, Good diet and poor diet.

CHAPTER ONE

INTRODUCTION

1.1 Background

The World Bank describes school feeding programs as "targeted social safety nets that deliver both educational and health advantages to the most vulnerable children, thereby increasing enrolment rates, decreasing absenteeism, and improving food security at the household level. (Wikipedia, 2021). Students from lower-income households can get food through the school feeding program(SFP), which is divided into two categories: homegrown SFP and non-homegrown SFP (Shikongo.L, 2021).In the broadest sense, "homegrown SFP" refers to a program that offers locally grown and prepared meals. "Non-home grown SFP" is a popular SFP that sources its food from outside the country (Bundy .D, et al., 2009).

The development and implementation of school feeding programs has a variety of theoretical backgrounds. The first is Millennium Development Goal 2 (MDG 2), which calls for "the progress of universal primary education" for those in need (MDG.UN, 2000). The major problem in various countries' attaining the goal is food insecurity. Food insecurity is an ongoing problem that affects more than 1.2 billion people who do not have enough to eat in the world today. The recent global economic crisis, fluctuations in food prices in 2006–2008, wars and political conflicts, and devastating natural disasters have deprived millions of people’s access to adequate food. One of the programs that introduced feeding children nourishing meals is school feeding programs. Currently, there are school feeding programs in 70 of the 108 low- and lower-middle-income countries, and the WFP is largely responsible for their establishment and funding. These programs provide meals in schools to lessen temporary hunger, which could otherwise affect children's performance, and to improve students' attention spans and learning capacities. The recently developed school feeding program emphasizes providing food for students as well as the nutritional value of the foods that improve their health state (WFP., 2020).

Studies have shown that many schoolchildren are anemic, underweight, wasted, and deficient in iodine or vitamin A, investigations have demonstrated that schoolchildren are not always naturally healthy. Children's ability to grow and gain educational benefits is affected in many places by health and nutrition-related issues. All of these commonly occurring health and dietary issues,

which are present in many Ethiopian regions, are believed to contribute to cognitive impairment (Truebwasser.U, 2017) . According to the 2008 national school health and nutrition survey (MoE, 2008), 23% of the children surveyed were stunted and a significant portion of them was underweight. The survey also showed a prevalence of national night blindness of 12.8%, a prevalence of iodine deficiency disorder (IDD) of 13.8%, and a goiter prevalence of 40% in schoolchildren for IDD in 2005/2006 (EHNRI, 2006) (MoE, 2012). A study conducted in 2014 in the Amhara region revealed that malnutrition was common among school-age children in both rural and urban settings, with rates of 42.7% in rural regions and 29.2% in urban areas, and corresponding rates of thinness were 20.8% and 21.6% in rural and urban settings, respectively (Herrador, et al., 2014).

Ethiopia's school feeding program (SFP) was established in 1994 with support from the World food Program, in the Amhara, Tigray, Afar, and Oromia regions. It began as a pilot program in 40 primary schools. The program's coverage of the nation's nine regional states was further increased in 2002 with the addition of the Southern Nations Nationalities and Peoples Region (SNNPR) and Somali regions (WFP., 2018) . A "National School Health and Nutrition Strategy" (SHN) was introduced in October 2012 by the Federal Democratic Republic of Ethiopia's Ministry of Education. This strategy was intended to serve as the main resource and guiding document for all school education, health and nutrition, agriculture, and social domains. The SHN strategic targeted areas associated with the school feeding program will be assessed for this study, with an emphasis on the diet diversity score of the school-fed children. Across the country, primary school levels are expected to complete these packages of activities and services related to school health and nutrition, which include: micronutrient supplementation, disease prevention and control, school feeding programs, nutrition education, and water, sanitation, and hygiene (WASH) services (MoE, 2012). The Ethiopia School Health Program Framework was developed in August 2017 by the FMoH, one of the major participants in the national school feeding program, as part of the national school health and nutrition strategy. This framework includes a variety of monitoring and evaluation tools and instruments for the various SHN activities and services (FMoH., 2017). This research will be conducted to analyze the diet diversity score of children by their school feeding participation status.

1.2 Statement of the Problem

Under-nutrition among schoolchildren in Ethiopia is a major public health issue. Stunting rates range from 41.9% in Arba Minch to 17.1% in the Hararghe zone (Tariku.E, et al., 2018). In the Hararghe zone, the degree of thinness was 17.9%, and in the Arba Minch, it was 8.0% (Miteku.H, et al., 2019). In the area where this study was conducted, under-nutrition was very common. A study in Gondar Town revealed that 46.1% and 9%, respectively, of the students in primary schools, were stunted and wasted (Getaneh.Z, et al., 2019).

Numerous socioeconomic problems exist in Addis Ababa. For instance, a study "on the food insecurity situation of the city's vulnerable primary school children" revealed that 14.7% of the study's youngsters were discovered to be beggars, 15.8% of them didn't eat a meal at all, and 26.5% of them ate only once per day (Yohannes.A, 2017). In a community-based cross-sectional study by Degarge et al. (2015), the nutritional status of school-age children in the Lideta sub-city was found to be 31% undernourished, with 19.6% stunted and 15.9% underweight (Degarege.D, et al., 2015). The Addis Ababa administration office implemented a school feeding program to minimize the socioeconomic and nutritional problems in primary school children. This study will focus on the positive changes in school feeding and the diet diversity scores of school-fed children.

For this study, I have used a research paper written by Yeshalem Mulugeta and Aazezu Asres, both from Bahir Dar University, in April 2020. The papers focus on the nutritional status and associated factors among primary school students in Meket Woreda. They concluded that there was a higher rate of thinness, which is a sign of malnutrition, among kids who skipped meals at school than among those who did, and they suggested expanding school feeding programs in locations with a lack of access to food (both rural and urban) (Yeshalem.M, et al., 2020).

Mastewal Zenebe, Samson Gebremedhin, Carol J. Henry, and Nigatu Regassa conducted a study in Addis Ababa, and their findings indicate that the SFP has increased the diet diversity and nutritional quality of schoolchildren. Children who were beneficiaries of the SFP also showed higher percentages of attendance and reduced dropout rates. Low community involvement, issues with storage and transportation, as well as the fact that the SFP took students' educational time, were among the difficulties encountered throughout the program's implementation. Given the

program’s benefits in terms of improving schoolchildren's nutritional status, diet diversity, and attendance, they strongly advise expanding the program to other places with food insecurity. To improve policy implications; it is crucial to emphasize the need for a subsequent longitudinal study that tackles the durability and potential long-term effects of the program (Mastewal.Z, et al., 2018).

The School Feeding Programs (SFPs) aim to reduce children's short-term hunger, improve their nutrition and cognition, and give families additional income. However, there is disagreement over how SFP affects schoolchildren's nutritional status and diet diversity scores (Dheressa.Dk, 2011). Especially the meal given is not intended to meet specific nutrient and calorie requirements for children of this age. The diet that is required to help the students overcome problems including hunger, wasting and stunting was not examined. The majority of research on the effects of school feeding programs has produced a range of results; for instance, the diet diversity score of school-aged children receiving school meals has yielded conflicting results (Dzifa.F, et al., 2013).

The basis of this study was to identify the diet diversity score of school children and the risk factors. Governmental and non-governmental organizations will take intervention measures and set appropriate plans to tackle the existing nutrition and health problems. Moreover, the study would be expected to provide information to fill the gap concerning the severity of schoolchildren's diet diversity scores both in the region. Therefore, the study was investigated to assess the dietary diversity score and associated factors of school feeding beneficiary and non-beneficiary students, in the selected primary school in Addis Ababa, Ethiopia in 2022.

1.3 Research Question

- ✓ What is the diet diversity score of students among selected school feeding program beneficiary and non-beneficiary children in the study schools?
- ✓ What is the association between school feeding program status and diet diversity score of students in the selected study schools of Addis Ababa?

1.4 Research Objectives

1.4.1. General objectives

To analyze the diet diversity score and associated factors among children on school feeding program beneficiary and non-beneficiary February first to March 31 in Addis Ababa Ethiopia.

1.4.2. Specific objective

- ✓ To analyze the diet diversity score of school feeding program beneficiary and non-beneficiary children in selected schools.
- ✓ To determine factors associated with a diet diversity score of children under beneficiary and non-beneficiary school feeding programs.

1.5 Significance of the Study

Early malnutrition can adversely affect physical, mental, and social aspects of a child's health, which as a result leads to underweight, stunted growth, lowered immunity, and mortality. The lack of nutrition imposes significant economic costs on individuals and nations, including how it affects academic performance and behaviors at school and long-term productivity among adults.

Since poor nutrition is associated with physical and mental retardation among school children and rapid growth mostly occurs at this age; it is important to know and address diet diversity scores among school children aged (7-14 years) and its associated factors. Therefore this study aims to serve as an input to the government, non-government school feeding programs for policymakers, and international organizations about school feeding programs and non-school feeding program students. Besides, it provides a baseline for regional & national researchers, international NGOs, and donors to make further research in Addis Ababa on school children's diet diversity score with the school feeding program. Furthermore, the study will contribute to the works that have been done in Addis Ababa regarding the school children's nutritional intervention on specifically in

Ethiopia as well as in Addis Ababa city; it provides the gap and uses the findings in strategic planning for those who are planning to give school feeding program. At last but not least, it contributes to a better understanding of school feeding programs on school children's diet diversity score to the community, donors, and local governments and will enable to have a baseline to design school feeding program related strategy, framework, and projects.

1.4 Scope and Limitations of the Study

The scope of the study covers primary school students enrolled in school feeding program beneficiaries and non-beneficiaries in Addis Ababa City, three sub-cities of selected Government and private primary schools. The study covers students' diet diversity scores. Since the study was done in Addis Ababa, it may not be representative for students who learn in schools out of Addis Ababa city. It may not be also representative for students out of elementary schools.

CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual Literature

The idea of school feeding has changed globally over several years. Since 1995, the World Health Organization (WHO) has supported the global adoption of the school health concept. To increase awareness of school health in the education sector and make a compelling case for the importance of school feeding in achieving "Education for All," UN agencies including WHO, UNESCO, UNICEF, and the World Bank organized a strategy session at the World Education Forum in Dakar, Senegal in 2000. School feeding programs (SFPs) enhance the effectiveness of other child development interventions, which boost social fairness and are very cost-effective (MoH., 2017).

Operational Definition of Terms

Diet diversity score: - Dietary diversity (DD) is defined as the number of different foods or food groups consumed in the previous day related to diet diversity score.

School feeding status: - students who are participating in a school feeding program.

Non-school feeding status: - students who do not participate in a school feeding program.

Poor diet: - students who eat less than three diversified food categories in 24 hours dietary recall.

Good diet:-students who eat three and more than three diversified food categories in 24 hours dietary recall.

2.2 Theoretical Literature

One of the school feeding theories is the theory of change, which contends that school feeding ultimately helps people become more resilient to food shocks and enhances their food security. In addition to service delivery, capacity building is regarded as a crucial component in achieving long-term goals. School feeding is considered a part of social protection and a potential factor in increasing attendance, enrolment, and retention, in addition to better nutrition and health. Educational success is not seen as the major goal of school feeding. Importantly, WFP is working

harder than ever to support countries in creating and managing their sustainable school feeding programs (Fennings.C, 2017).

It is known that nutrient intake is just one of many environmental elements that young children's genetic potential interacts with to influence their physical development. The malnutrition syndrome does not occur in a vacuum but rather within the context of a wide variety of elements, all of which act together to cause the final manifestation of the problem. Since nutrient intake may be related to numerous environmental factors, the current model's strategy is ecological. It is thought that the food diversity score of schoolchildren should be compared to elements that define their immediate environment, especially their family. According to the theoretical model created to investigate nutritional status, the family serves as the developing child's close environment and is crucial in creating the right conditions for interaction between him and the elements of the more distant environment. The interaction of matter, energy, and information flow within the family system is seen as the source of nutrient intake. The child, acting as a separate ecosystem, processes the nutrient supply in a way that results in physical development and diet diversity scores as system outputs (Laura.s, et al., 1978).

According to Kendra Cherry's incentive theory of motivation, rewards such as money, rewards, praise, or other rewards is what motivates people to do or act in a particular way. The theory proposes that people are motivated by rewarding acts and uninterested in those that do not. This idea argues that students who eat a filling lunch or snack at school will quickly spread the word to family members about the benefits of a school feeding program and will likely experience an increase in enrolment. Physiological, social, and cognitive factors all have an impact on the kinds of rewards that inspire people. For instance, people are more likely to be motivated by food when they are hungry as opposed to full (Igboji.O, et al., 2022).

2.3 Empirical Literature

Based on a community-based cross-sectional study on dietary diversity among school-age children in Merawi Town, Amhara Region, Ethiopia, in 2018, 8.3% had low diet diversity, 59.1% had good diet diversity, and 32.6% had better diet diversity, respectively (Tilahun.T, et al., 2018).

One hundred seventy-two (21.1%) participants in a study on dietary diversity and related factors in rural households in the south Gondar zone, northwest Ethiopia, consumed up to three food groups (low dietary diversity), 62.7% of participants consumed four to six food groups (medium dietary diversity), and 16.2% participants consumed seven or more food groups (high dietary diversity) in their diet during the previous 24 hours. In this study, 16.2% of individuals had a diverse diet to an acceptable level (Girma.N, et al., 2015)

In Yayu Biosphere Reserve, Southwest Ethiopia, a study on the determinants of household dietary diversity was conducted in 2019. The results revealed that out of 183 households, 32 (17.5%) participants consumed up to three food groups (low dietary diversity), 112 (61.2%) participants consumed four to six food groups (medium dietary diversity), and 39 (21.3%) participants consumed seven or more food groups (high dietary diversity) in their diet over the previous 24 hours. The mean score for household dietary diversity was 5.5 + 1.7 SD, with values ranging from 2 to 10 food groups. The average dietary variety ratings for the low, medium, and high household categories were 2.94, 5.3, and 7.9, respectively (Geremew.M, et al., 2019).

Abdu Oumer and Berhanu Abebaw's study on the Determinants of dietary adequacy in school-age children in the Gurage Zone of southern Ethiopia revealed that females scored lower on dietary diversity than males (COR=2.1, 95% CI=1.6-2.8). Older children also scored lower on diet diversity. Children from extended families reported less diversity in their diets than children from families with fewer than five people (COR=1.27, 95% CI=0.94-1.72). The diet diversity score was greater in children whose household head and caregiver had formal education (COR=3.8, 95% CI=2.8-5.3) and (COR=5.6, 95% CI=4.0-7.6), respectively (Abdu.O, et al., 2019).

2.4 Synthesis of the Reviewed Literature

Numerous studies done nationally and globally proved SFP improved students' diet diversity scores and learning participation by increasing school enrollment and attendance and also by reducing dropout rates. These outcomes are beneficial in ensuring equal opportunity for education for disadvantaged children and providing food for vulnerable school children. Understanding these benefits draws governments and development partners that work with children into school feeding. Now, almost all countries in the world have some form of school meal program. Though having a good plan is doing most of the work, executing the planned activities appropriately and making sure the project will meet its objectives in terms of deliverables, resources, and time needs preparation. This study will assess the diet diversity score of the school feeding program beneficiaries and non-beneficiaries run by the Addis Ababa administration bureau.

CONCEPTUAL FRAM WORK

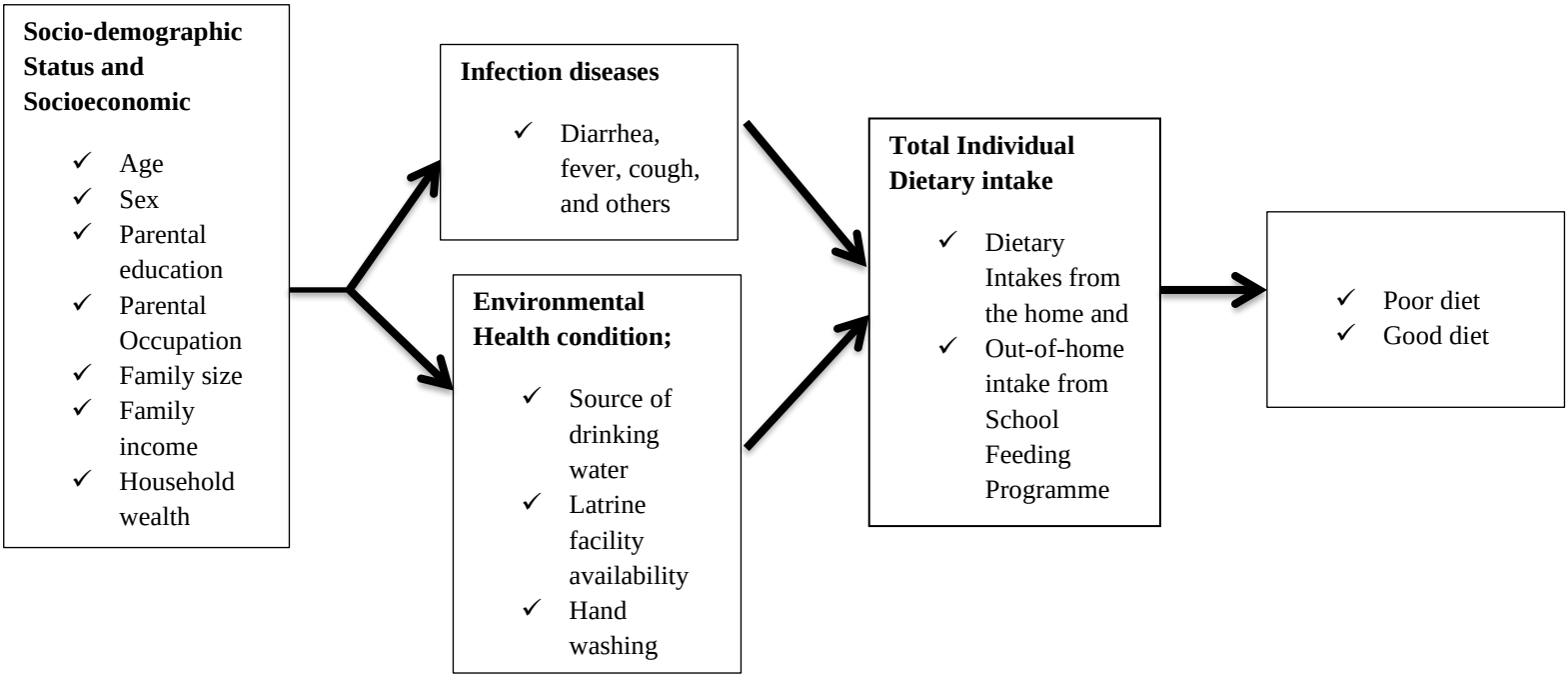

Figure 1:-Conceptual frame work for dietary diversity score in Addis Abeba, 2022.

CHAPTER THREE

RESEARCH METHOD

3.1 Study Setting

Addis Ababa is the capital city of the Federal Democratic Republic of Ethiopia, founded in 1886 by Emperor Menelik II. It is located at 9° 1′ 48″ North and 38° 44′ 24″ East, with a land area of 527 km2 (203 sq. mi) and an altitude of over 3,000 meters (9,800 ft.) in the Entoto Mountains to the north and its lowest point, around Bole International Airport, at 2,326 meters (7,631 ft.) above sea level. The city is the seat of the United Nations Economic Commission for Africa (ECA) and the African Union (AU), as well as various other continental and international organizations, which makes the city the political capital of Africa. The city is divided into 11 municipalities, called sub-cities (kifle ketema), and 116 districts (woredas) (Abenet.G, et al., 2017).

3.2 Research Approach and Design

A school-based quantitative comparative cross-sectional study design were employed. This study design collects data at a single point in time and is relatively cheaper and less time-consuming than other types of research. (Thomas.L, 2022). The present study analysis takes into account quantitative, and descriptive information and focuses on the diet diversity score of school feeding program beneficiaries and non-beneficiaries.

3.3 Sampling Technique

Probable sampling technique of simple random sampling technique by lottery method were used to select sub cities and woredas then stratify schools by beneficiaries of school feeding programs. Students were selected by simple random sampling technique of lottery method. Probable sampling method produce more reliable estimate and inference can be made about the population. Based on this from 11 sub cities we used 30% and 3 sub cites were selected and from those selected sub cites 2 weredas were selected. Those selected sub cities were Arada sub city, Yeka sub city and Gulele sub city.

3.3.1. Population

3.3.1.1. Study population

- All primary school students from age 7 to 14 years studied at Addis Ababa primary schools.

3.3.1.2. Target population

- All primary school students from age of 7 to 14 years studied at selected primary schools of Addis Ababa.

3.3.1.3. Inclusion criteria

- Students from age 7 to 14 years old and who were present in school during data collection time.

3.3.1.5. Exclusion criteria

- Students from age 7 to 14 years old and who were not present in school during data collection time
- Students from age of below 7 years and above 14 years
- Students who were mentally retarded
- Students (aged 7 to 14) who were refused taking part in the study

3.3.1.6. Sample Size Determination

Sample sizes were calculated by using Epi info version 7.2.1.0 by statcalc by taking CI 95%, Power 80%, Ratio 1:1, Outcome of unexposed group 99.3%, Outcome of exposed group 93.8% (Mitiku et.al, 2019). The final sample sizes were 228 for beneficiaries and 228 for non-beneficiaries including 10% non-respondent rates. Proportional allocations were used to select elementary schools by taking current student number of schools.

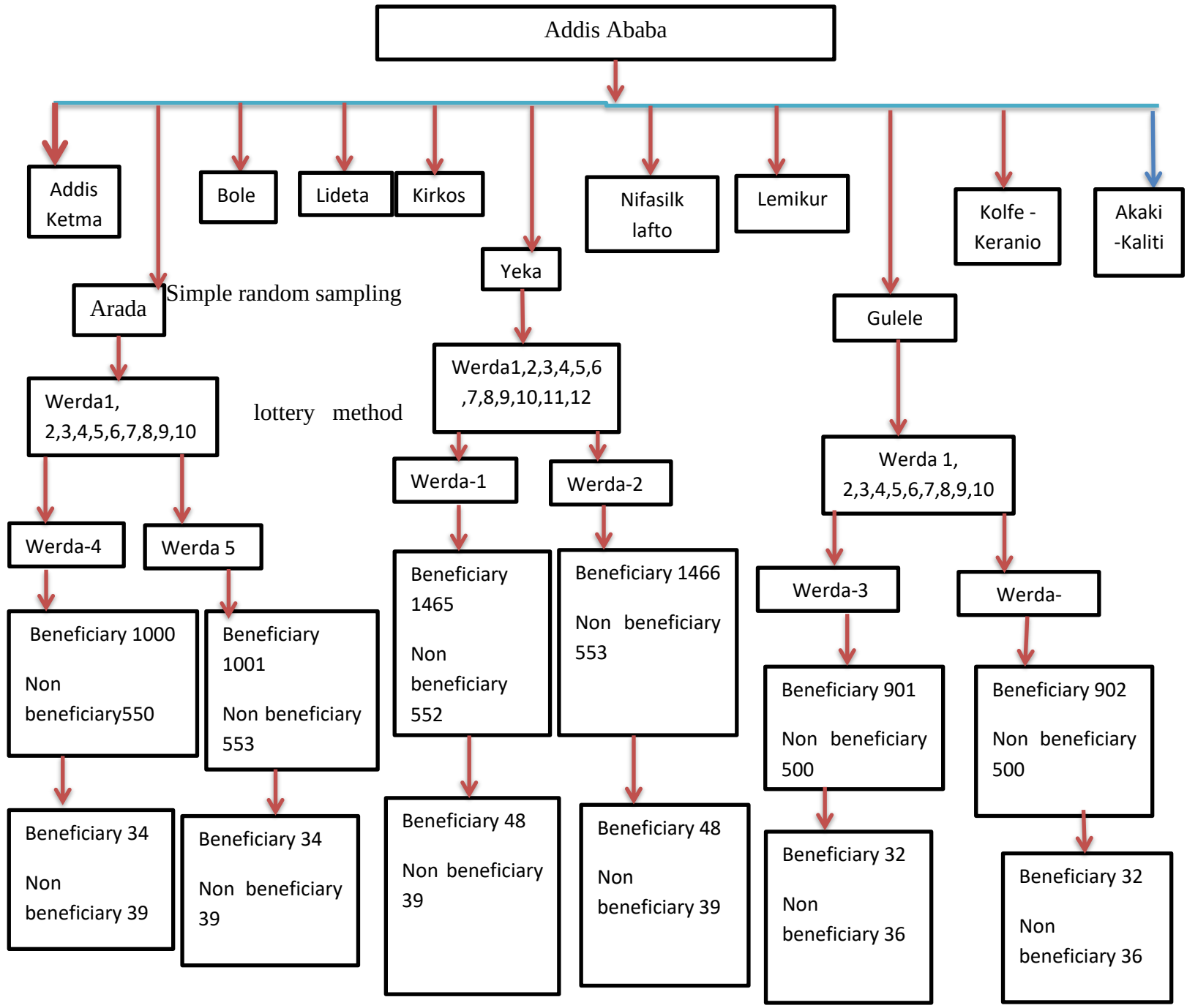

Figure 2:- Sample size distribution of students in Addis Ababa, 2022.

3.4. Data Collection Techniques and Procedures

3.4.1 Sources of Data

Primary data were collected between February first to March 31 from student.

3.4.2 Data collection tools

Data was collected by self-administer questionnaires. It includes information about students' demographics, socioeconomic status, school feeding situation, and diet diversity score. Some of the questionnaires were standard, while others were developed by the thesis's principal investigator. All participants were Amharic speakers, and there was a friendly atmosphere while the data was being collected.

3.4.3 Data collection procedure

All quantitative data from schools was gathered after obtaining the required ethical clearances from the College of Development Studies at Addis Ababa University and the relevant government officials in the respective education bureaus. Following approval from the school administrators, questionnaires were given to respondents' families, sent home by students and filled out by students with the help of their families and data is collected by data collectors after checking completeness and consistency.

Table 1:- Description of study variables and measurements of diet diversity score, Addis Ababa, 2022

Variables		Definition	Category
Dependent Variables	Dietary diversity	Dietary diversity (DD) is defined as the number of different foods or food groups consumed in the previous day related to the diet diversity score. (Rathnayake, Madushani, & Silva, 2012).	It has two category Poor diet < 3 food Good diet ≥ 3foods
Independent variables	Age	It is defined as the measure of the time elapsed from the date of live birth to a specific point in time, usually the date of collection of the data. (Demographic Variables, 1999)	It has two category 1) 7-10 2) 11-14
	Sex	**Sex** refers to a set of biological attributes in humans and animals. It is primarily associated with physical and physiological features including chromosomes, gene expression, hormone levels and function, and reproductive/sexual anatomy. (Canadian Institutes of Health Research)	It has two category 1) Female 2) male
	Parental education father/m-other	The highest level of education that the parent has achieved or completed(USA Census bureau, 2022)	It has five categories 1)cannot read and write 2)Informal education 3)primary education 4)secondary education 5)higher education
	Parental occupation of father /mother	Parental Occupation is defined as the main work undertaken by the parent/guardian. (Parental Occupation Definition)	It has five categories 1)Government employee 2)Private employee 3)Self-employee/Trader 4)Daily laborer 5)Others
	School feeding status	A social safety net instrument that targets children in program chronically food insecure areas and protects them against the worst consequences of household food insecurity and contributes to better learning and educational outcomes as well as to better nutrition. (Ministry of Education, October 2012)	It has two category 1)Yes 2)No

3.6 Data analysis techniques

After completion of the data collection, each questionnaire was checked for completeness every day and was coded accordingly before the data entry. Data was entered using Epi-data version 3.1and exported to SPSS version 23 for analysis. Frequency distribution in number and percentage mean median standard deviation were used to describe the data.

To identify factors associated with dietary diversity scores both bi-variable and multi-variable logistic regression were used, all independent variables each at a time were checked for the presence of association using a p-value of <0.25 a cut-off point to screen the variables for multivariable logistic regression. All associations between dependent and independent variables and statistical significance were measured using rate ratios at a 95% confidence interval and a p-value less than 0.05.

CHAPTER FOUR

RESULT

4.1. Socio-demographic status

A total of 456 who were 228 school feeding beneficiary and 228 school feeding non beneficiary students were enrolled with 100% respondent rate. Among the study participants 116(50.9%) of school feeding beneficiary students and 117(51.3%) of school feeding non beneficiary students were females. Among school feeding beneficiary students one hundred forty seven (64.5%) were found with age range of 11 to 14 whereas 125(54.8%) school feeding non beneficiary students were found with age range of 7 to 10. One hundred twenty four (54.4%) of school feeding beneficiary students had no separate room for kitchen and 162(71.1%) of school feeding non beneficiary students had separate room for kitchen. Eighty one (35.5%), 204 (89.5%) of school feeding beneficiary and non-beneficiary students ate breakfast almost every day. 149(65.4%) and 140 (61.4%) of school feeding beneficiary and non-beneficiary students ate less than or equal to 3 types of meal. The socio-demographic characteristics of participants presented in table 2.

Table 2:- socio-demographic status of students in Addis Abeba,2023.

Variable	School feeding beneficiary Frequency (%)	School feeding non beneficiary Frequency (%)
Sex		
Female	116(50.9)	117(51.3)
Male	112(49.1)	111(48.7)
Age in years		
7 – 10	81(35.5)	125(54.8)
11 – 14	147(64.5)	103(45.2)
Grade		
1 – 4	110(48.2)	134(58.8)
5 – 8	118(51.8)	94(41.2)
Number of Family		
5 and less	210(92.1)	221(96.9)
Above 5	18(7.9)	7(3.1)
Time taken to reach to school		
Less than 30 min	85(37.3)	79(34.6)
30 min and above	143(62.7)	149(65.4)
Religion		
Orthodox	196(86)	196(86)
Muslims	23(10.1)	29(12.7)
Protestant	9(3.9)	3(1.3)

Variable	School feeding beneficiary Frequency (%)	School feeding non beneficiary Frequency (%)
Father's educational status		
Below collage level	161(70.6)	133(58.3)
Above collage level	67(29.4)	95(41.7)
Mother's educational status		
Below collage level	173(75.9)	151(66.2)
Above collage level	55(24.1)	77(33.8)
Father's occupation		
Non Gov't work	200(87.7)	211(92.5)
Gov't work	28(12.3)	17(7.5)
Mother's occupation		
Non Gov't work	161(70.6)	150(65.8)
Gov't work	67(29.4)	78(34.2)
Monthly Income		
Less than 5000	188(82.5)	158(69.3)
5000 and above	40(17.5)	70(30.7)
Type of energy used for cooking		
Electronic	145(63.6)	196(86)
Kerosene	10(4.4)	6(2.6)
Charcoal/ Wood	73(32)	26(11.4)
Separate room for kitchen		
Yes	104(45.6)	162 (71.1)
No	124(54.4)	66 (28.9)
Eating breakfast b/r going to school		
No never	70(30.7)	7(3.1)
Sometimes (one's a week)	38(16.7)	9(3.9)
About 2 – 3 days a week	39(17.1)	8(3.5)
Almost every day	81(35.5)	204(89.5)

School feeding status and Health information of students

One hundred forty nine (65.4%) of school feeding beneficiaries and 140 (61.4%) school feeding non beneficiary students had poor diet diversity score. Eighty three (36.4%) of school feeding beneficiary children's and 50(21.9%) of school feeding non beneficiary children's were not ever fallen sick in the past 2 weeks. Major type of illness for school feeding beneficiary children were fever (9.6%) and for school feeding non beneficiary students were cough (8.3%). All school feeding beneficiary and non-beneficiary schools had latrine and 212 (93%) school feeding beneficiary and all non-beneficiary schools latrines had hand washing. Most school feeding beneficiary (92.5%) and non-beneficiaries (87.3%) sours of water for drink were tap water. Health information statuses of students are presented on table 3.

Table 3:- School feeding status & Health information status of students of Addis Ababa, 2022.

Variable	School feeding beneficiary Frequency (%)	School feeding non beneficiary Frequency (%)
Child ever fallen sick		
Yes	83(36.4)	50(21.9)
No	145(63.6)	178(78.1)
Type of illness		
Diarrhea	20(8.8)	2(0.9)
Fever	22(9.6)	6(2,6)
Cough	25(11)	19(8.3)
Others	23(10.1)	23(10.1)
Having school latrine		
Yes	228(100)	228(100)
No	0	0
School Latrine have hand washing		
Yes	212(93)	228(100)
No	16(7)	0
Having household latrine		
Yes	218(95.6)	223(97.8)
No	10(4.4)	5(2,2)
Household latrine have hand washing		
Yes	99(43.4)	124(54.4)
No	129(56.8)	104(45.6)
Source of drink water		
Tap water	211(92.5)	199(87.3)
Spring water (Protected)	4(1.8)	1(0.4)
Spring water (Unprotected)	12(5.3)	16(7)
Others	1(0.4)	12(5.3)
Dietary Diversity score		
Good dietary diversity score	79(34.6)	88(38.6)
Poor dietary diversity score	149(65.4)	140(61.4)

Diet Diversity characteristics of students

Two hundred twenty seven (99.6%) of school feeding beneficiary students didn't ate Grains, Roots or Tubers within 24 hours whereas 207(90.8%) of school non beneficiary students ate it. Two hundred twenty seven (99.6%) of school feeding beneficiary students and 226 (99.1%) school feeding non beneficiary students didn't ate vitamin A rich plant food within 24 hours. Two hundred twenty seven (99.6%) of school feeding beneficiary students didn't ate other fruits and vegetables whereas 176(77.2%) of students ate other fruits and vegetables within 24 hours. Two hundred twenty seven (99. 6%) of school feeding beneficiary and 135 (59.2%) non beneficiary students didn't ate Meat, Poultry, Fish, Seafood within 24 hours. Two hundred twenty seven (99. 6%) of school feeding beneficiary didn't ate eggs and whereas 121 (53.1%) of students ate eggs within 24 hours. Two hundred twenty seven (99. 6%) of school feeding beneficiary didn't ate legumes and whereas 153 (67.1%) of students ate legumes within 24 hours. Two hundred twenty seven (99. 6%) of school feeding beneficiary didn't drink milk and milk products and whereas 123 (53.9%) of students drink milk and milk products within 24 hours. Dietary diversity characteristics of students showed on table 4.

Table 4:- dietary diversity characteristics of students of Addis Abeba,2022.

Variable	School feeding beneficiary Frequency (%)	School feeding non beneficiary Frequency (%)
Grains, Roots or Tubers		
Yes	1(0.4)	207(90.8)
No	227(99.6)	21(9.2)
Vitamin A rich plant food		
Yes	1(0.4)	2(0.9)
No	227(99.6)	226(99.1)
Other fruits or Vegetables		
Yes	1(0.4)	176(77.2)
No	227(99.6)	52(22.8)
Meat, Poultry, Fish, Seafood		
Yes	1(0.4)	93(40.8)
No	227(99.6)	135(59.2)
Eggs		
Yes	1(0.4)	121(53.1)
No	227(99.6)	107(46.9)
Pulses /Legumes/ nuts		
Yes	1(0.4)	153(67.1)
No	227(99.6)	75(32.9)
Milk and Milk product		
Yes	1(0.4)	123(53.9)
No	227(99.6)	105(46.1)

School Attendance and Academic Performance

Most of school feeding beneficiary (85.1%) and non-beneficiary (89.5%) students didn't dropout from schools in present year and also 85.5% school feeding beneficiary students and 89 % school feeding non beneficiary students didn't ever repeat class. Academic performance of students showed on table 5.

Table 5:- School attendance and academic performance, 2022.

Variable	School feeding beneficiary Frequency (%)	School feeding non beneficiary Frequency (%)
Ever dropout of classes		
Yes	34(14.9)	24(10.5)
No	194(85.1)	204(89.5)
Ever repeated class		
Yes	33(14.5)	25(11)
No	195(85.5)	203(89)

Determinant Factors associated with Dietary Diversity scores of school feeding beneficiary and non-beneficiary students of students

During bivariate logistic regression from 30 variables, eleven (sex, age, grade, father educational level, father employee, mothers employee, monthly income, having separate room for kitchen, having breakfast at home before school, hand washing after toileting, class dropout,) of them met the criterion to be included into multivariate logistic regression by yielding a P-value of <0.25, controlling for the effect of other cofounding factor.

The final model revealed that factors like sex, having separate room for kitchen and school latrine having hand washing shows significant association. The odds of dietary diversity score among female students were 51.3 (AOR, 0.487, 95%CI = 0.248 – 0.959) times lower compared to male students. The odds of having separate room for kitchen were 2 times (AOR, 2.953, 95%CI = 1.436 – 6.072) higher than students who have no separate room for kitchen. Students whose school latrine have hand washing 66.3 times (AOR, 0.337, 95% CI = 0.137 – 0.831) lower than students whose school latrine have no hand washing.

Table 6:- Multivariate logistic regression.

Variables	Frequency		COR(95%CI)	AOR (95%CI)
	School feeding beneficiaries	School feeding non beneficiaries		
Sex				
Female	116(50.9)	117(51.3)	0.702 (0.479 – 1.029)	0.487(0.248 – 0.959) *
Male	112(49.1)	111(48.7)	1	1
Age in years				
7 – 10	81(35.5)	125(54.8)	0.643 (0.436 – 0.948)	0.795(0.288 – 2.198)
11 – 14	147(64.5)	103(45.2)	1	1
Grade				
1 – 4	110(48.2)	134(58.8)	0.728 (0.497 – 1.067)	0.882(0.329 – 2.359)
5 – 8	118(51.8)	94(41.2)	1	1
Father's educational status				
Below collage level	161(70.6)	133(58.3)	0.761 (0.513 – 1.130)	1.542(0.732 – 3.352)
Above collage level	67(29.4)	95(41.7)	1	1
Mother's occupation				
Non Gov't work	161(70.6)	150(65.8)	0.743 (0.496 – 1.114)	0.934(0.449 – 1.943)
Gov't work	67(29.4)	78(34.2)	1	1
Father's occupation				
Non Gov't work	200(87.7)	211(92.5)	1.665 (0.835 – 3.320)	2.631(0.824 – 8.398)
Gov't work	28(12.3)	17(7.5)	1	1
Monthly Income				
Less than 5000	188(82.5)	158(69.3)	0.613 (0.396 – 0.949)	0.894(0.386 – 2.069)
5000 and above	40(17.5)	70(30.7)	1	1
Separate room for kitchen				
Yes	104(45.6)	162 (71.1)	1.939 (1.300 – 2.890)	2.953(1.436 – 6.072) *
No	124	66 (28.9)	1	1

Variables	Frequency		COR(95%CI)	AOR (95%CI)
	School feeding beneficiaries	School feeding non beneficiaries		
Eating breakfast b/r school				
No never	70(30.7)	7(3.1)	0.609 (0.352 – 1.054)	0.713(0.302 -1.680)
Sometimes (one's a week)	38(16.7)	9(3.9)	0.713 (0.370 – 1.377)	1.273(0.471 – 3.445)
About 2 – 3 days a week	39(17.1)	8(3.5)	0.863 (0.455 – 1.637)	1.265(0.491 – 3.261)
Almost every day	81(35.5)	204(89.5)	1	1
School Latrine have hand washing				
Yes	212(93)	228(100)	1.282 (0.438 – 3.755)	0.337(0.137 – 0.831) *
No	16(7)	0	1	1
Ever dropout of classes				
Yes	34(14.9)	24(10.5)	2.212 (1.269 – 3.857)	0.494(0.040 – 6.168)
No	194(85.1)	204(89.5)	1	1

4.3 Discussion

In this study, a total of 456 students were participated who were 228 school feeding beneficiaries and 228 school feeding non beneficiaries, and of these, 149(65.4%) of school feeding beneficiary students consumed less than three food groups (poor dietary diversity) and whereas 79 (34.6%) were consume greater than three food groups (good dietary diversity). In the case of school feeding non beneficiary students 140 (61.4%) consumed less than three food groups (poor dietary diversity) whereas 88 (38.6%) of students consumed greater than 3 food groups (good dietary diversity). The mean DDS was 2.26 and the standard deviation was 2.596. The proportion of study participants with adequate dietary diversity in this study was therefore 31.9%.

In this study, participants of the school feeding program had lower diet diversity scores than those who did not participate in the program, but similar studies done in Sidama zone, Boricha district; Southern Ethiopia showed that school feeding program beneficiaries had better diet diversity scores than non-beneficiaries (Mastewal.Z, et al., 2018). But our finding contradicts this finding. Our finding showed that both school feeding beneficiaries and non-beneficiaries had poor dietary diversity scores. This might be due to management and budget problems. If the menageries didn't have good knowledge about child nutrition, they might manipulate the program.

The study revealed that female students had lower odds to dietary diversity score compared to males. Those finding was similar with study conduct in India that showed that females had lower diet diversity scores (30% had poor dietary diversity score) than males (25%) (Singh. B, et al., 2020). This might be due to gender discrimination and also female responsibilities at home is higher than males.

The odds of having separate room for kitchen were 2 times higher to score good dietary diversity than those who had no separate room. This might be due to our economic status that means when families status become poor, families food security also become poor, so having no separate room for kitchen shows our low economical status. We didn't gate baseline data to compare our finding with the others.

Students whose school latrine had hand washing 66.3 times lower to had good dietary diversity score than students whose school latrine have no hand washing. This finding shows out of reality so we couldn't justify reason. We didn't gate baseline data to compare our finding with the others.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Generally our finding shows both school feeding beneficiaries and non-beneficiary students had poor dietary diversity scores and sex, having separate room for kitchen and school latrine having hand washing were determinant factors identified.

5.2 Recommendation

- Addis Ababa Educational Biro should strictly follow feeding program.
- Addis Ababa health Biro should work by integration with Addis Ababa Educational Biro to prevent malnutrition of children by increasing children dietary diversity score.
- Schools directors, management and boards should work with responsibilities and strictly follow the food that the school provides.

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6. APPENDIX

Addis Ababa University College of Development Studies

Center for Population Studies

Participant information sheet and consent form

Participant information sheet

My name is Wassihun Kassaye. I am a graduate student at the Center for Population Studies of Addis Ababa University. I am here to humbly request you to take part in a study on the assessment of diet diversity score of students and associated factors in children between school feeding and non-school feeding program in Addis Ababa, Ethiopia.

The purpose of the study is to analyze the diet diversity score of students and associated factors among children on school feeding program beneficiaries and non-beneficiary in Addis Ababa Ethiopia.

Participation in this study is by choice. If you don't want to take part, you don't have to give a reason, and it will not affect you adversely in any way. If you want to take part now, but change your mind later, you can withdraw from the study at any time. Please note that participation in this study is important to the above-noted purpose. However, you won't be paid because you participate in this study.

Your responses will be reported as aggregates rather than individually so that no particular participant can be identified. When it is necessary to quote or cite you for the qualitative data, you will be kept anonymous, or false names will be used.

In this study, you will be asked to provide information regarding the socio-demographic characteristic of respondents, school feeding participation of children, and environmental health condition of children. The time required to complete this interview is about 45 minutes.

REMARK: I completed my explanation of the project. If you have any questions you can ask me now or reach out to the principal investigator at any time you like. The contact detail of the researcher is: Wassihun Kassaye, Telephone number 0913382374 Email: wassihunkassaye@gmail.com

Consent Form

The purposes of the study were described to me in a language I can understand. I asked for clarifications for any concerns I have related to this study and adequate explanations are given to me. I understand that taking part in this study is voluntary and that I may withdraw from the study at any time without this adversely affecting me. I understand that my participation in this study is confidential and that no material, which could identify me personally, will be used in any reports on this study. No one influenced my decision to participate or not in this study. I decided on my own.

I decided: To Participate □ Not to participate in this study □

ID _____

Date of Interview _____

Starting Time _____

Ending Time: _____

Name of Werda: _____

Name of school:_____

Status of School:_____

A) Socio-Demographic Characteristics of the students:-

1. Sex 1.Female ☐ 2. Male ☐

2. Date of birth _____ Age in year's _____

3. Grade_____

4. How many people including yourself, live in your household? _____[number of family members]

5. Do you have a brother and /or sisters?

1. Yes ☐ 2. No, ☐ if no skip to question number 7

6. If yes how many are they? Brother ---------- Sister ----------

7. Your position ----------

8. How do you go from your home to school?

1. Take Taxi/Bus ☐ 2. On foot ☐ 4. By Bicycl☐

5. Motorcycle ☐ 6. Private car ☐

9. How long does it Time take to reach school in a minute? ----------

10. What is your caregiver?

1. Father ☐ 2. Mother ☐

11. Religion

1. Orthodox ☐ 2 Muslim. ☐ 3. Catholic ☐ 4.Protestant ☐ 5.Other ☐

B) Educational level of caregivers

12. What is your father's Educational Status?

1. Cannot read and write ☐ 2.Informal education ☐ 3. Grade 1-8 ☐

4. High school ☐ 5.Higher education ☐

13. What is your mother's Educational Status?

1. Cannot read and write ☐ 2.Informal education ☐ 3. Grade 1-8 ☐

4. High school ☐ 5. Higher education ☐

C) Socioeconomic status

14. What are your father's occupations?

1. Farmer ☐ 2.Government employer ☐ 3. Private employee ☐

4. Self-employee/trader ☐ 5.Daily laborer ☐ 6. Other, specify ☐

15. What are your mother's occupations?

1. Farmer ☐ 2.Government employer ☐ 3.Private employee ☐

4. Self-employee/trader ☐ 5.Daily laborer ☐ 6. Other, specify ☐

16. What is your household average monthly income? [____] Birr

17. What type of energy/power does your household mainly use for cooking?

1. Electric ☐ 2. Kerosene ☐ 3.Charcoal /wood ☐ 4.others ☐

18. Do you have a separate room used as a kitchen?

1. Yes ☐ 2. No ☐

19. Do you eat any breakfast before going to school?

1. No never ☐ 2.Yes, sometimes (about once a week) ☐

3. Yes, about 2-3 days a week ☐ 4. Yes almost every day ☐

20. How many meals do you eat at your home per day during non-school days? _____

D) School feeding status of the children.

21. Do you eat meals/food as part of the school feeding program?

1. Yes ☐ 2. No, ☐ if the answer is "no" going to Q 24

If Yes to Q22:

22. When did you start eating in the school feeding program (years) _____

23. How many meals are you given at school per day? _____

24. If your answer is no for Q25 can you describe the reason not to participate in a school feeding program

E. Health information of student (Asked for parents/guardian/School administrative)

25. In the past 2 weeks, has your child ever fallen sick?

1. Yes ☐ 2.No never ☐

If yes to Q 25:

26. What illness did he/she suffer from?

1. Diarrhea ☐ 2.Fever ☐ 3.cough ☐ 4. Other (specify) _____

27. Does your school have a latrine (to be confirmed by observation)?

1. Yes ☐ 2. No ☐

28. Do this latrine have hand washing (to be confirmed by observation)?

1. Yes ☐ 2. No ☐

29. Does your household have a latrine?

1. Yes ☐ 2. No ☐ If the answer is "no" go to Q33

30. Does this latrine have hand washing?

1. Yes ☐ 2. No ☐

31. If Yes for Q30 which type of latrine?

1. Ventilated improved pit latrine ☐ 2 Pit latrine with slab ☐

3. Pit latrine with no slab/open pit ☐ 4. Other specify ☐

32. If your answer is **no** for Q30 where do you defecate?

1. Toilet ☐ 2. Open field ☐ 3.Others ☐

33. What is your main source of drinking water?

1. Tap water ☐ 2. Spring (protected) ☐

3. Spring (unprotected) ☐ 4. Others ☐

If the answer is "1" go to Q 35

34. What time does it take to collect water on a round trip? _____minute

35. How often did you wash your hands before eating?

1. not at all ☐ 2. Sometime ☐ 3.always ☐

36. How often did you wash your hands with soap after using the toilet or latrine?

1. not at all ☐ 2. Sometime ☐ 3.Always t ☐

F. Diet Diversity characteristics of students (7 food groups)

37. Twenty four Hour dietary Recall, (Foods eaten preceding 24 hours?): If at least one food from the food group has been given between sunrise yesterday and sunrise today, if 'Yes' write 1 in the column below. If no food has been given to the food groups, 'No.' write 2

No	Food Group	Foods	Home 1. Yes 2. No	school 1. Yes 2. No
1	Grains, roots, and tubers:	Bread, biscuits, cookies, Porridge, rice, noodles, pasta(macaroni), Injera, Kita, nufea, or other foods made from grains oats, maize, barley, wheat, White potatoes, white yams, Enset (false banana), cassava, or any other foods made from roots		
2	VITAMIN A RICH fruits and VEGETABLE	Ripe mangoes, ripe papayas, or ripe melon፧ Pumpkin, carrots, squash, or sweet potatoes that are yellow or orange inside Any dark green leafy vegetables like gomen, spinach, swiss chard, etc		
3	Other fruits and vegetables:	Any other fruits or vegetables (like cactus pair, strawberries (Wild fruits, Tomato, onion, including wild vegetables)		
4	FLESH MEATS	Any meat, such as beef, lamb, goat, chicken, camel or duck, Liver, kidney, heart, tongue, brain, or other organ meats Fresh or dried fish, shellfish, or seafood		
5	Eggs	Eggs		
6	LEGUMES, NUTS, AND SEEDS	Any foods made from beans, peas, lentils, nuts, or seeds		

7 MILK AND MILK PRODUCTS Milk, Cheese, yogurt, or other milk products

G. SCHOOL ATTENDANCE AND ACADEMIC PERFORMANCE

38. Have you ever dropped out of class?

1. Yes ☐ 2.No ☐

39. If yes to Q38, how many times? _____

40. Have you ever repeated class?

1. Yes ☐ 2.No ☐

41. If yes to Q40 how many times? _____

42. What was the performance of your end-semester results? _____

Individual Dietary Diversity Score (IDDS) (Children) 7 Food Groups

Grains, roots or tubers,
Vitamin A-rich plant foods
Other fruits or vegetables
Meat, poultry, fish, seafood
Eggs
Pulses/legumes/nuts
Milk and milk products,