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BAHIR DAR UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF NUTRITION AND DIETETICS

Micro-Nutrient Intake Inadequacy And Its Associated Factors Among Elders In Bahir Dar City, Northwest Ethiopia, 2023.

BY:

Betelhem Birhane (BSc IN PUBLIC HEALTH)

JULY, 2023

BAHIR DAR, ETHIOPIA

BAHIR DAR UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

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DEPARTMENT OF NUTRITION AND DIETETICS

MICRO-NUTRIENT INTAKE INADEQUACY AND ITS ASSOCIATED FACTORS AMONG ELDERS IN BAHIR DAR CITY, NORTHWEST ETHIOPIA, 2023.

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A THESIS RESEARCH SUBMITTED TO THE DEPARTMENT OF PUBLIC HEALTH NUTRITION AND DIETETICS, BAHIR DAR UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR A DEGREE OF MASTERS IN PUBLIC HEALTH NUTRITION.

JULY, 2023

BAHIR DAR, ETHIOPIA

DECLARATION

I certify that the study, entitled "micro-nutrient intake inadequacy and its associated Factors among Elders in Bahir Dar City," is entirely my own work and that all sources used or consulted are properly cited in this thesis. This thesis is a presentation of my original research work. Wherever contributions of others are involved, every effort is made to indicate this clearly, with due to reference in to the literature and acknowledgement of collaborative research. I certify that all information was private and that I only used it to evaluate and identify the gap in micronutrient inadequacy.

Betelhem Birhanie	_____	_____
Name of Investigator	Date	Signature

BAHIR DAR UNIVERSITY
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DEPARTMENT OF NUTRITION AND DIETETICS

Approval of thesis

We hereby certify that we have examined this dissertation/thesis entitled "Micro-nutrient intake inadequacy and its associated factors among Elders in Bahir Dar City, North west Ethiopia, 2023 by Betelhem Birhanie. We recommend and approve the thesis a degree of "Masters of Public health in nutrition"

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Board of Examiners

Examiner's name	Signature	Date
Dr. Dereje		13/11/2015

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ACRONYMS AND ABBREVIATION

AUDIT…….Alcohol Use Disorders Identification Test

DALYs ……Disability-Adjusted Life Years

DDS……..Dietary Diversity Score

EFCT…….Ethiopian Food Composition Table

FVS……...Food Variety Score

IDDS…….Individual Dietary Diversity Score

KSA……..Kingdom of Saudi Arabia

MAR…….Mean Adequacy Ratio

NAR…….Nutrient Adequacy Ratio

RDA ……Recommended Dietary Allowance

TPA…….Total physical activity

WHO……World Health Organization

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ABSTRACT

Background: Globally, deficiencies in essential micronutrients affect approximately 23-60% of the elderly. Micronutrient deficiencies, in particular, for elders contribute to a large number of disorders, like osteoporosis, anemia, eye or skin lesion, delayed wound healing, and others. In Ethiopia, there is no study conducted on micro-nutrient intake inadequacy among elders.

Objective: The aim of this study was to assess micro-nutrient intake inadequacy and associated factors among elders in Bahir Dar city, Northwest Ethiopia, 2023.

Method: A community based cross sectional study was conducted from February 01-12, 2023 in Bahir Dar city. Simple random sampling technique was employed to recruit a total of 544 study participants. Data were collected through epi-collect software using interviewer-administered semi-structured questionnaire, which include socio-demographic, dietary, health and life style related questionnaires'. A single 24 hours dietary recall was used then the collected data were transferred into SPSS version 25 for analysis. The Nutri-survey food processor software and Ethiopian food composition table were used for the calculation of nutrient values of the selected nutrient. The nutrient intakes were assessed by nutrient adequacy ratio and mean adequacy ratio. Binary logistic regression model was used and variables on multivariable analysis with P-value < 0.05 were considered as statistically significant factors with micronutrient intake inadequacy. The direction and strength of association was interpreted using adjusted odds at 95% confidence interval.

Result: The overall micronutrient inadequacy was 98.9 % and inadequate intake of calcium, vitamin A and zinc, were 98.5 %, 67.4 % and 2.9 % respectively. All individuals were adequate for iron. Having middle wealth status [AOR= 1.56, 95 CI (1.022, 2.368) was associated with vitamin A inadequacy and Physical inactivity [AOR=3.3, 95 % CI (1.086, 9.937)] were associated with Zinc inadequacy.

Conclusion and recommendation: Overall micronutrient intake inadequacy among elders was a high. Therefore, responsible bodies like health bureau or voluntary groups and health professionals shall have to advocate physical activity, and support economically for vulnerable elders.

Keywords: Micronutrient, inadequacy**,** elders, Bahir Dar City, Ethiopia.

1. INTRODUCTION

1.1. Background

Micronutrient inadequacy is the insufficient intake of essential micronutrients, needed to fulfill nutritional requirements for optimal health and the requirement for a given micro-nutrient (1). Elders are risk groups for micronutrient inadequacies(2). The definition of "elderly" varies depending on the country. The majority of developed nations regard the age of 65 and older as the later years of life when referring to the elderly (3). However, in Ethiopia defines elderly people as individuals 60 years of age or older (4). The proportion of these segment of population are steadily increasing. For the first time in history, the elderly represents worldwide the fastest growing segment of the population and the number of people over 65 is expected to rise from 703 million in 2019 to 1.2 billion in 2025 and to 2 billion by 2050 (5).

Globally, 11% of the population and 5 % of the Ethiopian population were classified as elderly (5, 6). Global life expectancy is expected to rise by 11 years, from 65 in 1995-2000 to 76 in 2045-2050 (7). In elders, micronutrient inadequacy occurs physiologically as a result of poor micro-nutrient absorption, loss of appetite, and a lack of ability to chew and swallow (8). Because, changes in each body organ, such as shifting body composition, immune system changes, and sensory changes, are unavoidable with aging (9). In addition for poor nutritional intake, the aging process may cause a decline in musculoskeletal mass and functions, increasing the risk of falls in the elderly (10).

During elderly, physiological changes can affect the nutritional and more specifically the micronutrient status of elders. Importantly, elders may be more susceptible to certain micronutrient deficiencies unless their diets contain micronutrient- rich foods since their energy requirements drop with age due to a loss of lean body mass and a decrease in physical activity (11).

The Nutrient Adequacy Ratio (NAR), which compares a person's daily intake of a nutrient with the current recommended amount for that nutrient given the respondent’s; the Mean Adequacy Ratio (MAR) determines the average of the NAR values for the chosen nutrients for specific people can be used to assess nutrient intake (12). Diet is a crucial component of maintaining health at any age. During ageing, the diet has an even more substantial effect on life quality and

in turn on longevity. However, a number of aging-related conditions may make it more difficult for people to meet their dietary demands (13). There are Strategies to improve nutrition in elderly people, those are "Food First'' strategy, eating small but frequent, high energy, high protein snacks and meals is the first treatment option for elderly people and Oral nutritional supplements are a top-up to food intake rather than a replacement they should be given between meals, not at meal times(14). Even if most nutritional intervention programs not directed on elder age groups, However, the interventions could play a part in the prevention of degenerative conditions of the elderly and an improvement of their quality of life and also there are some organizations in Ethiopia that support the elders (15).

1.2. Statement of the Problem

Globally, almost 3.1 billion people could not afford a healthy diet and Micronutrient inadequacy affect approximately 23-60% of the elderly. The prevalence rates in community-dwelling elders ranged from 5-30%, whereas it ranged from 16-70% in residential aged care settings (16). More than 67% of the elderly did not receive the recommended allowance (17). In sub-Sharan Africa it reported that over than half (51.8%) of the elderly were at risk of nutrient inadequacy (18).

The annual increase in the elderly population causes significant problems in terms of their quality of life (10). Micronutrient inadequacy could weaken immunity which would make elderly population susceptible to diseases (19). Micronutrient deficiency contributes to the progression of chronic disease from the normal aging process, as well as the susceptibility and exacerbation of disease and disability in the elderly. Micronutrient deficiency leads to many bad health outcomes (20). Inadequate nutrition can cause dependence, decreased functional capacity, frailty, and antisocial behavior. Community-dwelling elders, particularly women and those over 90 years of age, are especially vulnerable to micronutrient deficiencies (21).

Deficiencies in essential micronutrients affect an estimated 2 billion people in both developing and developed countries. This 'hidden hunger' has negative health impacts among vulnerable groups in the population, especially elders (22). Many studies have found a link between micronutrient inadequacy and negative health outcomes as well as long-term impairment in the elderly, including decreased immunity, oxidative, stress, impaired cognitive performance, metabolic diseases, hip fracture and increased morbidity and mortality (23-25). As a result, elders are at risk for Micronutrient inadequacy, which manifests as Night blindness,

exophthalmia, Development of osteoporosis, anemia, impaired cognitive function, depressed immune function, hair loss, eye and skin lesions, delayed wound healing, and taste alterations and other symptoms and assessed by different techniques (26). As a result, micro-nutrients deficiency is projected to cost around 0.8–2.5 per cent of the gross domestic product in some developing countries (27).

Micronutrient inadequacy affects due to a variety of factors like chewing, swallowing abilities, while variety of food, portion size, and meal sharing (28). Due to physiological changes brought on by aging, acute and chronic illnesses, declining financial and social status, and functional loss, as a result elderly person are more likely to experience nutritional inadequacies (29).The prevalence of micronutrient inadequacy in the elderly has become a major issue. As a result, it is critical to conduct research into issues concerning the nutritional intake of the elderly and the associated factors for them (30).

The government of Ethiopia has launched many programs and strategies to reduce the burden of malnutrition for different segments of its population including elderly (31). But most nutritional intervention programs are directed toward infants, young children, adolescents, and pregnant and lactating mothers. However, the country is facing daunting population ageing. In view of this changing trend, the older age group will become a globally significant health, social and economic policy concern of governments. There are limited data on the nutrient inadequacy among elders that could be used as a basis for health policy.

Micronutrient deficiencies are a major global public health problem with more than 2 billion people in the world estimated to be deficient in key vitamins and minerals, including. Vitamin A, iron and zinc and more than half of elders are at risk for this micronutrients.(32) But As far as my searching, no studies done on micronutrient inadequacy and its associated factors in Ethiopia. As a result, neither the prevalence of micro-nutrients inadequacy nor the associated factors studied among the elderly were addressed. Therefore, the purpose of this study was to assess micro-nutrient intake inadequacy and its associated factors among elders in Bahir Dar city, Northwest Ethiopia, 2023.

1.3. Significance of study

Since no study carried out concerning micronutrient inadequacy of the elderly individuals in this area the inadequacy of this problem is not clearly known. So, this study provide useful information about the magnitude of the problem. In addition, by identifying important associated factors it also provide useful information for the regional health bureau and nongovernmental organizations (NGOs) working in the area. The study also provides base line information for similar study conducted in this area. It is expected that the study further bridge the information gap and promote the care of the aged population.

It is also important to investigate diet-health relationships, and to inform food, nutrition, and agriculture programs and policies.

2. LITERATURE REVIEW

2.1 Prevalence of Micro-Nutrient intake inadequacy

According to the study conducted in Filipino the prevalence of micronutrient inadequacy among Elderly Filipino people were deficient in micronutrients like calcium, iron, and vitamin A, with percentages of 31%, 51%, and 27%, respectively (33). According to the study in Brazilian showed that elderly people have 15% prevalence of inadequate iron (34). And the study conducted in New Zealand shows that the prevalence of calcium was 80 % (35).

Based on the study in china showed that the prevalence of calcium, vitamin A, zinc and iron inadequacy were 59.3%, 76.7 %, 45.8 % and 3.3% (36). A survey conducted in Taiwan found that 52.5% of people had insufficient nutritional consumption and 49.4 % have vitamin A inadequacy (37). In addition the study conducted in Greece and shildi the prevalence of zinc were 10 and 21.5 % respectively (38, 39). According to a research done in Eroup, 10% of people had inadequate levels of zinc and iron. (40).

According to a study conducted in South Africa, the prevalence of poor micronutrient intake and zinc inadequacy were 69% and 88% (41). Another study conducted in Tanzania showed on micronutrients inadequacy of calcium and iron among elders in Tanzania were 70 % and 69 %, respectively (42).

2.2 Factors Associated with Micro-Nutrient inadequacy of Elders

2.2.1 Socio Demographic/Economic Factors

According to a study done in the United States Sex, education, and income level were linked to specific nutrient inadequacy. As a result, a significantly lower percentage of the RDA for calcium and iron was met by women's diet intake. Additionally, calcium consumption was found to be inversely correlated with education level. Lower vitamin intake was directly correlated with the lowest income (43). In addition According to the study in Brazilian and china wealth index was associated with micronutrient inadequacy (34, 36).

2.2.2 Dietary Related Factors

According to the study conducted in Taiwanese discovered dietary related factors significantly correlated with nutritional intake adequacy, including meal frequency, dietary habit, and eating with other residents (37, 43, 44).

2.2.3 Health Related Factors

According to the study conducted in Germany chronic disease are associated with micronutrient deficiency.(45) in addition according to the study conducted in United States micronutrient inadequacy was affected by both acute illness and chronic disease (46, 47).

2.2.4 Life Style Related Factors

According to the study in Netherlands showed that Physical inactivity was associated with zinc inadequacy (48). The study in Germany showed that former smokers, among elderly individuals, were more likely to ingest vitamin and mineral-containing supplements compared to never smokers(49). The study conducted in Taiwan, results that inadequate dietary intake was more prevalent in smoked and drank alcohol, but inadequate dietary intake was significantly higher for drinkers or those who had Comorbidity (37).

3. CONCEPTUAL FRAMEWORK OF MICRO-NUTRIENT INADEQUACY

This is the framework of micro-nutrient inadequacy which include socio-demographic/economic factors, dietary related factors, health related and life style factors which adopted after reading different literatures.

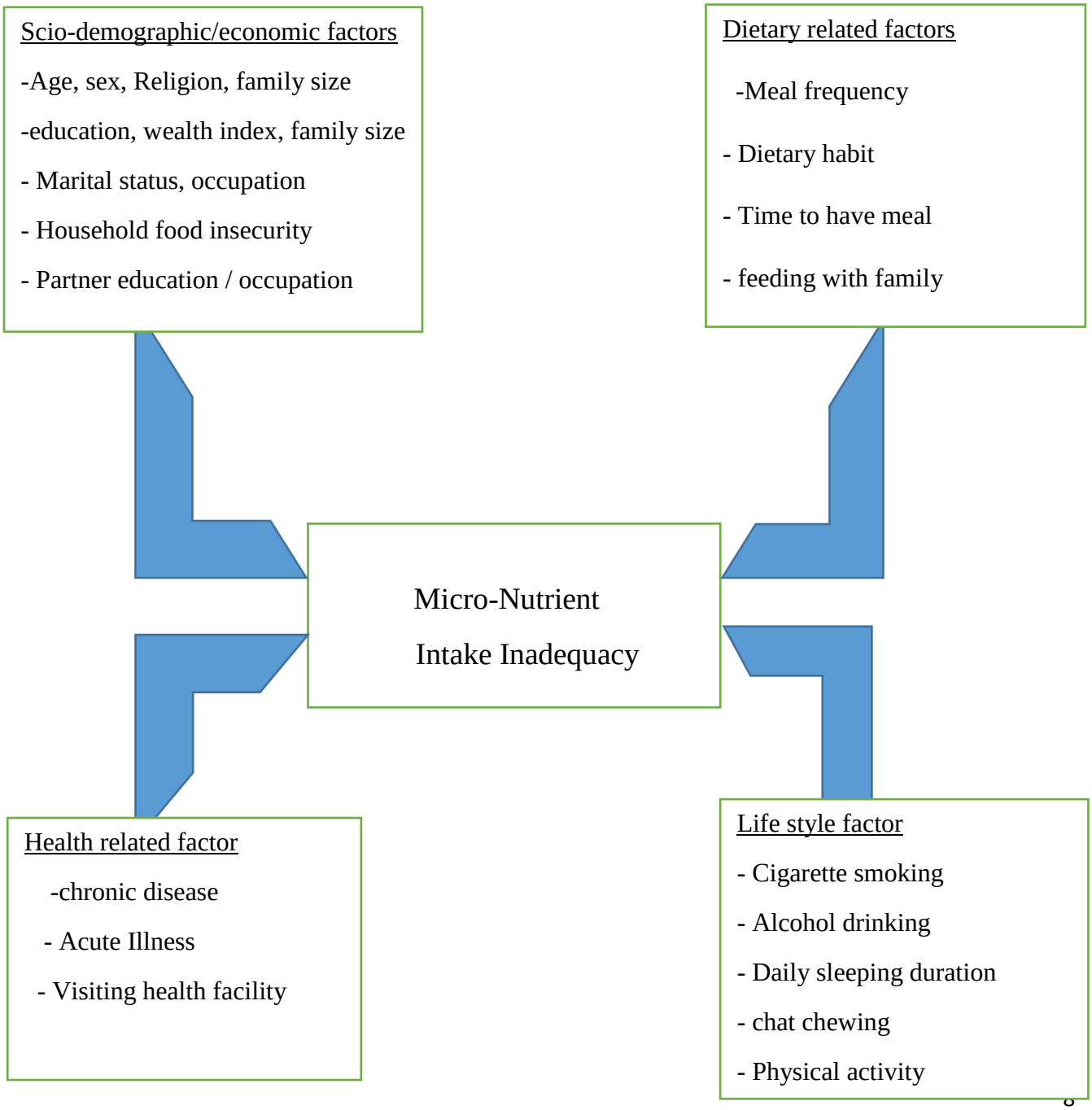


Figure 1: Conceptual framework of the study adapted from different literatures (33, 37, 43, 48)

4. OBJECTIVES

4.1 General Objective

-To assess micro-nutrient intake Inadequacy and associated factors among elders in Bahir Dar city, Northwest Ethiopia, 2023.

4.2 Specific Objectives

-To determine the prevalence of overall micro-nutrient intake inadequacy among elders in Bahir Dar city, Northwest Ethiopia, 2023.

- To determine the prevalence of calcium, zinc, vitamin A and iron intake inadequacy among elders in Bahir Dar city, Northwest Ethiopia, 2023

-To identify factors associated with vitamin A and zinc intake inadequacy among elders in Bahir Dar city, Northwest Ethiopia, 2023.

5. METHODS AND MATERIALS

5.1 Study Area and Study Period

This study was conducted in Bahir Dar city, northwest Ethiopia. Bahir Dar is the capital city of Amhara regional state which is 565 kilometers far from Addis Ababa, a capital city of Ethiopia. Bahir Dar has total population of 406,433 in 2023 and by the administration office report there are 4429 elders in Bahir Dar city (50).

The data were collected between february1 to 12, 2023. The common food items in Bahir Dar city are agricultural products which are available are Teff, wheat, sorghum, barley, maize, peas and beans, and some vegetables, such as; cabbage, potato, pumpkin, tomato, onion, carrots, and lettuce, and some fruits, such as; orange, papaya, banana, and mango. The most common types of food items which are found in Bahir Dar city includes niche Teff Enjera, key Teff Enjera, organ meat, pasta, milk, green pepper, steamed rice, Ambasha, nifro boiled, porridge, kolo, and beverages such as tella, soft drinks, tea, coffee etc… are commonly consumed.

5.2. Study Design

A community-based cross-sectional study was conducted among elderly population in Bahir Dar City, Northwest Ethiopia, 2023.

4.3. Population

5.3.1 Source Population

The source population was all elders who live in Bahir Dar city.

5.3.2. Study Population

The study population was elders who reside in randomly selected kebeles of Bahir Dar City.

5.4 Eligibility Criteria

5.4.1. Inclusion Criteria

Residents of Bahir Dar who were 60 years of age or older were participated in this study.

Elders who had been lived in Bahir Dar for at least six months.

5.4.2. Exclusion Criteria

Elders who were celebrating festivals (e.g. marriage, birth dates and Christianity) in the last 24hrs were excluded in the study.

5.5. Sample Size Determination

The sample size was calculated using single proportion formula for the first objective**.**

$n = \frac{\left(\frac{z\alpha}{2}\right)^2 p(1-p)}{(d)^2}$, where n=estimated sample size, Z= standard normal distribution corresponding to significance level, thus Z= 1.96, d= allowable margin of error (5%). For the outcome variable the proportion was taken as 0.7, 0.69 which is the prevalence of calcium and iron intake inadequacy among elders in Tanzania and the mean micronutrient inadequacy and nutrient inadequacy of zinc were 0.69 and 0.88 in South Africa respectively((41, 42).

The sample size was determined by using single population proportion formula with considering the following Assumptions: prevalence (P) = 69 % proportion of mean inadequacy ratio in elders, confidence interval (Cl) = 95%, margin of error (d) = 5%, design effect =1.5,

$$n = \frac{\left(\frac{z\alpha}{2}\right)^2 p(1-p)}{(d)^2} = \text{Accordingly, } n = \frac{(1.96)^2 * 0.69(1-0.69)}{0.0025} \approx 329$$

Design effect = 1.5, then 329(1.5) = 494. By considering 10% non- respondents' rate 494 +10% = 544 Then the final sampling size was **544.**

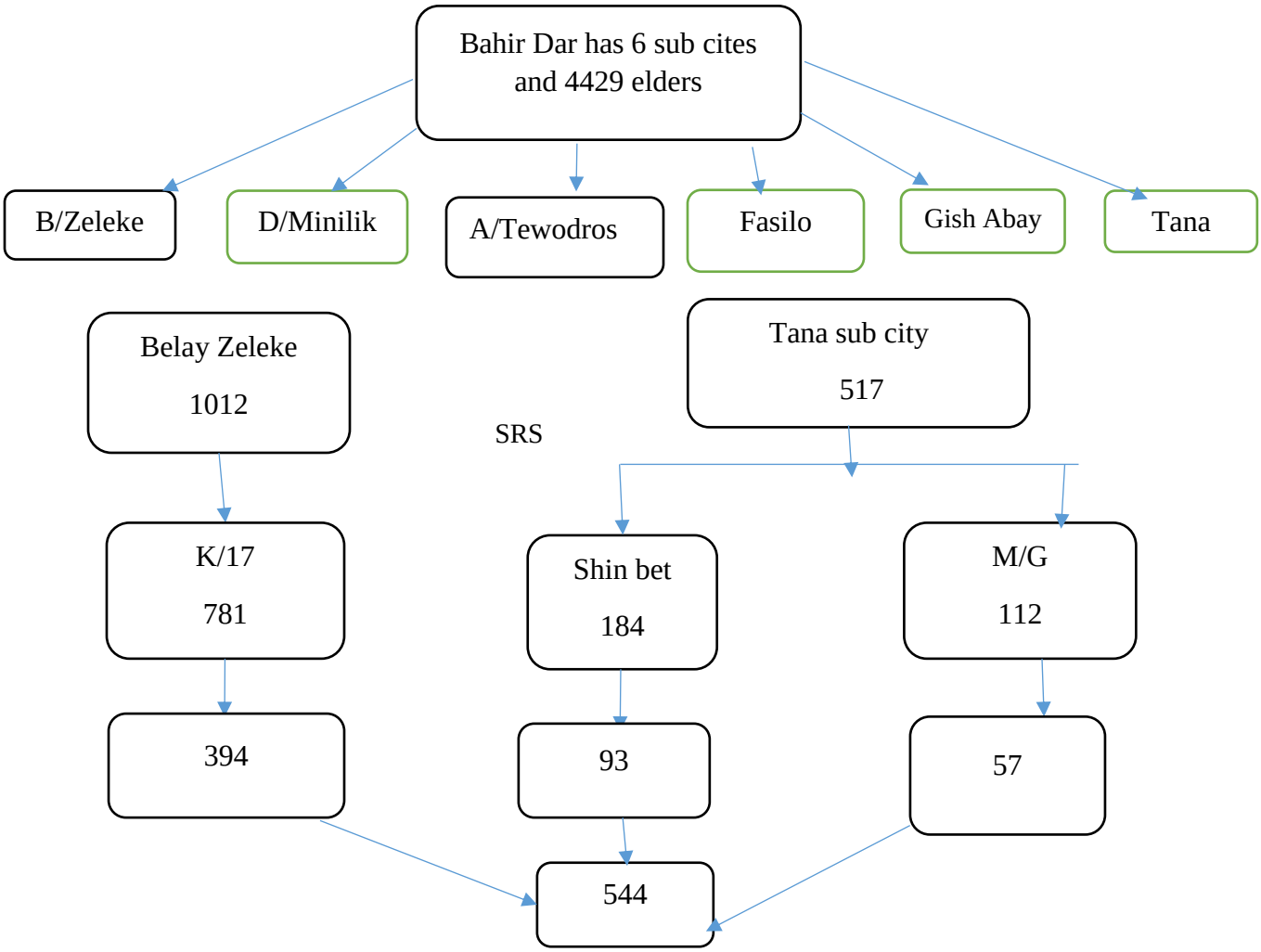
Table 1: sample size determination based on objective for nutrient intake inadequacy among elders at Bahir dar city, North West Ethiopia 2023

	Proportion	Sample size after adding 10% non-response rate and design effect
Calcium intake inadequacy	70%	536
Iron intake inadequacy	69%	544
Zinc intake inadequacy	88%	162
Mean inadequacy ratio	69 %	544

5.6. Sampling Procedure

The study participants were selected from target population through multistage sampling technique. Bahir Dar city has six sub cities. Among those two were selected randomly by

using lottery method. There are kebeles in each sub city, thus kebeles were also chosen from each sub city that was chosen, once the kebeles had been chosen, proportional allocation was done for each kebele, and then pre-survey was done in the selected kebeles in order to get the frame. Finally, elderly individual from each kebele were recruited by using simple random sampling technique. Occasionally, if two or more individuals were eligible in a household, only one was selected by lottery method. The selected elders were provided answers by face to face interview.



Key =SRS= Simple Random Sampling, k/17= kebele 17, M/G= Madre Genet, B/Zeleke=Belay Zeleke, D/Minilik = Dagmawi Minilik, A/ Tewodros/ Atse Tewodros

Figure 2: schematic presentation of sampling procedure for assessing micro-nutrient intake inadequacy among elders in Bahir Dar City, North West Ethiopia, 2023.

5.7 Study Variable

5.7.1 Dependent Variable

- Micro-Nutrient intake inadequacy of calcium, zinc, iron and vitamin A (yes/ no)

5.7.2 Independent Variable

-Socio economic characteristics (age, sex, wealth index, education, religion, marital status, occupation and food insecurity, family size, lives with persons/alone).
-Health related factors (chronic disease, acute illness, visit health center).
-Lifestyle factors (cigarette smoking, alcohol drinking, and chat chewing and daily sleeping duration, physical activity).
-Dietary related factors (time to have meal, habit, Meal frequency, feeding with family).

5.8. Operational and Term Definitions

Micronutrient intake inadequacy: when elders intake NAR for 4 (calcium, Zinc, iron, vitamin A) micronutrients was less than 1 (100%) in particular.

Recommended dietary allowance (RDA): is the average daily dietary intake level that is sufficient to meet the nutrient requirement of nearly all (97 to 98) health individuals in a particular life stage and gender group. It is the goal for usual intake by an individual (51).

Nutrient adequacy ratio (NAR): the ratio of subjects' nutrient intake to the requirement (RDA) (52).

Mean adequacy ratio (MAR): is the sum of NARs for nutrients divided by the number of nutrients evaluated (52).

Elderly: Persons with the age of >= 60 years (4).

Physically active: For this study the total physical activity level was determined based on the WHO recommendation of physical activity for health of 600 minute/ weeks. Which executed from vagarious activity, moderate activity, recreational time and travels. Participants with Total physical activity >= 600 minute per week was categorized as they 'met' the recommendation, which mean that physically active. Otherwise if they did not met WHO recommendation of physical activity minute they were considered as physically inactive (53).

Household Food Insecurity: household experiences none of the food insecurity (access) conditions, or just experiences worry, but rarely considered as secured, otherwise considered as food insecure (54).

Cigarette smoking: considering there is no safe level of tobacco consumption (55) a subject who smokes currently regardless of amount or the frequency of smoking per day is considered as smoker. (56)

Alcohol consumption: based on the national institute of alcohol and current research and guidelines it has been suggested that one up to two drink per day, or up to seven to fourteen drinks per week, measured in cup (1 cup=25ml) for areki and wine (1 cup =125 ml), glass for tella , bottle for beer (1 small bottle / lass =330ml) of alcohol can be considered safe or normal drinker for elderly persons (57).

Khat chewing: those individuals who claim to chew khat currently regardless of the frequency and amount of khat are considered as khat chewers.

Wealth index: the wealth score obtained during PCA analysis was used to tercial and to categorized households as poor, medium and rich. The highest the score indicates the wealthiest (the richest) the household will (58).

Meal frequency: normal meal frequency mean that a meal greater than or equal to 3 meal per day (59).

Dietary habits: can be defined as the conscious and repetitive way, if a person does not eat meat and mostly eats foods that comes from plants like grains, fruits, vegetables, and nuts. Considered as vegetarian. And if some ones usually eat both plant based and animal based foods considered as non-vegetarian (60).

Daily sleeping duration: It is the average person requires 7–8 hours of sleep with in a 24 hour from the time they go to bed to the time they wake up. If there is below or higher than 8 hours of sleep considered as lower or higher sleeping duration (61).

5.9 Data Collection Tool and Procedure

The data were collected by trained 10 data collectors with health background and supervised by the investigator. Socio-demographic factors, health-related factors, dietary intake, and lifestyle

factors were collected using semi- structured questionnaire developed after reading various literature (33, 37, 43, 48) and dietary data was evaluated using a Food and Agriculture Organization of the United Nations (FAO) Standardized tool.

Data were gathered through interview administered. The subjects then complete a 24-hour, one day food diary commonly consumed foods. During the interview, memory aids such as food models and pictures were used to help participants recall the amount and types of foods and beverages consumed in the previous 24 hours.

5.9.1 Dietary Assessment

In the community, a single 24-hour recall was used. Elders were asked to name all foods and beverages consumed in the previous day (24 hours), including those consumed outside the home, as well as the method of preparation. In addition, list of common food items as well as photographs of household apparatuses were used. A code was assigned to each apparatus for actual data collection. The actual data collection was beginning after the photographs of the apparatus have been coded. Respondents were asked which apparatuses were used in the photo banner. Some foods, such as oranges, mangoes, bananas, and lemons, were recorded in numbers and sizes such as large, medium, and small. Respondents were asked to list all of the ingredients for mixed dish foods.

An interactive multiple pass 24-hour dietary recall questionnaire adapted and validated for use in developing countries (62) was used. This multi-pass technique includes

First pass – quick list of all foods, drinks, snacks consumed within 24 hours was asked. Respondents are asked to report everything that they had to eat or drink on the previous day between midnight and midnight. This recall session is not interrupted. At the end of the recall, respondents were invited to add any additional items not initially recalled.

Second pass- detailed description of all foods and drinks consumed, including cooking methods and brand names (where possible). For each item of food or drink, respondents were asked to provide additional detail, like The time at which the food or drink was consumed, A full description of the food or drink, including brand name where available, Any foods likely to be eaten in combination e.g. milk in coffee, Recipes and other combinations of foods e.g.

sandwiches, The quantity consumed, based on household measures, photographs of different portion sizes of foods or weights, Any leftovers or second helpings.

Third pass- estimating portion size. In order to estimate portion size of foods and drinks consumed, photographs of coded locally available equipment's like cup, table spoon dishes and commonly consumed food in area at the time of study was given to data collectors. Respondents were given an opportunity to provide additional information and for the interviewer to prompt for information about foods or drink not mentioned. The interviewer reviewed all the food eaten and drunk in chronological order, prompts for any additional eating or drinking occasions or foods/drink possibly consumed and clarifies any ambiguities regarding type of food eaten or portion size. Finally, the interviewer asked the respondent to name the place where each food or drink item was consumed. All of the information gathered is recorded by the interviewer on the record sheet in the booklet called Food Consumption Record: Individual 24-hour recall.

Before the actual data collection inspection of market and surveillance of (5 %) which is thirty-two households in the study area was done to collect data on common foods eaten, cooking methods and equipment's used in the area. Photographs of household utensils and food portions was used to assist the participant to recall and for the determination of portion sizes of the consumed items. The respondents were asked which utensil they used from the photographic atlas and the portion at average by the equipment. For purchased food like pasta, beverages (soft drinks) the brand name was recoded together with the number of items consumed and these foods were assured to the market to see the nutrient content from their label. For shared bowel in different age or sex group, the individual consumption by elders were determined by asking to estimate the amount that individual already eaten. For those within the same age group the amount eaten together was divided equally. For mixed dishes the nutritive value was calculated from recipes. Furthermore, the foods commonly consumed (staple foods) in the study area during study period were listed and read the list for the participant after completing dietary recall to help the participant recall any food that they eat.

After actual data collection, the coded household utensils, and each consumed food items which were not standardized during the survey were again ready for standardization. The digital food weighing scale and dish was used for standardization. Initially the dish was put on the digital food weighing scale and calibrates it to zero. Then the food items which were consumed by

elders were measured by the corresponding household utensils. After that the measured (excluding the household utensil) food items put on dish and record the estimated weight in gram.

Small= 5g

Medium- 15g

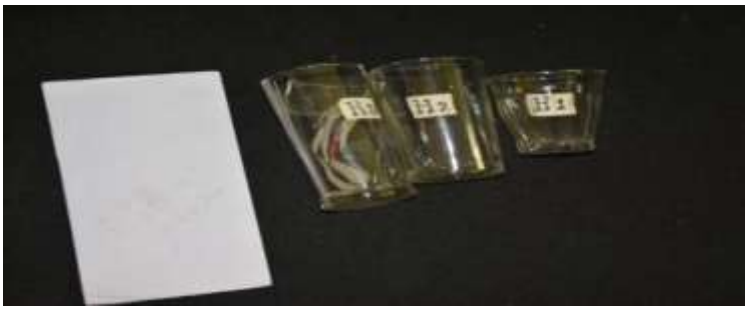
Large= 25g



Small= 90ml

Medium- 200ml

Large= 300ml



Small= 150g

Medium- 200g

Large= 300g



Figure 3: photographs banners of household apparatuses for portion size

Wealth index of the household: **Wealth index of the household**: Information on the wealth index was based on data collected in the household questionnaire. This questionnaire includes questions concerning the household's ownership of a number of consumer items such as a television and car; dwelling characteristics such as flooring material; toilet facilities; and other characteristics that were related to wealth status. In order to assess the wealth status first I was checked assumptions like variables coded into binary or dichotomous, Variables with measures of sampling adequacy less than 0.50 was removed, and the sample size was greater than 50 and other assumptions was checked And then Identified Variables to be used in Further Analyses Each household asset for which information was assigned a weight or factor score generated

through principal components analysis. The resulting asset scores were standardized in relation to a standard normal distribution with a mean of zero and a standard deviation of one. These standardized scores are then used to create the break points that define five groups of wealth quintiles as:, poor, Middle, rich, and richest was determined using principal component analysis (PCA) by considering from EDHS 2016 then for easily analysis recode into their which poor , middle and rich (58).

Food insecurity: was measured by household food insecurity access scale (HFIAS) which consists of nine occurrence questions represent a generally increasing level of severity of food insecurity (access) and nine frequency of occurrence questions that was asked as a follow-up to each occurrence questions to determine how often the condition occurred during the previous one month. If the respondent answer is yes for occurrence question was asked to determine whether the condition happened rarely (once or twice), sometimes (three to ten times), often (more than ten times) in the past four weeks To say food secure a household experiences none of the food insecurity (access) conditions, or just experiences worry, but rarely. and if the a household experience worry in sometimes/often and if there is the occurrence of other insecurity access conditions we classified as food insecure (54).

Meal frequency: frequency of meal was obtained by asking the participants to identify the meals they usually had as breakfast, morning snack, lunch, afternoon snack, and dinner and evening snack.

Alcohol consumption: Most countries do not have specific guidelines regarding alcohol consumption for older people. Based on the national institute of alcohol and current research and guidelines it has been suggested that one drink per day, or up to seven drinks per week, measured in cup (1 cup=25ml) for areki and wine (1 cup =125 ml), glass for tella , bottle for beer (1 small bottle / lass =330ml) of alcohol can be considered safe or normal drinker for elderly persons can be considered safe for elderly persons. If an individual consumed more than 14 dink of alcohol per week considered as drinker.

Smoking status and khat chewing: was measured by a tool developed from review of different literatures, elders was asked if there is chewing khat or smoking cigarate whatever the amount consideration , if they says yes for the current status, considered as smoker or khat chewer.

Physical activity: physical activity measured by global physical activity questionnaire, It collects information on physical activity participation in three settings (or domains) as well as sedentary behavior, comprising 15 questions. The domains are Activity at work, Travel to and from places and Recreational activities. The total physical activity level was determined based on the WHO recommendation of physical activity for health of 600 minute/ weeks. Participants with TPA >= 600 minute per week was categorized as they 'met' the recommendation, otherwise they were considered as they did not met WHO recommendation of physical activity (53).

5.10 Data Quality Control

The data collection tool (Questionnaire) was prepared in English and translated into the local language (Amharic) and translated back into English to check its consistency. The data quality was maintained and assisted by a pretest for 5% (32) elders, close supervision, and training of data collectors. In addition to this, the data quality was assured by using photograph banners of household apparatuses for portion size estimation, and the digital food weighing scale was used during the standardization of the portion sizes of consumed food and during data collection we were skipped the house if there was celebration or holiday to avoid date effect.

5.11 Data Processing and Analysis

The collected Data were transfer to SPSS version 25 for analysis. The data was presented in text, tabular and diagrammatic format. The nutrient value of each food item per 100 grams was obtained from the Ethiopian, Kenya and Tanzania Food Composition Table (EFCT). To calculate the actual micronutrient intake, each food item consumed by respondents, as well as the corresponding nutrient values of the studied micronutrient (ca, zinc, iron and vitamin A), were entered into the nutria-survey 2007 Food Processor software. Finally, the nutrient values calculated by the nutria-survey Food Processor software for each respondent was transferred to Microsoft excel and then to SPSS for analysis.

Nutritional intake was assessed using a multiple pass 24-hour dietary recall method. The calculated data was compared with Recommended Dietary Intake (RDI). Nutrients Adequacy Ratio (NAR) is the ratio of a subject's intake to the current recommended allowance for each sex and age category for a given nutrient and can be represented as ratio

or as a percentage. The nutrient inadequacy of four micronutrients (calcium, zinc, vitamin A, and iron) were estimated.

$$NAR = \frac{\text{Actual intake of micronutrient per day}}{\text{RDA of that nutrient}}$$

$$MAR = \sum \frac{\text{NAR (each truncated)}}{\text{Number of nutrients}} \quad (52)$$

The micro-nutrient adequacy ratio evaluated When we compare the consumed micronutrient from the recommended allowance for specific nutrient based on to sex and age, if the result is less than the recommended dietary allowance we said that there is micronutrient inadequacy for that micronutrient and vice versa. To calculate MAR, the sum of NAR was divided by the total number of micronutrients. If one of micronutrient adequacy result is less than one or 100%, it was concluded that there is overall micronutrient inadequacy because NAR was truncated at 1 so that a nutrient with a high NAR could not compensate for a nutrient with low NAR.

Bi-variable and multivariable logistic regression analysis was done to identify the factors associated with each micronutrient intake inadequacy. The variables observed in bi-variable logistic regression ($p <= 0.25$) were subsequently include in to the multivariable logistic regression analysis. In multivariable binary logistic regression models, the Hosmer-Lemeshow goodness of fit test was performed for model fitness and p-value >0.05 is considered as a good fit and the variable with p-value less than 0.05 at 95 CI was considered as statistically significant association and OR was used for measure of association.

5.12 Ethical Consideration

Ethical clearance was obtained from the Ethical Review Board of Bahir Dar University, College of Medicine and Health Science. To get the available data Oral informed consent was obtained. Any personal identification of the study participants was not recorded during data collection and the data was coded to keep all the information that was collected from the study participant confidential. The participants were informed that they have the right to

with draw from the study at any time without any consequences. The privacy right of the respondents was respected.

6. RESULT

6.1. Socio-demographic and socio-economic characteristics of respondents

A total of 525 elders participated in this study with making a response rate of 96.5 %. The mean age of the respondents was 66.61, with a standard deviation of 5.716, ranging from 60 to 87 years. Among those that responded, 310 (59%) were men. In terms of religion, there were 457 (87%) Orthodox. Among respondents, 26.7% of families experienced food insecurity, while 40.4% of households had lower class wealth. (Table 2)

Table 2: Socio-demographic and socio economic characteristics of elders in Bahir Dar City, North West Ethiopia, 2023(n=525)

Variable	Category	Frequency (N)	Percentage (%)
Sex	Male	310	59
	Female	215	41
Age in years	60-74	465	88.5
	75-84	55	10.5
	85-95	5	1.0
Religion	Orthodox	457	87.0
	Muslim	53	10.1
	Others	15	2.9
Marital status	Married	341	65.0
	Not married	184	35
Educational status	no formal education	294	56.0
	primary	56	10.7
	secondary	61	11.6
	higher education	114	21.7
Occupation	House wives	115	21.9
	Pensioner	138	26.3
	Gov’t work	155	29.5

	Private work	66	12.6
	Others	51	9.7
Partner educational status	no formal education	198	58.1
	primary	37	10.9
	secondary	40	11.7
	higher	66	19.4
Partner Occupation	House wives	117	34.3
	Pensioner	88	25.8
	Merchant	55	16.13
	Private work	52	15.25
	Other	29	8.5
Living with	Alone	28	5.3
	With family	497	94.7
Family size	< 5	356	67.8
	>=5	169	32.2
Food security	Secure	385	73.3
	Insecure	140	26.7
Wealth index	Poor	212	40.4
	Middle	105	20.0
	Rich	208	39.6

Key word=others for occupation (daily labour, merchant), others for partner occupation= (daily labour, gov't work, others for religion (catholic and protestant).

6.2. Health status of elders

Among the respondents, 108 (20.6 %) and 154 (29.3) had an acute and chronic disease, respectively, with nearly 70 (42.9 %) and 66 (64.8%) of the diseases being common cold and hypertension, respectively, but even if they were diseases, nearly 328 (62.5 %) did not visit a health facility. (Table 3)

Table 3: Health related status of elders Bahir Dar City, North West Ethiopia, 2023(n=525)

Variable	categories	Frequency	Percentage (%)
Chronic disease	Yes	154	29.3
	No	371	70.7
Name of chronic	HTN	66	42.9
Disease (n=154)	DM	47	30.5
	HIV	18	11.7
	TB	16	10.4
	Other	7	4.5
Acute illness	Yes	108	20.6
(In past 2 weeks)	No	417	79.4
Name of illness	Common cold	70	64.8
(n=108)	Pneumonia	20	18.5
	Diarrhoea/vomiting	10	9.3
	Others (constipation)	8	7.4
Visit health facility	yes	197	37.5
During diseased	No	328	62.5

6.3 Dietary practice of Elders

Almost 118 (22.5 %) of elders had fewer than three meals per day, 179 (34.1%) had not usual time for a meal, the time to have a meal of those persons were at any time when they get food and 59 (11.2 %) respondents were vegetarian.(Table 4)

Table 4: Dietary practice of elders Bahir Dar City, North West Ethiopia, 2023(n=525)

Variable	Categories	Frequency	Percentage (%)
Meal frequency	< 3 times	118	22.5
	>= 3 times	407	77.5
How did you feed	him/her self-	511	97.3
	With the help of others	14	2.7
With whom you are fed	alone	235	44.8
	With family	290	55.2
Dietary habit	vegetarian	59	11.2
	Non- vegetarian	466	88.8
Time to have a meal	any time	179	34.1
	At a time of breakfast, Lunch and dinner	346	65.9

6.4. Life style/ Behavioural condition of elders

Among respondents 77 (14.7%) were drunker and 452 (86.1%) were physically inactive. Among the participants 40.8 % of elders were not in normal daily sleeping duration. (Table 5)

Table 5: Life style conditions of elders in Bahir Dar city, North West Ethiopia, 2023(525)

Variable	categories	frequency	percentage (%)
Alcohol drinking	no	448	85.3
	Yes	77	14.7
Smoking	no	522	100
	Yes	3	0.6
Khat chewing	No	505	96.2
	Yes	20	3.8
Daily sleep duration	<7 hours	129	24.6
	7-8 hour	311	59.2
	9-10 hours	85	16.2
Physical activity	inactive	452	86.1
	Active	73	13.9

6.5. Micronutrient intake of elders

The median consumption of vitamin A among respondents was 396.9 mcg. Similarly, the median calcium consumption was 433.2 mcg. Almost all micronutrients, with the exception of iron, were not consumed at the required or appropriate daily requirement levels in the elderly. Approximately 517(98.5 %) of respondents had inadequate calcium intake (did not meet RDA for calcium). about 354 (67.4 %) of respondents did not consume the recommended amount of vitamin A and 2.9% of elders had insufficient zinc consumption. Surprisingly, the iron intake was completely adequate. For the assessment of micronutrients the median central tendency was used due to the skewness of the data during normality testing (Table 6)

Table 6: Micro-nutrient intake inadequacy among elders in Bahir Dar city, North West Ethiopia, 2023 (n= 525)

Micronutrient	Median /IQR	RDA M/F	Prevalence of inadequacy
Vitamin A (mcg RAE)	396.9±(399.4)	600/500	67.4(63.2, 71.4)
Calcium (mg)	433.2± (221.2)	1300/1000	98.5(97, 99.3)
Zinc (mg)	13.9± (8.3)	7/4.9	2.9(1.6, 4.7)
Iron (mg)	220.6± (114.25)	12.5/10.35	0(0, 0.7)
MAR (4 micronutrient)			98.9(975, 99.6)

RDA=recommended dietary allowance, M/F=male /female , IQR= interquartile range ,

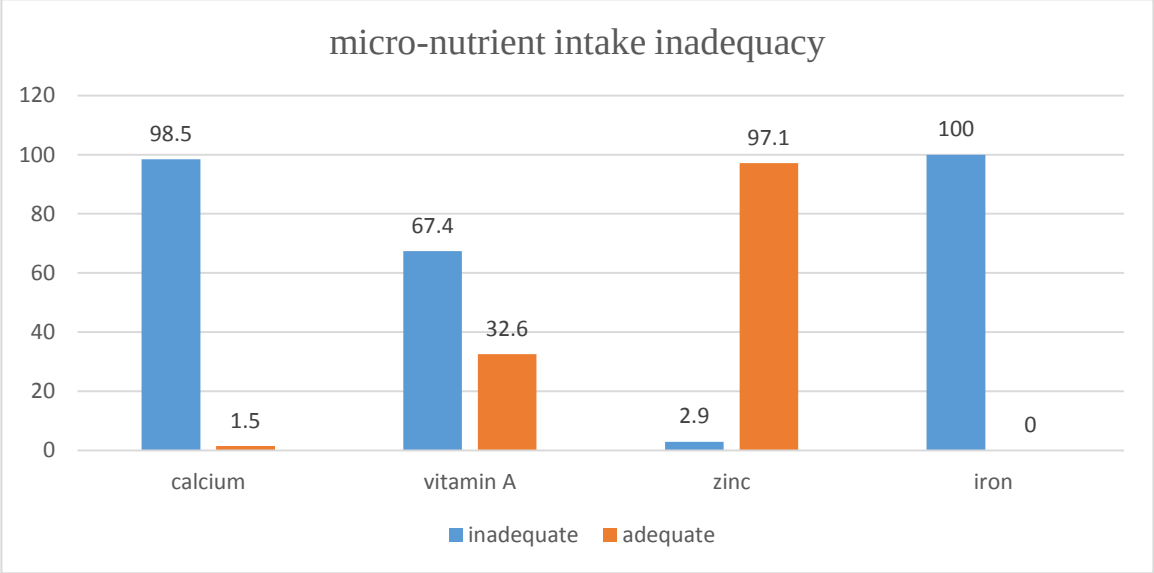


Figure 4:micro-nutrient intake inadequacy among elders in Bahir dar city , northwest Ethiopia , 2023

6.6. Overall micronutrient intake inadequacy of elders

The overall prevalence of micronutrient intake inadequacy among elders was 98.9 (95, 99) was computed from 4 micronutrients. The prevalence of adequacy of iron was 100%; this implies that all respondents had NAR >= 1. NAR was truncated at 1 so that a nutrient with a high NAR could not compensate for a nutrient with low NAR. The ideal cut-off for nutrient adequacy should be 1, which would mean that all the nutrients were consumed in sufficient/adequate amounts. (Index)

$$\text{MAR: } \frac{\sum NAR(\ each\ truncated\ )}{no\ of\ micronutrient} = 98.9\ \%$$

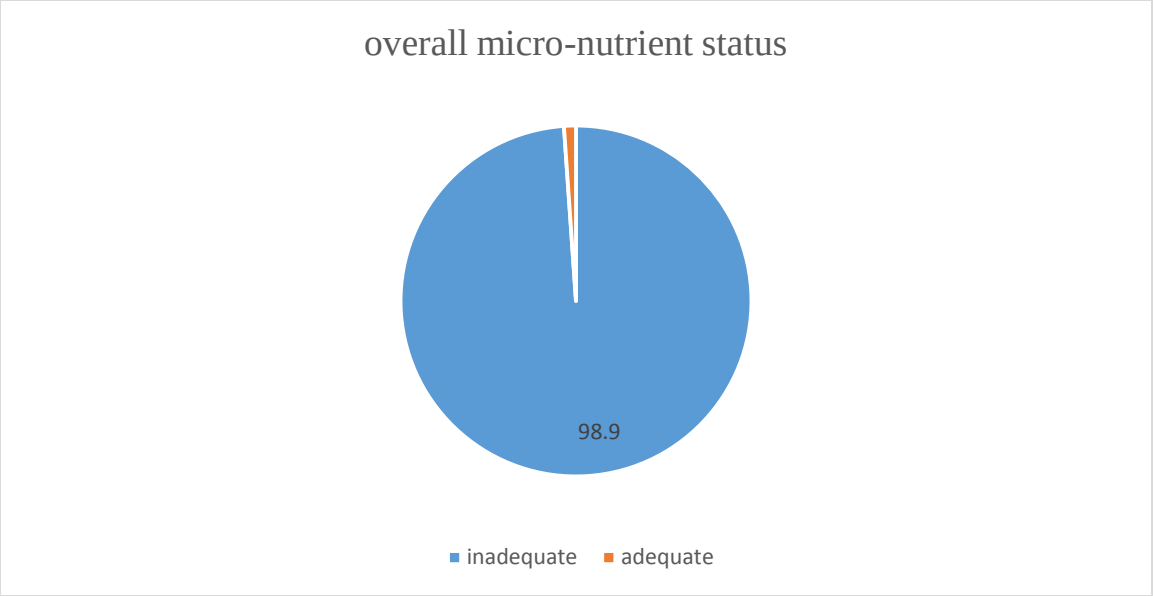


Figure 5: overall micro-nutrient status of elders in Bahir dar city, northwest Ethiopia, 2023

6.7. Factors affecting micronutrient intake inadequacy among elders

All variables in the bi-variable logistic regression which had p≤ 0.25 were entered to the Multivariable logistic regression analysis. Multivariable analysis of logistic regression was done on those factors to filter the net effect of an independent variable on the micro nutrient intake inadequacy (for each nutrient).

In bi- variable regression sex, religion, wealth index and physical activity were factors associated with zinc inadequacy. In multivariate regression model physical inactivity and marital status were significant. Being physically inactive was 3.3 more likely to have zinc inadequacy than those who were physically active [AOR=3.285, (1.086, 9.937)]. (Annex 1.1)

In bivariate regression, marital status, education, lives with persons, wealth index, chronic disease, visit a health facility, time to have meal, family size and dietary habit were associated with vitamin A intake inadequacy. In multivariate regression wealth index was significant, which is having middle wealth status was 1.56 times [AOR= 1.556(1.022, 2.368)] more likely to have vitamin A inadequacy. (Annex 1.2)

For this study, we cannot do association factors for iron and calcium intake because almost all study subjects dietary iron intake was adequate and inadequate for calcium, so the regression

model is not working in such conditions. Moreover, we cannot do also association factors for overall micronutrient intake inadequacy because almost all study subjects (98.9%) dietary micronutrient intake was inadequate. generally during higher prevalence of dependent variable may make it difficult to observe and detect meaningful associations.

Table 7: Associated factors of micronutrient intake inadequacy among elders in Bahir Dar city, North West Ethiopia, 2023 (n=525)

Micronutrient	variables	inadequate	adequate	COR(95%CI)	AOR(95%CI)
Vitamin A	wealth index				
	Poor	130(61.3)	82(38.7)		
	Middle	80(76.2)	25(23.8)	1.419(.948, 2.125) *	1.556(1.022, 2.368) **
	Rich	144(69.2)	64(30.8)	1	1
Zinc	physical activity				
	Inactive	6(8.2)	67(91.8)	4.408(1.520, 12.78) *	3.3(1.086, 9.937) **
	Active	9(2)	443(98)	1	1

Note: * significant at p 0.25. ** Significant at p< 0.05. Unmarked not significant, 1= reference Group, COR= crude odds ratio, AOR= adjusted odds ratio, CI= confidence interval.

7. DISCUSSION

The nutrient requirement for elders are different from those of younger individuals particularly in terms of micronutrient. This is because elders tend to loss more nutrients, have altered body compositions and metabolism, decreased absorption and utilization and also due to increased susceptibility to chronic diseases. Therefore, this study aimed to assess micro-nutrient intake inadequacy (iron, zinc, calcium, vitamin A) and identify factors associated with each micronutrient intake inadequacy among elders in Bahir dar city.

The prevalence of micronutrient intake inadequacy among elders was 98.9% in the present study area. The inadequate intake of calcium, vitamin A and zinc were 98.5 %, 67.4 % and 2.9 % respectively. The study approved that there is no iron inadequacy. The significant factors which have been associated with vitamin A inadequacy was wealth index and physical activity was a significant factor for zinc inadequacy.

The finding of this study showed that the prevalence of overall micronutrient intake inadequacy was 98.9% at 95% CI (97.5, 99.6) among elders. when we see this higher prevalence, it suggests that if the current dietary pattern is continued for an extended period of time, those proportions of research participants are susceptible to acquiring micronutrient deficiencies (63). Insufficient micronutrient consumption in our study sample could occur for a variety of causes. According to current study the first reason might be due to Low economic status (which is 40 %) might be also a barrier to the accessibility of micronutrient-rich foods since most of nutrient-rich foods especially animal sources are high in price and became difficult to access (64). Additionally, this segment of the population may be at a greater risk for inadequacy due to their nutrient and health susceptibility, as well as a variety of age-related processes like body structure changes, physiological changes which is as age increasing the lean body mass will be decrease, due to that the energy requirement will also decreased and then they used low diet and also this age-related physiological changes may affect micronutrient absorption, utilization, and requirements are some potential causes of this higher prevalence of inadequacy.

In Similar studies related with micronutrient intake inadequacy among elders, even if they studied more than four micronutrients the prevalence of inadequacy among elders was much lower than that of the current study. The prevalence of micronutrient intake inadequacy among elders in Taiwan and South Africa was 52.5%, 69%, respectively (37, 41). It's possible that the higher prevalence of inadequacy in the study area may be due to micronutrients which studied in this study were purposively selected which expected to be inadequate among elders, this might be the reason for this higher prevalence of inadequacy. In other way dietary practices like dietary habit, and a lack of food variety might be also a cause and blame for the higher prevalence of inadequateness. Since the majority of people consume a lot of low-micronutrient cereal-based diets, the reason for this discrepancy may be their decreased consumption of fruits, vegetables, and food derived from animals, all of which are important sources of micronutrients. Another

reason might be the educational status of the study participants which is (56%). Because education can influences dietary decisions to shift away from sugary/high-fat foods and toward sources of high-quality Micronutrient (43).

The prevalence of inadequate calcium intake was below the requirement for elders, 98.5 %(95% CI: (97, 99.3)) which is a higher proportion of inadequacy. This is consistent with study findings obtained in Chania (98.2 %) (36). On the other hand, a lower prevalence of calcium inadequacy was reported in Europe (59.3), Filipino (31%), and New Zealand (80 %) (33, 35, 40). The possible explanation of this discrepancy might be the high consumption of plant-based food, particularly cereals and legumes and it may also be related to the low consumption of dairy products, including milk, which was the main source of calcium. The gradual reduction occurring with age in the consumption of dairy products, i.e., the most important food source of dietary calcium, could be one of the main reasons explaining the corresponding decrease in dietary calcium intake (65).

The prevalence of inadequate vitamin A intake was below the requirement for elders, 67.4(63.2, 71.4) which is a higher proportion of inadequacy. These findings are in line with study findings in brazil which revealed that vitamin A inadequacy was (70 %) (34). On the other hand, a higher prevalence of vitamin A inadequacy was reported in China (76.7%) and Filipino (73%) (33, 36). And in addition, a lower prevalence of vitamin A inadequacy was reported in Japan (49.4%)(66). The possible explanation of this discrepancy based on the data might be low consumption of vitamin A-rich foods which is an important source of vitamin A, and education, which increases the dietary choice of elders.

Analysis of the factors associated with vitamin A inadequacy revealed that having middle wealth status was 1.56 times [AOR= 1.56(1.022, 2.368)] more likely to have vitamin A inadequacy. This finding is in agreement with the study finding in China and Brazil (34, 36).This might be In accordance with the findings of our study, many studies have identified that food and nutrient intakes were healthier among wealthy people (34, 36). On the other hand, our study showed that diversified foods, fruit and vegetables and dairy products were more evident in the high socio-economic groups. Our results indicate that elders with high levels of resources to purchase and choose have better food options which are necessary to achieve better-quality diets. A possible explanation is that the low-income and middle population has the lesser opportunity to consume

better vitamin A-rich food(42). Although there are few studies in middle- and lower-income individuals about the association between diet quality of diet (34).

The finding of this study showed that the prevalence of zinc inadequacy was 2.9 %(1.6, 4.7). These findings are in line with study findings in Eroup which revealed that zinc inadequacy was below 10 % (40). On the other hand, a higher prevalence of zinc inadequacy was reported in China (45.8%), SHILDI (10 %), Troms (12%) and Greece (35-45%) (36, 38, 39). And in addition, higher prevalence of zinc inadequacy was reported in South Africa (88%) (41). The possible explanation of this discrepancy based on the data implied that first the intake observed could only be apparent since bioavailability was not taken into consideration and in addition, the intake of these nutrients was mainly from plant sources, and the highly consumed food groups of this study area also plant source, so that, the reason might be the usual dietary consumption between study areas(34).

Physically inactive was 3.3 times more likely to have zinc inadequacy than those who were physically active [AOR=3.3(1.086, 9.937)]. This study is consistent with toenails (48). The possible explanation may be Physical activity level has been associated with food choice, with the higher appearance of cereals, fruits, and vegetables in the diet of active participants (67) which is a high source of zinc. It was previously reported that sedentary and low-active participants showed the lowest adherence to dietary patterns (68).

According to the study findings, the prevalence of iron inadequacy was zero percent (0, 0.7). On the other hand, a higher prevalence of iron inadequacy was reported in China (3.3 %), Europe (10%), and Filipino (51%) (33, 36, 40). The high consumption of legumes, grains, and cereals in the research area, commonly Teff, which are the main sources of iron, may be the cause of this discrepancy, as it does not take into account the variables that alter the bioavailability of iron. In general for these countries considered that the planted-based dietary pattern in the study area and meat consumption in others were the main reasons for sufficient iron intake (69).

8. LIMITATION OF THE STUDY

This study applies a single day record so it is difficult to discuss their usual dietary intake by twenty four hour dietary recall and also has social desirability bias and memory lapse.

9. CONCLUSION

The study revealed that overall micronutrient intake inadequacy among elders was a high. The intakes of micronutrients among the respondents were lower than the recommended, which is public health problem in the study area. The relevant factors that have been linked to each micro-nutrient intake inadequacy were wealth index for vitamin A, physical activity for zinc inadequacy.

10. RECOMMENDATIONS

Accordingly, it is recommended:

1) To regional health bureau and other concerned non-governmental organization: assigned officials is better to strength implementation of nutrition policies or programs on nutrition among elders.
2) The City health extension workers, volunteer groups and other stakeholders: shall to work actively to identify and help the elders who live in low socioeconomic status by supporting economically or link with sustainable governmental/ non-governmental organizations who help elders.
3) To elders: It is recommended that elders should consume more dairy products to produce more calcium, and should be improve the eating style(pattern) in order to improve absorption of iron or vitamins .
4) For health care providers and dietetician while elder persons have visit for health conditions they should consult about their eating habits and the benefit of physical activities and other suggestions that affect absorption of micronutrients.
5) For researchers: future researcher shall have to do this study by biochemical assessment, other dietary recorded method. And also in order to assess the total micronutrient intake level of elders, researchers shall have to do the study by including all micronutrients.

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12. APPENDEX

APPENDIX I: ENGLISH FORMAT INFORMATION SHEET

Number	Question	Response
101	Date of interview (dd/mm/yyyy)	☐☐/☐☐/☐☐☐☐
102	Kebele	*drop list:*
103	Interviewer's ID	☐☐
104	Supervisor's ID	☐☐

I am a student at Bahir Dar University, school of public health Department of nutrition and dietetics for conducting a research on Nutrient intake inadequacy and its associated factors among elders in Bahir Dar city, for the attainment of master's Degree. Your responses will be treated with almost confidentiality and will only be used for education purposes.

Confidentiality and Consent

My name is _____We are here to collect the data for the thesis of Betelhem Birhanie I would like you to answer some personal question. Your answer is completely confidential and participation is voluntary. You don't have to answer any question if you don't want to and you can stop the interview at any time. However, your honest answer to these questions will help to better understand the situation and contribute to improve the health status of the elders. I would like to appreciate your help in participating on this study.

Would you be willing to participate? Yes---- No-----

Data collectors who fills the questioner----------

-

Name ----------signature ----------date ----------

--

APPENDIX II ENGLISH VERSION QUESTIONNAIRE

1. SOCIO DEMOGRAPHIC CHARACTERISTICS

S.no.	Questions	Response	Skip
101	Sex of the respondent	1.Male 2.Female	
102	What is the Age of the respondent (in years)	[_____]	
103	What is your Religion	1. Orthodox [___] 2. Muslim [___] 3. Protestant [___] 4. Catholic [___] 5. other [___]	
104	What is your Marital status	1. Single [___] 2. Married [___] 3. Divorced [___] 4. Windowed [___]	
105	What is your Educational status	1. unable to read and write [___] 2. able to read and write [___] 3. Primary school(grade1-8) [___] 4. Secondary school(grade 9-12) [__] 5. college and above [___]	
106	What is Partners' /caregiver educational level	1. unable to read and write [___] 2. able to read and write [___] 3. Primary school(grade1-8) [___] 4. Secondary school(grade 9-12) [__] 5. college and above [___]	
107	What is your Occupation	1. Merchant [___] 2. Government employ [___] 3. Daily labor [___] 4. Housewife [___] 5. pensioner [___]	
		6. Other(specify) [___]	
108	What is your Partner / Occupation	1. Merchant [___] 2. Government employ [___] 3. Daily labor [___]	

		4. Housewife [___] 5. pensioner [___] 6. Other(specify) [___]	
109	With whom you are living?	1. With partner [___] 2. With Children's [___] 3. Lives alone [___] 4. Other (mention) [___]	
110	What is your House hold family size?	[_____]	
Household Food Insecurity Access Scale (HFIAS) Measurement Tool			
No.	Question	Response Options	Code
201.	In the past four weeks, did you worry that your household would not have enough food?	0 = No (skip to Q2) 1=Yes	[____]
201.a	How often did this happen?	1= Rarely (once or twice in the past four weeks) 2= Sometimes (three to ten times in the past four weeks 3 = Often (more than ten times in the past four weeks)	[____]
202	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	0 = No (skip to Q3) 1=Yes	[____]

202.a	How often did this happen?	1= Rarely (once or twice in the past four weeks) 2= Sometimes (three to ten times	[____]

		in the past four weeks 3 = Often (more than ten times in the past four weeks)	
203.	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	0 = No (skip to Q4) 1 = Yes	
203.a	How often did this happen?	1= Rarely (once or twice in the past four weeks) 2= Sometimes (three to ten times in the past four weeks 3 = Often (more than ten times in the past four weeks)	[____]
204.	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	0 = No (skip to Q5) 1 = Yes	
204.a	How often did this happen?	1= Rarely (once or twice in the past four weeks) 2= Sometimes (three to ten times in the past four weeks 3 = Often (more than ten times in the past four weeks)	[____]

205.	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	0 = No (skip to Q2) 1=Yes	[____]

205.a	How often did this happen?	1= Rarely (once or twice in the past four weeks) 2= Sometimes (three to ten times in the past four weeks 3 = Often (more than ten times in the past four weeks)	[____]
206.	In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	0 = No (skip to Q2) 1=Yes	[____]
206.a	How often did this happen?	1= Rarely (once or twice in the past four weeks) 2= Sometimes (three to ten times in the past four weeks 3 = Often (more than ten times in the past four weeks)	[____]
207.	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	0 = No (skip to Q2) 1=Yes	[____]
207.a	How often did this happen?	2 = Rarely (once or twice in the past four weeks) 3 2 = Sometimes (three to ten times in the past four weeks 3 = Often (more than ten times in the past four weeks)	[____]

208.	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	0 = No (skip to Q2) 1=Yes	[____]
208.a	How often did this happen?	1= Rarely (once or twice in the past four weeks) 2= Sometimes (three to ten times in the past four weeks 3 = Often (more than ten times in the past four weeks)	[____]
209.	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	0 = No (skip to Q2) 1=Yes	[____]
209.a	How often did this happen?	1= Rarely (once or twice in the past four weeks) 2= Sometimes (three to ten times in the past four weeks 3 = Often (more than ten times in the past four weeks)	[____]

Questions for assessing house hold socio economic status (wealth index)

Housed hold assets and housing condition (wealth index)			Skip
301.	Who is the owner of the house you live?	1. Private 2.rent 3. Other……..	
302.	What is the main construction materials used in exterior walls?	1.cement 2.wood with mud 3.other(specify)_____	
303.	What is the main construction material used for the roof?	1.cement/concrete 2. Corrugated iron/metal 3.other(specify)	

304.	What is the main construction material used for the floor of your house?	1.Mud 2.sand 2.Cement 5.Ceramic	
305.	Did you have a separating room for sleep?	1. Yes 2. No.	

306.	Did you have a separating room for kitchen?	1.Yes 2.No	
307.	Did you have a separate room for Shower and toilet?	1. Yes 2. No	
308	Which of the following is there in your household		
	Clock/watch	1. Yes 2. No	
309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321.	Radio	1. Yes 2. No	
	Television	1. Yes 2. No	
	Mobile phone	1. Yes 2. No	
	Home phone	1. Yes 2. No	
	Refrigerator	1. Yes 2. No	
	Chair	1. Yes 2. No	
	Sofa	1. Yes 2. No	
	Table	1. Yes 2. No	
	Bed with cotton sponge	1. Yes 2. No	
	Electric Mitad/stove	1. Yes 2. No	
	Bicycle	1. Yes 2. No	
	Motor cycle	1. Yes 2. No	
	Car/truck	1. Yes 2. No,	
	Gariii	.1. Yes 2. No,	
309.	Does the household own any livestock?	1. Yes 2. No	
310.	How many livestock are there		

CO-MORBIDITIES AND HEALTH RELATED FACTORS			
401	Do you have history of any chronic diseases?	1. Yes [___] 2. No [___]	
402	If Q403 yes, which one of the following (multiple answers are possible)	1. hypertension [___] 2. Diabetes Mellitus [___] 3. TB [___] 4. HIV/ADIS [___] 5. Other specify? [___]	
403	Have You ever ill for the last 2 week?	1. Yes [___] 2. No [___]	
404	If yes for number 403,what was the illness	1. Diarrhea 2. Vomiting 3. Common cold 4. Other	
405	Have you visit health facility	1. Yes 2. No	
DIETARY INTAKE RELATED QUESTIONNAIRES			
501	Meal frequency practice in the previous 24 hours	[_____]times	
502	Ability of the respondent to feed?	1. By him/herself [__] 2. With the help of others [__]	
503	With whom you are feeding?	1. Always alone [__] 2. Sometimes alone [__] 3. Always with family Members [__] 4.Sometimes with family members [__]	
504	Dietary habit	1.Non-vegetarian 2.Vegetarian	
505	Time to have meal?	1. Regular (at the time of breakfast,	

		lunch, snack and dinner) [__] 2. Irregular (any time s/he eat when they get food) [__]	

Life style factors			
601	Do you drink alcohol	1/ yes 2/ no	
602	How often do you have a drink containing alcohol per day/week?		
603	How many units of alcohol do you drink on a typical day when you are drinking (tella, areki, teji?		
604	Do you currently smoke Cigarettes?	1/ yes 2/ no	
605	How many Cigarettes did you smoke per day?		
606	Have you ever chewed chat?	1/ yes 2/ no	
607	How Many days did you chew chat?		
608	In a typical day, how long did you Spend sleeping at night?	Hrs……Minutes……..	
Physical activity questions;			
	Activity at work		
701	Does your work involve vigorous-intensity activity like [carrying or lifting heavy loads, digging or construction work etc.] for at least 10 minutes continuously?	1. Yes 2. No	
702	How many days do you do a week?	-----days	
703	How much time do you spend a week?	--hr/min	
704	Does your work involve moderate-intensity activity, such as (brisk walking [or carrying light loads] etc.) for at least 10 minutes continuously?	1. Yes 2. no	

705	How many days do you do a week?	-----days	
706	How much time do you spend a week?	----hr/min	
Travel to and from places			
707	Do you walk or use a bicycle (pedal cycle) for at least 10 minutes continuously to get to and from places?	1. Yes 2. No	If No, go to812
708	How many days do you do a week?	-----days	
709	How much time do you spend a week?	---hr/min	
Recreational activities			
710	Do you do any vigorous-intensity sports, fitness or recreational (leisure) activities like [running or football etc.] for at least 10 minutes continuously?	1. Yes 2. No	If no go to 815
711	How many days do you do a week?	-----days	
712	How much time do you spend a week?	----hr/min	
713	Do you do any moderate-intensity sports, fitness or recreational (leisure) activities such as brisk walking,(cycling, swimming, volleyball etc.) for at least 10 minutes continuously?	1. Yes 2. no	If no go to 818
714	How many days do you do a week?	----days	
715	How much time do you spend a week?	----hr/min	

Part II: 24 Hour Dietary Recall Entry Sheet

Gender_____ Date _____ Age _____

Time	Place	Meal	Food/Beverage Item	Details/ Ingredients/ Preparation	Shared during eating. /who are eaten together Number, sex, and age of persons	Portion code (amount)	Brand name
		Break fast					
		Snack					
		Lunch					
		Snack					
		Dinner					

APPENDIX III - AMHARIC VERSION CONSENT FORM

መግቢያ

ጤና ይስጥልኝ፤እኔ በባህር ዳር ዩኒቨርስቲ የህክምና ሳይንስ ኮሌጅ የህብረተሰብ ጤና አጠባበቅ የስነ ምግብ እና ዳይቲቲክስ ተመራቂ ተማሪ ስሆን በባህርዳር ዉስጥ በሚገኙ እረጋዊያን ላይ ከምንመገባቸዉ ምግቦች የሚገኘው የምግብ ንጥረነገር ብቂ መሆን እለመሆኑን እና እንዲሁም ተያያዝ ምክያቶች ለማጥናት ስለፈለኩ ትብብር እንድታደርጉልኝ ስል በአክብሮት እንጠይቃለሁ፡፡

የዚህ ጥናት ዋና አላማዉም እርጋዊያን ለይትው ስለሚያገኟቸው ንጥረ ነገሮች መረጃ ለማዎቅ እና የመፍተሄ ሀሳብ ለሚመለከታቸዉ አካላት ለመጠቆም ነዉ ፡፡ በዚህ ጥናት ዉስጥ የተገኘዉ መረጃ ከላይ ከተጠቀሰዉ አላማ ዉጭ ለሌላ ተግባር ስለማይዉል መረጃዉ በሙሉ በሚስጥር የሚቀመጥ መሆኑን ልንነግርዎት እንወዳለን፡፡

ለቃለ መጠይቁ ለሚያደርጉልን ትብብር የላቀ ምስጋናችንን እያቀረብን፤ መጠይቁ ከ15-20 ደቂቃ ሊወስድ ስለሚችል የበኩልዎን እንዲተባበሩን በትህትና እንጠይቃለን:

በዚህ ጥያቄ ለመሣተፍ ተስማምተዋል; 1. አዎ 2. አልተስማማዉም

መልሰዎ አዎ ከሆነ ወደሚቀጥለዉ ጥያቄ ይለፉ ፣ መልሰዎ አልተስማማሁም ከሆነ ደግሞ ጥያቄዉን መመለስ ማቆም ይችላሉ

መጠይቁን የሞላዉ/ችዉ መረጃ ሰብሳቢ ፊርማ ----------ቀን ----------

APPENDIX IV - AMHARIC VERSION QUESTIONARIE

1. ማህበራዊ፣ስነ- ህዝባዊእናኢኮኖሚያዊጥያቄዎች			ዝለል
ተ.ቁ	ጥያቄዎች	የመልስአማራጮች	
101	የተሳታፊ ፆታ	1. ወንድ [___] 2. ሴት [___]	

102	የተሳታፊ እድሜ	[_____]	
103	ሐይማኖትዎ ምንድን ነው	1. ኦርቶዶክስ [___] 2. ሙስሊም[___] 3. ፕሮቴስታንት [___] 4. ካቶሊክ[___]	
104	የትዳር ሁኔታዎ ምን ይመስላል	1. ያላገባ/ች [___] 2. ያገባ/ች [___] 3. የፈታ/ች [___] 4. የሞተችበት/ባት [___]	
105	የትምህርት ደረጃዎ ምን ያህል ነው	1. መፃፍማንበብየማይችል/የማትችል [___] 2. መፃፍማንበብየሚችል/የምትችል [___] 3. 1ኛደረጃ/1-8 ክፍል/ [___] 4. 2ኛደረጃ/9- 12 / [___] 5. ዲፕሎማናከዚያበላይ [___]	
106	የትዳር አጋር የትምህርትደረጃ ስንት ነው	1. መፃፍማንበብየማይችል/የማትችል [___] 2. መፃፍማንበብየሚችል/የምትችል [___] 3. 1ኛደረጃ/1-8 ክፍል/ [___] 4. 2ኛደረጃ/9- 12 / [___] 5. ዲፕሎማናከዚያበላይ [___]	
107	የስራ ሁኔታዎ ምን ይመስላል	1. ነጋዴ [___] 2. የመንግስትሰራተኛ [___] 3. የቀንሰራተኛ [___] 4. የቤትእመቤት [___] 5. ጡረተኛ [___] 6. ሌላ [___]	
108	የትዳር አጋርዎ የስራሁኔታ ምንድን ነው	1. ነጋዴ [___] 2. የመንግስትሰራተኛ [___] 3. የቀንሰራተኛ [___] 4. የቤትእመቤት [___] 5. ገበሬ [___] 6. ሌላ/ይገለፅ/ [___]	
109	ከማን ጋር ነዉ የሚኖሩት	1 ብቻዎትን 2፣ ከቢተሰብ ጋር	
110	የቤተሰብ ብዛት	[_____]	

የቤተሰብ የምግብ ዋስትናን የሚዳስሱ ጥያቄዎች			
ተ.ቁ	ጥያቄ	ምርጫ	መልስ
201	ባለፉት አራት ሳምንታት ውስጥ ቤተሰብዎ በቂ ምግብ አላገኘም ብለው አስበው (ተጨንቀው) ነበር?	ሀ/ አዎ ለ/ የለም	[____]

201. ሀ	መልስዎአዎከሆነ፣ ምንያህልጊዜተከስቶያዉቃል?	1 =አልፎአልፎ (1 ወይም 2 ጊዜ) 2 =አንዳንድጊዜ (ከ 3-10 ጊዜ) 3 =ብዙጊዜ (ከ 10 ጊዜበላይ)	[____]
202	ባለፉትአራትሳምንታትውስጥእርስዎወ ይምከቤተሰብአባልዎመካከልበገንዘብእ ጥረትምክንያትየመረጣቸሁትንምግብሳ ትመገቡየቀራችሁበትጊዜነበር	ሀ/ አዎ ለ/ የለም	[____]
202. ሀ	መልስዎ አዎ ከሆነ፣ምን ያህል ጊዜ ተከስቶ ያዉቃል?	1=አልፎአልፎ (1 ወይም 2 ጊዜ) 2 =አንዳንድጊዜ (ከ 3-10 ጊዜ) 3 =ብዙጊዜ (ከ 10 ጊዜበላይ)	[____]
203	ባለፉትአራትሳምንታትውስጥእርስዎወ ይምከቤተሰብአባልዎመካከልበገንዘብእ ጥረትምክንያትውስንየምግብአይነትተ መግበዋል?	ሀ/ አዎ ለ/ የለም	
203. ሀ	መልስዎ አዎ ከሆነ፣ምን ያህል ጊዜ ተከስቶ ያዉቃል?	1 =አልፎአልፎ (1 ወይም 2 ጊዜ) 2 =አንዳንድጊዜ (ከ 3-10 ጊዜ) 3 =ብዙጊዜ (ከ 10 ጊዜበላይ)	
204	ባለፉትአራትሳምንታትውስጥእርስዎወ ይምከቤተሰብአባልዎመካከልበገንዘብእ ጥረትምክንያትሌሎችየምግብአይነቶችን ባለማግኘትዎመመገብየማይፈልጉትንየ ምግብአይነትተመግበዋል?	ሀ/ አዎ ለ/ የለም	
204. ሀ	መልስዎ አዎ ከሆነ፣ምን ያህል ጊዜ ተከስቶ ያዉቃል?	1=አልፎአልፎ (1 ወይም 2 ጊዜ) 2 =አንዳንድጊዜ (ከ 3-10 ጊዜ) 3 =ብዙጊዜ (ከ 10 ጊዜበላይ)	
205	ባለፉትአራትሳምንታትውስጥእርስዎወ ይምከቤተሰብአባልዎመካከልበገንዘብእ ጥረትምክንያትበቂምግብባለመኖሩከሚ ያስፈልግዎ (ከበቂ) በታችየሆነምግብተመግበው.ያው.ቃሉ	ሀ/ አዎ ለ/ የለም	
205. ሀ	መልስዎአዎከሆነ፣ ምንያህልጊዜተከስቶያዉቃል?	1=አልፎአልፎ (1 ወይም 2 ጊዜ) 2 =አንዳንድጊዜ (ከ 3-10 ጊዜ) 3 =ብዙጊዜ (ከ 10 ጊዜበላይ)	
205. ሀ	መልስዎአዎከሆነ፣ ምንያህልጊዜተከስቶያዉቃል?	1=አልፎአልፎ (1 ወይም 2 ጊዜ) 4 =አንዳንድጊዜ (ከ 3-10 ጊዜ) 5 =ብዙጊዜ (ከ 10 ጊዜበላይ)	

206	ባለፉትአራትሳምንታትውስጥእርስዎወ ይምከቤተሰብአባልዎመካከልበገንዘብእ	ሀ/ አዎ ለ/	

	ጥረትምክንያትበቂምግብባለመኖሩበቀ ንውስጥከሚያስፈልገዎጊዜበታችተመግ በውያውቃሉ	የለም	[_____]
206. ሀ	መልስዎ አዎ ከሆነ፣ምን ያህል ጊዜ ተከስቶ ያዉቃል?	1=አልፎአልፎ (1 ወይም 2 ጊዜ) 2 =አንዳንድጊዜ (ከ 3-10 ጊዜ) 3 =ብዙጊዜ (ከ 10 ጊዜበላይ)	[_____]

207	ባለፉትአራትሳምንታትበቤተሰብዎውስ ጥበገንዘብእጥረትምክንያትምግብባለማ ግኘትዎበቤትዎውስጥምንምአይነትየሚ በላምግብአጥተውነበር	ሀ/ አዎ ለ/ የለም	[_____]
207. ሀ	መልስዎ አዎ ከሆነ፣ምን ያህል ጊዜ ተከስቶ ያዉቃል?	1=አልፎአልፎ (1 ወይም 2 ጊዜ) 2 =አንዳንድጊዜ (ከ 3-10 ጊዜ) 3 =ብዙጊዜ (ከ 10 ጊዜበላይ)	[_____]
208	ባለፉትአራትሳምንታትውስጥእርስዎወ ይምከቤተሰብአባልዎመካከልበገንዘብእ ጥረትምክንያትምግብሳትመገቡአድራች ሁታውቃላችሁ	ሀ/ አዎ ለ/ የለም	[_____]
208. ሀ	መልስዎ አዎ ከሆነ፣ምን ያህል ጊዜ ተከስቶ ያዉቃል?	1=አልፎአልፎ (1 ወይም 2 ጊዜ) 2 =አንዳንድጊዜ (ከ 3-10 ጊዜ) 3 =ብዙጊዜ (ከ 10 ጊዜበላይ)	[_____]
209	ባለፉትአራትሳምንታትውስጥእርስዎወ ይምከቤተሰብአባልዎመካከልበገንዘብእ ጥረትምክንያትሙሉቀንናማታያለምን ምምግብመመገብያሳለፉችሁትጊዜነበር?	ሀ/ አዎ ለ/ የለም	[_____]
209. ሀ	መልስዎ አዎ ከሆነ፣ምን ያህል ጊዜ ተከስቶ ያዉቃል?	1=አልፎአልፎ (1 ወይም 2 ጊዜ) 2 =አንዳንድጊዜ (ከ 3-10 ጊዜ) 3 =ብዙጊዜ (ከ 10 ጊዜበላይ)	[_____]
	የቢተሰብ ምጣኒ መጠየቂያ		
ተ. ቁ	ጥያቄ	የመልስ አማራጭ	

301	መኖሪያ ቤትዎ የማን ነው?	1. የእርስዎ(የግለዎ) [__] 2. ከግለሰብ ኪራይ [__] 3. ሌላ ይገለፅ.....	
302	የቤቱግድግዳየተሰራውከምንድንነው?	1.ድንጋይበጭቃ [___] 2. እንጨትበጭቃ [___] 3. ድንጋይበስሚንቶ [___] 4. ሌላ ----------	
303	የቤቱ ጣራ የተሰራው ከምንድን ነው?	1.ቀርቆሮከዳን [__] 2. እንጨት [__] 3. ሣርከዳን [__] 4. ሸንበቆ [__] 5. ሌላ ----------	

304	የመኖሪያ ቤቱ ወለል ከምን የተሰራ ነው?	1. አፈር/አሸዋ [___] 2. በእበትየተለቀለቀ [___] 3. በስሚንቶ 4. ሸንበቆ 5. ስጋጃ/ምንጣፍ	
305	ለምኝታ የሚሆን የተከፋፈለ ክፍል አለው?	1. አዎ [__] 2. የለም [__]	
306	ለማብሰያ የሚሆን የግል ክፍል አለው?	1. አዎ [__] 2. የለም [__]	

307	ለመታጠቢያ / መጠዳጃ ብይት የሚሆን የተከፋፈለ ክፍል አለው?	1. አዎ [__] 2. የለም [__]	
308	በቤትዎውስጥያሉቁሶች		
	ሀ. ኤሌክትሪክአላችሁ?	ሀ. አዎን [__] ለ. የለም [__]	
	ለ. ሬድዮአላችሁ?	ሀ. አዎን [__] ለ. የለም [__]	
	ሐ. ቴሌቭዥንአላችሁ?	ሀ. አዎን [__] ለ. የለም [__]	
	መ. የቤትስልክአላችሁ ?	ሀ. አዎን [__] ለ. የለም [__]	
	ሠ. ፍሪጅአላችሁ?	ሀ. አዎን [__] ለ. የለም [__]	
	ረ. ሶፋ/ ወንበርአላችሁ?	ሀ. አዎን [__] ለ. የለም [__]	
	ሰ. ጠረጴዛአላችሁ ?	ሀ. አዎን [__] ለ. የለም [__]	
	ሸ. አልጋ እና ከጥጥ /እስፓንጅ/ እስፕርንግየተሰራፍራሻ/አላችሁ?	ሀ. አዎን [__] ለ. የለም [__]	
	ቀ. የእጅ ሰዓት ?	ሀ. አዎን [__] ለ. የለም [__]	
	በ. ሞባይል?	ሀ. አዎን [__] ለ. የለም [__]	
	ተ. ሳይክል?	ሀ. አዎን [__] ለ. የለም [__]	
	ቸ. ጋሪ?	ሀ. አዎን [__] ለ. የለም [__]	
	ነ. መኪና?	ሀ. አዎን [__] ለ. የለም [__]	
	ረ. የንብቀፎ?	.....በቁጥር	
309	በቢታችሁ ዉሰጥ የቢት አንስሳ ፣ መንጋ፤አና ሊሎች አንስሳት አሉ?	1/አዎ 2/ የለም	
310	አዎ ካላችሁ ምን ያህል አንስሳ አለ	1/ከብት 2/በሪ 3/ ደሮ 4/ፍየል 5/በግ 6/አህያ 7/ የንብ ቀፎ 8/ሊላ	

4. የጤና ሁኔታ			
401	ባለፉት 2 ሳምንታት /ሶስት ወራት ውስጥ ታመውያውቃሉ?	1. አዎ [___] 2. አላመመኝም [___]	
402	ለጥ.ቁ.201መልስዎአዎከሆነያ መመዎ ምንድንነበር?	ይጥቀሱ.....	
403	ከዚህበፊትስርየሰደደ(የቆየ)	1. አዎ [___]	

	በሽታእንዳለብዎተነግሮዎትያው ቃል?	2. አላመመኝም [___]	
404	ለጥ.ቁ.403 መልስዎ አዎ ከሆነ ያመመዎየትኛውበሽታነው?	1. ደምግፊት [___] 2.ስኳር [___]	
405	ህክምና ቦታ ሂደዉ ታክመዉ ኑብር?	1 አዎ [___] 2. አይ [___]	

5	ከአመጋገብ ጋር የተገናኙ መጠይቆች		
501	ትናንት (በ24 ሰዓትውስጥ) ስንትጊዜተመግበሃል?	1. አንድጊዜ [___] 2. ሁለትጊዜ [___] 3. ሶስትጊዜ [___] 4. አራትጊዜ [___] 5.አምስትናከዚያበላይ [___]	
502	ራስንየመመገብችሎታ?	1. በራሱ/ሷመመገብየሚችል/የምትችል [___] 2. በሌላሰውድጋፍየሚመገብ/የምትመገብ [___] 3. ሌላይገለፅ[___]	
503	ማዕደዎንከማንጋርነውየሚመገ ቡት ?	1. ሁልጊዜብቻዎትን [___] 2. አንዳንድጊዜብቻዎትን [___] 3. ሁልጊዜከቤተሰብጋር [___]	
		4. አንዳንድጊዜከቤተሰብጋር [___]	
504	የእመጋገብ ልማድ	ነ እትክልት በል 2 ስጋ በል	
505	የማዕድአመጋገብጊዜዎምንይመ ስላል?	1. ሰዓቱንጠብቆቁርስ፣ምሳ፣መከሰስእናእራት [___] 2. በተገኘውጊዜከመመገቢያሰዓትውጭ [___]	

ክፍል 6-የሕይወት ዘይቤ መጠይቅ			
No	ጥያቄ	ምላሽ	Skip
601	በተለመደው ቀን በሌሊት ለምን ያህል ጊዜ ተኝተዋል?አስተያየት-ቃለ-መጠይቆች እባክዎን የአልጋ ጊዜን ይቀ	ሰዓታት..... ደቂቃዎች .....1.< 6 ሰዓታት 2.6-8 ሰዓታት 3. >8 ሰዓታት	
602	በአሁኑ ሰዓት ሲጋራ ያጨሳሉ?	አዎ 1 0	
603	በቀን ምን ያህል መጠን		
604	አልኮል ያለው መጠጥ ትጠጣለክ	ነ. አዎ 2. አይ	
605	በቀን ምን ያህል/ በወር ስንት ቀን		
606	ጫት ይቅማሉ	ነ. አዎ 2. አይ	
607	በቀን ምን ያህል/ በወር ስንት ቀን		
608	ብዙ ጊዚ በቀን ምን ያህል ሰአት ይተኛሉ		

የአካል እንቅስቃሴ ጥያቄዎች;			
በሥራ ላይ እንቅስቃሴ			
701	ሥራዎ ቢያንስ ለ 10 ደቂቃዎች ያለማቋረጥ እንደ ከባድ ሸክሞችን ፣	3. አዎ	ከሌለ ወደ

ዝለላ	ሩህ		ይህ ወቅት ልናደርገው የሚገባ ነገር	ከዚህ ያነሰ ጋዜጠኛ ነኝ ቁጭቡ ነው	ከዚህ በላይ ጥሩ ጋዜጠኛ ነኝ ወይም ነበርኩ	ከዚህ የሚሻል መጠን ላይ ደርሻለሁ (በቂ ነው)	ምልከታ መያዣ ነጥብ

	ቁፋሮዎችን ወይም የግንባታ ስራዎችን ወዘተ የመሳሰሉትን ጠንካራ-እንቅስቃሴን ያካትታል?	4. No	207 ይሂዱ
702	በሳምንት ምን ያህል ቀናት ይሠራሉ?	-----ቀናት	

703	በሳምንት ምን ያህል ጊዜ ያሳልፋሉ?	.....ሰዓት/ደቂቃ	
704	ሥራዎ እንደ የብስክ መራመድ ወይም ቀላል ሸክሞችን ወዘተ ያሉ መካከለኛ እንቅስቃሴን ያካትታል?	3. አዎ 4. no	ከሌለ ወደ 210 ይሂዱ
705	በሳምንት ምን ያህል ቀናት ይሠራሉ?	------ቀናት	
706	በሳምንት ምን ያህል ጊዜ ያሳልፋሉ?	-- ሰዓት/ደቂቃ	
ከቦታ ወደ ቦታ			
707	ከቦታ ቦታ ለመንቀሳቀስ ቢያንስ ለ 10 ደቂቃዎች ያለማቋረጥ ብስክሌትን ይጠቀማሉ?	3. አዎ 4. No	ከሌለ ወደ 213 ይሂዱ
708	በሳምንት ምን ያህል ቀናት ያዘወትራሉ?	-----ቀናት	
709	በሳምንት ምን ያህል ጊዜ ያሳልፋሉ?	------ ሰዓት/ደቂቃ	
የመዝናኛ እንቅስቃሴዎች			
710	ቢያንስ ለ 10 ደቂቃዎች ያለማቋረጥ እንደ ሩጫ ወይም እግር ኳስ ወዘተ ከባድ እንቅስቃሴዎች እንቅስቃሴዎች ፣ የአካል ብቃት ወይም መዝናኛዎችን ያደርጋሉ?	3. አዎ 4. No	ከሌለ ወደ 216 ይሂዱ
711	በሳምንት ምን ያህል ቀናት ይሠራሉ?	---- ቀናት	
712	በሳምንት ምን ያህል ጊዜ ያሳልፋሉ?	------ ሰዓት/ደቂቃ	
713	እንደ ብስክሌት መራመድ ፣ብስክሌት መንዳት ፣ መዋኘት ፣ ኳስ መጫወት ወዘተ ያሉ መካከለኛ-ተኮር ስፖርቶችን ፣ የአካል ብቃት እንቅስቃሴን ወይም መዝናኛዎችን ቢያንስ ለ 10 ደቂቃዎች ያለማቋረጥ ያደርጋሉ?	3. አዎ 4. no	ከሌለ ወደ 219 ይሂዱ
714	በሳምንት ምን ያህል ቀናት ይሠራሉ?	---- ቀናት	
715	በሳምንት ምን ያህል ጊዜ ያሳልፋሉ?	------ ሰዓት/ደቂቃ	

የ 24

		ቁርስ					
		መቆያ					
		ምሳ					
		መቆያ					
		ራት					

ሰአት

የተመገቡት ዝርዝር እና ሁኒታ

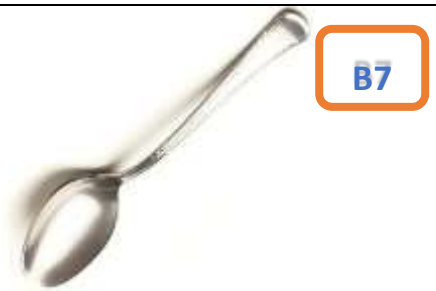
APPENDEXV: PHOTOGRAPHS OF 24 HR. RECALL

 A1	 A2	 A3
Drinking Glass	Drinking Glass	Drinking Glass
 A4	 A5	 A6
Stainless Steel Drinking Cup	Stainless Steel Drinking Cup	Plastic drinking cup
 A7	 A8	 A9
Plastic drinking cup	“Tsiwa”-Large	“Tsiwa”- Medium

 A10	 A11	 A12
Wancha”- Large	“Wancha”- Medium	“Wancha”- Small
 A13	 A14	 A15
Tin Can Cup- Large	Tin Can Cup- Medium	“Birlie”
 A16	 A17	 A18
Liquor Cup- “Melekia”	Liquor Cup- “Melekia”	Liquor Cup- “Melekia”
 A19	 A20	 A21
Enamel metal Mug	Ceramic Mug	Ceramic Mug

 A22	 A23	 A24
Tea cup	Tea cup	Tea cup
 A25	 A26	 A2
Coffee cup – “Sini”	Coffee cup	Coffee cup – Small
 B1	 B2	 B3
Ladle- Large	Ladle- Medium	Ladle- Small
 B4	 B5	 B6

Serving Spoon	Soup Spoon	Table Spoon

		
Tea Spoon – Large	Tea Spoon – Medium	Tea Spoon – Small
		
Ceramic Plate	Plastic Plate	Stailness steel Plate
		
Ceramic Bowel	Ceramic Bowel	Plastic Bowl
		
Handwoven Plate	Handwoven Plate- Small	

		
Injera- Large	Injera- Medium	Injera- Small
		
Bread	Bread	
		
Bread- “Ambasha”	Bread- “Shilito” - Large	Bread- “Shilito” – Small
		

no	List of food item	energy	Water	protein	CHO	fat	VA	Ca	Iron	zinc

Orange- Large	Orange- Medium	Orange- Small
		
Mango- Large	Mango- Medium	Mango- Small
		
Banana- Large	Banana- Medium	Banana- Small

1	Teff Injera	169	52.1	4.9	40.6	1	6	56.7	40.8	1.81
2	Teff Diblik	150.2	62.2	3.8	32.4	0.6	0.04	68	13.8	2.76
3	Guaya Shiro	96	75.3	6.6	11.8	2.9	33.3	43.6	16.8	0.69
4	Shimbra Shirow'	84	80.9	3.4	10.4	2	60.2	97.6	11.7	0.72
5	diblik shiro	53	86.6	3.4	7.6	1.2	114.8	11.2	2.7	0.42
6	Dinch Wet	80	78.8	1.6	12.1	3.9	115.3	29.8	6.3	0.29
7	Dinch Kikl	89.7	76.8	1.1	21.1	0.1	0.04	9	1	0.3
8	Dinch yetetebese	81.7	53.1	2.4	42.8	0.1	0	6	1	0.3
9	Misir Wete	101	73.4	5.6	14.9	2.6	572.1	25.7	8.8	0.78
10	Difn Misir	152.9	61.5	9	28.1	0.5	0.04	25	2.1	0.85
11	Ater, kikk wet	162	67.2	5.3	19	7.2	0	38	2.4	1.3
12	HabeshaGommen,	40.1	87.5	2.5	6.4	0.5	11.25	5	2.2	2.8
13	Tikil Gomen	23.7	93.3	1.1	4.6	0.1	0.09	43	0.7	0.1
14	Keysir	41	86.9	2	6.5	0.1	1	12	0.8	0.52
15	Carrot	27.8	91.4	40	6.1	0.2	1.15	31	0.5	0.1
16	Timatim Sls	20.5	94.4	1	3.9	0.1	1.85	7	0.5	0.4
17	Timatm Lebleb	136	76.2	2.2	8	10.8	0.33	19	1.5	0.2
18	Timatim Kurt	30.7	92.5	1.3	4.8	0.7	620	8	0.9	0.37
19	Selata	15.4	95.5	1	2.4	0.2	0.72	22	1.5	0.2
20	Doro Wet	214	59.5	20	6.5	12.5	0	61	8	1.8
21	Yebeg Tibis	194	53.6	35.8	2.9	4.4	0	136	0	4.1
22	Yebeg siga wot	203	59.5	27.4	0.4	10.2	0	18	3.3	4.1
23	Yebere siga wot	210	55.4	33.1	1.2	8.1	0	22	8	4.1
24	Yebere SigaTibis	212.3	53.7	35.8	2.2	6.7	0.19	88	10.6	4.1
25	Kuanta	193.1	57.3	28.3	4	7.1	0.06	44	4.8	5.87
26	Asa Wet	134	64	23.1	3.2	3.6	83	92	39.5	0.95
27	Enkulal Kikl	152.9	74.9	11.6	2.1	0.9	0.57	51	4.3	1.1
28	Enkulal Firifr	295.1	58	9.8	4.8	26.3	0	63	3.4	1
29	Genfo	134.7	71.5	2.1	19.2	5.5	0	6	1.6	0.1
30	Duba	62	81	2.4	14.2	0.2	4	22	7.9	0.47
31	Bakela kik wet	144	70.5	5.2	16.8	6.2	0	29	4.3	1.3
32	Ergo	82.6	86.4	3.5	3.2	6.2	0	52	0.1	0
33	Ayib	132.4	73.4	15.2	3.4	6.4	0	110	2.3	2.9
34	Arera	38.6	91.5	3.1	3.4	1.4	0	95	1	2.9
35	Kibe	760.4	17.2	1.3	0.1	81.2	0	24	1.5	0
36	Beso	368	9.1	8.5	79	2	0	17	6.3	2.5
37	Buna	2.2	99.4	0.2	0.3	0	0	2	0.2	0
38	Shay	0.5	99.8	0.1	0	0	0	8	0	0
39	Atmit	39.3	90.1	1.6	8	0.1	0	84	4	0
40	Rice	110.9	71.5	2.1	25.4	0.1	0.5	6	2.2	0.44
41	Ageda	95.3	76.2	0.5	22.2	0.5	0	49	0.08	0
43	Berbere(awaze)	474.2	1	7	51.6	26.2	131	250	34	0.1

44	Ye snde nifro	211	47	7	43.7	0.9	0	30	0.8	1.43
45	Bekolo nifro	170.1	58.9	3.6	35.1	1.7	0	5	1.7	0.6
46	dblk nifro	184.9	53.5	4.8	34.4	0.9	0.22	16	1.9	1.43
47	Bokolo Kolo	387.2	7.1	8.1	8.8	4.4	0	19	24	0.6
48	Shimbra Kolo	327	1.2	17.7	62.5	4.9	O	175.9	8.9	3.96
49	Ambahsa	208	44.8	6.6	45.6	0.7	2.5	38.4	3.4	1.63
51	Nech Dabo	249	36.9	7.7	48.8	1.9	0	37	1.7	0.8
52	Tela	7.9	983	0.3	0.3	0.3	1	1	8	0
53	Arekie		97.2							
54	Beer	41		0.3	3.7	0	0	5	0	0
55	Bakela Nifro	120	65.4	8.9	15.9	0.7	0	23	3.4	0.95
56	Fool	120	65.4	8.9	15.9	0.7	0	23	3.4	0.95
57	Chechebsa	208	44.8	6.6	45.6	0.7	2.5	38.4	3.4	1.63
58	Kinche	65.1	83.1	2.1	13.5	0.3	0	12	1.9	1.43
59	Wetet	65.5	87.3	3.4	4.8	3.6	30	122	0.1	0.4
60	Kariya	46.5	88.1	1.7	8.8	0.5	78	10	0.5	0.2
61	Gibtto	394.3	9.3	32.8	47.1	3.3	0.2	213	3	
62	Fendhsa	369	4	12.7	67.2	5	80	11	1.7	1.7
63	Temr	329.3	16.4	2.4	78.8	0.5	0.19	106	7.4	0.3
64	Birtukan	33.9	87.9	0.7	5.3	1.1	335	50	0.8	0.1
65	Mango	43.8	88.9	0.3	10.2	0.2	0	20	0.6	1
66	Muz	87.8	77.7	0.8	19.8	0.6	0	8	0.5	0
67	Bolokie and bakela	117	66.3	7.9	155	0.8	0	36	2.1	0.96
68	Gebs koloo	398.1	1.6	9.4	85.4	2.1	0	40	44	2.5

ANNEX

1.1. Zinc associated variables in bivariate regression

Variables	categories	Yes (n %)	No (%)	COR (95 % CI)	AOR (95% CI)
Sex	Male	13(86.7)	297(58.2)	1	
	Female	2(13.3)	213(41.8)	4.662(1.041,20.872)□	
Religion	Orthodox	11(73.3)	446(87.5)	1	
	Muslim	3(20)	50(9.8)	.411(.111,1.523) □	
	Other	1(6.7)	14(2.7%)	.345(.042,2.863)	
Physical activity	In Active	9	443	1	1
	active	6	67	4.408(1.520,12.780)	3.285(1.086,9.937)

Wealth index	poor	6	206		
	middle	6	99	.502(.124,2.036)	
	rich	3	205	.241(.059,.986)	

1.2. Vitamin A associated variables in bivariate regression

Variable	Categories	Yes (n %)	No (n %)	COR(95% CI)	AOR(95 CI)
education	higher	71	43	1	
	secondary	44	17	.638(.325,1.254)	
	Primary	37	19	.848(.434,1.658)	
	No formal Edu	202	92	.752(.479,1.182)	
With whom you live	Alone	22(6.2)	6(3.5)	1	
	With fam	332(93.8)	165(96.5)	1.822(.725,4.581)	
Marital status	Married	224(63.3)	117(68.4)	.795(.539,1.172	
	Not married	130(36.7)	54(59.9)	1.257(.853,1.854)	
w/index	Rich	144	64	1	
	Middle	80	25	1.419(.948,2.125)	1.74(1.015,3.079)
	poor	130	82	.703(.411,1.203)	
Chronic disease	No	235(66.4)	136(79.5)	1	
	Yes	119(33.6)	35(20.5)	.508(.330,.783)	
Visit health facility	No	211(59.6)	117(68.4)	1.468(.998,2.160)	
	Yes	143(40.4)	54(31.6)	1	
Time to have meal	At a time of meal	240	106	1	
	Any time	114	65	1.291(.882,1.889)	
Dietary habit	Non vegetarian	44(12.4)	15(8.8)	1	
	Vegetarian	310(87.6)	156(91.2)	1.476(.797,2.735)	
Family size	<5	233	123	1	
	>5	121	48	.751(.504,1.120)	

Thank you