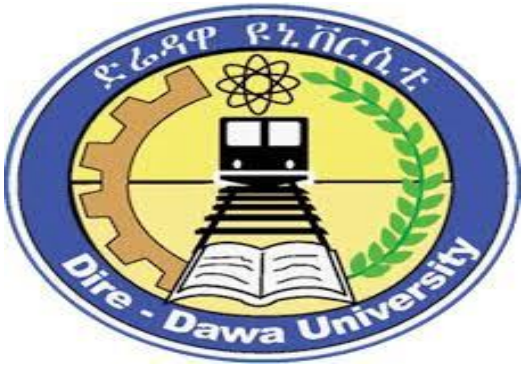


College of Medicine and Health Sciences

Department of Public Health

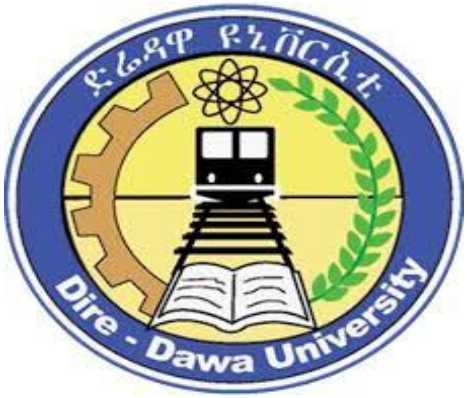
Availability of Adequately Iodized Salt at Household Level and Its Associated Factors in Rural Kebeles of Dire Dawa Administration, Eastern Ethiopia, 2022

By Abdurehman Aliyi Abdukerim (B.Sc)

A Research Thesis Submitted to Dire Dawa University College of Medicine and Health Sciences, Department of Public Health in Partial Fulfillment of the Requirements for the Master of Public Health (MPH) in Public Health Nutrition

November, 2022

Dire Dawa, Ethiopia



COLLEGE OF MEDICINE AND HEALTH SCIENCES

DEPARTMENT OF PUBLIC HEALTH

NAME OF PRINCIPAL INVESTIGATOR	ABDUREHMAN ALIYI ABDUKERIM
NAME OF MAJOR ADVISOR	ROBEL M(Msc,Asst.Prof.)
NAME OF CO- ADVISOR	---
FULL TITLE OF THESIS RESEARCH PROPOSAL	AVAILABILITY OF ADEQUATELY IODIZED SALT AT HOUSEHOLD LEVEL AND ITS ASSOCIATED FACTORS INRURAL KEBELES OF DIRE DAWA CITY ADMINISTRATION, EASTERN ETHIOPIA, 2022.
DURATION OF MPH RESEARCH (FULLY MPH PROJECT LIFE)	1 YEAR
STUDY AREA	DIRE DAWA RURAL KEBELES
TOTAL COST OF THE PROJECT (BIRR)	32,174.00 (THIRTY-TWO THOUSAND ONE HUNDRED SEVENTY FOUR BIRR)
ADDRESS OF INVESTIGATOR (EMAIL, CELL PHONE, AND LANDLINE TELEPHONE)	Email- abdurahmaanaliyyii2@gmail.com Tel- 0901352060/0974551950

ACKNOWLEDGEMENT

First I would like to Thanks Dire Dawa University, College of Medicine and Health Sciences, Department of Public Health for giving me chance to prepare this research on the availability of adequately iodized salt at the household level and factors associated in Dire Dawa administration rural kebeles, eastern Ethiopia, 2022.

My deepest gratitude goes to my major advisor Assistant Professor Robel Mekonin for his unreserved support, timely comment, and relevant guidance from beginning to end write-up of the study. Besides, I would like to extend my gratitude to Dire Dawa Administration health Bureau, for their support by giving me the necessary data during data collection.

Finally, I would like to express my appreciation and thanks to my families and friends for their advice, moral support, patience, and encouragement during the preparation of this research thesis.

TABLE OF CONTENTS

ACKNOWLEDGEMENT ii
TABLE OF CONTENTS iii
LIST OF TABLES v
LIST OF FIGURES vi
LIST OF ABBREVIATION AND ACRONOMY vii
ABSTRACT viii
1. INTRODUCTION 1
1.1 BACKGROUND 1
1.2 STATEMENT OF THE PROBLEM 3
1.3 SIGNIFICANCE OF THE STUDY 5
2. LITERATURE 6
2.1. PREVALENCE OF IODIZED SALT AT HOUSEHOLD LEVEL 6
2.2 FACTORS AFFECTING AVAILABLITY OF ADEQUATELY IODIZED SALT 8
2.2.1 SOCIODEMOGRAPHIC FACTORS 8
2.2.2 KNOWLEDGE ABOUT AFFECTING IODINE CONTENT OF SALT 8
2.2.3 PRACTICE AFFECTING IODINE CONTENT OF SALT 10
2.3 CONCEPTUAL FRAMEWORK 11
3.1 GENERAL OBJECTIVES 12
4. METHODS AND MATERIALS 13
4.1 STUDY AREA AND PERIOD 13
4.3 STUDY DESIGN 13
4.4.1. SOURCE POPULATION 13
4.4.2 STUDY POPULATION 13
4.4.3 STUDY UNIT 14
4.5. INCLUSION AND EXCLUSION CRITERIA 14
4.5.1. INCLUSION CRITERIA 14
4.5.2 EXCLUSION CRITERIA 14
4.6. SAMPLE SIZE DETERMINATION 14
4.7. SAMPLING TECHNIQUE 16
4.8. STUDY VARIABLES 19

4.8.1. DEPENDENT VARIABLES 19
4.8.2. INDEPENDENT VARIABLES 19
4.9. OPERATIONAL DEFINITIONS 19
4.10. DATA COLLECTION METHOD 20
4.11. DATA QUALITY CONTROL 21
4.12. DATA PROCESSING AND ANALYSIS 22
4.13. ETHICAL CONSIDERATIONS 22
5. RESULTS 24
5.1 SOCIODEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS 24
5.2. AVAILABILITY OF ADEQUATELY IODIZED SALT AND PRACTICE AT HOUSEHOLD LEVEL 25
5.3 KNOWLEDGE ABOUT IODIZED SALTAT HOUSEHOLD 27
5.4 FACTORS ASSOCIATED WITH AVAILABILITY OF IODIZED SALT 28
6. DISCUSSION 30
7. STRENGTH AND WEAKNESS OF THE STUDY 32
7.1 STRENGTH OF THE STUDY 32
7.2 WEAKNESS OF THE STUDY 32
8. CONCLUSION 33
9. RECOMMENDATION 34
ANNEXES 38
ANNEX II: QUESTIONNAIRE ENGLISH VERSION 41

LIST OF TABLES

Table4 1: sample size calculation for specific objectives of magnitude and factor associated with an iodine content of salt at the household level..... **Error! Bookmark not defined.**

Table5. 1 Socio-demographic characteristics of respondents in rural kebele of Dire Dawa administration, Eastern Ethiopia, 2022(n=521). 24

Table5. 2: Practice of household respondents regarding the use of iodized salt inrural communities of Dire Dawa Administration, Eastern Ethiopia, 2022(n=521). 25

Table5. 3 factors associated with the availability of iodized salt at household level inrural kebele Dire Dawa administration, 2022(n=521).....28

LIST OF FIGURES

Figure2. 1: A conceptual framework for iodine content of salt at household level and factors affecting the availability of adequately iodized salt in rural Dire Dawa Administration, eastern Ethiopia, 2022..... **Error! Bookmark not defined.**

Figure4. 1 Schematic presentation of sampling procedure of iodine content of salt at household level and factors affecting the availability of iodine in rural kebele of Dire Dawa administration, Eastern Ethiopia, 2022(n=521)..... **Error! Bookmark not defined.**

Figure5. 1 Iodine content of salt at household level and factors affecting the availability of iodized salt at Dire Dawa administration, Eastern Ethiopia 2022 (n=521) 27

Figure5.2 knowledge about iodized salt at householdlevel rural kebele of dire dawa administration,2022(n=521).....27

Figure5. 3 Information source of respondents of iodized salt at household level and factors affecting the availability of iodized salt at rural Dire Dawa administration, Eastern Ethiopia, 2022(n=521)..... **Error! Bookmark not defined.**

LIST OF ABBREVIATION AND ACRONOMY

AOR	Adjusted odds ratio
EDHS	Ethiopian demography and health survey
EFDA	Ethiopian food and drug authority
EPHI	Ethiopian public health institute
ETB	Ethiopian birr
GAIN	Global alliance for improved nutrition
HEW	Health extension worker
HH	Household
IDD	Iodine deficiency disorders
ICCIDD	International council for control of iodine deficiency disorders
IIH	Iodine-induced hyperthyroidism
IQ	Intelligence quotient
NIDDCP	National iodine deficiency disorders control program
NMS	National micronutrient survey
NNP	National nutrition program;
PPM	Parts per million
RERC	Research Ethics Review Committee
TSH	Thyroid-stimulating hormone
UNICEF	United nation children's education fund
USI	Universal salt iodization
WHO	World health organization

ABSTRACT

Background: Iodine is an essential trace element required in a small amount. Healthy humans require iodine, as a crucial component of thyroid hormone needed for the production of triiodothyronine and tetraiodothyronine which is important for thyroid gland proper functioning. Failure to have adequate iodine leads to inadequate hormone which results in goiters, hypothyroidism, and pregnancy-related problem. The consumption of salt-containing iodine is still low in Ethiopia. Therefore assessing the availability of adequately iodized salt and the factors associated is essential to understand the problem.

Objectives: The objective of this study was to assess the availibility of adequately iodized salt at the household level and factors affecting the availability of adequately iodized salt in rural Dire Dawa Administration, Eastern Ethiopia, 2022

Methods: Community-based cross-sectional study was conducted from 1-30 September at rural Dire Dawa administration, eastern Ethiopia, 2022. A total of 521 households were selected by using a simple random sampling technique.Data was collected usingthe face to face structured questionnaire. The concentration of iodine was determined by using an iodine test checker WYD. The captured data was cleaned, edited, and transferred to SPSS Version 20 for further analysis. Bivariate and multivariable logistic regression was used to determine the association between independent and dependant variables. Finally, the results of the findings were presented by using text, graphs, and tables.

Result: Two hundred thirty one (44.9%) of the 515 tested salt samples of households have adequately iodized salt (≥ 15 ppm). Using salts stored in dry place (AOR=1.393, CI=1.095-1.773), having packed type of salt (AOR=2.383, CI=2.044-2.779),having good knowledge about iodized salt (AOR=3.882, CI=3.149,4.785), using salt from covered saltcontainer(AOR=1.296,(CI=1.072,1.568),havingformaleducation(AOR=1.284(CI=1.097,1.502), and adding salt at the end of cooking (AOR=2.383, CI (1.449-3.920) were significantly associated with the presence of adequately iodized salt.

Conclusion and Recommendation: The availability of adequately iodized salt was low in the study area. So, strengthening the current universal salt iodization program and educational programto increase the knowledge of consumers on iodized salt is highly recommended.

1. INTRODUCTION

1.1 BACKGROUND

Iodine is one of the essential micronutrient components of the thyroid hormones (thyroxine(T4) and triiodothyroxine(T3)), which regulate physical and mental development in children. Low blood levels of iodine lead to an insufficient production of these hormones in the body, resulting in iodine deficiency disorder (IDD).Globally, 30% of the world's population is affected by IDD. Failure to have adequate iodine leads to insufficient production of these hormones, which affect many different parts of the body, particularly muscle, heart, liver, kidney, thyroid gland, and the developing brain which is result in iodine deficiency disorder like goiter, cretinism, abortion, stillbirth, psychomotor defect, and impaired mental function. But the human body cannot synthesize iodine and it cannot be stored for long periods; thus, it is necessary to obtain it from different sources. Dietary intake is the primary source of iodine. Seafood, dairy products, and plants are grown in iodine-rich soil are a common source of iodine(1, 2). So, iodine-rich foods are important to get recommended iodine. But the value of recommended intake of iodine for a different group of population (infants, children, and adults, pregnant and lactating women's) is different according to age and also for females during pregnancy and lactation(3).

Iodized salt has been credited with preventing about 750 million cases of goiter over the past years, with Iodine Global Network and United Nation children's fund (UNICEF) estimating that globally about 6.1 billion people are currently consuming iodized salt representing a significant achievement of large-scale food fortification(4). Despite efforts to eliminate iodine deficiency, Ethiopia is still among the high-risk iodine-deficient countries in East Africa(5). According to a national micronutrient survey 48% of school-aged children and 52% of reproductive-aged women had mean urinary iodine concentration below the cutoff. The national average goiter rate among reproductive-aged women was 10.8%, which indicates that the goiter prevalence rate remains of significant public health importance(5, 6).

Universal salt iodization (USI) is the most widely practical intervention and represents a major global public health success to prevent IDD (7-9). World Health Organization (WHO), United Nations International Children's Emergency Fund (UNICEF), and International Council for Control of Iodine Deficiency Disorder (ICCIDD) recommended universal salt iodization as the

safe and cost-effective measure to eliminate IDD(9). To prevent IDD, salt iodine testing is an important process that is an indicator for 2 monitoring progresses towards USI(10). After making allowance for losses of iodine during storage and distribution, the quality and standard authority of Ethiopia has set iodine level to be between 60 - 80 ppm as potassium iodate and 36 - 48 mg/kg as iodine. The average consumption of salt per person per day is 10 grams and salt with an iodine content of 60 mg/kg would satisfy the recommended daily requirement of 150µg of iodine per adult to prevent IDD(12).

1.2 STATEMENT OF THE PROBLEM

Globally, it has been reported that 2.2 billion people (38% of the world's population) live in areas with iodine deficiency risk and its complications of which 350 million are in Africa. Iodine deficiency results in a loss of economic productivity and slows progress towards achievement of Development(12).

Coverage of iodized salt does show fluctuate and a gradual improvement in Ethiopia at national and Dire Dawa according to Ethiopian Demographic Health Survey and national salt iodization coverage respectively as it was 28.4%, 33.3% in 2000, 54.3%, 91.7% in 2005, 15.4%, 13.3% in 2011, 88.8%, 94% in 2014, and 89%, 83.5 in 2016 according to 2016 EDHS report(18).

Iodine deficiency is a major health problem throughout the world and the greatest cause of preventable brain damage in childhood. This is the primary motivation behind the current worldwide initiatives to eliminate iodine deficiency through the strategy of universal salt iodization. The most overwhelming outcomes of iodine deficiency are increased perinatal mortality and mental retardation(13). According to a national survey made by the Ethiopian nutrition institute, one out of every 1000 is cretinism, and about 50,000 perinatal deaths are occurring annually due to IDDs(21)

In Ethiopia, household surveys of salt iodine levels were conducted at a different time and places and reported a low level of adequately iodized salt 28.9% in Gonder 2013(14), 37.7% in Wolaita southern Ethiopia(15), and 57.4% in northwest Ethiopia, Dera district(16).To eliminate iodine deficiency disorders, the WHO recommends that at least 90% of households should be able to access adequately iodized salt(17).

Another study conducted in northwest Ethiopian, Dera district show that age, educational level of respondent and storage place of salt are important factor associated with the availability of iodized salt (16). Another study which is undertaken in the northern part of Ethiopia found that urban residency, family size, availability, and affordability of iodized salt are associated factors of proper salt utilization(23).

In developing countries, salt production and the quality of available salt may be poor or salt may be incorrectly iodized, or correctly iodized salt may deteriorate due to excessive or long-term exposure to moisture, light, or heat(20). All these factors should be taken carefully into account, particularly when establishing the initial level of iodine in salt (production level), at shop and consumption level.

Several studies related to the iodine content of salt have been done in different parts of Ethiopia, but almost all of these studies were focused on the urban part of the country which doesn't represent entire the country. However, disparities exist in terms of the iodine content of salt at household level in dietary salt and its associated factors within and between different regions of the country. Therefore, identification of such factors that influence the availibity of adequately iodized salt is essential to formulate a better prevention policy and intervention measures.There was no other study that had been conducted on the assessing availability of adequate Iodine content of salt at household level and factors associated with that cover rural kebeles.

1.3 SIGNIFICANCE OF THE STUDY

The result of this research used as an input for all stakeholders working on iodized salt related to the content, coverage, and associated factors in rural kebeles of Dire Dawa administration.

Finding of this study will provide some contribution on increasing awareness about iodine content of salt at household level for the society.

The result of this study also used as a baseline and source of information for another researcher who is interested in this area for future studies in assessing and filling the gaps.

2. LITERATURE

2.1. PREVALENCE OF IODIZED SALT AT HOUSEHOLD LEVEL

A study conducted in India showed that out of the total salt samples collected, 13.2% had zero mg, 4.1% 1-5 mg, and 17.4% 6-15 mg of iodine per 1 kg of salt(24). Similar study conducted in Haiti showed that among salt samples tested for iodine content, 86% of the table salts labeled as "iodized" were found with no iodine at all(25).

A study conducted in Ghana; in 2020, revealed that Less than half (46.2%) of salts in household in the district have satisfactory (≥15 ppm) iodine, 41.6% have inadequate iodine(<15ppm) and 12.2% have no iodine(0ppm)(26).
A study in Sudan showed that 85.6% of the population obtained 13.7 mg of iodine in salt(27). In Ghana, another study conducted showed, 5% of the population consumes salt without iodine and 19.4% of the population consumes below the country's recommended level(28).

A Study conducted in Gonder town in 2013 Adequately iodized salt (≥15ppm) was found in 234 (28.9%)of the810 tested salt samples of households. Before testing the salt,659(81.4%) participantssaidthattheydidnothaveadequatelyiodizedsalt,and151(18.6%)participantssaidthatthey haveadequatelyiodizedsaltforcookingfood.Fromthosewhosaidwehadiodizedsalt,themajority(85.8 %) have got it from supermarkets(14).

Household dietary salt which was determined by using a rapid test kit during the data collection period in Dessie and Combolcha town, in 2018 show that among all respondents,18% (95% CI: 14.8–21.2%) of the households used salt without iodine (zero iodine concentration) and 13.2% (95% CI: 10.1–16.1%) of the respondents used salt with inadequately iodized (below 15 ppm) whereas, 68.8% (95% CI: 64.8–72.9%) of the salt sample was adequately iodized(29).

As study conducted on household and retailers in Shebe town showed Iodine concentration in the household salt samples ranged from 0.11-75 PPM with a mean value of 34.52 and standard deviation of 17.40 PPM, which was larger than household samples. The least proportion 10(30.5%) and largest proportion 17 (51.5%) were found in the range of 0.1-25PPM and 21.11-

50 PPM, respectively. Nearly similar proportions; six (18.2%) of household samples were found in the highest range of 50.1-75ppm. The variation of salt iodine level between household and retail samples gets wider when it comes to the lower ranges of iodine level in that the household sample had lower values as compared to the retail(30).

The study conducted at the household level in Mekele town, northern Ethiopia show that the majority (75.6%) of the respondents consumed salt with an iodine level of 25 PPM and above, whereas 9.4% and 5.9% consumed salt with an iodine content of less than 25 PPM and 0 PPM respectively. The Ethiopian Standards Board requires that the iodine content in salt should not be less than 50 PPM at the production point, and it is expected to be at 25 PPM at the retail level(31).

Result of the laboratory test of the salt from the household in Wolaita, Southern Ethiopia show that out of the total salt samples, 180 (40.9%) of the samples had no iodine; about a quarter (108 (24.5%)) had 15–29.99 ppm; 79 (18%) had 7–14.99 ppm; 58 (13.2%) had 30 ppm or more and the remaining (3.4%) had less than 7 ppm. From the total salt samples, only 166 (37.7%; 95% CI: 33.2% to 42.2%) was adequately iodized, while the majority (62.3%) was inadequately iodized or not iodized at all. Among the 138 (31.4%) households who reported as buyers of iodized salt, 101 (73.2%) households were found to have a salt of the iodine content of 15 ppm or more. The remaining 26 (18.8%) and 11 (8.0%) households had salt of the iodine content of 0 ppm and 1.00–14.99 ppm, respectively. Out of the 302 (68.6%), households who reported as not buyers of iodized salt, 65 (21.5%) households had salt of the iodine content of 15 ppm or more. The remaining 154 (51.0%) and 83 (27.4%) households had salt of the iodine content of 0 ppm and 1.00–14.99 ppm, respectively(15).

According to a study done on dire Dawa in 2016,from the total of 694 sampled households, an adequate amount of iodized salt was found only in 52 (7.5%) of the 694 sample households i.e. >15 ppm. 526(75.6%) of the respondent were purchased salt from a retail shop. Out of these, 39 (5.6%) of samples had an adequate amount of iodine in salt. 600 (86.5%) of the respondents were using common salt (coarse salt without packet) and out of which 0 (0%) of samples are have not adequate amount of iodine in salt (0-14.9 ppm) and also of which 94 samples of packed salt 42 samples are have not adequate amount of iodine in salt(32).

2.2 FACTORS AFFECTING AVAILABLITY OF ADEQUATELY IODIZED SALT

2.2.1 SOCIODEMOGRAPHIC FACTORS

A study conducted in Pakistan revealed that out of ninety-six, 91% of housewives knew about iodized salt. Thirty-six percent of the respondents were used iodized salt. Out of non-users, 79% did not use it due to high cost, 11% due to change of taste and 06% due to the fear that it interferes with reproduction & its relation with diseases. Only 10% of illiterate and 44% of educated were using iodized salt. Similarly, utilization of iodized salt was increased as income increased(35).

As study conducted in maychew woreda, Tigray regional state, northern Ethiopia, Being young age, formal education, knowledge about iodized salt and IDD, shorter duration of storage, place of storage, having radio and salt container with a cover were the factors associated with the availability of adequately iodized salt. However, those who have formal education were 2.07 times more likely to have adequately iodized salt than those who have no formal education(33).

2.2.2 KNOWLEDGE AFFECTING IODINE CONTENT OF SALT

As study conducted in India revealed that consumption of adequately iodized salt was higher in households where the household head was literate and the various reasons reported by households consuming crystalline salt included low cost since it tasted better and 'feeling it is pure and uncontaminated, unlike refined salt. Those households consuming refined salt, consumed it to save time and avoid the inconvenience of grinding crystalline salt but option for cheaper varieties owing to low purchasing power(34)

A study done in Viet Nam Women cited several explanations for not using iodized salt in response to open-ended questions. One was that they were familiar with the un-iodized product and saw no motivation to change. Another was that they preferred using newly available herbal seasonings that were being promoted locally and contained no salt. A third reason given was that iodized salt made food taste bitter. Also, many people in rural areas felt that food is "smoother" when prepared with cooking powder than when prepared with salt. Another reason was that iodized salt was not locally available for purchase. Lastly, many women replied not using iodized salt because they did not know that it was essential to use it. Iodized salt use was lower among nulliparous women, less educated women, factory workers or small-scale traders, government workers, and women with common mental disorders at recruitment (36).

As study conducted in Ghana showed, Knowledge of iodized salt was quite high, as 72% of the respondents knew that not every salt contained iodine. Besides, 69.3% indicated that an inadequate intake of iodized salt can lead to the development of goiter. The main 8 reason given by exclusive users of common salt was that the price of iodized salt is slightly higher than that of common salt(37).

The Another study conducted in Ghana showed significant associations between knowledge on iodized household sex, educational level, the primary source of information on iodized salt, salt texture, and where salt was placed in the house. The study also showed that household who were females was less likely to have high knowledge of iodized salt than the household who were males.household who attained basic education, secondary education, and tertiary education were more likely to have high knowledge. household who got information about iodized salt from the media and friend/family member were less likely to have high knowledge of iodized salt than those who got information about iodized salt from a health worker, while those who got information about iodized salt from the schools attended were more likely to have high knowledge of iodized salt than those who got information about iodized salt from a health worker. Also, household using coarse-textured salt and granular-texture salt were less likely to have high knowledge of iodized salt than household who are using fine texture salt, while household who placed salt under a shade were more likely to have high knowledge of iodized salt than household who placed salt directly in the sun(26).

As study conducted in maychew woreda, Tigray regional state, northern Ethiopia, Being young age, formal education, knowledge about iodized salt and IDD, shorter duration of storage, place of storage, having radio and salt container with a cover were the factors associated with the availability of adequately iodized salt. Those who had good knowledge about iodized salt were 2.11 times more likely to have adequately iodized salt than those who have poor knowledge and those who store salt for less than two months at household level were 1.61 times more likely to use adequately iodized salt than those who store salt for more than two months(33).

Moreover, a study conducted in Ethiopia showed that knowledge on IDD and the use of iodized salt was assessed in the survey households. In all the general states except Addis Ababa, more

than 90% of the study women did not know the importance of iodized salt. Similarly apart few in Tigray and Addis Ababa, the majority (>90%) had no understanding of the cause of iodine deficiency(38).

2.2.3 PRACTICE AFFECTING IODINE CONTENT OF SALT

A study done in Colombia showed that by using packaging with a good barrier like polyethylene plastic package iodine losses can be significantly reduced for at least six 7 months otherwise salt iodized with iodate showed losses of 28% to 51% after three months, 35% to 52% after 6 months and up to 66% after 12 months(39).

A study conducted in Haiti showed many potential barriers were identified to receiving adequate iodine intake and reducing IDD. Some of these include Household salt washing, Impurities in salt, salt packaging, Education, environmental, Legislation, and unavailability of iodized salt. When asked specifically about the importance of iodine in the diet, many participants were able to state that deficiency would lead to goiter and that it was important for health in children(40).

A Study conducted in Dire Dawa Urban area in 2016 on availability of adequately iodized salt and its associated factors at household level as shown Six hundred and forty (92.2%) respondents said they store the salt in a dry place. Twenty two (3.2%) of them wash salt to remove its impurities. 689 (99.3%) of respondents stored the salt for less than two months after purchase and 629 (90.6%) of participants reported their salt containers had cover. Five hundred and twenty six (75.6%) of the respondent said they purchase salt from retail shop and 600 (65.9%) of the respondents were using non- packed(32).

2.3 CONCEPTUAL FRAMEWORK

Based on literature reviewed, I came with this conceptual framework which helps to develop questionnaire variables, summarize the determinant factors, and analyze the association between dependent and independent variables.

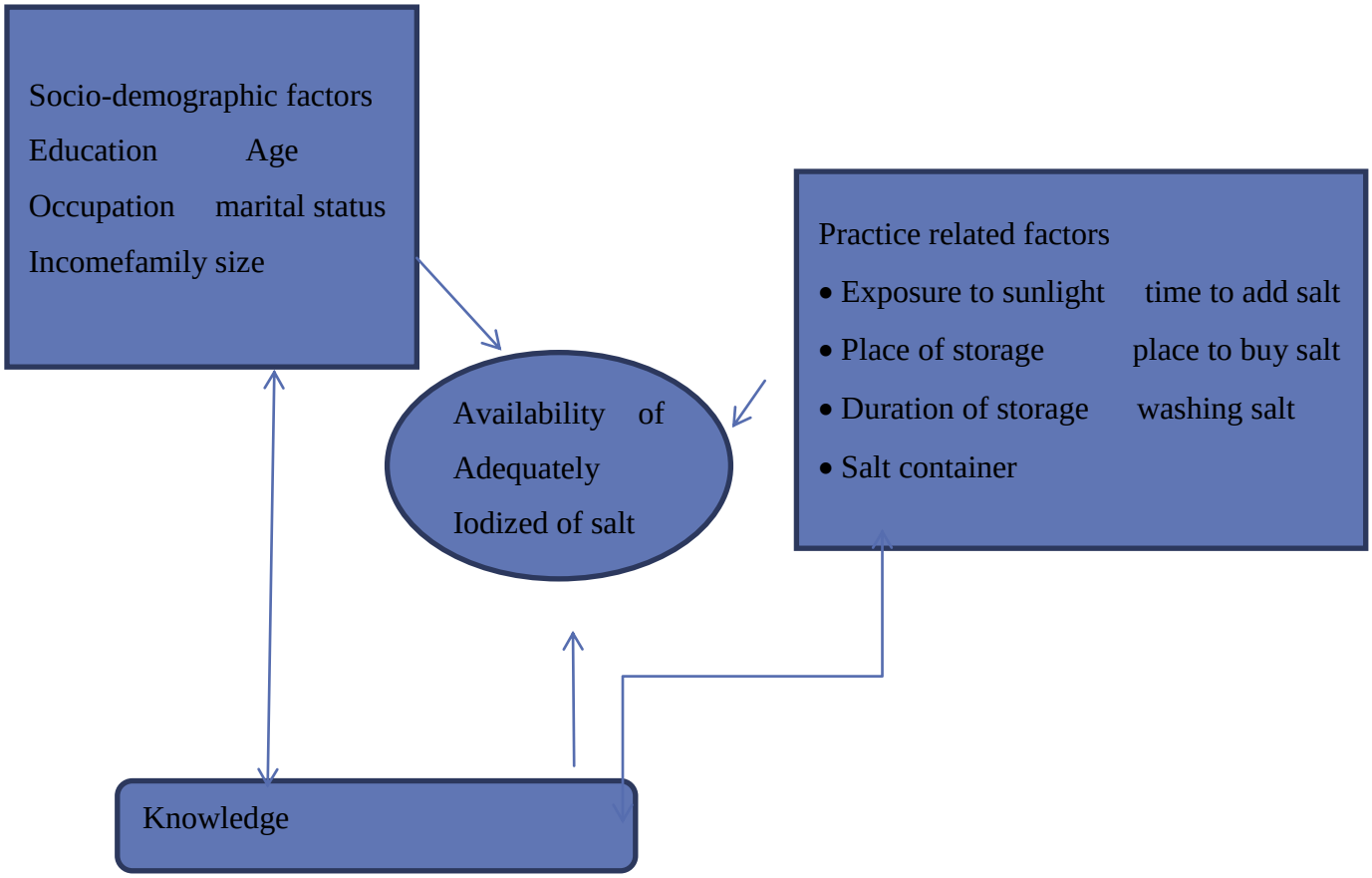


Figure2.1: A conceptual framework for Availability of adequately iodized salt at household level and factors affecting it in rural kebeles of dire dawa administration, eastern ethiopia, 2022

3. OBJECTIVES

3.1 GENERAL OBJECTIVES

To assess availability of adequately iodized salt at household level and factors affecting its availability in rural kebeles of dire dawa administration, eastern Ethiopia, 2022

3.2 SPECIFIC OBJECTIVES

To determine the availability of adequately iodized salt at the household level in rural kebeles of Dire dawa administration, Eastern Ethiopia, 2022.

To identify factors affecting availability of adequately iodized salt in rural kebeles of Dire dawa administration, Eastern Ethiopia, 2022.

4.METHODS AND MATERIALS

4.1 STUDY AREA

Dire Dawa is one of the two chartered cities in Ethiopia and it was founded on 24 December 1902 GC and located in the eastern part of Ethiopia, 48 km far away from Harar and 515 km from the capital city, Addis Ababa.This study was conducted in rural areas of Dire Dawa; Dire Dawa city is one of the cities found in eastern part of Ethiopia. It have urban and rural kebeles.According to the data obtained from the Dire Dawa health office, 2020/2021 projected population of the Dire Dawa Adminstration is around 506, 639 (49).

Dire Dawa rural administration issurrounded by Eastern Hararge Zone from south east –south west and Shinile Zone from north east –North West. It has 38 rural kebeles and 163,150 total populations of this 79,943.30 were males and 83,206.29 were females. Of all female population 45029.29 were women in the reproductive age group (15-49yr).Dire Dawa rural areas had also 7 health centers and 34 health post and 2 HEW and 1 clinical nurse have been employed in every health posts.Currently, the administration has one iodized salt manufacturer and five licensed iodized salt importers according to the Eastern Ethiopian Food and Drug Administration. All rural kebeles of Dire Dawa city administration are currently beneficiaries of the productive safety net program. However, there is no nutritional intervention in the urban kebeles of the city administration.

4.2.STUDY DESIGNAND PERIOD

A community-based cross-sectional study was conductedfrom 1-30 September, 2022.

4.3.POPULATION

4.3.1.SOURCE POPULATION

All households in rural kebeles Dire Dawa administration

4.3.2 STUDY POPULATION

Randomly selected households from randomly selected rural kebeles of Dire Dawa administration

4.3.3 STUDY UNIT

Individual households

4.4. INCLUSION AND EXCLUSION CRITERIA

4.4.1. INCLUSION CRITERIA

In this study all randomly selected household and respondents who were 18 years and above and who was volunteered to interview were included in the study.

4.4.2 EXCLUSION CRITERIA

Individuals resided in the study area for less than 6 months were excluded from the study.Householdswho were absent for three repeated visits during data collectionwere jumped to the next household.

4.5. SAMPLE SIZE DETERMINATION

The sample size was determined using a single proportion formula for specific objectives one, and double proportion formulas for specific objective two, using different proportions from previous findings by considering the following assumptions.

Single population proportion formula

Zα/2= Critical value at 95% confidence level of certainty (1.96)

D= 1.5 (Design effect)

d= 5% (Margin of error)

Non-response rate 10%

Prevalence for specific objective one (prevalence of adequately iodized salt is 28.9% from the Anteneh B. etal 2016 urban dire dawa(32).

$$n = \frac{(z\alpha/2)^2 p(1-p)}{d^2}$$

$$= \frac{(1.96)^2 * 0.289(1-0.289)}{(0.05)^2}$$

= 316

n= [316+non response rate (10%)] x 1.5 (design effect)

= [316+31.6] X1.5 =**521** is the total sample size

Epi info version 7 was used to calculate the sample size for second objective

- Two sided confidence level (1-alpha) = 95%
- Power (% chance of detecting) = 80%
- Ratio of control to case =1:1

The sample size estimation for specific objectives was summarized in the following table. The three most significant associated factors with an iodine content of salt were taken from similar studies(42).

table4.1: sample size calculation for specific objectives of magnitude and factor associated with an iodine content of salt at the household level

s.no	Factors	Prevalence of iodine content of salt		Calculated sample size	Reference
		Exposed	Non exposed		
1	Education	54.54%	24.82%	92	(43)
2	Knowledge	51.62%	22.59%	95	(43)
3	Duration of storage	36.40%	17.42%	222	(43)

Double population proportion formula

$$n=\frac{(p1q1) + (p2q2)(Alpha+Beta)2}{(p1-p2)2}$$

Where, p1=proportion among exposed, p2= proportion among unexposed, q=(1-p)=odds of outcome occurrence, Alpha=marginof error 5%,95%CI=1.96, Beta=power 80%=0.84, ratio of cases to controls=1

Therefore, based on the above sample size calculation for each objective, the largest sample size, that was single population (521), was selected for the precision of the research result.

4.6. SAMPLING TECHNIQUE

Simple Random sampling technique were used in the first step to ensured representative of all residents in the study area. In stage 1, Simple Random sampling (SRS) technique was employed to select the study kebeles. Seven kebeleswere selected from the total of thirty-eight rural kebeles using the Simple Random sampling technique. Kulayu, Korriso, Waahil, Goladen, Balawa, Aselliso and Harella were selected kebeles for this study. In stage2, the calculated sample size was proportionally allocated to each selected Kebeles based on its total number of households and also selected house hold by using simple random sampling after we were used health facility family folder number inorder to differentiate one household from another. N= Total number of households in all 7selected kebeles which is 6680.

n=the total sample size needed for the survey which is, 521.

In Seven selected kebeles for the study the sample size were allocated for each sampled kebeles, proportionally to their size using proportionate allocation formula of:

$ni = \frac{n\ Ni}{N}$ Where:

ni = is the sample size for the ith kebele.

Ni= number of households in each selected kebeles

N= N1+N2+N3 +……+Ni

N= Total number of households in all selected kebeles

N1=Total number of household in Kulayu kebele, which is, 401

N2= Total number of household in Korriso, which is, 484

N3= Total number of household in Waahil, which is, 1669

N4= Total number of household in Goladen, which is, 277

N5= Total number of households in Balawa, which is, 1514

N6= Total number of household in Aselliso, which is, 847

N7=Total number of household in Harella, which is, 1488

n= n1+n2+n3+……+ni is the total sample size needed for the survey which is, 521

$ni = \frac{n\ Ni}{N}$

$n1=\frac{521x}{6680}\ 401= 31.3$

n2=521x484 = 37.7

6680

n3=521x1669= 130.2

6680

n4=521x277 = 21.6

6680

n5=521x1514= 118.1

6680

n6 =521x847 =66.1

6680

n7 =521x1488 =116.1

6680

n=n1+n2+n3+n4+n5+n6+n7

n=31.3+37.7+130.2+21.6+118.1+66.1+116.1=**521**

The sampling technique was shown in the following schematic presentation

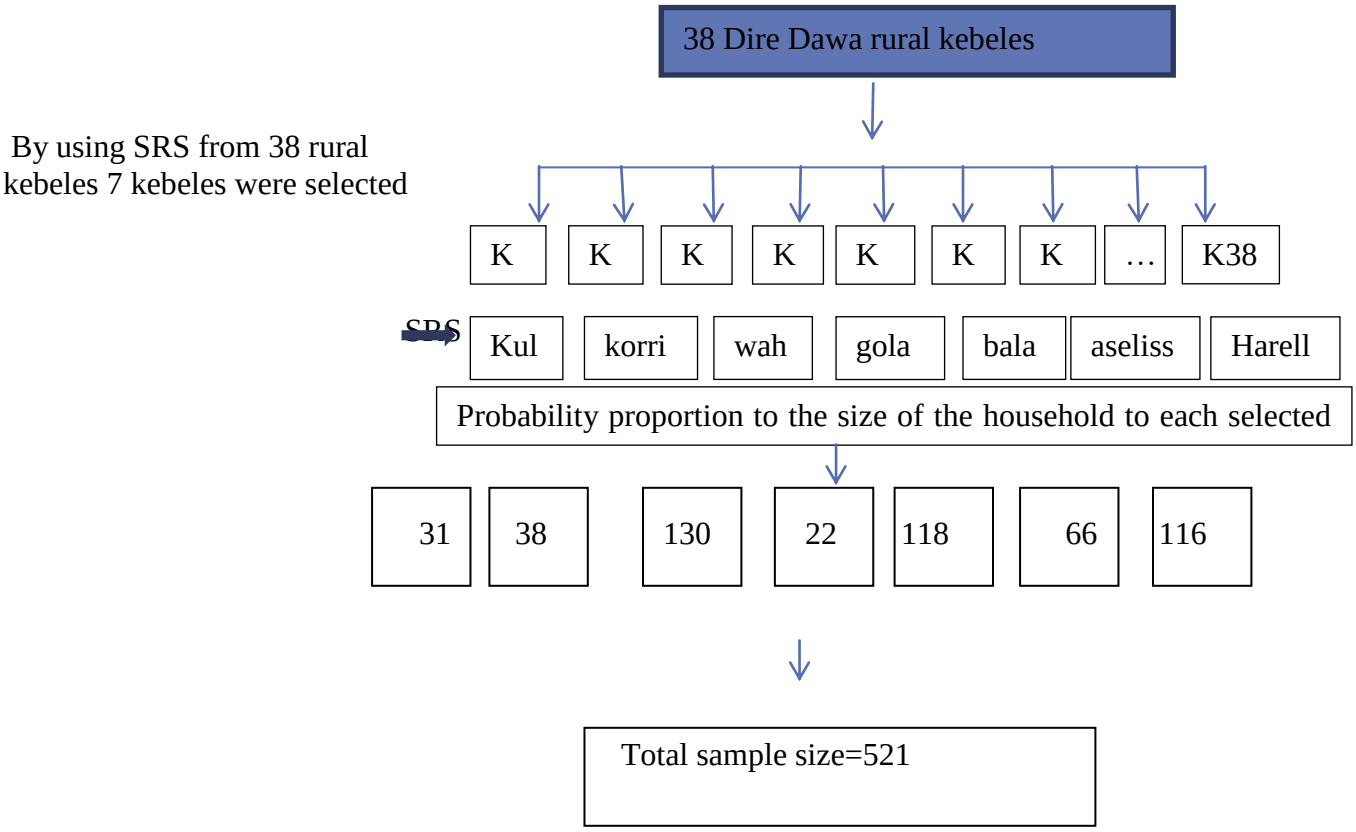


Figure4. 1 schematic presentation of sampling proceduree

4.7. STUDY VARIABLES

4.7.1. DEPENDENT VARIABLES

Availability of adequately iodized salt

4.7.2. INDEPENDENT VARIABLES

Socio-demographic factors Age, educational status, religion, marital status, and occupation

Knowledge related factors: knowledge of IDD, knowledge of iodized salt, knowledge on handling of iodized salt

Practice related factors: exposed to sunlight, washing salt, handling and storage of iodized salt

4.8. OPERATIONAL DEFINITIONS

Availability of adequately iodized salt: Households' salt samples have ≥15ppm iodized salt when it is tested with rapid test kits(44).

Knowledge: Participants who scored points 50% and above regarding iodized salt and IDD knowledge questions is considered as good knowledge and participants who scored below points 50% is considered as poor knowledge and those scored attitude questions 50% points (14).

Storage of iodized salt: When the participant stores their salt for more than two months after purchase from the market is considered as longer storage and those who stored their salt for less than two months considered as shorter storage(39).

Practice – Respondents with any single practice that might result in the reduction of salt iodine content were labeled to have improper practice and those without such practices is labeled to have proper practices(45).

4.9. DATA COLLECTION METHOD

Data were collected using a structured questionnaire via interviewing technique. The questionnaire was developed through a review of local and international literature and was prepared originally in English and translated to local language (Afaan oromoo and af Somali) and translated back to English to maintain consistency.

It contains socio-demographic characteristics, knowledge, practices and availability of iodized salt. During the data collection sample salt used for cooking were taken by mixing the salt at the bottom and with the salt at the topand then after properlty labeled its transported to test the iodine content using the standard WYD iodine checker instrument in East Ethiopian Food and Drug Authority(EFDA) food and nutrition laboratory.

The data were collected by 8 data collectors who had similar data collection experiences in the study area. The one-day training was given for data collectors on the purpose of the study, data collection techniques, and ethical issues. They were also being trained on how to collect the salt samples.

IODINE TEST

Preparation of standard solution, solution A and Solution B

Standard solution (1000 µg/ml of KIO_3)

Weighed 0.843 g of dried KIO_3 (Potassium Iodate) was dried in a 100-110 ^{O}C in the oven for 3 hours and dissolved in 500 ml distilled water. Then 5.0 ml from the above standard solution was taken and added 100 grams of refined sodium chloride (NaCl) and 0.5 gram$NaCO_3$(sodium carbonate), distilled water was added to make 500 ml, and the solution was shaken thoroughly. This solution can be used within 6 months. 5.0 ml of the solution equals the content of 50 mg/Kg (50 ppm) in the iodized salt sample.

Solution A (KI-Potassium iodide-starch solution)

Solution A was made in a sterilized container by adding Into 200 ml of boiling distilled water; 2.0 g of solublestarch and stirred thoroughly. Starch did not add into distilled water until it is boiling vigorously, and then maintains boiling for two min (heat above 100^{O}C).After cooling, 1.0 g KI (Potassium iodide), 20.0 g $K_2HPO_4.3H_2O$ (dipotassium hydrogen orthophosphate trihydrate), and 1.0 g $Na_2B_4O_7$.10H2O (di-sodium tetraborate decahydrate or Borax) was added and mixed thoroughly.

Solution B (1 mol/L sulphuric acid-H_2SO_4)

11 ml sulphuric acid (H_2SO_4) was mixedwith 190 ml distilled water evenly. When preparing the sulfuric acid solution, the acid must be added to the water slowly. As sulfuric acid is a hazardous chemical, handling and proper disposal are necessary of chemical plus any leftover reagents, standard solution, and sample specimens(50).

The salt sample was conducted using the portable digital iodine checker (WYD, UNICEF) by a laboratory professional with the support of the Ethiopian Food and Drug Authority Eastern Ethiopia branch office (EFDA) Laboratory. 1.0 g of well-mixed salt was weighed.Transfer the 1.0 g salt from the spoon to a 50 ml plastic test tube, and then 10 ml of distilled water was added to the 50 ml plastic tube. The test tube was shacked thoroughly to dissolve the salt as much as possible, then 2.0 ml of solution A were added into the 50 ml plastic test tube and 2.0 ml of solution B into the 50 ml of plastic test tube. The solution was mixed thoroughly and distilled water was added to the 50 ml plastic test tube till the mark, then the tube was shacked again thoroughly to mix. Finally, a clean cell (cuvette) was filled with the solution containing the iodized salt is carefully to wipe and excess moisture. The cell was placed in the WYD checker, close the lid and read the LCD panel for iodine concentration(50).

4.10. DATA QUALITY CONTROL

Different approaches were used to assure the quality of the data. The data collection instrument (questionnaire) was prepared in the English language first and carefully translated into Afan Oromo, and Af Somali by using Language experts to make it consistent. Enough Orientation and training were provided to data collectors and supervisors, on data collection procedures. A pretest was conducted on 5% of study sample before actual data collection begins, so that necessary modification or adjustment was made on the questionnaires. The supervisors together with the principal investigator were checked the completeness and consistency of collected data on daily basis.

The quality of the test kit was assured by observing for expiry date.All laboratory procedures were carried out by Eastern EFDA following a standard operating procedures (SOPs) and manufacturer instructions. Each day, internal quality control (QC) was performed before tests using three levels of commercial quality control material (absence, inadequate, and adequate), and the analyzer was calibrated per the manufacturer's suggestion.

4.11. DATA PROCESSING AND ANALYSIS

The collected data by structured questionnaire and it was checked, cleaned, and edited to be exported to SPSS windows version 20 for further analysis. The descriptive statistic was computed to determine frequencies and percentages to present categorical data.These descriptive statistics were done to determine the proportion of households using adequately iodized salt, socio-demographics, and concentration of iodine in the salt. For normally distributed data the mean and standard deviation were reported. Bivariate logistic regression was used to determine the association between independent and dependant variables. Independent variables with a significance level less than or equal to 0.20 in the bivariate logistic regression analysis were entered into the multivariable logistic regression analysis. The multivariable logistic regression model was built with backward elimination. Variable having $p < 0.05$ was considered as significant and AOR with 95% CI was used to interpret the result. Before the inclusion of predictors in multivariable logistic regression analysis, fulfillment of model assumption was checked. The goodness of model fitness was tested using the Homers and Lemeshow test at $p>0.05$(HL=0.973) and the result of the regression analysis provides evidence for model adequacy well fit with the predictors. Multicollinearity was checked using VIF0.10if VIF is greater than 10 it is considered as severe multicollinearity; (in this study minimum VIF is 1.038 and maximum VIF is 1.78) there is no multicollinearity. Finally, the results of the findings were presented by using text, bar graphs, and tables.

4.12. ETHICAL CONSIDERATIONS

The Ethical approval for the study was obtained from Research Ethics Review Committee (RERC) Dire Dawa University. Then permission letter written from DDU submitted to Dire Dawa Administrative health bureau and selected kebeles. Detail explanations were provided to study participants, before the beginning of the data collection and an interview were conducted following the standard procedures of COVID-19 transmission control. To keep confidentiality, the name of the participants were not written on the questionnaires. The participants were informed as they had the right to ask any question at any time, the right to refused or withdrawn from participating in the study, and finally, written consent were obtained from the participants.

.

4.13. DISSEMINATION OF THE RESULTS

The final result of this study finding will be submitted to Dire Dawa University college of medicine and Health Sciences, Department of public health for defense. After the defense was made the final document of the study will be submitted to the college and library. The findings of the study will also submitted to the Ethiopian Food and Drug administration authority and Dire Dawa Administration health bureau, stakeholders; those who were working on iodized salt, and all concerned bodies with hard and soft copy and also i have plan to publish.

5. RESULTS

5.1 SOCIODEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

A total of 515 households participated in the study with a response rate of 98.85%. Among 515 participants,505(98.1%) were female, 445(86.4%) were married, 502 (97.5%) were Muslim, 418 (81.2%) were from the Oromo ethnic group. Similarly, 249(48.3%) had no formal education, 420 (81.6%) were housewives, 296 of households (57.5%) were found in the 30-44 age group, 318 (61.7%) had family size less than five and 392 (76.1%) of the respondents' average monthly income wasmore than 2000(Table 5.1).

Table5.1Socio-demographic characteristics of respondentsin rural kebeles of Dire Dawa city administration,Eastern Ethiopia, 2022(n=515).

Variable	Category	Frequency	Percent (%)
Sex	Female	505	98.1
	Male	10	1.9
Age group	18-29	179	34.8
	30-44	296	57.5
	>45	40	7.8
Marital status	Single	31	6.0
	Married	445	86.4
Ethnicity	Oromo	418	81.2
	Amhara	7	1.4
	Somali	90	17.5
Religion	Muslim	502	97.5
	Orthodox	8	1.6
	Protestant	5	1.0
Educational status	no education	249	48.3
	Some primary	114	22.1
	Completed primary	118	22.9
	Completed secondary	25	4.9
	Above secondary	9	1.7
Occupational status	Housewife	420	81.8
	Government employer	23	4.5
	Private employer	11	2.1
	Merchant	27	5.2
Age group	18-29	179	34.8

	30-44	296	57.5
	≥45	40	7.8
Family size	<5	318	61.7
	=>5	197	38.3
Monthly income	=<1000	51	9.9
	1001-1999	72	14.0
	=>2000	392	76.1

5.2. AVAILABILITY OF ADEQUATELY IODIZED SALT AND PRACTICE AT HOUSEHOLD LEVEL

This study shows that out of the 515 tested salt samples of households, 231 (44.9%) have adequately iodized salt (≥ 15 ppm). The availability of adequately iodized salt and its practice shows that 94(18.3%) of the respondents were used packed salt out of which 80(85.1%) were adequately iodized. About 420(81.5%) households used not packed salt (under iodized), out of which 150(35.7%) were adequately iodized.

From the total household 364(70.7%) stored their salt in dry place out of which 178(48.9%) were adequately iodized salt. About 437 (84.9%) household respondents were stored their salt for less than two months after purchasing, out of which 199(38.6%) were adequately iodized.

About 78 (15.1%) household respondents stored their salt for more than two months after purchasing, out of which 32(13.9%) were adequately iodized. About 49 (8.5%) had proper practice related to iodized salt, they usually add salt late at the end of cooking, 466(91.5%) while adding salt in the early beginning or in the middle of cooking which is improper practice (Table-5.2).

Table5. 2: Practice of household respondents regarding the use of iodized salt in rural kebele communities of Dire Dawa City Administration, Eastern Ethiopia, 2022(n=515)

Variable	Categories	Frequency	Percent
Type of salt Iodized	packed salt	94	18.3
	Unpacked salt	421	81.7
Sunlight exposure to salt	Yes	51	9.9
	No	464	90.1
Washing salt	Yes	82	16.0
	No	433	84.0
Salt storage place	dry pace	364	70.7
	Moist area	151	29.3

Salt container	with cover	172	33.4
	Without cover	343	66.6
Duration of salt storage After purchase	<2months	437	84.9
	≥ 2months	78	15.1
Time salt is added during food cooking	at the beginning of cooking and the middle of cooking	466	91.5
	at the end of cooking	49	8.5
Distance traveled to get iodized salt	<30 minutes	215	41.7
	≥ 30 minutes	300	58.3
Iodine content os salt	≥ 15ppm	231	44.9
	<15ppm	284	55.1

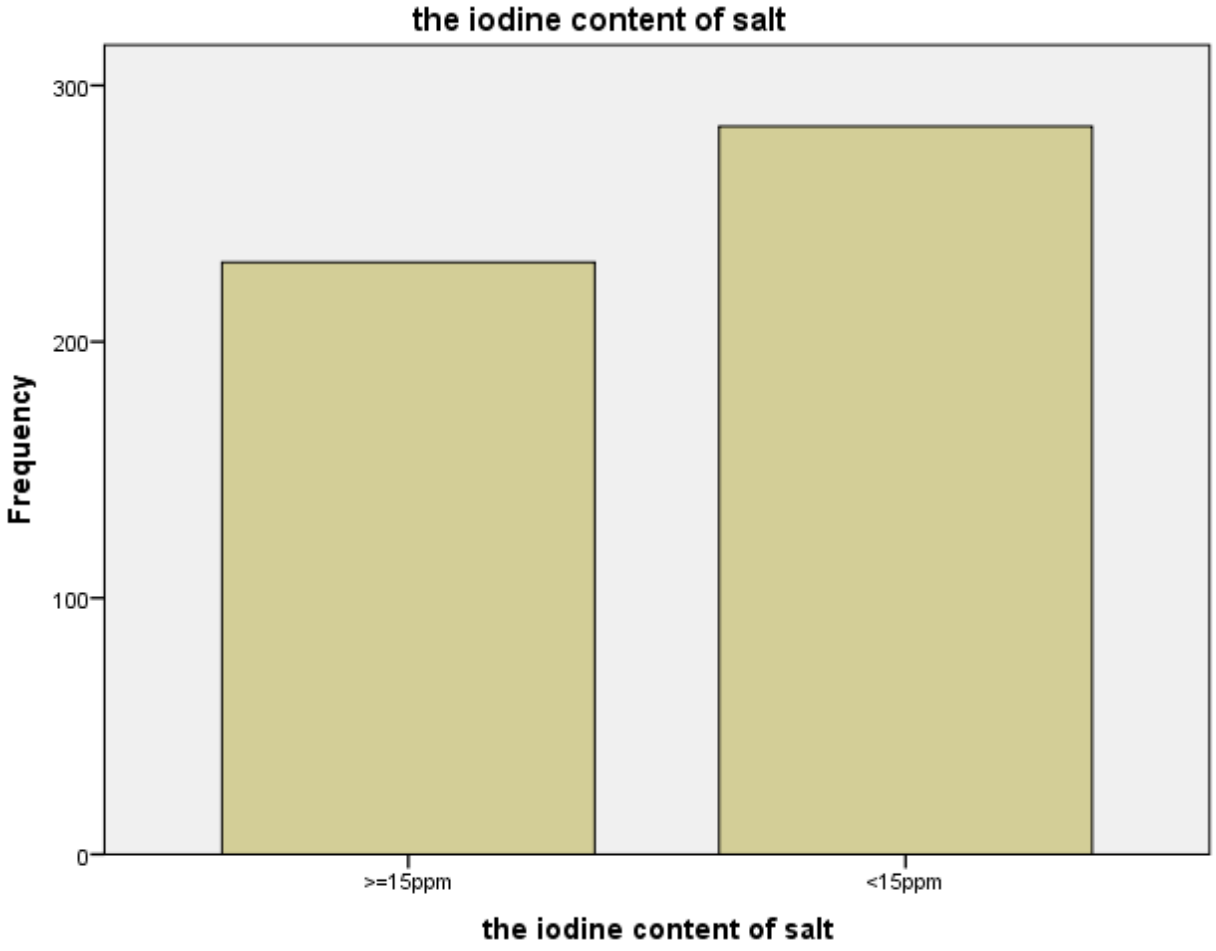


Figure 5.1 Iodine content of salt at household level and factors affecting the availability of iodized salt at rural kebele of Dire Dawa administration, Eastern Ethiopia 2022 (n=515).

Availibility of adequately iodized salt at rural dire dawa administration were found from total sampled household 231(44.9%) ,whereas, inadequate iodized salt were found 284 (55.1%).(figure 5.1)

5.3 KNOWLEDGE OF RESPONDENTS ON IODIZED SALTAT HOUSEHOLD

Out of 182 household those had good knowledge 157(86%) household were found adequately iodized salt, whereas out of 333 household those had poor knowledge only 74 (22%) household were found adequately iodized salt.(Figure5.2).

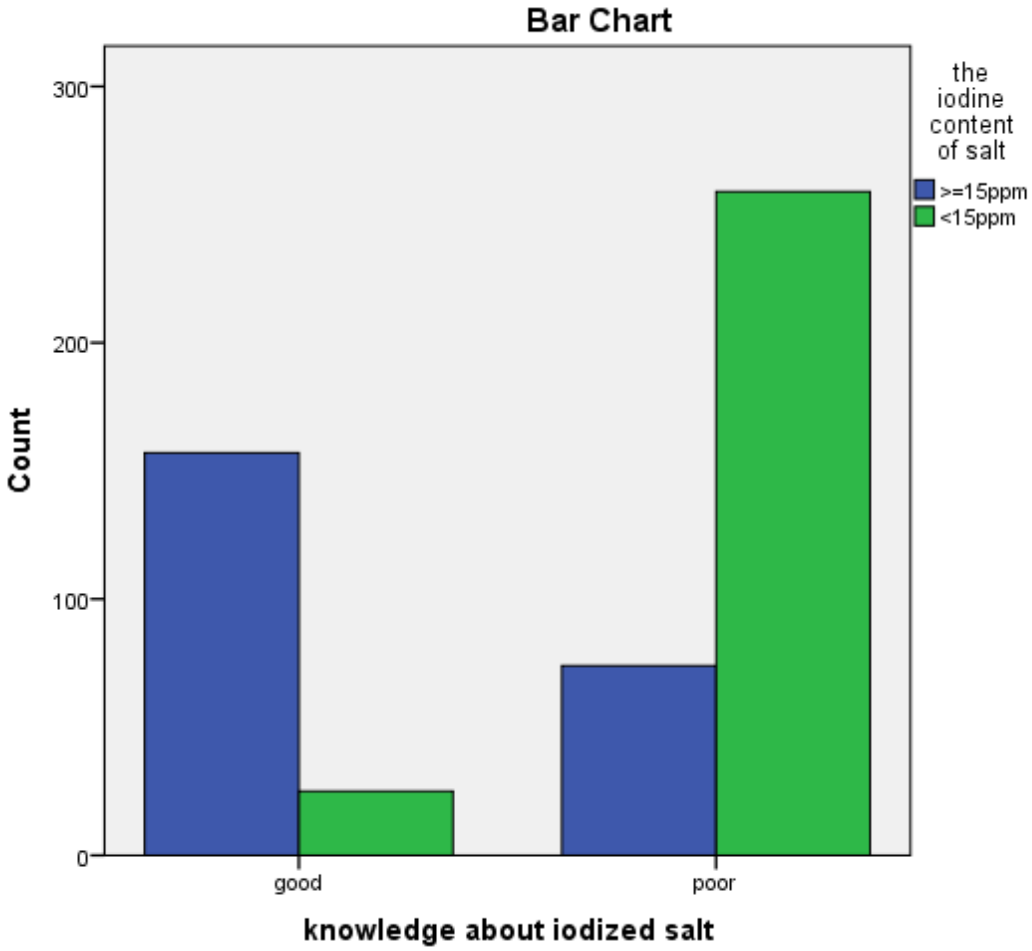


Figure5.2 knowledge about iodized salt at household level in rural kebele of dire dawa administration,2022(n=515).

5.4 FACTORS ASSOCIATED WITH AVAILABILITY OF IODIZED SALT

The present study indicated that having used salt stored in dry place, using salt with covered salt container, having a good knowledge about iodized salt, using a packed type of salt, adding salt at the end of cooking and having formal education were significantly associated with the presence of adequate iodine in salt during bivariate analysis.

However, the multivariable logistic regression analyses revealed that those who have using salts stored in dry place were 1.4 times more likely to have adequately iodized salt than those who had not [AOR=1.393, 95% CI (1.095-1.773)], those who used packed type of salt were 2.4 times more likely to have adequately iodized salt than those who used unpacked type of salt [AOR=2.383, 95% CI (2.044-2.779)], those who used salt in covered salt container were 1.3 [AOR= 1.296, (95% CI=1.072, 1.568)] times more likely to have adequately iodized salt than those who used salt from uncovered salt container.

Similarly, those who had good knowledge about iodized salt were 3.9 [AOR=3.882 (95% CI=(3.149, 4.785)] times more likely to have adequately iodized salt than those who had poor knowledge about iodized salt, those who had no formal education were 43% times less likely to use adequately iodized salt than those who had formal education [AOR=0.571,(95%CI=(0.402,0.811)]. Respondents those who add salt at the early or middle of cooking were 77% [AOR=0.231, 95% CI (0.118-0.455)]times less likely to use adequately iodized salt than those who add salt at the end during cooking.

Table5. 3 factors associated with the availability of iodized salt at household level in rural kebele of Dire Dawa city administration, 2022(n=515).

Variables	Iodine content		COR(95%CI)	AOR(95%CI)	P value
	Inadequate=>15Ppm)	Adequate (<15ppm)			
Family group ≤5 >5	 134 96	 182 100	 0.767(0.536,1.097) 1	 1.177(0.945,1.466) 1	 .082
Education Illiterate Formal education	 94 137	 155 129	 0.733(0.602,0.893) 1	 0.571(0.402,0.811)* 1	 .002
Type of salt Packed Unpacked	 80 150	 14 270	 10.28(5.634,18.777) 1	 2.383(2.044,2.779)* 1	 .000

Storageplace of salt					.003
Dry place	178	186	1.770(1.195,2.620)	1.393(1.095,1773)*	
Not dry place	53	98	1	1	
Time to add salt					
At the beginning and middle	194	272	0.551(0.455,0.668)	0.231(0.118,0.455)*	.010
At the end	37	12	1	1	
Knowledge about iodized salt					
Good	157	25	23.120(13.994,38.1	3.882(3.149,4.785)*	.000
Poor	74	259	96)	1	
			1		
Sunlight exposure					
Yes	25	26	1.204(0.675,2.148)	1.104(0.820,1.487)	.054
No	206	258	1	1	
Salt container					
With cover	91	81	1.629(1.127,2.356)	1.296(1.072,1.568)*	.011
Without cover	140	203	1	1	

* indicate significant variables ,COR= Crude odd ratio, AOR=Adjusted Odd Ratio,

6. DISCUSSION

The study identified that 44.9 %of households had adequately iodized salt which were lower than the WHO's recommended.According to the WHO and International Council fo Control of Iodine Deficiency Disorder(ICCIDD) Standard, elimination of Iodine Deficiency Disorder(IDD) will be possible if over 90% of the householdsconsume adequately iodized(17).

Having Good knowledge about, having formal education, using a packed type of salt, adding salt at the end of cooking, using salt stored at dry place, not washing salt before use and using covered salt were found to be positive and statistically significantly associated with utilization of adequate salts. This study is similar with the study conducted in the rural community of India(24) and the study that conducted in rural community of laelay maychew woreda, tigray regional state,2014(33).

The percentages of edible salt with acceptable iodine content at the household level in this study was higher than a similar study conducted in Gidami district; Oromia region(46) and Gonder town(14) which were both equal to 28.9% and also lower than when compared with similar study done in Dessie and Kombolcha town, (67%)South Wollo in 2017(29), Lallo Assabi District,(56.6%) west Ethiopian in 2014,(2), Tach Armachio District, northwest Ethiopia in 2019 which is 61.1% (CI 57%–65%) of households(19), india 2019(48%)(9), laelay maychew district 2015(59.7%)(43) and Kolfe Karanio sub-city, Addis Abeba which is 64% household use adequately iodized salt in 2020(22). This difference might due to study period, study area, information access, and knowledge of respondents about iodized salt.

The percentages of iodized salt with acceptable iodine content at the household level in this study were lower than the study conducted by EDHS (Ethiopian Demographic and Health Survey) of Dire Dawa in 2016 which is 83.5% of households have adequate iodized salt EDHS survey(18). This difference might be due to study area differences. EDHS may conducted both rural and urban areas but the present study was conducted entirely in rural areas.

Regarding factors associated with the availability of iodized salt in the households, having good knowledge about iodized salt of respondents was among the associated factors. This result is aligned with studies done in India(9), Gidami district; Oromia region(46), and Gondor town(14). This might be because good knowledge about the issue can change and increase the decision-making of individuals.

Using packed saltfrom covered salt container and stored dry place salt at the household level was significantly associated with the availability of adequately iodized salt.Also many study showed that the iodine content of the salt remained constant and its distribution remained uniform for many months when the salt is packed and kept dry, preferably in a cool place and away from strong light. This finding might be supported by a study done in Morocco(47), Tach Armacho North West Ethiopia(19), Dera district, Northwest Ethiopia(16),Wolayta town(15), Gonder town, Northwest Ethiopia(14) and Robe town, Bale zone Southeast Ethiopia(48). This may have been packing packaging material and covering salt container and putting in dry place that may protected the iodized salt from exposure to heat, sunlight and kept it from moisture. Because of inappropriate salt utilization at household level iodine in salt may prone to evaporation since iodine by its nature is highly volatile.

Respondents' practice of adding salt at the end of cooking showed an association with the presence of adequately iodized salt at the household level. This study was similar to a study conducted in the wolaita Town of Southeast Ethiopia(15). This may be because when we add salt at the beginning and middle of cooking the solid salts are converted to liquid and the liquid will evaporate and reduce iodine concentration and consumption.

7. STRENGTH AND WEAKNESS OF THE STUDY

7.1 STRENGTH OF THE STUDY

- Being a community-based approach.

7.2 WEAKNESS OF THE STUDY

- ✓ The studydid not include a titration method to determine the concentration of iodine in the salt.
- ✓ Among respondents, there might be potential recall bias while answering questions relating to events happening in the past.
- ✓ Information on some important confounding variables which could cause inadequate iodine content was not collected.

8. CONCLUSION

The present study identified that more than half of the households were consuming salt with inadequate iodine. Majority of the household were adding salt during cooking either at the beginning or in the middle of cooking which may affect iodine content in salt.

Having good knowledge about iodized salt, using a packed type of salt, adding salt at the end of cooking, putting salt at dry place and using covered salt container were found to be positive and statistically significantly associated with the availability of adequately iodized salts.

Educating the households regarding proper practices of iodized salt use should be extensively addressed like to adding salt at the end of cooking, placing in a dry place, and proper storage of salt in the house.

9. RECOMMENDATION

- Nutrition educational programs with specific interventions are recommended to increase the knowledge of consumers on iodized salt.
- Awareness should be given to households on proper storage, handling, place to buy salt, and type of salt used and to be bought.
- Salt used for consumption recommend being iodized and packed.
- Health workers at the community level should educate people on the importance of iodized salt that adding iodized salt at the end of cooking is better than adding it at the beginning or the middle of cooking.
- Increasing involvement by community leaders in nutrition education by incorporating universal salt iodization.
- Further study should be done in other parameters like the titration method to determine the full iodine status of the population.

References

1. Mohammed H. randomized cluster trial to evaluate the effect of iodized salt exposure on birth outcome and infant development in Ethiopia. 2016;1.
2. Regassa D M, H TW. Utilization of Adequately Iodized Salt on Prevention of Iodine Deficiency Disorders at Household Level and Associated Factors in Lalo Assabi District, West Ethiopia. Journal of Nutrition & Food Sciences. 2016;06(02).
3. Raj Shakya P. Determination of Iodine Level in Consumer Table Salt from Production to Consumption in Palestine. scholaar. 2016;14.
4. Claydon J. Global_Nutrition_Report. Development Initiatives Poverty Research Ltd. 2018;1.
5. Gebretsadika T. Progress and challenges in eliminating iodine deficiency in Ethiopia: a systematic review. BMC nutrition. 2016;1.
6. institute Eph. ethiopian national micronutrient survey report. EPHI. 2016;1.
7. Al-Dakheel MH. Prevalence of iodine deficiency disorders among school children in Saudi Arabia: results of a national iodine nutrition study. Eastern Mediterranean Health Journal. 2016;22(5).
8. WHO. Assessment of iodine deficiency disorders and monitoring their elimination. BMC Public Health. 2007;07(3).
9. Uma Maheswari K, Saravanan R, Somasundaram M, Vaishnavi J. Estimation of iodine content of commercially available consumable salts in and around Madhuranthagam, Tamil Nadu, South India. Indian Journal of Clinical Anatomy and Physiology. 2019;6(2):183-5.
10. KA A. IODINE DEFICIENCY DISORDERS (IDD) IN BURIE AND WOMBERMA DISTRICTS, WEST GOJJAM, ETHIOPIA. ajfund. 2014;14(4).
11. Gerensea H. Knowledge, attitude and practice (kap) towards iodized salt utilization in HaweltiKebelle, Axum, Tigray, Ethiopia, 2015. Edorium journal. 2016;2(1-8).
12. UNICEF. Sustainable Elimination of Iodine Deficiency. 2008.
13. Ebrahim SM. Consumption of iodized salt among households of Basra city, south Iraq. Eastern Mediterranean Health Journal. 2016;18(9).
14. Gebremariam HG, Yesuf ME, Koye DN. Availability of Adequately Iodized Salt at Household Level and Associated Factors in Gondar Town, Northwest Ethiopia. ISRN Public Health. 2017;2:1-6.
15. Kumma WP, Haji Y, Abdurahmen J, Mehretie Adinew Y. Factors Affecting the Presence of Adequately Iodized Salt at Home in Wolaita, Southern Ethiopia: Community Based Study. International journal of food science. 2018;2018:33.
16. Anteneh ZA, Engidayehu M, Abeje G. Iodine content of dietary salt at household level and associated factors using Iodometric titration methods in Dera District, Northwest Ethiopia. BMC nutrition. 2017;3:83.
17. WHO. Assessment of iodine deficiency disorders and monitoring their elimination. whoint. 2017;3.
18. Agency CS. Demographic and Health Survey. The DHS Program. 2016.
19. Mamo W, Derso T, Nigatu SG. Adequately Iodized Salt Utilization and Associated Factors among Households in Tach Armachio District, Northwest Ethiopia: A Community-Based Cross-Sectional Study. Journal of nutrition and metabolism. 2021;2021:5.

20. Abebe Z, Gebeye E, Tariku A. Poor dietary diversity, wealth status and use of un-iodized salt are associated with goiter among school children: a cross-sectional study in Ethiopia. BMC Public Health. 2017;17(1).
21. TW D. Availability-and-Knowledge-of-Iodized-Salt-at-Household-Level-and-Associated-Factors-at-Debre-Tabor-Town-Northwest-Ethiopia.pdf. nutrition and health science. 2019;6(1).
22. Teka B. Utilization of Adequately Iodized Salt at Household Level and Associated Factors In Kolfe Keranyo Sub-City, Addis Ababa. DSpace Institution. 2020;1:29.
23. Desta AA, Kulkarni U, Abraha K, Worku S, Sahle BW. Iodine level concentration, coverage of adequately iodized salt consumption and factors affecting proper iodized salt utilization among households in North Ethiopia: a community based cross sectional study. BMC nutrition. 2019;5:28.
24. Yadav K. Iodized salt spreads across India. hindawicom. 2015;39(2).
25. Ngnie-Teta I. Iodine content in imported table salt in Haiti on the eve of a mandatory salt iodization bill. biomedcentral. 2016;12(2).
26. Appiah PK, Fenu GA, Yankey FW-M. Iodine Content of Salt in Retail Shops and Retailers' Knowledge on Iodized Salt in Wa East District, Upper West Region, Ghana. Journal of Food Quality. 2020;2020:1-8.
27. Hussein I. Sudan launches universal salt iodization. INTERNATIONAL COUNCIL FOR CONTROL OF IODINE DEFICIENCY DISORDER. 2016;40(3).
28. Buxton C. Knowledge and practices of people in Bia District, Ghana, with regard to iodine deficiency disorders and intake of iodized salt. Eur J Epidemiol. 2017;70(5).
29. Mekonnen TC, Eshete S, Wasihun Y, Arefaynie M, Cherie N. Availability of adequately iodized salt at household level in Dessie and Combolcha Towns, South Wollo, Ethiopia. BMC Public Health. 2018;18(1):1152.
30. TAKELE L. IODINE CONCENTRATION IN SALT AT HOUSEHOLD AND RETAIL SHOP LEVELS IN SHEBE TOWN, SOUTH WEST ETHIOPIA. East Afr Med J. 2011;08(10).
31. Ambaye TG. Knowledge of Iodine Deficiency Disorders and Intake of Iodized
Salt in Residents of Mekelle Tigray,Ethiopia. Journal of Food Science and Nutrition Therapy. 2015;02(07).
32. Berhane A. Availability of Adequately Iodized Salt at Household Level and Associated Factors in Dire Dawa, Eastern Ethiopia. International Journal ofPublic Health Science. 2016;5(4):394.
33. Gidey B. availability of adequately iodized salt at household level and associated factors in rural community of laelay maychew woreda, central zone, tigray, north ethiopia. 2014:29.
34. Agarwal S, Sethi V, Sharma D, Vaid M, Agnihotri A, Sindhwani A, et al. Consumption of iodized salt among slum households of north-East delhi, India. Indian journal of community medicine : official publication of Indian Association of Preventive & Social Medicine. 2009;34(4):368-9.
35. Imdad Ali S, Shoukat MS, Khalid M. Appraisal of the knowledge & practices about iodized salt amongst housewives in toba tek singh city and the impact of socio economic factors on such knowledge and practices. 2015;5:796-9.

36. Fisher JT, T. Biggs, B. Tran, T. Dwyer, T. Casey, G. Tho, D. H., Hetzel B. Iodine status in late pregnancy and psychosocial determinants of iodized salt use in rural northern Viet Nam. Bull World Health Organ. 2015;89(11):813-20.
37. Buxton C, Baguune B. Knowledge and practices of people in Bia District, Ghana, with regard to iodine deficiency disorders and intake of iodized salt. Archives of public health = Archives belges de sante publique. 2016;70(1):5.
38. Abuye C, Berhane Y. The goitre rate, its association with reproductive failure, and the knowledge of iodine deficiency disorders (IDD) among women in Ethiopia: Cross-section community based study. BMC Public Health. 2007;7(1):316.
39. Diosady LL. Stability of iodine in iodized salt used for correction ofiodine-deficiency disorders. . Food and Nutrition Bulleti. 1998;19(3):388-96.
40. Tyan A. Salt Iodization in Haiti: Challenges to Improving Salt Production Quality and Recommendations for Pursuing Iodization. 2010.

41. Khan JR, Biswas RKae. Factors associated with the availability of iodized salt at household level: a case study in Bangladesh. Public Health Nutr. 2019;22(10):1815-23.

42. Gidey B. AVAILABILITY OF ADEQUATELY IODIZED SALT AT HOUSEHOLD LEVEL AND ASSOCIATED FACTORS IN RURAL COMMUNITY OF LAELAY MAYCHEW WOREDA, CENTRAL ZONE, TIGRAY, NORTH ETHIOPIA. 2014;1:24.
43. B G, K A, A A, M K, Y TY, Hr S. Availability of Adequate Iodized Salt at Household Level and Associated Factors in Rural Communities in Laelay Maychew District, Northern Ethiopia: A Cross Sectional Study. Journal of Nutrition and Health Sciences. 2015;1(4).
44. World Health O. Assessment of iodine deficiency disorders and monitoring their elimination : a guide for programme managers. 2nd ed ed. Geneva: World Health Organization; 2001.
45. Belay T. Lack of dietary sources of iodine and the prevalence of iodine deficiency in rural women from Sidama Zone, Southern Ethiopia. African Journal of Food, Agriculture, Nutrition and Development. 2013;13:8401-14.

46. Dinka AW, Kebebe T, Nega G. Iodine Level of Salt and Associated Factors at Household Level in Gidami District, Oromia Region, Ethiopia: A Cross-Sectional Study. Nutrition and Dietary Supplements. 2021; Volume 13:9-16.

47. Zahidi A, Zahidi M, Taoufik J. Assessment of iodine concentration in dietary salt at household level in Morocco. BMC Public Health. 2016;16:418.

48. Dida N, Legese A, Aman A, et al a. Availability of adequately iodized salt at household level and its associated factors in Robe town, Bale Zone, South East Ethiopia: community-based cross-sectional study. South Afr J Clin Nutr. 2018;33(3):58-63.

49. *Dire Dawa Administration Regional Health Berue. 2020*

50. Salt Research Institute of China National salt industry corporation on WYD iodine checker instruction manual.

ANNEXES

ANNEX I: PARTICIPANT INFORMATION SHEET AND
INFORMED VOLUNTARY CONSENT FORM

My name is _____. I am working as a data collector for the study being conducted in this community by ABDUREHMAN ALIYI who is studying for his Master's degree at Dire Dawa University, the College of Medicine and Health Sciences. I kindly request you to lend me your attention to explain you about the study and being selected as the study participant.

1. The study/project title:

Sample Thesis Title: Availability of adequately iodized salt at household level and factors affecting the availability of adequately iodized salt in rural kebeles of dire dawa city administration, eastern Ethiopia

2. Purpose/Aim of the study:

Sample: The findings of this study can be of a paramount importance for the regional health office to plan intervention programs as a wake-up call to all stakeholders working on iodized salt related to the content, itscoverage, and associated factors in Dire Dawa city administration. Moreover, the aim of this study is to write a thesis as a partial requirement for the fulfillment of a Master's Program in Public Health for the principal investigator.

3. Procedure and duration:

Sample: I will be interviewing you using a questionnaire to provide me with pertinent data that is helpful for the study. There are 34 questions to answer where I will fill the questionnaire by interviewing you. The interview will take about 30 minutes, so I kindly request you to spare me this time for the interview.

4. Risks and benefits:

The risk of being participating in this study is very minimal, but only taking few minutes from your time. There would not be any direct payment for participating in this study. But

the findings from this research may reveal important information for the local health planners. The finding of this study will provide some contribution on increasing awareness about iodine content of salt at the household level and factors affecting the availability of adequately iodized salt with those whodidnotknow iodized salt previously.

5. Confidentiality:

The information you will provide us will be confidential and highly protected. There will be no information that will identify you in particular. The findings of the study will be general for the study community and will not reflect anything particular of individual persons or housing. The questionnaire will be coded to exclude showing names. No reference will be made in oral or written reports that could link participants to the research.

6. Rights:

Participation for this study is fully voluntary. You have the right to declare to participate or not in this study. If you decide to participate, you have the right to withdraw from the study at any time and this will not label you for any loss of benefits which you otherwise are entitled. You do not have to answer any question that you do not want to answer.

7. Contact address:

If there are any questions or enquires you may have about the study or the procedures, please contact: Mr. Abdurehman Aliyi; Phone Number: 090352060 and 097455950; Email address: abdurahmaanaliyyii2@gmail.com contact address of the responsible Institutional Research and Ethics Review Committee (RERC) office phone 0254115425, Dire Dawa, Ethiopia.

8. Declaration of informed voluntary consent:

I have read/ was read to me the participant information sheet. I have clearly understood the purpose of the research, the procedures, the risks and benefits, issues of confidentiality, the rights of participating and the contact address for any queries. I have been given the opportunity to ask questions for things that may have been unclear. I was informed that I have the right to withdraw from the study at any time or not to answer any question that I do not want. Therefore, I declare my voluntary consent to participate in this study with my initials (signature).

Name and signature of participant:_____ _____ Date _____

Name and signature of Data Collector:_____ _____ Date _____

ANNEX II: QUESTIONNAIRE ENGLISH VERSION

Questionnaires and checklists on the assessment availability of adequately Iodized salt at household level and factors associated with availability of adequately iodized salt,2022.

Part I. Socio-demographic characteristics of the household

S.no	Questions and filters	Response coding categorization	Skip
100	Area identification	1. Kebele_ 2. VillageName_ 3. codehousehold if any	
101	Sex of the respondent	1. Male_____ 2. Female___	
102	Age of respondents	1. _____years	
103	Marital status	(1) single (2) married (3) divorced (4) widowed (5) separated	
104	Ethnicity	(1) oromo (2) amara (3) Somali (4) tigre (5) Other	
105	Religion	(1) Muslim (2) Orthodox (3) Protestant (4) Catholic (5) Other	
106	Educational status	(1) cannot read and write (2) can read and write (3) grade 1-8 (4) grade 9-12 (5) above preparatory school	
107	Occupational status	(1) housewife (2) government employer (3) private employer (4) merchant (5) other	
108	Family size	_____in number	
109	Monthly household income	_____ ETB	

Table 2: Knowledge of respondents regarding the use of iodized salt

s.no	Questions and filters	Response coding categorization	Skip
201	Do you heard about iodized salt	1. Yes 2. No	If your answer is no go to 303
202	Information source about iodized salt	(1) From health workers (2) From radio (3) From their children (4) From neighbors	
203	Do you think consuming iodized salt important?	(1) Yes (2) No	If your answer is #2 go to 305
204	What do you think the importance of iodized salt(multiple answer possible)	1. To keep healthy 2. To prevent from goiter 3. Better than other 4. To grow well 5. I don't know	
205	Do you know any consequence if not using iodized salt?	1. Yes 2. No	If your answer is #2 go to 307
206	What do you think the cause of not consuming iodized salt	1. Cause goiter 2. Cause stillbirth 3. Cause mental retardation 4. I don't know	
207	Is every salt containing iodine	1. Yes 2. No	
208	Knowledge about iodized salt	1. Good 2. Poor	

Part 3: Availability and Practice of household Regarding the Use of Iodized Salt at Household Level

s. no	Questions and filters	Response coding categorization	Skip
301	Type of salt used	1. Packed(iodized) 2. Not packed(under iodized) 3. Rock salt	If you answer is #1 go to 303
302	What are the	1. expensive	

	reasons for not using iodized salt?	2. is too salty 3. not salty 4. Difficult to find 5. is too bitter 6. lack of awareness	
303	The place to buy salt	1. Open market 2. Retailers shop 3. Super market	
304	how much distance travel to get iodized salt?(single travel)	1. _____minutes	
305	Salt exposure to sunlight	1. Yes 2. No	
306	Washing of salt before use	1. Yes 2. No	
307	Salt storage place	1. Dry place 2. Not dry place	
308	Salt container	1. With cover 2. Without cover	
309	Duration of storage salt at the household level	1. ≤ 2 month 2. > 2 month	
310	Time salt is added during food cooking	1. At the early beginning of cooking 2. At the middle of cooking 3. At the end of cooking	
311	The iodine content of salt	1. ≥15ppm 2. <15ppm	

DABALATAI: GUCA WALIIGALTEE AFAAN OROMOON QOPHAAHE

DABALATA1: AF GAAFFII AFAAN OROMOON QOPHAA'E

Mata duree qoranno: qabiyyee iyodinii ashaboo nyaataafii kanneen isaan wal qabatan bulchinsa magalaa dirre dawaa keessatti A.L.I 2015

Galumsa:

Kab./obbo/aaddee akkam bultan/ooltan

Ani maqaan koo_____n jedhama.Ani qorannoo yunivarsiitii Dirre Dawaatti gaggeffamaa jiru tokkoof odeeffannoo walitti qabaa ta'een dalagaa jira. Yeroo ammaa kanattii af gaaffii namoota dursitootan maatii ta'aniin kan deebi'u qabiyyee iyoodinii ashaboo nyaataa keessatti argamuufii waantota isaan walqabatan irratti qopheessinee jirra. Gaaffilee deebisuuf namatti hin ulfaanne isin gaafachuuf jirra. Maqaan keessan waraqaa kana irratti hin galmeessiinu, akkasumas deebii isin nuuf laattan nama biraatti hin dabarsinu. Hirmaannaan keessan fedhii irratti kan hundaa'eefii gaaffii deebisuu hin barbaanne akka deebiftan hin dirqisiifamtan. Yoo isinitti toluudhaa baate yeroo barbaaddanitti gaaffiifi deebii kana adda kutuu dandeesu. Gaaffiif deebii kana itti fufuu dandeenyaa?

1. Eeyyee(eeyyee yoo jedhan galateeffadhuuti gaaffif deebiikee itti fufi)
2. Lakki(lakki yoo jedhan galata hin barbaachisu gara itti aanutti darbi)

Odeeffannoonkun qorannoo qabiyyee iyodiinii ashaboo nyaataa keessatti argamuufi waantota isaan walqabatanirratti irratti kan qophaa'edha. Qorannoon kun qorataa, namoota odeeffannoo walitti qaban saddeet fi suuppervisara lama of keessa qaba.

Barbaachisummaa qorannoo: qorannoon kun qabiyyee ayoodiinii ashaboo nyaataa keessatti argamuufii waantota isaan wal qabatan yoo ta'u barbaachisummaan isaas rakkina hirdhina ayoodiitii irratti poolisii haaraa ifa gochuufi furmaata kennuudha. Bu'aan qorannoo kana karaa ittii hirdhinni ayoodiinii hirdhachuu danda'u hojirraa oolchuufi hanga qabiyyee ayoodiini ashaboo nyaataa keessatti argamuu baruudha.

Adeemsaa

Qorannoon kun abbootii/haadhaa warraa gaaffif deebii kana irratti hirmaatan hunda of keessatti kan qabatudha. Isin qorannoo kana keessatti akka hirmaattan kan filatamtan akka carraa yoo ta'u fedha keessaan yoo ta'e nuwaliin akka turtan kabajaan isin gaafanna. Yoo qorannoo kana irratti hirmaachuuf fedha qabaattan baayyee gammannee barbaachisumma qorannoo kana erga isin hubachiifnee booda waliif mallatteessina.Dhuma irratti deebii keessan barbaachisoo ta'an akka

nuuf kennitan isin gaafanna. Waanti waadaa isiniif gallu maqaa keessan guca kana irratti hin galmeessinu akkasumas deeebii isin nuuf laatta nama biraatti dabarsinee hin himnu.

Miidhaafi faayidaa

Qoranna kana irratti hirmaachuu keessaniin yeroo daqiiqaa 20 isinirraa fudhachuu waan maluuf xiqqoo dadhabuu dandeessu garuu hirmaannaan keessan qorannoo qabiyyee iyoodiinii ashaboo nyaataa keessatti argamuufi waantota isaan wal qabatan irratti baayyee barbaachisaadha.Qorannoo kana irratti hirmaachuun miidhaas faayidaas hin qabaatu.

Nama quunnamtan

Qorannoon kun koree yuunivarsiitii Dirre Dawaatiin gamaggamamee/ilaallamee ragga'a. qorannoo kana irrattii gaaffii yoo qabaattan namoota armaan gadii yeroo barbaaddanitti quunnamuu dandeessu.

- Obbo Abdurehman Aliyi lakk. Bilbilaa 0901352060/0974551950
- Email: abdurahmaanaliyyii2@gmail.com
- Wiirtuu qorannoo/komitee lakk. 0254115425 yunivarsiitii Dirre Dawaa

Kutaa 3 guca walii galtee

Waa'ee qorannoo kana dhagaheen dhimmi isaa qabiyyee ayoodiinii ashaboo nyaataa fii waantota isaan waliin wal qabataan irratti akka dalagamu hubadheetiin jira.Qorannoo kana irrattii hirmaachuun feedhiidhaan akka ta'e hubadheen jira. Deebiin ani gaaffii kanaaf kenne nama biraattii dabarfamee akka hin kennamne waadaa naaf galamee jira. Akka walii galaatti qorannoo kana irrattii hirmaachuunkoo faayidaas miidhaas akka hin qabne ifa naaf ta'eera.

Mallattoo hirmaataa_____

Yoo fedha hin qabaanne gara nama itti aanuutti darbi

Guyyaa gaaffif deebii_____sa'aa itti eegale_____sa'aaa itti xumurame_____

Maqaa gaggeessaa_____guyyaaa_____ mallattoo_____

Maqaaa suppervaayizeraa_____guyyaaa_____ mallattoo_____

DABALATAII.: AF GAAFFII AFAAN OROOMOON QOPHAA'E

Af gaaffii qabiyyee ayoodiinii ashaboo nyaataa fii waantota isaan wal qabatan bulchinsa magaalaa Dirre Dawaa irratti qophaa'e

Kutaa1 gaaffilee hawaasumma (bu'urummaa) ilaallatan.

Tar lakk	Gaaffilee	Deebii	Irra darbi
100	Bakka argamaa	1. Ganda _____ 2. Maqaa naannoo_____ 3. Maqaaadda_____yoo qabaate	
101	Saala	1. Dhiira 2. Dhalaa	
102	Umurii abba warraa/ haadha warra	_____waggaa	
103	Haalaa gaa'ilaa	1. Kan hin fuunee/heerumne 2. Kan heerume/fuudhe 3. Kan seeran wal hiikan 4. Kan du'aan dhabe/de 5. Kan lolaan adda bahan	
104	Saba	1. Oromoo 2. Amaaraa 3. Somaalee 4. Tigiree 5. Guraagee 6. Kan bira_____ibsi	
105	Amantii	1. Muusilima 2. Ortodoksii 3. Pirootestaantii 4. Kaatolikii 5. Kan biraa _____ibsi	
106	Haala barnootaa	1. Barreessufii dubbisuu hin danda'u 2. Barreessuufi dubbisuu nan danda'a 3. Kutaa 1-8 4. Kutaa 9-12 5. Qophaa'inaa ol	
107	Gosa hojii	1. Haadha warraa 2. Hojjetaa mootumma 3. Hojii dhuunfaa 4. Daldalaa 5. Kan biraa_____ibsi	
108	Baay'ina maatii	_____	
109	Galii maatii ji'atti	_____birr	

Kutaa 2: beekumsa hirmaattotaa qabiyyee ayodiinii ashaboo nyaataa kessatti

Tar. Lakk.	Gaaffii	Deebii	Irra cehi
201	Waa'ee ayoodiinii dhageessee beektaa?	1. Eeyyee 2. Lakki	Yoo deebiinke lakki ta'e gara 303 deemi
202	Yoo dhageesse maalirraa dhageesse?	1. Hojjeettota fayyaa 2. Raadiyoonii 3. Ijoollee kiyyarraa 4. Olla iraa	
203	Ashaboon nyaataa ayoodiini qabu faayidaa qaba jettee yaaddaa?	1. Eeyyee 2. Lakki	Yoo deebiinke 2 ta'e gara 305 deemi
204	Faayidaan ayoodiinii ashaboo nyaataa keessaa mal jettee yaadda?	1. Fayyinaaf 2. Ucuba irraa nama ittisa 3. Namoota biro caaluuf 4. Seeraan guddachuuf 5. Hin beeku	
205	Ashaboo nyaataa ayoodiinii hin qabne soorachuun miidhaa qaba jettee yaaddaa?	1. Eeyyee 2. Lakki	Yoo deebiinkee 2 ta'e gara 307 deemi
206	Miidhaan ashaboo nyaata ayodiinii hin qabnee nyaachuu maal sitti fakkata?	1. Ucuba namatti fida 2. Ulfa hadholii irraa baasa 3. Rakkoo sammuu fida 4. Hin beeku	
207	Ashaboon nyaataa hunduu ayoodiinii qaba jettee yaaddaa	1. Eeyyee 2. Lakki	
208	Beekumsa ayoodiinii ashaboo nyaata irratti qabu/du	1. Gaarii 2. Gadi bu'aa	

Kutaa3: argaminsaafii fayyadama ashaboo nyaataa ayoodiinii qabuu

Tar.lakk	Gaaffii	Deebii	Irra darbi
301	Gosa ashaboo nyaataa	1. Kan saamsame 2. Kan hin saamsamiin 3. Ashaboo amoolee	
302	Sababiin isin ashaboo ayoodinii hin qabne fayyadamtan maali?	1. Qaalii waan ta'eef 2. Gar malee waan ashabawuuf 3. Ashaboo ashaboo	

		waan hin jennef 4. Waan hin argamneef 5. Waan hadhaawuuf 6. Faayidasaa waan hin beekneef	
303	Fageenya hangamii deemtanii ashaboo argattu	_____daqiiqaa	
304	Bakka ashaboon nyaataa bitamu	1. Gabaa daandiirraa 2. Suuqii	
305	Ashaboon aduuf saaxilamaadhaa?	1. Eeyyee 2. Lakki	
306	Ashaboo nyaataa osoon fayyadamiin dura ni dhiqxuu?	1. Eeyyee 2. Lakki	
307	Bakka ashaboon itti kuufamu	1. Bakka jiidhinsa hin qabne 2. Bakka jiidhinsa qabu	
308	Qabiyyee ashaboo nyaataa	1. Aguuggaa kan qabu 2. Kan aguuggaa hin qabne	
309	Hanga ashaboon nyaata mana keessa turuu danda'u	1. ≤ ji'a 2 2. > ji'a 2	
310	Yeroo ashaboon nyaataa ittootti dabalamu	1. Jalqaba yeroo ittoon dalagamu 2. Gidduu yeroo ittoon dalagamu 3. Dhumarratti erga ittoon bilchaatee	
311	Qabiyyee ayoodiinii ashaboo nyaataa	1. ≤ 15ppm 2. > 15ppm	

LIFAAQA I: XAASHA MACLUUMAADKA KU JIRA AFKA SOMALI

Cinwaanka Mashruuca Cilmi Baadhista : Waxyaabaha ay ku jirto maadada iodine ee cusbada heer qoys iyo arrimo la xidhiidha maamulka magaalada Dire Dawa , bariga Itoobiya, 2022

Hordhac

Marwo / mudane qaali subax / galab wanaagsan

Magacaygu waa _____ Waxaan u shaqeeyaa sidii xog ururin mashruuc mashruuc cilmi baaris ah, oo ay fuliso Jaamacadda Dire Dawa . Waxaan wareysaneynaa shaqsiyaadka qaangaarka ah ee sida saxda ah u fahmi kara su'aalaheena ku saabsan maadada odine ee cusbada dukaanka tafaariiqleyda iyo waxyaabaha la xiriira .Waxaan ku weydiinayaa su'aalo aan dhib badnayn in laga jawaabo.Magacaaga looma qori doono foomkan waligiisna looma adeegsan doono wixii macluumaad ah ee aad noo sheegto.Dhammaan macluumaadka aad bixiso waa qarsoodi. Kaqeybgalkaagu waa ikhtiyaari oo waajib kuguma aha inaad ka jawaabto su'aal kasta oo aadan rabin inaad ka jawaabto. Haddii aad ku buuxiso raaxo-darrida tan, fadlan si xor ah u dhig waqtiga aad rabto.Tani waxay qaadan doontaa qiyaastii 15-20 daqiiqo.Ma heli karaa ogolaanshahaaga inaan sii wado?

1. Haa, (haddii haa dhahdo mahadsanid kuna sii wad iyada)
2. Maya, (haddii aad dhahdo mahadsanid oo ka bood)

Xaashidan macluumaadka iyo foomka oggolaanshaha waxaa loo diyaariyey iyada oo looga dan leeyahay in lagu qiimeeyo maadadda odinka ee cusbada ku jirta heerka qoysaska iyo arrimaha la xiriira. Kooxda cilmi-baarista waxaa ka mid ah baaraha guud, sideed xog-ururiyayaal xog ursan, iyo laba kormeere

Ujeedada Mashruuca Cilmi-baarista

Daraasaddan ayaa ujeedadeedu tahay in lagu qiimeeyo maadada odine ee cusbada ku jirta heerka qoyska iyo arrimaha la xiriira kuwaas oo muhiim u ah dejinta siyaasad ka hortag oo wanaagsan iyo tallaabooyin wax ka qabasho ah. Natiijooyinka daraasaddan waxaa loo isticmaali doonaa in lagu qorsheeyo barnaamijyo wax-ka-qabad ku habboon si wax looga qabto isticmaalka hooseeya ee cusbada iodized.

Nidaamka

Daraasadani waxay ku lug leedahay dhammaan qoysaska bixin kara macluumaad buuxa oo ku saabsan su'aalaha la diyaariyey. Adiga ayaa si aan kala sooc lahayn looguu doortay inaad ka mid

noqotid kaqeybgalayaasha daraasadda haddii aad diyaar u tahay inaad kaqeybqaadato daraasaddan waxaanan si naxariis leh kuugu martiqaadeynaa inaad kaqeybqaadato mashruucan.Haddii aad diyaar u tahay inaad kaqeybqaadato, waan ku faraxsanahay waxaanan u baahan nahay inaad si cad u fahamto ujeeddada daraasaddan iyo inaad saxiixdo foomka oggolaanshaha.Ugu dambeyntii, waxaa si naxariis leh lagaa codsaday inaad jawaab dhab ah ka bixiso su'aalaha wareysiga.Uma baahnid inaad u sheegto magacaaga xog aruuriyaha dhammaan jawaabahaaga natiijooyinka aad heshayna waxaa loo xafidi doonaa si qarsoodi ah iyadoo la adeegsanayo nidaam koodh oo aan cidina heli doonin jawaabahaaga.

Faa'iidooyinka, Khatarta iyo / ama Raaxada

Markaad kaqeybqaadato mashruucan cilmi baarista waxaad dareemi doontaa xoogaa raaxo daro ah inaad waqtigaaga ku lumiso (ugu badnaan 20daqiiqo).Si kastaba ha noqotee, kaqeybgalkaagu wuxuu muhiim u yahay heerka maadada odine ee cusbada heerka qoyska iyo arrimaha laxiriira dejinta istiraatiijiyad kahortag habboon oo lagu xoojinayo iodization-ka milixda guud.Ma jiraan wax khatar ah ama faa'iido toos ah oo kaqeybgalka mashruucan cilmi baarista ah.

Dhiirrigelin / Lacag bixinno loogu talagalay kaqeybqaadashada

Ma lagu siin doono wax dhiirigelin ah ama lacag bixin ah oo aad uga qayb qaadato mashruucan.

Qarsoodi

Macluumaadka lagaa soo aruuriyay waxaa lagu ilaalin doonaa qarsoodi waxaana lagu kaydin doonaa feyl, magacaaga la'aanteed adoo u yeelaya lambar lambar.Mana loo sheegi doono cidna marka laga reebo baaraha guud oo waxaa lagu xirayaa fure.

Xaqa Diidmada ama Ka Noqoshada

Waxaad xaq u leedahay inaad diido kaqeybqaadashada cilmi baaristaan.Waxaad sidoo kale xaq u leedahay inaad ka baxdo daraasaddan waqti kasta oo aad rabto.

Qofka lala xiriirayo

Mashruucan cilmi baarista ah waxaa dib u eegi doona oo ansixin doona guddiga anshaxa ee Jaamacadda Dire Dawa .Haddii aad qabtid wax su'aalo ah waxaad la xiriiri kartaa mid ka mid ah shaqsiyaadka soo socda waxaadna weydiin kartaa waqti kasta oo aad rabto.

- Mudane Abdurehman Aliyi ; Lambarka taleefanka: 0901352060;
    - Cinwaanka emaylka: abdurahmaanaliyyii2@gmail.com iyo
- Institutional Research iyo Guddiga Dib u Eegista Anshaxa (RERC)

Xafiiska taleefanka 0254115425, Jaamacadda Dire Dawa , Kuliyadda caafimaadka iyo sayniska caafimaadka, Itoobiya.

LIFAAQA II. FOOMKA ASSENT

Waxaa la igu wargaliyay in ujeedada daraasaddan ay tahay in la qiimeeyo jiritaanka cusbada iodized-ka ah iyo arrimaha la xiriira ee heer qoys.Waxaan fahansanahay in kaqeybgalka daraasaddan ay tahay mid iskaa ah. Waxaa la ii sheegay in jawaabahayga su'aalaha aan la siin doonin qof kale, mana jiraan warbixino daraasaddan ku saabsan oo si walboo ii aqoonsan kara. Sidoo kale waxaa la igu wargaliyay in kaqeybgalkeyga ama kaqeybgalkiisa ama diidmada ah inaan ka jawaabo su'aalaha aysan aniga saameyn doonin. Waxaan fahansanahay in kaqeybgalka daraasaddan aysan kujirin khatar

Saxeexa Jawaab celiyaha_____

Hadday maya tahay, u gudub ka qaybgalayaasha xiga

Taariikhda wareysiga: _____ Waqtiga uu bilaabmay: _____ Waqtiga la dhammeeyay: _____

Magaca Wareystaha_____ Saxeexa_____

Taariikhda_____

Magaca kormeeraha _____ saxiixa _____

LIFAAQA III: QUESTIONNAIRE AF SOMALI VERSION

Su'aalo-waydiimaha iyo liisaska hubinta ee ku saabsan maadadda odine ee cusbada heerka qoyska iyo arrimaha la xiriira

Qaybta I. Astaamaha dhaqan-bulsho ee qoyska

S.no	Su'aalaha iyo miirayaasha	Kala soocista summada summada	kabood
100	Aqoonsiga aagga	1. Kebele _____ 2. Magaca Tuulada_____ 3. code guri _ hadday jirto	
101	Galmada jawaabta	1. Lab _____ 2. Dheddig _____	
103	Kooxaha da'da	_____	
104	Xaaladda guurka	1. hal 2. guursaday 3. la furay 4. carmal	
105	Qowmiyadda	1. oromo 2. amxaara 3. Soomaali 4. Tigree 5. Gurage 6. Kale	
106	Diinta	1. Muslim 2. Orthodox	

		3. Protestant 4. Kaatolig 5. Kale	
107	Xaaladda waxbarasho	1. ma aqrin karo waxna ma qori karo 2. waxna qori kara waxna qori kara 3. fasalka 1-8 4. fasalka 9-12 5. dugsiga sare	
108	Xaaladda shaqada	1. marwada guriga 2. loo shaqeeyaha dawlada 3. loo shaqeeye gaar loo leeyahay 4. ganacsade	
109	Tirada qoyska	_____	
110	Dakhliga qoyska bishii	_____EBR	

Jadwalka 2: Aqoonta jawaabeyaasha ee la xiriira isticmaalka milixda iodized

s.no	Su'aalaha iyo miirayaasha	Kala soocista summada summada	Ka bood
201	Miyaad ka maqashay cusbada iodized	1. Haa 2. Maya	Hadday jawaabtaadu tahay maya tag 303
202	Isha macluumaadka ee ku saabsan cusbada iodized	1. Ka yimid shaqaalaha 2. caafimaadka 3. Ka yimid raadiyaha 4. Laga soo bilaabo 5. carruurtooda 6. Ka yimid deriska	

203	Miyaad u maleyneysaa in cunitaanka cusbada iodized ay muhiim tahay?	1. Haa 2. Maya	Haddii yor jawaabta waa # 2 tag 305
204	Maxaad u maleyneysaa muhiimadda milixda iodized	1. Inuu caafimaad qabo 2. Si looga hortago goit 3. Ka wanaagsan kuwa kale 4. Si aad si fiican ugu koraan 5. Ma aqaan	
205	Ma ogtahay wax cawaaqib ah haddii aadan isticmaalin cusbada iodized?	1. Haa 2. Maya	Haddii jawaabtaadu tahay # 2 tag 307
206	Maxaad u maleyneysaa sababta keentay cunista milixda iodized	1. Sababta goiter 2. Sababta umusha 3. Sababta dib u dhac 4. maskaxeed 5. Ma aqaan	
207	Ma yahay cusbo kasta oo ay ku jirto iodine	1. Haa 2. Maya	
208	Aqoonta ku saabsan cusbada iodized	1. Wanaagsan 2. Miskiin	

Qeybta 3: Availabili ty iyo Ku-dhaqanka reerka ee ku saabsan Adeegsiga Cusbada Iodized ee Heerka Qoyska

s. maya	Su'aalaha iyo miirayaasha	Kala soocista summada summada	Ka bood
301	Nooca cusbada la isticmaalay	1. Xirmo (iodized) 2. Ma jiro wax la buuxiyo (ka hooseeya iodized) 3. Milix dhagax ah	Hadaad jawaabto waa # 1 gooto 203

302	Maxay yihiin sababaha aan loo isticmaalin cusbada iodized?	1. qaali ah 2. waa cusbo badan 3. aan cusbo lahayn 4. Way adagtahay in la helo 5. waa qadhaadh 6. wacyigelin la'aan	
303	Meesha laga iibsado cusbada	1. Suuqa furan 2. Dukaamada dukaamada 3. Suuq weyn	
304	Immisa masaafad ah ayaa loo socdaa si loo helo cusbo iodized ah (hal safar)	_____daqiiqo	
305	Soo-gaadhista milix ee iftiinka qoraxda	1. Haa 2. Maya	
306	Dhaqida milixda kahor intaadan isticmaalin	1. Haa 2. Maya	
307	Meel cusbo lagu keydiyo	1. Meel qalalan 2. Meel qalalan maahan	
308	Weelka cusbada	1. Iyada oo dabool leh 2. Dabool la'aan	
309	Muddada milixda lagu keydiyo heer qoys	1. ≤ 2 bilood 2. > 2 bil	
310	Waqti cusbo ayaa lagu daraa inta cuntada la karinayo	1. Bilowga hore ee karinta 2. Qeybta dhexe ee karinta 3. Dhamaadka karinta	
311	Maaddada iodine ee cusbada ku jirta	1. ≤15 ppm 2. > 15 ppm	

Dire Dawa University

School of Graduate Studies

PG Thesis Approval Form

Student Particulars

Name of the student Abdurehman Aliyi Abdukerim ID No DDU1300044

Year of admission II Semester of admissionII

Type of Admission Weekend

Institute/College of Medicines and Health Sciences Department Public Health

Level of Study MPH

Specialization Nutrition

Research Title Availability of adequately Iodized salt at household level and factors affecting its availability in rural kebeles dire dawa administration, Eastern Ethiopia, 2022

Thesis Cr hr.-6

As a members of thesis /Project proposal defense evaluation team, I certify that I read and this proposal and examined the student during proposal defense. I recommend this proposal to be submitted to RERC.

_____ _____ _____

Evaluator Signature Date (dd/mm/yy)

As Thesis advisors, I hereby certify that I have read and evaluated this research proposal

_____ _____ _____

Major Advisor Signature Date (dd/mm/yy)

_____ _____ _____

Co-advisor Signature Date (dd/mm/yy)

Officials use (signature and date with stamp)

Department head _____

SGS coordinator_____

College Dean _____

Declaration

I hereby declare that this MPH thesis is my original work and has not been presented for a degree in any other university and all sources of material used for this thesis have been duly acknowledged. Name: _____

Signature:_____

Date:_____

Annex 10:

Examiner's Approval Sheet

Dire Dawa University

College of Medicine and Health Sciences

Examiners' Approval Sheet

We, the undersigned, members of the Board of Examiners of the final open defense by "_____" have read and evaluated his/her thesis "_____" and evaluated the candidate. This is therefore to certify that the thesis has been accepted in partial fulfillment of the requirements for the MPH Degree in _____.

_____ _____ _____ Name of Chairperson Signature Date _____ _____ _____ Name of Internal Examiner Signature Date _____ _____ _____ Name of External Examiner Signature Date

Final approval and acceptance of the thesis is contingent upon the submission of the final copy of the thesis to the candidate's Department through the office of the Graduate Program Coordinator.

Thesis Approved by

_____ _____ _____ Graduate Program Coordinator Signature Date

Certification of the Final Thesis

I hereby certify that all the corrections and recommendations suggested by the Board of Examiners are incorporated into the final thesis entitled "_____" by _____.

_____ _____ _____ School Head Signature Date