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Addis Ababa University

ADDIS ABABA UNIVERSITY

COLLEGE OF NATURAL SCIENCE

CENTER FOR FOOD SCIENCE AND NUTRITION

IODINE STATUS AND ITS DETERMINANTS AMONG SCHOOL AGE CHILDREN IN KINDO DIDAYE DISTRICT OF WOLAITA ZONE, SOUTHERN ETHIOPIA

BY: ALEMITU TOMA

A THESIS SUBMITTED TO THE CENTER FOR FOOD SCIENCE AND NUTRITION COLLEGE OF NATURAL SCIENCE OF ADDISABABA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERIN FOOD SCIENCE AND NUTRITION

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Advisor's Approval Sheet

This is to certify that the thesis entitled "Iodine Status in School Age Children and Its Determinants in KindoDidaye District, Wolaita Zone, Southern Ethiopia" submitted in partial fulfillment for the requirements of a M.Sc. degree in Food Science and Nutrition, to the Center for Food Science and Nutrition Graduate program, College of Natural Science, is a record of original research carried out by AlemituToma, Id. No GSR1455/05, under my supervision, and no part of the thesis has been submitted for any other degree or diploma.

The assistance and help received during the course of this investigation have been duly acknowledged.

Therefore I recommend that it be accepted as fulfilling the thesis requirements.

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Examiners' Approval Sheet

We, the undersigned, members of the Board of Examiners of the final open defense by AlemituToma have read and evaluated her thesis entitled "Iodine Status in School Age Children and Its Determinants in KindoDidaye District, Wolaita Zone, Southern Ethiopia", and examined the candidate. This is therefore to certify that the thesis has been accepted in partial fulfillment of the requirements for the degree of master in Food Science and Nutrition.

Name of external examiner _____ Signature _____Date _____

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Name of chairperson _____ 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 Department Graduate Program Coordinator.

_____ _____ _____

Graduate Program Coordinator Signature Date

I hereby certify that all the corrections and recommendations suggested by the Board of Examiners are incorporated into the final Thesis entitled "Iodine Status in School Age Children and Its Determinants in KindoDidaye District, Wolaita Zone, Southern Ethiopia" by AlemituToma.

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Abbreviation

CSA: Central Statistical Agency

DALY: Disability Adjusted Life Time

EDHS: Ethiopian Demographics and Health Survey

EPHI: Ethiopian Public Health Institute

FMoH: Federal Ministry of Health

ICCIDD: International Council for the Control of Iodine Deficiency Disease

IDD: Iodine Deficiency Disorder

IQ: Intellectual Quotient

K/Didaye: Kindo Didaye

Kg: Kilogram

MOH: Ministry of Health

PPM: Parts Per Million

RTK: Rapid test kits

PPS: Probability Propositional to Size

SAC: School Age Children

SNNPR: Southern Nation Nationalities and Peoples Region

SPSS: Statistical Package for Social Sciences

T3: Triiodothyronine

T4: Thyroxine

TGR: Total Goiter Rate

TSH: Thyroid Stimulating Hormone

UIC: Urinary Iodine Concentration

UNICEF: United Nations International Children's Education Fund

US: United State

USI: Universal Salt Iodization

WHA: World Health Assembly

WHO: World Health Organization

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Abstract

Iodine deficiency is public health problem in the world especially in developing countries. The main aim of this study was to assess iodine status in school children aged between 6-12 years and its determinant factors. Cross sectional study design was conducted in Kindo Didaye district on March 2014. Two stage cluster sampling technique was used to select study participants. One hundred twenty one children and their corresponding mothers/caregivers were involved in study. Socio demographic and economic characteristics, mothers/caregivers knowledge about iodized salt and food habits of children were assessed through a face-to-face interview technique.Spot urine sample was taken to measure urinary iodine concentration using ammonium persulfate (method A), physical examination of goiter was made as per the criteria of WHO/UNICEF/ICCIDD and salt samples were collected to assess iodine content by rapid test kits. Descriptive (frequency and percent) and inferential analysis (binary and multiple variable logistic regression and independent sample Ttest) were performed to analyze data. Total goiter rate and median urinary iodine concentration (UIC) of children was 38% and 51.2ug/l respectively. Only 30% of households use iodized salt. Asbinary logistic regression analysis indicated gender, salt iodine content, place of purchase salt and cassava consumption were associated with goiter rat. In multiple variable logistic regression analysis being male had lower risk of goiter (odds ratio(OR) of 0.284(0.113,0.712) at 95% confidence interval than female. Children consuming salt with iodine content of <15ppm were (OR 3.58 (1.261,10.164)) more likely to develop goiter than that of >15ppm. Source of purchase salt from shop were (OR of 0.311(0.1,0.962) less likely to had goiter when compared with retail salt from open market. The results of goiter rate and UIC obviously indicate that the problem of iodine deficiency was severe in study area. The observed degree of goiter rate and urinary iodine concentration in children and available quantity of iodized salt in K/Didaye district needs urgent action to combat iodine deficiency.

KEYWORDS: Iodine deficiency, goiter, school age children, K/Didaye district.

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CHAPTER I

1. INTRODUCTION

1.1. Background

Although a person requires only one teaspoon full of iodine in a life time [1], more than two billion individuals worldwide live in areas of iodine deficiency and the adverse consequences of iodine deficiency are widely observed [2, 3]. Iodine is one of the essential micronutrients required for the normal mental and physical wellbeing of human [4]. It is a critical component of thyroid hormones, which are necessary for controlling metabolic rate, growth, and development of body structures, as well as neuronal function and development [2]. Iodine deficiency is the single most common preventable cause of mental retardation and brain damage in the world [6-10]. It mainly caused by low iodine content in the diet arising from low iodine levels in the soil, water and crops [15, 16]. All the adverse effects caused by iodine deficiency are collectively called iodine deficiency disorders (IDD) [15, 17]. These disorders include stillbirth, miscarriage, endemic cretinism, goiter, mental retardation and hypothyroidism [9, 10, 15, 18-24]. Goiter is a sign of iodine deficiency in human, which can be detected easily. In areas of severe iodine deficiency the majority of the community has goiter [13, 23, 25].

One third of the world's population [26, 27] and 29.8% (241 million) of school age children still remain at risk for inadequate iodine nutrition. Sharp regional differences persist; southeast Asia has the largest number of school age children (SAC) with low iodine intakes (76 million) and in Africa, where 39% (58 million) has inadequate iodine intakes[28]. Assessment of iodine status of school age children in Ethiopia revealed a worse scenario; more than 4 million children (39.9%) have goiter. The reported median urinary iodine concentration for school age children is 24.5µg/L indicating moderate iodine deficiency for a national sample. The Southern Nation Nationalities

Peoples Region has the highest goiter rates in the country both in school age children (56.4 %) and women of reproductive age (59.9 %) [29] .Yet the goiter status in K/Didaye district (one of the district in Wolaita zone, Southern Nation Nationalities Peoples Region) is not studied. Therefore;in this study iodine status and its determinants will be studied.

1.2. Statement of the Problem

Ethiopia is a country that accounts highestIDD with (39.9%of goiter among school age children, one out of every 1000 people is affected by cretinism and about 50,000 prenatal deaths occur yearly) as studies shown. The education potential of the nation is unattained as iodine deficiency may cause an intelligence quotient reduction of 13.5 points. This problem has been estimated at nearly US$ 1 billion loss over the 2000–2005.Even though variation of goiter rate occur among regions; in SNNPR the problem accounts to 56% in school age children [25, 33]. Despite the fact that highest amounts of goiter in SNNPR among school age children when compared to other region in Ethiopia, very little has been given in terms of intervention activities and etiological investigation. According to ICCIDD a total goiter rate of 5%, in primary school children (6-12 years) is an indicative of a public health risk of adverse functional consequences and need to be addressed.

K/Didaye is one of the districts in Wolaita zone, SNNPR, where no information on iodine status, factors affecting iodine status and coverage of iodized salt consumption in household. Hence the present investigation was planned with the following objectives, to assess the iodine status with its determinants and coverage of household iodized salt in view of putting the information that the K/Didaye district is lacking.

1.3. Objectives

1.3.1. General objective

To assess iodine status and associated factors among school age children 6-12 years in K/Didaye district of Wolaita zone, Southern Ethiopia.

1.3.2. Specific objectives

1. To determine iodine status of school age children 6-12 years in study area.
2. To determine factors affecting iodine status of school age children 6-12 years.
3. To assess households iodized salt coverage in the district.
4. To assess the knowledge of iodized salt among the mothers/caregivers of the study participants.

1.4. Research hypotheses

1. Gender is associated with iodine status in school children aged 6-12, in K/Didaye district, Wolaita Zone, Southern Ethiopia.
2. Salt iodine content is associated with iodine status in school children aged 6-12, in K/Didaye district, Wolaita Zone, Southern Ethiopia.
3. Consumption of goitergenic foods is associated with iodine status in school children aged 6-12, in K/Didaye district, Wolaita Zone, Southern Ethiopia.

1.5. Significance of the Study

The main focus of the this study was to assess iodine status and its determinants among school age children in K/Didaye District of Wolaita zone, Southern Ethiopia.

Few studies have been done on status of iodine and its determinants among school age children 6-12 years in Ethiopia in general and no study in K/Didaye district particularly. Hence this study will be valuable to other researchers' as base line information.

This study will be useful to health workers and nutritionists to give over view of the community iodine status of school children. The findings of this study will be also useful to District health development army which plan promotional and educational programmes on iodine nutrition in K/Didaye district.

Based on this study finding; interventions for elimination of iodine deficiency disorder will be easy to design intervention in the district. Finally this study will contribute to create awareness on the iodine status of school children and factors affecting.

CHAPTER II

2. REVIEW LITERATURE

2.1. Iodine deficiency

In the world, there are almost no developing countries where iodine deficiency was not a public health problem [17, 34]. 38% (2.2 billion) of the world population [2, 3] and 266 million school-aged children live in areas with iodine deficiency are prevalent [35] . In developing countries 750 million populations are live with iodine deficiency [2, 3]. At least 350 million Africans are at risk of iodine deficiency [36]. In Ethiopia more than 35 million people are at risk of iodine deficiency [37].

The global prevalence in school age children (SAC) of low iodine intakes has fallen over the past 8 year from 36.5% (285 million) in 2003 to 31.5% (266 million) in 2007 and to 29.8% (241 million) in 2011. Of these recent (241 million), 5.2% (95% CI = 5.0, 5.3%) have iodine intakes that are severely deficient (UIC, 20 mg/L), 8.1% (95% CI = 7.9, 8.4) have iodine intakes that are moderately deficient (UIC 20–49 mg/L), and 15.9% (95% CI = 15.6, 16.2) have mildly deficient intakes (50–99 mg/L). Over one-half of the children with low intakes are in 2 regions: 76 million children in Southeast Asia and 58 million children in Africa. From 10 top iodine-deficient countries in 2011(based on a national median UIC ,100 mg/L) Ethiopia accounts for the greatest number of SAC with insufficient iodine intakes [26].

Iodine deficiency in school age children may also result in learning disabilities and a reduced achievement [15, 38]**.** Even mild to moderate iodine deficiency has been shown to cause abnormalities in psychomotor and intellectual development in children [6, 15]. About 38 million newborns in developing countries every year remain unprotected from the lifelong consequences of brain damage associated with iodine deficiency disorders [34, 35, 39]. In Sudan, about 1 million

newborns yearly (91% of all newborns) are not protected against brain damage [40]. In Ghana, it is estimated that 120,000 children borneach year are at risk of intellectual impairment because of iodine deficiency [38].

The World Health Organization (WHO) recommended intake (population requirement) of iodine is 150 μg/day for adults and adolescents 13 years of age and older, 200 μg/day for women during pregnancy and lactation, 120 μg/day for children 6–12 years of age, and 90 μg/day for children 0–59 months of age [2, 8]. Deficiency in the intake or absorption of iodine has serious consequences on mental, health and physical functions. Iodine deficiency affects different parts of body such as muscle, heart, river, kidney, and the developing brain and nervous system. The spectrum of iodine deficiency extended to be a cause for discrimination in marriage, schooling and public gatherings [18, 41].

Although the most visible indications of iodine deficiency are goiter and cretinism, many more people are afflicted with less severe deficits that are not obvious clinically and not easy to measure.

2.2. Iodine deficiency disorder

All adverse consequences of iodine deficiency are collectively known as IDD. Around the world every year, 40 million newborns are not yet protected against IDD [26]. Sixty million people are at risk of iodine deficiency disorders in the African continent alone, thirty million have goiter and 0.5 million suffer from overt cretinism [25]. The risk of IDD in the WHO regions was 181 million in Africa, 168 in America, 173 in Eastern Mediterranean, 141 in Europe, 486 Southeast Asia and 423 in Western Pacific [32]. In India an estimated 350 million people are at risk of IDD as they consume salt with inadequate iodine. Every year nine million pregnant women and eight million newborns are at risk of IDD in India [36]. The South Asia region, with 18 million infants born at

risk of IDD every year, carries the highest burden [34]**.**An estimated twenty-eight million Ethiopians suffer from IDD [42].

The most visible expression of iodine deficiency is goiter. Globally, the TGP in the general population is estimated to be 15.8%, ranging from 4.7% in the Americas to 28.3% in Africa [28]. In Sudan goiter prevalence is 22%, which leads to a reduction of up to 25% in the productivity of the affected people [40]. The overall national weighted of TGR in Ethiopia was 39.9% (more than four million) school age children estimated to have goiter. The highest total goiter rates 56.2% in school age children was found in SNNPR followed by 42% in Oromia, 40.5% in Benshangul-Gumuz and 29.1% in Amhara region. Similarly for the same regions, including Tigray the magnitude of the total goiter rate is greater than 30% in mothers of the children. In the rest of the regional states except Harari total goiter rates were greater than 5% both for children and mothers [20, 25, 33]

Table 1: The spectrum of IDD

Fetus	Miscarriage Stillbirths Congenital anomalies Increased perinatal morbidity and mortality Endemic cretinism
Neonate	Neonatal goiter Neonatal hypothyroidism Endemic mental retardation Increased susceptibility of the thyroid gland to nuclear radiation
Child and adolescent	Goiter (Subclinical) hypothyroidism Impaired mental function Retarded physical development Increased susceptibility of the thyroid gland to nuclear radiation
Adult	Goiter with its complications Hypothyroidism Impaired mental function Spontaneous hyperthyroidism in the elderly Iodine-induced hyperthyroidism Increased susceptibility of the thyroid gland to nuclear radiation

Source: [14, 16, 18, 21, 30, 36].

2.3. Assessment of Iodine Nutrition

Several methods for assessment of iodine status are available. The most common indicators used are UIC and goiter rate. TSH is used as a test for detecting congenital hypothyroidism in neonates [17]. Serum T3, T4 and TSH levels are only variable in severe cases but do not properly reflect present iodine status, in contrast to the urinary iodine [43].

2.4. Urinary Iodine Concentration

Urinary iodine concentration is the most feasible indicator that can be used; however it indicates only current iodine status. Urinary iodine concentrations can help recognize excess as well as deficient iodine intake[17]. Eighty five to ninety percent of excess iodine is excreted in the urine [44] . Casual urine samples from a representative fraction of the population provide accurate information on the status of iodine nutrition a population [45].

WHO/ICCIDD/UNICEF have set interpretation criteria for urinary iodine. A median urinary iodine value of 100ug/l shows optimal iodine nutrition. A value between 50-99ug/l indicates mild-iodine deficiency , 20-49 ug/l indicates moderate iodine deficiency , while urinary iodine value less than 20ug/l indicates severe iodine deficiency[17].

2.5. Thyroid Size

The thyroid size is also another indicator of iodine deficiency. Thyroid size can be measured by palpation or ultrasound and is the most easily detected sign of deficiency [43]. The prevalence of goiter reflects a population's history of iodine nutrition but does not properly reflect its present iodine status. According to the criteria set by WHO/ICCIDD/UNICEF, thyroid size by palpation can be classified into three grades. Grade 0 indicates no palpable goiter or visible goiter. Grede 1 indicates palpable but not visible goiter when neck is normal position. Grade 2 indicates a clearly visible goiter[17]. Determination of thyroid size by palpation is less reliable in cases of mild iodine deficiency where prevalence of visible goiter is low [46].

2.6. Factors affecting iodine status

2.6.1. Iodized salt

One third of the world's population [27] and 29.8% (95% CI = 29.4, 30.1) SAC (241 million) still remains at risk for inadequate iodine nutrition. Sharp regional differences persist; southeast Asia has the largest number of SAC with low iodine intakes (76 million) and in Africa, where 39% (58 million) have inadequate iodine intakes [28]. WHO estimates that 54 countries out of 126 still have inadequate iodine nutrition and 23 million babies each year globally are still born with inadequate iodine nutrition mostly in the poorest and economically least developed areas [27]. Ahmed and his colleagues study in India indicated that 42% household salt samples were having iodine content less than 15 ppm, so they are at risk of developing IDD & around 4% households sample that contain no iodine are highly susceptible to IDD [47].

According to the Ethiopian Demographic and Health Survey in 2011 (EDHS), only 15.4 percent of the households were using iodized salt [48] also study on neighbouring country reported that less than 20% of coverage in Ethiopia household [42]. As national study of Ethiopia shows only sixteen percent of children live in households that use iodized salt. The percentage is higher in urban areas than in rural areas (24 percent compared with 14 percent) [48]. One of study done on Jimma to determine the prevalence and severity of iodine deficiency in school children revealed that 71.0% of the households were using non-iodized salt containing iodine level less than 15ppm. Study prior to this study indicating that 81% of household salt samples of the study area had iodine level below the minimum standard set by the Quality and Standard Authority of Ethiopia (QSAE) [8]. Proportion of households consuming iodated salt in SNNPR are 2.2% [25].

2.6.1.1. Factors Affecting Consumption Iodized Salt

There are many factories that affect consumption of iodized salt in the population. The finding reported by Baguune and Buxton in Ghana indicate that 26.8% of the respondents used both common and iodized salt, partly due to shortage of iodized salt on the market at certain times, others indicated that they were unable to distinguish iodized salt from that of not ionized salt sold on the markets and some others indicated that iodized salt was expensive two times higher as compared with common salt [38]. Study in India points out that five times higher cost from common salt [49] and regarding reasons of occasional or never use of iodized salt in Pakistan, majority of the respondents mentioned its high price (31.4% and 31%) and unavailability (42.7% and 25.4%) in the area this influenced decision to use common salt. The survey also revealed a high level of knowledge about iodized salt (85%) but low level of use due to its high price (31%), unavailability (25%) and misconception (7%) [50].

Study on Sudan revealed that education of the head of the household, gender, mode of living, the region, and wealth index have strong association with the consumption of iodized salt. Households are more likely to consume iodized salt if the head of household is male, lives in urban setting or live in the areas where iodized salt is accessible in the markets. On the other hand, households are more likely to consume iodized salt if the head of household is more educated and comparatively wealthy [42]. As the educational level of the women increased their knowledge about iodine, their making sure the salt they bought was iodized, use of iodized salt at home, and storing salt in a closed cupboard increased at significant levels as reported Akdeniz et al. [51]. Accordingly to CSA in 2011 use of iodized salt is correlated with the mothers' education level; about 30 percent of children of mothers who are educated at the secondary or higher level live in households using iodized salt, compared with 15 percent of children whose mothers have no education [48].

Study revealed that respondents who were exposed to mass media consuming adequately iodized salt [49]. Study on Turkey showed similar findings that the use of local mass media is effective in raising the prevalence of iodized salt use. According to Tyan study the most proximal and obvious barrier to poor iodine intake is highly limited access to iodized salt. In addition study revealed that in examining WHO regions and the overall access to iodized salt, there appears to be a strong positive correlation between the proportion having access to iodized salt and the percentage of its population receiving adequate iodine nutrition [9]. In Tanzania study reported that price (35%), taste (31%), packaging (29%) and availability (5%)as the factors that determine their choice of salt [52].

2.6.2.Goitrogens Food

Even though inadequate intake of iodine is the principal cause of IDD, goitrogenic food items like cabbage, cassava, millet, soya bean, bamboo shoot, turnip, kale, which interfere with the metabolism of iodine and hormone secretion [8, 18, 41, 53]**.** Goitrogen can be substances or conditions that include goiter formation. It could be social, biological, geo-chemical compounds that contribute to iodine deficiencies [36].

Cassava is consumed as staple food in many developing countries[21]. From Ethiopia SNNPR, Benishngul-Gumuz and some part of Western Oromiya region consume cassava as staple food. In area where cassava is consumed as staple food, endemic goiter and cretinism are common [54]. Cassava contains glucosides upon conversion to thiocyanates in the body after ingestion, a known goitrogenic substance that inhibits thyroid iodine transport and at higher doses, competes with iodide in organification process. Study in 1998 indicated that the high rate of goiter is attributed to the frequency of cassava consumption[55] and study in Jimma points out also similar results [22]. Study in Hawassa points out consumption of cassava has been shown as a risk factor for goiter development among children in southern Ethiopia. Goitrogens in foods can block the absorption

and utilization of the available iodine from the diet [15]. In Bonke and Gofazuria districts of SNNP regional state where cassava is used as staple food, almost all school children are affected by goiter [25]. Cabbage contains thiocyanate and isothiocyanate that inhibit iodine uptake by the thyroid follicular cells and also blocks the thyroid peroxidase enzyme. Study in Jimma found that among children who consumed cabbage every day highest prevalence of goiter, 76.7% when compared to never use cabbage 41.7% of goiter. Children who take cabbage on regular bases were exposed to goiter more than those who have never taken cabbage[8]. Study in Wolaita indicated that two hundred twenty seven (84.1%) of children with goiter and 196 (74.2%) children without goiter reported goitrogenic foods like cabbage, cassava as their common meals. Same study also revealed that consuming foods (cabbage and cassava) was significantly associated with goiter (AOR=1.9; 95%CI=1.2, 2.9) [13].

2.6.3. Other factors

Generally, besides low iodine intake and goitergenetic food consumption there are also other factors that affect iodine status; such as, living in high altitude, IDD knowledge cessation of intervention program, illiteracy of family, income etc. seem to play role in exacerbating and worsening IDD situation in the country[10, 54].

Survey carried in national Ethiopia provided that coliforms and E. coli isolated from drinking water contribute to the high incidence of endemic goitre other than iodine deficiency[6]**.** Contamination of drinking water by different microbe is factor which contribute to the occurrence of IDD [56]**.** Chemical pollutants in water supplies such as bromine, chlorine, fluoride as well as nitrogen compounds such as ammonium are known to be chemical goitrogens. Water from shallow and pouted streams and walls may contain humic substances that blocks thyroidal iodination. In multivariate logistic regression model, drinking water from river (AOR=2.5; 95%CI=1.2, 4.9) had

independent association with goiter. The odds of developing goiter among those who used river was 2.5 times higher as compared to those who used piped water [13].

The soil composition of fluorine in the rift valley region of Oromia is extremely high and this put the people in that area at greater risk to iodine deficiency [18].

Study in Jimma Southern Ethiopia points out that prevalence of goiter is common in economically low families. A correlation was found to be existed between the income of the household and goiter prevalence. Children who belong to the parents earning monthly income > 1500 birr have the least TGR (23%) as compared to those who earn <1000 birr. As study suggested that living standard has direct relationship with iodine nutritional status and thereby with prevalence of IDDs in a population [8]. Many studies indicate that iodine defiency was found to be more prevalent in females compared to males. As per national survey in Ethiopia 2005 the prevalence rate of goiter was higher in females (56.1%) than in males (50.1%) [25]. Study on 1313 people, 917 women and 396 man in Western Ethiopia revealed that a goiter at 84% of the women and 64% of the men as reported by Ney-Bruin et al. [41]. Negalign and his colleagues 2004 reported that goiter was significantly higher among females than males [56].

Finding in Wolaita and other area revealed that education status of father significantly related to child goiter rate [13]. In general, use of iodized salt is correlated with the mother's education level; about 30 percent of children of mothers who are educated at the secondary or higher level live in households using iodized salt, compared with 15 percent of children whose mothers have no education [31].

2.7. Dietary sources of iodine

The native iodine content of most foods and beverages is low, and most commonly consumed foods provide 3 to 80 µg per serving [21, 57].Foods of marine origin have higher iodine content because marine plants and animals concentrate iodine from seawater [21]. Although it is inadequate, the second major sources of iodine are meat, eggs, milk and milk products. The iodine contents of fruits, vegetables, nuts and cereals are dependent on the iodine content of the soil. The concentration of iodine is higher in young than in old vegetables of the same species [18]. From Ethiopia food the highest iodine levels were found in cereals and legumes. However, iodine concentration in tubers is low and varied between 12 and 30 µg/kg. The iodine content of milk from cows ranged from 16 µg/L in Kodowono to 23 µg/L in Sankura. The iodine supply of animals is mainly determined by their habitat and their food. Iodine levels in cow's milk are eight-fold lower than those found in Great Britain since cows in Ethiopia are in open pasture throughout the year and the pasture is low in iodine content. On the basis of this study, one can estimate the daily intake of iodine when shiro is included in the meal. For example, 150 g of shiro wot (spiced legume sauce) in addition to 200g of tef prepared as injera will provide 24µg of iodine. Supplemented with one litre of drinking water from the surface of a river in Kodowono will increase the intake to 40 µg/day. The intake is much lower when injera is consumed with sauce prepared from tubers. Estimated iodine intake by the survey population is thus far below the recommended allowance at 150µg/day [6].

2.8. Prevent and Control of IDD

Elimination of iodine deficiency partly contributes to achieving the Millennium Development Goals agreed upon by UN Member States in 2000. Meeting these goals would transform the lives of millions of children and families [42].

2.8.1. Iodine Oil Capsules

In some regions, iodization of salt may not be feasible for the control of IDD, at least in the short term [17]. This is particularly likely to occur in remote areas where communications are poor or where there are numerous small-scale salt producers. In such areas, supplementation with iodized oil to correct IDD should be considered [26]. The first iodine supplements were in the form of an oral solution of iodine such as Lugol, which was given daily. After the Second World War, considerable progress was made in reducing IDD with iodized oil initially using the intramuscular form and in the 1990s, using the oral form. The oral form of iodized oil has several advantages over the intramuscular form: it does not require special storage conditions or trained health personnel for the injection and it can be given once a year. Compared to iodized salt, however, it is more expensive and coverage can be limited since it requires direct contact with each person. With the introduction of iodized salt on a large scale, iodized oil is now only recommended for populations living in severely endemic areas with no access to iodized salt [16].

2.8.2. Salt Fortification

Worldwide, 34 countries have eliminated iodine deficiency disorders through Universal Salt Iodization (USI) [42]. Universal Salt Iodization, (USI) is the effective, safe, sustainable and cost effective intervention strategy for prevention, control and elimination of iodine deficiency [17, 18, 30, 31]. Consistent monitoring of iodized salt at production, storage, transportation and consumption level; and prevention of sale of non-iodated salt are key components of salt iodization program [32].

Over the past century, many food vehicles have been fortified with iodine: bread, milk, water and salt. Salt is the most commonly used vehicle. USI was chosen as the best strategy based on the

following facts: salt is one of the few commodities consumed by everyone; (ii) salt consumption is fairly stable throughout the year; (iii) salt production is usually in the hands of few producers; (iv) salt iodization technology is easy to implement and available at a reasonable cost (0.4 to 0.5 US cents/kg, or 2 to 9 US cents per person/year); (v) the addition of iodine to salt does not affect its colour, taste or odour; (vi) the quality of iodized salt can be monitored at the production, retail and household levels; and (vii) salt iodization programmes are easy to implement [26, 38].

Iodization of salt is an effective and sustainable public-health strategy to prevent and control iodine deficiency and has been ongoing in several countries for over 60 years [26]. From the time when Universal Salt Iodization (USI) start, primary strategy to prevent IDD more than 90 million newborns are protected each year from learning disabilities caused by IDD [56]. There are two forms of iodine in iodized salt: 'iodide' and 'iodate', usually as the potassium salt. Both are generally referred to as 'iodized' salt. Iodate is recommended as the preferred fortificant because it is much more stable [8, 16, 26, 37, 41]. Iodized salt, the preferred method of intervention, costs only $0.05 per person per year to prevent IDD, according to the World Health Organization (WHO) [56].

CHAPTER III

3. METHODOLOGY

3.1. Study Area

K/Didaye is one of the twelve districts found in Wolaita Zone, Southern Nations Nationalities and Peoples Region (SNNPR). It is located at about 470 km south of Addis Ababa, between 7º37" and 7º61" N Latitude and 37º30" and 37º33" E Longitude. It is bordered to Omo river in the north, Kindo Koysha district to the east and Ofa district to the west of the Wolaita Zone and Kucha district to north of the Gamo-Gofa Zone. The total area of Kindo Didaye district is 380 square kilometer[56].

According to Central Statics Agency (CSA) and the National Population and Housing Census of Ethiopia, the total population was 113,560, with male is 56,524, female 58,831, households 23,541, <1year 4037, <5 year 17,995 and 15-49 year is 56,374 [31]. The district encompasses three agro-ecologies of Dega (highland), Woyna Dega (mid land) and Kola (low land) with proportion of 14%, 75%, and 11%, respectively. Annual rainfall ranges from 800 – 1400 mm. The major economic activities are agriculture (production of legumes, root crops and some cereals), and livestock rearing. Annual crops such as maize, teff, wheat, pea, bean, barely, sweet potatoes, cassava and others, and perennial plants like enset, bananas, mango, avocado, coffee and others are cultivated [56].

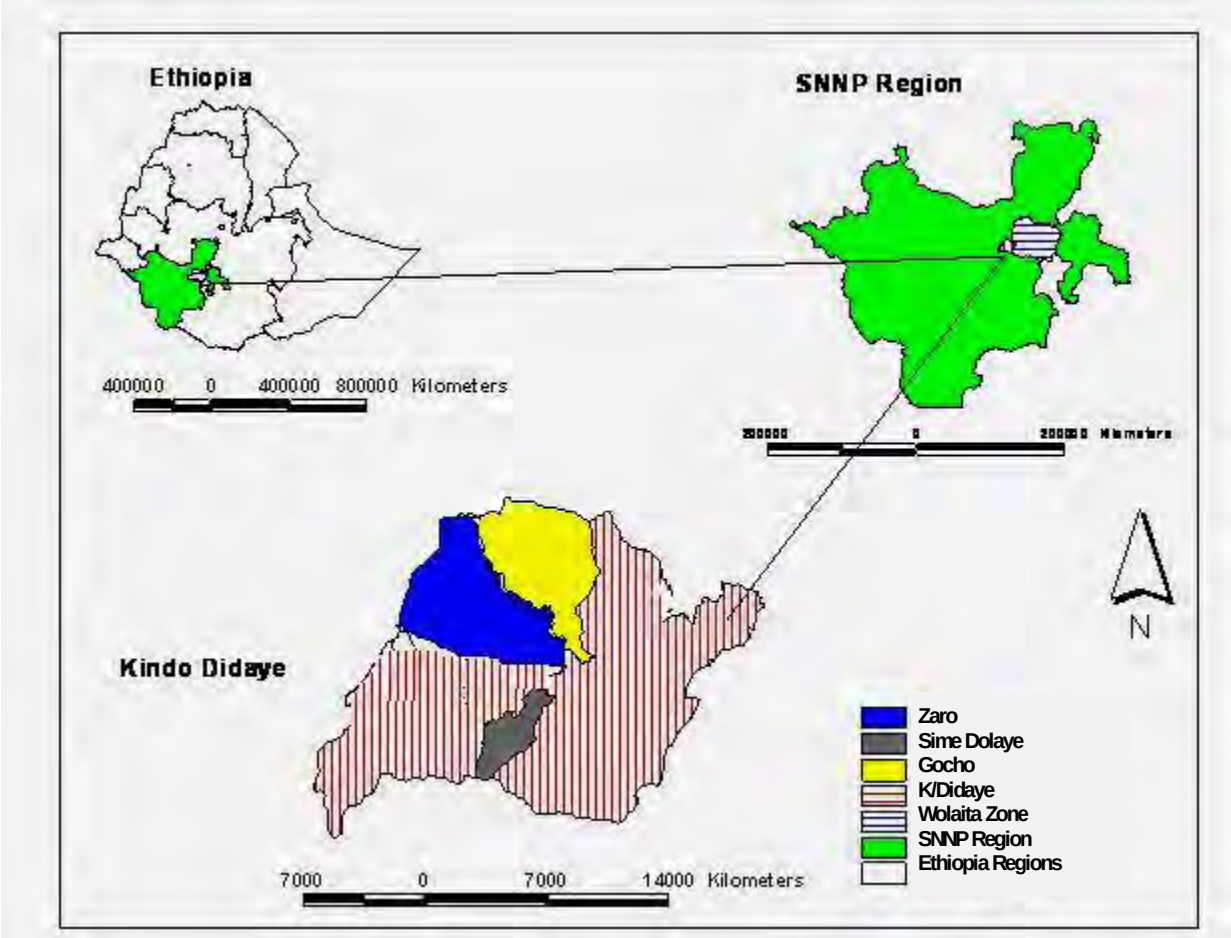

Figure 1 Map of study area.

3.2. Study Design

The study was a community-based cross sectional survey with both quantitative and qualitative components. These two components were usedto collect data from respondents by administrating questionnaire to get accompanying data for study.

3.3.Population

3.3.1.Source Population

All households with children found in K/Didaye district.

3.3.2. Study population

Households with school age children (6-12 years) in K/Didaye district.

3.4. Inclusion Criteria

Children who are in the age range 6-12 years were included in the study.

Children who have stayed in the district for at least six months.

3.5. Exclusion Criteria

Children with acute illness during the study

3.6.Sample size

The sample size to be surveyed was calculated using single population proportion formula from school age children 6-12 years. Study by Cherinet and Kelibessa in Gamogofa Kodowana village indicated that prevalence of goiter rate among school age children was 91 % [31]**.** Kodowono was selected from neighboring village because of foods reported to containing goitergenic substances are consumed as staple foods like ways in K/Didaye district. Considering 5 % margin of error and

95% confidence interval of certainty the actual sample size for the study is computed using the formula indicated below. In addition 10 % was added as non respondants.

$$n = \frac{\left(z_{\sim /2}\right)^2 \times pq}{d^2}$$

Where, n = Sample size,

Zα /2 = 95% confidence interval =1.96

P = School children in kodowono village of Gamo Gofa with goiter = 0.91

q = School children in kodowono village of Gamo Gofa without goiter = 0.09

d = margin error (5%)

$$n = \frac{(1.96)^2 \times 0.91 \times 0.09}{(0.05)^2}$$

$n = 110 + 10\%(11) contingenc\ y = 121$ House holds with children 6-12 years.

3.7. Sampling procedure

Two stage cluster sampling method was followed for selection of households with school age children. In the first stage among twenty one kebeles in K/Didaye district three kebeles was selected by simple random sampling method. Proportional to population size technique were used to select required number of households with school age children from each selected kebele. In this method from S/Dolaye kebele twenty seven, Gocho forty three and Zaro fifty one households with school age children were taken according to number of households that the selected kebeles contain.

In stage two, from those three selected kebeles study participants chosen by the following method.

- Locating the centre of the kebele/cluster by asking stake holders or kebele leader

- Spinning a pen and proceeding to the direction that the pen pointed to.
- Households along the direction until to the edge of the kebele was counted and numbered.
- A random number selected between one and the number of households counted when walking, which was the first house to be interview.
- The subsequent households were chosen by proximity of households.
- In a cluster where the houses are closely packed together, chosen the next house on the right.
- Continued to go in this direction until the required numbers of households with school age children were found.
- Those mothers/children who were not present at the time of the survey were revisited [20, 29].

3.8. Data collection tools and procedure

A structured questionnaire was developed by reviewing prior study and other materials that are related to the topic. First the questionnaire was translated from English to Amharic, then back to English to ensure its consistency. Then it was administered to mothers or caregiver through face to face interviews. Data collectors can Wolaitign as well as Amharic, so translator not used for translation.

The entire questionnaire was consists: socio-demographic and socio-economic characteristics, child dietary habits, some IDD related issue, knowledge of mothers/caregivers to iodized salt, availability and acceptability of iodized salt.

Data was collected by three data collectors, who are recruited from K/Didaye district. They were trained for two days on the objectives of the study, methods of data collection and urine sample taking approach. Prior to the administration of the questionnaire, the questionnaire tool was pre-tested in 11 (10%) households. The questionnaires were administered to all 121 mothers to assess

the socio demographic variables, child dietary habits, knowledge at the household level to iodized salt. Questioner was checked for completeness on daily basis by the researcher. Incorrectly filled or missed one was sent back to the respective data collectors for correction.

A wealth category composed of 9 variables was formed to assess socioeconomic status and make comparisons between study participants. Variables used to assess wealth in the 2005 Ethiopian Demographic Health Survey [59] and variables suggested for use in classifying wealth in rural Ethiopian households [60] were used to construct the wealth categories. Variables used included asset ownership, source of drinking water, type of toilet facility used, house type, number of rooms, presence of windows, type of flooring and land size. Each variable was given a weighted numerical value in which a higher value was assigned to a more favorable condition. The best possible score was 48 and the least was 6.

One health officer who is an expert in grading goiter was selected from K/Didaye district of health office for grading goiter.

Salt samples were taken from each household to check for the concentration of iodine in salt that households consume. Concentration of iodine in salt was checked by rapid test kits (RTK). After fill small cup with half tea spoon sample of salt obtained from the household add two drop of starch solution (white in color) to salt. After one minute if the color changed (from light blue to dark violet), it was matched to a color chart provided with the test kit and recorded the iodine level as <15 or >15 ppm. If the initial test was negative (no change in color)after one minute, two drops of second confirmatory test/recheck solution (red in color) add on the same spot. If the color of the salt does not change even after the confirmatory test, the salt is not iodized (zero Iodine level).

About 5 ml spot urine samples were collected from each child 6-12 years from selected households in a properly labeled and acid rinsed urine collection tube.This urine containing tube was

immediately transferred to the thermo cool box containing ice bags and stay in Didaye district and Gocho health post in deep refrigerator until data collection end. After the end of data collection the samples of urine was transported to Ethiopian public health institute (EPHI) nutrition laboratory and keep at -20C^{o}until analysis. Analysis of urinary iodine was done using method of ammonium persulfate (method A). It is based on ammonium persulfate method which was suggested and approved by WHO/UNICEF/ICCIDD. Small samples of urine 250ml are digested with 1 ml of ammonium persulfate at 100 °C for 60 minutes, 2.5ml arsenious acid added after cool down of sample and following 15 minutes 300ul ceric ammonium sulfate are added. The decrease in yellow colour over a fixed time period is then measured by a spectrophotometer and plotted against a standard curve constructed with known amounts of iodine. Exactly 30minutes after addition of ceric ammonium sulphate to the first tube the absorbance was read at 420nm. Read successive tubes at the same time interval as when adding the ceric ammonium sulphate. Results calculated by constructing a standard curve on graph paper by plotting iodine concentration of each standard on the abscissa against its optical density at 405ug/l.

IDD manifested as goiter was palpated and graded by physicians using standard procedures as per the criteria of WHO/UNICEF/ICCIDD. According to these criteria, goiter was graded as follows: Grade zero: no palpable or visible goiter; Grade 1: a goiter that is palpable but not visible when the neck is in the normal position i.e., the thyroid is not visibly enlarged and Grade 2: A swelling in the neck that is visible when the neck is in a normal position. Based on severity, goiter is categorized as mild if TGR = 5.0-19.9%, moderate if TGR = 20-29.9% severe if TGR ≥30%. [56].

3.9. Data Quality Management

Data quality assurance was in place during questionnaire designing, data collection, data entry and analysis. Questionnaire was objective based, logically sequenced, free of scientific terms, non-leading and pretested. The three data collectors were recruited and trained for effective data collection that enabled them to help the respondents answer the questionnaire without ambiguity. In order to reduce variability, goiter grading was done by experienced health professional.

In order to avoid contamination sample collection tube was rinsed with acid and deionised water before use.

3.10. Data Analysis

The data collected were analyzed using SPSS version 16. After entry of data, cleaning was undertaken in order to identify and correct errors. Data from questionnaires were checked by running summary descriptive statistics for all variables. For categorical variables, entered values were cross checked against pre-defined values. For continuous variables, range checks were done by setting plausible lower and upper limit values for a specific variable. Values that fell outside of the specified range were checked and corrected, if they were entry errors, by going back to questionnaires. Descriptive statistics were used to describe basic subject and family characteristics. Association between dependent and independent variables is assessed by chi square. Independent sample t test was used to show mean urine iodine concentration difference between two different groups. Multiple logistic regression analysis was done to control confounding variables and to observe the effect of independent variables on the outcome variables (evaluate variables which strongly predicted goiter rate). The data was summarized in percentages, tables.

3.11. Variables

3.11.1. Independent variables

Socio demographics factors, consumption of iodized salt, consumption of goiterogenic and animal source food, Sex, age of children, literacy of father and mothers

3.11.2. Dependent variables

Goiter status

3.12. Ethical Consideration

The Ethical Review Committee of the Addis Ababa University was approved the study. The study design was also explained to Officials of HealthDepartment and Administrative of Kindo Didaye district for their permission and support. The nature of the study was fully explained to all households included in the study to obtain oral ascent. Information was collected after securing consent from study participant. Data obtained from each study participant is kept confidential and all who participated in the study were acknowledged.

3.13. Plan for dissemination of results

The study findings were communicated to the children and their mothers/caregivers. After finalization of the thesis, results will be communicated to the health office. The study will also be submitted to a journal for publication so that the findings will be shared.

3.14. Limitations

Using only rapid test kits to determine iodine content in salt, was the limitation in this study.

3.15. Operational definitions

Iodized Salt: It is a salt that is mixed with iodine.

Goiter: Enlargement of thyroid gland in the fore neck due to iodine deficiency.

Knowledge: Understanding/ awareness of iodized salt.

CHAPTER IV

4. RESULTS AND DISCUSSION

4.1. Results

4.1.1. Socio-demographic characteristics of children and their households that included in the fromK/Didaye district, Wolaita zone, Southern Ethiopia, 2014.

Analysis of 121 school age children indicated that 58(47.9%) were male and 63(52.1%) female. The children had a mean age of (SD) 7.53 (1.46) years. The predominant religion at children were protestant which accounts for 88(73%) and all children were Wolaita by ethnicity.

Nearly 35% of the children's mothers were in the age group 25-29, while the 0.8% are above the age of 55. Education status of mothers, 71.1% had no education and 3.3% were attained secondary level education.

About 89% of head of household occupation were farming and remaining accounts for trading and governmental employers. Regarding education status of head of household 46.3% had no education while 38.8%, 14% and 0.8% had primary education, secondary education and higher education respectively. Majority of household wealth quintile lie down on lowest level of 32 (26.4%) followed by second and middle level 26(21.5%) and few 17(14%) were in highest level.(Table 1)

Table 1: Socio-demographic characteristics of childrenand their households in K/Didaye district, Wolaita zone, SouthernEthiopia, 2014 (N=121).

Variables	Frequency	Percent
Sex of the child		
Male	58	47.9
Female	63	52.1
Age (mean± Standard deviation)	7.53 ± 1.46	
Religion of the child		
Orthodox	27	22.3
Protestant	88	72.7
Catholic	1	0.8
Other	5	4.2
Ethnicity of child		
Wolaita	121	100
Educational status of father		
No Education	56	46.4
Primary education	47	38.8
Secondary education	17	14
Higher education	1	0.8
Occupation of father		
Farmer		
Yes	107	88.5
NO	14	11.5
Merchant		
Yes	28	23.2
No	93	76.8
Government employee		
Yes	24	19.8
NO	97	80.2
Educational status of mothers/caregivers		
No education	86	71.1
Primary education	31	25.6
Secondary education	4	3.3
Wealth quintile		
Lowest	32	26.4
Second	26	21.5
Middle	26	21.5
Fourth	20	16.5
Highest	17	14.1

4.1.2. Characteristics of households that included in the study from K/Didaye district, Wolaita zone, Southern Ethiopia, 2014.

Nearly all households use public tap water 115(95%), only 6(5%) had used well as a source of water. Type of toilet used by study participants were 3.3%, 3.3% and 93.4% of no toilet, traditional pit latrine and traditional pit latrine with shade respectively. Most of households live in corrugated iron roof made with mud/soil floor, while 9(7.4) of the respondents in grass roof hut and 1(0.8%) live in Corrugated iron roof with cement floor. Twenty eight percent of the households had radio, nearly one third of households had mobile, thirty seven percent had bed with sponge and point eight percent had motorcycle. Most respondents (87.6%) had cow followed by 46.3% of ox, 30% hen, 32% goat, 23% sheep and 1.7% and 0.8% had donkey and house/mule respectively. Ninety five percent of households had agricultural land.

Table 2: Characteristics/assets of households in K/Didaye district, Wolaita zone, Southern Ethiopia, 2014 (N =121).

Variables	Frequency	Percent
Source of drinking water		
Protected water	115	95
Non protected water	6	5
Type of toilet facility		
No toilet	4	3.3
Traditional pit latrine	4	3.3
Traditional pit latrine with shade	113	93.4
House type		
Grass roof hut	9	7.4
Corrugated iron roof mud floor	111	91.7
Corrugated iron roof cement floor	1	0.8
Number of rooms		
1-3	42	34.7
4-5	72	59.5
>=6	7	5.7
Window	102	84.3
Yes		
No	19	15.7
Household Assets that have:		
Radio	33	27.3
Mobile	47	38.8
Motor bicycle	1	0.8
Bed with sponge	45	37.2
Ox	56	46.3
Cow	106	87.6
Goat	39	32.2
Sheep	28	23.1
Donkey	2	1.7
Horse/mule	1	0.8
Hen	46	38
Agricultural land	115	95
Yes		
No	6	5

4.1.3. Children dietary intake who included in the study from K/Didaye district, Wolaita zone, Southern Ethiopia, 2014.

Nearly 88%, 85% and 84% of cassava, sweet potato and maize respectively consumed by children throughout the prior week from survey. From animal source foods milk and milk products consumed more frequently than egg, meat and meat products.

Table 3: Frequency of food intake among children participants during one week prior to the survey in K/Didaye district, Wolaita zone, Southern Ethiopia, 2014 (N=121).

Food items	**N (%) Consumed per week**			
	Once	Twice	Three-six times	Never
Cassava and any food made from cassava	10(8.3)	9(7.4)	94(77.7)	8(6.6)
Kale and any food made from kale	25(20.7)	22(18.2)	40(33.1)	34(28.09)
Cabbage	5(4.1)	2(1.7)	5(4.1)	109(90.1)
Sweet potato	6(5.0)	6(5.0)	103(85.1)	6(5.0)
Maize and any food made from maize	5(4.1)	12(9.9)	102(84.3)	2(1.7)
Egg	4(3.3)	1(0.8)	2(1.7)	114(94.2)
Milk and milk product	14(11.6)	8(6.6)	56(46.3)	43(35.5)
Meat and meat product	21(17.4)	5(4.1)	3(2.5)	92(76.0)

4.1.4.Knowledge and practice of mothers/caregivers to iodized salt and iodine deficiency disorder in K/Didaye district, Wolaita zone, Southern Ethiopia, 2014.

Apart from one mother all other had no knowledge about iodine, iodized salt and iodine deficiency disorder. None of households use iodized salt as per answer given by mothers/caregivers. Participants asked for reason why not using iodized salt and all of them responded that there is no iodized salt in market and lack knowledge about iodized salt. About 46 (38%), 73 (60.3%) and 2(1.7%) of households add salt before, middle and after cooking respectively.

Table 4: knowledge and practice of mothers to iodized salt and iodine deficiency disorder in K/Didaye district, Wolaita zone, Southern Ethiopia, 2014 (N=121).

Variables	Frequency	Percent
Knowledge of iodine (n=121)		
Yes	1	0.8
No	120	99.2
Knowledge of iodized salt (n=121)	1	0.8
Yes	1	0.8
No	120	99.2
Source of knowledge about iodized salt (n=1)		
Red cross	1	0.8
Knowledge of iodine deficiency disorder (n=121)		
Yes	1	0.8
No	120	99.2
Risk group for iodine deficiency disorder (n=1)		
Children	1	0.8
Adolescent	1	0.8
Pregnant	1	0.8
Elder	1	0.8
Men	1	0.8
Women	1	0.8
Other	1	0.8
Perceived consequence of iodine deficiency (n=1)		
Goiter	1	0.8
Prevention of iodine deficiency disorder (n=1)		
Iodized oil, iodized salt and other	1	0.8
Use of iodized salt (n=121)		
Yes	121	100
No	0	0
Adding time for salt in food		
Before cooking	46	38
Middle of cooking	73	60.3
After cooking	2	1.7
Why not use iodized salt (n=121)		
Not available in the market		
Yes	121	100
No	0	0
No knowledge		
Yes	120	99.2
No	1	0.8

4.1.5. Classification of children according to IDD status using urinary iodine concentration (UIC) and goiter rate in K/Didaye district, Wolaita zone, Southern Ethiopia, 2014.

Total goiter rate was determined by palpation/screening from both visible and palpable goiter. Seventy five (62%) of the school children had no goiter while forty six (38%) had grade one goiter. However, because no visible goiter was observed in represents only palpable goiter for these children. Urine analysis revealed that 13.2%, 40% and 32.2% of children had severe, moderate and mild type of iodine deficiency respectively. Less than one fourth of children had adequate iodine concentration that was >100ug/L. The median urinary iodine concentration of the study participants was 51.2 µg/L ranging from (from none detectable level to 221 µg/L).

Table 5: Goiter rate and UIC of school age children in K/Didaye district, Wolaita zone, Southern Ethiopia, 2014 (N=121).

Items	**Number of samples**	**Proportion**
Urinary iodine concentration		
Severe iodine deficiency (<20ug/L)	16	13.2
Moderate iodine deficiency (20-49ug/L)	41	33.9
Mild iodine deficiency (50-99ug/l)	39	32.2
Adequate (100-199ug/L)	25	20.7
Goiter rate		
Grade zero	75	62
Grade one	46	38

4.1.6.Salt iodine content of households in K/Didaye district, Wolaita zone, Southern Ethiopia, 2014.

Totally121 salt sample collected and tested for iodine content using rapid test kit. About three fourth of household salt samples had <15ppm Parts per million (Ppm) iodine content and 36 (29.8%) had >15ppm. Only three out of ten households salt had iodized salt; >15ppm.

Table 6: Iodine content of salt samples from K/Didaye district, Wolaita zone, Southern Ethiopia, 2014 (N=121).

Items	Number of samples	Proportion
Iodine content of salt		
<15ppm	85	70.2
>15ppm	36	29.8

<15 ppm (parts per million): slight blue colour change;

>15 ppm: deep blue colour change.

4.1.7. Factors associated with goiter among school age children in K/Didaye district, Wolaita zone, Southern Ethiopia, 2014.

The investigation on the association between suspected factors and response variables revealed the following results in binary logistic regression analysis. Gender were significantly (0.003) associated with goiter likewise iodine content of salt ansignificantly (0.002) associated with goiter. Purchasing salt from shop and three to six times cassavaconsumption per week also significantly associated 0.001, 0.046 goiter respectively.

Table 7: Association between goiter and some independent variables among school age children in K/DidayedistrictWolaita zone, Southern Ethiopia 2014 (N=121).

Presence of Goiter					**OR (95%)**	
Factors		Category	Grade0 n(%)	Grade 1 n(%)	COR	P value
Sex		Male	44(36.4%)	14(12%)	0.308(0.142,0.671)	**0.003**
		Female	31(26%)	32(26.4%)	1.00	
Age		6-8	63(52%)	37(31%)	0.783(0.301,2.035)	0.616
		9-12	12(10%)	9(7%)	1.00	
Education status of Head of household		No education	37(31%)	19(16%)	0.514(0.175,1.507)	0.225
		Primary education	29(24%)	18(15%)	0.621(0.208,1.856)	0.393
		Secondary education	9(7%)	9(7.4%)	1.00	
Occupation of head of household	Farmer	Yes	67(55.4%)	40(33%)	0.796(0.257,2.461)	0.692
		No	8(7%)	6(5%)	1.00	
	Merchant	Yes	20(17%)	8(7%)	0.579(0.231,1.450)	0.243
		No	55(45.5%)	38(31.4%)	1.00	
	Gov'nt employee	Yes	15(12.4%)	9(7.4%)	0.973(0.387,2.447)	0.954
		No	60(50%)	37(31%)	1.00	
Education status of the mothers		No education	57(47%)	29(24%)	0.509(0.068,3.798)	0.510
		Primary education	16(13%)	15(12.4)	0.937(0.117,7.524)	0.952
		Secondary education	2(2%)	2(2%)	1.00	
Parity		1-2	5(4%)	5(4%)	1.625(0.426,6.205)	0.478
		3-4	31(26%)	17(14%)	0.891(0.408,1.944)	0.772
		>=5	39(32%)	24(20%)	1.00	
Wealth quintile		Lowest	21(17.4%)	11(9%)	0.748(0.223,2.510)	0.639
		Second	17(14%)	9(7.4%)	0.756(0.215,2.664)	0.664
		Middle	15(12.4%)	11(9%)	1.048(0.303,3.621)	0.941
		Fourth	12(10%)	8(6.6%)	0.952(0.255,3.553)	0.942
		Highest	10(8.3%)	7(6%)	1.00	
Source of drinking water		Public tap	71(59%)	44(36.4%)	1.239(0.218,7.051)	0.809
		Well	4(3%)	2(2%)	1.00	
Source for buying salt from shop		Yes	69(57%)	32(26%)	0.199(0.070,0.565)	**0.002**
		No	6(5%)	4(12%)	1.00	
Iodine in salt		<15ppm	45(37.2%)	40(33.1%)	.4.44(1.677,11.777)	**0.003**
		>15ppm	30(25%)	6(5%)	1.00	
		Once per week	3(2.5%)	7(6%)	1.400(0.195,10.032)	0.738

Cassava consumption	Twice per week	5(4%)	4(3%)	0.480(0.069,3.352)	0.459
	Three - six per week	64(53%)	30(25%)	0.281(0.063,1.255)	**0.046**
	Never per week	3(2.5%)	5(4%)	1.00	
	Once per week	16(13%)	9(7.4%)	0.563(0.195,1.620)	0.286
Kale consumption	Twice per week	14(12%)	8(7%)	0.571(0.191,1.714)	0.318
	Three - six per week	28(23%)	12(10%)	0.429(0.165,1.112)	0.082
	Never per	17(14%)	17(14%)	1.00	

Statistical significance at $p<0.05$

4.1.8 Multiple logistic regression analysis predicting the likelihood of having goiter among school children in K/Didaye district, Wolaita zone, Southern Ethiopia, 2014.

Variables which are identified to have significant association (at significance level of 0.05) with goiter in the binary logistic analysis were entered in to stepwise forward multiple logistic regression.

Male were less likely to have goiter 0.284 (0.113,0.712) than female. Iodine content of salt with <15ppm were 3.58(1.261,10.164) more likely to develop goiter than that of >15ppm. Source of purchasing salt from shop were 0.311(0.1,0.962) less likely to had goiter when compared to open market. Cassava consumption not shows significance in the case of AOR analysis.

Table 8: Variables associated with presence of goiter in multiple logistic regression analysisamong school age children in K/Didaye district Wolaita Zone, Southern Ethiopia, 2014 (N=121).

Presence of Goiter				**OR (95%)**	
Factors	Category	Grade 0 n(%)	Grade 1 n(%)	AOR	P value
Sex	Male	44(36.4%)	14(12%)	1	
	Female	31(26%)	32(26.4%)	0.284(0.113,0.712)	**0.007**
Source of purchasing Salt from shop	Yes	69(57%)	32(26%)	1	
	No	6(5%)	14(12%)	0.311(0.1,0.962)	**0.043**
Iodine content in salt	<15ppm	45(37.2%)	40(33.1%)	3.58(1.261,10.164)	**0.017**
	>15ppm	30(25%)	6(5%)	1	
Cassava consumption	Once per week	3(2.5%)	7(6%)	0.794(0.092,6.822)	0.834
	Twice per week	5(4%)	4(3%)	0.694(0.085,5.682)	0.734
	Three - six per week	64(53%)	30(25%)	0.225(0.045,1.122)	0.069
	Never per week	3(2.5%)	5(4%)	000	

Statistical significance at p<0.05

4.1.9. Comparison of mean urinary iodine concentration of school age children withindependent variables by using independent sample T test

The sample data provided that convincing evidence to conclude that there is a significant mean urinary iodine concentration difference between male and female children. Male urinary iodine concentration increases by 21.45 (3.78,39.12) when compared to female. Consumers of meat and meat product per week increases mean urinary iodine concentration by 21 (0.1, 41.8) when compared to non consumers.

Salt iodine content <15ppm showed less mean urinary iodine concentration than that of >15ppm, but it is not statically significant. Likewise consuming cassava had less mean urinary iodine concentration when compared to non consumers; however it is not statically significant.

Table 9: Comparing means of urinary iodine concentration of school age children with different variables in K/Didaye district, Wolaita zone, Southern Ethiopia 2014 (N=121)by using independent sample T test.

Variables		**N(%)**	**Sig**	**Mean UIC**	**Mean UIC difference**	**Upper and lower difference at 95%**
Sex	Male	58(48%)		75.5	21.45	3.78, 39.12
	Female	63(52%)	**0.018**	54		
Wealth quintile	Lowest	32(26%)	0.250	63	17.8	-13, 48.45
	Highest	89(74%)		45.3		
Salt iodine content	<5ppm	85(70%)	0.195	60.5	-12.92	-32.55, 6.71
	>15ppm	36(30%)		73.4		
Cassava consumption	Consumed per week	113(93.4%)	0.622	63.7	-9	-45.4, -27.7
	Never consumed per week	8(6.6%)		72.8		
Meat and meat product	Consumed per week	29(24%)	**0.049**	80.2	21	0.1, 41.8
	Never consumed per week	92(76%)		59.3		
Milk and milk product	Consumed per week	78(64.5%)	0.296	60.8	-10	-28.8, 9
	Never consumed per week	43(35.5%)		70.8		

4.2. Discussion

Goiter prevalence is an important proxy for long term iodine nutrition [61]. The study found that 38% of the examined children in the district had grade one goiter which is regarded as severe according to the classification of WHO/UNICEF/ ICCIDD[17] and 62% had goiter grade zero. The finding is comparable to the national figure, which shows prevalence of goiter among school to be 39.9% [20, 25]. Study in Tigray region documented that total goiter rate was 35.6%, which was also similar to current study [37]. Study carried by Ney-Bruin and his colleagues in Dembi-Dollo and Nekemte area of Wollega shown that approximately 63% and 60% of the examined school children had goiter respectively [41]. A cross-sectional community based goiter prevalence survey in Shebe Senbo District in Jimma Zone revealed that higher goiter prevalence of 59% [8] may be because study area are lowlands with different ecological setting. In general the results of this study are not very different from other studies done in different corners of the country with similar ecological zone.

Iodine deficiency is considered to be a public health concern if the median urinary iodine is below 100 µg/l [17]. The median urinary iodine concentration of the study participants was 51.2µg/L. This results similar to another study in West Gojam that showed median urine concentration of 6-12 years children was 50ug/l [62]. Another study in Oromia region Jimma Zone also reported a similar median Urine iodine concentration was 56ug/l [8].

This study indicated that there were no significant associations between household characteristics and children iodine status. Unpublished research conducted by Meron in 2009 in Hawassa also showed consistent result [63]. Also study in Tanzania demonstrated that iodine status of school children found no relationship with household characteristics [52].

Mothers/caregivers knowledge about iodine, iodized salt and importance of iodized salt was almost null (0.8%) in study area. Lack of awareness about iodized salt, Iodine Deficiency Disorders and severity of its consequences might have contributedto the severe public health problem of goiter in

study area. According to national survey in Ethiopia 98.5% of the mothers/caregivers in SNNPR do not know the importance of iodated salt. Similarly more than 95% do not have knowledge about causes and consequences of iodine deficiency disorders [25]. Another study by Cherinet and Yemane concluded that more than 90% of women do not know IDD, the cause of iodine deficiency and the importance of iodized salt in all regions of Ethiopia [29].

From the total of 121 salt sample tested for content of iodine large majority 85(70.2%) of sample were found to have iodine levels be less than 15ppm. Only 36(29.8%) had iodine content >15ppm. The present finding is in line with the study reported by Yinebeb et al., 2012 in Shebe Senbo District, Jimma Zone, as a large majority of the households were using non-iodinated salt 277(71.2%), a less number 102(26.2%) of the households were using iodized salt [8]. Additional study conducted in Gonder indicated that only 28.9% of salt samples had iodine content >15ppm, this also support the current finding[2]**.** Even though 30% of iodized salt available in study area, all respondents answer that no iodized salt and not used iodized salt at all. All respondents answer that main reasons given for not having iodized salt were unavailability of iodized salt (100%) and lack of knowledge 120 (99.2%). This finding result of reason for not using iodized salt was in line with study done in Gondar that indicated the main reasons given for not having adequately iodized salt were lack of knowledge about the benefit of iodized salt [2]. Even though 30% of iodized salt available in K/Didaye district majority (70%) of salt was not iodized. Tyan in 2010 in Haiti did study and he found that unavailability of iodized salt was the most proximal and obvious barrier to adequate iodine consumption [26].

This study reported that purchasing of salt from retail shop or salt not exposure to sunlight was largely associated with goiter during multivariate analysis. Those who purchase salt from retail shop were 0.311(AOR (95% CI) = 0.311(0.1, 0.962) times more likely to not develop goiter than

those who purchase from open market. This showed that the participants who retail salt from shop are less likely to lose iodine from salt because of not exposure of salt to sunlight. A study in India also showed that seventy-two percent of the salt samples from the retail shops had the iodine content of ≥15 ppm [7]. A cross sectional study in Gondar revealed the same report that not exposing salt to sunlight was one of the factors significantly associated with availability of adequately iodized salt [2].

The prevalence of goiter is more in female than male in this study. This is in agreement with study conducted by Eskindir 2011 in Wolaita Zone, Soddo [13], Negalign et al., 2004 in Southwestern Ethiopia [56], Yinebeb et al., 2012 in Shebe Senbo District of Jimma Zone [8], Kidane and Woldegebriel 2006 in Tigray [24], Cherinet et al., 2007 in Ethiopia [20], Cherinet and Kelibessa 2000 in different regions of Ethiopia [6], EHNRI et al., 2005 in national survey of Ethiopia [25] and by Sanusi and Ekerette 2008 in Ibadan, Nigeria[53] reported that goiter is more commoner in females than in males. The possible explanation is that females are the more vulnerable category because of physiological reasons [8].

Goitrogenictic foods such as cassava, kale and sweet potato which can block the absorption and utilization of the available iodine from the diet [44, 64] and can have a significant impact when dietary intake of iodine is low [43]. From this goitergenetic food consumed by children in study area, only cassava consumption related to goiter presence. Also median urinary iodine concentration among cassava consumers less than that of non consumers according to independent sample t test even though the result were not statically significant.

CHAPTER V

5. CONCLUSION AND RECCOMENDATIONS

5.1. Conclusion

This study was conducted with the aim of assessing iodine status and relation with its determinants among school children aged 6-12. In the study area total goiter rate was 38% and median urine iodine concentration 51.2ug/l,both theseresults obviously indicate that the problem of iodine deficiency was severe in study area. Only three out of ten assessed households had salt with adequate amounts of iodine and almost all mothers/caregivers lack knowledge about iodized salt. These findings clearly stress the need to implement intervention programs to eliminate iodine deficiency.

It is believed that many factors contribute to goiter rate. In this study from those factors the goiter rate was found to be more prevalent with females, cassava consumers, purchasing their salt from open market and households that had salt with iodine content less than 15ppm.

Proportion of households that had iodated salt werefar below the internationally recommended values for control of IDD. Knowledge about iodized salt and its importance at household level are almost null. For all households lack of knowledge and unavailability of iodized salt in the market is only determining factor for not using iodized salt. Despite children are the stem of the future generation, nearly half of children have severe to moderate forms of iodine deficiency. Thus these results suggest that there is a need to provide intervention programs to eliminate iodine deficiency without any additional time delay.

The study hypothesized that a relationship between gender, salt iodine content, goitergenic and animal source foods with iodine status would be observed in the study participants. Significant

relationship occurs between gender, salt iodine content and goitergenic food consumers and iodine status was observed. Thus the study reject the null hypothesis which states no relationship between iodine status and gender, salt iodine content and cassava consumers is present.

5.2. Recommendations

5.2.1 Salt iodization

Salt iodization is the recommended method of eradicating iodine deficiency. Although this is a step in the right direction a stronger commitment and reinforcement is required to alleviate the problem of IDD. Extremely monitoring and inspection in the place of production, transportation and distribution of iodized salt are highly recommended.

5.2.2 Availability of iodized salt

Whenever and wherever iodized salt alone is available at the retail place, people will use it even though they are not aware of its benefits.

5.2.3 Education

Education programs are needed to make people aware of the importance and proper usage and handling of iodized salt are crucial to have adequate iodine content from salt. In addition giving awareness about the causes and consequences associated with goiters and iodine deficiency are essential to eliminate the problem. Technical training for health extension workers in overall aspects of goiter and iodine deficiency are obligatory to reach knowledge for entire population.

To further improve the knowledge and awareness on IDD and iodized salt, disseminate knowledge at different level like in school, mass media, hospitals, churches, market day, meeting, prison, idir and ikub are important place to address about iodized salt and other related issues to whole population. Integrated approaches towards eradication and control of IDD are necessary.

Suggestions for future studies: Further studies to determine processing method that will minimize or remove goitrogenic substances from goitergenetic foods and Why iodine deficiency more prevalent with female SAC..

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APPENDICES

Annex A: Ascent form

Good morning/afternoon, my name is _____ and am one of data collectors for the study conducted by masters student (Alemitu Toma) in Food science and nutrition program in Addis Ababa University for a graduate research entitled in iodine status in school age children and its determinant in Kindo Didaye district of Wolaita zone, Southern Ethiopia. You and your children (6-12) years in household are selected randomly to be participant on this study.

The purpose of this study is to determine iodine status of children 6-12 years, analyze factors affecting iodine status in addition to consumption of iodized salt in household and associated factors with consumption of iodized salt in study area and goiter rate prevalence in school age children will be studied.

This study will help you in giving knowledge and awareness of iodine status of your children, to avoid factors affecting their growth and mental development.

If you give your consent to participate in beside of your children, I would like to ask some questions related to IDD, your child will be examined for goiter by experienced heath professional, one of your children will be asked to give 5ml urea in age range of 6-12 years, if more than one children in the household in mentioned age range, the younger child will be asked to give his/her urine and a teaspoon of salt will be taken from your household to test presence of iodine. You and your children participation in the study is on voluntary bases; however, your honest response will help us in understanding the situation better and will eventually contribute in designing appropriate interventions. All the information gathered will be kept confidential and your children name will never be linked with any of the information that you provided.

There is no risk to you and children by answering the questions or taking a urea sample from your child and teaspoon of salt from your household except you will spend 30 minutes in the interview.

You have a full right to participate throughout, or to discontinue at any time, or never participate in the study.We would greatly appreciate your help in responding to these questions.Do you have any questions about the survey? Would you be willing to participate in the study?

If yes continue. Respondent's signature _____.

If no thanks and stop interview and go to other household with 6-12years child

Address of researcher:

Tel. +251939496539

E-mail: alemtoma@gmail.com

Annex B: Questionnaires

Section 1

Screening information from mothers or caregivers

All questionnaires except section 3 are administered to mothers or caregivers in a household who have child of 6-12 years.

Are there child age 6 to 12 years in your household (probe date of birth)?

If yes continue.

If no Stop the interview.

Questionnaire identification number**:**

Children 6-12years ID Kebele name Kebele ID_____.

Village name Household ID

.

Instruction: For each question listed below circle the one that mothers or caregivers will be selected.

PartI: Socio demographic and economic characteristics of the households and children

No	Questions	Response coding Categorization	Skip
101	How many children do you have 6 upto12 age groups (questions go to the younger one)	_____ in number	
102	Sex of the child	1. Male 2. Female	
103	Age of child (probe date of birth)	1. six-eight 2. nine-twelve	
104	Head of the house hold	1. Father_____→ 2. Mothers /caregivers___→ 3. Other specify_____	107 109
105	What is the educational Status of the head of the households?	1. Illiterate 2. Read and write 3. Elementary school 4. High school 5. Higher institution	
106	Occupation of the head of household (multiple answers allowed)	1. Farmer 2. Merchant 3. Governmental 4. Daily worker 5. Others specify_____	
107	What is the educational Status of the father?	1. Illiterate 2. Read and write 3. Elementary school 4. High school 5. Higher institution	
108	Occupation of the father (multiple answers allowed)	1. Farmer 2. Merchant 3. Governmental	

		4. Daily worker 5. Others specify_____	
109	What is the educational Status of the mothers or caregivers?	1. Illiterate 2. Read and write 3. Elementary school 4. High school 5. Higher institution	
110	Occupation of the mothers or caregivers (multiple answers allowed)	1. Housewives 2. Farmer 3. Merchant 4. Governmental 5. Daily worker 6. NGO 7. Others specify_____	
111	Age of the mothers or caregivers?	1. 15-19 years 2. 20-24 years 3. 25-29 years 4. 30-34 years 5. 35-39 years 6. greater than forty	
112	What is child religion?	1. Orthodox 2. Muslim 3. Protestant 4. Catholic 5. Others specify _____	
113	What is Ethnic origin of child?	1. Wolaita 2. Oromo 3. Tigray 4. Amhara 5. Others specify .	
114	Household monthly income in Ethiopian Birr	.	
115	What is the source of drinking water for your households?	1. Public tap 2. Well	

		3. Other_____	
116	What kind of toilet facility does your household use?	1, No toilet 3. Traditional pit latrine 4. Latrine with shade 6. Other specify_____	
117	What type of house do your members of household live in?	1. Grass roof hut 2. Corrugated iron roof hut 3. Walls covered with cement and Corrugated iron roof) 4. Other_____	
118	From what type of material your floor made of?	1. Mud/soil 2. Cement	
119	How many rooms do you have in house?	1. One room 2. Two- three rooms 3. Four rooms 4. Five and above	
120	How many rooms do you have for sleeping?	_____rooms	
121	Does your house have windows	1. Yes 2.No _____→	121
122	What are the windows of your house made of?	1 Open windows 2. Screening 3. Wood shutters 4. other_____	
123	Does your household have: Electricity? A radio? A mobile telephone? A table? A chair?	Yes No	

	A bed with cotton/sponge/spring mattress? A kerosene lamp/pressure lamp		
124	Whose property is the house in which you live?	1. Our own 2. Rent 3. Other specify	
125	Does any member of your household own: A bicycle? A motorcycle or motor scooter ?	Yes No	
126	What type of fuel does your household mainly use (multiple will be answer possible)	1. Wood 2. Charcoal 3. Other specify	
127	Where is the cooking usually done in?	1. In the house 2. In a separate building 3. Outdoors 4. Other (specify)	
128	Does your household own any animals? Animals Ox Cow Goat Sheep Donkey Horse/mule Other	(No) (Yes) (Number)	
129	Do your household own agricultural land?	1.Yes 2. No _____→	II
130	What is the size of your land?	1. 0-0.25 hectare 2. 0.26-0.5 hectare 3. 0.6-1 hectare 4. greater than 1 hectare	

No	Questions	Response coding Categorization	Skip

201	Did your child received any iodine Supplementation?	1. Yes 2. No _____→	204
202	What was the supplementation	1. Iodized oil capsule 2. Lugol solution 3. If other specify _____	
203	When did he/she received?	1. Below 3 month 2. 3 to 6 month 3. 6 to 12 months 4. More than 12 month	
204	Did your child take any drug that affect function of thyroid hormone in the last ? year?	1.Sulfadimethoxine, 2. Propylthiouracil, 3. Potassium perchlorate, 4. Iopanoic acid 5. Other specify_____	
205	How many times have you been pregnant?	1. No child 2. One- two 3. Three -four 4. Greater than equal to five	
206	Do you currently use any family planning method?	1. Yes 2. No_____→	208
207	Which type of family planning?	1. Pills 2. IUCD 3. Injection 4. Others/specify _____	
208	Did you used pesticide, fertilizers or herbicides during planting?	1. Yes 2. No _____→	III
209	What kind of pesticide	1. DDT 2. 2,4-D 3. Dap 4. Other specify _____	

Part II. Some IDD related information

Part III. Knowledge about Iodized salt and IDD among household

No	Questions and filters	Response coding Categorization	Skip
301	Do you know what iodine is?	1. Yes 2. No_____→ 3 .I don't know _____→	 304 310
302	Do you know iodine rich foods?	1 .Yes 2. No _____→ 3. I don't know	 304
303	What are those iodine rich foods?	----------, ---------- , ---------- ----------, ----------, ----------	
304	Do you know iodine deficieny disorder (Goiter)?	1. Yes 2. No_____→ 3. I don't know	 310
305	Is there anyone who has goiter in the family? -If yes verify	1. Yes 2. No 3. I don't know	
306	Do you know who are at risk for goiter? (multiple answers allowed)	1. Children 2. Elderly 3. Pregnant women 4. Adolescent 5. Men 6. Women 7. Others Specify_____	
307	Do you know how to prevent goiter?	1. Yes 2. No 3. I don't know_____	
308	If yes what are the prevention mechanisms do you know?	1. .Iodized oil 2. Iodized salt 3. Sea foods 4. Others specify_____	
309	From whom did you get the information of prevention and control of goiter?(multiple answers allowed) 1.Radio 2. Television 3.Newspaper/magazine 4.Pamphlet/poster 5.Health Worker 6.Community events 7.Family/friends 9.Health extension worker 10.Others specify _____	 <u>Yes</u> <u>No</u>	
310	Do you use iodized salt?	1. Yes 2. No_____→ 3. I Don't know_____→	 312 314

311	If yes why do you choose iodized salt?	1. For health 2. Taste 3 I don't know 3. Others Specify----------	
312	If no why don't you choose iodized salt	1. It has no salty taste 2. Not available in the market 3. Too costly 4. Finished for a while 5. Other Specify	
313	How do you verify that salt you buy is iodized salt?	1. Reading the label of container 2. By observing the container 3. Trust the merchant 4. Others, specify_____	
314	How do you store salt?	1. Keep the packet open 3. Plastic airtight containers 4. Keep it open in the plate 5. Other specify	
315	Do you know iodized salt is sensitive to temperature, sun light and humidity.	1. Yes 2. No 3. I don't know	
316	When do you usually add salt to your food?	1. Before cooking 2. During cooking 3. After cooking	

Part IV. Accessibility and availability of iodized salt

401	Where is your source of buying salt?	1 .Market 2. Shop 3. Others Specify_____	
402	How often do you usually buy salt?	1. Weekly 2. Monthly 3. Others, Specify_____	
403	How much do you usually buy at a given time? (grams)	[_____]	
404	How much salt does your family consume per month in KG?	[_____]	
405	Is there both iodized and non iodized salt in the market?	1.Yes 2. No _____→ 3. I don't know _____→	 V V
406	There a difference in cost?	1. Yes 2. No _____→ 3. I don't know _____→	 V V
407	If the price of iodized salt is a little bit more expensive than regular salt can you afford to buy the iodized salt?	1. Yes 2. No 3. I don't know	

Part V. Check list for iodine presence in the salt

501	Ask respondent for a teaspoonful of cooking salt: Test salt for iodine presence	1. 0 (no) iodine 2. >15ppm 3. <15ppm	

Part VI. Check list for goiter presence in the child

601	Ask child for checking goiter	1. Grade zero 2. Grade 1 3. Grade 2	

Section 2

Part 1.Instruction: For each food item listed below, indicate with a checkmark (√) the category that best describes the frequency with which the child usually eat that particular food item. Thinking about the last one week, how frequently did your child eat the following food items

How frequently did your child eat the following food items per day during the last one week?

Food	Once per week	Twice per week	3-6 per week	Never per week
Cassava				
Any foods made from sweet potato				
Cabbage				
Kale				
Maize				
Peanuts				
Millet				
Red teff				
Meat and meat product				
Milk and Milk product				
Egg				
Avocado				

This is all my questions for mothers/caregivers and Thank you for your response

የፈቃደኝነትመጠየቂያቅፅ

ጤናይስጥልንእንደምንአደሩ/ዋሉ? ስሜ_____

_____ይባላል፡፡እኔመረጃከሚሰበስቡአንዱ/ዷነኝ፤ጥናቱየሚሰበሰበውበድህረ-ምረቃተማሪ (አለሚቱቶማ) በአዲስአበባዩኒቨርሲቲበምግብሳይንስናስነምግብትምህርትክፍልለመመረቂያጥናትማሟያእንዲሆንበአዮዲንመጠንናተዛማጅጉዳዮችበኪንዶዲዳዬወረዳበሚገኙዕድሜያቸውለትምህርትበደረሱ(ከ6-12 ዓመት) ህጻናትላይጥናትለማድረግነው፡፡

የጥናቱዓላማአዮዲንመጠንንማወቅናተዛማችችግሮችንመለየት፣አዮዲንያለበትንጨውመጠቀምንናየተገናኙችግሮችንመለየትእናእንቅርትመጠንንበልጆችላይማጥናትነው፡፡

ይህጥናትየሚሰጠውጥቅምየልጅዎንአዮዲንመጠንላይዕውቀትእንዲኖረዎትያደርጋል፤የልጅዎንአካላዊናአዕምሮአዊዕድገትንየሚከለክሉችግሮችንለማስወገድይረዳል፡፡

ፈቃደኛከሆኑበልጅዎፈንታከጥናቱጋርየተገናኙአንዳንድጥያቄዎችንእጠይቃለሁ፤የልጅዎእንቅርትመጠንበሰለጠነበጤናባለሙያይታያል፣

5ሚሊሊትርሽንትከልጅዎይወሰዳል፣እቤትዎውስጥከአንድበላይልጅበተገለፀውዕድሜክልልካለሽንትየሚወሰደውበዕድሜከሚያንሰውልጅነው፣በቤትዎከሚጠቀሙትጨዉአንድየሻይማንኪያየሚሞላጨውይወሰዳል፣የእርስዎናየልጅዎተሳትፎበዚህጥናትበፈቃደኝነትላይየተመሠረተነው፤ቢሆንምየእርስዎበትክክልመመለስችግሩንበደንብለማወቅናተገቢውንመፍትሔእንዲመጣይረዳል፡፡የሚሰጡንመልስናመረጃበምስጥርየሚያዝመሆኑንእገልጻለሁ፡፡

በጥናቱተሳታፊበመሆንዎ 30 ደቂቃከማባክንውጪበእርስዎምሆነበልጅዎላይምንምጉዳትአያመጣም፡፡እርስዎምሆኑልጅዎበጥናቱአለመሳተፍምሆነእየተሰተፉበየትኛውምጊዜማቋረጥይችላሉ፡፡መልሶችንበመመለስለሚያደርጉልንትብብርከልብእናመሰግናለን፡፡ጥያቄአለዎት?ለመሳተፍፈቃደኛነዎት?

ፈቃደኛከሆኑፊርማዎትን_____

ፈቃደኛካለሆኑአመስግነውከ6-12 ዓመትልጅወዳለበትቤትማለፍ፡፡

የተመራማሪውአድራሻ፡-

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ጥያቄዎች

ክፍልአንድ

መረጃከእናትወይምከአሳዳግመሰብሰብ

ሁሉምጥያቄዎችከክፍልሦስትውጪከ6-12 ዓመትልጅላላትእናትየሚቀርብነው፡፡

ከ6-12 ዓመትልጅአለዎት? (የወለዱበትንጊዜእንዲያስታውሱማድረግ) _____

አዎንከሆነቀጥል/ይ፡፡

የለምከሆነወደቀጣዩቤትማለፍ፡

የጥያቄመለያኮድ፡

ከ6-12 ዓመትልጅመ/ቁ_____የቀበሌስም_____የቀበሌመ/ቁ_____

የመንደርስም_____የቤተሰብመ/ቁ_____

መመሪያለአንድ፡ከታችለተዘረዘሩትለእያንዳንዱጥያቄዎችእናትወይምአሳዳግየምትሰጠውንመልስለአክብብ/ቢ

ሀ. የቤተሰብማህበራዊናኢኮኖሚያዊመረጃ

ቁጥር	ጥያቄ	የመልስኮድ	ይዝለሉት
101	ከ6-12 ዓመትስንትልጆችአለዎት? (ቀጣዩንጥያቄየሚጠይቆትስለከ6-12 ዓመትካሉትልጆችበእድሜትንሹልጅዎትንነው)	በቁጥር	
102	የልጅዎፆታ	1. ወንድ 2. ሴት .	
103	የልጅዎዕድሜ (የወለዱበትንጊዜእንዲያስታውሱማድረግ)	1. ከስድት- ስምንት 2. ከዘጥኝ- አስራሁለት	
104	የቤተሰቡአስተዳዳሪ	1.አባት_____> 2.እናት/አሳዳግ_____> 3. ሌላከሆነይጥቅሱ	107 109
105	የቤተሰቡአስተዳዳሪየትምህርትደረጃ	1. ያልተማረ 2. ማንበብናመጻፍየሚችል 3. ከአንድእስከስድስት 4. ከዘጠኝእስካአስራሁለት 5. ከአስራሁለትበላይ	
106	የቤተሰቡአስተዳዳሪመተዳደሪያምንድነው?	1. ገበሬ 2. ነጋዴ 3. መንግስትተቀጣሪ 4. የቀንሰራተኛ 5. የእርዳታድርጅትሠራተኛ 6. ሌላከሆነይጥቅሱ	
107	አባትየትምህርትደረጃ	1. ያልተማረ 2. ማንበብናመጻፍ 3. ከአንድእስከስድስት 4. ከዘጠኝእስካአስራሁለት 5. ከአስራሁለትበላይ	
108	አባትአስተዳዳሪመተዳደሪያምንድነው?	1. ገበሬ 2. ነጋዴ 3. መንግስትተቀጣሪ	

		4. የቀንሰራተኛ 5. የእርዳታድርጅትሠራተኛ 6. ሌላከሆነይጥቀሱ	
109	እናትወይምአሳዳግየትምህርትደረጃ	1. ያልተማረ 2. ማንበብናመጻፍየሚችል 3. ከአንድእስከስድስት 4. ከዘጠኝእስካአስራሁለት 5. ከአስራሁለትበላይ	
110	የእናትወይምአሳዳግመተዳደሪያምንድነው?	1. የቤትእመቤት 2. ገበሬ 3. ነጋዴ 4. መንግስትተቀጣሪ 5. የቀንሰራተኛ 6. የእርዳታድርጅትሠራተኛ 7. ሌላከሆነይጥቀሱ	
111	የእናትወይምአሳዳግዕድሜ	1. ከአስራአምስት- አስራዘጠኝ	
112	የልጅዎሀይማኖት	1. ኦርቶዶክስ. 2. ሙስሊም 3. ፕሮቴስታንት 4.ካቶሊክ 5. ሌላከሆነይጥቀሱ	
113	የልጅዎብሄርምንድንነው?	1. ወላይታ 2. ኦሮሞ 3. ትግራይ 4. አማራ 5. ሌላከሆነይጥቀሱ	
114	የቤተሰቦየወርገቢ	_____.	
115	የቤተሰቦዋነኛየመጠጥውሃምንጭከየትነው?	1. ቦኾ 2. ከወንዝከሀይቅወይምከግድብ 3. ሌላካለይጥቀሱ	
116	ቤተሰቦየሚጠቀምበትየሽንትቤትአይነት	1.ሽንትቤትየለንም	

		3. የደረቅጉድጓድሽንትቤት 4. ጥላያለውሽንትቤት 5. ሌላከሆነይጥቀሱ	
117	ምንአይነትቤትውስጥነውየሚኖሩት?	1. ሳርቤት 2. ባለቆርቆሮጣርያ.ጭቃቤት 3. ባለቆርቆሮጣርያናግንብግድግዳ 4. ሌላከሆነይጥቀሱ	
118	የቤትዎወለልከምንየተሰራነው?	1.ከጭቃ 2.ከሲሚንቶ 4. ሌላከሆነይጥቀሱ	
119	ቤትዎስንትክፍልአለው?	1. አንድ 2. ሁለት - ሦስት 3. አራት 5. አምስትናከዛበላይ	
120	ስንትመኝታክፍልአለው?	.	
121	ቤትዎመስኮትአለው?	1. አለው 2. የለውም _____→	121
122	የቤትዎመስኮትየተሰራውከምንድንነው?	1.ክፍት (መዝጊያየሌለው) 2. በመከለያ (ወንፊት) 3. የእንጨትመስኮት 4. ሌላከሆነይጥቀሱ	
123	ቤተሰቦአለው? መብራት ሬድዮ ሞባይል ጠረጴዛ ወንበር አልጋከስፖንጅፍራሽጋር ፋኖስ/ማሾ	1. አለው 2. የለውም	
124	የመኖሪያቤትየባለቤትነትሁኔታ	1. የግል 2. የኪራይ 3. ሌላካለይጥቀሱ	
125	ከቤተሰብዎአባላትየራሱየሆነ፡ ብስክሌትያለውአለ?	አዎየለም	

	ፈረስጋሪያለውአለ?		
126	ምንዓይነትየእሳትፈጀታነውየምትጠቀሙት? (ከአንድበላይመልስይቻላል)	1. እንጨት 2. ከሰል 3. ሌላካለይጥቀሱ	
127	የሚታበስሉትየትነው?	1. ቤትውስጥ 2. ሌላቤት 3. ከቤትውጭ 4. ሌላካለይጥቀሱ	
128	የቤትእንስሳትአሉዋቹው? <u>የቤትእንስሳት</u> በሬ ላም ፍየል በግ አህያ ፈረስ/በቅሎ ሌላከሆነይጥቀሱ	<u>የለንምአለንበቁጥር</u>	
129	ቤተሰቡየእርሻመሬትአለዉ?	1. አለው 2. የለውም_____→	ለ
130	ምንያህልስፋትአለው?	1. 0-0.25 ሄክታር 2. 0.26-0.5 ሄክታር 3. 0.6-1 ሄክታር 4. > 1 ሄክታር	

ለ. ከአዮዲንእጥረትበሽታጋርየሚገኙመረጃዎች

ቁጥር	ጥያቄ	የመልስኮድ	ይዝለሉት
201	ልጅዎየምግብደጋፊአዮዲን (የአዮዲንሳፕልመንት) ወስዶነበር?	1. አዎ 2. አልወሰደም ---------->	204
202	የምግብደጋፊአዮዲንምንነበር?	1. አዮዲንዘይትእንክብል 2. ሉጎልበውሃመልክ 3. ሌላካለይጥቀሱ	
203	መቼነውየተሰጠው?	1. ከ3ወርበታች 2. ከ3-6 ወር 3. ከ6-12 ወር 4. ከ12ወርበላይ	
204	ልጅዎማንኛውንምየታይሮድእጢአሰራርንየሚያዛባመድኃኒትባለፈውዓመትወስዶነበር?	1. ሳልፋዳይሜቶክሳይን 2. ፕሮፓይልቲዮራሲል 3. ፖታሲየምሮክሎሬት 4. አዮፓኒየክአሲዲ 5. ሌላካለይጥቀሱ	
205	ስንትልጅወልደዋል?	ጊዜ	
206	በአሁኑጊዜየቤተሰብምጣኔዜዴእየተጠቀሙነው?	1. አዎ 2. አልጠቀምም ---------->	208
207	የትኛውንነውየሚጠቀሙት?	1. ክኒን 2. ሉፕ 3. መርፌ 4. ሌላካለይጥቀሱ	
208	በእርሻወቅትየተለያዩኬሚካሎችን (ማዳብሪያ፣ተባይመግደያ...) ተጠቅመዉነበር?	1. አዎ 2. አልተጠቀምኩም ---------->	ሐ
209	ምንዓይነትነውየተጠቀሙት?	1. ዲዲቲ 2. 2፣ 4-ዲ	

		3.ማዳበሪያ 4. ሌላካለይጥቀሱ	

ሐ. እውቀትስለአዮዲንናአዮዲንያለበትጨውበተመለከተ

301	አይዲንምንእንደሆነያውቃሉ?	1. አዎ 2. አይ ----------> 3. አላውቅም ---------->	 304 310
302	በአዮዲንየበለፀገንምግቦችንያውቃሉ?	1. አዎ 2. አይ ----------> 3. አላውቅም	 304
303	እነማናቸው?	--------፣---------፣--------፣------	
304	የአዮዲንእጥረትምንእንደሆነያውቃሉ?	1. አዎ 2. አይ ----------> 3. አላውቅም	 310
305	በቤተሰብዎየአዮዲንእጥረትያለውሰውአለ?	1. አዎ 2. የለም 3. አላውቅም	
306	ለአዮዲንእጥረትየተጋለጡእነማንእንደሆኑያዉቃሉ?	1. ሕጻናት 2. ሽማግሌዎች 3. ነፍሰ-ጡር 4. ጎልማሳዎች 5. ወንዶች 6. ሴቶች 7. ሌላካለይጥቀሱ	
307	የአዮዲንእጥረትንእንዴትእንደምንከላከልያውቃሉ?	1. አዎ 2. አይ----------> 3. አላውቅም	 310
308	መፍትሔችምንምንድናቸው?	1. አዮዲንያለበትዘይት 2. አዮዲንያለበትጨው 3. የሀይቅምግቡች 4. ሌላካለይጥቀሱ	
309	ከየትሰሙ? ሬዲዮ ቴሌቪዥን ጋዜጣ በራሪወረቀት ጤናባለሙያ ማህበረሰብ ቤተሰብ/ጓደኛ ጤናኤክስቴሽንባለሙያ ሌላካለይጥቀሱ	1.አዎ 2. አይደለም	

310	በአዮዲንየበለፀገጨውንይጠቀማሉ?	1. አዎ 2. አልጠቀምም----------> 3. አላውቅም---------->	 312 314
311	ለምንመረጡ?	1. ለጤና 2. ለጣዕም 3. አላውቅም 4. ሌላካለይጥቀሱ	
312	በአዮዲንየበለፀገጨውንለምንአይጠቀሙም?	1. የጨውጣዕምየለውም 2. በገበያአይገኝም 3. ውድነው 4. ለጊዜውጨርሼነው 5. ሌላካለይጥቀሱ	
312	የአዮዲንጨውእንድትጠቀሙማንይወስናል?	1. ባል 2. ሚስት 3. ሌላካለይጥቀሱ	
313	አዮዲንያለበትጨውመሆኑንበምንያረጋግጣሉ?	1. ዕቃውላይየተጻፈውንበማንበብ 2. ዕቃውንበማየት 3. ሻጮችንበማመን 4. ሌላካለይጥቀሱ	
314	ጨውንበምንያስቀምጣሉ?	1. የመጣበትንዕቃቀይሮ 2. መጠቅለያውንክፍትበማደረግ 3. በፕላስትክ 4. በሰኃንክፍትበማድረግ 5. ሌላካለይጥቀሱ.. ___.	
315	የአዮዲንጨውለሙቀት፣ለፀሐይብርሃን፣ለቅዝቃዜተጋላጭመሆኑንያውቃሉ?	1. አዎ 2. ኣይ 2. አላውቅም	
316	ምግብዎላይምንጊዜነውጨውምጨምሩት?	1. ከመብሰሉበፊት 2. እየበሰለእያለ 4. ከበሰለበኃላ	

መ. አዮዳይዝድጨውአቅርቦትናተደራሽነት

401	ጨውከየትይገዛሉ?	1.ከገበያ 2. ሱቅ 3. ሌላካለይጥቀሱ	
402	መቼይገዛሉ?	1. በሳምንት 2. በወር 3. ሌላካለይጥቀሱ	
403	በምትገዙበትጊዜስንትኪሎይገዛሉ?	_____.	
404	ቤተሰባችሁበወርስንትኪሎይጠቀማል?	_____.	
405	በገበያላያአዮድንያለዉናየለሌዉጨውአለ?	1. አለ 2. የለም----------> 3. አላውቅም---------->	 ሠ ሠ
406	የዋጋልዩነትአለ?	1. አለ 2. የለም----------> 3. አላውቅም	 ሠ
407	ይህየአዮዲንጨውበዋጋመጨመሩምክንያትየመግዛትአቅምአሎት?	1. አለን 2. የለንም 3. አላውቅም	

ሠ. አዮዲንመኖሩንጨውላይማረጋገጫ

501	ተጠያቂዉንአንድማንኪያጨውጠይቆበመውሰድአዮዲንመኖሩን/አለመኖሩንያረጋግጡ	1. 0(አዮዲንየለም) 2. < $15/10^6$ 3. >$15/10^6$	

ረ. ልጆዎላይእንቅርትመኖሩንማረጋገጫ

601	ልጅዎላይእንቅርትመኖሩንማረጋገጥ	1. ደረጃዜሮ 2. ደረጃአንድ 3. ደጃሁለት	

ክፍል 2

ሀ. መመሪያሁለት፡ከታችለተዘረዘሩትእያንዳንዱየምግብአይነቶችልጆዎባለፈውሳምንትበየቀኑስንቴእንደወሰደየሚጠይቅነው።

ያለፈውንሳምንትበማሰብስንቴእንደወሰደይንገሩን፡

ምግብ	አንዴበሳምንት	ሁለቴበሳምንት	3-6 ግዜበሳምንት	አልበላምበሳምንትውስጥ
እንጨትቦዬ				
ሱካሬድንችናየትኛውንከሱየተሰራምግቦች				
ጥቅልጎመን				
ሀበሻጎመን				
ቦቆሎ				
ለውዝ				
ማሽላ				
ቀይጠፍ				
ሰጋናየስጋምርት				
ወተትናየወተትምርት				
እንቁላል				
አቮካዶናጮማ				

ጥያቄውንጨርሻለሁአመሰግናለሁ፡፡