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Utilization of Adequately Iodized Salt on Prevention of Iodine Deficiency Disorders at Household Level and Associated Factors in Lalo Assabi District, West Ethiopia

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Abstract

Background: Iodine deficiency disorder is a significant public health problem in Ethiopia. Fortification of salt with iodine has been the long term and effective preventive measure against iodine deficiency disorders. However, there is no other study has been conducted on utilization of adequately iodized salt in the study area. Hence, the need to undertake this study was to provide current information regarding the utilization of adequately iodized salt at household levels in the west part of Ethiopia.

Method: A community based cross-sectional study was conducted among 768 households in the district from December 01 to 31, 2014. A multistage sampling was used to identify study unit. Data were collected using a pretested and structured questionnaire by a face-to-face interview technique and the households' salt was tested for its iodine content. Logistic regression analyses method was used to check associations and control confounding.

Results: Only 8.7% of households had adequately iodized salt. Residence of respondents [AOR = 1.26, 95% CI = (1.12, 3.43)], using packed salt [AOR = 1.38, 95% CI = (1.27, 3.12)], not exposing salt to sunlight [AOR = 0.86, 95% CI = (0.67, 0.99)], storing salt in dry place AOR = 2.15, 95% CI = (1.82, 3.11] and storing salt in container with a lid [AOR = 1.45, 95% CI = (1.36, 2.71)] were significantly associated with utilization of adequately iodized salt.

Conclusion: Utilization of adequately iodized salt at household level was very low in the study area. The finding of this study revealed that residence of study participants; using packed salt, not exposing salt to sunlight, storing salt in dry place and storing salt in container with a lid were significantly associated with availability of adequately iodized salt at household level. Thus, an organized effort should be made at all levels to improve the utilization of adequately iodized salt at household level.

Keywords: Iodized salt; Utilization of adequately iodized salt; Associated factors; Household level

Abbreviations

EDHS: Ethiopian Demographic and Health Survey; ICCIDD: International Center for the Control of Iodine Deficiency Disorders; IDD: Iodine Deficiency Disorders; MOH: Ministry of Health; PPM: Parts-Per-Million; TGR: Total Goiter Rate; UI: Urinary Iodine; UNICEF: United Nations International Children's Emergency Fund; USI: Universal Salt Iodization; WHO: World Health Organization

Introduction

Iodine is an essential micronutrient required in small amounts for the normal physiological function of the human body. Iodine is a critical component of the thyroid hormones, which are necessary for various metabolic and enzymatic processes. The recommended dietary intake for adult men and women is 150 µg/day. Seafood, dairy products, and plants grown in iodine-rich soils are good food sources of iodine. Most other foods contain low amounts of iodine. Iodine is found naturally in topsoil and top soil has been lost due to deforestation, erosion and flooding. Thus food crops lack iodine resulting in dietary iodine deficiency. So individuals require additional sources to meet the recommended amounts [1].

Iodine deficiency disorders (IDD) is a significant public health problem in more than 50 countries. According to WHO, an estimated 2 billion people worldwide (35.2% of the world population) suffer from insufficient iodine intake, defined as urinary iodine levels below 100 µg/L [2]. As a result, twenty-two million children globally each year are at risk of impaired intellectual function and lower school performance [3]. Approximately 70% of households in the world used iodized salt by 2000, compared with less than 20% in 1990. The elimination of iodine deficiency, by expedient production, marketing, and universal consumption of iodized salt, represents a significant development effort in public nutrition.

Although globally iodine nutrition has greatly improved, 20% to 30% of pregnancies and thus newborns still do not fully benefit from the use of iodized salt [4].

Many of the developing nations have the highest prevalence for IDD, often due to the high level of food insecurity. IDD is more closely linked to food insecure populations, which are also often low-income and rural populations, who lack access to food, including food that may have been prepared with iodized salt. It is common in Ethiopia because of high plateau areas. Iodine is found naturally in topsoil and top soil has been lost due to deforestation, erosion and flooding thus food crops lack iodine resulting in dietary iodine deficiency. School children, pregnant and lactating mothers are vulnerable to the problem [2].

According to the Ethiopian Demographic and Health Survey, only 15.4 percent of the households were using iodized salt [5].

Iodine deficiency results from either low iodine intake in the diet or ingestion of goitrogens [5]. Salt iodization to prevent iodine deficiency is a major global public health triumph; it is estimated about 70% of the global population now has access to adequately iodized salt. Salt is generally used as the vehicle for providing iodine because it is consumed by most of the population at fairly constant levels throughout the year and its taste and appearance is not affected by iodization [6].

Universal salt iodization (USI) has been extremely effective at reducing the burden of IDD and represents a major global public health success. In Africa, great progress has been made towards the elimination of iodine deficiency, saving millions of children from its adverse effects, largely due to the increased household availability of iodized salt [7].

According to Salt Iodization Council of Ministers Regulation No. 204 / 2011 of Ethiopia, every salt for human consumption should be iodized. No person shall process, import, transport, distribute, store and sale none iodized salt for human consumption [8]. Despite this, on study conducted in Shebesenbo district Jimma zone, in 2011, only 26.2% of the households were using iodized salt [9].

No other study has been conducted on utilization of adequately iodized salt in the study area. Hence the need to undertake this study is to provide current information regarding the utilization of adequately iodized salt on prevention of iodine deficiency disorders in the district level.

The result of this study will contribute in determining the proportion of households with adequately iodized salt and identifying factors which affect iodine content of the salt at household level so that appropriate action will be taken to promote utilization of iodized salt. It will contribute towards understanding the percentage of households which are not getting adequate amount of iodine and at risk of iodine deficiency in the district.

The investigators will be able to forward recommendations to the concerned bodies to enhance appropriate planning and implementation of intervention relevant to utilization of adequately iodized salt and associated factors based on the findings of the study.

Methods

Study setting, design and period

The study was conducted in Lalo Assabi district which is located 23 km west of the Gimbi town. It is located at a distance of 133 km from Nekemte town and 461 km from Addis Ababa town. Lalo Assabi lies in climatic zone of woinadega and altitude range of 1300-1873 meters above sea level. The district has 4 urban and 27 rural kebeles with a total of 19467 households and has a total population of 93498 from which 45976 (49.5%) were males and 46904 (50.5%) were females. The district has three governmental health center and 27 health posts. Corn and sorghum were the staple food in the area. In this study a community based cross-sectional study design was conducted from December 01 to 31, 2014.

Source and study population

Source population was all households of the Lalo Assabi district. Study population was randomly selected households in the selected kebeles of the district.

Inclusion and exclusion criteria

Individuals in the households who were 18 years old and above and mostly involved in food preparation were included. In the households where two or more household members are mostly involved in food preparation, one of them was chosen randomly. Individuals who were sick and unable to respond at the time of data collection were excluded from the study.

Sample size determination

The sample size was determined by using single population proportion formula. The following assumptions were made: 50% proportion of iodized salt availability, 95% confidence level, 5% margin of error, and design effect of 2. Then, 5% was added for the expected non response, making the final sample size 806 households.

Sampling procedures

A multistage sampling was used to select households from the source population. At first stage kebeles were selected then at the second stage households were selected from the selected kebeles. The stratified sampling technique was deemed appropriate because of the presence of difference among study participants based on their residence (urban and rural).

In the first stage, two from the four urban kebeles and fourteen from the twenty seven rural kebeles were selected randomly by lottery method. Then, sample was allocated proportional to the household size of each selected kebeles. In the second stage; households from each selected kebeles were identified using systematic random sampling technique. Sampling interval (K) was determined by dividing the total number of households in the kebele by the desired sample size of that kebele then a number between one and K was selected randomly. This number represented the first household to be included in the sample. The next households were identified every K^{th} interval. The member of the household who was responsible for purchasing food items and mostly involved in food preparation in the selected households was interviewed. In the households where two or more household members are responsible for purchasing food items and / or mostly involved in food preparation, one of them was chosen randomly.

Pretesting the questionnaire

Before data collection, the instrument was pre-tested in 40 households in the kebeles not selected for the actual study in the district. The necessary modifications and corrections were made on the questionnaire before it is used for the actual study. The expiry date of the rapid test kit was checked before use.

Data collection procedure

Data were collected by a face-to-face interviewing technique using structured questionnaire adopted from Iodized Salt Program Assessment Tool [9]. The questionnaire contains both open and close ended questions. The questionnaire included a section for observing the type of container used to store the salt and place of salt storage. The determination of iodine levels in samples of salt used by households was done by using the rapid test kits. The questionnaire was written in English and then translated into local language (Afan Oromo). To assess the iodine content of the salt at household level, interviewers asked households to provide a teaspoon of salt used for cooking. The salt was tested for iodine using the iodine rapid test kit (MBI Kits International). MBI KITS is improved iodized salt Field Test kit for salt fortified with potassium iodide. The test kit contains 2 test solution ampoules of 10 ml, 1 Recheck solution ampoules of 10 ml, 1 color chart and 1 white cup.

Procedure to test iodine content of salt

1. Fill small cup with salt, then spread the salt surface flat.
2. Add two drops of the test solution on the surface of the salt by piercing the white ampoule with a pin and gently squeezing the ampoule.
3. Compare the color on the salt with the color chart, within one minute and determine the iodine content.
4. If no color appears on the salt (after one minute),on a fresh sample add up to five drops of the recheck solution in red ampoule and then add two drops of test solution on the same spot. Now compare the color with the color chart and determine the iodine content.

Data collectors

Data were collected by 8 people who had completed 10th grade and above. Three B.S.C nurses were recruited as supervisors. Data collectors and supervisors were trained for two days prior to the data collection (Figure 1).

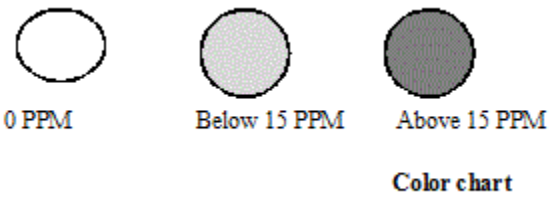

Figure 1: Chart colour.

Operational definitions

Iodized salt is table salt mixed with a minute amount of various salts of the element iodine.

Adequately iodized salt is defined as salt sample which has ≥ 15 parts per million (ppm) of iodine.

Variables of the study

Utilization of adequately iodized salt was considered as dependent variable in this studySocio-demographic characteristics of study subjects (age, sex, residence, religion, ethnicity, occupation, monthly income, educational status, marital status); knowledge about iodized salt, and practice of study subjects on iodized salt were considered as independent variables.

Data processing and analysis

The coded quantitative data were checked for completeness, double entered in to a computer, cleaned, and processed and analyzed using SPSS windows version 20.0. Descriptive statistics and binary logistic regression analysis methods were used. A binary logistic regression analysis was performed to determine the association. Statistical association was checked by 95% confidence interval and crude odd ratio. The significant variables (p-value <0.5) observed in bivariate analysis were subsequently included in multivariate analysis to control confounding factors. Finally, 95% confidence interval and adjusted odd ratio were reported. P value less than 0.05 were considered as statistically significant.

Data quality control

Quality control measures were employed during data collection and analysis. Before data collection data collectors and supervisors were trained on procedures. The data were verified by the investigator and were cleared and edited daily. Data collection instrument was translated to local language (Afan Oromo) and pretest of the study tools was done before data collection and accordingly necessary corrections were undertaken.

Ethical considerations

Ethical approval was obtained from Wollega University ethical approval committee. A formal letter of cooperation was written to Lalo Assabi district from Wollega University. After the purpose of the study is explained, written consent was obtained from each study participant. Interviews were carried out privately in a separate room. Participants were informed that participation is on voluntary basis and that they can withdraw at any time if they are not comfortable about the question. Participants were assured that their names or personal identifiers are not included in the written questionnaire to ensure confidentiality.

Results

Socio-demographic characteristics of respondents

In this study a total of 768 participants were included with 95% response rate. The mean age of study participants was 34 years (SD ± 12). Almost all 753 (98%) of the respondents were women. The Oromo ethnicity constituted the majority 764 (99.5%) of the study participants. Among all respondents 665 (87%) were followers of protestant by religion, 606 (79%) were married, 712 (92.7%) reported farming as their main occupation, 384 (50%) had at least primary school level education, 431 (56%) had family size of more than five and 437 (56.9%) of them earned ≤ 250 Ethiopian Birr per month (Table 1).

Utilization of adequately iodized salt at household level

The study finding revealed that adequately iodized salt (salt sample which has ≥ 15 parts per million of iodine) was found in 67 (8.7%) of the 768 tested salt samples.

Variable		Frequency (%)
Sex	Female	753 (98)
	Male	15 (2)
Age	20-24	112 (14.6)
	25-29	203 (26.4)
	30-34	137 (17.8)
	35-39	124 (16.1)
	40+	192 (25.0)
Residence	Rural	640 (83.4)
	Urban	128 (16.6)
Religion	Protestant	665 (87)
	Orthodox	69 (9)
	Others	34 (4.4)
Ethnicity	Oromo	764 (99.5)
	Others	4 (0.5)
Marital status	Currently married	606 (79)
	Divorced	8 (1)
	Never married	65 (8.5)
	Separated	11 (1.4)
	Widowed	78 (10)
Educational status	Cannot read and write	329 (42.8)
	Grade 1-8	385 (50)
	Grade 9-12	54 (7)
Occupation	Farmer	712 (92.7)
	Employed	23 (3)
	Student	33 (4.3)
Household's monthly income	≤ 250 ETB	437 (56.9)
	251-750 ETB	267 (34.7)
	751-1500 ETB	64 (8.3)
Total family size	< 3	34 (4.4)
	5-Mar	303 (39.4)
	5+	431 (56)

Table 1: Socio demographic characteristics of respondents in Lalo Assabi district, December, 2014 (n = 768).

The majority (77.3%) of the respondents use salt with an iodine level of less than 15 ppm, whereas 107 (14%) use salt with an iodine content of 0 ppm (Figure 2).

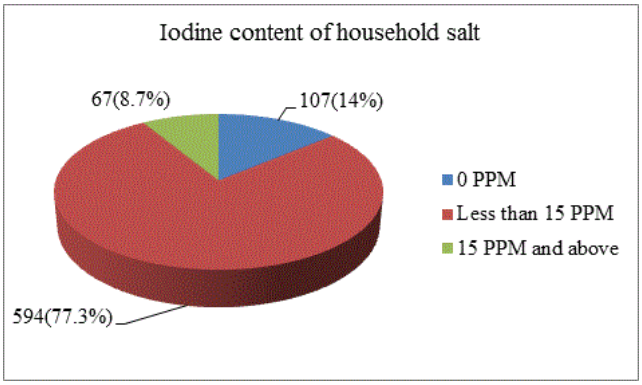

Figure 2: Iodine content of tested household salt samples, Lalo Assabi district, December, 2014.

Factors associated with utilization of adequately iodized salt at household level

The investigation on the presence of association between suspected factors and utilization of adequately iodized salt revealed the following results. Residence of respondents [AOR = 1.26, 95% CI = (1.12, 3.43)], using packed salt [AOR = 1.38, 95% CI = (1.27, 3.12)], not exposing salt to sunlight [AOR = 0.86, 95% CI = (0.67,0.99)], storing salt in dry place AOR = 2.15, 95% CI = (1.82, 3.11] and storing salt in container with a lid [AOR = 1.45, 95% CI = (1.36, 2.71)] were significantly associated with utilization of adequately iodized salt (Table 2).

Expose salt to sun light	Utilization of adequately iodized salt			
	≥ 15 ppm	< 15 ppm	COR (95% CI)	AOR (95% CI)
Yes	4 (0.5%)	44 (5.7%)	0.94 (0.44, 0.98)	0.86 (0.67, 0.99)
No	63 (8.2%)	656 (85.4%)	1	1
Residence				
Urban	56 (7.3%)	72 (9.4%)	8.3 (4.13, 9.45)	1.26 (1.12, 3.43)

Rural	64 (8.3%)	683 (88.9)	1	1
Type of salt				
Packed	4 (0.5%)	30 (3.9)	1.4 (1.12, 2.35)	1.38 (1.27, 1.3.12)
Not packed	62 (8.1%)	672 (87.5%)	1	1
Place of salt storage				
Dry place	56 (7.29%)	489 (63.6%)	2.2 (1.93, 3.21)	2.15 (1.82, 3.11)
Moisture area	11 (1.5%)	212 (27.6%)	1	1
Knowledge about iodized salt				
Good	40 (5.2%)	420 (54.6%)	1.01 (0.85, 1.64)	1.00 (0.89, 2.43)
Poor	26 (3.4%)	280 (36.4%)	1	1
Type of container				
Container with a lid	39 (5.1%)	325 (42.3%)	1.67 (1.23, 2.31)	1.45 (1.36, 2.71)
Container without a lid	27 (3.5%)	377 (49%)	1	1

Table 2: Logistic regression analysis showing factors associated with utilization of adequately iodized salt at household level in Lalo Assabi district, December, 2014.

Discussion

Ethiopia, in its national guideline for control and prevention of micronutrient deficiencies, has set a goal to virtually eliminate IDD by the year 2005 through universal salt iodization (USI) and an objective to increase access to iodized salt among households up to 80%. This study revealed that 8.7% of households had adequately iodized salt at household level. This is very low as compared to a study conducted in Afghanistan which showed that 63% of household salt samples were found to be adequately iodized [10]. Study conducted in Bia district, Ghana revealed that 64.6% of households in the district exclusively used iodized salt [11]. This finding is still low as compared to EDHS 2011 report in which the national coverage of iodized salt was 15.4% and 17.4% for Oromia region [5]. This might be related with the presence of poor practice of iodized salt at household level in the district. Study conducted in ShebeSenbo District, Jimma Zone and Gondar revealed that 26.2% and 28.9% of the households were using iodized salt respectively [9,12]. The finding of this study is low when compared to the above studies.

The finding of this study revealed that residence of respondents, using packed salt; not exposing salt to sunlight, storing salt in dry place and storing salt in container with a lid were significantly associated with utilization of adequately iodized salt.

Residence of study participants was one of the factors associated with utilization of adequately iodized salt at household level. Accordingly, study participants who were from urban areas were 1.26 times more likely to have adequately iodized salt than those were from rural areas.

Not exposing salt to sunlight was one of the factors significantly associated with utilization of adequately iodized salt. Those participants who expose their salt to sun light were 0.86 times less likely to have adequately iodized salt at household level than those who do not expose. A study conducted in Delhi documented that there was about 31% iodine loss from iodized salt when exposed to sunlight [13-16]. This might be due to the effect of heat on the iodine content. Another study conducted in Kazakhstan showed that salt that is iodized with iodine slowly loses its iodine content when exposed to sunlight. The halogen iodide over time and exposure to excess oxygen and carbon dioxide slowly oxidizes to metal carbonate and elemental iodine which then evaporates [17]. A similar study done in Gondar, Ethiopia also indicated that exposure to sunlight was associated with utilization of adequately iodized salt at household level [12].

Using packed salt at the household level was significantly associated with utilization of adequately iodized salt. Those who use packed salt were 1.38 times more likely to have adequately iodized salt than those who use non packed salt. A study conducted in Canada showed that 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 [14]. Another study done in Iraq showed that packed salt was mostly adequately iodized compared with non-packed salt [15]. A similar study done in Gondar, Ethiopia showed that using packed salt was associated with utilization of adequately iodized salt at household level [12]. This might be due to good transportation system, storage, and keeping it in a suitable environmental condition.

This study also revealed that place of salt storage was significantly associated with utilization of adequately iodized salt at household level. Accordingly those participants who store salt in dry place were 2.15 times more likely to have adequately iodized salt than those who store salt in moisture area. A study conducted in Canada showed that 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 [14,18,19].

Type of containers used to store salt was one of the factors significantly associated with utilization of adequately iodized salt. Those study participants who use container with a lid to store their salt

at home were 1.45 times more likely to have adequately iodized salt than those who use container without a lid.

The limitation of the study was that practices of iodized salt at retail shops which were not measured in this study can affect the iodine content of the salt. Due to the cross-sectional nature of the study, it is weak in elucidating cause and effect relationships of variables.

Conclusion

Utilization of adequately iodized salt at household level was very low in the study area. The finding of this study revealed that residence of study participants; using packed salt, not exposing salt to sunlight, storing salt in dry place and storing salt in container with a lid were significantly associated with utilization of adequately iodized salt at household level.

Thus, an organized effort should be made at all levels to improve the utilization of adequately iodized salt at household level. Further studies need to be conducted by researchers to assess practice of iodized salt at retail shops and the iodine status of population in the district, particularly school age children and pregnant women, as these two groups are described as the most vulnerable groups affected by iodine deficiency disorders.

Competing Interests

The authors declare that they have no competing interests.

Authors' Contribution

The authors' responsibilities were as follows: **MR** participated in the design of the study, performed the data collection and the statistical analysis and served as the lead author of the manuscript. **TW** & **BM** designed and supervised the study, and ensured quality of the data and made a substantial contribution to the local implementation of the study assisted in the analysis and interpretation of the data. **TW** highly participated in preparing and revising this final manuscript. All authors read and approved the final manuscript.

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References

1. WHO (2004) Iodine Status Worldwide, WHO Global Database on Iodine Deficiency, World Health Organization Department of Nutrition for Health and Development, Geneva, Switzerland.
2. Ohlhorst SD, Slavin M, Bhide JM, Bugusu B (2012) Use of Iodized Salt in Processed Foods in Select Countries Around the World and the Role of Food Processors. CRFSFS.
3. Geneva (2009) WHO/UNICEF/international council for control of iodine deficiency disorders 31: 1.
4. Maberly GF, Haxton DP, van der Haar F (2003) Iodine deficiency: consequences and progress toward elimination. Food Nutr Bull 24: S91-98.
5. CSA and ICF International (2011) Calverton, Md, USA, Ethiopia Demographic and Health Survey.
6. Delange F (2002) Iodine deficiency in Europe and its consequences: an update. Eur J Nucl Med Mol Imaging 29 Suppl 2: S404-416.
7. Seal AJ, Creeke PI, Gnat D, Abdalla F, Mirghani Z (2006) "Excess dietary iodine intake in long-term African refugees," Pub Healt Nutr 9: 35-39.
8. Federal Democratic Republic of Ethiopia (2011) Salt Iodization Council of Ministers Regulation No. 204/2011.
9. Mezgebu Y, Mossie A, Rajesh P, Beyene G (2012) Prevalence and severity of iodine deficiency disorder among children 6-12 years of age in shebe senbo district, jimma zone, southwest ethiopia. Ethiop J Health Sci 22: 196-204.
10. WHO and UNICEF (2013) AfghanistanAwareness and household coverage of iodized salt in Afghanistan.
11. Buxton C, Baguune B (2012) Knowledge and practices of people in Bia District, Ghana, with regard to iodine deficiency disorders and intake of iodized salt. Arch Public Health 70: 5.
12. Hailay GG, Melkie EY, Digsu NK (2013) Availability of Adequately Iodized Salt at Household Level and Associated Factors in Gondar Town, Northwest Ethiopia.
13. Girma K, Nibret E, Gedefaw M (2014) The status of iodine nutrition and iodine deficiency disorders among school children in Metekel Zone, northwest Ethiopia. Ethiop J Health Sci 24: 109-116.
14. Davidson W, Finlayson M, Watson C (2005) "Iodine deficiency disorder" KJAS 31: 148.
15. Ebrahim SM, Muhammed NK (2012) Consumption of iodized salt among households of Basra city, south Iraq. East Mediterr Health J 18: 980-984.
16. Kapil U, Prakash S, Nayar D (1998) "Study of some factors influencing losses of iodine from iodized salt" IJMCH 9: 46-47.
17. Waszkowiak K, Szymandera K (2008) "Effect of storage conditions on potassium iodide stability in iodized table salt and collagen preparations" IJFST 43: 895-899.
18. Diosady LL (2004) "Stability of iodine in iodized salt used for correction of iodine deficiency disorders" Food and Nutrition Bulletin 2: 240-250.
19. The Program against Micronutrient Malnutrition (1998) ICCIDD, Partnership for tracking country progress in universal salt Iodization towards the sustainable elimination of iodine deficiency disorders.