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Availability of Adequately Iodized Salt at Household Level and Associated Factors in Dire Dawa, Eastern Ethiopia

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ABSTRACT

In Ethiopia, Iodine Deficiency Disorder has been recognized as a serious public health problem for the past six decades. In 2011, an estimated 12 million school-age children were living with inadequate iodine, and 66 million people were at risk of iodine deficiency. One out of every 1000 people is a cretin mentally handicapped, due to a congenital thyroid deficiency, and about 50000 prenatal deaths are occurring annually due to iodine deficiency disorders. Only 5.7% of the households were using iodized salt in Dire Dawa city Administration, which is below the legal requirement.This study assessed availability of adequately iodized salt at household level and associated factors in Dire Dawa town, East Ethiopia. Community based cross-sectional study was carried out among households in Dire Dawa town during March 16-26, 2015. Multistage sampling technique was used. Data were collected using a pretested and structured questionnaire by a face-to-face interview technique. Bivariate and multivariate analyses were performed to check associations and control confounding. A total of 694 participants were participated. The availability of adequately iodized salt (≥15 parts per million) in the study area was 7.5% (95% CI; 5.6-9.5). Multivariate result showed that health information about iodized salt (AOR=8.96, 95% CI; 4.68-17.16) (p=0.03), good knowledge about iodized salt (AOR=9.23, 95% CI; 3.34-25.5) (p=0.01) and using packed salt (AOR=3.99, 95% CI; 1.48-10.73) (p=0.006) were associated with availability of adequately iodized salt at household level. Availability of adequately iodized salt at household level was very low. Hence, households should be sensitized about importance of iodized salt and its proper handling at the household level.

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1. INTRODUCTION

Healthy humans require iodine, an essential component of the thyroid hormones, thyroxin, and triiodothyronine. Failure to have adequate iodine leads to insufficient production of these hormones, which affect many different parts of the body, particularly muscle, heart, liver, kidney, thyroid gland, and the development of brain. Inadequate hormone production adversely affects these tissues resulting in the disease status known collectively as Iodine Deficiency Disorders (IDD). These include mental retardation, defects in development of the nervous system; goiter, physical sluggishness, growth

retardation, reproductive failure, increased childhood mortality, and economic stagnation.the most devastating of these consequences are on the development of human brain [1].

Globally, an estimated 66 million people were at risk of iodine deficiency (ID) and 12 million school-age children were living with inadequate iodine level [3]. Despite the improvements in iodine status between 2007 and 2013, a significant burden of ID still remains in Africa. According to 2013 report, 11 Africa countries were iodine deficient, 6 countries were moderately iodine deficient and 5 countries had mild ID. The largest burden of ID in 2013 was because of large populations, remains in Ethiopia, Algeria, Sudan, Morocco, Angola, Ghana and Mozambique [2]. Ethiopia had the lowest coverage of adequately iodized salt amongst countries in Sub-Saharan Africa during this period [3]. In 2012, a study conducted in Ethiopia, showed that IDD is a serious public health problem for the past six decades.

Universal salt iodization has been extremely effective at reducing the burden of IDD and represents a major global public health success (Seal, A.J.et al, 2006). A national iodization strategy was developed by the Ethiopian government and passed new salt legislation since March 2011 which requiring salt for human consumption should be iodized [4]. The actual availability of iodine from iodized salt at the consumer level can vary widely due to a number of factors such as monthly income; heard information, knowledge, and type of salt used and place of purchasing salt. According to the 2011 Ethiopian Demographic and Health Survey (EDHS) repot, only 15.4 percent of the households were using iodized salt [5-6]. Therefore, this study was conducted to assess the availability of adequate iodized salt at household's level and associated factors in Dire Dawa City, Eastern Ethiopia.

2. METHODS

Cross-sectional study design was carried out during March 16-26, 2015, in Dire Dawa City Administration which is located in Eastern Ethiopia Dire Dawa is 515 km East of Addis Ababa. The city is divided into 9 urban kebeles. According to the 2007 Ethiopian census report, Dire Dawa has a total population of 369,541 [7]. The study population consists of people residing in selected urban kebele areas of Dire Dawa city administration and selected using multistage sampling technique. The sample size was determined by using both single double population proportion formulas. The following assumptions were made: 28.9% proportion of iodinated salt [8] 95% confidence levels, 5% margin of error, and design effect of 2. Then, 10% non-response rate was considered, making the final sample size 694.

First, 4 kebeles were selected using simple random sampling technique. Then, sample was allocated proportional to the household size of each kebele. Then random table method until the sample size of the household is reached from each selected kebele. The member of the household who is responsible for purchasing food items and mostly involved in food preparation in the selected households was interviewed.

Socio-demographic characteristics, income, educational status, knowledge, environmental factors were collected using pre tested structured questionnaire by a face-to-face interviewing technique. To assess the use of iodized salt at the household level, interviewers asked households to provide a teaspoon of salt used for cooking. The availability of iodine in the salt was analyzed using a portable digital electronic iodine checker. Data were collected by 15 trained female diploma nurses. Two B.Sc. Environmental health officers were also recruited as supervisors.

After data collection, each questionnaire was checked for completeness and consistency by after data collection, each questionnaire was checked for completeness and consistency by supervisors. The data were entered into Epi Info version 3.5 and transferred to SPSS version 16 for analysis. Association between dependent and independent variables was assessed by using a logistic regression model. Variables with a p value ≤ 0.25 in the bivariate analysis were entered into multiple logistic regression models to control for confounding variables. Odds ratio with 95% confidence interval was calculated to show the associations between independent variables and outcome variable. P value ≤ 0.05 was considered statistically significant. Adequately iodized salt at household level was defined as salt sample which has ≥ 15 parts per million (PPM) of iodine. Participants who scored above the mean for knowledge questions were considered as having good knowledge about iodized salt.

Ethical clearance was obtaining from Institutional Health Research Ethics Review Committee of the Collage of Health and Medical Sciences, Haramaya University. A formal letter of cooperation was writing for Dire Dawa Health Bureau and Ethiopia Food, Medicine & Health Care Administration and Control Authority Eastern Branch. Informed consent was obtained from each of the member of the household who was responsible for purchasing food items and mostly involved in food preparation before conducting of the interview was conducted. An interview was carrying out privately in a separate room. Names or personal identifiers were not included in the questionnaires in order to ensure participants' confidentiality.

3. RESULTS AND ANALYSIS

3.1. Socio-Demographic Characteristics of the Study Participants

A total of 694 study participants were involved in the study with a response rate of 100%. The Mean age of the participants was 30.64 years with (±SD 8.749) years ranging from 16-60 Year. The predominant sex of the total (694) study participants were females, accounting for 545 (78.5%), and208 (30%) had at least secondary school level in education (9-12). Out of the 694 participants, 446 (64.3%) were married, 185 (26.7%) were Amhara by ethnicity, 278 (40.1%) were Orthodox Christians, and164 (23.6%) were private sector employees by occupation. Six hundred and twenty one (89.5%) of the study households had family size of ≤5, and the average monthly income of the families was ≥2000 Ethiopian Birr (ETB) in 414 (59.7%) of the households (Table 1).

Table 1. Socio-Demographic Characteristics of Study Participants at Dire Dawa, Eastern Ethiopia, 2015 (n=694)

Variables	Label	Frequency	Percent (%)
Sex	Male	149	21.5
	Female	545	78.5
Age Group In years	16-29	350	50.4
	30–44	284	40.9
	≥45	60	8.6
Educational status	Illiterate	94	13.5
	Primary school(1-8th)	88	12.7
	Secondary school(9th-12th)	208	30.0
	Tertiary school	178	25.6
Current Marital status	Single	187	26.9
	Married	446	64.3
	Widowed	40	5.8
	Divorce	21	3.0
Religion	Orthodox	278	40.1
	Muslim	245	35.3
	Protestant	114	16.4
	Catholic	50	7.2
	Others	7	1.0
Ethnicity	Amhara	185	26.7
	Oromo	162	23.3
	Gurage	88	12.7
	Somali	112	16.1
	Tigrai	54	7.8
	Others	93	13.4
Occupation	Governmental employee	130	18.7
	Private sector employee	164	23.6
	Daily laborer	43	6.2
	House wife	152	21.9
	Merchant	147	21.2
	Others	58	8.4
Family size	≤5	621	89.5
	>5	73	10.5
Average Family Income(Birr)	< 1000	110	15.9
	1000–1499	123	17.7
	1500–1999	47	6.8
	≥2000	414	59.7

3.2. Availability of Adequately Iodized Salt at the Household Level

From the total of 694 sampled households, adequate amount of iodized salt was found only in 52 (7.5%) (95% CI; 5.6 - 9.5) of the 694 sample households i.e. >15 ppm (Figure 1). Five hundred and twenty six (75.6%) of the respondent were purchased salt from retail shop. Out of these, 39 (5.6%) of samples had adequate amount of iodine in salt. 600 (86.5%) of the respondents were using common salt (coarse salt without packet) and out of which 0 (0%) of samples are have not adequate amount of iodine in salt (0-14.9 ppm) and also of which 94 samples of packed salt 42 samples are have not adequate amount of iodine in salt.

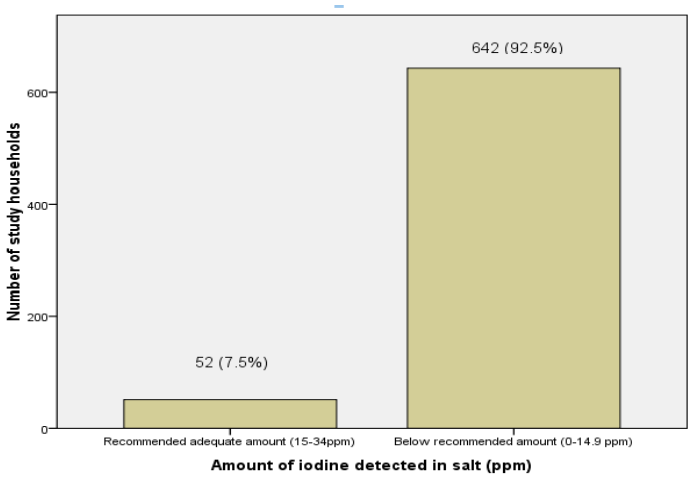

Figure 1 Amount of Iodine Detected in Household Salt, Eastern Ethiopia, 2015

3.3. Factors Associated with Availability of Iodized Salt at Household Level

3.3.1. Knowledge and Health Information of the Respondents about Iodized Salt and Iodine Deficiency Disorders (IDD).

Five hundred forty eight (78.9%) heard about iodized salt from different sources of information. Out of 548, 469 (67.6%) got the information from radio/television.677 (97.6%) participants responded that they did not receive any information regarding importance of iodized salt and IDD from health workers or health extension workers. Moreover, 677 (97.6%) responded that health care workers did not teach or inform them about factors that lead to loss of iodine during salt utilization (Table 2).

Table 2. Knowledge and Health Information of Study Participants about Iodized Salt in Dire Dawa, Eastern Ethiopia, 2015

Variables	Label	Frequency	Percent (%)
Heard about iodized salt	Yes	548	78.9
	No	146	21.1
Source of Information about iodized salt	Health workers	17	2.4
	Radio /TV	469	67.6
	Neighbors	19	2.7
	Own child	14	2.0
	Others:	29	4.2
Health workers teach you about importance of iodized salt for health and its consequence of IDD	Yes	17	2.4
	No	677	97.6
Health workers/regulators teach you about associate factors that lose iodine from salt and utilization of iodized salt.	Yes	17	2.4
	No	677	97.6
Heard/seen those born still birth in your family/experienced it.	Yes	112	16.1
	No	582	83.9
Why intake of iodized salt is important?	To cure goiter	204	29.4
	To remain healthy	144	20.7
	To prevent IDDs	177	25.5
	To grow well	25	3.6
	Better than other salt	9	1.3
	I do not know	135	19.5
The ill effects of iodine deficiency	Goiter	507	73.1
	Still birth	19	2.7
	Mental retardation	21	3.0
	I Don't know	147	21.2
Aware of any inspections regarding the sale of salt?	Yes	44	6.3
	No	650	93.7
The Status of iodine if a storage, transporting etc is un favorable in salt?	Iodine content reduces	78	11.2
	Nothing happen	258	37.2
	I don't know	358	51.6
The Status of iodine if excessive heat or fire and stay a long period of time	Iodine content reduces	78	11.2
	Nothing happen	249	35.9
	I don't know	367	52.9

Regarding knowledge of participants about the importance of intake of iodized salt, 204 (29.4%) responded that it cures goiter and, 507 (73.1%) reported that iodized salt is important to prevent goiter. 147 (21.2%) did not know the ill effects of ID and 650 (93.7%) were not aware of any inspections regarding the sale of salt. Only 145 (20.9%) had knowledge on what may happen to the iodine concentration in iodized salt during its transportation, storage, distributing and at retail shops, (i.e. Before it reaches the consumers). 155 (22.3%) had good knowledge on the status of iodine if iodized salt is not stored properly before it reaches to the consumer, (i.e. exposed to excessive heat, direct sun light, moisture and long storage times) (Table 2).

3.3.2. Practice of Respondents Regarding the Use of Iodized Salt of the Households

Six hundred and forty (92.2%) respondents said they store the salt in a dry place. Twenty two (3.2%) of them wash salt to remove its impurities. 689 (99.3%) of respondents stored the salt for less than two months after purchase and 629 (90.6%) of participants reported their salt containers had cover. Five hundred and twenty six (75.6%) of the respondent said they purchase salt from retail shop and 600 (65.9%) of the respondents were using non- packed (Table 3).

Monthly income, heard information, knowledge, type of salt used and place of purchasing salt were factors associated with the amount of adequately iodized salt (outcome variable) in the bivariate logistic regression analysis. In the multivariate logistic regression, only health information, knowledge, place of purchasing salt and type of salt used were associated with the outcome variable.

Table 3. Practice of Study Participants about Iodized Salt in Dire Dawa, Eastern Ethiopia, 2015, (n=694)

Variables	Label	Frequency	Percent (%)
Place of salt storage	Dry place	640	92.2
	Moisture area	9	1.3
	Others	45	6.5
Washing salt	Yes	22	3.2
	No	672	96.8
Duration of salt storage	≤2 months	689	99.3
	>2 months	5	0.7
Use cover for salt container	Yes	629	90.6
	No	65	9.4
Place of purchasing salt	Open Market	24	3.5
	Retail shop	647	93.2
	Super market	23	3.3
Type of salt used	Non-packed	505	72.8
	packed-salt	189	27.2

Table 4. Factors Associated with Availability of Adequately Iodized Salt at Household Level in Dire Dawa, Eastern Ethiopia, 2015.

Variables	Concentration of iodine <15 ppm	>15 ppm	COR(95% CI)	AOR(95% CI)	P-value
Marital status					
Single	174	13	1		0.5
Married	417	29	0.93(0.47-1.83)	0.91(0.41-2.02)	0.82
Widowed	33	7	2.83(1.05-7.65)	1.93(0.56-6.59)	0.292
Divorced	18	3	2.23(0.58-8.57)	1.97(0.32-12.07)	0.46
Health information					
Yes	526	22	1	1	1
No	116	30	0.06(0.009-0.48)	8.96(4.68-17.16)	0.03
Knowledge					
Poor	510	48	3.1(1.1-8.76)	9.23(3.34-25.5)	0.01
Good	132	4	1	1	0.01
Purchasing place					
Open Market	21	3	0.09(0.02-0.4)	0.026(0.004-0.197)	0.01
Retail shop	612	35	0.03(0.01-0.91)	0.013(0.003-0.065)	0.01
Super market	9	14	1	1	1
Type of salt used					
Non packed	458	47	3.77(1.47-9.64)	3.99(1.48-10.73)	0.006
Packed	184	5	1	1	1

P-value is significant at $\alpha<0.05$; COR=Crude Odds Ratio; AOR=Adjusted Odd Ratio; CI=Confidence Interval.

Study participants who had health information about iodized salt were 9 times more likely to have iodized salt than those who had not health information (AOR=8.96, 95%I; 4.68-17.16) (p = 0.03). Those who had good knowledge about iodized salt were 9.2 times more likely to have iodized salt than those who had poor knowledge (AOR=9.23, 95% CI; 3.34-25.5) (p = 0.01). Those who used packed salt were 4 times more likely to have adequately iodized salt than those who used non packed salt (AOR=3.99, 95% CI; 1.48-10.73) (p=0.006). Study participants who purchased salt from super market were less likely to have iodized salt than those who purchase from open market (AOR=0.026, 95% CI; 0.004-0.197) (p=0.001) (Table 4).

3.4. Discussion and Analysis

Availability and consumption of adequately iodized salt must be granted for sustainable elimination of IDD. According to WHO and International Council for Control of Iodine Deficiency Disorders (ICCIDD) standard, IDD will be possible if more than 90% of the households consume adequately iodized salt. 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% [9-10]. But according to the EDHS 2011 report, the national coverage of USI was only 15.4% [5].

In this study, 7.5% (95% CI; 5.6-9.5) of the households had adequately iodized salt at household level. This is lower than a study conducted in Gondor town (28.9%) Benishangul-Gumuz (39.7%), Oromiya (19.4%), Tigray region (22.3%), Addis Ababa city administration (29.6%) and Ethiopian Somalia Region (19.2%) [5], [8]. This difference might be due to a sample size, a poor knowledge of a community about iodine fortified salt and a poor implementation of a strategies at the production site and distribution of iodized salt at the retailer level to enhance universal salt iodization program, a poor regular follow up and monitoring regarding of iodized salt. Whereas, this finding is higher than iodized salt coverage of EDHS 2011 report in Dire Dawa City Administration (5.7%) [5]. this difference might be due to variations in sample size and study settings. EDHS was conducted both in urban and rural areas but the present study was conducted entirely in urban setting. Urban dwellers used iodized salt more as compared to rural dwellers as evidenced from EDHS 2011[5].

In this study, health information regardin iodized salt was significantly associated with availability of adequate iodized salt (AOR=8.96, 95%I; 4.68-17.16). Majority, (97.6%) study participants did not receive any information or health education about iodized salt and IDD from health workers or others sources. A study conducted in Laelay Maychew District, Northern Ethiopia, showed that 60.8% of the respondents obtained information from health care workers [11]. This might be due to poor initiation effort made by health workers and other collaborators in the dissemination of pertinent information and create awareness about the importance of consuming iodized salt in the study area.

Knowledge of study participants about iodized salt was significantly associated with the outcome variable in this study (AOR=9.23, 95% CI; 3.34-25.5). In this study, 598 (86.16%) study participants had poor knowledge about iodized salt and its consequences. This is consistent with a report in Gondor town (74.8%) [8].

A report in Bia District, Ghana indicated that having good knowledge about iodized salt was positively associated with utilization of adequately iodized salt in the household [12]. This might be due to increased knowledge regarding the importance of using iodized salt and the effects of its deficiency in the diet of an individual; there has also been an increase in the consumption rate of iodized salt. However, a study from Hawassa town, Sothern Ethiopia, revealed that having knowledge about iodized salt was not significantly associated with the use of adequately iodized salt [13]. This variation might be due to differences in study population and instruments used to measure knowledge.

In this study, using packed salt at the household level was significantly associated with availability of adequate iodized salt at households (AOR=3.99, 95% CI; 1.48-10.73). In the present study, 505 (72.8%) of the respondents were using none packed and out of which 458 (90.7%) of the samples had no adequate concentration of iodine in salt (<15 ppm). A report in Gonder, Northwest Ethiopia showed that 669 (83%) households were used non packed salt; of these 544(81.5%) were inadequately iodized. The remaining 141 (17%) households used packed salt, and out of these, 109(77.3%) were adequately

iodized salt [8]. A study conducted in North Parganas District of West Bengal, India indicated that (83.3%) households were purchasing non-packed salt and consume inadequately iodized salt compared to others (22.4%) who always purchased salt in the sealed packet (PR: 2.9, 95% CI 1.8-4.8) [14]. This might be due the nature of transportation system, packing material, conditions, amount of packaged iodine fortified salt storage, and keeping it in a suitable environmental condition.

4. CONCLUSION

The availability of adequate iodized salt at household level was very low as compared to the WHO recommendation to prevent IDD. Based on the findings of this study, we can conclude that availability of adequately iodized salt at household level was very low in Dire Dawa town. Health information about iodized salt, knowledge of participants and type of salt used and place of purchasing salt were identified as factors associated with availability of adequately iodized salt at household level. Nutrition education program regarding about iodized salt and the importance of iodized salt needs to be implemented to promote the awareness of the community. Hence, households should be sensitized regarding the importance of iodized salt and its proper handling at the household level.

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