

## **Knowledge and Practice on Iodized Salt Consumption and Associated Factors at a Household level at Debre Tabor Town, Northwest Ethiopia**

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### **Abstract**

**Background:** Iodine enables the thyroid gland to produce thyroid hormones, which are vital for growth and development. Iodine Deficiency Disorders are among the major public health problems of the world. About 350 million Africans are at risk of iodine deficiency and face many risks from its deficiency complications. It is also public health importance in Ethiopia. Iodization of salt is an effective, cheap and sustainable strategy to prevent and control iodine deficiency in the community. Poor Educational status, Occupation and Sources of Information were frequently cited factors related to Knowledge and Practice on iodized salt consumption. This study will help to know knowledge, utilization, and associated factors of households on iodized salt, furthermore current epidemiological data are necessary to assist policymakers and utilizers in their efforts.

**Objective:** The objective of this study was to assess the magnitude of knowledge and practice on iodized salt consumption and associated factors at Debre Tabor town, Northwest Ethiopia.

**Methods:** A Community-based cross-sectional study was conducted at Debre Tabor town. Six hundred thirteen households were interviewed using a structured questionnaire and face to face interviewing technique. Multistage sampling technique was used. The degree of association between independent and dependent variables was assessed using odds ratio with 95% confidence interval and p-value < 0.05.

**Result:** From six hundred thirty-eight participants, 613 participants with 96% response rate participated. The magnitude of poor knowledge and practice with regard to iodized salt consumption were 53.8% and 55.6% respectively. Adjusting all other factors in the final model, the multivariate analysis showed that marital status AOR [95% CI] = 0.04 [0.00, 0.179], educational status AOR [95% CI]= 2.28 [1.181, 4.395], occupation AOR [95% CI] = 2.51 [1.421, 4.419], know sources of iodine diet, AOR [95%CI] = 0.28 [0.162, 0.477] and sources of information like school, AOR [95%CI] = 0.42 [0.242, 0.711] were found significantly associated with poor knowledge and poor practice.

**Conclusion:** Poor knowledge and poor practice of iodized salt consumption were found high. Hence, households and the community as a whole need to be advised about the importance of iodized salt and its proper serving and handling practices.

**Keywords:** *Iodine utilization; Debre Tabor*

## Abbreviations

ANRS: Amhara National Regional State; AOR: Adjusted Odds Ratio; BDU: Bahir Dar University; BOFED: Bureau of Finance and Economic Development; BSc: Bachelor of Science; CEE: Central and East Europe; CSA: Central Statistics Agency; EDHS: Ethiopian Demography Health Survey; EPHI: Ethiopian Public Health Institute; ETB: Ethiopian Birr; FMO: Federal Ministry of Health; HEW: Health Extension Workers; HHS: Households; ICCIDD: International Council on Control of Iodine Deficiency Disorder; IDD: Iodine Deficiency Disorder; ID: Iodine Deficiency; PPM: Parts Per Million; PPS: Proportional Probability Sampling; SHHS: Sudan Household Health Survey; SPSS: Statistical Package for Social Science; TV: Television; UIE: Urinary Iodine Excretion; UNICEF: United Nation International Children Funds; USI: Universal Salt Iodization; WHO: World Health Organization; WI: Wealth Index

## Introduction

Iodine is an essential micronutrient that enables the thyroid gland to produce thyroid hormones which are vital for growth and development of the brain and central nervous system [1].

Nearly two billion individuals worldwide live in areas of iodine deficiency and the adverse consequences of iodine deficiency are widely observed due to poor knowledge and practice related to poor iodine diet and improper iodized salt utilization [2]. About 350 million Africans are at risk of iodine deficiency [3]. More than 90% of childbearing age women in Ethiopia did not know the cause of iodine deficiency and the importance of iodized salt [4]. In Ethiopia, one out of every 1000 children is in a state of cretinism and mentally handicapped due to a congenital thyroid deficiency and about 50,000 prenatal deaths are occurring annually due to iodine deficiency disorders and further 26% and 62% have a goiter and at risk of other IDD respectively from the total population [5]. World health organization recommended that USI should be above 90% at the household level for countries started the USI program to eliminate IDD [6]. Unfortunately, 76% of households are consuming adequate iodized salt globally [7].

Ethiopia has launched the USI program since the 1980s but, iodized salt availability is still less than 15% and 15.4 according to 2005 and 2011 EDHS respectively and only 9.6% of the households are using iodized salt in Amhara region [8] so that; the minister's council of Ethiopia has passed new legislation on iodized salt in February 2011. Ethiopia has also set a goal to eliminate IDD by the year 2015 through universal salt iodization (USI) by increasing the proportion of households using iodized salt from 15.4% to 95% to control and prevent micronutrient deficiencies [9], but knowledge and practice related to iodized salt utilization at household level is still low [10,11]. About 20% of iodized salt loss its iodine at the household level before consumption so that < 15 ppm or < 90% the community is consuming iodized salt as recommended by WHO, therefore; this study will help to increase awareness and appropriate practice in utilizing iodized salt at a household level. National prevalence of endemic goiter was 36% in women and 35% in children which is one of the visible manifestations of IDD [4,12].

Iodine deficiency is of public-health importance in Ethiopia and hence, iodization of salt is an effective and sustainable strategy to prevent and control it. It is feasible, economical, safe, most effective and broadly accepted by the community. Hence the effectiveness of salt iodization program depends on the conservation of iodine concentration in salt at various stages of consumption and the supply-chain [13].

## Materials and Methods

A community-based cross-sectional study was conducted at the household level.

### Setting

The study was conducted at Debre Tabor town, which is located in South Gondar Zone in the Amhara region. It is about 666kms far from Addis Ababa and 103 km from the capital city of Amhara region, Bahir Dar. It has 4 kebeles and 21 sub kebeles. According to the

current population profile (BOFED, 2008 E.C), the Zone has an estimated total population of 2,435,309 of whom 1,224,736 are males and 1,210,609 are females. From the population, around 310,556 are urban and 2,124,789 are rural, Childbearing age (15 - 49 women) are 567601, and less than 5 yrs are 302,715.

As BOFED, 2008 E.C, the town has a total population of 83,082 of whom 39,781 are males and 43,301 are females.

### **Study population and sampling**

The study population was all the households in the selected kebeles of the town. All households 18 years and above who were engaged in food preparation were included, but Participants who are critically ill at the time of data collection and unable to hear were excluded in the study.

The sample size was determined by using a single population proportion formula considering the assumptions of households with poor knowledge on iodized salt utilization was 74.8% [2], 95%CI, level of significance to be 5%,  $Z_{\alpha/2} = 1.96$ , and absolute precision or margin of error to be 5%. Design effect [14] was used to multiply and a 10% non-response rate also used to have a total sample size 638.

Multi-stage sampling technique was used to address the study subjects. Simple random sampling [5] technique was undertaken to select kebeles. Two kebeles [15] were included in the study, households were selected systematically every 20 households in each kebele. As the total population of each kebele was known and as mini EDHS, 2014, urban household averagely composes 3.6 persons, participants were allocated proportionally to get 638 participants [16].

### **Data collection**

The data were collected by administering a structured questionnaire and face to face interview. The questionnaire was first prepared originally in English and translated to Amharic by a translator. The Amharic version questionnaire was pre-tested before actual data collection in kebeles not included in the research. Data were collected by 10 trained diploma nurses and supervised by four-trained BSc Nurses. The supervisors were available throughout the data collection period.

### **Statistical analysis**

Data were checked for completeness and all responses to the survey questionnaires were coded against the original English version. The data were entered to Epi Info version 7, and analysis was done by using SPSS version 20 software.

For all statistical significance tests, the cut-off value set is  $p \leq 0.05$ . Logistic regression analysis was used for explanatory variables. Descriptive data were presented using tables and graphs.

### **Ethical considerations**

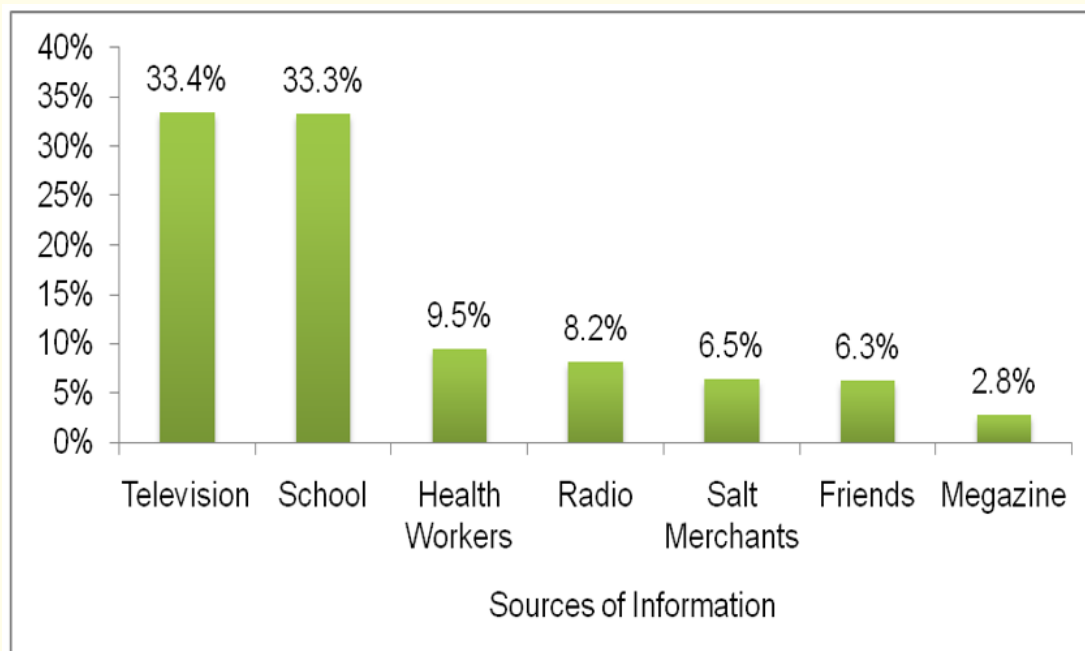
Ethical clearance was obtained from Bahir Dar University Ethical Review Board, Permissions was be taken from the concerned bodies of the Amhara Regional Health Bureau and Zonal Health Department. The necessary explanation about the purpose of the study and its procedure was given an oral consent was obtained from the respondents.

### **Result**

From 638 participants invited to participate in the study, 613 of them agreed to participate, yielding a response rate of 96%. The age of participants ranged from 18 to 76 years (mean 37.2, SD,  $\pm 13.7$ ). Out of the 527 (86%) were female, 538 (87.8%) were Orthodox, 70 (11.4%) were Muslims; 5 (0.8%) were other religion followers, 359 (58.6%) were married, 164 (26.8%) were unmarried, 158 (25.8%)

were unable to read and write, 223 (36.4%) were housewives, 88 (14.4%) were government employees, 288 (47%) were unemployed, depending on their WI, 205 (33.4%), 211 (34.4%) and 197 (32.1%) were poor, medium and rich respectively, 516 (84.2%) have a family size of less than five (Table 1).

From 613 participants, 430 (70.1%) had the information on iodine nutrient; and 391 (63.8%) heard about iodized salt. Most of them had information from the mass media especially through television 205 (33.4%) and 50 (8.2%) on the radio. More than half of the participants heard the information from school and through Television.



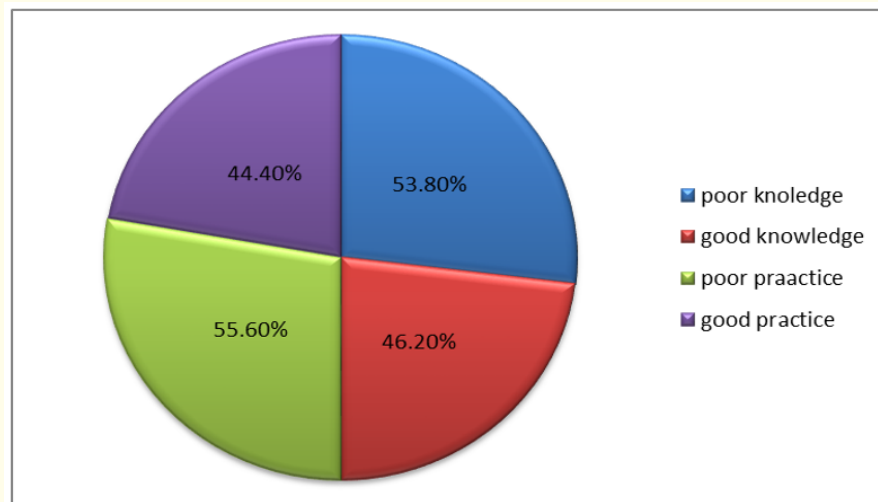
**Figure 1:** Source of information about iodine nutrient.

Variable		Frequency (n = 613)	Prevalence (%)
Sex	Male	86	14
	Female	527	86
Age in years	18 - 24	119	19.4
	25 - 34	163	2.6
	35 - 44	140	22.8
	45 - 54	115	18.8
	55 and above	76	12.4
Ethnicity	Amhara	613	100
Religion	Orthodox	538	87.8
	Muslim	70	11.4
	Others*	5	0.8
Marital status	Married	359	58.6
	Single	164	26.8
	Divorced	67	10.9
	Widowed	23	3.8

Educational status	Cannot read and write	158	25.8
	Can read and write	178	29
	Secondary school	102	16.6
	College and above	175	28.5
Occupation	Housewife	223	36.4
	Merchant	14	2.3
	Employed	88	14.4
	Unemployed	288	47
Wealth index	Poor	205	33.4
	Medium	211	34.4
	Rich	197	32.1
Family size	≤ 5	516	84.2
	> 5	97	15.8

**Table 1:** Frequency distribution of socio-demographic factors among households at Debre Tabor town, Northwest Ethiopia, 2016. Others\*-Protestant, Catholic, Mission.

Even though 430 (70.1%) had information on iodine nutrient and 391 (63.8%) knew about iodized salt respectively, 330 (53.8%) of the participants had poor knowledge and 341 (55.6%) had poor practice related to iodized salt consumption at the household level.



**Figure 2:** Magnitude of knowledge and practice on iodized salt utilization.

Even though 430 (70.1%) had information on iodine nutrient and 391 (63.8%) knew about iodized salt respectively, 330 (53.8%) of the participants had poor knowledge and 341 (55.6%) had poor practice related to iodized salt consumption at the household level.

**Factors associated with knowledge and practice on iodized salt consumption**

Bivariate analysis was used to explore the association between knowledge and practice with each of the determinants factors. Marital status, educational status of the participants, educational status of the spouse, an occupation of the participants, knowing the source of iodine diet and source of information on iodized salt and source iodine nutrient were met the criteria for knowledge to be further analyzed in multivariate logistic regression analysis. In addition to the above, age, wealth index, family size, Knowing sources of iodine diet and sources of information on iodized salt for the practice of the participants on iodized salt consumption, also fulfilled the minimum criteria (P < 0.2) for further multivariate logistic analysis.

Factors which had bivariate associations at p-value < 0.2 were then entered into the multivariate logistic regression analysis. The variables associated by multivariate logistics analysis (p ≤ 0.05) with knowledge and practice were: age, marital status, educational status, spouse’s educational status, occupation, knowing types of iodine diet and source of information on iodized salt (Table 2 and 3).

Variable		Knowledge		Crude OR (95% CI)	Adjusted OR (95% CI)
		Poor	Good		
Marital status	Married	190	169	1	1
	Single	96	68	1.256 [0.864, 1.824]	0.78 [0.382, 1.595]
	Divorced	42	25	1.494 [0.874, 2.556]	0.73 [0.320, 1.679]
	Widowed	2	21	0.085 [0.020, 0.367]**	0.04 [0.007, 0.179]**
Educational status	Un able to read and write	97	61	2.12 [1.368, 3.287]**	1.55 [0.945, 2.557]
	Able to read and write	103	75	1.83 [1.201, 2.793]**	1.22 [0.759, 1.963]
	Secondary school	55	47	1.56 [0.955, 2.550]	1.32 [0.775, 2.245]
	College and above	75	100	1	1
Spouse’s education	Unable to read and write	150	113	1.64 [1.127, 2.397]**	2.35 [1.132, 4.870]*
	Able to read and write	78	53	1.82 [1.159, 2.864]**	1.35 [0.825, 2.204]
	Secondary school	18	13	1.71 [0.794, 3.699]	1.41 [0.632, 3.137]
	College and above	84	104	1	1
Occupation	Housewife	135	88	1	1
	Merchant	11	3	2.39 [0.648,8.810]	2.43 [0.571, 10.362]
	Employed	45	43	0.68 [0.415, 1.121]	0.51 [0.280,0.931]*
	Unemployed	139	149	0.61 [0.427, 0.867]**	0.69 [0.459, 1.038]
WI	Poor	122	83	1.37 [0.922,2.032]	1.08 [0.690, 1.702]
	Medium	106	105	0.94 [0.638,1.387]	0.84 [0.544, 1.287]
	Rich	102	95	1	1

Source of information	School	No	232	172	1.53 [1.092, 2.137]*	1.30 [0.895, 1.886]
		Yes	98	111	1	1
	Television	No	235	169	1.67[1.192, 2.336]**	1.35 [0.923, 1.974]
		Yes	95	114	1	1
	Magazine	No	325	271	2.88[1.002, 8.272]*	1.95 [0.650, 5.839]
		Yes	5	12	1	1
Know the source of iodine diet	Yes	207	211	0.58[0.405, 0.814]*	0.62[0.431, 0.904]**	
	No	123	72	1	1	

**Table 2:** Bivariate and multivariate analysis for factors associated with knowledge on iodized salt utilization among households at Debre Tabor town, Northwest Ethiopia, 2016.

N.B \* p value < 0.005, \*\* p value ≤ 0.01.

Variable	Practice		Crude OR (95% CI)	Adjusted OR (95%CI)	
	Poor	Good			
Age in years	18 - 24	73	46	1	1
	25 - 34	97	66	0.93 [0.571, 1.502]	0.52 [0.245, 1.102]
	35 - 44	67	73	0.58 [0.352, 0.950]*	0.36[0.153,0.822]**
	45 - 54	67	48	0.88 [0.521, 1.484]	0.42 [0.172, 1.047]
	55 and above	37	39	0.60 [0.334, 1.070]	0.46 [0.174, 1.218]
Marital status	Married	217	142	1	1
	Single	88	76	0.76 [0.522, 1.100]	0.47 [0.145, 1.511]
	Divorced	28	39	0.47 [0.277, 0.798]*	0.55 [0.155, 1.928]
	Widowed	8	15	0.35 [0.144, .845]*	0.82 [0.170, 3.933]
Educational status	Un able to read and write	77	81	0.75[0.485, 1.150]	2.18 [1.043, 4.566]*
	Able to read and write	98	80	0.96[0.632, 1.465]	2.28 [1.181,4.395]**
	Secondary school	68	34	1.57 [0.945, 2.613]	1.72 [0.825, 3.569]
	College and above	98	77	1	1
Educational status of spouse	Unable to read and write	125	135	0.38 [0.257,0.569]**	0.16 [0.034,0.721]
	Able to read and write	57	74	0.31 [0.194,0.496]**	0.70 [0.119,4.079]**
	Secondary school	22	9	0.99 [0.426, 2.276]	0.55 [0.123, 2.482]
	College and above	134	54	1	1
Occupation	Housewife	92	131	1	1
	Merchant	5	9	0.79 [0.257, 2.437]	1.44 [0.308, 6.706]
	Employed	40	40	1.71 [1.039, 2.809]*	2.04 [0.907, 4.590]
	Unemployed	196	92	3.03 [2.108,4.365]**	2.51 [1.421,4.419]**

Spouse's occupation	Housewife	132	139	1	1
	Merchant	13	9	1.52 [0.629, 3.677]	1.65 [0.229, 11.940]
	Employed	8	12	0.70 [0.278, 1.772]	0.75 [0.079, 7.045]
	Un employed	188	112	1.77 [1.266, 2.468]*	2.74 [0.463, 16.164]
WI	Poor	100	105	0.62 [0.420, .927]*	0.96 [0.523, 1.775]
	Medium	122	98	0.90 [0.605, 1.334]	1.39 [0.774, 2.503]
	Rich	119	78	1	1
Family size	< 5	246	516	1	1
	> 5	65	97	1.77 [1.118, 2.790]*	1.75 [0.887, 3.441]
The frequency of using iodized salt	Always	1	1	1	1
	Sometimes	238	28	8.50 [0.517,139.68]	12.29 [0.685,220.614]
	Never	102	243	0.42 [0.026, 6.776]	0.59 [0.033, 10.591]
<b>Sources of information</b>					
School	No	191	213	0.35 [0.246,0.505]**	0.42 [0.242,0.711]**
	Yes	150	59	1	1
Television	No	196	208	0.42 [0.292, .592]**	0.46 [0.276,0.777]**
	Yes	145	64	1	1
Radio	No	301	262	0.29[0.141, 0.586]*	0.39 [0.152, 0.983]*
	Yes	40	10	1	1
Magazine	No	327	269	0.26 [0.074, 0.916]*	2.63[0.565, 12.187]
	Yes	14	3	1	1
Health worker	No	297	258	0.37 [0.196, 0.684]*	0.88 [0.353, 2.198]
	Yes	44	14	1	1
Knowing the source of iodine diet	Yes	208	210	1	1
	No	133	62	2.17 [1.515, 3.096]**	0.28 [0.162, 0.477]**

**Table 3:** Bivariate and multivariate analysis for factors associated with practice on iodized salt utilization among households at Debre Tabor town, Northwest, Ethiopia, 2016.

*N.B \* p value <0.05, \*\* p value ≤ 0.01.*

## Discussion

In this study, the magnitude of poor knowledge on iodized salt consumption was 330 (53.8%) with 95%CI (50.2%, 58.1%). Which is nearly in line with the study done in, Sheba Town, Ethiopia (50.6%) [17]. Even though salt iodization was started since 1990 in the region, knowledge and practice towards iodized salt utilization is still poor. This may be due to underestimated emphasis of the government and the community too.

This study result is lower than the studies conducted in Orissa, India, (over 80%) [18], Ghana, 98% [19] and in Ethiopia like, Laelay Maychew (64.2%) [20], Gondar town (74.8%) [21] and Hawasa Town (65.5%) had poor knowledge [2]. This significant difference may be due to the accessibility of information through ICT and its proper utilization, time difference as well as goes vernment concern about its utilization.



The current study result was higher than, studies done in south Iraq, Basra city (33.6%) [22], Sindh district, Pakistan 41.3% [23], Bia district Ghana (9.6%) [19], Arsi zone, Ethiopia (13.6%) [24] which had poor knowledge. This may be due to poor sources of information and its utilization, in effective community awareness about IDD and its prevention, less community and government concern and furthermore less awareness of the availability of iodized salt.

On the other hand, this study showed that poor practice of the participants related to iodized salt consumption was 341 (55.6%) with 95% CI (51.9%, 59.5%) which is higher than the community-based study done in Assela town Arsi zone Ethiopia 59.9% of the participants add salt at right time [24] and the study done in Gondar Town, Ethiopia 22.7% of the population had poor practice [25]. This could be low awareness of the community and continuous follow up of the practices of iodized salt utilization.

This study result is lower than studies done in southern Iraq, Basra city (89.3%) [22] and Kenya that 78.4% of the participants add iodized salt at the very beginning [3]. This could be due to time difference and increased information.

According to this study the multivariate analysis of logistic regression for knowledge of the participants related to iodized salt consumption pointed out that; Marital status, occupation, educational status, knowing the source of iodine diet of the participants were significantly associated with poor knowledge of iodized salt consumption.

In this study, marital status was strongly associated with knowledge. Those widowed AOR [95%CI] = 0.04 [0.007, 0.179] were by 96% less likely to have poor knowledge as compared to married ones. This may be due to the accessibility of information; on the other hand, the workload at home for married ones that could hinder them from getting information on iodized salt.

Educational status was found to be a significant factor. Those participants had lower educational status partners were more likely to have poor knowledge; participants with couples of able to read and write AOR [95% CI] = 2.35 [1.132, 4.870] were two times more likely to have poor knowledge as compared to participants with couples of college and above educational status. This result is consistent with the studies done in Sigh city of Pakistan, Basra City of Iraq [22], Sudan [26], Kenya [3] and Shebe Town southwest Ethiopia [17] and Assela town of Ethiopia [24]. This is due to the fact that education could increase awareness and decision making level so that couples could share information [3].

Occupation was associated with poor knowledge of iodized salt consumption. Those employed ones, AOR [95%CI] = 0.51 [0.280, 0.931]; were by 49% less likely to have poor knowledge as compared to housewives. This result is consistent with the study conducted in Assela Town of Ethiopia [24].

This could be the fact that employed ones may access the information from school, office, workshops; because this study showed that school was one of the main means of sources of information for iodized salt consumption. This could indicate housewives should be informed on iodized salt utilization.

Knowing source and types of iodine diet with AOR [95%CI] = 0.63 [0.423, 0.926]; was also significantly associated with poor knowledge. Those participants who knew the source of the iodine diet were by 37% less likely to have poor knowledge of iodized salt consumption as compared to those who did not know the source of the iodine diet.

On the other hand, factors associated with poor practice related to iodized salt consumption were Age, educational status, spouse's educational status, and occupation, sources of information and knowledge of sources of iodine diet.

The multivariate logistics analysis for practice also pointed out that; those participants with age 35 - 44 years, AOR [95%CI] = 0.36 [0.141, 0.923], were by 64% less likely to have poor practice as compared to those with the age range 15 - 24 years old. This could be due to the fact that as the age advances the practice acquisition may be increased.

With regarded to educational status, participants who were unable to read and write, AOR [95%CI] = 2.18 [1.043, 4.566] and those who were able to read and write, AOR [95%CI] = 2.28 [1.181, 4.395], were two times more likely to have poor practice as compared to those having university and above educational status but, spouse's educational status, those able to read and write, AOR [95%CI] = 0.70 [0.119, 4.079] were by 30% less likely to practice wrongly in iodized salt consumption. This result is consistent with the studies done in Basra city of Iraq [25], Assela Town of Ethiopia (53%) [24] and Sheba Town Southwest Ethiopia [17]. This could be due to the fact that education drives learning.

Occupation was also associated with the practice. Unemployed, AOR [95%CI] = 2.51 [1.421, 4.419] were three times more likely to have poor practice in iodized salt utilization as compared to housewives. This result is consistent with the study done Shebe Town southwest Ethiopia [17]. This could be given due emphasis to strengthen housewives as those people were taking the most part in food preparation who could meet the USI goal.

Sources of information had also associated with the practice. Those participants who get information from mass-media like Television and radio had better practice on iodized salt consumption. Participants who got information from school, AOR [95%CI] = 0.42 [0.242, 0.711], participants who had heard information through Television, AOR [95%CI] = 0.463 [0.276, 0.777] and participants who had heard information on Radio, AOR [95%CI] = 0.39 [0.152, 0.983] were by 58, 54 and 61 percent less likely to practice wrongly in iodized salt consumption as compared to those who had no information on iodized salt consumption. This study result pointed out that, Television and Radio were the main sources of information; that they could help people to change their behavior if they are accessible.

Knowing types of iodine diet, AOR [95%CI] = 0.28 [0.162, 0.477] was also one of the factors strongly associated with poor practice on iodized salt consumption; those who knew the source of iodine nutrient were by 72% less likely to practice poorly in iodized salt utilization. This is due to the fact that information precedes practice and it could bring practice.

In general, the high proportion of poor knowledge and practice might have been resulted from: Poor information system, having lower educational status, being housewives and not knowing the source of iodine diet.

## **Conclusion**

Poor knowledge and practice related to iodized salt consumption were high. The factors associated with poor knowledge and practice were age, marital status, educational status, occupation and source of information.

Therefore, information, education and communication strategy should be adopted with a view to improving knowledge and practice related to iodized salt utilization.

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## **Authors' Contributions**

TW designed the study, participated in the data quality control, performed analysis and interpretation of draft of the paper and prepared the manuscript. TA assisted with the design, approved the proposal, and revised drafts of the paper. GN also assisted with the design, approved the proposal, and revised drafts of the paper. All authors contributed to and approved the final manuscript.

### **Ethics Approval and Consent to Participants**

Ethical clearance was obtained from Bahir Dar University Ethical Review Board, Permissions was be taken from the concerned bodies of the Amhara Regional Health Bureau and Zonal Health Department. The necessary explanation about the purpose of the study and its procedure was given an oral consent was obtained from the respondents. Study participants had got information about that, they have the full right not to participate in the study if they are not willing. To ensure confidentiality anonymity was explained clearly for the participant. An arrangement was made in the kebele if there was an emergency condition happened during data

### **Competing Interest**

The authors declare that they have no competing interests

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### **Bibliography**

1. Dahl L MC and Bjorkkjaer T. "A short food frequency questionnaire to assess intake of seafood and n-3 supplements". *Nutrition Journal* 10 (2011): 127.
2. Girma M., *et al.* "Iodine deficiency in primary school children and knowledge of iodine deficiency and iodized salt among caretakers in Hawassa Town: Southern Ethiopia". *Ethiopian Journal of Health Development* 26.1 (2012): 30-35.
3. Kahindi Kazungu and Charles Mbakaya. "Factors Contributing to Iodide Deficiency in Coast Province Of Kenya". *European Journal of Research in Medical Sciences* 3.2 (2015).
4. Abuye C and Berhane Y. "The goitre rate, its association with reproductive failure, and the knowledge of iodine deficiency disorders (IDD) among women in Ethiopia: Cross-section community-based study". *BMC Public Health* 7.1 (2007): 316.
5. Mezgebu Y., *et al.* "Prevalence and severity of iodine deficiency disorder among children 6-12 years of age in shebe senbo district, Jimma zone, southwest Ethiopia". *Ethiopian Journal of Health Sciences* 22.3 (2012): 196-204.
6. Organization WH, Disorders ICfCoID, UNICEF. Indicators for assessing iodine deficiency disorders and their control through salt iodization (1994).
7. Mannar MV. "Making salt iodization truly universal by 2020". *IDD Newsletter* 42 (2014): 12-15.
8. Zerfu D. "National salt iodization coverage toward Prevention of Iodine Deficiency Disorder in Ethiopia". *Ethiopian Public Health Institute* (2014).

9. Kumma WP, *et al.* "Factors Affecting the Presence of Adequately Iodized Salt at Home in Wolaita, Southern Ethiopia: Community Based Study". *International journal of food science* (2018).
10. Network IG. "IDD Newsletter". *Age* 2.3 (2015): 6.
11. Adish A, *et al.* "Ethiopia: breaking through with a new iodized salt law". *IDD Newsletter* 41.4 (2013): 1-24.
12. Gebretsadikan TM and Troen AM. "Progress and challenges in eliminating iodine deficiency in Ethiopia: a systematic review". *BMC Nutrition* 2.1 (2016): 12.
13. S hawel D, *et al.* "Post-production losses in iodine concentration of salt hamper the control of iodine deficiency disorders: a case study in northern Ethiopia". *Journal of Health, Population and Nutrition* 28.3 (2010): 238-244.
14. Alpha summaries - a special section. *Health Services Reports* 87.5 (1972): 406-444.
15. de Jong N, *et al.* "Variability of micronutrient content in enriched dairy and fruit products. Executive Group for Development of Nutrient Dense Foods for Frail Elderly". *International Journal of Food Sciences and Nutrition* 51.4 (2000): 247-257.
16. Bogale A, *et al.* "Iodine status and cognitive function of women and their five-year-old children in rural Sidama, southern Ethiopia". *East African Journal of Public Health* 6.3 (2009): 296-299.
17. Takele L, *et al.* "Iodine concentration in salt at household and retail shop levels in Shebe town, south west Ethiopia". *East African Medical Journal* 80.10 (2003): 532-539.
18. Bulliyya G, *et al.* "Determination of iodine nutrition and community knowledge regarding iodine deficiency disorders in selected tribal blocks of Orissa, India". *Journal of Pediatric Endocrinology and Metabolism* 21.1 (2008): 79-87.
19. Buxton C and Bagueune B. "Knowledge and practices of people in Bia District, Ghana, with regard to iodine deficiency disorders and intake of iodized salt". *Archives of Public Health* 70.1 (2012): 5.
20. Gidey B, *et al.* "Availability of adequate iodized salt at the household level and associated factors in rural communities in Laelay Maychew District, Northern Ethiopia: a cross-sectional study". *Journal of Nutrition and Health Sciences* 2.1 (2015): 1.
21. Gebremariam HG, *et al.* "Availability of Adequately Iodized Salt at Household Level and Associated Factors in Gondar Town, Northwest Ethiopia". *ISRN Public Health* 2013.
22. Ebrahim SM and Muhammed NK. "Consumption of iodized salt among households of Basra city, south Iraq". *Eastern Mediterranean Health Journal* 18.9 (2012): 980-984.
23. Gul Nawaz, *et al.* "A Study on the Household Use of Iodised Salt in Sindh and Punjab Provinces, Pakistan: Implications for Policy Makers". *Pharmacy and Nutrition Sciences* 2 (2012): 148-154.
24. Hawas S, *et al.* "Proper Utilization of Adequately Iodized Salt at Household Level and Associated Factors in Asella Town Arsi Zone Ethiopia: A Community-based Cross-Sectional Study". *Journal of Food Processing and Technology* 7.573 (2016): 2.
25. Hailay Gebrearegawi Gebremariam M and Digsu Negese Koye. "Availability of Adequately Iodized Salt at Household Level and Associated Factors in Gondar Town, Northwest Ethiopia". Academic Editors: CRisseland MJ Toole (2013).
26. Mahfouz MS, *et al.* "Iodized Salt Consumption in Sudan: Present Status and Future Directions". *Journal of Health Population and Nutrition* 30.4 (2012): 431-438.

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