

Knowledge and practices of pregnant women about iodized salt and its availability in their households in Hawassa city. Community-based cross-sectional study

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Abstract

Objectives: This study was aimed to assess the knowledge and practices of pregnant women about iodized salt and its availability in their households in Hawassa city, Ethiopia

Methods: A community-based cross-sectional study design was conducted among pregnant women with a total sample size (N) = 553 in Hawassa city. A multi-stage sampling technique was employed. First, four sub-cities of Hawassa city (out of eight sub-cities) were selected using the lottery method. Households of pregnant women in each selected sub-city were identified and screened. Finally, representative samples were drawn using systematic random sampling technique.

Results: A total of 537 pregnant women was included, a response rate of 97.1%. This was due to incomplete data for nine and participation refusal for seven participants. The mean age of the participants was 26.98 ± 4.75 years. About 52.51% and 52.33% of the respondents had good knowledge and good salt handling practices, respectively. Regarding availability of iodized salt, 65.55% of pregnant women (31.66% salt with iodine level ≥ 15 parts per million (ppm) and 33.89% salt with iodine level < 15 ppm) had iodized salt and the remaining 34.45% non-iodized salt (0 ppm) respectively.

Conclusion: Availability of iodized salt in households of pregnant women was 65.55% (> 0 ppm). More than one-third of pregnant women in Hawassa city are utilized non-iodized salt (0 ppm). Nearly half of the pregnant women in Hawassa city had poor knowledge and poor practice about iodized salt. Hawassa city Health Department along with concerned stakeholders should invest more effort to increase awareness about iodized salt and how to handle it safely in households.

Keywords

Iodine deficiency, knowledge, iodized salt, pregnant women

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Introduction

Iodine is a trace micronutrient that is essential for the metabolic pathway of the human body, development of brain tissue, and maturation of the central nervous system. It is an essential component of the thyroid for the synthesis of thyroid hormones (thyroxine and triiodothyronine).^{1,2} Due to marked physiological changes and increased production of thyroid hormones, iodine requirement during pregnancy increases more than 50% compared with non-pregnant women of reproductive age.³ Pregnant women who are unable to get sufficient amount of iodine (150–249 $\mu\text{g/L}$) required during pregnancy develop a disorder called iodine deficiency disorder (IDD).⁴

Severe iodine deficiency problems manifested by goiter (maternal hypothyroidism) and neurological problems including mental disability (mental retardation) and neurological cretinism (deaf mutism, mental deficiency, spasticity, and squint) that permanently harm the fetus cause the fetus

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to develop with lower learning ability (lower intellectual quotient), reduced capacity, and less investment in education and creativity.³ Congenital deformity, stillbirth, and irreversible fetal brain damage are also poor obstetric outcomes caused by insufficient intake of iodine during pregnancy.^{4,5}

Globally, more than two billion people are affected by IDD. Pregnant and lactating women and children of school age are part of the population categorized highly vulnerable groups by IDD. Among school-aged children who are iodine insufficient, more than half reside in two regions (78 million in Southeast Asia and 58 million in Africa). Europe is also one of the continents where IDD is highly prevalent which accounting for 30.5 million school age children being iodine insufficient.²

An additional need for iodine is required by the fetus, maternal iodine requirement to maintain maternal euthyroidism, and increased renal excretion of iodine during pregnancy causes pregnant women to fall under a highly vulnerable group for iodine deficiency.² The global urinary iodine concentration data in pregnant women compiled from 65 countries indicates that iodine intake in pregnant women is insufficient in 37 countries.⁶

Despite its irreversible effect on the developing fetus, IDD is an easily preventable public health problem. According to the World Health Organization, International Council for Control of Iodine Deficiency Disorders and United Nations International Children's Fund recommendations, Universal Salt Iodization (USI) is a safe, cost-effective, and sustainable strategy to deliver sufficient iodine to all individuals living in the iodine deficit country. It is iodization of all human and livestock salt, including salt used in the food industry by considering the required amount of iodine to be delivered to individuals living in iodine-deficient countries.⁷ IDDs can be prevented, if 90% or more households from iodine deficient country are available with iodized salt.⁷

Ethiopia is one of the Sub-Saharan countries that has implemented USI strategy for more than a decade to prevent iodine deficiency. Currently, the availability of iodized salt to households at national level is 88.8%; however, the country's goiter rate ranges between 14% and 59%, which leads Ethiopian pregnant women to have 50,000 stillbirths annually and at least one out of 1000 births to be a cretin (permanent mental disability). Poor knowledge about iodized salt and low dietary intake of foods fortified with iodine are the major contributing factors for insufficient iodine within households.⁸⁻¹⁰ Currently, the iodized salt coverage for households at the national level is 88.8%, but only 26% of households use adequately iodized salt.¹¹ There is a scarcity of evidence regarding the knowledge and practices of pregnant women regarding iodized salt and its availability in their households, both at the national level in general and in Hawassa city in particular (Hawassa city health department report in 2019). Therefore, this study aimed to assess the knowledge and practices of pregnant women about iodized

salt and its availability in their households in Hawassa city administration.

Objective

General objective

To assess the knowledge and practice of pregnant women about iodized salt and its availability in their households in Hawassa city administration.

Specific objective

To assess the knowledge of pregnant women about iodized salt in Hawassa city administration.

To assess the practice of pregnant women about iodized salt utilization and its availability in their households in Hawassa city administration.

Methodology

Study area

This study was conducted in Hawassa city administration, the city of the Sidama Regional State located at 70°03' latitude and 89°28' east longitude. It is 270 km south of Addis Ababa, the capital city of Ethiopia and 1708 m above sea level. The city has 8 sub-cities and 32 kebeles (the lowest administrative structure in Ethiopia) inhabited by a total population of 376,539, of which 187,517 were men and 189,022 women. The city has 7 hospitals (3 public and 4 private hospitals), 12 public health centers (11 governmental and 1 non-governmental), 13 private special clinics, 19 health posts, 7 diagnostic laboratories, 111 drug stores, and 14 pharmaceutical suppliers. According to a health department report of the city administration, it was estimated that about 13,028 pregnant women were living in the city in the 2020 Ethiopian fiscal year.

Study design and period

A community-based cross-sectional study was conducted among pregnant women between October and November 2020.

Inclusion and exclusion criteria

Inclusion criteria. All pregnant women who permanently reside in eight sub-cities of Hawassa city and who are not medically restricted to take iodized salt by physician (health professionals) were candidates for this study.

Exclusion criteria. Pregnant women who are restricted to take iodized salt for medical reason and those who did not give consent to participate in the study were excluded from this study.

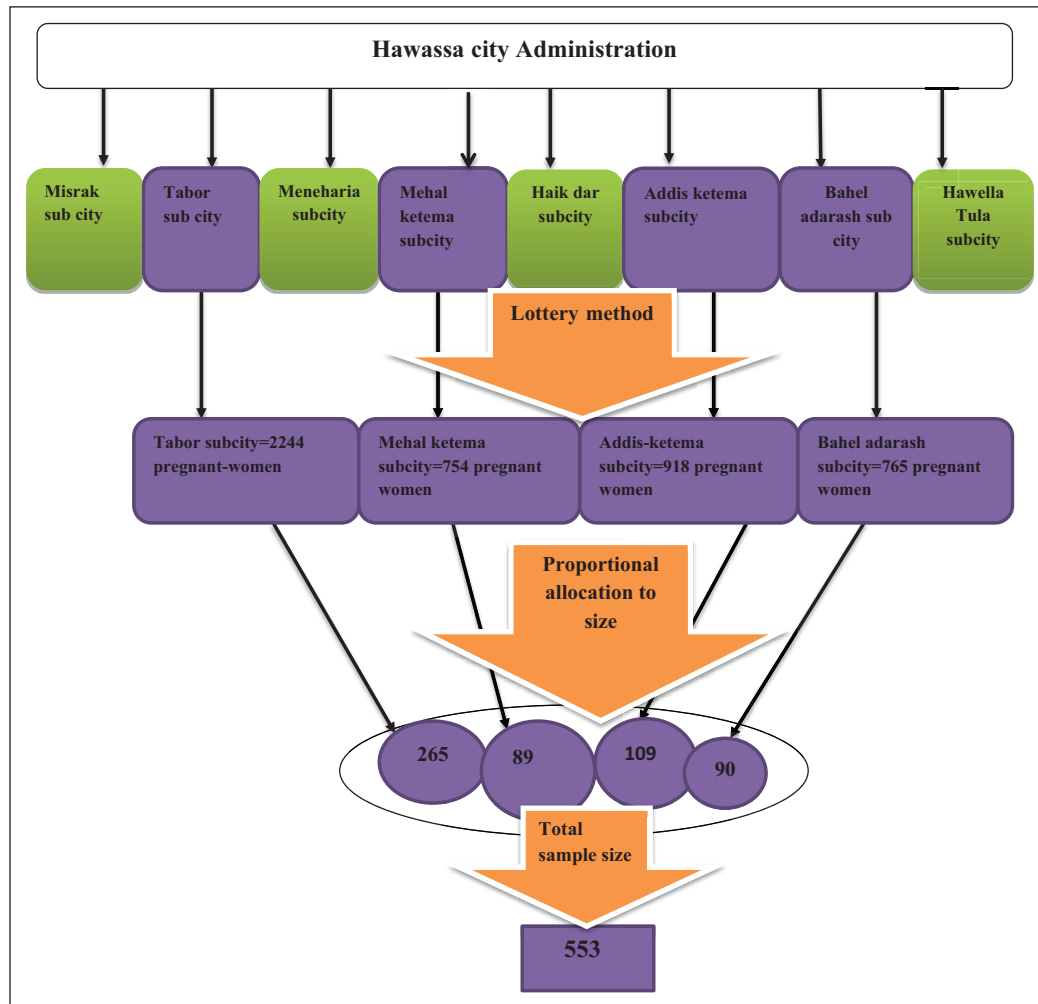


Figure 1. Schematic representation of sampling procedure to assess the knowledge and practices of pregnant women about iodized salt and its availability in their households in Hawassa city, 2020 ($N=553$).

Source and study population

Source population. The source population for this study was all pregnant women residing in Hawassa city administration

Study population. The study population consisted of pregnant women living in households in selected sub-cities of Hawassa city.

Sample size determination

The sample size was calculated using Open Epi version 3.03 Stat Cal c. software by considering 95% confidence level, proportion of availability of iodized salt, $p=37.7\%$,¹² margin of error, $d=5\%$, design effect=0.5, and non-response rate=5% which gives the total sample size, $n=553$.

Sampling procedure

A multistage sampling technique was employed to determine the samples used in this study. First, the number of sub-cities in Hawassa city administration (a total of 8 sub-cities) was

determined and four sub-cities (Bahel adarash, Mehal ketema, Addis ketema, and Tabor) were selected using lottery method. Households of pregnant women in each selected sub-city were identified and screened. Representative samples were drawn from each selected sub-city through proportionally allocating samples to the size of the study population. Lottery method was used to determine the first household with a pregnant woman and systematic random sampling technique is employed to determine the next participating pregnant women. Only one pregnant woman was interviewed if more than two pregnant women resided in a single household (see Figure 1).

Operational definition

Availability of iodized salt: Salt used by pregnant women for cooking within the preceding 24h and observed to have a color change of salt or presence of iodine by the test kit.

Adequately iodized salt: Salt with an iodine level ≥ 15 parts per million (ppm; deep blue color of salt) after the salt was tested using the kit.

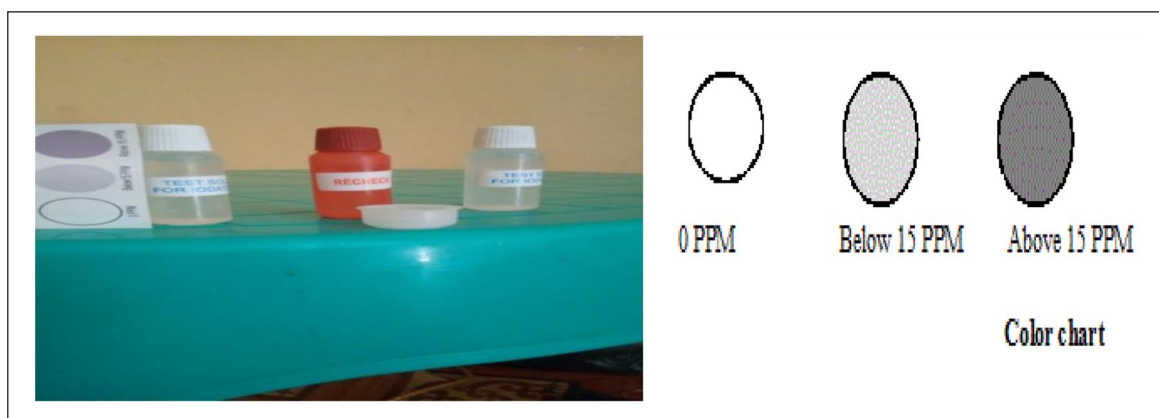


Figure 2. Components of a Rapid Iodine Test kit (BMI kits international) used to assess the availability of iodized salt in households of pregnant women living in Hawassa city, 2020 ($N=553$).

Inadequately iodized salt: Salt with an iodine level <15 ppm (light blue color of salt) after the salt was tested using the kit.

Non-iodized salt: Salt with an iodine level of $=0$ ppm (no color change of salt) after the salt was tested using the kit.

Good knowledge: Pregnant women who answered half and more than half ($\geq 50\%$) of knowledge questions correctly.

Poor knowledge: Pregnant women who answered less than half ($<50\%$) of knowledge questions correctly.

Good practice: Pregnant women who answered practice questions more than or equal to the mean correctly.

Poor practice: Pregnant women who answered less than the mean of the practice questions correctly.

Data collection tools and procedures

Data were collected through an interviewer-administered semi-structured questionnaire adapted from previous similar literatures.^{13,14} The questionnaire was developed in English and translated into Amharic and Sidaamu Afoos (common languages commonly spoken by Hawassa city residents) and finally retranslated into English by language translators to check consistency. The questionnaire was structured to obtain information on sociodemographic characteristics (monthly income, educational status, family size, and occupational status), knowledge about iodized salt, and practices of iodized salt utilization (exposure of salt to sunlight), place and duration of salt storage and testing salt for iodine using a Rapid Iodine Test Kit (BMI Kits International, Chennai, Tamil Nadu, India). The reliability test result indicated that Cronbach's alpha is 82.3%.

To assess the iodine content in the salt, interviewers asked pregnant women to obtain a teaspoon of salt used for cooking within the preceding 24 h. The salt was tested for iodine by interviewers using a Rapid Iodine Test Kit (MBI Kits International). This is an iodized salt test kit for assessing salt in home to home visit for salt fortified with either

potassium iodide or potassium iodate with 89.8% and 65.8% sensitivity and specificity, respectively.¹⁵

The kit includes two white ampules each containing 10 mL solutions called test solutions; one red ampule containing 10 mL solution called recheck solution; one white plastic cup; one color chart with circular color spots showing 0 ppm, below 15 ppm, and above or equal to 15 ppm; and one instruction sheet all fitting into a handy pocket size kit¹⁵ (see Figure 2).

Data were collected by six female Bachelor of Science in clinical laboratory health professionals who were fluent speakers of both Amharic and Sidaamu Afoos. Two health professionals, who were specialized in Master of Science in a clinical chemistry and who had experience in supervising previous similar study, were recruited as supervisors for this study. If participants were not present in households selected for data collection, a revisit was made otherwise a pregnant woman in the next household was considered.

Data quality assurance

A week before actual data collection, data collectors and supervisors were trained for 1 day about the procedures to be followed during testing salt for iodine. The pretest was conducted on 5% (28 participants) of the sample in Yirgalem town (115 km away from Hawassa city in the southern direction) to check the validity and consistency of the data collection tool. Ongoing supervision was made to check whether all the questionnaires were appropriately completed and the recorded information made sense or not. A Rapid Iodine Test Kit was used (before the kit expiry date) to test the salt.

Statistical analysis

Completeness of data was checked on daily basis by supervisors during data collection and if data were missed, an

Table 1. Sociodemographic characteristics of pregnant women living in Hawassa city, 2020 (N=537).

Variables	Category	Frequency	Percent (%)
Age in years	16–24	169	31.5
	25–34	324	60.3
	>34	44	8.2
Marital status	Married	519	96.6
	Other	18	3.4
Religion	Protestant	323	60.1
	Orthodox	184	34.3
	Muslim	27	5.0
	Catholic	3	0.6
Occupation	Housewife	188	35.0
	Government Employee	129	24.0
	Merchant	113	21.0
	Student	50	9.3
	Self employed	39	7.3
	Day laborer	18	3.4
	Not educated at all	73	13.6
Educational level	College and above	155	28.9
	Secondary-preparatory	157	29.2
	Primary	152	28.3
	>2000 ETB (51.0 US\$)	322	60.0
	1500–1999.99 ETB (39–50.9 US\$)	45	8.4
Monthly income in ETB or in US\$	1000–1499.99 ETB (26–38.9 US\$)	40	7.4
	500–999.99 ETB (13–25.9 US\$)	21	3.9
	<500 ETB (13 US\$)	109	20.3
	<5	477	88.8
	>5	60	11.2
Family size	Sidamo	260	49.9
	Wollayta	108	20.1
	Guragae	77	14.3
	Others	84	15.6

ETB: Ethiopian birr; US\$: US dollar

interviewer is returned back to pregnant women and completes the missed data. After the data collection process is completed, each data was entered to Epi Data version 3.0 software and then exported to Statistical Package for Social Sciences version 20. Frequency distribution, mean, and percentage were calculated to know the magnitude for each variable. Tables, pie charts, and bar charts were used to describe the final result.

Result

Sociodemographic characteristics

A total of 537 pregnant women participated in the study, a response rate of 97.1%. This was due to incomplete data for nine and participation refusal for seven participants, respectively. The mean age of participants was 26.98 ± 4.75 years. In all, 519 (96.6%) was married and 3.4% were others. The majority were Protestant religion followers (60.1%) followed by Orthodox (34.3%), Muslim

(5%), and Catholic (0.6%), respectively. About 157 (29.2%) participants attended secondary school, 28.9% college and above, 28.3% primary, and the remaining (13.6%) had not attended formal education at all. Regarding the occupational status, the majority (35.0%) were housewives followed by government employee (24.0%), merchant (21.0%), student (9.3%), self-employed 39 (7.3%), and daily laborer (3.4%) (see Table 1).

Knowledge about iodized salt

Among nine questions used to assess knowledge of pregnant women about iodized salt, 52.51% had good knowledge about iodized salt. In all, 296 (55.1%) had previously heard about iodized salt. Of those who heard about iodized salt, 17.5% heard from television, 14.2% from health workers, 11.7% from the radio, 7.4% from friends, and 4.3% from printed materials (leaflets about iodized salt) (see Figure 3 and Table 2).

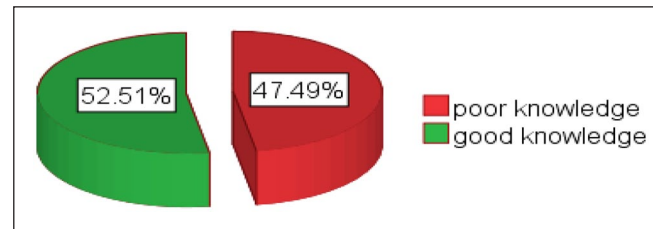


Figure 3. Knowledge of pregnant women about iodized salt in Hawassa city, 2020 (N=537).

Table 2. Assessment of iodized salt knowledge of pregnant women living in Hawassa city, 2020 (N=537).

Variable	Category	Level of iodine		Total	Percent (%)
		>0 ppm	= 0 ppm		
Knowledge	Good knowledge	248 (46.2%)	34 (6.3%)	282	52.5
	Poor knowledge	104 (19.4%)	151 (28.1%)	255	47.5
Have you ever heard about salt iodine added to it?	Yes	255 (47.5%)	41 (7.6%)	296	55.1
	No	97 (18.1%)	144 (26.8%)	241	44.9
From where you heard about salt iodine is added to it (n=296)?	Television	81 (27.4%)	13 (4.4%)	94	31.8
	Health workers	63 (21.3%)	13 (4.4%)	76	25.7
	Radio	54 (18.2%)	9 (3.0%)	63	21.2
	Friends	36 (12.2%)	4 (1.4%)	40	13.6
Do you think that every salt is rich with iodine?	Printed materials	20 (6.8%)	3 (1.0%)	23	7.8
	Yes	78 (14.5%)	113 (21.0%)	191	35.5
	No	274 (51.0%)	72 (13.4%)	346	64.4
Do you know the importance of an increased intake of iodine during pregnancy?	Yes	152 (28.3%)	11 (2.0%)	163	30.3
	No	200 (37.2%)	174 (32.4%)	374	69.6
Do you know the benefit of cooking food with salt iodine is added to it?	Yes	246 (45.8%)	35 (6.5%)	281	52.3
	No	106 (19.7%)	150 (27.9%)	256	47.7
What benefit of iodine do you know (n=281)?	Prevents goiter	123 (43.7%)	9 (3.2%)	132	46.9
	Promotes good fetal growth	55 (19.7%)	11 (3.9%)	66	23.6
	Promotes health	42 (15.1%)	11 (3.9%)	53	19.0
	Prevents Miscarriage	25 (9.0%)	5 (1.4%)	30	10.4
Do you know the problems caused by loss of iodine from the diet we eat?	Yes	246 (45.8%)	34 (6.3%)	280	52.1
	No	106 (19.7%)	151 (28.1%)	257	47.8
What problems of iodine deficiency did you know (n=280)?	Goiter	98 (35.0%)	13 (4.6%)	111	39.6
	Mental retardation	69 (24.6%)	6 (2.1%)	75	26.7
	Miscarriage	35 (12.5%)	8 (2.9%)	43	15.4
	Stunted growth	22 (7.9%)	5 (1.8%)	27	9.7
	Malformation	21 (7.5%)	3 (1.1%)	24	8.6
Do you think that the test of salt iodine added is different from salt without iodine?	Yes	122 (22.7%)	101 (18.8%)	223	41.5
	No	230 (42.8%)	84 (15.7%)	314	58.5

Practices about iodized salt

About 52.33% pregnant women had good iodized salt handling practice in their households. The majority of the participants bought their salt from small shop (57.2%) followed by supermarkets (24.0%) and open market (18.8%), respectively. About 71.7% pregnant women bought their salt packed with original covering, 63% stored salt in containers having cover, and 43.2% stored salt in the dry and cool area (see Figure 4 and Table 3).

Availability of iodized salt in households of pregnant women

A teaspoon of salt was taken from households of pregnant women used for cooking within the preceding 24 h for determining the iodine level within the salt. Nearly one-third of the participants (31.66%) had been using salt with iodine level >15 ppm, 33.89% of women used salt <15 ppm, and 34.45% used non-iodized salt (0 ppm) (see Figure 5).

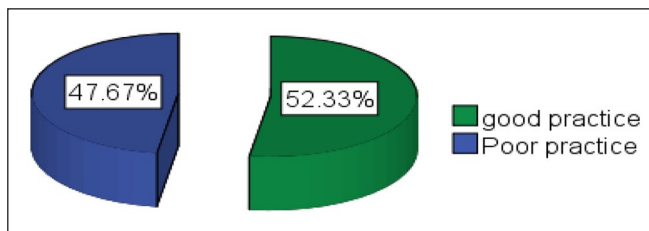


Figure 4. Salt handling practices of pregnant women living in Hawassa city, 2020 (N=537).

Table 3. Assessment of salt handling practices of pregnant women living in Hawassa city, 2020 (N=537).

Variable	Category	Level of iodine		Total	Percent (%)
		>0ppm	= 0ppm		
Salt handling practice	Good practice	244 (45.4%)	37 (6.9%)	281	52.3
	Poor practice	103 (19.2%)	153 (28.5%)	256	47.7
From where you bought your salt?	Supermarket	123 (22.9%)	6 (1.1%)	129	24.0
	Small shop	224 (41.7%)	83 (15.5%)	307	57.2
	Open market	5 (0.9%)	96 (17.9%)	101	18.8
Is your salt bought is packed with original covering?	Yes	330 (61.5%)	55 (10.2%)	385	71.7
	No	22 (4.1%)	130 (24.2%)	152	28.3
Is salt stored in your house is covered?	Yes	276 (51.4%)	64 (11.9%)	340	63.3
	No	76 (14.2%)	121 (22.5%)	197	36.7
Do you expose salt to sunlight?	Yes	75 (14.0%)	126 (23.4%)	201	37.4
	No	277 (51.6%)	59 (11.0%)	336	62.6
At what place, usually you stored salt?	Dry and cool area	193 (35.9%)	39 (7.3%)	232	43.2
	Moist/near the fire area	159 (29.6%)	146 (27.2%)	305	56.8
For how long you stored your salt at home?	≤2 weeks	326 (60.7%)	141 (26.3%)	467	87.0
	>2 weeks	26 (4.8%)	44 (8.2%)	70	13.0
When you add salt to the food while cooking?	At the beginning of cooking	72 (13.4%)	57 (10.6%)	129	24.0
	At the middle of cooking	114 (21.2%)	68 (12.7%)	182	33.9
	At the end of cooking	166 (30.9%)	60 (11.2%)	226	42.1
What type of salt you used for cooking?	Powdered	337 (62.8%)	100 (18.6%)	437	81.4
	Table salt	15 (2.8%)	85 (15.8%)	100	18.6

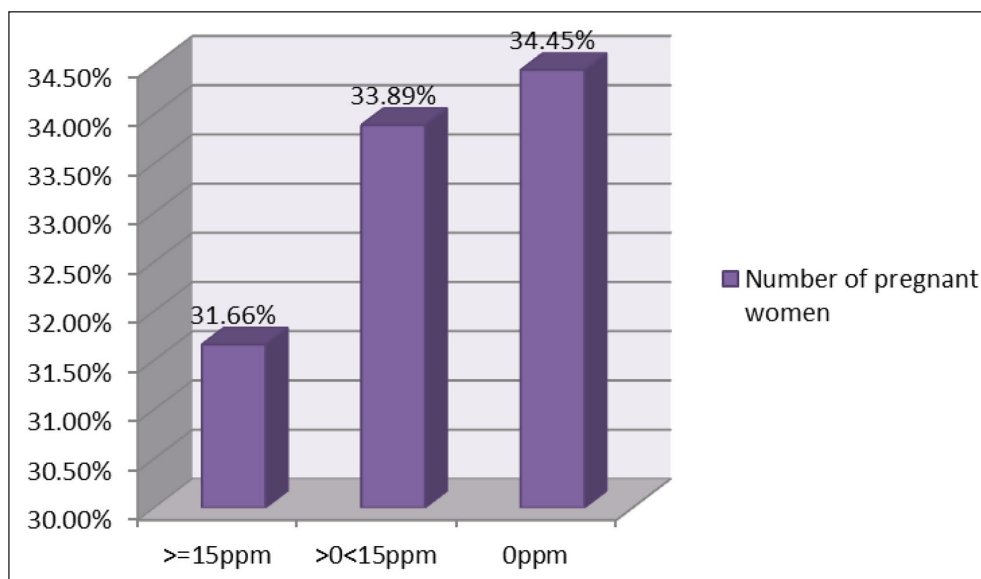


Figure 5. Availability of iodized salt in households of pregnant women living in Hawassa city, 2020 (N=537).

Discussion

Among the 537 pregnant women involved in this study, 52.5% (95% confidence interval (CI): 48.2–56.8%) had good knowledge about iodized salt. Among those who were knowledgeable, 47.0% of women responded that salt rich with iodine prevents goiter followed by promotes fetal growth (23.7%) and improves maternal health (19.0%), respectively. A study which was conducted in Ghana found that 59.3% pregnant women were knowledgeable about salt rich with iodine.¹⁶ This might be due to a special focus of Ghanaian government toward improving maternal and child health problems related to iodine deficiency.¹⁷

The knowledge of pregnant women about iodized salt in this study was lower as compared with the study conducted in Ambo town health institutions.¹⁸ This might be due to the difference both in the study area and in the study population. The previous study was conducted among pregnant women attending antenatal care service in Ambo town health institutions where education toward improving the nutritional status of pregnant women is given as one part of the service and may account for better knowledge for the previous study.

The knowledge of pregnant women living in Hawassa city was in consistent with the study conducted at Arbaminch town, southern Ethiopia, where 52.8% pregnant women were knowledgeable about iodized salt.¹⁹ This might be due to the similarity in the study setting; both studies were conducted among pregnant women living in urban residences and might have similar accessibility of information through media. However, the knowledge of pregnant women living in Hawassa city was more as compared with the study conducted at Srinagarind Hospital, north-eastern region of Thailand, where only 33.3% pregnant women knew about iodized salt.¹⁴ This difference might be due to the difference both in study setting and in the study population. The previous study was institution based and the participants were only pregnant women coming for their first antenatal visit while the present study is conducted at the community level and involves all pregnant women (pregnant women with history of more than one antenatal visits and might have obtained information about iodized salt in their earlier antenatal visits).

About 52.3% (95% CI: 48–56.8%) pregnant women had good salt handling practice in Hawassa city. This is lower than salt handling practices of pregnant women in Ambo town, Oromia regional state, Ethiopia, where three-quarters of respondents have good salt handling practice.²⁰ This difference might be due to the difference in the study area. The previous study was conducted on pregnant women coming for antenatal care visits that might have more access to health education about iodized salt utilization and may account for good practices of handling iodized salt. However, it is greater as compared with the study conducted in Thailand, where only 23.7% pregnant women had good practice of iodine supplementation.¹⁴

Among households of pregnant women tested for iodine using the kit, 31.66% households have salt with iodine level ≥ 15 ppm (deep blue color of salt), 33.89% < 15 ppm (light

blue color of salt), and 34.45% with 0 ppm (no color of salt). This is in consistent with the study conducted in Goba town, Bale zone, Oromia regional state of Ethiopia¹⁸ and might be due to the similarity of the study area. Both this and the previous study were conducted on urban residence dwellers and might have similar access to information regarding nutritional education including iodized salt. Availability of iodized salt with iodine level ≥ 15 ppm in households of pregnant women in Hawassa city was too low (31.66%). It was nearly reduced by half compared with salt availability in households of pregnant women in Kimbibit District, Oromia Regional State, Ethiopia.²¹ This difference might be due to Kimbibit district is located near the trading center of the nation (addis ababa) by which iodized salt can be easily accessed as per the demand of pregnant women in the district.

In Ethiopia, a ban has been made by Salt Iodization Council of Ministers Regulation No. 204/2011 for processing, importing, and transporting non-iodized salt for edible consumption. According to the regulation, any inspector may inspect any processing, storage, transporting, or sales premises to ascertain that salt intended for human consumption is iodized.²² However, salts supplied from small shops and open market have either lower or absence of iodine in the salt.^{18,23} This might be account for the lower availability of iodized salt in Hawassa city as the majority purchased salt from small shops and open market.

Limitation of the study

Rapid Iodine Test kit (BMI international kits) which was used for this study is not a very accurate assay for iodine content in the salt. It is based on the principle that the kit estimates the level of iodine based on the color change observed after testing salt for iodine using the kit. However, the kit is an easy, effective, and rapid method of assessing the iodine content of salt at the field or home to home visit.¹⁵

Conclusion

Availability of iodized salt in households of pregnant women living in Hawassa city was low. More than one-third of pregnant women in Hawassa city are utilized non-iodized salt (0 ppm). Nearly half of pregnant women in Hawassa city had poor knowledge and poor practice about iodized salt, yet knowledge and practice play a major contribution in increasing access and availability of iodized salt in households. Hawassa city Health Department along with concerned stakeholders should invest more effort to increase awareness about iodized salt and how to handle it safely in households.

Acknowledgements

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Author contributions

KN conceived and designed the study, performed statistical analysis and drafted the paper. ST, AK and BB participated in study design, closely supervised the overall undertaking of the study and participated in writing the paper. All authors contributed to the data analysis and interpretation and read and approved the final version of the paper.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethics approval

Ethical approval for this study was obtained from Research Ethics Committee of Mizan-Tepi University, College of Medicine and Health Sciences with a reference number, MTU/CHS/00741/2020.

Informed consent

Written informed consent was obtained from all the study participants or/and legally authorized representatives of the study participants before the study.

Trial registration

Not applicable.

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Supplemental material

Supplemental material for this article is available online.

References

- Kabata-Pendias A and Mukherjee AB. *Trace elements from soil to human*. Berlin: Springer Science & Business Media, 2007.
- Menon K and Skeaff S. *Iodine: iodine deficiency disorders (IDD)* [Internet]. 1st ed. Vol. 3, Encyclopedia of Food and Health. Elsevier Ltd., 2015, pp. 437–443.
- Stage L and Amount R. *Iodine fact sheet for consumers*. Bethesda, MD: National Institute of Health, 2020.
- Scope B. *Urinary iodine concentrations for determining iodine status in populations*. Vitamin and Mineral Nutrition Information System. Geneva: WHO, pp. 1–5, <http://www.who.int/nutrition/vmnis/indicators/urinaryiodine>.
- Tolozza FJK, Motahari H and Maraka S. Consequences of severe iodine deficiency in pregnancy: evidence in humans. *Front Endocrinol (Lausanne)* 2020; 11: 1–8.
- Pearce EN. *Iodine deficiency disorders and their elimination*. Cham: Springer Cham, 2017, pp. 1–158.
- WHO UI. *Assessment of iodine deficiency disorders and monitoring their elimination*. Geneva: WHO, UNICEF and ICCIDD, 2007.
- Wang X, Lou X, Mo Z, et al. Poor iodine knowledge, coastal region, and non-iodized salt consumption linked to low urinary iodine excretion in Zhejiang pregnant women. *Nutrients*. 2019; 11: 413.
- Tesema M, Belay A, Zerfu D, et al. *Reviews of the prevalence of iodine deficiency among vulnerable population in Ethiopia*. Addis Ababa: Ethiopian Public Health Institute and Micronutrient Initiative, 2014.
- Yibrie A, Yifru S, Tigabu D, et al. *Iodine deficiency disorders module. Ethiopia Public Health Training Initiative Students Born ISR*. Gondar: University of Gondar, Ethiopia, 2007.
- Federal Democratic Republic of Ethiopia. *Demographic and health survey*. Addis Ababa: Central Statistical Agency, 2016, pp. 1–59.
- Kumma WP, Haji Y, Abdurahmen J, et al. Factors affecting the presence of adequately iodized salt at home in Wolaita, Southern Ethiopia: community based study. *Int J Food Sci* 2018; 2018: 4394908.
- Zoysa GED, Hettiarachchi M, Jayathilaka KAPW, et al. Knowledge and practices of iodized salt consumption among pregnant women in Galle District. *Gall Med J* 2015; 20(1): 10.
- Khamsingnork J, Chongsomchai C, Kuchaisit C, et al. Attitude and practice regarding iodine deficiency disorder among pregnant women at Srinagarind Hospital. *Thai J Obstet Gynaecol* 2016; 24(4): 255–264.
- World-Vision. Using rapid test kits to measure salt iodisation at the household level. WV Guidance Document, 2011.
- Sarah NA, Prince AK, Yao AS, et al. Knowledge on iodized salt use and iodine content of salt among households in the Hohoe Municipality, Volta Region – Ghana. *Cent Afr J Public Health* 2016; 2(1): 1–10.
- Gbogbo S. *Ghana launches a new advocacy campaign on USI*. Accra: Nutrition Department, Ghana Health Service, 2013.
- Tololu AK, Getahun FA and Abitew DB. Coverage of iodized salt and associated factors at household level in Goba Town, Bale Zone, South East Ethiopia, 2015. *Sci J Public Health* 2016; 4(4): 346–351.
- Dessu S, Dawit Z and Alemu G. Assessment of knowledge on iodized salt utilization and associated factors among households in Arba Minch Town, Southern Ethiopia. *Int J Res Stud Med Health Sci* 2018; 3(12): 1.
- Demissie DB. Knowledge and practice of antenatal care attendant mothers towards iodized salt utilization and associated factors in Ambo town public health facilities, Oromia, Ethiopia. *J Gynecol Womens Health* 2018; 11(5): 5–10.
- Abera T, Deybasso HA and Gebaba EM. Utilization of iodized salt and associated factors among pregnant mothers in Kimbibit District, North Shoa Zone, Oromia Regional State, Ethiopia. *Am J Health Res* 2021; 9(3): 89–99.
- Yohannes A. Ethiopian legel brief: Salt Iodization Council of Ministers Regulation No. 204/2011: Public Servants' Pension Proclamation No. 1267-2022, 2011.
- Tsegaye M, Hailu D and Zegeye M. Availability and utilization of adequately iodized salt by urban and rural households and associated factors in Southern Ethiopia, Sidama Zone, Bensa Woreda: a comparative cross-sectional study. *Int J Food Sci Nutr Eng* 2016; 6(3): 69–71.