

Knowledge and Practice of Iodized Salt and Iodine Deficiency Disorders among Men in Nungua, Ghana

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Abstract Background: Iodine Deficiency Disorders (IDDs) continues to be a problem in Ghana after several years of salt fortification with iodine. Sustainable IDD prevention requires a well-informed population and their willingness to use iodized salt. This study determined the levels of knowledge of men on iodized salt, IDD iodized salt usage. Methods: This was a cross-sectional study involving 400 men (18 years and above) sampled conveniently at Nungua in the Ledzokuku Krowor Municipality of the Greater Accra Region, Ghana. Data on socio-demographics, knowledge, use of iodized salt and IDD were collected. We computed descriptive statistics for socio-demographic data, knowledge of iodized salt, usage of iodized salt and knowledge on IDD. We grouped scores for knowledge on iodized salt into poor and good. Scores for knowledge on IDD were split into tertiles and labeled as low, moderate, and high. Chi-Square (χ^2) test and multinomial logistic regression were performed to determine the association between socio-demographic characteristics, good knowledge on iodized salt and high knowledge about IDD. Results: Majority of respondents (37.5%) were aged between 26 and 41 years. About 97.8% have heard about iodized salt and 69.3% first heard about iodized salt through the media. About 70.5% used iodized salt in cooking and 76.8 % of the respondents would encourage women to use salt in cooking. When knowledge level was split into two groups, the higher proportion (266 out of 400) had poor knowledge on iodized salt and in tertiles, the majority (184 of 400) had low knowledge on IDD. There were statistically significant differences between age, marital status and educational level and knowledge on IDD all at $P < 0.001$. Those with Junior High School education had 54% less chance, OR= 0.465; 95% CI: (0.244, 0.884) of obtaining good knowledge on

iodized salt compared with those who had University education. Conclusions: Knowledge on iodized salt was low, and knowledge on IDD was low among the men. There is a difference in the level of knowledge of IDD among the socio-economic groups but not knowledge on iodized salt and its use. The more educated the men are, the more likely they are to use iodized salt.

Keywords Iodine Deficiency Disorders, Iodized Salt, Ghana, Knowledge, Men

1. Introduction

The World Health Organization (WHO) estimated that about two billion individuals in 118 countries worldwide have insufficient iodine intake [1; 2; 3]. The WHO and the United Nations Children Fund (UNICEF) have recommended Universal Salt Iodization (USI) to ensure sufficient intake of iodine by all individuals, and seeks to achieve at least 90% of household consumption of adequately iodized salt [3; 4]. In Ghana, Universal Salt Iodization (USI) programme was launched in 1995, with legal backing by Act 523 of 1996, and was aimed at 90% household consumption of iodized salt by the end of 2005 [5;6]. However, a recent study indicated that Ghana had not achieved the USI of 90% consumption of iodized salt by households [2]. There has also been marginal increases in household consumption of adequately iodized salt from 28% to about 39% between 2003 and 2014 in over a decade [7] since USI implementation. Iodine deficiency disorders (IDDs) is of significant importance in public health

globally [8]. Iodine Deficiency Disorders (IDDs) are endemic in 51.8 % of Ghana's 216 districts [9; 10]. It has been projected that 1.5 million children will suffer from mild to severe irreversible brain damage due to iodine deficiency between the period of 2011 to 2020 [11]. Currently, only 39% of Ghanaian households are consuming adequately iodized salt [7]. Multiple Indicator Cluster Survey (MICS) (2010-2011) found that there was a difference in levels of household iodized salt consumption. Nearly one in four (24%) households used salt that was not iodized [11]. Nine out of 10 districts in Ghana have less than half of households that consumed iodized salt [7] and almost half of Ghanaian households (42%) used salt that was not iodized [5]. Studies conducted in Ghana to assess why the country had not attained USI revealed mixed results [4; 7]. In Ghana, men as household heads were generally responsible for providing finances for food and its ingredients and therefore their knowledge on the use of iodized salt and IDDs are important to the use of iodized salt [7]. Despite the implementation of USI and strategies to ensure individuals use iodized salt for food, low iodized salt usage and iodine deficiency disorders (IDDs) continue to exist in Ghana [7]. Awareness of iodized salt (81.7%) was higher than awareness of iodine deficiency (40.2%) nationally. Household coverage for salt with any iodine was 61.9% [7]. Despite the returns associated with improved nutritional health due to iodized salt consumption, there is no iodized consumption and knowledge data among men in an urban area in Ghana. A study by Ahiadeke et al. has shown that the choice of using iodized salt is a function of the knowledge of the potential benefits [12]. Consequence of nutrient deficiency, such as stunting as a leading post-Millennium Development Goal [13; 14]. Micronutrient strategies for the elimination of nutritional malnutrition is being examined. There is the need to examine the evidence to support policy [15; 16]. There The prevention and correction of iodine deficiency may be an important contributor to reducing stunting which is high among Ghanaian children under five years. Ghana is a patrilineal country where men are the household heads and therefore decides what foods the household eats and what types of ingredients they use in the food preparation. To continually use the views of women to drive policy on USI is not sufficient and may have accounted for the low usage of iodized salt since the strategies were developed and implemented. This accounted for the reason why we decided to sought the views of men alone in this study. Nungua is a very patrilineal society where men make input into food system. Therefore, this cross-sectional study on men (household heads) was undertaken in Nungua, a paternalistic community to assess their level of knowledge on iodized salt, its use, knowledge on IDDs and the associated socio-demographic factors.

2. Participants and Methods

2.1. Study Area

The study was carried out at Nungua, in the Ledzokuku Krowor Municipality (LEKMA) of the Greater Accra Region of Ghana. Nungua is the administrative capital of the Ledzokuku Krowor municipal Assembly. The total land area of LEKMA is estimated at 47.57510 square kilometers. The Southern boundary of the Municipality is the Gulf of Guinea from the Kpeshie Lagoon to the Mukwe Lagoon near Regional Maritime Academy. The population of Ledzokuku Krowor Municipality is 227,932 representing 5.7 percent of the region's total population [7]. Males constitute 47.9 percent, and females represent 52.1 percent. The municipality has a household population of 221,757 with a total number of 60,859 households. The average household size in the municipality is 3.6 persons [7].

2.2. Study Design

This was a quantitative cross-sectional study.

2.3. Sample Size and Sampling Procedure

We calculated sample size based on the formula of Gorstein et al. [17]. The formula yielded a sample size of 384 male respondents. This number was however rounded up to 400 to increase the precision of the estimates and account for any incomplete data that may result from the data collection exercise. Earlier studies on knowledge of iodized salt use in Ghana had about the same number of respondents [6, 7]. A sample of 400 men were selected conveniently at the Nungua township. We adopted two types of sampling procedures for recruiting potential respondents at the workplace and within the community. Two hundred respondents each were sampled from the community and workplaces. At the community, a bottle was spun to determine the direction to proceed in sampling the houses and then the households with the household heads. A maximum of eight houses were sampled from each direction since the communities are small, after which the bottle was spun at the same spot for a new direction. This was repeated until the sample size was achieved. Regarding the sampling at the workplaces, a list of public and private organizations in Nungua was collected from the municipal assembly. Six of the organization in the Nungua township was purposively selected. Weighting was used to determine the number of workers to sample from each organization. Systematic sampling was used to recruit respondents irrespective of position within the organizational structure.

2.4. Instruments

Validated questionnaires were pretested and later administered to participants in their homes and workplaces by in-person interviews. The questionnaire contained items that were used in similar studies in South Africa [18] and Ethiopia [19]. Face and content validities were ensured by getting feedback from an expert in iodine study at the Nutrition Unit of the Ministry of Health, Ghana and also piloting the questionnaire on a sample of men at Teshie which have similar socio-economic characteristics like Nungua and the lineage is the same. The questions were on three main parts; socio-demographics status, knowledge on iodized salt usage and knowledge on IDD. The socio-demographic characteristics were on their ages (years), highest level of educational attainment, ethnicity, religious affiliation and marital status. On knowledge on iodized salt, the questions were: if you have heard about iodized salt, where they first heard about iodized salt, it was important to use iodized salt for cooking, whether every salt on the market contain iodine? Whether common salt contains an adequate amount of iodine? Whether the taste of iodized salt different from taste of common salt when used to prepare food. Information was sought on the use of iodized salt and these were: whether respondent cooked own food, the person responsible for your cooking use iodized salt in cooking, duration of iodized salt use, How often do respondent use iodized salt, if iodized salt always available at home for cooking, if salt change the flavor/taste of food, respondent would encourage women to use iodized salt in cooking. Knowledge on IDD was sought by asking the following questions on presence: of goiter, lack of energy, dry skin, frequent tiredness, low blood level (anemia), sluggishness, low blood level and sleeplessness among adults.

2.5. Data Collection Procedure

The questionnaire was pre-tested on four men for appropriateness and clarity of the questions to solicit appropriate responses from the respondents. Edits were made to the logic of the items on the questionnaire. After this, questionnaires were administered on participants by trained interviewers either at home or their workplaces. Questions were asked in the local language (Ga) or English language depending on language proficiency and preference of the respondents.

2.6. Quality Control

Quality of the data to be collected was ensured through training of the interviewers on the study protocol and the use of instruction manual for the interviews for two days at the University of Ghana resource center. There was also supervision and monitoring of the data collection process, spot checking during field interviews and field editing of completed questionnaires. Regarding reliability, the

supervisor sampled completed questionnaires and went back to administer a new questionnaire and compare responses with the previously filled questionnaire by the research attendant. Cronbach's alpha for the test items on the questionnaire was 0.81.

2.7. Data Analysis

Data was coded, entered and analyzed using IBM Statistical Package for the Social Sciences (SPSS version 19, SPSS Inc., Chicago, Illinois, USA). Descriptive statistics were computed for socio-demographic data, knowledge on iodized salt and IDD. Percentages were presented for knowledge on IDD among adults. For a correct response to a question on knowledge, the respondent scores a point and for an incorrect answer there was no point. Scores for knowledge on iodized salt were grouped into poor knowledge (≤ 4 points) and good knowledge (> 4 points). Scores for knowledge on IDD were split into tertiles and labeled as low (≤ 2 points), moderate knowledge (3-6 points) and high (≥ 7 points). Scores for the levels of knowledge of iodized salt were also split into two groups based on participants' responses. Chi-Square (χ^2) test and multinomial logistic regression were performed to determine the association between socio-demographic characteristics, knowledge on iodized salt and knowledge about IDD, and predictors of good knowledge about iodized salt and high knowledge about IDD.

2.8. Ethical Considerations

The approval for the study was given by the Scientific and Ethical Committee of the Department of Nutrition and Food Science, University of Ghana, Legon. Permission was sought from the municipal assembly where the research took place. Signed informed consents were sought from every participant before recruitment into the study. Details of the study were read out to participants in their preferred language. Respondents were made aware that, participation was voluntary and they could withdraw at any stage. Confidentiality was assured and soft copies of data was stored on the cloud, secured with a password while hard copies were stored in a secured cupboard at the Principal investigator's office.

3. Results

3.1. Background Characteristics and Knowledge of Participants on Iodized Salt

This section presents results on the background characteristics and knowledge on iodized salt by 400 respondents. Majority (37.5%) of respondents were aged between 26 and 41 years, and 37.0% had attained SHS/Vocational/Commercial educational level (Table 1).

More than half (58.8%) were either single/divorced/unmarried (Table 1). Most have heard about iodized (97.8%) and majority (69.3%) first heard about iodized salt through the media. About 79.8% of respondents (agreed that it was important to use iodized salt to cook, although more than half (52.0%) said iodized salt tastes different from non-iodized salt.

Table 1. Background characteristics and knowledge of participants on salt (N=400)

Age (years)	n (%)
≤25	145 (36.3)
26-41	150 (37.5)
≥42	105 (26.2)
Highest Level of education attainment	
≤Primary	37 (9.3)
Up to JHS	100 (25.0)
SHS/Vocational/Commercial	148 (37.0)
Polytechnic/University	115 (28.7)
Marital status	
Single/Divorced/Widowed	235 (58.8)
Married/Cohabiting	165 (41.2)
Have you heard about iodized salt?	
Yes	391 (97.8)
No	9 (2.2)
Where first did you hear about iodized salt?	
Media	277 (69.3)
Health workers	18 (4.5)
Friends	17 (4.2)
Own child	6 (1.5)
Others	82 (20.5)
Is it important to use iodized salt in cooking?	
Yes	319 (79.8)
No	57 (14.2)
Don't know	24 (6.0)
Do every salt contains iodine?	
Yes	98 (24.5)
No	242 (60.5)
Don't know	60 (15)
Adequate iodine in common salt.	
Yes	111(27.75)
No	219 (54.75)
Don't know	70 (17.5)
Taste of iodized salt different from taste of common salt.	
Yes	208 (52)
No	122 (30.5)
Don't know	70 (17.5)

3.2. Participants' Use of Iodized Salt

Since knowledge on salt was high among respondents, their use of iodized salt at home in food preparation was examined and responses presented (Table 2). About 70.5% used iodized salt in cooking, and 52.0% have used iodized

salt for 10 years. About half of respondents (51.5%) used iodized salt every day and 63.0% have iodized salt at home always for cooking. Less than half (46.5%) indicated that iodized salt change the flavor/taste of food when added to food. A large proportion of respondents (76.8%) would encourage women to use iodized salt in cooking.

Table 2. Participants' use of iodized salt (N=400)

Variable	n (%)
Do you cook your own food?	
Yes	188 (47.0)
No	212 (53.0)
Do you or the person responsible for your cooking use iodized salt in cooking?	
Yes	282 (70.5)
No	81 (20.3)
Don't know	37 (9.2)
How long have you been using iodized salt?	
≤5 years	79 (28.0)
6-10 years	79 (28.0)
11-15 years	30 (10.7)
≥16 years	33 (11.7)
Don't remember	61 (21.6)
How often do you use iodized salt?	
Everyday	206 (51.5)
≤4 times a week	62 (15.5)
Once a month	32 (8.0)
Once in a while	100 (25.0)
Is iodized salt always available at home for cooking	
Yes	252 (63.0)
No	129 (32.2)
Don't know	19 (4.8)
Does iodized salt change the flavor/taste of food	
Yes	186 (46.5)
No	132 (33.0)
Don't know	82 (20.5)
Would you encourage women to use iodized salt in cooking	
Yes	307 (76.8)
No	80 (20.0)
Don't know	13 (3.2)

¹Applies to the participants who used iodized salt

3.3. Participants' Knowledge about Effects of Non-Use of Iodized Salt on Adults

The IDD's knowledge among the participants are presented in Figure 1. Majority (38.4%) indicated that iodine deficiency can result in goiter but 13.1% of the men also do not know whether lack of iodine in the body can result in any IDD's. Lack of energy was indicated by 9.8% of the respondents.

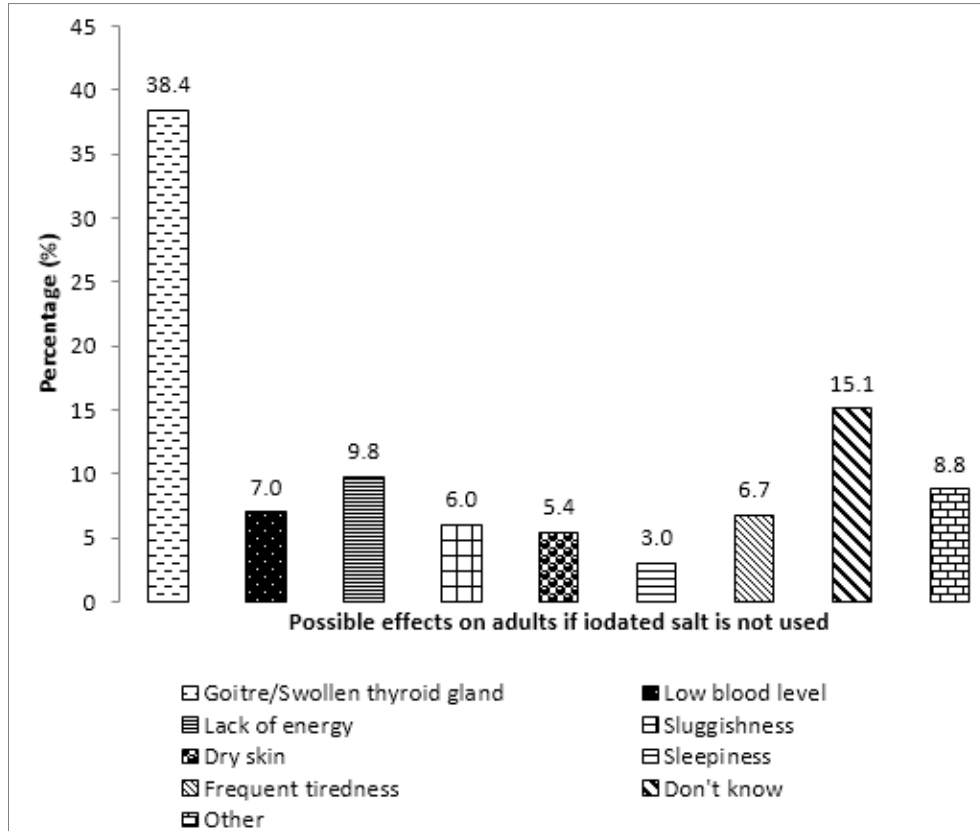


Figure 1. Percentage distribution of participants' knowledge about effects of non-use of iodized salt on adults.

3.4. Socio-Demographic Characteristics by Knowledge of Iodized Salt and IDD

Associations between socio-demographic characteristics and knowledge of iodized salt (poor and good) socio-demographic and Knowledge of IDD (low, moderate and high) were tested using Chi-square test (Table 3). Majority had poor knowledge (266) on iodized salt. Majority also had low knowledge on IDD (184). The socio-demographic characteristics did not have any statistically significant associations with the level of knowledge of iodized salt. There were statistically significant differences in the knowledge of IDD between the age groups ($P < 0.001$), level of education ($P < 0.001$) and marital status ($P < 0.001$).

Table 3. Socio-demographic characteristics by knowledge of iodized salt and IDD (N=400)

Variable	Knowledge of iodized. salt			Knowledge of IDDs			
	Poor n=266†	Good n=134†	P-value.	Low n=184†	Moderate n=102†	High n=114†	P-value.
Age (years)							
≤25	96 (36.1)	49(36.6)	0.861	49(26.6)	52(51.0)	40(35.1)	<0.001‡
26-41	102(38.3)	48(35.8)		69(37.5)	39(38.2)	51(44.7)	
≥42	68(25.6)	37(27.6)		66(35.9)	11(10.8).	23(20.2)	
Level of education*							
≤Primary	20(7.5)	17(12.7)	0.370	29(15.8)	2(2.0)	6(5.3)	<0.001
JHS	70(26.3)	30(22.4)		60(32.6)	21(20.6)	19(16.7)	
SHS/Vocational/ Commercial	99(37.2)	49(36.6)		63(34.2)	34(33.3)	51(44.7)	
University/Polytechnic	77(28.9)	38(28.4)		32(17.4)	45(44.1)	38(33.3)	
Marital Status							
Married/ Cohabiting	155(58.3)	80(59.7)	0.830	92(50.0)	75(73.5)	68(59.6)	<0.001
Single/Widowed/ Divorced	111(41.7)	54(40.3)		92(50.0)	27(26.5)	46(40.4)	

‡Significant at $P < 0.05$; †Values in columns are n (%); *JHS = Junior High School, SHS= Senior High School

3.5. Multinomial Logistic Regression Results of Factors That Predicted Good Knowledge of Iodized Salt and High Knowledge of IDD

The predictors of good knowledge of iodized salt and high knowledge of IDD were determined using a multinomial logistic regression (Table 4). The odds of having high knowledge on IDD were not statistically significant among the selected socio-demographic characteristics. The odds for having good knowledge on iodized salt was statistically significant less for those who had JHS compared with those who had university education OR=0.465; CI: (0.244, 0.884) at P< 0.020.

Table 4. Multinomial logistic regression results of factors that predicted good knowledge of iodized salt and high knowledge of IDD (N=400) Write the method section and include this.

High knowledge of IDD			
Variable	OR	95%CI	P-value
Age (years)			
≤25	0.924	(0.471, 1.815)	0.819
26-41	0.856	(0.483, 1.520)	0.596
*≥42.	1.000		
Level of education.			
≤Primary	1.715	(0.787, 3.737)	0.175
JHS	0.860	(0.478, 1.548)	0.615
SHS/Vocational/ Commercial	0.981	(0.582, 1.655)	0.943
University/Polytechnic	1.000		
Marital Status			
Married/ Cohabiting	1.130	(0.661, 1.930)	0.655
Single/Widowed/ Divorced	1.000		
Good knowledge of salt			
Variable	OR	95%CI	P-value
Age (years)			
≤25	1.105	(0.531, 2.299)	0.789
26-41	0.968	(0.521, 1.799)	0.919
≥42	1.000		
Level of education#			
≤Primary	0.386	(0.145, 1.026)	0.056
JHS	0.465	(0.244, 0.884)	0.0201
SHS/Vocational/ Commercial	1.064	(0.631, 1.792)	0.817
University/Polytechnic	1.000		
Marital Status			
Married/ Cohabiting	0.856	(0.480, 1.526)	0.589
Single/Widowed/ Divorced	1.000		

*=reference value; #JSH= Junior High School, SHS= Senior High School

As women are more actively involved in the process of cooking, their knowledge and practice should also be assessed. This could also be addressed in the limitations of the study. This was indicated as a limitation of the study,

but all data on knowledge on knowledge were on women. We compared the findings on the men with the data on women in Ghana. The results indicated that the majority of the participants were unmarried. The findings should be compared with the marital status of the population. In case of difference in the distribution patterns, the sample assessed might not be the representative of the population in the region. Marital status was not part of the inclusion criteria for this study. We therefore did not understand how this would affect the representativeness of the findings. There was a reason which we indicated in our discussion.

4. Discussion

The knowledge of respondents on iodized salt and Iodine Deficiency Disorders (IDD) were assessed among 400 men in Nungua, a suburb of Accra, Ghana. Knowledge on iodized salt was poor, and most men also had low knowledge on IDD. This compares contrarily to previous studies in Ghana on women that indicated that knowledge on iodized salt was high [6]. The disparity may be due to the fact that women were targeted in the messages on iodized salt compared with men. Probably the poor knowledge on iodized salt and the low knowledge on IDD by men have been a contributory factor in not achieving USI in the area. In a patrilineal society, a decision such as including use of iodized salt would have to be approved by the men who are the household heads and also provides the funds for purchase of household items including food ingredients. Men, however, can serve as advocates within the households since majority have heard about iodized salt (Table1) [5]. The news media and health workers were the main source of information on iodized salt. These findings were consistent with that by [20] and Ahiadeke et al. [12] and [11]. Previous studies on iodized salt usage in Ghana, views on women were usually sampled ignoring those of the men who are the household heads and actually have a say in the type of salt that should be used in the cooking. It is equally important to note that, a little less than half of the respondents (47%) of respondents cook their own food Table 2. They would also encourage household member preparing food to use iodized salt in cooking food for the family. The proportion is higher than 28% in 2003 and 39% of females in 2014 and may suggest continued upward trend in iodized salt usage [7]. Having heard of iodized salt translated into availability and consumption of iodized salt (Table 2). The few who did not use iodized salt for cooking may be due to the change in taste or flavour when iodized salt is used in food preparation and compares well with an earlier study [11]. It may also be due to non-enforcement of the law that regulates iodized salt production and use since there are still non-iodized salts being sold on the market and are cheaper [6;7] than iodized salt [21]. Others believe that consumption of iodized salt can lead to the development of some strokes and cancers [6]. There may be constructs in the health behavior of respondents that

were not assessed here, which may also account for the non-translation of knowledge to use. Perceptions about potential benefits and dangers may be associated with a certain behavior which are illustrated in the health belief model [22]. The low level of educational attainment of respondents had a direct association with good knowledge as determined in this study, where knowledge among Junior High School (JHS) graduates was lower compared with University graduates (Table 4). This probably suggests that messages, on radio which is the main avenue for dissemination of information on knowledge, are not advocated in ways that are comprehensible to the segment of the population that do not have higher educational status to understand. This can be shored up through information transmission in the local dialect and also conveying messages to JHS in the Municipality [6; 12]. The greater percentage of men compared with previous study reported they had iodized salt at home always (Table 2). This was contrary to the findings of Ahiadeke et al. [12] where 32% of Ghanaian households had available iodized salt. Greater number 235 (58.8%) of respondents were either single/divorced. This suggested that they cook their own meals and therefore their knowledge on the use of iodized salt would influence their behaviors when it comes to iodized salt usage. When this number eventually gets a spouse, this knowledge is likely to be transferred to them. Indeed, 70% of respondents cook own food and 76.8% would recommend use of iodized salt to women. It was known that residents of Volta, Eastern, Northern and Upper East regions mostly use non-iodized salt, while people living in the Western, Greater Accra (a suburb of which this study took place), Ashanti and Brong Ahafo regions used relatively greater amount of iodized salt [6]. Majority of the respondents were not married. There were statistically significant differences in the level of knowledge of IDD among the socio-demographic and the selected socio-demographic characteristics (age, marital status and educational level) Table 3. Marital status differences may be attributed to misconception that use of iodized salt may lead to infertility [23]. Age differences in the use of iodized salt may be attributed to misconception as well, since an earlier study found that chronic disease among older people are attributed to use of iodized salt [23]. Older respondents may be reluctant to use iodized salt in food preparation. Results in this study shows clearly the differences in the knowledge variables among men. It was found in a study in western Ghana where the people are mostly farmers and suggested that the use of public health personnel in the dissemination of information in the local languages [6; 12]. A study by Sandaresan et al. found the similar results [24]. Education helps give understanding to messages on iodized salt [25]. One limitation of the study was that, the authors did not explore the access of iodized salt at Nungua. This was because in a patrilineal community, men do not access food ingredients including salt of any form. Another, limitation of the study was not assessing the knowledge of the women in the household

but the findings of the men were compared with earlier studies on women which can be generalized. In addition, not all the men sampled were married and the knowledge of their spouses could be sought. In Ghana, men are the head of households, and their lifestyle choices affect the health of members. In Ghana, they estimated that 120,000 children born each year are at risk of intellectual impairment because of iodine deficiency [12]. Therefore, assessment of knowledge and use is a monitoring process that gives policy-makers feedback on USI and status, knowledge and level of use of iodized salt.

5. Implications for Health Promotion

Men should be used as advocates on iodized salt use in the house and also education on the health consequences on iodine deficiency. Tailored messages on IDD should target the different socio-demographic groupings such that messages on IDD will be received and interpreted across the various socio-demographic groups the same way. This can be done through schools, churches and mosques. There should be monitoring and enforcement of legislation on USI so that there will be no non-iodized salt on the market for consumer purchase and use. On the other hand, there should be readily available iodized salt at affordable prices. There should be national and sub-national committees to provide practical and effective mechanisms to sustain commitments to IDD elimination, since the laws alone are not enough to compel households to use iodized salt.

6. Conclusions

Awareness on iodized salt among the men was high. The knowledge on iodized salt was low, and the knowledge on IDD was low among the men. There is a difference in the level of knowledge of IDD among the socio-economic groups but not knowledge on iodized salt and its use. The more educated the men are, the more likely they are to use iodized salt.

Abbreviations

IDDs: Iodine Deficiency Disorders
 JHS: Junior High School
 LEKMA: Ledwokuku krowor Municipal Assembly
 OR: Odds Ratio
 MICS: Multiple Indicator Cluster Survey
 SPSS: Statistical Package for Social Sciences
 UNICEF: United nations Children Educational Fund
 WHO: World Health Organization

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Availability of Data

All data supporting the conclusions of this article are in the manuscript.

Authors Contribution

JS was engaged in data collection, data curation, analysis and interpretation of data, drafting and reviewing of manuscript. PNG was involved in analysis and interpretation of data, reviewing of the manuscript. FS, was involved in data management, data analysis and reviewing of manuscript. CB was engaged in sample collection, data analysis as well as reviewing of manuscript. FNA was involved in data collection and reviewing of manuscript. BAA was involved in data collection, data analysis and drafting of manuscript. MSA was involved in data collection, analysis and interpretation and reviewing of manuscript. All authors approved of final version of the manuscript.

Ethical Approval and Consent to Participate

Ethical approval was given by the Scientific Board of Department of Nutrition and Food Science, University of Ghana. Study participants gave their written consents or thumb impression to participate. Permission was granted by the Municipal Assembly.

Competing Interest

Authors have no conflict of interest.

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