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Coverage with Adequately Iodized Salt and Practices Affecting Iodine Content of Salt at Household Level in Shimla City

Dr. Amit Sachdeva[1], Dr. Anmol Gupta[2*], Dr. Devender Kumar[1], Dr. Prem Lal[1], Dr. Resham[3], Dr. Saurabh[3], Dr.Nidhi[3], Dr.Priyanka[3]

[1]Senior Resident, Department of Community Medicine, Indira Gandhi Medical College, Shimla, Himachal Pradesh India
[2]Professor & Head, Department of Community Medicine, Indira Gandhi Medical College, Shimla, Himachal Pradesh India
[3]Junior Resident, Department of Community Medicine, Indira Gandhi Medical College, Shimla, Himachal Pradesh India

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***Corresponding author:** Dr. Anmol Gupta

Abstract **Original Research Article**

Background: Iodine deficiency is an important public health problem throughout the world. Globally, 2 billion people are at a risk of Iodine Deficiency diseases (IDD) due to insufficient iodine intake. Objectives of the present study were to find the percentage of households consuming adequately iodized salt in Shimla city, to assess the knowledge regarding benefits of iodized salt use, iodine deficiency diseases etc and the storage and cooking practices with respect to the current use of iodized salt. ***Material & Methods:*** This household survey conducted from November 2018 through April 2019 among population residing in all 25 wards under Municipal corporation area of Shimla City. Proportionate households from all 25 wards were interviewed. The salt was tested for iodine using rapid iodine test MBI kits. Various Factors related to use of iodized salt like type of salt used, storage & cooking practices, knowledge regarding benefits of iodized salt and iodine deficiency disorders were assessed. The data was collected using pre-tested questionnaire and analyzed by using Epi info version 7 software. ***Results:*** A total of 394 households had been surveyed and the coverage of adequately iodized salt was found to be 96.20%. In the survey 87.6 % respondents had heard about iodine, More than half don't have much knowledge about iodized salt while only half were aware of importance of iodized salt .73.60% were using air tight plastic container for storage of salt and 71.75% were keeping salt container within 2-4 feet from stoves/gas chulha. Boiling (66 %) was the most common cooking practice and 77.66% were adding salt at the starting time while gravy preparation. Per capita salt consumption was found to be 8.98±2.35 gm. ***Conclusions:*** IEC regarding proper storage and cooking practices and the benefits of iodized salt are recommended to increase community awareness and to bring in positive attitude toward utilization of iodized salt.

Keywords: Iodized salt coverage, cooking and storage practices, Shimla city.

INTRODUCTION

Iodine is a vital micronutrient required at all stages of life; fetal life and early childhood being the most critical phases of requirement [1]. Iodine is an essential component of thyroid hormones, which are needed for optimal mental and physical development and regulation of body metabolism (generation and utilization of body energy)[2].

Iodine deficiencies disorders (IDD) constitute the single largest cause of preventable brain damage worldwide [3]. Majority of consequences of IDD are invisible and irreversible but at the same time these are preventable [3].

India is one of the countries which has accepted iodine deficiency as a national public health problem and has recognized the importance of addressing IDD by ensuring the provision of iodized salt to its population [4]. Fortification of salt with iodine is recognized as the most simple and cost effective strategy to achieve recommended daily intake of iodine [5].

Under the 'National Iodine Deficiency Disorder Control Program' (NIDDCP) the recommended level of iodine in salt at household level is 15 parts per million (ppm) of iodine [6]. The WHO/UNICEF/ICCIDD also recommended that 90% of household salts should get iodized at the recommended level of 15ppm [7].

This study was carried out as a joint initiative of NHM Himachal Pradesh and Community Medicine Department, Indira Gandhi Medical College, Shimla to assess coverage of adequately iodized salt & associated factors at household level in Shimla city.

Objectives of the study

- To find the percentage of households consuming adequately iodized salt in Shimla city.
- To assess the storage and cooking practices with respect to the current use of iodized salt.
- To assess the knowledge regarding benefits of iodized salt use, iodine deficiency diseases.

MATERIAL & METHODS

Study design

It was a community based Cross sectional survey

Study area

The study was conducted in Shimla city of Himachal Pradesh located in the south-western ranges of the Himalayas.

Study period

6 months (November 2018 through April 2019)

Study population

Population residing in all 25 wards under Municipal corporation area of Shimla City

Sample size

Sampling unit was households in the Municipal corporation area of Shimla city. Sample size was estimated to be 374 expecting 80% of household in selected area are consuming adequately iodized salt with 95% level of confidence, design effect 1.5 and 5% confidence interval. Taking non response rate of 5%, we take a total sample size of 394 households.

Sampling design

Stratified random Sampling was done for the selection of 400 Households for survey. We equally divide the households in all 25 wards of Shimla city. (i.e. 15-16 households per municipal ward in Shimla city). First household of the ward was selected randomly and then every 10th household was selected to complete the sample size in the respective ward.

Data collection

Before doing the data collection, the survey team consisting of medical social workers and residents of department of community medicine was given training regarding the testing for estimation of iodine in salt with the help of MBI kits and administration of the questionnaire. The data collectors obtained consent from the head of Family and Pretested Standardized Questionnaire was administered in every selected household, and the respondents was asked questions regarding salt storage and consumption habits, benefits of Iodine, and iodized salt awareness etc. After that salt iodine content was tested by using rapid salt iodine testing kit in front of family and the results was conveyed to them.

Outcome indicators

- Proportions of household consuming adequately iodized salt i.e. iodine content >15ppm at HH level.
- Proportions of household having adequate knowledge regarding benefits of consuming iodized salt and knowledge of harmful effects on consuming unionized salt.
- Storage practices and cooking practices affecting iodine content of salt.
- Per-capita consumption of salt

Criteria for Assessment of adequately iodized salt

S. No.	Colour of salt after adding regent of MBI Kit	Result
1	White	No iodine
2	Purple blue	Adequate iodine
3	Grey/light blue	Inadequate iodine

Data analysis: The collected Data was thoroughly screened and entered in Microsoft Excel spreadsheet 2007. Statistical analysis was done by using Epi Info 7 software. Descriptive statistics, frequency percentages were determined for categorical variables with 95% confidence interval.

Ethical aspects: Prior permission was taken from municipal co-operation of Shimla to go ahead with the study. Objectives of study were explained to the participants during the visit. Informed consent was taken from the participants in the study. Participants were fully assured regarding the confidentiality and anonymity of the information provided by them. Confidentiality of information gathered from study subjects was maintained in accordance with the principles embodied in the declaration of Helsinski and International guidelines for ethical review of epidemiological studies.

RESULTS

A Total of 394 households from all 25 wards of municipal corporation area of Shimla City had been surveyed for iodized salt coverage, using MBI salt Iodine detection kit. Most of the participants belongs to 31-45 years, females, SES of class II, educated up to class Xth, housemaker by occupation and belongs to nuclear family.

Table-1: Demographic profile of study participants

Variables	Frequency (n-394)	Percentage (%)
Age groups (years)		
18-30	112	28.43
31-45	145	36.80
45-60	83	21.07
> 60	54	13.71
Gender		
Female	356	90.35
Male	38	9.65
S.E. Status (According to Modified KS Scale 2019)		
Class I	26	7.36
Class II	157	39.85
Class III	118	29.95
Class IV	78	19.80
Class V	15	3.81
Respondents Education		
Illiterate	18	4.57
Primary	14	3.55
High school	31	7.87
Secondary education	132	33.50
Senior secondary	92	23.35
Graduate or above	107	27.16
Respondents occupation		
House maker	282	71.57
Government job	70	17.77
Private job	42	10.66
Type of family		
Nuclear	307	77.92
Joint	87	22.08

Table-2: Results of iodine detection test in current survey

S.No.	Iodine content (ppm*)	Interpretations	Frequency	Proportion
1	0	No iodine	5	1.3
2	1-15	Inadequate iodine	10	2.5
3	15-30	Adequate iodine	102	25.9
4	More than 30	Adequate iodine	277	70.3

*ppm= parts per million

The present study shows that household coverage of adequately iodized salt in current survey was found to be 96.20% in Shimla city.

Table-3: Knowledge of survey respondents regarding iodized salt

Heard of Iodized salt		**Yes**	**No**
		345 (87.6%)	49 (12.4%)
Source of information		Frequency	%age
1. Television /Radio/ Internet		302	87.54
2. Newspaper/ Poster		5	1.45
3. Health personnel		18	5.22
4. Others *		20	35.80
Knowledge	Response		
	Yes	No	Don't Know
Every salt don't contain iodine	157 (39.8%)	52 (13.2%)	185 (47%)
Iodine reduces when salt not stored properly	117 (29.7%)	20 (5.1%)	256 (65.3%)
Iodine deficiency cause Mental retardation in children	139 (35.3%)	11 (2.8%)	244 (61.9%)
Iodine deficiency cause Growth retardation in children	143 (36.3%)	11 (2.8%)	240 (60.9%)
Taste of iodized salt is same of common salt	106 (26.9%)	103 (26.1%)	185 (46.9%)

*(Friends, relatives)

87.6 % respondents in Shimla city had heard about iodine. Mass media i.e. TV/Radio/Internet was found the primary source of information in most of the cases. More than half the respondents either don't have much knowledge or had wrong knowledge about iodine or iodized salt.

Table-4: Respondents understanding of Iodized salt

Variables	Frequency	%age
Important of Iodized salt		
1. To cure goiter	102	25.9
2. To prevent IDD	4	1.0
3. To remain healthy	135	34.3
4. Better than other salt	39	9.9
5. No importance at all	2	0.5
6. Don't know	112	28.4
Cooking with non-iodized salt leads to		
1. Goiter / thyroid disease	148	37.6
2. Hypertension	8	2.0
3. Stunting in children	7	1.8
4. Mental & Growth retardation	61	15.5
5. No effect	2	0.5
6. Don't know	168	42.6

In the current survey only half the respondents were aware of importance of iodine / iodized salt and its role in normal growth and prevention of diseases.

Table-5: Storage practices of salt among survey respondents

Variables	Frequency	%age
Type of container		
1. Air tight glass container	30	7.61
2. Open glass container	1	0.3
3. Air tight steel container	27	6.85
4. Open steel container	18	4.57
5. Air tight plastic container	290	73.60
6. Open plastic container	28	7.11
Shape of container		
1. Wide base	281	71.3
2. Narrow base	113	28.8
Dampness/moisture observed in salt		
1. Never	264	67
2. Some time	123	31.2
3. Often	7	1.8
Exposing moisturized salt to light or heat		
1. Never	372	94.4
2. Some time	19	4.8
3. Often	3	0.8
Average duration needed to consume salt after opening of packet		
1. Less than 2 weeks	17	4.3
2. 2 – 4 weeks	166	42.2
3. 5 – 8 weeks	173	43.9
4. More than 8 weeks	38	9.6
Distance of salt container from stove/gas chulha		
1. Less than 2 feet	121	30.71
2. 2-4 feet	254	71.75
3. More than 4 feet	19	4.82

In the present survey 73.60% of the respondents of Shimla city were using air tight plastic container for storage of salt. Most of them were using wide base container. 94.4% respondents never practice exposing salt to heat and light. Almost half the respondents was consuming salt within 4 weeks after opening of packet. 71.75% respondents were keeping salt container within 2-4 feet from stoves/gas chulha.

Table-6: Common cooking practices

Variables	Frequency	Proportions
Most common cooking practices		
1. Frying	121	30.71
2. Steaming	13	3.29
3. Boiling	260	65.99
Timing of Salt added to food		
1. At the start	306	77.66
2. During	62	15.73
3. At the end	23	5.84
4. At the time of serving	3	0.76

Boiling (66 %) was the most common cooking practice found in survey followed by frying and steaming. Majority of respondents (77.66%) were adding salt at the starting time while gravy preparation, followed by during the gravy preparation (15.73%) while only few (5.84%) were adding at the end of cooking.

Table-7: Per capita salt consumption

Variable	Mean ± SD
Per capita salt consumption (gm)	8.98±2.35

Per capita salt consumption in Shimla city was found to be 8.98±2.35 gm.

DISCUSSION

Household coverage of adequately iodized salt in current survey was found to be 96.2% in Shimla city which is slightly less than what was reported in NFHS 4 (2015-16) for Himachal Pradesh [8]. Coverage was almost similar to be reported for urban population in India as per NFHS 4.[9]. Behavioral and environmental factors at the community level could contribute to such variations. For example, most people were unaware of the IDD and managed iodized salt poorly.

Most of respondents (87.6%) had heard about iodine and the major source of information was mass media (TV, Radio & Internet) which is similar to study done by Chakraborty S S e*t al*.[10]. The finding suggested that continuous awareness was generated by center and state government through print as well as electronic media about iodized salt in community. The mass media, as implicit in the name, have the potential to reach large proportions of the population and groups which cannot readily be accessed through other channels. More than half of the respondents either don't have much knowledge or had wrong knowledge about iodine or iodized salt. Similarly half of respondents were unaware of importance of iodine / iodized salt and its role in normal growth and prevention of diseases. These findings imply that mass media has not been explored to full strength for creating awareness about IDD prevention.

Regarding storage practices, majority of the respondents of survey were using air tight plastic container for storage of salt. Most of them were using wide base container. Most of them never practice exposing salt to heat and light. Half the respondents was consuming salt within 4 weeks after opening of packet. Majority of them were keeping salt container within 4 feets from stoves/gas chulha. These finding were similar to the studies done by Deepika PS *et al*. [11] and Kumar P *et al*. [12]. Therefore, storage of salt in hot and humid condition near the cooking area should be avoided.

Boiling was the most common cooking practice found in this survey followed by frying and steaming. Creating awareness among population on desirable cooking method is very important so that the population gets iodine in adequate amount after cooking.

Almost three fourth of respondent were adding salt at the time of gravy preparation, while only less than one tenth were adding at the end of cooking, Similar findings were reported by Deepika PS *et al*. in their study. Loss of iodine depends upon type of cooking method and time at which salt is added while cooking. Thus, to prevent iodine losses while cooking, it is advisable to sprinkle salt on food after cooking (wherever possible) rather than adding salt at the start of cooking which is done traditionally in India.

Salt consumption could be anywhere in the range of 5–12 gm within a given region or country. Similarly Per capita salt consumption in Shimla city was found to be 8.98±2.35 gm which greater than the 5 gm per day as per the recommendation by W.H.O [13].

CONCLUSION

The findings of the present survey suggested that Shimla city had transformed their phase from iodine deficient to iodine sufficient as more than 90% of household were using iodized salt at the recommended level of more than 15ppm by the WHO/UNICEF/ICCIDD. In spite of the continuous awareness generated through print as well as electronic media about iodized salt in community, more than half of the respondents either don't have much knowledge or had wrong knowledge about iodine or iodized salt and were unaware of importance of iodine/iodized salt and

its role in normal growth and prevention of diseases. The knowledge and awareness of the respondents about the storage, cooking and usage of iodized salt was unsatisfactory as majority of the respondents of survey had faulty storage and cooking practices.

RECOMMENDATIONS

Government should ensure availability of adequately iodized salt at consumer level to achieve Universal Salt Iodization. There is also a need of enforcing the Prevention of Food and Adulteration Act, to ensure that salt with iodine content of 15ppm and more, is sold in the market. Effective IEC and Periodic monitoring should be done for elimination of IDD in HP. 'Rapid salt testing kits' should be made available to Anganwadi /ASHA workers/health workers for better monitoring of level of Iodization of edible salt at consumer level. Govt. authorities should make a plan to provide the iodized salt in appropriately sized container to avoid faulty storage practices. Mass media in augmentation with other modes of health education should emphasize on importance of iodine in our diet along with storage and cooking practices. Government can start public awareness campaign, with key messages focusing on proper methods for storage of iodized salt, keeping the salt away from flame, adding salt towards the end of cooking etc. Banners and posters can be placed on schools, bus & railway stations, parks, malls, markets, Anganwadi centers and health centers.

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