

Knowledge and practices regarding use of iodised salt among population of selected goitre endemic districts of Bihar

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Background: Iodine deficiency disorders (IDDs) are important public health problem which can be prevented by consumption of iodized salt. For sustainable elimination of IDDs, the goal of universal salt iodization (USI) is to cover more than 90% of household to consume adequately iodized salt. This study was conducted with objectives to assess knowledge and practices regarding salt consumption and to find the factors associated with consumption of adequately iodized salt in selected districts of traditional goitre belt of Bihar. **Materials and Methods:** The study was a community based cross-sectional study conducted in three districts of Bihar by using cluster sampling technique from January 2018 to March 2018. **Results:** Only 1.7% children and 33% adults were able to identify the condition of goitre. Among adults who identified the case as goitre, around 52% respondents had correct knowledge about cause of goitre. Around 30% caregivers knew the brand name of salt that was used in their household and only 19% of adults had heard about iodized salt. In around 13% households; salt was added at the end of cooking during food preparation. Adequately iodized salt was consumed in 73.5% households. The salt stored in air tight container had significantly higher iodine content in comparison to salt stored in open container ($p=0.041$). **Conclusion:** The knowledge among people regarding IDDs and iodized salt was very poor which need to be focused in our national programme. The goal of USI regarding iodized salt consumption is yet to be achieved in these districts.

Keywords: Goitre, Iodized salt, Knowledge and Practice, Bihar

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Introduction

Geographically, Bihar lies in the sub-Himalayan goitre belt. Iodine deficiency causes a spectrum of disorders, from poor growth, retarded development, low urinary iodine excretion and poor cognitive function and goitre, to severe cognitive disability and death.

Consistent consumption of small quantities of iodine can prevent these disorders and reverse some, but not all, of the negative effects of iodine deficiency [1, 2].

The World Health Organization (WHO) estimates that approximately 37% of school-age children (285 million) and nearly 2 billion individuals worldwide, have insufficient iodine intake in 2004 [3,4].

In 1993, the World Health Organization (WHO), the United Nations Children's Fund (UNICEF) and the International Council for the Control of Iodine Deficiency Disorders (ICCIDD) recommended universal iodization of salt to prevent and treat iodine deficiency disorders [5].

Globally, the proportion of people consuming iodized salt rose from less than 20 percent in 1990 to about 70 percent by 2000 but the figure remains stagnant since that date [6].

Though universal salt iodization (USI) was made mandatory in India since 2005, only 71% of households were consuming adequately iodized salt (>15ppm) as per the Coverage Evaluation Survey, 2009 [7]. This gap in the utilization of adequately iodized salt could be due to various reasons.

Rural residence, illiteracy, lower monthly per-capita income, poor socioeconomic status, unavailability of the salt, lack of awareness about the risk of Iodine Deficiency Disorders (IDD), exposing salt to sunlight, expensiveness, and lack of knowledge about iodized salt are among the factors associated with the absence of adequately iodized salt at home [8].

This study was conducted with following objectives:

01. To assess the proportion of households consuming adequately iodized salt
02. To assess knowledge and practices regarding salt consumption
03. To find the factors associated with consumption of adequately iodized salt in selected districts of traditional goitre belt of Bihar.

Materials and Methods

The present study was a community based Cross sectional study conducted in Gopalganj, East Champaran and West Champaran districts of Bihar from January 2018 to March 2018. This study was a part of IDD survey assigned to Department of Community Medicine, Patna Medical College, Patna by State Health Society, Bihar. The study population consisted of Children (6-12 years) and caregivers of child (mostly mothers) present at the time of visit.

Sample size calculation: Sample size was calculated using population estimates, where 66% is the assumed coverage of adequately iodized salt consumption in rural area [9], 95% confidence level, 10% margin of error and a design effect of 2. Thus a sample size of 412 house holds per district and 1236 households for this study was calculated. Cluster sampling was adopted for selection of village as a cluster.

Sampling method: In assigned districts block wise village list was collected for preparing a sampling frame. 3 blocks were randomly selected from each district and from each block 10 villages were selected assuming village as cluster. From each selected village, 14 households were selected randomly and from each household one child of 6-12 years age group was selected.

If in a house a child of desired age group was not present the neighbouring house was selected for the study. The first choice of caregiver was the mother of child; usually responsible for organizing food preparation in the household.

In absence of mother we interviewed other responsible person who had knowledge about food preparation and salt use in household. All the selected children and their mothers were interviewed to assess their knowledge regarding salt consumption and the salt samples were collected from each household to measure level of Iodine in salt.

Study tools: A pre-tested semi-structured questionnaire was used in every household for collecting information about the knowledge of IDD and practices of iodized salt. The questionnaire was pre-tested in 20 households in another area not selected for the actual study. The necessary modifications and corrections were made on the questionnaire before it was finally administered in the study area.

Knowledge of Children and their caregivers related to Iodine deficiency disorders were assessed by showing clinical photographs of Goitrous patient and asking that 'do you identify this condition'. If the answer came yes then the name of condition, cause of that condition and source of information regarding the condition were asked. We also assessed their knowledge regarding iodized salt by asking 'have you heard about iodized salt'. If answer came yes then they were asked about 'what are the benefits of consuming iodized salt'. The brand name of the salt used in household was also asked from mothers.

The practices regarding salt consumption were assessed by observing which type of salt they were using that is either refined or granular and the type of container they were using to store the salt after purchasing from the market. Mothers were asked about when they add salt into meal during cooking process i.e. either in the beginning or in between cooking or at the end of cooking.

The socio-economic status was calculated on the basis of Modified BG Prasad classification and then classified into upper, middle and lower class [10].

Salt iodine determination: Salt samples were collected from households that were routinely being consumed in their respective homes in auto-seal polythene pouches. The iodine content was measured by standard iodometric titration method. According to WHO, adequately iodized salt for the sustainable elimination of IDD is defined as salt with iodine content of 15 parts per million (ppm) or more [5].

Method of statistical analysis: Statistical analysis was performed by statistical software SPSS version 22. Frequency distribution and percentages were expressed for categorical variables. The association between salt consumption and various factors were assessed by applying chi-square test. In all cases the level of rejection of a null hypothesis was 0.05.

Ethical issue: The study was approved by Institute ethical committee of Patna Medical College, Patna. Head of the households were informed about the purpose of the study and written consent was taken from them.

Results

A total of 1263 children and same number of mothers or any other family members were included in the study. Only 21 children (1.7%) were able to

Identify the condition of goitre on being shown picture. The main source for their information was book they had studied (66.7%) followed by television or radio and other sources which include family members, relatives and health workers. Only 1.1% children had heard about iodized salt. Around 33% adults were able to identify the condition of goitre on being shown picture. In 29% adults the source for their information was book they had studied. Television and radio was the source of information in 26% respondents. Family members, relatives and health workers were source of information in 45% caregivers. Among those who identified the case as goitre, around 52% respondents had correct knowledge about cause of goitre. Only 19% of adults had heard about iodized salt. Only 30% caregivers know the brand name of salt that was used in their household. (Table: 1)

Table-1: Knowledge of Children and their caregivers related to Iodine deficiency disorders (N=1263).

Variables		Frequency	Percentage
Does child identify the condition	Yes	21	1.7
If yes, source of information (n=21)	Book	14	66.7
	TV	3	14.3
	Other	4	19.0
Reason for Goitre according to child (n=21)	Iodine deficiency	14	66.7
	Don't know	7	33.3
Does child has heard about iodized salt (n=1263)	Yes	13	1.1
Does mother/caregiver identify the condition (n=1263)	Yes	420	33.3
If yes, source of information (n=420)	Book	121	28.8
	Television/Radio	110	26.2
	Others	189	45.0
Reason for Goitre according to mother/ caregiver (n=420)	Iodine deficiency	218	51.9
	Drinking of well water	37	22.2
	Don't know	165	8.8
Does mother/caregiver has heard about iodized salt (n=1263)	Yes	238	18.8
Brand name of salt	know	383	30.3
	Don't Know	880	69.7

Refined salt was used in every household. The salt was stored in container with closed lid in around 95% houses, in rest of the houses salt was either stored in container with open lid or open polythene bag.

In around 87% houses salt was either added in the beginning or in between cooking. Adequately iodized salt was consumed in 73.5% household (Table: 2)

Table- 2: Practices related to Iodised salt consumption in selected districts (N=1263).

Variables		Frequency	Percentage
Type of salt	Refined	1263	100

Container used to keep the salt	Container with closed lid	1199	94.9
	Container with open lid	16	1.3
	Polythene bag	48	3.8
Timing of adding salt during cooking	At the beginning	259	20.5
	In between cooking	835	66.1
	At the end of cooking	169	13.4
No. of families consuming adequately Iodized salt		928	73.5
No. of families consuming inadequately Iodized salt		335	26.5

Table 3: Factors associated with iodized salt consumption.

Variables		Iodine level in salt		Chi-square	p-value
		<15ppm	>15ppm		
Religion	Hindu	278(27.0)	752(73.0)	0.622	0.43
	Muslim	57(24.5)	176(75.5)		
Category	OBC	198(24.8)	600(75.2)	10.99	0.012
	SC	75(30.6)	170(69.4)		
	ST	35(37.6)	58(62.4)		
	General	27(21.3)	100(78.7)		
Socio-economic status	Upper	31(25.0)	93(75.0)	1.10	0.58
	Middle	112(25.1)	334(74.9)		
	Lower	192(27.7)	501(72.3)		
House type	Katchha	173(31.1)	384(68.9)	10.675	0.005
	Mixed	103(23.5)	336(76.5)		
	Pucca	59(22.1)	208(77.9)		
Mother's/Caregiver's knowledge about Iodised salt	No	73(30.7)	165(69.3)	2.589	0.108
	Yes	262(25.6)	763(74.4)		
Knowledge about salt brand	No	237(26.9)	643(73.1)	0.247	0.619
	Yes	98(25.6)	285(74.4)		
Container used to store salt in household	In closed vessel	311(25.9)	888(74.1)	4.167	0.041
	In open vessel/ Polythene bag	24(37.5)	40(62.5)		

(Figures in parenthesis denotes percentage. OBC: Other Backward Castes, SC: Scheduled caste, ST: Scheduled tribe)

The proportion of people consuming adequately iodized salt was most among General category (78.7%) followed by Other Backward Class (75.2%), Scheduled Caste (69.4%) and Scheduled Tribe category (62.4%) and the association was statistically significant (p=0.012). The family living in Katchha houses had poor iodized salt consumption in comparison to people living in mixed and pucca houses (p=0.005). The salt stored in air tight container had significantly higher iodine content in comparison to salt stored in open container (p=0.041). Religion, socio-economic status, caregiver's knowledge about iodized salt and caregiver's knowledge about brand name of salt had no any significant association with iodized salt consumption (Table: 3).

Discussion

The present study collected information on the iodine content of household salt, knowledge and practices regarding storage of edible salt as well as the factors influencing iodized salt use. One of the objectives of present study was to assess the knowledge of children and adults regarding iodine deficiency disorders.

The knowledge of children was quite poor. As a little age group of 6-12 years we cannot expect too much from them to know about IDD. But one of the aims of National Iodine Deficiency Disorders Control Programme (NIDDCP) is to increase awareness among common people regarding IDDs and iodized salt consumption.

Only 33% adult were able to identify the condition of goitre. And only 19% had heard about iodized salt.

So the knowledge of adults was quite poor regarding these aspects. This poor knowledge is also reflected in their practices.

As we have found the consumption of adequately iodized salt was 73.5% against the goal of universal salt iodization (USI), which is to cover more than 90% of households [5]. The target of universal salt iodization is yet to be achieved at the consumer level in the surveyed districts of Bihar.

The use of non-iodized salt was not found in any household. This finding revealed that although the salt was being iodised; either the iodine was added in inadequate quantity or there were losses of iodine at the different points in distribution system.

In present study for 29% caregivers, the source for their information was book they had studied. Television and radio was the source of information in 26% respondent. Family members, relatives and health workers were source of information in 45% caregivers. Roy et al (2016) reported common sources of information for iodized salt were television and radio (60%) [11].

However, in a study by Sen et al. [12] television (66.7%) was the principal source of information. The salt was stored in container with closed lid in around 95% houses in our study. Almost similar finding was reported in a study where salt was stored in container with closed lid in 87% households [11].

In this study; Category, house status and container used to store salt in household were the factors significantly associated with iodized salt consumption in households. NFHS-4 (2015-16) data of Bihar reported that the iodized salt consumption was highest in households of other category followed by other backward class (OBC), scheduled caste (SC) and scheduled tribe (ST) [13].

Similar trend was found in present study which shows that the proportion of people consuming adequately iodized salt was most among General category (78.7%) followed by Other Backward Class (75.2%), Scheduled Caste (69.4%) and Scheduled Tribe category (62.4%).

The adequately iodized salt consumption in these districts was 73.5% which is around 16 point below the goal of universal salt iodization (USI) [5]. This gap may be either due to iodine was added in inadequate quantity or there were losses of iodine due to faulty storage practice.

In some instances the quality of iodized salt remains poor, or the salt is incorrectly packaged, or the salt deteriorates due to excessive long term exposure to moisture, heat, and contaminants [5]. We found that salt stored in air tight container had significantly higher iodine content in comparison to salt stored in open container ($p=0.041$). Kapil U (1998) revealed that the maximum loss of iodine occurred when iodised salt was exposed to sunlight (40%) [14].

Halogen nature of iodine and its exposure to excess oxygen and carbon dioxide slowly oxidizes it to metal carbonate and elemental iodine which then evaporates. Exposure to heat also reduces the iodine content of salt [15]. In a study, not exposing salt to sunlight and higher monthly income of respondents showed a strong relationship with the presence of adequately iodized salt at home.

The possible explanation for this might be due to loss of iodine because of exposure to heat, sunlight, and moisture during storage at home or elsewhere in the supply chain [14, 15]. In the present study, salt was added at the end of cooking during food preparation in around 13% households. However, to maintain iodine in prepared food the salt should be added to a meal at the end of cooking [5, 6].

Conclusion

Despite NIDDCP being in place for more than 20 years, the consumption of adequately iodized salt in these districts is still below the goal of the program. The knowledge among children and adults regarding IIDs and iodized salt was very poor.

Children are known to be agents of change; therefore, there is need to intensify health education activities in the school curricula so as to increase early awareness among children on the benefits and effects of iodine. The knowledge and practices among adults can be improved by active participation of our grass root level workers in generating awareness about the health benefits of consuming adequately iodized salt.

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