A Study on Estimate of Iodine Deficiency Disorders and Iodized Salt Consumption in Sitamarhi District of Bihar

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Abstract

Background-Elimination of iodine deficiency disorder is a very important health and social goal.Iodine deficiency at critical stages during pregnancy and early childhood results in impaired development of brain and subsequent impaired mental function. Objective is To estimate the proportion of householdsusingadequatelyiodized saltand to estimate the Total GoiterRate (TGR) in children ofage6-12years.Material and Method- A cross sectional study was carried out in few administratively selected blocks using simple random sampling. A total of 172 households and 5 schools were visited and 172 children were examined clinically for presence of goiter .Salt samples were collected from every household for iodometric titration. Statistical analysis was done in excel. Result-The respondents were mainly females living in pukka houses with recently built toilet facilities. All of them were using packet salt (retail iodine content-100%, household iodine content -76.9%) but storage of salt was either from the packet itself , Any container without lid and covered container . Presence of goiter after clinical examination was 5.2 %. Conclusion-Sitamarhi district needs more awareness about storage and use of iodized salt. It falls under mild endemic for IDD.

Keywords-*Goiter ,Iodometric titration,Iodine content ,Iodized salt,Iodine deficiency disorder*

Introduction

Elimination of iodine deficiency disorder is a very important health and social goal. Iodine deficiency at critical stages during pregnancy and early childhood results in impaired development of brain and subsequent impaired mental function[1]. Iodine deficiency can lead to a variety of health and developmental consequences known as iodine deficiency disorders (IDDs). Iodine deficiency is a major cause of preventable mental retardation. It is the single largest cause of preventable mental retardation globally.[2] It is especially damaging during pregnancy and in early childhood. In their most severe forms, IDDs can lead to cretinism, stillbirth and miscarriage; even mild deficiency can cause a significant loss of learning ability. Iodine deficiency may lead to impaired human resource development and subsequently affecting progress of the country.[3]Variety of methods exist for correction of iodine deficiency, in practice the most common is universal salt iodization–the addition of potassium iodate to all salt for human and livestock consumption. There are 3 major components of a sustainable program to eliminate IDD–political support, administrative arrangements and assessment and monitoring systems. Progress in elimination of iodine deficiency disorders (IDD) needs to be tracked and monitored as to ensure sustainability of the progress made towards IDD elimination. Progress can only be demonstrated if it is measured. Sound techniques are needed in order to reliably measure indicators of IDD, and these techniques must be applied using suitable epidemiological methods that take target population, geographical area, and timing of survey factors into account. Realizing the magnitude of the problem the govt of India launched 100 percent centrally assisted National Goiter Control Programme in 1962.[4] In August 1992 the program was renamed as National Iodine Deficiency Disorder Control Programme (NIDDCP). Goal of this programme is to bring the prevalence of IDD to below 5% and to ensure 100% consumption of adequately iodized salt at the household level (15 ppm).[5,6]Salt testing lab at PMCH, Patna was

established to improve monitoring at the state level and to improve the coverage and frequency of district level survey.There are many endemic districts even after so many years of salt iodization and frequent surveys and focused interventions are neededto achieve the desired coverage.[7] Spectrum of IDD having substantial consequences on pregnancy outcomes ,neurologic development and impairment of cognitive function makes it an important public health priority [8].

Goal**:**To track progress towards sustainable elimination of iodine deficiency disorders in Sitamarhi district.

Objective:

1. To estimate the proportion of households using adequately iodized salt (>15ppm iodine) in Sitamarhidistrict.

2. To estimate the Total Goitre Rate (TGR) in children of age (6-12years)

3. To assess the availability of adequately iodized salt (>30 ppm iodine) at their retail shops in the district.

Material and Methods

Study Design: It was a community based cross sectional study conducted from November 2017 to January 2018 in 15 randomly selected villages/clusters of 5 blocks of Sitamarhi district. Asha coordinators and Asha workers of the blocks were contacted for household visits. Household list of those villages was obtained from the block office. List of children of 6-12 years was obtained from the schools. Only those houses were visited where children of that age group were present .

Study Population– It was selected based on inclusion-exclusion criteria.

Inclusion criteria:

1. Children (6-12years)

2. Households (Head of family or any other responsible person present at time of visit)

3. Retail shop owners.

4. Community and stakeholders.

Exclusion criteria:

1**.**Those who did not give consent.

2.Those who were ill/incapacitated.

SAMPLING TECHNIQUE & SAMPLE SIZE CALCULATION – Simple Random sampling technique was used to achieve the desired sample size (196). Given the time frame and administrative feasibility this was only applicable.Thesample size was calculated using theformula:$N = 4PQ/L^2$ where P=Percentage of household using adequate salt (based on findings of first national iodine and salt intake survey (NISI) 2014-15 at 70%) ,

Q = 1 – P =0.3, P=0.7, L= Allowable error =10% of P = 0.07

$$N = \frac{4 \times P \times Q}{L^2} = 172$$

Considering 15% non response rate, sample size was calculated to be 196.

Data collection Method–A structured Government of India (GOI) questionnaire was used for obtaining information from the selected households. Training and orientation Workshops were done in the Department of Community Medicine, IGIMS and in Sitamarhi district to orient the field staff and impart practical training in Goiter examination and others details of survey methodology. After the training and orientation workshop, teams comprising of faculty member, senior resident and interns were allotted the villages and selected households. The field survey started immediately after the workshop. The team contacted the ASHA/ ASHA coordinator of the village for the house visit and survey. They would conduct the thyroid palpation and assign the goiter grade. They collected salt samples from the households. Informed consent was obtained from the head of the family or the person present at the time of data collection. Sample size was 196 households in the selected blocks but only 172 households participated, and salt samples were collected from the same. Only one child per household was examined. Total 172 Children of 6-12 years were examined in 172 households of 15 villages situated in 5 blocks. Few children of those households were in school so school was also visited

with the help of ASHA and ASHA coordinator to assess the goiter status. Salt packets were purchased from the retail shops. Collected salt samples were sent to PMCH USI lab at department of Community Medicine for testing level of iodine by iodometric titration as the testing facilities are not available at IGIMS, Patna. In the households, the type of salt that is used, type of fuel, type of oil, information on the quantity purchased at a time, price, method of storage of salt, presence of a toilet in the household and other demographic information was also collected.

Method of statistical analysis– Data was entered in excel and analyzed in excel and Epi info (version 7). Awareness, literacy, cooking practices and storage of iodized salt was compared with the presence of clinical goiter and presented as proportion and chi square.

Indicators to be monitored:

A set of indicators have been prescribed by WHO/ UNICEF/ICCIDD to track the progress towards sustainable elimination of IDD as a public health problem. Goiter prevalence should be less than 5% (mildly palpable thyroid) and adequately iodized salt should be 15 ppm or more in > 90% households.

Salt samples were transported immediately to the laboratory.

Laboratory Training and Quality Assurance:

The analysis of iodine in salt was done at the state IDD monitoring lab at PMCH. Only 165 samples could be tested for iodine content. Seven samples could not be tested for various reasons like damage or inadequate quantity.

Results

Socio-demographic profile

Mostly female members were present at the time of survey (88%). Mean age of the respondents was 31 yrs (range-15-76). Literacy of the respondents (more than class 10^{th}) was 40%. Most of the houses were pukka (85%). A toilet facility was present in 90% of the pukka houses and 50% of the semi pukka houses. IncidentlySitamarhi was declared the first ODF in Bihar .Only one house was a kachcha house. Mobile was present in 90% of the households. Heads of the family were daily wage workers in 60% of households, Govt employee in 8% of households.

Purchase of salt and cooking practices

Labeled and packet salt was procured from village retail shops. Salt was kept in covered containers by majority of the houses (75%). Few of them kept salt in any bowl or uncovered container (20%). Few used the salt directly from the packet (5%). Most of the households had food cooked in indoor kitchen (90%). Few of the households had outdoor kitchen (10%). Many of them had gas connections too (60%). The food was cooked by mother of the household in 88% of households. In few households (12%) eldest daughter or any other member cooked the food. Only 78% of them used packaged or sealed cooking oil. 18% used loose oil purchased from the retail shops. **(Table 1)**

Knowledge and information about iodized salt and iodine deficiency disorders

Only 32% of the respondents had heard about iodized salt. Total 20% of them have some knowledge about goitre. Only 2% of them ever heard about mental retardation, birth or developmental defects due to iodine deficiency. Knowledge about iodized salt came from TV , Radio and from ASHA (**Table 2**).

Proportion of iodized salt

Only 76.9% of households were using adequately iodized salt (**Table 3**).

Goiter prevalence:

Goiter was found to be present in only 9 out of 172 (5.2 %) children .

Storage of salt samples in uncovered containers was directly associated with less than adequate iodine content in the salt sample and clinical thyroid. (**Table 4 & 5**)

Table 1: Purchase/storage of salt and cooking practices/Awareness about iodized salt (N=172)

Variables	Frequency (in number)	Percent (%)
1. Place of cooking food Indoor kitchen Outdoor kitchen	 154 18	 89.5 10.5
2. Type of cooking fuel used Gas Wood/coal/others	 103 69	 59.9 40.1
3. Hand washing with soap before Cooking food No Yes	 161 11	 93.6 6.4
4. Storage of salt Covered container Bowl or uncovered container In the packet itself	 130 35 7	 75.58 20.35 4.07
5. Food cooked by Mother Eldest daughter or other member <15 yr	 151 21	 87.8 12.2
6. Cooking oil type (packeted,tinned) Loose oil from retail	135 30	82 18

Table 2 .Knowledge and information about iodized salt and iodine deficiency disorders

Variable	Frequency	Percentage
1.Ever heard about iodized salt	55	31.9
2.Ever heard about iodine deficiency disorders	24	13.9
3.Ever heard about goitre due to iodine deficiency	35	20
4.Ever heard about mental retardation, pregnancy complication due to iodine deficiency	3	1.7
5.From which source you came to know about iodized salt TV,Radio,ASHA	 (20,15,20)	 (11.6,8.7,11.6)

Table 3: Proportion of adequately iodized salt at household and retail level

Total No of household samples	**172**
No tested	165
No having adequate iodine	127
% of adequately iodized salt	76.9%
Total no of pkts purchased from retail shops	7 types (all had required iodine content)

Table 4: Association of Goitre status with consumption of Iodized salt (N=165)

	No	**Use of adequately iodised salt**	**Use of inadequately iodised salt**	**P value**
Children examined	165	127	38	
Goitre grade 1	8	2	6	<.05
Goitre grade 2	1	0	1	<.05

Table 5: Association of Literacy/storage/cooking practice and salt iodine content (N=165)

Storage practice of salt	**Adequately iodized salt**	**Inadequately iodized salt**	**P value**
Stored in covered jar (125)	120	5	< .05
Stored in non covered jar (40)	7	33	< .05
Total	127	38	
Literacy level of participant	Adequately iodized salt	Inadequately iodized salt	P value
Not went to school (48)	28	20	<.05
≥ class 10th (117)	99	18	<.05
Outdoor/indoor kitchen	Adequately iodized salt	Inadequately iodized salt	P value
Outdoor kitchen(18)	6	12	< .05
Indoor kitchen (147)	121	26	<.05
Age/experience of incharge of household cooking	Adequately iodized salt	Inadequately iodized salt	P value
Younger<15 yr (20)	13	7	< .05
Older (145)	114	31	<.05

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Declaration

Funding-This study is funded by state health society ,IDDCP Cell.

Conflict of interest-none

Abbreviations

IDD-Iodine deficiency disorder

NIDDCP-National Iodine deficiency disorder Control programme

PMCH-Patna Medical College Hospital

IGIMS-Indira Gandhi Institute Of medical Sciences

USI-Universal Salt Iodization

WHO-World Health Organization

UNICEF-United Nations International Children Emergency Fund

ICCIDD-International council for control of Iodine Deficiency Disorders

ASHA-Accredited Social Health Activist

Discussion

Production and availability of adequately iodized salt is essential to achieve the targets of Iodine deficiency disorder control programme. The effort of Government in making good supply chain of iodized salt in the rural areas is commendable as all the salt packets had adequate iodine content as evident from our finding. There has been considerable improvement in usage of household salt iodization that may considerably improve the overall health status wrt IDD.[9,10] Most of the respondents were not aware of spectrum of iodine deficiency disorders . Most of them were not aware of pregnancy related adverse health outcomes that is critical for achieving health related goals.[11,12] There was very little attention paid to proper storage of salt in those households where mothers were illiterate or someone younger was in-charge of household cooking .Therefore other critical components such as proper storage of the salt, awareness levels of the house hold about iodized salt also need attention. There are gaps in the knowledge and storage practices of salt as evident from this study that may result in diminished iodine content of the salt.[13] The household availability of iodized salt is only 76% which reflects the poor storage practices of salt resulting in diminished iodine content of the salt, which is consistent with the findings of other studies.[14,15] The less literate had less proportion of adequately iodized salt. At the village level or household level there is a need for awareness activities. Less experienced cook or younger member of family as the in charge of cooking increases the chances of less iodized salt. There is a need to scale up behavior change communication in terms of storage of salt in order to fight adverse effects of less iodized salt on pregnancy and its outcome.[16] Iodine deficiency may make it difficult to attain universal health coverage or slow our progress towards attainment of Sustainable Development Goals.A very huge burden of iodine deficient population belongs to south east Asia including our part of the globe.[17] Frontline workers like ASHA and others may be given training or orientation about IDD spectrum, Iodized salt usage, storage and cooking practices.These frontline workers consequently can educate the community in their respective work areas.Health education may be done at schools,Self help groups and Village health ,sanitation and Nutrition Days may also provide a platform to address this knowledge gap.[18]

Ethical Clearance-Taken from Institute Ethics committee.

Source of Funding-Self

Conflict of Interest-Nil

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