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Research Article

Impact of iodine deficiency disorders control programme implementation in four districts of Chhattisgarh, India: baseline survey

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ABSTRACT

Background: Iodine deficiency disorder constitute the largest cause of preventable brain damage. Majority of the consequences of IDD are invisible and irreversible and as well preventable. World Health Organization (WHO) and United Nations Children's Fund (UNICEF) joint Committee on Health Policy recommended Universal Salt Iodization (USI) as a safe, cost effective and sustainable strategy to ensure sufficient intake of iodine by all individuals. Chhattisgarh Government made efforts to achieve wider coverage of population by iodized salt through Public Distribution System, but lack of recent baseline data to know the impact of this effort has been a major constraints. Keeping this in mind, a survey was proposed to assess the impact of NIDDCP in four districts of Chhattisgarh. (Rajnandgaon, Mahasamund, Koriya and Kanker). Objective of the study was: 1. To ascertain the prevalence of clinical forms of IDD among 6-12 years children in 4 selected districts of Chhattisgarh. 2. To document iodine uptake status reflected by random urinary excretion levels in a sample of 6-12 year children covered for clinical examination and 3. To evaluate the coverage of iodized salt at the community level (i-e at household) by on the spot testing by Rapid Salt Testing Kit.
Methods: Cross sectional Observational study was done based on IDD survey guidelines by Government of India during July-Oct 2015
Results: Present study results showed Goiter prevalence among 6-12 years children was in the range of 3.37-17.56% (Highest in Rajnandgaon). Iodine deficiency reflected by urinary iodine excretion (UIE) was found unacceptable limit maximum (87%) in Rajnandgaon. Half of the surveyed districts had subnormal (<100 mcg/L), median urinary iodine excretion (MUIE). Our Study reveals that iodized salt coverage was in the range of 70-82 % in all the surveyed Districts.
Conclusions: Among the 4 surveyed district, Goiter is a public health problem in 3 districts (prevalence >5%). The adequately Iodized salt coverage which should have been more than 90 % is not fulfilled in all the 4 districts.

Keywords: MUIE, IDD, NIDDCP, USI

INTRODUCTION

Globally, iodine deficiency disorders (IDD) continues to be a major public health problem which affect large segment of population.[1] IDD constitute the single largest cause of preventable brain damage which leads to learning difficulties and psychomotor impairment.[2] Iodine deficiency disorder impact 'refers' to all ill effects caused by iodine deficiency in a population, which can be prevented by ensuring adequate intake of iodine.[3] By

giving due importance to elimination of IDD as a public health problem, the Government of India launched the National Goiter Control Programme; in 1962 which was renamed as National Iodine Deficiency Disorders Control Programme (NIDDCP) in the year 1992.[1] Base on nationwide survey done by ICMR no state is free from Iodine deficiency and are 'at risk' of developing IDD in India.[4] Based on Iodized salt coverage around 350 million people are at risk of IDD in our country. IDD is endemic in India with 303 districts out of 365 districts surveyed reporting Total Goiter Rate(TGR) >10%.[5] Coverage Evaluation survey 2009 shows still gap in accessibility of quality iodized salt with wide variation of coverage among rural (85.6%) and urban communities (46.4%).[6] Moreover monitoring of quality of iodized salt is a major constraint and therefore monitoring of USI is crucial.[7] Urinary Iodine Excretion(UIE) is a scientific tool to evaluate nutritional status of Iodine in a individual. Currently, there is no nationwide data available for the same. Although a number of small scale surveys have been carried out in the past. Thus, there are insufficient data to directly estimate the regional or global prevalence of low iodine intake in important groups. (E.g. children and pregnant women).[8] Chhattisgarh government showed its commitment by providing iodized salt to the masses through Public Distribution System. Major area of concern is to get baseline data to know the impact of this effort to overcome IDD throughout the state. Keeping this in mind, a survey was conducted to assess the performance of IDD control programme in four districts of Chhattisgarh; namely Kanker, Rajnandgaon, Koriya and Mahasamund with the following objectives:

- To ascertain the prevalence of clinical forms of IDD among 6-12 years children in 4 selected districts of Chhattisgarh.
- To document iodine uptake status reflected by random urinary excretion levels in a sample of 6-12 year children covered for clinical examination.
- To evaluate the coverage of iodized salt at the community level (i-e at household) by on the spot testing by Rapid Salt Testing Kit.

METHODS

30 clusters methodology was applied in each district according to revised policy guidelines on national IDD control Programme.[1] For clinical examination of goiter, a sample size of 90 children (45 boys and 45 girls) between age group of 6-12 years from the schools from identified cluster was taken for the survey. If desired number of children not found in identified cluster, nearby schools of higher class of same cluster/nearby village were taken for better geographical representation of surveyed subjects to fulfill the criteria of prerequisite number. From each identified district, 2700 (90X30) children are covered for clinical examination of goiter. A total of 10,800 children (90 Children/cluster) were examined clinically during entire survey. For collection of salt & urine sample, every 5th child examined for goiter asked to bring edible salt from their houses for salt testing on the spot and every 10th child examined for goiter survey selected for urine sample respectively. In this way 18 salt samples and 9 urine samples collected from each cluster, so total 540 Salt Samples and 270 Urine samples collected from each district. Thus 1080 (9 samples/cluster) Urine samples were evaluated for Urinary Iodine Excretion (UIE) by Wet Digestion Method (i.e. The Sandell Kolthaff Reaction). Total 2640 salt samples 2160 (18/cluster) brought by school children and 480 (4/cluster) Household samples checked for iodine content in it by Rapid Salt Testing Kit in surveyed districts by Team of PG scholars/Interns under supervision of faculty members of Dept. of Community Medicine, Pt. JNM Medical College Raipur C.G; during June-Oct 2015. Informed consent was taken from school teachers for urine collection.

Enlargement of thyroid gland was assessed by clinical examination and the goiter was graded as follows:

Grade 0: No Palpable or visible goiter/No Goiter.

Grade 1: A mass in the neck that is consistent with an enlarged thyroid, that is palpable but not visible when the neck is in normal position. It moves upward in the neck as subject swallows.

Grade 2: A swelling in the neck that is visible when the neck is in normal position and is consistent with an enlarged thyroid when neck is palpated/goiter visible and palpable.

RESULTS

It was observed that overall prevalence of goiter in the surveyed district was in the range 3.37-17.56%; with the highest (17.56%) prevalence in the Rajnandgaon district and lowest (3.37 %) in Koriya district (Table 2). Almost equal prevalence of goiter was found in both the sexes in all the surveyed districts (Table 1).

Urinary Iodine Excretion is the most useful indicator of IDD and it has been recommended that no iodine deficiency is indicated in a population when median urinary iodine excretion(MUIE) level is ≥100 mcg/L but in two districts out of four namely Rajnandgaon (44.80 mcg/L) and Kanker (76.32 mcg/L): these indicators were within unacceptable range (i.e < 100 mcg/L) and in Koriya (103.57 mcg/L) and Mahasamund (106.67 mcg/L) no iodine deficiency is indicated as per MUIE (Table 2).

In all the surveyed districts, Salt Iodization Coverage was found unsatisfactory against the recommended goal of USI. (>90% household coverage) (Table 2).

Table 1: Age and sex distribution prevalence rate of goiter among 6-12 years children in 4 surveyed districts.

Age group (years)	Kanker			Rajnandgaon			Koriya			Mahasamund		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
6-7	7.93	7.67	7.79	15.88	17.76	16.86	3.03	2.94	2.98	3.03	2.94	2.99
8-9	10.38	9.92	10.14	20.30	19.64	19.97	4.12	3.88	4.01	6.19	3.69	4.97
10-11	9.57	9.77	9.68	16.43	15.97	16.20	3.19	4.66	3.93	4.62	6.73	5.67
12	7.75	9.62	8.6	17.78	16.61	17.21	2.36	2.71	2.54	3.51	3.57	3.54
Total	9.00	9.21	9.11	17.60	17.52	17.56	3.20	3.56	3.37	4.35	4.24	4.30

Table 2: Status of indicators of iodine deficiency disorder as public health problem in 4 surveyed districts.

Target indicator (IDDCP targets)		Kanker	Rajnandgaon	Koriya	Mahasamund
Goiter Prevalence (<5 %)		9.11	17.56	3.37	4.3
Urinary Iodine Excretion	Proportion <100 mcg / L (<50%)	66.7	87	37.8	37.4
	Proportion <50 mcg / L (<20%)	37.4	55.6	13.7	13.0
Median Urinary Iodine Excretion (MUI) mcg/L (>100mcg /L)		76.32	44.80	103.57	106.67
Salt Iodization coverage (i.e. Salt Iodization Coverage >15 PPM >90% household)		70	70.92	82.78	82.78

DISCUSSION

Since long after implementation of National goiter control programme in 1962, Chhattisgarh is still struggling to achieve the target set by NIDDCP. Present study results showed Chhattisgarh state is yet to achieve standards by NIDDCP. Goiter prevalence among 6-12 year children was in range of 3.37-17.56% which is low in surveyed districts in comparison to observations made by other researchers in various community based studies among same study population (i.e. 6-12 year children) was in range of 7.74-23.4% in different states of country.[1,9-11,12] As a WHO/ICCID standard of >5% Goiter Prevalence is present against the set standards for IDD as a public health problem for any geographical region but 2 districts (namely Kanker and Rajnandgaon) out of 4 districts surveyed lagging behind to meet this standard. A similar study done in Udupi, Karnataka among students of class 1 to 7 showed prevalence of goiter to be 19.8%, was found more among females as compared to males.[13] Zama et al. assessed the prevalence of goiter as 7.74 % in Chamrajnagar in 2013.[14] Kamath R et al during 2006 assessed the prevalence of goiter as 16.6 % amongst the general population in Belgaum district.[15] A similar study was done in 4 districts of Chhattisgarh; Bilaspur, Raigarh,Ambikapur and Jashpur in 2014 and all 4 districts were found endemic for Goiter. (prevalence >5%).[16]

Urinary iodine excretion is an indicator of recent dietary intake of iodine absorbed in the body which appears in the urine. The present study found that median urinary iodine excretion level was low (<100 mcg/L) in 2 districts indicating inadequate iodine status. In similar studies done at Kullu and Kangra district of Himachal Pradesh, the Median Urinary iodine excretion level was found to be >100 mcg/L except at Solan district of Himachal Pradesh where it is found to be 62.5 mcg/L.[9-11] Earlier study conducted among school children in other 4 districts of Chhattisgarh namely Bilaspur, Raigarh, Ambikapur and Jashpur in the year 2014 reported median UIC level of >100 mcg/L in all indicating adequate iodine status except Jashpur (<100 mcg/L) indicates low iodine nutrition.[16] These observations point out that there is patchy endemicity of Iodine Deficiency Disorders in Chhattisgarh. In a study conducted in 3 districts of Uttarakhand (Udhamsingh Nagar , Nainital and Pauri Garhwal in 2013-14 noted MUIC level of 150 mcg/L,125 mcg/L and 115 mcg/L respectively.[17] Our study reveals that iodized salt coverage was in the range of 70 - 82% in all the surveyed districts. This shows we are failed to achieve Universal Salt Iodization (i.e. >90% households were consuming adequate iodized salt) decided by National Iodine Deficiency Disorder Control Program (NIDDCP) in the state. The other state level IDD surveys carried out in seven states (Kerala, Tamilnadu, Orissa, Rajasthan, Bihar, Goa and Jharkhand) also showed that the household consumption of adequately iodized salt (≥15 ppm) ranged from low (18.2%) in Tamilnadu to high (91.9%) in Goa.[18] Similar study in West Bengal the consumption of adequately iodized salt was 55% at household level and in previous year's baseline survey of Chhattisgarh state was in range of 51-71%.[4,16] NFHS-3 report showed that 51% of the

country was using adequately iodized salt (>15 ppm).[19] In a study by Kamat et al in Belgaum, 50 % of households are consuming adequately iodized salt.[15] and in Delhi, it was noted that 41 % of the households consumed adequately iodized salt.[20]

CONCLUSION

Study observations showed that IDDCP could not be successfully implemented yet in the state. District Rajnandgaon had highest prevalence of goiter among surveyed districts. This study shows that only 13 % of target population (i.e. children 6-12 years) in Rajnandgaon had Urinary Iodine Excretion of >100 mcg/L (against WHO norms i.e. 50%) and thus is highly endemic for IDD. Other districts may be at risk of becoming endemic zone for iodine deficiency disorders. Therefore for monitoring purpose periodic assessment of Iodine Deficiency Disorders, through monitoring of Iodine intake and all other preventive, promotive as well as curative measures should be undertaken in other surveyed as well as un-surveyed districts. Since all the surveyed districts showed gaps in Universal Salt Iodization (i.e. edible salt iodine content >15 PPM to >90% of households), this needs to be addressed as top priority. Government should ensure availability of adequately iodized salt at consumer level for all in the state to achieve Universal Salt Iodization.

'Rapid salt testing kits' should be made available at village/school/Sub Center/Anganwadi level especially to Anganwadi workers for better monitoring of level of Iodization of edible salt at consumer level. As per our observation in the surveyed districts less than recommended level of iodine (i.e. <15 PPM) in edible salt was observed in majority of samples. This may be due to known fact that bulk procurement, long duration and faulty storage (i.e. open container) of the same. Therefore the authors strongly recommend that iodized salt should be distributed through public distribution system in Low volume pack in closed airtight plastic containers of ½ Kg instead of polythene pack of 1 Kg provided through Public Distribution (PDS) in the state. This study was restricted to school-aged children, further there is a urgent need to assess endemicity of Iodine Deficiency Disorder in other risk group, especially among Pregnant Women.

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