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Original Research Article

Comparison of Adequacy of Salt Iodization in Past Two Years in Ten Districts of Chhattisgarh

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ABSTRACT

Introduction: Almost one third of population carries possible risk of Iodine deficiency disorders (IDD). Particularly in Indian setting about 80% districts have been found to be endemic zones for IDD. Most effective population based strategy for prevention of iodine deficiency is salt Iodization. Routine monitoring of adequacy of Iodization at both manufacturer and household levels has been recommended by WHO.
Aim of the study: In this study we have aimed to estimate the adequacy of Iodization of salt samples in ten districts of Chhattisgarh under National Iodine Deficiency Disorder Programme (NDDCP) of National Health Mission.
Material and methods: Salt samples from ten districts of Chhattisgarh were analysed by standardised titration method in the community based analytical study.
Results: Total number of samples received have shown significant rise in year 2015 compared to 2014. Significant improvement in adequacy of Iodization was noted in 3 districts Ambikapur, Baster and Dantewada. Improvement in Iodization was noted in samples from 6 districts but the difference was not found to be significant.
Conclusion: our study shows improvement in adequacy of iodization in samples received from all the 10 districts of Chhattisgarh in the year 2015 compared to year 2014 with significant improvement in Ambikapur, Baster and Dantewada district.
Keywords: Iodine Deficiency Disorders, salt Iodization, Integrated nutrition Programme.

INTRODUCTION

Micronutrient deficiency, correctly and commonly referred to as 'hidden hunger' contributes to the significant burden of malnutrition worldwide. Developing and highly populated countries as India share the major burden of these micronutrient deficiencies owing to demographic, economic and geographic characteristics along with typical food practices. Commonest of these deficiencies encountered worldwide include those of minerals viz. Iodine, iron, zinc and vitamins viz. Folic acid and vitamin A, thus constituting major public health problems. [1]

Iodine in particular owing to its role in synthesis of thyroid hormones and normal functioning of nervous system, is associated with many disorders, if deficient in diet. [2] Iodine deficiency disorders (IDD) previously thought to be limited to goitre and cretinism have in last quarter of century been found to include much wider array of disorders spanning over all the spectrum of ages of human life. Causative role of Iodine deficiency have been additionally related to thyroid hormone deficiency, neurological sequels, loss of pregnancy, still birth, delayed social, motor and cognitive milestones in children, defects in speech and hearing etc. Majority of them are irreversible and subclinical but yet preventable by simple means such as food fortification. [3]

IDD constitute single largest preventable cause of neurological damage leading to learning and psychomotor illnesses. [4] Globally, almost one third of population is at risk. [5] In India, 263 out of 325 districts have been found to be endemic zone for IDD with prevalence being more than 10 per cent. [6] Further all Indians carry the natural inherent risk of IDD owing to the sub continental properties of Iodine deficient soil, thus also limiting the Iodine content of grown food. [7]

Universal salt iodization (USI) remains the most cost effective strategy recommended to eliminate IDD. [8,9] Along with universal salt iodization World health Organization (WHO) has recommended regular periodic monitoring and adjustment of salt iodine concentration. [10]

Government of Chhattisgarh has established 'National Iodine deficiency Disorder Control Programme' (NIDDCP) in the year 2013 Under 'National Health Mission' (NHM). Functions of NIDDCP are to evaluate the adequacy of iodization in salt samples distributed by 'CG district food and civil supply' and samples obtained from households and to estimate burden of IDDs in community. In this study we aimed to estimate adequacy of Iodization of salt in ten districts of Chhattisgarh and to compare the adequacy of Iodization in year 2014 and 2015.

MATERIALS AND METHODS

The present study was a Community based analytical study with cross sectional data collection. Under NIDDCP Salt samples were collected from nine districts of Chattisgarh. The adequacy of iodization of these salt samples was assesses by standardised titration method. The samples having Iodine levels >30 ppm were considered adequate, those with Iodine levels 15-30 ppm were considered to be adequate at household levels and if the sample were found t be containing <15 ppm (0-14ppm) Iodine they were considered to be inadequate. Data for ten districts for the year 2014 and the year 2015 was assessed. These districts included Raigarh, Bilaspur, Ambikapur, Jashpur, Rajnandgaon, Mahasamund, Baster, Dantewada, Raipur and Koreya.

Statistical analysis

Data was expressed as percentage and median (range). Kolmogorov-Smirnov analysis was used to assess the linearity of data. Extended Fischer's exact test or Chi square test were used for significance of difference in frequency distribution in different years and districts. To assess the significance of difference in number of samples received in two consecutive year Mann Whitney U test was used. Statistical significance was assembled as $p<0.05$. SPSS vs. (IBM® inc.pvt ltd.) and Microsoft Excel (Microsoft inc®) were used for statistical analysis.

RESULTS

Total number of samples received from all the districts shows significant increase ($p=0.01$) in year 2015 (Median= 53 (6-371)) compare to in year 2014 (Median=10 (3-23)) (Fig. 1). Adequacies of iodization in salt samples received in current year and previous year were assessed and compared (Table1). Significant improvement in adequacy of Iodization was noted in samples received from Ambikapur

(p=0.04) Baster (p=0.007) and Dantewada (p=0.019) (Fig. 2, 3). Though improvement was noted in percentage adequacy in Raigarh (79.47% in 2015 compared to 50.00% in 2014) Bilaspur (60.38% in 2015 compared to 39.62% in 2014), Jashpur (89.66% in 2015 compared to % in 2014), Rajnandgaon (100% in 2015 compared to 0.00% in 2014), Mahsamund (69.00%% in 2015 compared to 50.00% in 2014), Raipur (71.97% in 2015 compared to 65.22)% in 2014 the difference was not found to be statistically significant (p>0.05) (Table 2) (Fig. 4).

Table 1: Frequency of adequate and inadequate samples in Districts of Chhattisgarh

District	Adequate		Inadequate		P Value
	2015	2014	2015	2014	
Raigarh	120	4	31	4	0.07
Bilaspur	32	5	21	5	0.39
Ambikapur	6	6	0	6	0.04
Jashpur	17	3	0	1	0.19
Rajnandgaon	26	5	3	2	0.66
Mahasamund	69	7	31	7	0.24
Koriya	0	0	0	2	1
Baster	63	4	18	7	0.007
Dantewada	15	1	0	2	0.019
Raipur	267	15	104	8	0.3

Table 2: Percentage adequacy and inadequacy of salt samples in districts of Chhattisgarh

District	%adequate 2015	%adequate 2014	%inadequate 2015	%inadequate 2014
Raigarh	79.47	50.00	20.53	50.00
Bilaspur	60.38	50.00	39.62	50.00
Ambikapur	100.00	50.00	0.00	50.00
Jashpur	100.00	75.00	0.00	25.00
Rajnandgaon	89.66	71.43	10.34	28.57
Mahasamund	69.00	50.00	31.00	50.00
Baster	77.78	36.36	22.22	63.64
Dantewada	100.00	33.33	0.00	66.67
Raipur	71.97	65.22	28.03	34.78

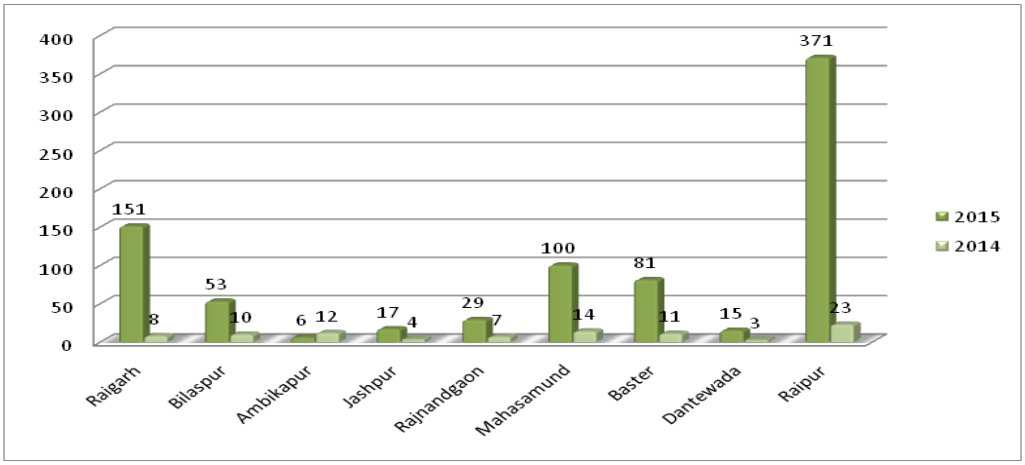

Fig 1: District wise salt samples collected in year 2014 and year 2015, p=0.01

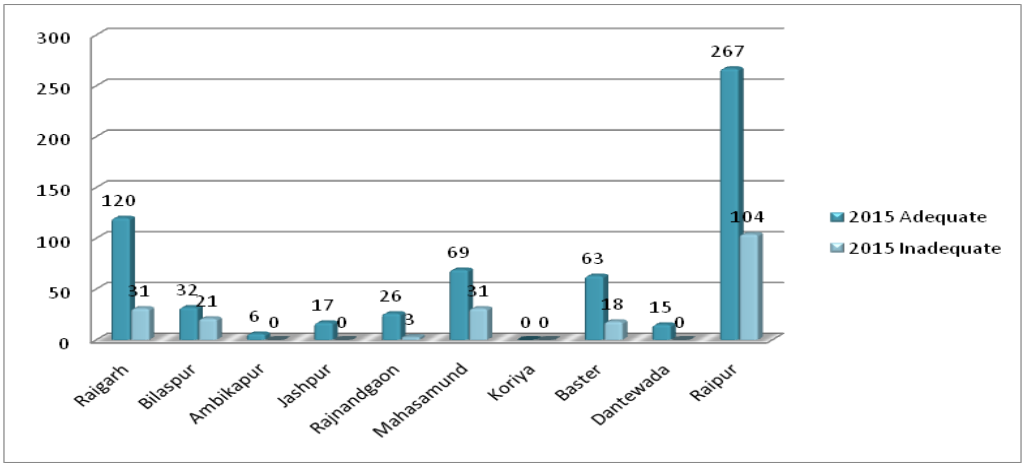

Fig 2: Frequency of Samples with Adequate Iodine concentration in year 2015

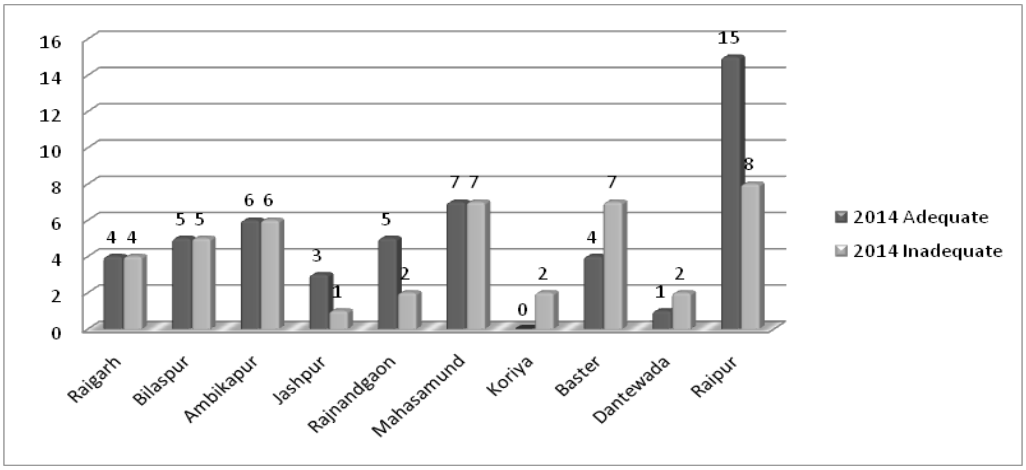

Fig 3: Frequency of Samples with inadequate Iodine concentration in year 2014

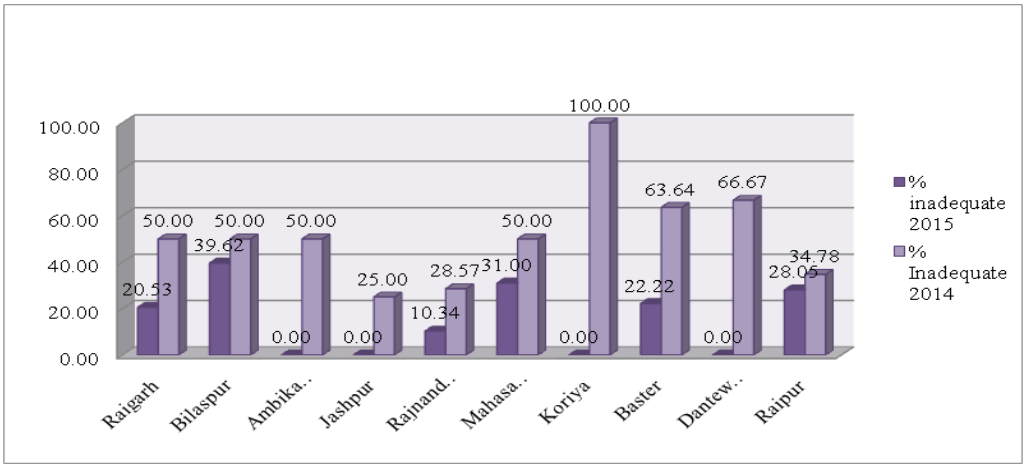

Fig 4: District wise Comparison of percentage inadequate sample in year 2014 and 2015

DISCUSSION

In developing countries the integrated nutrition programme are usually at the losing end when considered with respect to implementation and specifically in terms of evaluation. This particular disadvantage has been highlighted in many studies in a recent review [11] Necessity of regular and effective evaluation of public health programmes have been strongly recommended by Victora *et al.* And Habicht *et al.* [12,13] Evaluation of adequacy of Iodization ensures the effective delivery of sufficient concentration of Iodine to target population.

In our study we tried to evaluate the adequacy of salt Iodization in 10 districts of Chhattisgarh in the year 2014 and 2015. We observed improvement in adequacy of Iodization in samples received from all the districts though significant improvement was noted only in Ambikapur, Baster and Dantewada districts compared to previous year. Our data also shows significant increase in number of sample collected in the year 2015 compared to year 2014 indicating that the programme is slowly and steadily being implemented effectively. Further it is noteworthy that the districts showing significant improvement in adequate samples are the districts those were having relatively less number of samples in the year 2014 as well as year 2015 compared to other districts. This may particularly indicate the stringency of sample collection in the way that less distribution and less sample collection of Iodised salt in these districts. This is a possible indication for implementing more manpower and resources to these districts. While increase in samples collected and improvement in adequacy of iodization are the positive findings, the frequency of inadequate samples is the issue worth

addressing specially in districts Bilaspur, Raipur, Baster and Raigarh.

Establishment of mini laboratories with standardisation of titration method and training of healthcare workers for effective quantitative analysis of iodine in salt at the production level has been proposed by some authors. They also suggest inclusion of this protocol in national IDD programme. The continuous quality control by factory management and regular oversight by national IDD Control programme and national food safety and standard regulating bodies has been termed as the key components for maintaining adequate salt iodization and reduction in goitre prevalence. [14,15]

This particular study have not only served to highlight the improvement in adequacy of iodization in salt samples but also has pointed out areas to be addressed regarding further improvising the current situation of Iodization and sample collection. Further regular assessment of data including the details of Iodine concentration at production, distribution and household level in all the districts of Chhattisgarh is strongly recommended to evaluate the efficacy of IDD programme in Chhattisgarh.

CONCLUSION

To conclude, our study shows improvement in adequacy of iodization in samples received from all the 10 districts of Chhattisgarh in the year 2015 compared to year 2014 with significant improvement in Ambikapur, Baster and Dantewada district. We also noted remarkable increase in number of samples received from all the districts. We further recommend regular evaluation salt concentration at both manufacturer as well as household levels.

***Conflict of interest*:** Authors declare that there was no conflict of interest involved in the study.

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