International Journal of Community Medicine and Public Health
Biswas DK et al. Int J Community Med Public Health. 2019 Nov;6(11):4934-4939
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20195083

Original Research Article

Prevalence of iodine deficiency disorders among school student of Purba Medinipur, 2018: a cross sectional study

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Received: 13 September 2019
Accepted: 10 October 2019

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ABSTRACT

Background: Iodine deficiency disorder is one of the preventable public health diseases in India. Prevalence of goiter is also still prevalence at sub-Himalayan region of West Bengal. Study was conducted to assess prevalence of goiter among school students between 6 and 12 years age, to find out urinary excretion of iodine and iodine content in salt sample and to recommend for consuming iodized salt.
Methods: We conducted the study among the school students aged 6 to 12 years during the month of June 2018 in Purba Medinipur district, West Bengal, India. Multistage cluster sampling method was conducted for selecting the study population. Clinical examination was done by medical officer to detect goiters. Salt and urine samples were taken from the selected students and were sent to State Iodine Monitoring Laboratory, Kolkata for examination of iodine content in household salt samples and urine samples.
Results: Total 2821 students were examined for survey. Over all prevalence of goiter was 3.75% (109/2821). Girls had more prevalence 4.63% than boys 3.18%. Average urinary iodine excretion (UIE) level is 184.74% in 30 clusters of 339 urine samples. Only 5.60% showed UIE level ≤100 microgram/liter. Total 541 household salt samples were tested for iodine and average iodine content was 22.85%. Among them 91.5% (495) had iodine ≥15 ppm indicating adequate iodine contents in salt samples.
Conclusions: Purba Medinipur may be considered a non-endemic district. We recommended continuing use of iodized salt.

Keywords: Iodine deficiency disorders, Goiter, Purba Medinipur

INTRODUCTION

Iodine is an important micro-nutrient essential for growth and development of human body.[1] Iodine deficiency disorder is one of the preventable public health problems.[2] Globally two billion people are at risk of iodine deficiency disorders (IDD).[3] Disorders includes goiter, mental retardation, deaf mutation, squints etc.[4] According to World Health Organization (WHO), goiter rate 5% or more among the school student of 6-12 years age; should indicate a serious public health concern.[5]

In India estimated 150 million people are at risk of iodine deficiency disorders, among them 55 million have goiters; 2.2 million having cretin and about 6.6 million have other mild neurological disorders.[6] Iodine deficiency disorders survey was conducted in 275 districts in India, among them 235 districts were found endemic.[7] In West Bengal, four districts (such as Maldah, Birbhum, Dakshin Dinajpur and North 24 Parganas) were surveyed and all

these districts were endemic for IDD.[8] National Health and Family Survey (NHFS)-2 of India (1998-99) report showed that only 62% of household people were used Iodized salt whereas NHFS report 2015-16 showed consumption of iodized salt among household level increased to 93%. The expected level is > 90%. So, IDD is still a public health problem in West Bengal.[9] Prevalence of goiter is also still prevalence at sub-Himalayan region of West Bengal. Fortification of common salt with iodine began in India in the late 1960s. Other initiatives like awareness generation were also undertaken during these last decades. However reported impact assessment of these initiatives of the district of Purba Medinipur was done more than 10 years ago.[10]

Purba Medinipur district is the southern part of West Bengal and have large coastal areas and seems to be lower prevalence in IDD. The objectives of the study were to assess the prevalence of goiter among the school student of 6 to 12 years age, to find out urinary excretion and iodine content in salt sample of the study population and to recommend to consume iodized salt.

METHODS

Study setting

We conducted the study among the school students aged 6 to 12 years during the month of June to July 2018 in Purba Medinipur district, West Bengal, India. Purba Medinipur district had been split in to Purba Medinipur district and Nandigram health district by the department of Health, Government of West Bengal. Purba Medinipur district has 14 development blocks and 4 municipalities and Nandigram Health District has 11 development blocks and one municipality. Study was conducted at Purba Medinipur district. The southern side of the district has coastal area "the Bay of Bengal". Study was conducted among the school students aged 6-12 years, because they will be true representative (school enrollment of children in the district is more than 90%), easily accessible and high chance of developing iodine deficiency disorders.[11,12]

Sample size and sampling procedure

Sample size was calculated based on population proportionate to size in the age group of 6-12 years. A sample of 30 village or municipality ward (cluster) have been selected for the study. Multistage cluster sampling method was conducted for selecting the study population. Sampling was done as follows as total population district was 3191395 considered as census 2011, sample size=30 village/ward (cluster), sampling interval=total population/30=k (3191395/30), we took sampling interval was 106379 an integer [k], selection of random number 1 to k was 85001 [r], random number would be r (r=85001), r+k, r+2k, r+29k.[13]

Total 90 students of each cluster preferably 45 boys and 45 girls of 6-12 years student were examined for study. All villages and municipalities had been listed in excel sheet. From the village list, we selected the villages by PBS sampling method. School had been selected in the villages and wards identified during sampling. If there was no school available in the selected village and ward, then nearby village and ward had been chosen where school were available for selection of school. Line list of student was obtained from the headmaster or head mistress of school. After identification of schools a meeting with the respective school authority was conducted and the purpose of survey was also communicated to the guardian of the student through leaflets. So all student of 6-12 years participated in the study. Before conducting the survey, a training programme on data collection tool was organized among the health workers and medical officers those who were engaged in the survey.

Data collection and analysis procedure

We constructed data collection format. All information was recorded in the format. Examinations of student for goiters were done for each student. Salt samples were collected from the household of the selected student and urine sample were obtained from the randomly selected student. Salt samples was collected every 5th student and urine samples were collected every 10th student of the line list. A total 18 salt samples and 9 urine samples were collected from in each cluster of 90 students. About 15-20 gm of salt samples was collected from the household by the identified student and was kept preserved in poly packet (zipper packet) with air tight condition. Approximately 10-15 ml of urine samples were collected in the plastic container with crew capped air tight condition. Two-three drops of toluene was added in each urine samples as preservative. All the data were analyzed in excel and SPSS software.

Measurement of iodine content

Salt samples and urine samples were sent to "Sate Iodine Monitoring Laboratory" Department of Biochemistry, Calcutta Medical College and Hospital, Kolkata, West Bengal maintaining the cold chain 2-8 degree centigrade temperature for measurement of iodine content in salt and urine. Salt contains ≥15 ppm iodine would be considered as adequate iodized salt. Urinary iodine content ≥100 mcg/dl would be also considered as no iodine deficiency.

Assessment of goiter

Standard palpation method for grading of goiter recommended by WHO/UNICIEF/ICCIDD was applied to detect goiter and gradation of goiter such as Grade 0, Grade I and Grade II.[14]

Grade 0

No palpable or visible goiter was seen.

Grade I

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

Grade II

A swelling in the neck that is visible when the neck is in a normal position and is consistent with an enlarged thyroid when the neck is palpated.

Sum total of grade I goiter and grade II goiter would be considered as total number of goiter cases.

RESULTS

Total 2821 students were examined for survey of goiter screening, urinary iodine excretion and iodine content in household salt. Among them, boys and girls were more or less 50%. About 35% (1010/2821), 45% (1282/2821), 17% (473/2821) and 2% (56/2821) of them were belonged to 6-7 years, 8-9 year, 10-11 years and 12 years age group respectively. Over all prevalence of goiter (Grade I and II) was 3.75% (109/2821). Among them girls had more prevalence 2.26% (65/2821) than boys 1.60% (45/2821). Most of the goiter cases detected in the age group of 6-7 years 3.56% (36/1010) and 3.81% (18/473) in the age group of 10-11 years. Grade I goiter cases were only 24.77% (27/109) among the total cases. Table 1 cases were scatter distributed at different development blocks.

Table 1: Prevalence of goiter by age group (6-12 year) and sex in Purba Medinipur district, West Bengal, India' 2018.

Age group (in years)	Gender	Total student examined	Grade of goiter			Total goiter cases	Prevalence (%)
			Grade 0	Grade I	Grade 2		
6-7	Male	503	491	11	1	12	2.39
	Female	507	483	17	7	24	4.73
	Total	1010	974	28	8	36	3.56
8-9	Male	642	618	20	4	24	3.74
	Female	640	610	23	7	30	4.69
	Total	1282	1228	43	11	54	4.21
10-11	Male	241	232	6	3	9	3.73
	Female	232	223	4	5	9	3.88
	Total	473	455	10	8	18	3.81
12	Male	36	36	0	0	0	0
	Female	20	19	1	0	1	5
	Total	56	55	1	0	1	1.79
Over all	Male	1422	1377	37	8	45	1.60
	Female	1399	1335	45	19	64	2.26
Grand total		2821	2712	82	27	109	3.86

Table 2: Urinary iodine excretion by age (6-12 years) and sex of Purba Medinipur district, West Bengal, India' 2018.

Age (in years)	Sex	Total sample tested (n=339)	UIE >100 mcg/dl	UIE <100 mcg/dl	% of UIE <100 mcg/dl
6	M	25	23	2	8.00
	F	17	15	2	11.76
7	M	20	19	1	5.00
	F	27	25	2	7.41
8	M	33	30	3	9.09
	F	42	41	1	2.38
9	M	44	42	2	4.55
	F	31	28	3	9.68
10	M	21	20	1	4.76
	F	26	26	0	0.00

Continued.

Age (in years)	Sex	Total sample tested (n=339)	UIE >100 mcg/dl	UIE <100 mcg/dl	% of UIE <100 mcg/dl
11	M	14	13	1	7.14
	F	11	11	0	0.00
12	M	15	14	1	6.67
	F	13	13	0	0.00
Total	M	172	161	11	6.40
	F	167	159	8	4.79

A total 339 urine samples were tested for iodine. Over all urinary iodine excretion (UIE) less than 100 mcg/dl were indicated maximum among the boys 6.40% (11/172) than girls 4.79% (8/167) and also seen more in the age group of 6-7 years. Average UIE below100 mcg/dl was 5.60% (19/339) (Table 2).

Total 543 household salt samples were examined for iodine content. Iodine content in household salt samples less than 15 ppm were found only 8.47% (46/543) (Table 3).

Table 3: Iodine content at house hold level of Purba Medinipur district, West Bengal, India 2018.

Iodine content (ppm)	No. of samples tested (n=543)	%
0	0	0
<15	46	8.47
15-29.9	398	73.29
≥30	99	18.23

Table 4: Criteria for tracking progress towards eliminating Iodine deficiency disorders as a public health problem in Purba Medinipur, West Bengal, India' 2018.

Indicators	Goal (%)	Purba Medinipur (%)
Thyroid enlargement (age 6-12 years)	<5	3.86
Median UIE (mcg/dl)	>100 mcg/dl	184.73 mcg/dl
Proportion of UIE below 100 mcg/dl	<50	5.60
Proportion of UIE below 50 mcg/dl	<20	0
% of households consuming adequately iodised salt (≥15 ppm)	>90	91.53

The district achieved the elimination criteria of iodine deficiency disorder. Because thyroid gland enlargement (goiter) was only 3.86%, medium urinary iodine excretion was 184.74 mcg/dl, proportion of UIE below 100 mcg/dl was only 5.60% and use of iodized salt more than 15 ppm at household level was 91.53% (Table 4).

DISCUSSION

Prevalence of goiter

The district Purba Medinipur, West Bengal, India is a non-endemic district to iodine deficiency disorder, as prevalence of goiter was 3.86%. WHO iodine deficiency disorder (IDD) elimination criteria was if >5% of children aged 6-12 years have goiter then the district is still endemic to IDD. With increasing use of iodized salt the prevalence of goiter was decreased in West Bengal, India. In Purba Medinipur district the total goiter rate (TGR) has come down from 19.7% (16.7% grade I and 3% grade II) to 3.86% in this study.[10]

But TGR was observed high 25.9% in Purulia district in 2005 and also high TGR in Darjeeling district as 8.7%.[8,15] Prevalence of goiter among the girls was higher 2.26% than the boys 1.60% in our study. Similar finding was observed in a study at Budgam district of Kashmir, India where TGR among girls were 6.18% than boys 5.51%.[16]

Urinary iodine excretion level

More than 90% of human body's iodine is excreted through urine. So, urinary iodine excretion is one of the important indicators for assessment of IDD.[17] When median urinary iodine excretion level is 100 mcg/l indicates that 50% of samples should have UIE level above 100 mcg/dl. If not more than 20% of sample shows UIE level below 50 mcg/dl, this is indicated there was no iodine deficiency in the community.[18] In this study median urinary iodine excretion was 184.74 mcg/l. Similar finding was observed in a study at Bellur district of Karnataka when median urinary iodine excretion was 179 mcg/l and in Chattishgarh.[19]

Iodine content of salt

In 2007, 50.3% of the population was consumed iodized salt with iodine content >15 ppm in Purba Medinipur district where as our study revealed more than 93% of the population consumed iodized salt with iodine content >15 ppm.[10] Consumption of iodized salt increased.

This was more than the WHO/UNICIEF and ICCIDD recommended level of 15ppm of iodine in salt in more than 90% of households in the community needed for the elimination of IDD in a community.[20] The district Purba Medinipur, West Bengal, India was a non-endemic district to iodine deficiency disorder, because prevalence of goiter was 3.86%.

Though Purba Medinipur district is a non-endemic district to IDD, but still a few percentages of children having IDD and they require sensitization about use of iodized salt. Their family will be sensitized for use of iodized salt. We recommended to organize community sensitization programme on use of iodized salt in identified villages where salt content <15 ppm of iodine. Angwanwadi workers, self-help group and accredited social health activist workers may be involved to create awareness generation in the community. It would be more effective to provide hands on training to female household personnel regarding use of iodized salt during cooking. We recommended distributing information, education and communication (IEC) materials on use of iodized salt to every antenatal mother during their antenatal health check and mother meeting programme.

CONCLUSION

District Purba Medinipur was not endemic for iodine deficiency disorders. This was achieved due to effective implementation of universal iodization programme at both rural and urban areas. There are localized areas where a few cases were detected and iodine deficiency was identified. Focal awareness programme may be conducted at these sites. At the same time regular surveillance of salt and IEC will be done to maintain the sustainability of non endimicity about IDD in Purba Medinipur district in future.

ACKNOWLEDGEMENTS

Authors would like to thank health staffs of Purba Medinipur district who helped for data collection. The author would also thank to head of the department of Biochemistry, Medical College for helped for samples testing. Author would also acknowledge Dr. Kamala Kanta Pati, Jt. DHS (NCD), Government of West Bengal, Department of Health and Family Welfare, Swasthya Bhawan, Kolkata who helped to compete the study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. WHO. Investigating in the future. A united call to action on vitamins and mineral deficiencies. Global Report 2009. Available at: https://www.who.int/vmnis/publications/investigating_in_the_future.pdf. Accessed on 12 June 2019.
2. Assessment of iodine deficiency disorders and monitoring their elimination. A Guide for Programme Managers. 3rd ed. France: World Health Organization; 2007.
3. Sustainable Elimination of Iodine Deficiency. UNICEF; 2008.
4. Panday CS, Yadav K, Srivastava R, Panday R, Karmakar MG. Iodine deficiency disorders (IDD) control in India. Indian J Med Res. 2013;138:418-33.
5. Indictors for assessing iodine deficiency disorders and their control through salt iodization. Geneva: World Health Organization; 1994: Document No. WHO/NUT/94.6.
6. Pradhan R, Choudhry M. Assessment of iodine deficiency disorders in urban areas of Rajasthan. Indian Pediatrics. 2003; 40:406-9.
7. Elimination of iodine deficiency disorders in South East Asia. World Health Organization; 2008. Southeast Asia, SEA/NUT/174.doc.
8. Biswas AB, Chakraborty I, Das DK, Roy RN, Ray S, Kunti SK. Assessment of iodine deficiency disorders in Purulia District, West Bengal, India. J Trop Pediatr. 2006;52(4):288-92.
9. National Family Health Survey (NFHS-2), India 1990-99 and National Family Health Survey (NFHS-4). Mumbai: International Institute of Population Sciences; 2017.
10. Biswas AB, Chakraborty I, Das DK, Chakraborty A, Ray D, Mitra K. Elimination of iodine deficiency disorders–current status in Purba Medinipur district of West Bengal, India. Indian J Public Health. 2008;52(3):130-5.
11. National informatics center. Purba Medinipur district unit, West Bengal. Available at: purhttp://purbamedinipur.gov.in/EDUCATION-NEW.htm. Accessed on 9 June 2019.
12. Gakkar RK, Bhardwaj VK, Chansoria M, Jain S, Visnoi R. Prevalence of goitre in school going children in Jabalpur. Indian J Pediatr. 2001;68(3):229-33.
13. Tiwari BK. Revised Policy Guidelines on National Iodine Deficiency Disorders Control Programme. Revised edition 2006. IDD and Nutrition Cell. Directorate General of Health Services, Ministry of Health and Family Welfare. Nirman Bhawan, New Delhi: 2006.
14. Assessment of iodine deficiency disorders and monitoring their elimination: a guide for programme managers, 2nd ed. World Health Organization; 2001.
15. Biswas AB, Das DK, Chakraborty I, Biswas AK, Sharma PK, Biswas R. Goiter prevalence, urinary iodine, and salt iodization level in sub-Himalayan Darjeeling district of West Bengal, India. Indian J Public Health. 2014;58:129-133
16. Biswas AB, Chakraborty I, Das DK, Roy RN, Mukhapadhyay S, Chatterjee S. Iodine deficiency

disorders among school children of Birbhum, West Bengal. Current Sci. 2004;87(1):78-80.
17. Dunn JT, Van der Haar F. A practical guide to the correction of iodine deficiency-technical manual no. 3. The Netherlands: ICCIDD/UNICEF/WHO Publication; 1990; 13-20.
18. Sridhar PV, Kamala CS. Iodine Status and prevalence of goitre in school going children in rural area. J Clin Diagnost Res. 2014;8(8):15-7.
19. Sinha AK, Sharma H, Panda PS, Chandrakar A, Pradhan SK, Dixit S. Prevalence of goitre, iodine uptake and salt iodization level in Mahasamund district of Chhattisgarh: a baseline study in Central India. Int J Res Med Sci. 2016;4(8):3590-4.
20. ICCIDD/UNICEF/WHO. Assessment of iodine deficiency disorders and monitoring their elimination. A Guide for Programme Managers. 2nd ed. WHO/NHD/01.1; 2001.

Cite this article as: Biswas DK, Bhunia R, Mukherjee A. Prevalence of iodine deficiency disorders among school student of Purba Medinipur, 2018: a cross sectional study. Int J Community Med Public Health 2019;6:4934-9.