Original research article

A study of prevalence of Goiter among 6-12 years old school children: an observational study

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Abstract

Aim: In the present study we have estimated the prevalence of goiter in the age group of 6-12 years in district Bihar, India and have assessed type of salt consumed by the population. **Methods:** A cross-sectional descriptive in the Department of Community Medicine, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India from 1 year was conducted among school children aged 6-12 years in Bihar India . A total of 600 children (300 urban and 300 rural) were selected for goiter examination by multistage random cluster sampling technique. A total of 200 children were tested for the median urinary concentration and 200 salt samples were tested from the households of the study population. **Results:** The total Goiter rate was 8.67% among primary school children aged 6-12 years with a significant difference between ages. As the age increased the goiter prevalence also increased. The median urinary iodine excretion level was found to be 133 µg/l and 85% salt samples had >15 ppm iodine content. **Conclusions:** Present study shows mild goiter prevalence in primary school children in Bihar, India and an adequate iodine content of salt and urine.

Keywords: Goiter, Prevalence, IDD, Urinary iodine

Introduction

Iodine deficiency disorders (IDD) has been recognized as a public health problem in India. Surveys conducted in various states showed that no state in the country is free from IDD. Sample surveys conducted in 25 states and 5 Union territories of the country revealed that out of 282 districts surveyed so far, IDD is a major public health problem in 241 districts where the prevalence is more than 10%. It has been estimated that in India 200 million people are living in iodine deficient areas, 71 million persons are suffering from goiter and other IDD.[1,2] Enlargement of thyroid gland is the IDD. Failure to undertake early detection and intervention measure results in secondary disabling conditions. Universal Salt Iodization (USI) is a strategy to ensure sufficient intake of iodine by all individuals was recommended by the WHO and UNICEF Joint Committee on Health Policy in 1994.[3] Some experts believe that universal salt iodization may be the most successful public health effort of the past two decades[4] and a remarkably cost-effective public health goal.[5]

Iodine is an essential micronutrient required at 100-150 micrograms daily for normal human growth and development.[6] Iodine deficiency leads to a much wider spectrum of disorders commencing with the intrauterine life and extending through childhood into adult life with serious health and social problems. Majority of consequences of iodine deficiency disorders (IDD) are invisible and irreversible but at the same time preventable.[7] School-age children of 6 to 12 years are considered as an important target group for surveillance of IDD because they are highly vulnerable, easy to access, and also their applicability in a variety of surveillance activities.[8] Bihar, being a drought prone area with semi-arid climate, mainly dependent on ground water for drinking has also been home for fluorosis. As there are no recent studies on the prevalence of goiter in this part. Hence the present

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study was undertaken with the aim to assess the prevalence of goiter among 6-12 years old school children

Materials and Method

A cross-sectional descriptive study was conducted in the Department of Community Medicine, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India.

The study protocol was reviewed by the Ethical Committee.

Sampling

A total of 600 students were selected, 300 each from the urban and rural schools. Multistage cluster random sampling technique was used to select study sample.

Methodology

The assessment for prevalence of goiter among school children was done using a pre-tested semi structured and pre-validated questionnaire. Urine iodine was measured by Sandall Kolthoff method and salt iodine by a semi- quantitative test kit.[8]

Statistical Analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2010) and then exported to data editor page of SPSS version 19 (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics included computation of percentages.

Results

Table 1: Distribution of study subjects according to grade of goiter

Grade of goiter	Rural	Urban	Total
	N (%)	N (%)	N (%)
Grade 1	264 (88)	284 (94.67)	548 (91.33)
Grade 2	28 (9.33)	12(4)	40 (6.67)
Grade 3	8(2.67)	4(1.33)	12 (2)
Total	300	300	600

$\chi 2=20.758$, df=2, p=0.001.

Table 2: Age wise distribution of children according to grades of goiter

Age (years)	Grade 1	Grade 2 and 3	Total
	N (%)	N (%)	N (%)
6-8	181 (33.02)	4 (7.69)	185 (30.83)
8-10	171 (31.20)	8(15.38)	179(29.83)
10-12	196 (35.76)	40 (76.92)	236 (39.34)
Total	548	52	600

$\chi 2=37.05$, df=2, p=0.001.

Table 3: Mean urine iodine level among the study subjects

Urine iodine	
No.	200
Minimum	36 µg
Maximum	199 µg
Mean	122.45 µg
Median	133 µg
SD	34.36

Table 4: Distribution of UIE levels among the study subjects.

UIE	Frequency	%
Inadequate	30	15
Adequate	170	85
Total	200	100

Table 5: Distribution of salt iodine levels among study subjects

Salt iodine	Frequency	%
Inadequate iodine	30	15
Adequate iodine	170	85
Total	200	100

Discussion

The present study was conducted 26years after the implementation of universal iodization of edible salt. This study was conducted to find the current status of goiter prevalence in bihar region among school children aged 6- 12 years.

The total prevalence of goiter (i.e., the palpable and visible goiter) in the present study was found to be 8.67%. According to the WHO criteria for severity of goiter, this rate of goiter prevalence falls under the category of being a mild public health problem as it falls in the range of 5.0- 19.9%. This indicates that bihar is in a transition phase from iodine deficient to being iodine sufficient.[9]There is a wide variation of prevalence of goiter across the country, as observed in various studies ranging from 0.125-50.1%.[10,11] Severe endemicity of goiter was reported by Joshi et al in a rural area of Meerut with an overall prevalence of goiter of 50.1%, and Sayed et al (34.6%). Persistence of severe goiter was attributed to environmental iodine deficiency and also diets high in certain foods which interfere with iodine utilization by the body.[11,12]

Kapil reported IDD to be of mild degree in Bharatpur, Rajasthan and Champaran district, Bihar with an overall goiter prevalence of 7.2% and 11.6% respectively.[13,14] Similar findings were made by Sareen et al in Uttarakhand (TGR=13.2%) and by Lohiya et al in Faridabad, Haryana (TGR=17%).[15,16]

This wide variation could be due to geographical disparity in the country with respect to the environmental factors influencing the prevalence of goiter.[17] This could also be due to variation in the methodology adopted in terms of sample size and age groups included in various studies.

The present study showed that among the grades of goiter, Grade 2 (6.67%) was found to be more prevalent than grade 3 (2%). Chandra et al, also observed in Imphal, Manipur and Sundarban delta of West Bengal, that most of the goiter was found to be Grade 2 (24.73% and 30.4% respectively) and the prevalence of Grade 3 was only 5.29% and 2.7% respectively.[18,19] Similarly other studies in Churachanpur District of Manipur by Singh et al and Kulgam district of Jammu and Kashmir by Khan et al, the prevalence of Grade 2 goiter was found to be higher than Grade 3 goiter.[20,21]

The prevalence of goiter was found to increase with age in the present study, with highest prevalence among 10- 12 years age group (76.92%). This was similar to the

observations made by Chaudhary et al in Ambala district of Haryana, the goiter rate was higher (1.7%) in 9 to 12 years age group as compared to 6 to 8 years (1.45%).[22] Similar observations of increase in the goiter prevalence with age was observed in other studies by Makwana et al in Jamnagar and by Amin et al in Amreli, Gujarat with a highest prevalence among 11-12 years of age.[23,24]

Biswas et al in Birbhum, West-Bengal found that the prevalence was found to increase with age except for children aged 10 years (12.9%), with a goiter rate of 11.9% and 13% among 8 and 9 year old children respectively.[25]

The median urine iodine in the present study was found to be 133 µg/l, 15% of them had inadequate UIE, whereas 85% of the children had adequate urine UIE iodine excretion which was similar to recent study by Kapil U et that 86% of the districts in India had adequate UIE (100 µg/l).[26] Similarly in Sundarbans, West-Bengal, it was found that median urinary iodine level was 225 mg/l, 76.7% of the children had adequate UIE whereas 23.3% had UIE below 100 µg/l.[27] Whereas Jagirdar et al in Kolhapur district of Maharashtra, observed that only 19.8% of the samples had adequate UIE and 80.2% samples had inadequate UIE.[17]

The salt iodine content was found to be adequate (>15 ppm) in 85% of the samples. The 15% of the samples which had inadequate iodine content can be explained due to improper methods of storing the iodized salt at the household level.

Das et al in Chandigarh observed that majority (98.1%) of the samples had adequate iodine content (>15 ppm).[27] Whereas in the basin of the river Ganga and the Bay of Bengal in the Howrah and Purba districts showed that 66.4% of households were consuming salt with adequate iodine.[28]

In Jodhpur, Rajasthan, it was observed that majority of children consumed inadequately iodized salt which indicates that the consumption of iodized salt in desert area is extremely low in spite of the national programs in operation.[25]

Conclusion

The study concludes that goiter continues to be prevalent in mild endemic proportions (8.67%) in bihar ,india this calls for identification of factors leading to goiter despite effective implementation of universal salt iodisation. It can be considered that it is in a transition phase from iodine deficient to iodine sufficiency. However, it continues to be an important public health problem and it is essential to monitor the iodine content of salt on a regular basis. IDD control activities should be strengthened and surveys should be done every 3-5 years to monitor the progress in eliminating IDD. Therefore, sustainment of and proper monitoring of the universal salt iodisation program can lead to elimination of IDD in the area, in near future.

Reference

1. National Iodine deficiency control programme, Annual Report (2001-2002) Ministry of Health and Family Welfare, Govt of India, New Delhi.
2. Taneja DK. National Health Policies and programmes in India. 4th ed. New Delhi: Doctor Publications; 2004.
3. WHO, UNICEF, ICCIDD: Assessment of iodine deficiency disorders and monitoring their elimination: a guide for programme managers. Geneva: World Health Organization; 2007.
4. UNICEF: Sustainable Elimination of Iodine Deficiency, Progress since the 1990 World Summit for Children. New York: UNICEF; 2008:1-29.
5. Mannar MGV: Iodized Salt for the Elimination of Iodine Deficiency Disorders. InNew Delhi: Manzar Khan. Edited by Hetzel BS. New Delhi: Oxford University Press; 2004
6. Directorate General of Health Services Ministry of Health and Family Welfare, Government of India; 2006. National Rural Health Mission IDD and Nutrition Cell. Revised Policy Guidelines On National Iodine Deficiency Disorders Control Programme. Available at: http://www.whoindia.org LinkFiles/Nutrition_Revised_Policy_Guidelines_On_NIDDCP.pdf. Accessed on 1 July 2019.
7. Pandav CS, Yadav K, Srivastava R, Pandav R, Karmarkar MG. Iodine deficiency disorders (IDD) control in India. Indian J Med Res. 2013;138:418- 33.
8. ICCIDD, UNICEF, WHO. Assessment of iodine deficiency disorders and monitoring their elimination: a guide for programme managers. Geneva: World Health Organization; 2007
9. Status Report on National Iodine Deficiency Disorders Control Programme in Southern States. Available at: http://www.iddindia.20m.com/status NIDDCPSouthernstates2. htm). Accessed on 30 September 2019.
10. Sridhar PV, Kamala CS. Status and Prevalence of Goitre in School Going Children in Rural Area.J Clin Diagn Res. 2014;8(8):15-7.
11. Joshi DC, Mishra VN, Bhatnagar M, Singh RB, Garg SK, Chopra H. Socioeconomic factors and prevalence of endemic goiter. Indian J Public Health. 1993;37:48-53.
12. El-Sayed NA, Mahfouz AA, Nofal L, Ismail HM, Gad A, Zeid HA. Iodine deficiency disorders among school children in upper Egypt: an epidemiologic study. J Trop Pediatr. 1998;44:270-4.
13. Dodd NS, Samuel AM. Iodine deficiency in adolescents from Bombay slums. Natl Med J India. 1993;6(3):110-3.
14. Kapil U, Singh J, Prakash R, Sundaresan S, Ramachandra S, Tandon M. Assessment of iodine deficiency in selected blocks of east and west Champaran districts of Bihar. Indian Pediatr. 1997;34:1087-91.
15. Sareen N, Kapil U, Nambiar V, Pandey RM, Khenduja P. Iodine nutritional status in Uttarakhand State, India. Indian J Endocrinol Metab. 2016;20(2):171-6.
16. Lohiya A, Yadav K, Kant S, Kumar R, Pandav C. Prevalence of iodine deficiency among adult population residing in Rural Ballabgarh, district Faridabad, Haryana. Indian J Public Health. 2015;59(4):314.
17. Karmarkar MG, Deo MG, Kochupillai N, Ramalingaswami V. Pathophysiology of Himalayan endemic goiter. Am J Clin Nutr. 1974;27:96-103.
18. Chandra AK, Singh LH, Debnath A, Tripathy S, Khanam J. Dietary supplies of iodine and thiocyanate in the aetiology of endemic goitre in Imphal East district of Manipur, North East India. Indian J Med Res. 2008;128:601-5.
19. Chandra AK, Tripathy S, Ghosh D, Debnath A, Mukhopadhyay S. Iodine nutritional status and prevalence of goitre in Sundarban delta of South 24- Parganas, West Bengal. Indian J Med Res. 2005;122:419-24.
20. Singh LH, Haobam, Arke L, Chandra AK. Prevalence of Endemic Goiter in School Children during Post Salt Iodization Period in Churachanpur District, Manipur, India. Int J Med Health Sci. 2015;4:20-3.
21. Khan SMS, Mahjabeen R, Masoodi MA, Kauser J, Nabi S. Prevalence of goiter among Primary

school children of Kulgam district, Jammu and Kashmir, India. Acad Med J India. 2014;2:18-21.
22. Chaudhary C, Pathak R, Ahluwalia SK, Goel RKD, Devgan S. Iodine deficiency disorder in children aged 6-12 years of Ambala, Haryana. Indian Pediatr. 2013;50(6):587-9.
23. Shah H, Shah V, Makwana N, Unadkat S, Yadav S. Goiter prevalence and current iodine deficiency status among school age children years after the universal salt iodization in Jamnagar district, India. Thyroid Res. 2012;9(2):40.
24. Amin D, Rathod S, Doshi V, Singh MP. Changing Prevalence of Iodine Deficiency Disorders in Amreli District, Gujarat, India. Natl J Integr Res Med. 2011;2(3):77-80.
25. Biswas AB, Chakraborty I, Das DK, Roy RN, Mukhopadhyay S, Chatterjee S. Iodine deficiency disorders among school children of Birbhum, West Bengal. Curr Sci. 2004;87(1):78-80
26. Kapil U. Successful efforts toward elimination iodine deficiency disorders in India. Indian J Community Med. 2010;35:455-68.
27. Singh MB, Marwal R, Lakshminarayana J. Assessment of iodine deficiency disorders in school aged children in Jodhpur dictrict of Rajasthan. J Hum Ecol. 2010;32(2):79-83.
28. Girma K, Nibret E, Gedefaw M. The status of iodine nutrition and iodine deficiency disorders among school children in MetekelZone, northwest Ethiopia. Ethiop J Health Sci. 2014;24(2):109-16

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