# **Research Article**

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20151555

# Prevalence of iodine deficiency disorders among 6 to 12 years school children of Ramanagara district, Karnataka, India

Mallikarjun K. Biradar\*, Manjunath M., Harish B.R., Nagaraj Goud B.

Department of Community Medicine, MIMS, Mandya, Karnataka, India

Received: 12 October 2015 Accepted: 01 December 2015

\*Correspondence:

Dr. Mallikarjun K. Biradar,

E-mail: mallubiradar82@gmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

#### **ABSTRACT**

**Background:** Iodine is an essential micronutrient with an RDA of  $100-150~\mu g$  for normal human growth and mental development. Iodine deficiency disorders (IDD) constitute the single largest cause of preventable brain damage worldwide. Majority of consequences of IDD are invisible and irreversible but at the same time these are preventable. The study was conducted to assess the prevalence of goiter in school children aged 6-12 years and to assess the level of iodine concentration in salt samples obtained from households of selected school children.

**Methods:** Population proportionate to size sampling. Sample size: 90 primary school-going children of age 6-12 years in each selected village, total 2700 from 30 villages in Ramanagara district, Karnataka, India.

**Results:** The prevalence of goiter among the 6 - 12 years children was found to be 8.6%. Females had higher prevalence compared to males in all the age groups but the difference was not statistically significant (0.437). Of the 540 salt samples, 518(95.3%) had iodine concentration  $\ge 15$  ppm at household level.

**Conclusions:** IDD is a mild public health problem in Ramanagara district. There is a need of periodic surveys to assess the change in magnitude of the IDD with respect to impact of iodized salt (IS) intervention.

**Keywords:** Goiter, Iodine deficiency disorders (IDD), Iodized salt, Prevalence, School children

# INTRODUCTION

Iodine is an essential micro nutrient that is used for the synthesis of thyroid hormones from thyroid gland, which are involved in regulating metabolism, development and tissue differentiation. Iodine is primarily obtained through the diet, deficiency of which results in a spectrum of disorders categorized as iodine deficiency disorders (IDDs). IDD constitute the single largest cause of preventable brain damage worldwide leading to learning disabilities and psychomotor impairment. Children living in iodine-deficient areas on an average have lower intelligence quotient (IQ), by as much as 13.5 IQ points as compared to children living in iodine-sufficient areas. IDD have been shown to be associated

with at least six of the eight Millennium Development Goals.<sup>2</sup> Sample surveys have been conducted in 28 States and 7 Union Territories which have revealed that out of 324 districts surveyed so far, 263 districts are IDD endemic i.e. the prevalence of IDD is above 10 percent.<sup>3</sup>

In 1983, mandatory iodization of all table salt was introduced in India in an attempt to eliminate iodine deficiency. The Government of India has relaunched National Iodine Deficiency Disorders Control Programme (NIDDCP) in the year 1992 with a goal to reduce the prevalence of IDD to non-endemic level. After implementation of NIDDCP, India has made considerable progress toward IDD elimination. During November, 2005, central government has issued notification banning

the sale of noniodized salt for direct human consumption in the entire country, which became effective from 17<sup>th</sup> May, 2006 under the Food Adulteration Act.<sup>4</sup>

The launch of NGCP and a Goiter Cell was established in the Bureau of Nutrition, Directorate of Health and Family Welfare Services. An interim study conducted between 1988 and 1991 for the first time estimated the magnitude of the problem across Karnataka.<sup>5</sup> .The survey in Bangalore rural district which included today's Ramanagara district in year 1988-89, showed a goiter prevalence of 1.79 & and total percentage of population consuming >15ppm of iodized salt was 28.9.<sup>6,7</sup> Ramanagara district was carved out of the Bangalore Rural district on 23 August 2007 and the present survey was carried out with the objective to assess the prevalence of goiter in school children aged 6-12 years and to assess the level of iodine concentration in salt samples obtained from households of selected school children.

#### **METHODS**

The survey was conducted in the month of January & February 2015 using the method of Population Proportionate to Size (PPS) sampling in the age group of 6-12 years children. As per 2011 census report the total population of the district is 10, 82,636 and the population residing in rural areas of Ramanagara district is 8,14,877. Using the list of villages as per the 2011 Census report of Ramanagara district and by calculating cluster interval, 30 villages were selected from the list (Annexure). Only rural areas were included and urban population was excluded. Permission from the authorities of the education department and the district health office were obtained. In the selected villages, the primary schools were visited and a sample of 90 children in the age group of 6-12 years was selected and examined. If the required number of children was not covered, then schools in

adjacent villages were visited to ensure 90 children were examined in that cluster.

Prevalence of goiter was assessed by standard palpation method and graded as Grade-0, no palpable or visible goiter; Grade-1, goiter that is palpable but not visible when the neck is in the normal position; and Grade-2, a goiter that is visible when the neck is in normal position and is palpable. Every 5<sup>th</sup> child in the selected sample was covered for obtaining the salt sample from their home.

#### Statistical analysis

Data were entered in Microsoft Office excel 2007, compiled and analyzed using Epi Info software, version 3.5.2. Proportions, Chi-Square test were used for statistical analysis.

The Institutional Ethical Committee approved this study, as this was a part of the National Health Program assigned by the State Government.

# **RESULTS**

# Prevalence of goiter

From the selected 30 villages, a total of 2700 school children in the age group of 6-12 years were examined for the presence of goiter.

The prevalence of goiter among the 6 - 12 years children was found to be 8.6%. Prevalence of goiter was observed to increase with age, but was found to be statistically significant (P-Value=0.01047). Females had higher prevalence compared to males in all the age groups but the difference between sexes was not statistically significant as shown in Table 1.

Table 1: Age and sex wise goiter prevalence among 6-12 years school children of Ramanagara district, Karnataka, India.

Age Group (years)	Sex	Total Examined	Grades of Goiter		(%)
			0 Grade	1 <sup>st</sup> Grade	
6 -7	Male	257	243	14	5.4
	Female	292	274	18	6.2
	Total	549	517	32	5.8
8 - 9	Male	314	289	25	8.0
	Female	369	34 <b>3</b>	26	7.0
	Total	683	632	51	7.5
10 - 11	Male	476	430	46	9.7
	Female	463	411	52	11.2
	Total	939	841	98	10.4
12	Male	264	242	22	8.3
	Female	265	236	29	10.9
	Total	529	478	51	9.6
Grand Total		2700	2468	232	8.6

Chi Square = 11.25; d.f=3; P-Value= 0.01047.

Table 2: Analysis of Iodine content of the salt samples (MBI Kit).

Total Number of salt samples	<15 ppm	≥15 ppm
540(100)	22(4.07%)	518(95.3%)

# Analysis of iodine concentration of salt samples

As per the revised NIDDCP guidelines during the survey, 540 (20% of the total sample size) salt samples were collected from the houses of children. Approximately 20 grams of salt were collected in auto seal plastic pouches and the iodine concentration of the salt samples was estimated by the MBI kit.

Of the 540 salt samples, 518(95.3%) had iodine concentration of more than or equal to 15 ppm at household level. 22 (4.07%) of the salt samples had iodine concentration less than 15 ppm of which 14 samples (2.6%) had no Iodine content in them as shown in Table 2.

# DISCUSSION

A total of 2700 school children in the age group 6-12 years were examined for the presence of goiter. The goiter prevalence rate of 8.6% in the 6-12 year school children indicates that IDD is a mild public health problem in the district of Ramanagara, Karnataka, India.

Similar findings were observed in a study done by Chudasama RK et al in Saurasthra region showed the prevalence rate of 8.8% and a study by Pushpa Sarkar et al, in neighbouring district Mandya, showed that the prevalence rate was 6.6% in school children and females had a higher prevalence compared to males in all the age groups. <sup>8,9</sup> Makwan NR et al ,study shows the overall prevalence of goiter among the study population was 4.83%. <sup>4</sup>

Contrast to our study findings, higher prevalence rate of goiter (13.2%) was observed in a study by Kapil U, Haresh Rameshkumar Chandwani et al study in Bharuch district, Gujarat  $(23.2\%)^{11}$  and Kamath R et al study in Rural Belgaum, 16.6%.

About 95.3% of the salt sample had iodine concentration  $\geq 15$  and 2.6% had no iodine content. This may be because salt was iodized inadequately at the manufacturer level or due to loss of iodine during the distribution process.

Haresh Rameshkumar Chandwani et al study shows that about 93% of the households were consuming salt at adequate levels, 11 and Kamath R et al study in rural Belgaum, revealed that only 50% of the household had adequate iodine content (>15 ppm). 12

Iodine deficiency disorders (IDD) are preventable disorders, but in India previous studies had shown that no states or union territories of the country were free from IDD. The WHO / UNICEF / ICCIDD also recommended that 90% of household salts should get iodized at the recommended level of 15ppm. In India, IDD can be eliminated by changing dietary habits or eating certain kinds of the foods grown in that area. However, the previous study conducted in a similar setting suggested that behavioural and environmental factors at the community level could contribute to such variations. For example, most people were unaware of the IDD and managed iodized salt poorly. The environment within which iodized salt was stored was insufficient for maintaining proper salt iodization at the consumer level. The preventable measures can also be taken by fortification of salt with iodine which has been low cost and successful intervention. The findings of the present study suggest that the Ramanagara district is in the transition phase from iodine deficient to iodine sufficient with nearly mild goiter prevalence. But detailed data analysis should be done to identify geographical distribution of goiter prevalence within the district.<sup>4,11</sup>

# **CONCLUSION**

The present study showed mild Goiter prevalence in primary school children in the Ramanagara district and adequate iodine content of salt found at the household level. There is a need of periodic surveys to assess the magnitude of the IDD with respect to impact of iodized salt (IS) intervention, providing iodized salt in Public Distribution System, strengthening monitoring and evaluation of IDD programme and ensuring sustainability of IDD control activities are essential to achieve sustainable elimination of IDD in India.

# **ACKNOWLEDGEMENTS**

The authors wish to acknowledge the Directorate of Health and Family welfare, Government of Karnataka for entrusting the Mandya Institute of Medical Sciences, Mandya, with the survey and providing the necessary financial assistance, district education department, Ramanagara for their support and also to the Glasix company for supplying MBI kit free of cost to conduct level of iodine in salt sample. The authors would also be thankful to all the school children, teachers who participated and gave their cooperation in conducting the survey.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

Institutional Ethics Committee

#### REFERENCES

- Rao GN, Krishnamurthy U. Trend in Iodine Deficiency Disorders in Karnataka, India. Indian journal of applied research.2013;3(5):17-9.
- 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
- 3. Tiwari BK, Ray I, Malhotra RL. Policy Guidelines on National Iodine Deficiency Disorders Control Programme-Nutrition and IDD Cell. New Delhi: Directorate of Health Services, Ministry of Health and Family Welfare, Government of India; 2006.1-22
- 4. Makwan NR, Shah VR, Unadkat S, Shah HD, Yadav S. Goiter prevalence and current status among school age children years after the universal salt iodization in Jamnagar district, India. Thyroid Res Pract .2012;9:40-4.
- Sundaram J, Sugunammanni BK, Chandrashekar T. Report, Control of iodine deficiency disorders - an initiative in Karnataka. IDD Cell, Bureau of nutrition, Director of Health and Family Welfare Services, Bangalore.1990:1-10.
- Sundaram J, Sugunammanni BK, Chandrashekar T.
  Goiter prevalence in Karnataka. Indian J
  Community Health.1997;63:98-105.
- 7. Kapil U, Singh P, Pathak P. Rapid Survey of Status of Salt Iodization and Urinary Iodine Excretion

- Levels in Karnataka, India. Current Science. 2004;87:1058-60.
- 8. Chudasama RK, Verma PB, Mahajan RG. Iodine nutritional status and goiter prevalence in 6-12 years primary school children of Saurashtra region, India. World J Pediatr .2010;6:233-7.
- Sarkar P, Harish BR, Raghunath H, Mahendra BJ, Vinay M, Nimisha V. Prevalence of Iodine Deficiency Disorders among School Children Aged 6-12 Years in Mandya District, Karnataka. International Journal of Scientific Study. 2014;2(8):155-8.
- 10. Kapil U, Pandey RM, Jain V, Kabra M, Sareen N, Bhadoria AS. Status of iodine deficiency disorder in district Udham Singh Nagar, Uttarakhand state India. Indian J Endocr Metab. 2014;18:419-21.
- 11. Chandwani HR, Shroff BD. Prevalence of Goiter and Urinary Iodine Status in 6- 12 Year Old Rural Primary School Children of Bharuch District, Gujarat, India. Int J Prev Med. 2012;3(1):54–9.
- 12. Kamath R, Bhat V, Rao R, Das A, Ganesh KS, Kamath A. Prevalence of Goiter in rural area of Belgaum district, Karnataka. Indian J Community Med .2009;34:48-51.

Cite this article as: Biradar MK, Manjunath M, Harish BR, Goud NB. Prevalence of iodine deficiency disorders among 6 to 12 years school children of Ramanagara district, Karnataka, India. Int J Community Med Public Health 2016;3:166-9.