International Journal of Community Medicine and Public Health
Sonavane RS et al. Int J Community Med Public Health. 2017 Dec;4(12):4553-4557
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20175329

Original Research Article

A community based cross sectional study on prevalence of iodine deficiency disorders among 6-12 years children of a district of North Karnataka

Rekha S. Sonavane[1], Ramesh H. Mayappanavar[1]*, Ananthachari K. R.[1], Subarna Roy[2], Venkateswara Prasad U.[3], Mahesh Byakod[1], Roshan Mudaraddi[1], Shilpa K.[1]

[1]Department of Community Medicine, Gadag Institute of Medical Sciences, Gadag, Karnataka, India
[2]MRHRU, NITM, Belgavi, Karnataka, India
[3]MRHRU, Sirwar, Riachur District, Karnataka, India

Received: 13 September 2017
Revised: 02 November 2017
Accepted: 03 November 2017

***Correspondence:**
Dr. Ramesh H. Mayappanavar,
E-mail: rameshmayappanavar2@gmail.com

ABSTRACT

Background: Iodine deficiency is the major preventable cause of irreversible mental retardation in the world with nearly 2 billion people with iodine deficiency disorders (IDD). In India district level surveys conducted in 2006 in 324 districts have revealed that IDD is a major public health problem in 263 districts that is total goitre prevalence rate of more than 10% in the population.
Methods: The survey was conducted from November 2016 to January 2017, after obtaining permission from Institutional Ethical Committee, using population proportionate to size (PPS) sampling method among of 6-12 years children. In the selected villages, primary schools were visited and a sample of 90 children was selected and was examined after consent from school authority. Prevalence of goitre was assessed and graded by standard palpation method. In few selected children urine and house hold salts are examined.
Results: The prevalence of goitre among the 6 to 12 years children was found to be 22.78%. There was not much difference in prevalence of goitre in females compared to males in all the age groups and prevalence of goitre was observed to increase with age, which was found to be statistically significant (p=0.00001).
Conclusions: Prevalence of iodine deficiency is significantly high and higher prevalence was found with increasing age.

Keywords: Iodine deficiency disorder, Prevalence, Children

INTRODUCTION

Iodine is an essential micronutrient (100-150 microgram) required for thyroid harmones- Tri-iodothyronine (T3) and Thyroxine (T4) synthesis and it must be consumed adequately in the diet. Inadequate iodine intake leads to inadequate thyroid hormone production resulting in iodine deficiency disorders (IDD).[1]

It could result in abortion, still birth, mental retardation, deaf-mutism, squint, dwarfism, goitre, neuromotor defects etc. Thus IDD directly affects human resource development and in turn national development.[2]

Iodine deficiency is the major preventable cause of irreversible mental retardation in the world with nearly 2 billion people with IDD.[3]

In 1983 mandatory iodization of all table salt was introduced in India in an attempt to eliminate iodine deficiency and national iodine deficiency disorder control programme (NIDDCP) was launched during 1992 by directorate of health and family welfare services, as 100% centrally sponsored scheme with the creation of an IDD cell.[2] In 2005, Government of India has banned the sale of non-iodized salt for direct human consumption thought the country under the food adulteration act to be effective from May 17th 2006.[4]

Inspite of this, in India district level surveys conducted in 2006 out of 324 districts, IDD is a major public health problem in 263 districts, that is total goitre prevalence rate of more than 10% in the population.[2] Hence this study was conducted to assess the burden of IDD among children in the district.

Objectives

To estimate the prevalence of iodine deficiency disorders and its associated factors among 6-12 years children of rural area of Gadag district.

METHODS

The survey was conducted from November 2016 to January 2017, after obtaining permission from Institutional Ethics Committee, using population proportionate to size (PPS) sampling method among of 6-12 years children.

As per 2011 census report the total population of the district was 10, 64,570 and the population residing in rural areas of Gadag district was 9, 66,803. Using the list of villages in all five taluka as per the 2011 Census report of Gadag district, by cluster sampling method cluster interval calculated and 30 villages were selected from the list. 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, government primary schools were visited and a sample of 90 children in the age group of 6-12 years was selected by systematic sampling and examined after consent from school authority.

Inclusion criteria

All the selected students in the age group of 6-12 years who were present during study were included.

Exclusion criteria

Students absent on the day of visit were excluded and in place of absent students, the next role number students were enrolled in to study.

Among students who fulfilled inclusion criteria prevalence of goitre was assessed by standard palpation method and graded as Grade 0-no palpable or visible goitre; Grade 1- goitre that is palpable but not visible when the neck is in the normal position; and Grade 2-goitre that is visible when the neck is in normal position and is palpable.

Every 5th child in the selected sample was covered for obtaining the salt sample from their home. Every 10th child in the selected sample was covered for obtaining the urine sample for iodine estimation.

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 iodometric titration method.

Urine samples were collected in sterile container which was kept in cold box and transported to department where it was stored in ILR. Urine samples were tested for urinary iodine by Sandell – Kolthoff method at Model Rural Health Research Unit (MRHRU) Sirwar (Raichur district).

Data was entered in Microsoft excel and analysed using percentages and chi-square test.

RESULTS

Out of 2700 children, who were examined for assessing IDDs, 1348 were male and 1352 were females (Figures 1 and 2).

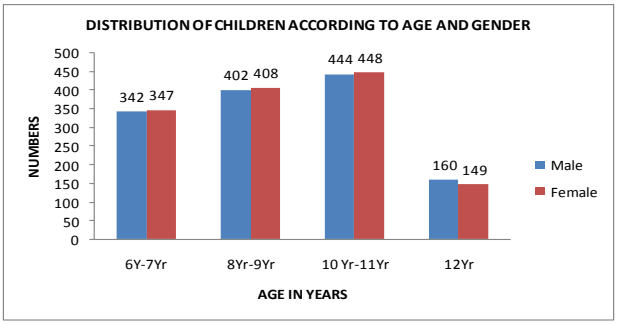

Figure 1: Age and sex distribution of the children.

From the Tables 1 and 2 it is observed that, the prevalence of goitre among the children was found to be 22.78%. And 19.67% of children had grade 1 goitre and 3.11% had grade 2 goitre. Among those male children who had goitre, 20.25% were grade 1 and 1.85%; were grade 2 goitre; among those female children who had goitre 19.08% had grade 1 and 4.38% had grade 2 goitre (Figure 3).

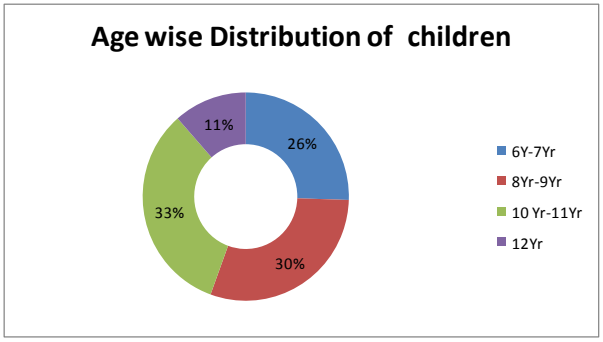

Figure 2: Pie diagram showing age distribution of the children.

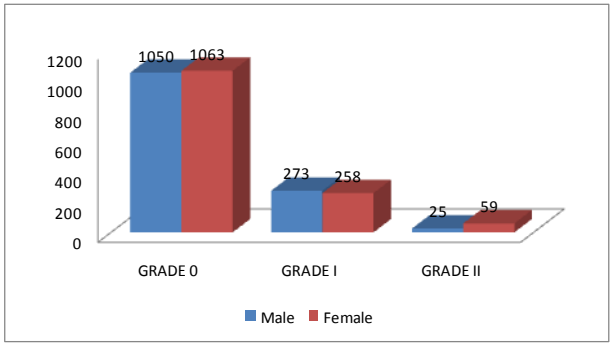

Figure 3: Age and sex distribution of the children according to the goitre status.

Table 1: Prevalence rate of goitre among 6-12 years aged school children of Gadag district by sex.

Sex	Total examined	Grades of Goitre			(%)
		0 Grade	1st Grade	2nd Grade	
Male	1348	1050	273	25	22.11
Female	1352	1063	258	59	23.45
Total	2700	2113	531	84	22.78

Chi square=13.892; d.f= 2; p=0.00096.

Table 2: Prevalence rate of goitre among children aged 6 to 12 years in Gadag district.

Age group (years)	Sex	Total examined	Grades of Goitre			(%)	Significance
			0 Grade	1st Grade	2nd Grade		
6 to 7	Male	342	287	54	1	16.08	χ^2=0.035
	Female	347	293	54	0	15.56	df= 2
	Total	689	580	108	1	15.82	p=0.8517
8 to 9	Male	402	330	68	4	17.91	χ^2=0.309
	Female	408	339	64	5	16.91	d.f= 2
	Total	810	669	132	9	17.40	p=0.8569
10 to 11	Male	444	329	101	14	25.90	χ^2=0.8907
	Female	448	333	96	19	25.67	d.f= 2
	Total	892	662	197	33	25.78	p=0.6406
12	Male	160	104	50	6	35	χ^2=0.0499
	Female	149	98	45	6	34.23	d.f=2
	Total	309	202	95	12	34.63	p=0.9754

Table 3: Analysis of iodine content of the salt samples.

Total number of salt samples	<15 ppm	≥15 ppm
540 (100)	214 (39.63%)	326 (60.37%)

Table 4: Analysis of iodine content of the urine samples in microgram per liter.

Total number of urine samples	20–49.9	5 0– 99.9	100–149.9	150–200
270 (100)	106 (39.26%)	105 (38.88%)	13 (4.81%)	3 (1.11%)

There was not much difference in prevalence of goitre in females compared to males and prevalence of goitre was observed to increase with age, with prevalence of 15.82%, 17.40%, 25.78%, 34.63% in 6-7 years, 8-9 years, 10-11 years and 12 years of ages respectively; which was found to be statistically significant (p=0.00001) (Table 1 and 2).

Of the 540 salt samples, 326 (60.37%) had iodine concentration of more than or equal to 15 ppm at

household level. 214 (39.63%) of the salt samples had iodine concentration less than 15 ppm (Table 3).

From the Table 4 it is observed that, of the 270 urine samples, 106 (39.26%) had iodine content in the range of 20-49.9 and 105 (38.88%) of them had iodine content of around 50-99.9 mcg/Lt (Table 4).

DISCUSSION

In our study, the goitre prevalence rate of 22.78% among the 6-12 year school children indicates that IDD is a big public health problem in the Gadag district and 19.67% of children had grade 1 goitre and 3.11% had grade 2 goitres.

Similarly in a survey at Bharuch district of Gujarat in 2012 by Chandwani, goitre prevalence in was found to be 23.2% (grade 1 – 17.4%, grade 2– 5.8%); and in survey carried out during January 2005 in Belgaum district of Karnataka State by Kamath, the overall prevalence of goitre was 16.6% (Grade 1 -15.7%; grade 2 -0.9%).[5,6]

In contrast, a survey done in 2015 in Ramanagar district (Karnataka State) by Biradar, goitre prevalence rate was 8.6% and in Shimoga district (Karnataka state) survey in 2014 by Praveen, goitre prevalence rate was 9.3%.[7,8]

According to MOHFW report in 1998 in Karnataka 6 of 17 districts surveyed had goitre prevalence rate was in the range of 10.67% to 41.11%.[9]

In our study there was not much difference in prevalence of goitre in females compared to males and prevalence of goitre was observed to increase with age, which was found to be statistically significant (p=0.00001).

In contrast in a survey done in 2005 at Belgaum District by Kamath, Prevalence of palpable and visible goitre was significantly high among females (21.8%) when compared to that of males (7.2%) (χ^2 =15, p≤0.001).[6] And in survey done in 2015 at Ramnagar District, females had higher prevalence compared to males in all the age groups but the difference was not statistically significant (0.437).

But in a survey done in 2014 at Shimoga district the prevalence of goitre was found to be highest in the age group of 8–9 years (10.84%) and study showed a high goitre prevalence rate among girls aged 12 years (11.59%).[8]

In our study, iodine concentrations in the 540 salt samples were tested. Out of this, 214 (39.63%) of the salt samples had iodine concentration less than15 ppm of which 43 samples (15.93%) had no iodine content in them. And 326 (60.37%) salt samples had iodine concentration more than or equal to 15 ppm at household level. This may be because salt was iodized inadequately at the manufacturer level or due to loss of iodine during the distribution process.

In contrast to our study, in a survey of Shimoga district in 2014, 60.8% (332) salt samples had iodine levels of less than 15 ppm; 214 (39.62%) salt samples had iodine levels more than 15 ppm; And in a survey done 2015 in Ramnagar district 95.3% had iodine concentration ≥15 ppm at household level.[7,8]

In our study out of the 270 urine samples, 211 (78.15%) had iodine deficiency.106 (39.26%) samples had moderate iodine deficiency; 105 (38.88%) had mild iodine deficiency (Table 4).

Similarly in survey done at Shimoga district 74.7% of all the urine samples showed iodine deficiency; and 183 showed severe iodine deficiency, whereas 11 showed moderate and 1 showed mild iodine deficiency.[8]

Similarly in study done in Himachal Pradesh in 2000 by Kapil et al, 3.5%, 3.8%, 14.2% had urinary iodine excretion of <20, 20-49.9, 50-99.9 mcg/Lt.[10]

CONCLUSION

Prevalence of iodine deficiency is significantly high among 6-12 year children in this district of south India with increasing age.

Recommendations

Efforts must be made to ensure that the quality of iodized salt meets the required standards (≥15 ppm) at the consumer level. Also periodic surveys must be carried out to assess status of IDD by clinical examination, and estimation of urinary iodine excretion and estimation of the iodine concentration of the salt.

ACKNOWLEDGEMENTS

We are thankful to Deputy Director (Nutrition), Directorate of Health and family welfare services, Government of Karnataka, Bengaluru. We also thank DHO, DDPI, BEO's of Gadag district, Head Masters/ Head mistresses and teachers of schools of Gadag District and School children; and Mr Mallayya Kalmath , Mr Basavaraj Badiger, Health inspectors of community medicine-GIMS, Gadag.

Funding: The study was funded by IDD Cell-Banglore
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Park K. Textbook of Preventive and social Medicine, Banarasidas Bhanot; 23rd Edition; 624.

2. Tiwari BK, Ray I, Malhotra RL. Policy Guidelines on National Iodine Deficiency Disorders Control Programme—Nutrition and IDD Cell. Directorate of Health Services, Ministry of Health and Family Welfare. New Delhi; Government of India. 2006: 1–22.
3. Andersson M, Takkouche B, Egli I, Allen HE, De Benoist B. Current global iodine status and progress over the last decade towards the elimination of iodine deficiency. Bull World Health Organ. 2005;83:518–25.
4. Park K. Textbook of Preventive and social Medicine, Banarasidas Bhanot; 23rd Edition; 2015: 441.
5. Chandwani HR, Shroff BD. Prevalence of Goiter and Urinary Iodine Status in Six-Twelve-Year-Old Rural Primary School Children of Bharuch District, Gujarat, India. Int J Prev Med. 2012;3(1):54.
6. 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.
7. 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.
8. Praveen KN, Sagar MV, Revathy R, Krishna M. Is iodine deficiency still a big threat? A descriptive cross-sectional study on iodine deficiency disorders among children aged 6–12 years in Shimoga district, Karnataka, India. Int J Med Sci Public Health. 2015;4(3):365-8.
9. Iodine Deficiency Disorders Control Programme. Annual Report 2005–06. New Delhi, India: Ministry of Health and Family Welfare, Government of India: 89–90.
10. Kapil U, Singh P, Pathak P. Rapid survey of status of salt iodization and urinary iodine excretion levels in Karnataka, India. Current Sci. 2004;87:8-25.

Cite this article as: Sonavane RS, Mayappanavar RH, Ananthachari KR, Roy S, Venkateswara PU, Byakod M, et al. A community based cross sectional study on prevalence of iodine deficiency disorders among 6-12 years children of a district of North Karnataka. Int J Community Med Public Health 2017;4:4553-7.