

ORIGINAL ARTICLE

Prevalence of iodine deficiency disorders among 6-12 years school children of GulbargaRaveesh P M¹, Ajay Kumar G², Boramma G³, Srinivas Reddy⁴, Rajashekhar Kapate⁵¹Assistant Professor, Department of Community Medicine, Sri Siddhartha Medical College, Tumkur, Karnataka,^{2,3,5}Professor, Dept. of Community Medicine, M. R. Medical College, Gulbarga, Karnataka, ⁴Lecturer Biostatistics,

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Source of Funding : Nil **Conflict of Interest:** None declared**Abstract**

Introduction: Iodine Deficiency Disorders is among the easiest and least expensive of all nutrient disorders to prevent. Salt iodization is currently the most widely used strategy to control and eliminate Iodine Deficiency Disorders. The Central Government has issued the notification banning the sale of non-iodated salt for direct human consumption in the entire country with effect from 17th May, 2006 under the Prevention of Food Adulteration Act 1954. **Rationale:** 6 out of 17 districts surveyed in Karnataka were endemic to Iodine deficiency with goitre prevalence rates in the range of 10.67–41.11%. In Gulbarga more than 90% of the families were consuming salt with Iodine content less than 15 ppm. **Objectives:** To assess the magnitude of the Iodine Deficiency Disorders among the children. To determine the Iodine content of the salt used at houses of the children and to find out the availability of adequately iodized salt at the retail shops. **Materials and Methods:** A cross sectional study among 6-12 Years School Children conducted in Gulbarga city. Cluster sampling methodology and surveillance methods for iodine deficiency disorders as recommended by WHO/ICCIDD were used. The study included 1620 school children with equal proportion of girls and boys. The salt samples were tested on spot with MBI kit provided by UNICEF, and Iodine concentration was recorded as 0, <15 and >15 ppm. **Results:** The overall prevalence of goitre was 4.32%, there was no significant gender variation in total goitre prevalence. The association between anaemia and the prevalence of total goitre was statistically significant. Proportion of the children consuming adequately iodised salt was 51.1%. Among salt samples collected from retail shops, only 44.62% samples were adequately iodised. **Conclusion:** prevalence of goitre was 4.32% which is below the cut-off to indicate endemicity of IDD. Adequately iodised salt availability and consumption among household is not satisfactory.

Key Words

Iodine Deficiency Disorders; Goitre; Iodised Salt; School Children; Retail Shops.

Introduction

Iodine deficiency is the single most important preventable cause of brain damage. Iodine Deficiency Disorders (IDD) is among the easiest and least expensive of all nutrient disorders to prevent. Salt iodization is currently the most widely used strategy to control and eliminate Iodine Deficiency Disorders. (1) However to be fully effective in correcting Iodine deficiency, salt must not only reach the entire susceptible population but it also needs to be adequately iodized. The Central Government has

issued the notification banning the sale of non-iodated salt for direct human consumption in the entire country with effect from 17th May, 2006 under the Prevention of Food Adulteration Act 1954.(1)

IDD are widespread in India. 263 districts out of 324 surveyed have been identified as endemic to iodine deficiency. (1) According to National Family Health Survey NFHS-3 (2005-06) just over half of households in India (51 percent) were using sufficiently iodized salt at the time of the survey. (2) Use of iodized salt varies greatly by region. The surveys conducted by the central

Iodine Deficiency Disorders survey team, Government of India in Karnataka documented that 6 out of 17 districts surveyed were endemic to Iodine deficiency with goiter prevalence rates in the range of 10.67–41.11%. It was also found that in Gulbarga more than 90% of the families were consuming salt with Iodine content less than 15 ppm and had median UIE less than 100.0 mg/l, indicating deficient iodine nutrition in children. The goal of NIDDCP is to reduce the prevalence of iodine deficiency disorders to below 10 per cent in the entire country by the year 2012 A.D. (3) Epidemiological criteria for assessing the severity of IDD based on the prevalence of goitre in school children

Total goitre rate Severity of IDD

0.0 - 4.9%	None
5.0 – 19.9%	Mild
20.0 – 29.9%	Moderate
>30%	Severe

Indicator for Sustainable Elimination of IDD with regard to salt iodisation Proportion of Households consuming adequately iodised salt > 90 % (4)

The age group recommended by WHO for IDD survey (goiter survey) was 6 - 12 years. This age group was recommended to be used in the surveys in all the countries because children in this age group have a high vulnerability, easy access, and are useful for surveillance of other health activities. Affected children develop an enlarged thyroid, in response to Iodine deficiency and can be readily examined in large numbers in school settings. (5) Use of a uniform age group helps in comparison of research findings of the various surveys conducted by the scientists in different regions and nations. National and International data bases are being developed for comparison using such data.

Aims & Objectives

- To assess the magnitude of the Iodine Deficiency Disorders among the children.
- To determine the Iodine content of the salt used at household level of the children.
- To find out the availability of adequately iodized salt at the retail shops.

Material and Methods

Source of Data: 6- 12 years children of primary schools of Gulbarga city.

The required sample size was calculated using the formula $n = 4 pq/L^2$

With the prevalence of Iodine deficiency disorders 10% (3) and allowable error as 15% of p, the sample size required was 1600. Both boys and girls in equal proportion in the age group of 6- 12 years were included.

Study Duration : January 2010 to June 2011. **Study Design :** Cross sectional study. **Sampling Method:** Cluster sampling method: A school was considered as a cluster, thirty clusters were selected from 10 urban health centers. From each urban health centre, 3 schools were selected by simple random sampling method to get required 30 clusters. 54 children from each cluster maintaining equal ratio for both gender were selected to make total 1620 children under study. Children suffering from congenital anomalies and chronic diseases and also Children with existing physical and mental disabilities were excluded. The head of the selected school was first briefed about the study and the permission was taken. The day of the visit was fixed in discussion with the head. The selected students were also briefed about the study and were asked to bring 2 table spoons (20g) salt from their houses in the polythene pouches provided. On the day of study, eligible children were clinically examined according to the pre designed and pre tested proforma. Salt samples were collected from the houses of students in the polythene pouches provided. The samples were tested on spot with MBI kit and Iodine concentration was recorded as 0, <15, >15 ppm. Goiter was assessed by palpation method and was classified as grade 0, 1 and 2 according to WHO / UNICEF / ICCIDD Guidelines. (4) The diagnosis of goiter was based entirely on inspection and palpation of the neck.

Grading of the goitre:

- Grade 0 :** No palpable or visible goitre
- Grade 1 :** A goitre that is palpable but not visible when the neck is in the normal position (i.e. the thyroid is not visibly enlarged). Thyroid nodules in a thyroid which is otherwise not enlarged fall into this category
- Grade 2 :** 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.

Five retail shops from each health centre area were randomly selected and all salt samples both packed and unpacked were collected and Iodine content was estimated using MBI kits.

Results

Of the 30 schools selected for study, 12 schools were Govt. schools and 18 schools were private schools. English was the medium of study in 14 schools followed by Kannada in 12 schools (40%) and Urdu was the medium of study in 4 schools.

Maximum children i.e. 318 were aged 11 years and minimum i.e. 107 were aged 12 years with equal representation of both sexes. 935 (57.72%) belonged to Hindu religion, followed by 658 children (40.62%) belonged to Muslim and 27 children (1.66%) belonged to other religions like Christianity and Jainism

Total goitre prevalence rate in the present study was 4.32%; Goitre prevalence in girls (5.19%) was slightly more when compared to boys (3.46%).

Out of 240 children with anaemia 21 (8.75%) children were also had goitre. The association between anaemia and the prevalence of total goitre was statistically significant. Out of 29 children with signs of Vitamin A deficiency 10 children (34.50%) had goitre. 07 (01.39%) children out of 503 children with caries teeth had goitre.

Total 805 (49.69%) were consuming adequately iodised salt. 279 (17.22%) and 536 (33.08%) were consuming inadequately iodised and non iodised salt respectively. Use of non iodised salt among Girls (34.69%) was slightly higher compared to boys (31.48%).

Adequately iodised salt usage was around 50% in both illiterates and literates. Out of 40 graduate mothers 18(45.00%) were consuming non iodised salt. Prevalence of total goitre was 36 (4.47%) among children who were consuming adequately iodised (> 15 ppm) salt. Equal percentage of children 24(4.47%) consuming non iodised salt were also suffering from goitre. Prevalence of Grade 2 goitre was slightly higher (0.93%) among children consuming salt without iodine. Out of 195 salt samples, 145 samples were claimed by manufacturer as adequately iodised salt samples. Out of 195 salt samples 41(21.02%) were unpacked crystal salts, 119 samples were powder packed salt and 35 samples were packed crystal salt. Among 195 salt samples collected from retail shops (32.82%) samples were non-iodised, 46(22.56%) samples were inadequately iodised and only 87 (44.62%) samples were adequately iodised. Of the 35 crystal salt samples all (100%) had name of manufacturer but only 22 (64.70%) and 26(76.47%) had mentioned batch number and iodine content respectively.

Discussion

Total goitre prevalence rate in the present study was 4.32%, which is below 5% to declare it as endemic zone area as per epidemiological criteria by WHO. NIN survey (5) conducted in 2001 to 2003 the overall prevalence of total goitre among 6 to 11 year children was about 4%, which is below the cut-off to indicate endemicity of IDD. But in R Kamath et. al (6) study on the prevalence of goiter among rural population of Belgaum district, prevalence of goitre was 16.6%. Goiter of grade 1 was 15.7% and that of grade 2 was 0.9%.

In the present study, Goitre prevalence in girls (5.19%) was slightly more when compared to boys (3.46%). According to Bhat I A. et.al. (7) Study also there was higher goitre prevalence in girls (13.0%) than in boys (10.1%).

Total 805 (49.69%) were consuming adequately iodised salt in the present study. Umesh Kapil et. al. (8) In the Rapid survey of status of salt iodization and urinary iodine excretion levels in Karnataka in 2001 observed that 45.6% of the families were consuming iodised salt with less than 5 ppm of iodine. In Gulbarga district less than 10% of the families were consuming salt with iodine content more than 15 ppm. There is increase in the consumption of adequately iodised salt in urban areas of Gulbarga.

Adequately iodised salt usage was around 50% in both illiterates and literates. So education of mother had no impact on use of iodised salt usage for cooking purpose according to the present study.

In a study done by S. Misra et al. (9) Of the 47 salt samples examined from salt sold at private shops of 15 clusters, 95.8 per cent were branded, 85.1 per cent powdered. In the present study (21.02%) were unpacked crystal salt samples were available in the retail shops and only 87 (44.62%) samples were adequately iodised. But in the study done by Binod Kumar Patro et al (10) total of 39 (70.9%) samples, the iodine content was 15 ppm or more.

Out of 195 salt samples, 145 samples were claimed by manufacturer as adequately iodised salt samples. Only 87 (60.00%) were adequately iodised on testing with MBI kit. In a study done by S. Misra et al. (9) 55.5 per cent of claimed samples were adequately iodised (>30 ppm).

Conclusion

The present study has showed that the overall prevalence of goitre was 4.32%, which is below 5% to declare it as endemic zone area as per epidemiological criteria by WHO. Total goitre prevalence was equal (4.47%) among both in children who were consuming adequately iodised salt and who were consuming salt without iodine. Besides nutritional iodine deficiency, a variety of other environmental, socio-cultural and economic factors operate to aggravate iodine deficiency and related thyroid dysfunctions. Only 49.69% school children were consuming adequately iodised salt, which is far from the goal of Universal Salt Iodisation [>90%]. Salt samples collected from the retail shops only 44.62% samples were adequately iodised.

Recommendation

The present study shows that over a half of children are consuming salt at adequate level, which is far from the goal of Universal Salt Iodisation [>90%]. There is need for effective monitoring of ban on sale of non iodised salt. Health education to mothers is important regarding the benefits of using iodised salt.

Limitation of the study

The study was limited to only urban area of a district. In this district school dropouts rate was slightly higher, they were not included in the study. Urinary iodine excretion is a good marker of very recent dietary iodine intake. Urinary iodine excretion levels were not estimated due to non-feasibility.

Relevance of the study

Prevalence of Grade 2 goitre was slightly higher among children consuming salt without iodine even though overall prevalence of goitre was 4.32% and Total goitre prevalence was equal among both in children who were consuming adequately iodised salt and who were consuming salt without iodine. Even in non-endemic areas also there are benefits of using iodised salt.

Authors Contribution

RPM: contribution is in the design of the study method, acquisition of data, analysis and interpretation. AKG & BG: helped in the conception, drafting and revision of the study design. SR: helped in analysis of the data and KR: revised it critically and approved the final draft.

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Tables

TABLE 1 DISTRIBUTION OF CHILDREN ACCORDING TO EDUCATION OF PARENTS

Education	Father	%	Mother	%
Illiterate	153	09.45	311	19.20
Primary	876	54.07	1031	63.64
Secondary	533	32.90	238	14.69
Graduate	58	03.58	40	02.47
TOTAL	1620	100	1620	100

TABLE 2 ASSOCIATION BETWEEN EDUCATION OF MOTHER AND SALT INTAKE

Education	Total no. Children	Salt iodine content				0 ppm	
		>15 ppm		<15 ppm		No.	%
		No.	%	No.	%		
Illiterate	311	159	51.12	57	18.32	95	30.54
Primary	1031	500	48.49	183	17.74	348	33.75
Secondary	238	125	52.52	38	15.96	75	31.59
Graduate	40	21	52.50	01	2.5	18	45.00
Total	1620	805	49.69	279	17.22	536	33.09

TABLE 3 ASSOCIATION BETWEEN IODINE CONTENT OF SALT AND GOITRE

Iodine Content of Salt	Total no. Children	Goitre				Total	
		Grade 1		Grade 2		Number	Percent
		Number	Percent	Number	Percent		
>15ppm	805	29	3.60	7	0.87	36	4.47
<15ppm	279	8	2.86	2	0.72	10	3.58
0 ppm	536	19	3.54	5	0.93	24	4.47
Total	1620	56	3.46	14	0.86	70	4.32