RESEARCH BRIEF

Iodine Deficiency Disorder in Children Aged 6-12 Years of Ambala, Haryana

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We conducted this study to assess the prevalence of goitre among 2700 children (6-12 yr) of district Ambala in Haryana. Children were examined as per standards laid by National iodine deficiency disorder control programme (NIDDCP). Multi stage cluster sampling method was used. Urine and salt samples were also studied for iodine concentration. The overall prevalence of goitre in the studied subjects was 12.6%. The median urinary iodine excretion in the study sample was more than 100µg/L Iodine content was found to be adequate in 88% of salt samples. We conclude that there was a high prevalence of goitre in young children despite iodine repletion. This calls for identification of factors to strengthen NIDDCP and the need to emphasize use of iodized salt in Haryana.

Key words: *Goitre, IDD, Urinary Iodine excretion.*

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National Iodine Deficiency Disorders Control Program was launched in India in 1962. But after 44 years of the implementation of the program, a recent nationwide survey revealed that out of 324 districts surveyed, 263 districts were still endemic for iodine deficiency disorders (IDD) with prevalence more than 10 % [1]. We conducted this study to assess the prevalence of iodine deficiency disorders in children aged between 6-12 years in district Ambala, to assess the level of iodine in salt samples at household level; and to determine median urine iodine concentration in a sample of children.

METHODS

The present study was conducted in 6-12 years old children from November 2010 to October 2011. Multi-stage cluster sampling methodology was adopted for selecting the study population. A list of all the schools in Ambala district was procured from the office of District Education Officer and a cumulative population was calculated. It came out to be 81,525. As per data available from census 2001 there were 1,09056 children in the age group of 6-12 years in the district under study. Thus, the school enrolment rate of the 6-12 years old children in Ambala district came out to be 74.6%. So, for proportionate representation, 75% (2050) of the total study population was taken from the school and 25% (650) from community representing the out of school children. Those children were screened for goitre by standard palpation method and were graded according to the criteria recommended by the joint WHO/UNICEF/ ICCIDD.

Consents were taken from the school authorities of Ambala, principals of each school surveyed, and the parents of the children whose urine samples were taken. Ethical clearance was also sought from Institutional ethical committee before conducting the study.

Salt Samples: As per NIDDCP guidelines during the survey, 540 ($1/5^{th}$ 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 were tested qualitatively on spot with MBI kit and iodine concentration was recorded as 0, <15, >15 ppm [2].

Urine Samples: As per NIDDCP guidelines during the survey, 270 (half of the salt sample size) urine samples *i.e.* 9 samples of urine per cluster were obtained from 6-12 years old children for iodine estimation, maintaining equal ratio for both genders. Those samples were collected in labelled plastic bottles (50 mL capacity with screw cap and thymol crystal as preservative) and taken to the IDD cell Karnal, for quantitative estimation of iodine in urine. The iodine content of urine was estimated by iodometric titration.

Statistical analysis: Data processing and analysis was done by using SPSS version 17.0. Number and percentages were calculated for categorical data. Chi-Square test was applied. Median urinary iodine excretion was calculated.

TABLE I AGE AND SEX-WISE PREVALENCE OF GOITER AMONG STUDY SUBJECTS (*N*=2700)

	Age in years						*Total No.(%)*
	6-8 years No. (%)		*9-10 years No. (%)*		*11-12 years No. (%)*		
Goitre grades	Female	Male	Female	Male	Female	Male	
Grade 0	557 (20.6)	580 (21.5)	296 (10.9)	348 (12.9)	223 (8.3)	356 (13.2)	2360 (87.4)
Grade I	42 (1.5)	38 (1.4)	48 (1.8)	32 (1.2)	67 (2.5)	44 (1.6)	271 (10)
Grade II	14 (0.5)	11 (0.4)	13 (0.5)	9 (0.3)	10 (0.4)	12 (0.4)	69 (2.6)
Total	613 (22.7)	629 (23.3)	357 (13.2)	389 (14.4)	300 (11.1)	412 (15.2)	2700 (100)

Chi square– 16.09, p- value - 0.0003

RESULTS

Two thousand and seven hundred children from six to twelve years were clinically examined for the presence of goitre during survey. Of these, 53% were males and 47% were females. The mean age of the children vary between 8.88 ± 1.83 years. Prevalence of goitre increased with that of age. The highest prevalence (%) was observed in the age group of 11-12 years. Overall goitre prevalence rate was 12.6%. Prevalence was significantly higher among females than males (*P*=.0003) (***Table* I**). Age-specific prevalence rate (ASPR) was higher in 9 to 12 yr age group as compared to 6 to 8 yr age group. No case of nodular goitre was observed (***Table* I**).

In our study, since there was no child with UIE of < 20 µg/L, we used a modified classification as follows: <50 µg/ L was labelled as moderate deficiency, 50-100 µg/L as mild deficiency and >100 µg/ L as adequate iodine intake. Median iodine concentration of >100 µg/L defines a population with no iodine deficiency, *i.e.* at least 50 per cent of the samples should be above 100 µg/L according to the epidemiological criteria for assessing iodine nutrition based on median urinary iodine concentration in children. Median iodine concentration of the study population was more than 100 µg/L.

Overall, 8.5% salt samples examined at consumer level by spot kit showed some iodization, majority (88%) were adequately iodised, i.e. having >15 ppm, while 3.2% were non-iodised (***Table* II**).

DISCUSSION

According to WHO/UNICEF/ICCIDD, a total goitre rate of 5% or more in primary school children (6-12 yr) is used to signal the presence of a public health problem [3]. Overall prevalence of goitre in the present study was 12.6%. There is a wide variation in prevalence of goitre across the country. The prevalence ranged from 2.6 % to 67% as observed in different studies [4-9]. This variation in goitre prevalence could be due to geographical disparity in the country along with the probable environmental and dietary iodine deficiencies. Additionally this could be due to variation in the methodology adopted in terms of sample size and age group included in the study.

Estimation of iodine content in salt samples showed that 11.7 % of the powdered salt samples did not had adequate iodine content (15 ppm and above). That means advice on powdered salt use does not ensure adequate iodine intake. This problem can be addressed by advocating the use of fresh stock of iodized salt available in the market. Alternatively, iodine content of the salt should be monitored regularly by health authorities by salt testing kits to ensure adequate iodine content in the iodized salt.

In the present study it was observed that prevalence of goitre increased with that of age. This could be due to higher demand of iodine during adolescence. Prevalence of goitre was found to be higher among females when compared to males. Similar observation was made by Mohapatra, *et al*. [10]

One evident limitation of this study is that no biochemical tests or hormonal estimation were conducted among children with grade 2 goitre due to logistic

TABLE II LEVEL OF URINARY IODINE EXCRETION AND IODINE CONTENT OF SALT SAMPLES

Level of urinary iodine	*Number*	*% of subjects*
<50 µg/ L	2	0.7
50-100 µg/ L	5	1.8
>100 µg/ L	263	97.5
Total	270	100
Iodine content of salt	*Number*	*% of subject*
0 ppm	17	3.2
<15 ppm	46	8.5
>15 ppm	477	88.3
Total	540	100

constraints. Clinical populations tend to differ from population-based samples in terms of several factors. Secondly, diseases like autoimmune thyroiditis and presence of goitrogens in the diet could account for some of the cases of goitre in the present study. Further studies should also evaluate the above causes of goitre among school children.

To conclude, findings of the present study demonstrates that prevalence of goitre was high (12.6%) among children in Ambala district and therefore it constitutes a public health problem in this region. Strict implementation of salt iodization and marketing in hard to reach areas is recommended as a measure to control the situation.

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