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A study of prevalence of goiter among school children in Kolar

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ABSTRACT

Background: Iodine deficiency disorders (IDD) constitute the single largest cause of preventable brain damage worldwide leading to learning disabilities and psychomotor impairment. Nearly 266 million school children worldwide have insufficient iodine intake. IDD was found to be a public health problem in 47 countries. Since the information on current prevalence of goiter in Kolar was not available, the present study was undertaken.

Methods: A cross-sectional study was conducted among school children aged 6-12 years in Kolar taluk. A total of 650 children (325 urban and 325 rural) were selected for goiter examination by multistage random cluster sampling technique. A total of 150 children were tested for the median urinary concentration and 150 salt samples were tested from the households of the study population.

Results: The total goiter rate was 6.6% 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 $137 \mu g/l$ and 92.7% salt samples had >15 ppm iodine content.

Conclusions: Present study shows mild goiter prevalence in primary school children in Kolar and an adequate iodine content of salt and urine.

Keywords: Goiter, Prevalence, IDD, Urinary iodine

INTRODUCTION

Iodine is an essential micronutrient required at 100-150 micrograms daily for normal human growth and development. 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. 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.

Nearly 266 million school-aged children worldwide have insufficient iodine intake. IDD was a public health problem in 47 countries. Sample surveys in India revealed that out of 324 districts surveyed so far, 263 districts are IDD endemic (prevalence 10%). India has made considerable progress toward IDD elimination by implementing National Iodine Deficiency Disorders Control Programme (NIDDCP) in the year 1992. Kolar, 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 area, a cross sectional study was conducted.

METHODS

The present study was a cross-sectional descriptive study, undertaken in schools of Kolar taluk, including the students from both rural and urban areas. The children aged between 6-12 years were included from lower and higher primary schools in rural and urban areas of Kolar. The study was conducted from 1st November 2014 to 31st October 2015 (one year). A total of 650 students were selected, 325 each from the urban and rural schools. Multistage cluster random sampling technique was used to select study sample.

The sample size was calculated by considering the prevalence of goiter among the school children as 30% from a previous study conducted in Belgaum by Kamath et al. The absolute error for the sample size calculation was considered as (d=5%), at 95% confidence interval and α error of 5%. Since multistage cluster random sampling technique was used, a design effect of 2 was multiplied to get the final sample size. The total sample size calculated was 644 which were rounded upto 650. 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.

The collected data was entered into Microsoft Excel spread sheet. The data was summarized and presented as frequencies, proportion, mean and standard deviation, depending on the quantitative or qualitative variables. Analysis was performed using SPSS 22 version. Chisquare was the test of significance for qualitative data. Independent t-test or Z-test was the test of significance for quantitative data between two groups, p value less than 0.05 was considered as statistically significant.

RESULTS

The following table provides the grade wise distribution of goiter. The overall prevalence of goiter among the school children aged 6-12 years was found to be 6.6%, in which 4.8% had Grade 2 goiter and 1.8% had Grade 3 goiter. The prevalence of goiter was found to be high in rural area (11.07%) when compared to urban area (2.15%) (Table 1).

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

Grade of goiter	Rural N (%)	Urban N (%)	Total N (%)
Grade 1	289 (88.92)	301 (92.61)	607 (93.4)
Grade 2	26 (8)	5 (1.53)	31 (4.8)
Grade 3	10 (3.07)	2 (0.61)	12 (1.8)
Total	325	325	650

 χ 2=20.945, df=2, p=0.001.

The study also revealed that among the 43 children having goiter, most of the children of 10-12 years were found to have goiter (81.39%), and followed by 8-9 years (13.95%). There was increase in prevalence of goiter with increase in age, this was found to be statistically significant (p=0.001) (Table 2).

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

Age (years)	Grade 1	Grade 2 and 3	Total
	N (%)	N (%)	N (%)
6-7	200 (32.94)	2 (4.65)	202 (31.07)
8-9	195 (32.12)	6 (13.95)	201 (30.92)
10-12	212 (34.92)	35 (81.39)	247 (38)
Total	607	43	650

 χ 2=37.45, df=2, p=0.001.

The Table 3 shows that the median urine iodine excretion (UIE) among children was 135 μ g/l. Among the 150 urine samples tested for iodine levels in urine, only 12% of the children were found to have inadequate UIE, whereas 88% of the children had adequate UIE (Table 4).

Table 3: Mean urine iodine level among the study subjects.

	Urine iodine
No.	150 µg
Minimum	40 μg
Maximum	214 μg
Mean	128.83 μg
Median	135 μg
SD	35.45

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

UIE	Frequency	%
Inadequate	18	12
Adequate	132	88
Total	150	100

Table 5 shows that among the 150 salt samples collected, 18 (12%) had inadequate iodine (<15 ppm) whereas 132 (88%) of the samples were found to have adequate iodine.

Table 5: Distribution of salt iodine levels among study subjects.

Salt iodine	Frequency	%
Inadequate iodine	18	12
Adequate iodine	132	88
Total	150	100

DISCUSSION

The present study was conducted 24 years after the implementation of universal iodization of edible salt. This study was conducted to find the current status of goiter prevalence in Kolar taluk among school children aged 6-12 years.

Prevalence of goiter

The total prevalence of goiter (i.e., the palpable and visible goiter) in the present study was found to be 6.6%. 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 Kolar is in a transition phase from iodine deficient to being iodine sufficient.⁷ There is a wide variation of prevalence of goiter across the country, as observed in various studies ranging from 0.125-50.1%. 8,9 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.9,10

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. ^{11,12} Similar findings were made by Sareen et al in Uttarakhand (TGR=13.2%) and by Lohiya et al in Faridabad, Haryana (TGR=17%). ^{13,14}

This wide variation could be due to geographical disparity in the country with respect to the environmental factors influencing the prevalence of goiter. ¹⁵ This could also be due to variation in the methodology adopted in terms of sample size and age groups included in various studies.

Grades of goiter

The present study showed that among the grades of goiter, Grade 2 (4.8%) was found to be more prevalent than grade 3 (1.8%). 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. 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. 18,19

Age and prevalence of goiter

The prevalence of goiter was found to increase with age in the present study, with highest prevalence among 10-12 years age group (81.39%). 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%). 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. 21,22

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.²³

UIE

The median urine iodine in the present study was found to be 135 μ g/l, 12% of them had inadequate UIE, whereas 88% 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 μ g/l).²⁴ 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 μ g/l.²⁵ 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

Salt iodine

The salt iodine content was found to be adequate (>15 ppm) in 88% of the samples. The 12% 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). 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. ²⁶

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. ²³

CONCLUSION

The study concludes that goiter continues to be prevalent in mild endemic proportions (6.6%) in Kolar taluk, 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.

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Institutional Ethics Committee

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