Original Article

Goiter prevalence in school-going children: A cross-sectional study in two border districts of sub-Himalayan Jammu and Kashmir

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Abstract

Introduction: Iodine deficiency disorder remains one of the major public health problems, despite it being easily preventable. Initially thought as the disorder of Himalayan goiter belt, the disorder has been found to have a pan-India presence. The study was planned with the aim to assess the prevalence of goiter among 6–12 years school-going children and to identify levels of iodine in salt consumed at the household level in the study area. **Materials and Methods:** The study was conducted among 3955 school-going (2162 children from Rajouri and 1793 children from Poonch) children age 6–12 years in Rajouri and Poonch districts of Jammu Province. The children were examined clinically to detect and grade the goiter. Salt samples were collected from subsample (n = 400) to estimate iodine content in the salt. **Results:** The prevalence of goiter in the study population was found to be 18.87% and 9.70% in Rajouri and Poonch districts, respectively. Goiter prevalence was higher in 9–12 years age group as compared to 6–9 years age group and the difference in goiter prevalence in males of these two age groups was statistically significant (P = 0.02). Estimation of iodine content of the salt samples revealed that all of them (100%) had adequate iodine content. **Conclusion:** Despite the implementation of Universal Iodization Program and adequate content of iodine in salt consumed by the families, the goiter prevalence in both the districts is high. The future research should focus on identifying the reasons for this high prevalence.

Keywords: Goiter, iodine deficiency, iodized salt

Introduction

Iodine deficiency disorder (IDD) is an epidemiological concept proposed by Hetzel[1] to represent all the negative health consequences of low iodine intake on the growth and development, which could be totally prevented by adequate iodine intake. IDDs are still a major public health problem in India,[2] and it affects people among all groups across different socioeconomic strata.[3] Among children and adolescents, disorders of thyroid are a common endocrine entity and can be approached from the perspective of goiter[4] which affects their somatic growth, cognitive, and motor function.[5,6] It may ultimately lead to growth and development abnormalities in children[6,7] and consequently poses a serious threat to the social and economic development of countries.[8] In India, more than 200 million people reside in goiter endemic areas and 71 million suffer from IDDs.[9]

About 241 of the 282 districts surveyed have been found to be goiter endemic in India.[10] Coverage Evaluation Survey (2009)

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showed that of the 91% households in India, who had access to iodized salt, only 71% consumed adequate iodine.[11]

Geographically, Jammu and Kashmir is a sub-Himalayan state in India, which has two provinces, namely, Jammu and Kashmir. The twin districts of Rajouri and Poonch fall in the Pir Panchal belt of Jammu province. Most of the area is cut off, mountainous, and inaccessible with very meager infrastructural facilities available in this belt. An extensive review of literature on PubMed revealed that there is a paucity of data on prevalence of goiter from this part of India. Hence, a study was undertaken to evaluate the current prevalence of goiter among school children in the age group of 6–12 years.

Materials and Methods

This cross-sectional goiter survey was conducted in two border districts of Jammu Province, i.e., Rajouri and Poonch. Taking the estimated prevalence of the disease to be 20%, confidence level of 95%, and allowable error of 10% of estimated prevalence, a sample size of 1600 was obtained. Teachers and students were briefed about the objectives of the study and informed written consent was obtained from the parents/guardians of participants. The study has been approved by the Institution Ethics Committee.

Sampling of the present study was done as per the WHO guidelines for school-based surveys, making use of probability proportion to size (PPS) cluster sampling.[12] Based on the PPS sampling technique, a minimum number of participants from each school to be included in the study was arrived at. However, more students than the required sample size were included to accommodate the requests by principals of the school to examine more children. Thus, a total of 1793 were included in the study from the Poonch district and 2162 students were included from Rajouri district.

The clinical examination of all the children was done by the standard palpation method to note the presence/absence of goiter and grading was done according to the criteria recommended by the joint WHO/UNICEF/ICCIDD[12] and the sum of Grades 1 and 2 provided the total goiter prevalence in the study population.

Salt samples were collected from subsample (n = 400) in each district of the same study group to estimate iodine content in the salt, respectively. The process of selection of the subsample was similar to the process of selection of sample using a PPS. The subsample of these students was asked to bring 20 g of salt sample from home in a polyethylene pouch that was provided to them.

Iodine content was estimated using Spot Testing Kits and salt sample containing ≥15 ppm of iodine was considered adequately iodized.

Results

During the survey, 2162 and 1793 children in the age group of 6–12 years were examined in Rajouri and Poonch districts, respectively. Age- and sex-wise distribution of the surveyed children is shown in Table 1. Total goiter rate (TGR)/prevalence was 18.87% and 9.70% in Rajouri and Poonch districts, respectively. The results have shown that in these two districts, Grade 1 goiter cases were more in males while Grade 2 cases were almost equally distributed among both the sexes [Table 2]. The results further revealed that goiter prevalence was 15.70% in 9–12 year age group in comparison to 13.64% in 6–9 year age group, but no statistically significant association was found between sex and goiter in these two age groups.

In the current study, 12.87% males in 6–9 years and 16.28% males in 9–12 years age group had goiter, the difference among males in these two age groups was statistically significant (P = 0.02017), whereas the difference in prevalence of goiter among females in these two age groups failed to show statistical significance (P = 0.9419) and when computed as a whole, no statistically significant difference (P = 0.06823) between these two age groups for goiter prevalence was found [Table 3].

Analysis of salt samples from both the districts showed that 100% of salt samples had adequate level of iodine.

Discussion

In the current study, the prevalence of goiter (TGR) in Rajouri district was 18.87% and it was in agreement with the results reported by Gupta *et al.*[13] in three other districts of Jammu Province, namely, Jammu, Udhampur, and Samba. The results also concur with those reported from Kulgam district of Kashmir Province.[14] However, results are in contrast to those reported by Bhat *et al.*[15] in an earlier study in Rajouri district. On comparing the results with other districts of India, Kapil *et al.*[16] also reported higher prevalence in Kangra district of Himachal Pradesh.

TGR in Poonch district (9.70%) was not in-line with those reported by Bhat *et al.*[15] who reported a higher prevalence of 13.40%. The improvement in Poonch region could be due to increased awareness about benefits of iodized salt, wide availability of iodized salt, and improved socioeconomic

Table 1: Age- and sex-wise distribution of examined children in Rajouri and Poonch districts

Age group (years)	Rajouri district			Poonch district		
	Male	Female	Total	Male	Female	Total
6-7	260	207	467	194	130	324
7-8	171	114	285	116	89	205
8-9	234	164	398	120	99	219
9-10	235	142	377	140	94	234
10-11	168	131	299	160	107	267
11-12	213	123	336	318	226	544

Table 2: Prevalence of goiter with relation to sex in Rajouri and Poonch districts

District	Sex	Number of students examined	Number of students with goiter	Grade of goiter		TGR (%)	*P*
				Grade I	Grade II		
Rajouri	Male	1281	248	241	7	19.35	0.4854
	Female	881	160	152	8	18.16	
	Total	2162	408	393	15	18.87	
Poonch	Male	1048	105	103	2	10.01	0.5966
	Female	745	69	66	3	9.26	
	Total	1793	174	169	5	9.70	

TGR: Total goiter rate

Table 3: Age- and sex-wise goiter prevalence in Rajouri and Poonch districts

Age groups (years)	Gender	Total children examined	G0	G1	G2	TGR (%)	*P*
6-9	Male	1095	954	136	5	12.87	0.2556
	Female	803	685	112	6	14.69	
	Total	1898	1639	248	11	13.64	
9-12	Male	1234	1033	197	4	16.28	0.3723
	Female	823	701	117	5	14.82	
	Total	2057	1734	314	9	15.70	

TGR: Total goiter rate

condition of the population with better purchasing power. Bhat *et al.*[15] had reported that percentage of children suffering from Grade 0 and Grade 1 was 86.6 and 13.4, respectively, in Poonch district and none suffering from Grade 2 goiter; but the current study showed that prevalence of Grade 1 goiter to be 9.42% which is a positive development, but 5 children had Grade 2 goiter which is a cause for concern. In Rajouri district, the results are rather alarming or showing an increase in Grade 1 goiter from 10.8% to 18.17% in addition to 15 children who had Grade 2 goiter.

In the current study, a higher goiter prevalence of 19.35% in boys in comparison to 18.16% in girls was seen in Rajouri district, whereas in Poonch district, it was10.01% and 9.26%, respectively, in boys and girls.

At the national level, these results do not concur with those reported by the Government of India survey[17] where a higher rate was reported among females in district Pilibhit. Sahu *et al.*[18] also reported a higher prevalence in the girls in comparison to boys in Orissa. In the current study, all the salt samples were adequately iodized. Biswas *et al.*[19] reported 92.6% and 90.75% salt samples to be adequately iodized in their respective studies.

It is a paradoxical situation that on one hand, 100% salt samples were found to be adequately iodized while on the other hand, TGR was quite high in both of these districts. The probable explanation could be the dietary habits of the people who consume foods that have naturally occurring goitrogens such as soybean, millets, sweet potato, cabbage, and cauliflower, and leaching of iodine by erosion of soil in mountainous area also reported in the study by Bhatia *et al.*[20] Another reason could be that these districts may be in the transition phase where universal salt iodization may show result a few years down the line.

Conclusion

Prevalence of TGR in the twin districts of Rajouri and Poonch in Jammu province was 18.87% and 9.70%, respectively, which is quite high and amounts to a serious public health problem. Although Grade 1 goiter cases were more in males, but no statistically significant difference was found for goiter prevalence between two age groups (6–9 years and 9–12 years). The paradoxical condition of high TGR in school-going children and iodine sufficiency of iodine samples analyzed needs to be probed further.

Since iodine deficiency is multifactorial in causation, we suggest that there is an urgent need to conduct dietary survey to identify the goitrogens in the area along with awareness campaigns regarding use of iodized salt being stepped up. The feasibility about use of iodized oil capsules could be explored. Periodic evaluation of these two districts regarding IDD control program is also recommended.

Limitation of the study

Since we did not assess the urinary excretion of iodine, we cannot say with certainty that high TGR was due to the operational problems in implementation of universal salt iodization, the presence of micronutrient deficiencies or the presence of thiocyanates in diet.

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Conflicts of interest

There are no conflicts of interest.

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