Prevalence of Goiter among Children Aged 11–16 Years in Ahwaz, Iran

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Introduction

Goiter in childhood is a heterogeneous endocrine disorder associated with several factors, such as iodine deficiency and autoimmunity. The most practical method for determining iodine deficiency for a region is to assess the goiter prevalence [1]. Iodine deficiency is associated with reduced efficiency of thyroid hormone synthesis, leading to increased thyroid-stimulating hormone, which stimulates thyroid growth [2].

The identification of a target group is as crucial as the method used in determining iodine deficiency. Generally, school-age children are considered an appropriate target group because they fulfill the desired criteria of susceptibility to iodine deficiency, accessibility as a study group and representativeness of society as a whole [3].

Iodine deficiency disorders (IDD) were prevalent in the Islamic Republic of Iran before 1989, when the national salt iodization program was initiated. Despite a comprehensive IDD control program, less than 50% of the households in rural areas consumed iodized salt as of 1994 [4]. A law for the mandatory production of iodized salt for households was subsequently passed in 1994. Seven years after the beginning of salt iodization and 2 years following mandatory iodized salt consumption, urinary iodine excretion was adequate in schoolchildren. Considering the data of the percent of households consuming iodized salt and programmatic setting of the IDD program, the Islamic Republic of Iran has reached a sustainable control program for iodine deficiency [4]. The purpose of this study was to evaluate the prevalence of goiter in school-age children of Ahwaz City after implementation of the law.
Subjects and Methods

This study was carried out in 2001 in 14 schools in Ahwaz City, Iran, among 1,950 students (male: n = 1,050; female: n = 900), who ranged in age between 11 and 16 years, with a mean age of 12.47 years. The number of students for each age was as follows: 11 years, n = 327; 12 years, n = 334; 13 years, n = 323; 14 years, n = 341; 15 years, n = 332, and 16 years, n = 293. The sample size of children to be surveyed was based on the assumed goiter prevalence rate of 50% (as there was no available information on likely prevalence in the study district), confidence interval of 95%, a design effect of 3, and a relative precision of 10%. The sample size of 500 children was sufficient, but as our intention was to assess the degree of severity also, the sample size had to be larger.

Multistage sampling methodology was followed for selecting the study population. All the schools in the district with their respective population were enlisted. Fourteen schools were randomly selected, and 10–15 students were selected using simple random sampling technique in each identified school. The students were examined by general pediatricians who were trained in goiter grading and physical examination of the thyroid. Goiter size was determined by palpation and classified into three grades [5]: grade 0: absence of goiter; grade 1: thyroid gland palpable; grade 2: goiter visible in normal position of the neck; grade 3: very large goiter, clearly visible from a distance. Data were collected on age, sex, weight, height, iodized salt consumption, family history of goiter, thyroid size by palpation and goiter grade and type of goiter (diffuse or nodular). Height was measured to the nearest millimeter and weight was obtained in simple measure using a single balance with a precision of 100 g.

The statistical analysis was performed using SPSS, version 10 (SPSS Inc., Chicago, Ill., USA). The χ² test with a 5% significance level was used. A p value of 0.05 or less was considered significant.

Results

Of the 1,950 students examined, goiter was detected in 146 (7.48%). The means of height and weight of the students were 150.13 cm and 41.9 kg, respectively. Within each age group, there was no statistically significant difference in height or weight between those with and without goiter. For boys, height ranged from 139.5 (age 11 years) to 165.2 cm (age 16 years). Corresponding heights for girls were 136 and 158 cm. The boys weighed 33 (11 years) to 56 kg (16 years); corresponding weights for girls were 33.9 and 45.4 kg. The mean height and weight for all the students were 150.1 cm and 41.9 kg, respectively.

Of the 146 cases of goiter, 96 (56.8%) consumed iodized kitchen salt compared to 1,581 (87.6%) without goiter (p < 0.0006). Of the 146, 40 (27.4%) had a family history of goiter and 33 of them were females.

The distribution of students according to gender, age and grade of goiter is shown in Table 1. Of the 146 with goiter, 46 (31.5%) were male and the remaining 100 (68.5%) were female. Prevalence of goiter among male and female students was 4.4 and 11.1%, respectively (p < 0.05). The prevalence of grade 1, 2 and 3 goiter among female students was found to be higher than in male students and the ratio of female to male cases with goiter was 1.86 (p < 0.05). They all had diffuse goiter: grade 1, 83 cases (56.8%); grade 2, 55 cases (37.7%), and grade 3, 8 cases (5.5%).

There was no significant difference between grade of goiter and age (p > 0.05). A significant difference was found between the height of students with grade 1 goiter and students with grade 2 and 3 goiters (p < 0.001). A significant difference was also found between the weight of students with grade 1 goiter and students with grade 2 goiters (p < 0.002).

Discussion

In general, it has been reported that goiter prevalence in schoolchildren is 5–14% [6]. The sensitivity of clinical examination in establishing the presence of goiter increases with better training of health personnel and clinical examination is regarded as a practical screening method in population-based studies [7, 8].

Goiter is endemic in Iran as evidenced by the reports of Bazrafshan et al. [10] in 7- to 11-year-old children in Gorgan, and of Azizi et al. [4] in adults. The iodine deficiency disorders program begun with the use of iodized salt appears to be reducing the prevalence of goiter in young children [11] as confirmed by our study where the overall prevalence of goiter in school-age children was 7.48%. The relatively low prevalence of goiter could also be due to the geographic location of this area (the low altitude of sea level) or nutritional habits of its inhabitants.
(consumption of fish). However, the prevalence of grade 2 and 3 goiter was 37.7 and 5.5%, respectively. Given that the goiter rate is high in iodine-deficient areas, and the sensitivity of clinical examination increases with higher grades of goiter, the overall goiter prevalence we found should be considered with caution.

The observed differences between height and weight of children with and without goiter may be due to other factors that include the effect of thyroid hormones on growth, nutrition, economic status of parents, environment and genetics.

It has been recommended that if more than 10% of schoolchildren (6–12 years) suffer from goiter, the area should be classified as endemic to iodine deficiency [3, 12]. In the present study, the goiter prevalence rate among children from 11 to 16 years was 7.48%. Thus, we cannot classify the Ahwaz City district as endemic for iodine deficiency with certainty. Consequently, further studies are recommended to include sonographic evaluation of thyroid size because ultrasonography is more accurate than palpation in estimating thyroid size.

Conclusion

These results indicate that Ahwaz City is not an endemic area for iodine deficiency, probably because of its geographic location (the low altitude of sea level) or nutritional habits of its population (consumption of fish and iodized salt).

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References