

A SURVEY OF ENDEMIC GOITER IN SCHOOL CHILDREN IN KERMANSHAH

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ABSTRACT

In the fall of 1991, the incidence of goiter was determined in 1078 male and female school children in Kermanshah city. The study was considered from two view points i.e., clinical examinations and measurements of levels of iodine excreted in urine, and was performed in three age groups: 7-11 years of age, 12-15 years of age and 16-18 years of age.

Clinical examination showed 16.5% occurrence of goiter in boys and 21.2% occurrence in girls of all age groups. The most common type of goiter in boys was Ia with occurrence of about 14.2% whereas Ia and Ib were the most common in girls with occurrence of 14.9% and 3.6%, respectively.

The results obtained from laboratory studies showed that the levels of iodine in urine of healthy boys was about 89.17 ± 4.7 micrograms iodine per gram of creatinine, and in healthy girls 97.9 ± 3.5 micrograms iodine per gram creatinine, which indicates a significant difference in the levels of excreted iodine between the two sexes. The levels of iodine in urine was decreased considerably in children with goiter, up to 47% in boys and 58% in girls.

The results obtained from this survey indicate that Kermanshah province fits in the moderate-deficiency region of the Hetzel classification for having a maximum of 35% occurrence of goiter. Furthermore, 25 to 50 μg iodine consumption per gram creatinine becomes one of the urgent priorities of the national campaign against iodine deficiency disorders.

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INTRODUCTION

Goiter is the most common of all endocrine diseases. According to the latest reports from the World Health Organization (WHO), in 1986 more than 400 million people suffered from goiter and the resulting disorders in the world including Iran.¹ It is estimated that up to 800 million people live in the high risk regions of the world.²

Twenty years ago, for the first time, Imami et al. made an attempt to determine if goiter existed in Iran.³ It took several years before another group of investigators from the endocrinology department of Taieqani Hospital of

Shahid Beheshti University in 1983, decided to conduct a study of goiter in southeastern part of Tehran. This survey showed that 80% of the residents were suffering from goiter, 7% of whom had visible goiter.⁴

In the recent years more attention is given to people with iodine deficiency who look normal, especially school children,^{5,6} in order to determine the hidden and contemptible disorders that iodine deficiency might create in the growth of the nervous system.

A rapid survey for prevalence of goiter in school children was conducted in 1989 in eight provincial centers of Iran, along with a rural center in each province.⁷ The

survey indicated 20-70% prevalence of goiter in school children.

This high prevalence denotes that goiter is an important public health problem. The main aim of this investigation is to complete Iran's goiter map in order to help national endeavours against IDD.

MATERIALS AND METHODS

In cooperation with the education and cultural office of Kermanshah province, from among all the male and female students, 381 school-boys and 697 school-girls in three age groups were selected for our investigation. The survey consisted of a multistage sampling procedure⁸ and had two aspects: 1) clinical examinations were conducted by a specialist in internal medicine, and diagnosis was according to the classification provided by WHO, and 2) measurements of iodine in urine.

Sample collection

All urine samples were collected before noon between 8:30-10:00 AM in disposable tubes and the measurements were conducted on the same day.

This is the first extensive survey in Iran in which levels of iodine excretion in all subjects are reported in relation to goiter. The results have been interpreted using the table suggested by Hetzel.²

Determination of iodine in urine

Quantitation of iodine in urine was conducted according to the modified method of Sandell and Kolthoff.^{9,10}

Determination of creatinine in urine

To measure creatinine, we used the classic method of Jaffe. In this method the reaction between creatinine and picric acid in an alkaline environment gives rise to the production of a red creatinine-picric complex.^{11,12} The autoanalyzer used in our work was a technicon RAXT-10(X).

RESULTS

Studies performed on all the subjects showed that 16.5% of total subjects were goitrous boys and 21.2% goitrous girls (Fig. 1). 14.2% of goitrous boys had type Ia whereas only 1.6% had type Ib and 0.3% type II goiter.

For girls, we found 14.9% goiter type Ia, 3.6% Ib and 1.9% type II (Table I). Type Ia goiter seemed to be the most common in all three age groups, which is considered a statistically significant observation.

All the results are obtained by testing the ratios and evaluating the ($P < 0.05$) t-student values.

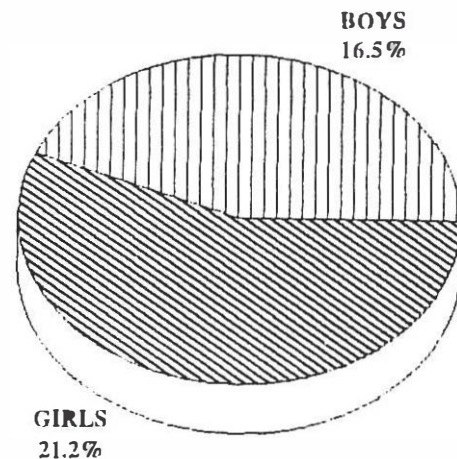


Fig. 1. Prevalence of goiter in school boys & girls in Kermanshah.

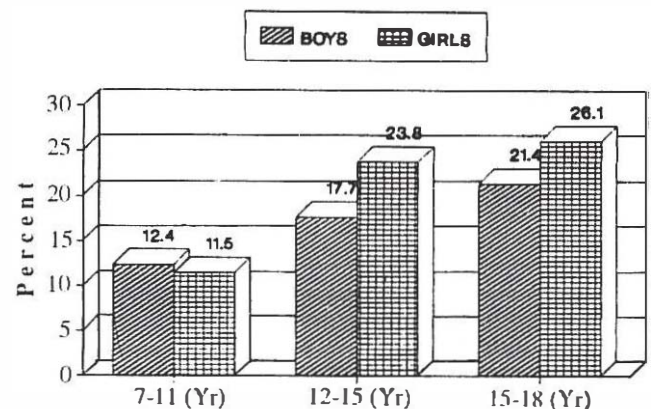


Fig. 2. Percentage distribution of goiter in different age groups of school boys & girls in Kermanshah.

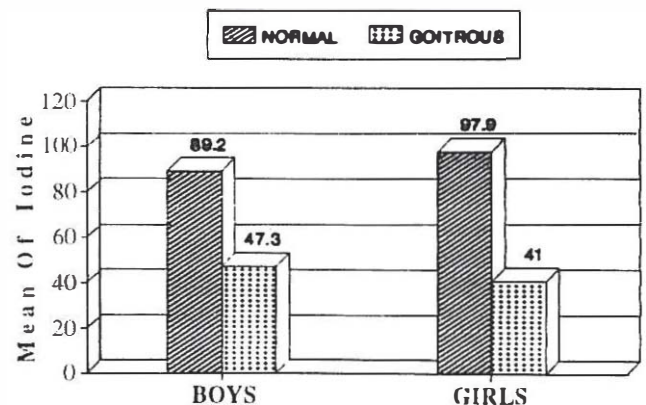


Fig. 3. Urinary excretion rate of iodine per gram creatinine in normal & goitrous school boys & girls in Kermanshah.

TABLE I: The incidence of various grades of goiter in school boys & girls in Kermanshah.

Goiter grade		0	I	Ia	Ib	II	Sample
Age group (Yr)							
7 - 11	M	134	0	17	2	0	153
	F	177	1	18	3	1	200
12 - 15	M	107	0	21	2	0	130
	F	160	4	32	10	4	210
16 - 18	M	77	2	16	2	1	96
	F	212	1	54	12	8	287
Total	M	318	2	54	6	1	381
	F	549	6	105	25	13	697
Percent %	M	83.5	0.5	14.2	1.6	0.3	100
	F	78.8	0.9	14.9	3.6	1.9	100

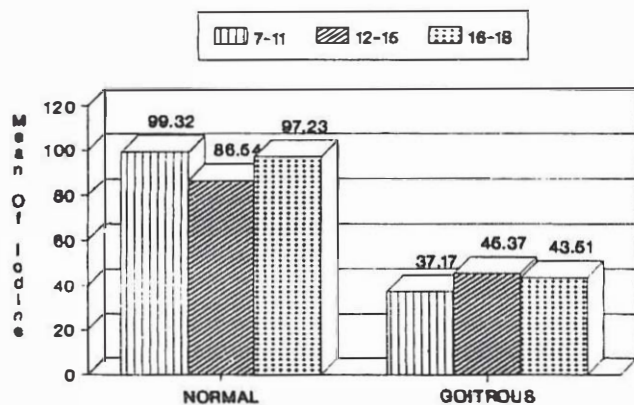


Fig. 4. Urinary excretion rate of iodine per gram creatinine in different age of normal and goitrous school boys & girls.

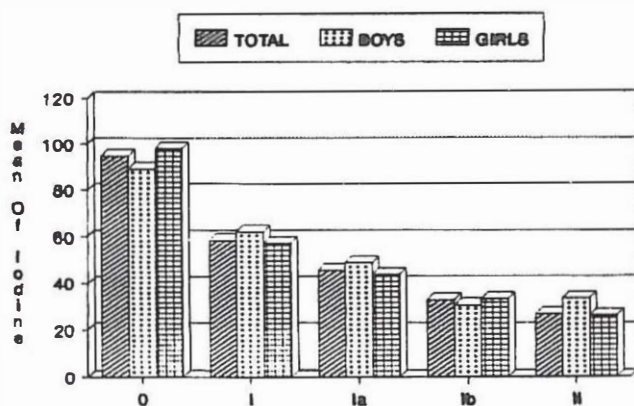


Fig. 5. Relationships between severity of goiter & urinary iodine excretory rate by sex in study population.

Comparison of the results for different age groups showed firstly, among the subjects of the first age group (7-11 yr), there was no difference in the relative ratios of goitrous boys and girls. Secondly, although there is an

increase in the ratio of goitrous girls in the other age groups, (12-15) and (16-18), up to 6.1% and 4.7% respectively, this difference is not significant. Thirdly, the difference observed between the ratio of the goitrous girls in the first age group and the other two age groups is significant (Fig. 2).

Iodine excretion in urine

The average iodine excreted in urine of healthy boys amounted to 89.17 ± 4.7 , and that of healthy girls, 97.92 ± 3.5 μ g iodine per gram creatinine, which shows a significant excess ($P < 0.05$) in girls compared to boys. The average amount of iodine in urine of goitrous boys and girls was measured to be 47.29 ± 5.6 and 41.02 ± 2.31 μ g iodine/gram creatinine, which is more in boys than girls. This difference is also statistically significant. As a result, the iodine levels in goitrous boys are 47% less than its levels in healthy boys. The decrease

among girls. Both these changes are statistically significant (Fig. 3). Considering the significant differences that are seen between the two healthy sexes, the question arises as to whether other factors such as physiological factors could cause the increased iodine uptake in boys or the increased iodine excretion in girls. Further investigations are necessary to answer this question.

The results regarding the iodine excretion among different age groups show that in the first and third age groups, iodine levels in urine of the healthy subjects could be considered statistically equal whereas in the second age group, a statistically significant decrease is evident ($P < 0.05$). However, in goitrous subjects, iodine excretion levels are equal for the 2nd and 3rd age groups and the first age group shows a significant decrease. In addition, all the differences that exist in the levels of iodine in urine of healthy and goitrous subjects are meaningful within all age groups (Fig. 4).

The increase in goiter intensity and the decrease in the iodine excretion in urine is shown in Fig. 5. This decrease in normal subjects is significant compared to the goitrous subjects, but among goitrous subjects it is not significant with respect to different classifications provided by WHO.

DISCUSSION

Thyroid hormones have important roles in regulating cellular metabolism and growth, especially in the first years of life. The thyroid gland will be capable of synthesizing and secreting thyroid hormones if it has normal cells and tissues, if the levels of TSH secreted by pituitary gland are normal and if enough iodine is received by the thyroid.¹³ Iodine deficiency is an essential element in creating disorders in the performance of the thyroid which can eventually lead to IDD.

According to the Hetzel classification, Kermanshah-

city is a moderately iodine-deficient area and has a 30% incidence of goiter. The iodine levels in urine per gram creatinine ranges from 25-50 micrograms. Measurements of iodine levels in urine suggest that iodine deficiency is the main cause of goiter in this region. The difference in the iodine excretion levels among healthy and goitrous subjects are significant which shows an indirect proportionality with goiter intensity.¹⁴

It is hoped that this research will help further development of national programs in the campaign against IDD which has been active since 1989, with the objective of preventing and fighting any disorders caused by iodine deficiency.⁷

It is clear that continuation of similar studies in regions not surveyed so far and determination of goiter incidence in those areas will aid the distribution of iodine-rich table-salt,¹⁵ as the best alternative to decrease goiter incidence and implementation of WHO programs in those areas, and hopefully a positive step would be taken to prevent iodine deficiency disorders and maintenance of the health of residents of this nation.

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REFERENCES

1. Hetzel BS: Progress in the prevention and Control of iodine

- deficiency disorders. *Lancet* I: 266, 1987.
2. Hetzel BS, Dunn JT, Stanbury JB: The prevention and control of iodine deficiency disorders. New York: El Sevier, 1987.
3. Emami A, Shahbazi H, et al: Goiter in Iran. *Am J Clin Nut* 22: 1584, 1959.
4. Azizi F, Kimiagar M, et al: Evaluation of goiter in Shahriar. *Shaheed Behshti University Medical Journal* 9: 84, 1983.
5. Rajabian R, et al: IDD in Neishabour. *Med J Islam Repub Iran* 4: 207-10, 1990.
6. Lind P, Leopold B, et al: Jodversorgung in Oesterreich. *Therapiewoche Oesterreich* 8: 811-4, 1987.
7. Azizi F, Kimiagar M, et al: Current status of iodine deficiency in the Islamic Republic of Iran. *EMR Health Surv J* 8: 23-7, 1990.
8. Shirani P: Theory of Sampling, Tehran: Markaz-e Nashr-e Daneshgahi (Center for University Publications), 173, 1985.
9. Sandell EB, Kolthoff, IM: Chronometric catalytic method for the determination of microquantities of iodine. *J Am Chem Soc* 56: 1426, 1934.
10. Wawschinek O, Eber O, Petek W: Bestimmung der Harniodidausscheidung Mittels einer modifizierten CER-Arsenite-Methode. *Berichte der OGKC* 8, 13-15, 1985.
11. Jaffe M: Ueber den niederschlag, Welchen pikrinsaeure in normalem harn erzeugt und ueber reaktion des kreatinins: *Zeitschrift fuer Physiologische Chemie* 10: 391-400, 1986.
12. Chasson AL, Grady HJ, Stanley MA: Determination of creatinine by means of automatic chemical analysis, *Am J Clin Pathol* 35: 88, 1961.
13. Azizi F, et al: Endocrinological Disease. Tehran: Markaz-e Nashr-e Daneshgahi (Center of University Publications), 105, 1986.
14. Hesse V, Bertram-Bewer G, et al: Orientierende untersuchungen zur strumahaufigkeit und urinjodausscheidung bei schulern der DDR. *Dt Gesundh Wesen* 48: 33, 1978.
15. Kharrazi, H, Moaveni S: Quantitative measurement of "iodine" in salt stones of Garmsar and Semnan mines. *Iranian Journal of Chemistry & Chemical Engineering* 2: 109-13, 1991.