

Original Article

PREVALENCE STUDY OF IODINE DEFICIENCY DISORDERS AMONG HIGH SCHOOL GIRLS IN SHIRAZ, ISLAMIC REPUBLIC OF IRAN, 1996-1997

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ABSTRACT

Objective: To assess the prevalence of iodine deficiency disorders, in high school girls in Shiraz, Iran.

Design: A cross-sectional study based on a multi-stage cluster sample.

Setting: The study subjects underwent clinical examination for presence of goiter. A sub sample of study sample was selected to conduct Urinary Iodine determination.

Subjects: High school girls aged 14-18 years.

Results: Prevalence of goiter was 25%. Grade 1B goiter was more prevalent (13.9%) than grade 1A (7.4%). Iodine deficiency according to two indices, Urinary Iodine level and Urinary Iodine/Creatinine ratio in sub sample of study sample were 4.7% and 12.1% respectively.

Conclusion: Salt iodination program should be continued and further studies to investigate other factors in genesis of thyroid enlargement are recommended.

KEY WORD: Goiter, Urinary iodine concentration, Urinary iodide / Creatinine ratio. High school girls, Shiraz-Iran.

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INTRODUCTION

One of the most important and well-known global nutritional problems is iodine deficiency. It is estimated that more than one billion people

concentrated primarily in less developed countries, are unable to consume adequate levels of iodine. Only during the last decade has it been organized that iodine deficiency disorders are the leading cause of intellectual impairment¹. World wide, over 600 million people have goiter and 20 million have some degree of brain damage caused by the effects of iodine deficiency in pregnancy². In the Eastern Mediterranean Region, at least 16 countries have alarming prevalence rates of iodine deficiency disorders (IDD)³. The prevention of this deficiency is one of the most important achievable international health goals of the decade. Endemic goiter was reported in Shiraz about 30 years ago⁴. In 1989 Taheri H.⁵ reported a goiter prevalence rate of 90.1%, 98.9% and 98.3% among school girls aged 6-11, 11-14 & 14-18 years respectively. In 1997 Janghah, A.⁶ found that 19.8% of Shiraz primary school girls aged 6-11 years old were goitrous. Ghamie S⁷ in

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1997 also found that 50% of Shiraz school girls aged 11–14 year were goitrous.

According to the World Health Organization (WHO), a total goiter rate of 5% or more in primary school children (6–12 years) should signal the presence of a public health problem⁸. The aims of the present survey were to assess the prevalence of IDD in high school children aged 14–18 years in Shiraz Iran after 8 years of salt iodination programme and urinary iodine determination.

SUBJECTS AND METHODS

Subjects

In this cross sectional study, a sample of 1200 (3.18% of the population) high school girls aged 14–18 years were selected randomly by proportionate multistage cluster sampling method from 22 high school located in four educational regions in Shiraz.

1. Goiter Survey

Every child under went clinical examination for presence of goiter. Examination of the thyroid gland was made by palpation according to criteria endorsed by the World Health Organization and ICCIDD (International Council for The Control of Iodine Deficiency Disorders⁹.

Classification of goiter size in this system is as follows:

Grade	Description
0	No goiter
1A	Thyroid lobes larger than ends of thumbs.
1B	Thyroid enlarged, Visible with head tilted back.
2	Thyroid enlarged, Visible with neck in normal position.
3	Thyroid greatly enlarged, Visible from about 10 meters.

Grades 2 and 3 are collectively called visible goiter.

2. Determination of Urinary Iodine

A sub sample of 107 high school girls (about 10% of pre-determined sample size) was chosen to conduct the urinary iodine determination. Untimed (causal) urine samples were taken from each child in the sub sample. Urine was collected in clean bottles which has been rinsed with acid and ion exchange water before use. A sample of each urine was stored in a clean container without preservative at -20°C until analysis. Iodide was measured in urine using the method of Thomson CD¹⁰.

Statistical analysis

The statistical package for social sciences (SPSS) was used for statistical analysis. Student t-test, chi-square, and analysis of variance were used in the statistical analysis.

RESULTS

1. Goiter Prevalence

The present study revealed that the prevalence rate of goiter was 25% (Table-I). The prevalence rates ranged from 23.16% to 29%. Prevalence (%) of goiter according to goiter grade 1A, 1B, 2 and 3 were 7.4%, 13.9% and 3.41% and 0.25% respectively. Grade 1B goiter was the most prevalent (13.9%). Age

Table-I: Prevalence (%) of goiter among high school girls in Shiraz

Age (year)	No.	Goiter grade								Prevalence (All Grades) %
		1A		1B		2+3		1B+(2+3)		
		No.	%	No.	%	No.	%	No.	%	
14	122	6	4.9	18	14.75	5	4.1	23	18.85	23.75
15	294	20	6.8	47	16	9	3	56	19	25.8
16	406	36	8.87	48	11.8	18	4.4	66	16.25	25.12
17	285	18	6.3	41	14.4	7	2.46	48	16.86	23.16
18	93	9	9.7	13	14	5	5.3	18	19.35	29
All ages	1200	89	7.4	167	13.9	44	3.67	211	17.58	25

Table-II: Comparison of prevalence (%) of goiter among schoolgirls in 1989 and 1997 (8 years after salt iodination program) in Shiraz

Year/ Goiter Grade	1A %	1B %	2 %	3 %	Prevalence %
1989 (Tahiri H)					
6-11	45	40.6	4.5	-	90.1
11-14	39.8	48.5	10	0.6	98.9
14-18	38.5	46.0	13.5	0.3	98.3
1997 (Present study)					
6-11	3.31	11.1	5.01	0.4	19.82
11-14	16.2	27.4	6	0.4	50
14-18	7.4	13.9	3.41	0.25	25
Differences					
6-11	41.69	29.5	-0.51	-	70.28
11-14	23.6	21.1	4	0.2	48.9
14-18	31.1	32.1	10.1	0.05	73.3

P - value = P<0.001

Table-III: Mean and standard deviation of urinary iodide and urinary iodide / creatinine ration in the (107 high school girls) sub sample examined by grade of goiter

Goiter grade	No.	% ($\mu\text{g/dl}$) mean \pm SD	Urinary iodide iodide/creatinine ratio ($\mu\text{g/dl}$) mean \pm SD	Urinary
0	71	66.35	20.3 \pm 6.8	197.15 \pm 116.74
1a	7	6.54	21.54 \pm 8.4	154.85 \pm 31.34
1b	21	19.62	19.9 \pm 9.25	175.53 \pm 110.3
2+3	8	7.47	16.7 \pm 11.74	203.76 \pm 167.15
TOTAL	107	100	19.95 \pm 7.8	190.63 \pm 115.6

specific prevalence rate was highest (29%) at age 18 years and lowest (23.16%) at 17. Prevalence rates specific for school district were compared. Prevalence rate was higher in districts with lower economic status. There was not a statistically significant difference between four districts.

97.75% of the subjects used iodized salt and only 2.25% reported using non-iodized salt. Comparison of prevalence rate of goiter among high school girls in 1989 and present study in 1997, 8 years after salt iodination programme

revealed that prevalence rate of goiter for grade 1A, 1B and (2+3) have significantly decreased ($P<0.001$) by 30.84%, 32.1% and 9.86% respectively (Table-II).

2. Urinary iodine excretion in sub samples

Table-III illustrates the mean \pm SD levels of urinary iodine and urinary iodine / creatinine ratio in a sub sample of 107 high school girls according to goiter grade. The overall mean \pm SD urinary iodine and urinary iodine / creati-

Table-IV: Iodine deficiency disorders according to urinary iodide and urinary iodide/creatinine ratio in 107 high school girls in Shiraz

Grade of IDD	Urinary Iodide ($\mu\text{g/dl}$)			Urinary Iodide: Creatinine ratio ($\mu\text{g/g}$)		
	Criteria	No	%	Criteria	No.	%
None	>5	102	95.3	>89.1	94	87.9
Mild	3.6-5	2	1.9	44.6-89.1	1	0.9
Moderate	2-3.5	0	0	22.3-44.5	8.5	7.5
Severe	<2	3	2.8	<22.3	4	3.7
TOTAL	—	107	100	—	107	100

nine ratio were $19.95 \pm 7.8 \mu\text{l/dl}$ and $190.63 \pm 115.6 \mu\text{g/g}$ respectively. The present study also shows that mean \pm SD of urinary iodine were $21.54 \pm 8.4 \mu\text{g/dl}$ and $19.9 \pm 9.25 \mu\text{g/dl}$ for grade 1A and 1B goiterous girls respectively. Grade 1A goiterous children excreted more iodine in urine than grade 1B children. Severe, moderate and mild iodine deficiency according to urinary iodine excretion are illustrated in Table-IV.

The present study revealed that only 4.7% and 12.1% of sub sample girls according to two indices, (urinary iodine and urinary iodine/creatinine ratio) had iodine deficiency (Table-IV).

DISCUSSION

Iodine deficiency disorders are still a major public health problem in many countries of the world. The prevention and control of IDD, because of its dramatic impact on the quality of life, productivity and educability of millions would make a major contribution to the development of countries whose people are at risk of developing IDD. In addition, it would contribute significantly to the attainment of the World Health Organization's goal of health for all by the year 2000¹¹.

Goiter is arbitrarily defined to be endemic in an area if more than 10% of the population of

school children age 6-12 years is goitrous. Recently¹², the cut-off point of 10% was revised downward because it was found that goiter prevalence rates between 5% and 10% may be associated with a range of abnormalities, including subnormal circulating level of thyroid hormones and elevation of thyroid stimulating hormones (TSH) in the population, clearly representing a public concern¹².

The present study revealed that the prevalence of goiter was 25% in high school girls. This rate is lower than that reported by Taheri H.⁵ in 1989, which showed 98.3% of high school girls are goitrous.

Grade 1B goiter was more prevalent (13.9%) than grade 1A (7.4%). Prevalence rate of goiter for grade 1A, 1B, 2 and 3 among high school girls in 1989 compare to present study decreased by 31.1%, 32.1%, 10.1% and 0.05% respectively (Table-II). Comparison of prevalence rate of goiter among school children aged 6-11, 11-14 and 14-18 years old in 1989 and 1997 i.e. 8 years after salt iodination programme were decreased by 70.28%, 48.9% and 73.3% respectively (Table-II).

This difference could be attributed to the variability in sampling method, sample size, interobserver variation¹³ and mostly 8 years salt iodination programme.

Severe, moderate and mild Iodine deficiency is present when the concentration of iodine in

urine is less than 2 $\mu\text{g}/\text{dl}$, 2-3.5 $\mu\text{g}/\text{dl}$ and 3.6-5 $\mu\text{g}/\text{dl}$ respectively¹⁴. The present study revealed that 4.7% and 12.1% of sub sample girls according to two indices i.e. urinary iodide excretion and urinary iodide / creatinine ratio respectively were iodine deficient. Janghah, A⁶ and Ghamie, S⁷ reported that 8.66% and 9.8% of sub sample of 6-11 and 11-14 year old school girls in Shiraz respectively, were iodine deficient according to urinary iodine/creatinine ratio.

The present study suggests the involvement of other factors (dietary or non-dietary) in the genesis of thyroid enlargement besides iodine deficiency.

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