

Prevalence of goiter among high school students in Sanandaj, Iran in the year 2012.Jafar Moballeghi¹, Hossein Mohamadzadeh², Fardin Gharibi^{3*}, Mozhdeh Zarei⁴, Alireza Gharib⁵¹Department of Surgery, Besat Hospital, Kurdistan University of Medical Science, Sanandaj, Iran²Assistant Professor of Sociology, Department of Social Science, Payam Noor University^{3*}Ms PH Health Management. Deputy of Research and Technology, Kurdistan University of Medical Sciences, Sanandaj, Iran.⁴Ms PH Midwifery. Deputy of Research and Technology, Kurdistan University of Medical Sciences, Sanandaj, Iran⁵MSc in Community Health Nursing, Deputy of Research and Technology, Kurdistan University of Medical Sciences, Sanandaj, Iran.*Corresponding Author: fardin.gharibi@muk.ac.ir

Abstract: Iodine deficiency is a prevalent, yet easily preventable cause of brain damage. In this study we evaluated the prevalence of goiter among high school students lower than twenty years of age in the city of Sanandaj, knowing that iodized salt program began twenty years ago. **Methods:** This descriptive - analytical study was conducted on 700 high school students in Sanandaj during 2011-12 academic years. Sampling method was multistage. Data were collected by referring to the chosen schools in coordination with high school principals. Demographic information of were collected after interviews and were recorded in the questionnaire. Height and Weight measurement students'. The diagnosis of goiter is based on clinical examination and is graded in accordance with World Health Organization criteria. Collected data were analyzed by SPSS 16, and then chi-square test was used to determine the relationship between demographic variables and goiter grades. **Results:** In our study the prevalence of goiter in high school students was 11.7%; females 16% and males 7.4% ($p=0/0001$). The frequency of grade one goiter in students that had mothers with high school education was 15.2% and in students that had fathers with university education was 13.5%. Prevalence of grade one goiter in students with normal body mass index was 11.2%. **Conclusion:** Findings of the present study showed that in view of the descending trend of goiter prevalence during the past 20 years, the iodine deficiency disorders control program in Sanandaj has been highly successful. Therefore for the purpose of maintaining a successful control monitoring program the iodine deficiency disorders program needs to be strengthened.

[Jafar Moballeghi, Hossein Mohamadzadeh, Fardin Gharibi, Mozhdeh Zarei, Alireza Gharib.

Prevalence of goiter among high school students in Sanandaj, Iran in the year 2012. *Life Sci J* 2013;10(7s):534-538](ISSN:1097-8135). <http://www.lifesciencesite.com>. 83**Keywords:** Iodine deficiency- goiter -high school students**Introduction**

Iodine deficiency is a prevalent, yet easily preventable cause of brain damage (1,2). Although the importance of adequate iodine consumption is fully understood and most countries in the world had done many efforts toward general iodination(3,4), still in many countries even industrialized and developing ones there are people suffering from iodine deficiency (5,6). A major cause of iodine deficiency is inadequate iodine intake due to low quality iodine and iodine shortage in soil and water of iodine poor regions (7). Iodine deficiency is one of the main causes of impaired cognitive development. Iodine deficiency, once believed to be eliminated is returning to some communities (8). To this end salt iodization has been recommended as the preferred strategy for prevention and control of iodine deficiency (9). In 1998, salt in approximately one-third of the countries in the world was being iodized (10). Recent reports indicated that about one-third of the world population suffer from iodine deficiency (11).

The latest Iranian survey shows that around 93 % in the rural and 97 % in the urban areas use iodized salt, nevertheless prevalence of goiter is 9.8%(12). The prevalence of Iodine deficiency among school children in Kurdistan province was 24.4% in 1380, of which 18.9% classified as grade 1 and 5.5% as grade 2 goiter(13). Major reasons for failure in "salt iodization" program in some communities were due to inappropriate supervision on iodine intake and consumption(14). Studies showed that return to iodine deficiency after a successful control period was due to lack of accurate annual supervision on iodized salt intake(15,16). A good strategic planning is mandatory to evaluate the adequacy of iodine intake in a given population and in case of any insufficiency necessary steps to follow up and intervention should be taken immediately. In this study we evaluated the prevalence of goiter among high school students lower than twenty years of age in the city of Sanandaj, knowing that iodized salt program began twenty years ago.

Coordinates: $35^{\circ}18'41''N46^{\circ}59'46''E$ $35.3113^{\circ}N$
 $46.9960^{\circ}E$.

Kurdistan Province is one of the 31 provinces of Iran covering an area of 28,817 km² [2]. This mountainous region is located in the western part of Iran and shares its boundary with Iraq. Sanandaj also known as Senna serves as the provincial capital of Kurdistan.



Methods

This descriptive - analytical study was conducted on 700 high school students in Sanandaj during 2011-12 academic years. Sampling method was multistage. Sanandaj city is divided into three socioeconomic neighborhood classes; marginal, mid city areas and uptown. Two girls' and two boys' high schools from schools in each region were chosen of which 25 students from each grade in each school were selected at random. Data were collected by referring to the chosen schools in coordination with high school principals. Demographic information of students including year of birth, gender, education and parents' occupations were collected after interviews and were recorded in the questionnaire. For height measurement students took off their shoes, raised their body as straight as possible with their back, scapulae and buttocks in contact with the solid wall. Weight was measured with minimum clothing, without shoes, using digital scales which were checked alternately with a standard weight. Measurements recorded in the questionnaire were in metric units. The diagnosis of goiter is based on clinical examination and is graded in accordance with World Health Organization criteria (17), according to which it is divided into the following four grades:

Grade 1: thyroid is neither palpable nor visible even if the head is tilted back; this stage is called the zero point. Grade 2: thyroid is palpable but not visible.

Grade 3: thyroid is visible and palpable when the neck is in normal position. Grade 4: presence of a relatively large thyroid, visible from a distance.

Collected data were analyzed by SPSS 18, and then

chi-square test was used to determine the relationship between demographic variables and goiter grades.

Results

The gender distribution of students in this study were 50% in both females and males. Mean age of the female participants in the study was 16.68 years and standard deviation of 0.97 and for males it was 16.5 years with standard deviation of 1.1. The frequency of high school first year students was 19.4 %. Humanities students with 31.4 %, and seventeen years of age students with 32.1 % had the most frequency. (table1). On the subject of body mass index, 30.3% of the students were slim, 52.3% were normal and 13.3% were overweight. Concerning parent's education, most of the parents had primary education with a frequency of 31% and 34.1% for fathers and mothers respectively. In our study the prevalence of goiter in high school students was 11.7%; females 16% and males 7.4% ($p=0/0001$). The frequency of grade one goiter in students that had mothers with high school education was 15.2% and in students that had fathers with university education was 13.5%. Prevalence of grade one goiter in students with normal body mass index was 11.2% (table2).

Discussion

Iodized salt production became mandatory in 1994, therefore its consumption increased by Iranian households. According to the last survey in 2000, 95% of the people in urban and 92% of them in rural areas used iodized salt (12). In 2000, IRAN was declared as free of iodine deficiency by World Health Organization Regional Office for the Eastern Mediterranean. In the second and third national survey in the years 1996 and 2000 at country level the prevalence of goiter were 58% and 9.8% respectively (18,19). In the country level, IDD control depends on the effective national IDD combat program. Negligence in performing any component of the program will cause failure in IDD combat plan, followed by persistence of iodine deficiency in the community. In some countries the effective implementation of the IDD program eliminated iodine deficiency, but negligence in maintaining the program caused returned iodine deficiency to these communities (13). Consistent with WHO guidelines, monitoring of the iodized salt program has a number of criteria among which one can refer to; iodized salt coverage rate, goiter prevalence, thyroid size, and biochemical parameters (17). In the following study the prevalence of goiter in high school students was 11.7 % (10.3% grade one goiter and 1.4 % grade two goiter). Prevalence of goiter between 5-19.5 % is considered as mild goiter according to World Health Organization classification (17).

In 1989, based on the first national survey on iodine deficiency disorders the prevalence of goiter among the students were 30%-80% (20). In 1996, in the second national survey and seven years after salt iodination program, prevalence of goiter in Kurdistan province was 66% (21). In 2001, 12 years after the start of the national program, iodine deficiency combat, the overall prevalence of goiter in Kurdistan province was 24.4% (18.9% grade one and 5.5% grade two) which declined significantly compared to the 1996 survey (22). In the present study, prevalence of goiter is 7.11% which is lower than that of 2001. Subsequently the national program in combating iodine deficiency was to a large extent successful in preventing the development of goiter in Sanandaj.

In this study the overall prevalence of goiter among genders, being more common in girls than boys, is statistically significant. In a study done by Mozaffari et al in 2002 the indicator for boys and girls, not being statistically significant, were 40.3% and 41.8 % respectively (23). In Tehran prevalence of goiter reported to be 30% and 21% in girls and boys respectively (24). Another study in Fars province suggested that gender prevalence for girls and boys were 69% and 66% respectively (25). A meta analyze study in Iran showed that odds ratio of female to male goiter was estimated to be 1.39 by which the proportion of grade one goiter was 1.30 and grade two goiter was 1.78 (26). Another study showed that levels of TSH and thyroid hormones in girls decreased at puberty compared with earlier years, however these changes did not happened in boys. These gender differences could be caused by effects of estrogen on TRH-TSH axis, as well as changes in body structure in both sexes during the course of puberty (27). Prevalence in goiter showed no significant difference in other age groups and was similar to studies done in Yazd (7) and Ahvaz (28). On the other hand, other studies such as a study done by Setodehmaram et al in Shiraz prevalence in goiter reported to be different across different age groups (29). In areas where iodine intake is appropriate, a common cause of goiter in youth is thyroid autoimmunity (30) which has an unknown cause. Genetics plays a large role in etiology of autoimmune thyroid disease (31) as well as environmental factors such as stress, infection, smoking, aging, and the amount of consumable iodine (32-34). Students with normal body mass index had higher prevalence of grade one goiter comparing to obese or slim students (11.2 %). In a study done in Ahwaz there were no significant difference between BMI of healthy students and those suffering from goiter (28). Several previous studies examined the link between thyroid

function and anthropometric parameters. For example, a study conducted in Turkey, found that children with palpable goiter were skinny (35). BMI of Isfahani children with grade 1 and 2 goiter were lower than those with grade zero goiter (36). This may in part reflect severity of disease along with other genetic and environmental factors on anthropometric status of children. The study limitations include high sensitivity and low specificity of the World Health Organization standards for assessment of goiter by palpation (37). Estimated goiter rate in this study is conceivably more than real, thus it is necessary to have thyroid volumes of children living in free iodine deficiency areas and include them in goiter monitoring program and use it as reference points. Furthermore, clinical examination as well as ultrasonographic methods for assessment of thyroid volume is beneficial.

Table 1: Frequency of demographic variables among high school students.

Variables		N(%)
Age (year)	Fifteen	115(16.4)
	Sixteen	215(30.7)
	Seventeen	225(32.1)
	Eighteen	145(20.8)
High school year	First year	136(19.4)
	Second year	272(38.9)
	Third year	292(41.7)
Field of Study	Math and Physics	91(13.0)
	Humanities	220(31.4)
	Experimental Sciences	205(29.3)
	Vocational education and training (VET)	48(6.9)
	Theoretical sciences.	136(19.4)

Graph1) Distribution of goiter among high school student in Sanandaj

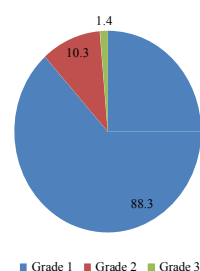


Table 2: Relationship between severity of goiter and their demographic variables among high school students.

		Grade 1	Grade 2	Grade 3	P
Variables		N(%)	N(%)	N(%)	
sex	Girl	294(84.0)	46(13.6)	10(2.9)	0.0001
	Boy	324(92.6)	26(7.4)	0	
Age	Fifteen	84(91.3)	8(8.7)	0	0.29
	Sixteen	173(91.5)	14(7.4)	2(1.1)	
	Seventeen	184(86.0)	26(12.1)	4(1.9)	
	Eighteen	118(86.1)	15(10.9)	4(3.0)	
Mother's level of education	Uneducated	176(89.4)	18(9.1)	3(1.5)	0.38
	Primary	214(89.5)	23(9.6)	2(0.9)	
	Guidance	100(88.5)	11(9.7)	2(1.8)	
	High School	94(83.9)	17(15.2)	1(0.9)	
	Universities	28(84.8)	3(9.1)	2(6.1)	
Father's level of education	Uneducated	67(90.5)	4(5.4)	3(4.1)	0.61
	Primary	194(89.4)	21(9.7)	2(9.1)	
	Guidance	113(86.9)	16(12.7)	1(0.8)	
	High School	128(89.5)	13(9.1)	2(1.4)	
	Universities	94(84.7)	15(13.5)	2(1.8)	
Body mass index	Thin	188(88.7)	23(10.8)	1(0.5)	0.55
	Normal	317(86.6)	41(11.2)	8(2.2)	
	Overweight	86(92.5)	6(5.4)	1(1.1)	
	Fat	27(93.1)	2(9.6)	0	

Conclusion

Findings of the present study showed that in view of the descending trend of goiter prevalence during the past 20 years, the iodine deficiency disorders control program in Sanandaj has been highly successful. Therefore for the purpose of maintaining a successful control monitoring program the iodine deficiency disorders program needs to be strengthened.

Corresponding Author:

Fardin Gharibi

Ms PH Health Management. Deputy of Research and Technology, Kurdistan University of Medical Sciences, Sanandaj, Iran. Post Code: 66177-13446, Email: fardin.gharibi@muk.ac.ir

Tell: +988716131281

References

- Delange FM, Dunn JT. Iodine deficiency. In: Braverman LE, Utiger RD. The Thyroid: A fundamental and clinical text. 9th ed. Philadelphia: Lippincott Williams & Wilkins; 2005. p. 264-88.
- Hetzel BS. Eliminating iodine deficiency disorders-the role of the International Council in the global partnership. Bull World Health Organ 2002; 80: 410-3.
- Delange F. Iodine deficiency as a cause of brain damage. Postgrad Med J 2001; 77: 217-220.
- Delange F, de Benoist B, Pretell E, Dunn JT. Iodine deficiency in the world: where do we stand at the turn of the century? Thyroid 2001; 11: 437-47.
- Vitti P, Delange F, Pinchera A, Zimmermann M, Dunn JT. Europe is iodine deficient. Lancet 2003;361:1226.
- Dunn JT .What's happening to our iodine? J Clin Endocrinol Metab 1998; 83: 3398-400.
- H. Mozaffari-Khosravi, F. Zare, MH Farahzadi, M. Afkhami-Ardakani, A. Jafari-Nodushan .State of Goiter in 6-11 Year Old Students of Southern Khatam, Yazd. Journal of Shahid Sadoughi University of Medical Sciences And Health Services 2008;16(5): 31-39
- Mehran L, Sheikhol Eslam R, Samad Pour K, Haji Pour R, Soleimani B, Khadivi R, Azizi F The prevalence of Goiter and urinary Iodine excretion in school-aged children of Chaharmahal & Bakhtyari. Iranian Journal of Endocrinology & Metabolism 2006;8(29): 15-9
- Sadegholvad AS, Dabbagh Manesh MH, Ejtehadi F, Omrani Ranjbar Gh. H. Prevalence of Goiter and Iodine deficiency ten years after salt Iodination in school children (8-13 years old) in Marvdasht. Iranian Journal of Endocrinology & Metabolism 2006;8(29): 7-1
- WHO/UNICEF/ICCIDD, editors. Assessment of the iodine deficiency disorders and monitoring their elimination: A guide for programme managers. 2nd ed. Geneva: WHO; 2001.

- 11-Li M, Eastman CJ. The changing epidemiology of iodine deficiency. *NatRevEndocrinol*. 2012 Apr 3;8(7):434-40.
- 12-Azizi F, Delshad H, Amouzegar A, Mehran L, Mirmiran P, Sheikholeslam R, Naghavi M, Ordookhani A, Hedayati M, Padyab M. Marked Reduction in Goiter Prevalence and Eventual Normalization of Urinary Iodine Concentrations in Iranian Schoolchildren, 10 Years After Universal Salt Iodination (Third National Survey of Iodine Deficiency Disorders 2000). *Iranian Journal of Endocrinology & Metabolism* 2008;10(3): 191-203
- 13-H Delshad. History of the Iodine Deficiency in the World and Iran. *Iranian Journal of Endocrinology & Metabolism* 2008;9(4):439-453.
14. Dunn JT. Seven deadly sins in confronting endemic iodine deficiency, and how to avoid them. *J Clin Endocrinol Metab* 1996; 81: 1332-5.
15. Zimmermann MB, Wegmuller R, Zeder C, Torresani T, Chaouki N. Rapid relapse of thyroid dysfunction and goiter in school-age children after discontinuation of salt iodization. *Am J Clin Nutr* 2004; 79: 642-5.
16. Guttikonda K, Burgess JR, Hynes K, Boyages S, Byth K, Parameswaran V. Recurrent iodine deficiency in Tasmania, Australia: a salutary lesson in sustainable iodine prophylaxis and its monitoring. *J Clin Endocrinol Metab* 2002; 87: 2809-15.
17. WHO, UNICEF, ICCIDD. Assessment of Iodine other trace elements, and goitrogenic factors in the etiopathogeny of iodine deficiency disorders (IDD). *Biol trace elem res* 1992; 32:229-43.
18. Azizi F, Sheikholeslam R, Hedayati M, Mirmiran P, Malekafzali H, Kimiagar M, et al. Sustainable control of iodine deficiency in Iran: beneficial results of the implementation of the mandatory law on salt iodization. *J Endocrinol Invest* 2002; 25: 409-13.
- 19-H. Delshad, Y. Mehrabi, F. Azizi. Thyroid Volumes in Tehranian Schoolchildren 15 Years After Universal Salt Iodization. *Iranian Journal of Endocrinology & Metabolism* 2009;10(5): 489-494.
- 20-Azizi F, Kimiagar M, Nafarabadi M, Yassai M. Current status of iodine deficiency disorders in the Islamic Republic of Iran. *EMR Health Survey J* 1990; 8: 23- 6.
- 21-Hajipour R, Shaikholeslam R, Abassi G, Mahdavi AR, Mirmiran P, Azizi F. Goiter survey and urinary Iodine concentration in schoolchildren aged 8 to 10 years of Kurdistan province in 1996. *Scientific Journal of Kurdistan University of Medical Sciences* 2001;5(19): 32-28
- 22-Azizi F, Mehran L, Sheikholeslam R, Ordookhani A, Naghavi M, Hedayati M, et al. Sustainability of a well-monitored salt iodization program in Iran: marked reduction in goiter prevalence and eventual normalization of urinary iodine concentrations without alteration in iodine content of salt. *Endocrinol Invest* 2008;31:422-31.
- 23- Mozaffari H, Dehghani A, Afkhami M, Jalali BA, Ehrampush MH. Goiter Prevalence, Urinary Iodine Excretion and Household Salt Iodine after 10 Years of Salt Iodization in Yazd Province. *Iran, Pak J Med Sci* 2005; 21(3): 298-302.
- 24-Azizi F, Sheikholeslam R, Hedayati M, Mirmiran P, Delshad H. Goiter survey and urinary Iodine concentration in 8-10 year-old school children, Tehran province, 1996. *Journal of The Shaheed Beheshti University of Medical Sciences And Health Services* 2001;25(2): 29-25
- 25-Azizi F, Sheikholeslam R, Hedayati M, Mirmiran P, Mahdavi AR, Delshad H. Goiter survey and urinary Iodine concentration in 8 to 10 year-old schoolchildren from Fars province in 1996. *Iranian Journal of Endocrinology & Metabolism* 2001;3(9): 42-37.
- 26-malboosba framin, hosseinpanah farhad, azizi fereidoun, Mojarrad M, Jambarsang S. Difference in Goiter Prevalence Between Genders: a Metaanalysis of Literature. *Iranian Journal of Endocrinology & Metabolism* 2011;12(6): 641-646.
- 27-Kaloumenou I, Duntas LH, Alevizaki M, Mantzou E, Chiotis D, Mengreli C, et al. Gender, age, puberty, and BMI related changes of TSH and thyroid hormones in schoolchildren living in a long-standing iodine replete area. *Horm Metab Res* 2010; 42(4): 285-9.
- 28-Aminzadeh M, ziaei Kajbaf T, Valavi E, Khoshoe A, Heidari F, Cheraghian B. Goiter and associated thyroid dysfunction in Ahvaz primary school children, 2008. *Journal of Hormozgan University of Medical Sciences* 2010;14(2): 109-114
- 29-Setoudehmaram E, Ravanshad Sh, Soleymani Sh, Mostafavi H. Prevalence study of Goiter in 6-10 year old girls of Shiraz, 1995. *Journal of Kerman University of Medical Sciences* 1998;5(3): 133-128.
- 30-Braverman LF. Iodine induced thyroid disease. *Acta Med Austriaca* 1990; 17 suppl 1: 29-33.

4/12/2013