PREVALENCE OF ENDEMIC GOITRE IN SCHOOL CHILDREN : SHIRUR (DIST. PUNE, MAHARASHTRA)

Lt Col PB PILLAI*, Shri SR RAJAN+,
Lt Col GS SAIPRASAD*, Brig AG GOKARN#

ABSTRACT

A survey for estimation of goitre in school children in the Rural Health Training Centre, Shirur area was undertaken. A total of 4664 students from 17 schools were surveyed. The goitre prevalence was found to be 59.8% with visible goitre rate of 6.2% in pre- and peri-adolescent (10-19 years) age group. Thus a highly endemic goitre focus was located in Shirur area in Pune District (Maharashtra). This area is located on the eastern tail-end slopes of Sahyadri Hills in Balaghat ranges, situated at an altitude of 533 metres. The area is generally drought prone and receives scanty rain, with poor agricultural practices. Environmental deficiency of iodine was found to be the main cause for this high prevalence of goitre.

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KEY WORDS : Goitre endemic; Iodine.

Introduction

Endemic goitre is one of the four major nutritional deficiency disorders facing the world [1]. It is the tip of the iceberg called "Iodine deficiency disorders (IDD)" [2]. The consequences of IDD in humans range from the mildest condition, goitre, to the graver conditions like cretinism, deaf mutism, subnormal intelligence and intrauterine death [3]. In India IDD was considered to be prevalent in sub-Himalayan and Vindhya-chal regions. But recent surveys have established its presence in all the states of India [2]. Surveys carried out for endemic goitre in the state of Maharashtra were few and they detected high rates of prevalence of endemic goitre in some areas. The Rural Health Training Centre (RHTC) Shirur, covering some parts of Pune District (Shirur taluk) and Ahmednagar District (Parner taluk), hitherto remained unsurveyed for endemic goitre. We undertook to study the extent of the problem of endemic goitre in this area and to find out reasons thereof.

Methods

a) Study area

Shirur is the headquarter town of taluk (tehsil) Shirur, located on the eastern tail-end slopes of Sahyadri Hills, at an altitude of 533 metres. The average annual rainfall is 50 cm, maximum ambient temperature reaching up to 42°C. The climate is hot and dry. The hillocks around are all barren and devoid of vegetation. The soil generally is rocky and drought prone. The seasonal Ghod and Kukadi rivers flow in the area.

b) Survey methods

We selected school students from 12 villages, located around Shirur. We did not follow any sampling technique in selecting the villages. But the villages selected were well dispersed all over the area and generally based on the village having a school. All the students attending school on the day we visited were examined. As the half yearly examinations were going on in the schools the attendance was almost 100%. The survey was

* Reader, + Scientist 'D', Dept of PSM, AFMC, Pune 411 040. # Commandant, AFMSD, Lucknow.

carried out during October 1992. We have followed the technique of examination and assessment of the size of the gland and classified the goitre as per the guidelines given by WHO [4], with modification in grade "I" as suggested by Thilly et al [5].

Grade (O) : No goitre. Goitre can neither be palpated nor can be seen even when the neck is extended.

Grade (IA) : Goitre cannot be seen but can be palpated when the neck is extended.

Grade (IB) : Goitre can be seen and palpated when the neck is extended.

Grade (II) : Goitre can be seen when the neck is in normal position.

Grade (III) : Goitre can be seen from a

distance of about 6 metres.

All the investigators were practising clinicians and presently pursuing postgraduate studies. The difference in prevalence of goitre by age in both the sexes as well as in the total group was analysed by chi-square test. The rising trend of goitre with age in both the sexes was analysed by chi-square test for linear trend [6].

c) Water samples

Samples of 250 ml of water from each village were tested for iodine content using the method described by ICMR [7].

Results

A total of 4664 students from 17 schools of

TABLE 1

Age and sex-wise prevalence and severity of goitre and the ratio between total goitre rate (TGR) and visible goitre rate (VGR).

Age group (years)	n		TGR(%)*		VGR(%)*		Ratio between VGR : TGR	
	F	M	F	M	F	M	F	M
≤ 8	488	560	52.7	57.4	0.8	1.3	1 : 66	1 : 44
9 - 11	907	1059	60.2	59.0	3.6	2.7	1 : 17	1 : 22
12 - 14	531	923	65.5	66.0	11.1	6.7	1 : 6	1 : 10
≥ 15	62	134	66.1	41.8	19.4	0.74	1 : 3	1 : 56
Total	1988	2676	59.9	59.7	5.4	3.7	1 : 11	1 : 16
Total (M & F)	4664		59.8		4.44		1 : 13.4	

Note : F = females and M = males; n = number of subject; * TGR : Total goitre rate (ie IA + IB + II + III); ** VGR : Visible goitre rate (i.e. grade II + III)

TABLE 2

Prevalence rates of goitre by age-group and grade-wise

Age gps (years)	n	Goitre grade				Total Goitre rate (TGR)*
		O	IA	IB	II	
≤ 8	1048	46.9	28.2	25.6	1.1	53.8
9 - 11	1966	40.4	28	28.4	3.2	59.6
12 - 14	1454	34.1	26.1	31.5	8.3	65.9
≥ 15	196	50.5	19.4	23.5	6.6	49.5
Total	4664	40.2	26.8	28.5	4.4	59.8

Note : n = number of subject; * TGR : Total goitre rate (ie IA + IB + II + III); Rates given in prevalence are percentages; chi-square = 56.47, df = 4; p < 0.001 (highly significant). There was no case in Grade III.

12 villages were surveyed. The ages ranged between 5-18 years. There were 1988 (42.6%) girls and 2676 (57.4%) boys. Total goitre rate (TGR) was 59.8%. The sex-wise and age-wise prevalence rates are shown in Tables 1 and 2. The visible goitre rate (VGR) for all the ages was 4.44% with girls having higher VGR than boys. In both the TGR and VGR gradually increased with age up to 14 years of age, in girls this increasing trend continued even after 14 years whereas in boys both these rates dropped after 14 years of age. The rising trend in the prevalence of goitre with age among girls was found to be statistically significant by chi-square test for linear trend ($p < 0.01$). However, the linear trend was not statistically significant among boys ($p > 0.05$).

The iodine content of water ranged between 1.9 to 12.0 $\mu\text{g/L}$ which is comparatively low (Table 3).

Discussion

a) Characteristics of the sample

School students were selected for this study because of easy accessibility and because they represent different parts of the study area. As per the existing estimates, children aged between 5-19 years constitute about 36.6% of the total population in our country [8]. Accordingly the study area with a total population of 65,000 should have about 23,700 children in the age group of 5-19 years. In the present study, we surveyed 4664 students in this age group, which formed about 20% of the student population of this age group, and about 7% of the total popula-

tion. This is considered adequate for a goitre endemicity survey [4].

b) Prevalence of goitre

The TGR in these students was found to be 59.8%. From Table 4, it can be inferred that all surveys for goitre endemicity carried out in Maharashtra were based on general population in the community. The Mahabaleshwar study [9] does not give many details and was not considered for discussion. In the remaining two general population based community surveys carried out, the prevalence was found to be 48.2% and 52% [10,11] whereas in the third study it was 16.5% [12]. The reasons for

TABLE 3
Estimation of iodine content in drinking water

Name of the village	Source of water sample	Iodine content ($\mu\text{g/L}$)
Ralegan Sindi	Tap water	5.7
do	Shallow well	8.7
Narayan Gaon	Shallow well	7.0
Wade Gaon	Tap water	8.0
Tardoba wadi	River (Ghod)	12.0
do	Tap water	7.0
Gole gaon	Tap water	12.0
Shirur town	Tap water	3.5
Maltan	Shallow well	5.5
Annapur	Hand pump	1.9
Juna Shirur	Tap water	2.6
Karda	Hand pump	2.5
Sarad Wadi	Tap water	7.2
Kare gaon	Tap water	5.7
Ranjan gaon	Tap water	2.8

TABLE 4
Some studies on prevalence of goitre in Maharashtra

Region/Place	Year	Sample size	Number of villages	TGR
Mahabaleshwar & Ranjanwadi [9]	1958	4800	2	45 cases seen
Sillod Taluk [10]	1970	1135	16	48.2%
	1973	1238	8	52%
Ghode gaon (Dist. Pune) [12]	1974	5829	1	16.5%

the lower prevalence of goitre in the Ghodegaon study (16.5%) as compared to that in neighbouring Aurangabad study (48.2% and 52%) may be due to the differences in the topography and climate. The climate and topography of Shirur, the present study area, is more akin to the Aurangabad area rather than to Ghodegaon area. The prevalence rates of goitre at Shirur agree with Aurangabad study [8-11].

In the present study, the higher prevalence of goitre as compared to that of Aurangabad studies may be due to the fact that the population under study was school students as compared to that of general population in the community. In both boys and girls, there is a growth spurt during pre- and peri-adolescence and there is an increase in thyroid activity. As the boys reach adulthood this reduces, whereas in girls, it continues to increase due to higher physiological demands due to menstruation, pregnancies and lactation. This appears to be the spirit underlying the recommendation of PAHO [5] that whenever prevalence rates for goitre are more than 10% in school children, surveys based on general population should be undertaken to arrive at correct prevalence rates.

c) Goitre grade by age and sex

From Table 1 it can be seen that the TGR in both sexes is almost the same. However, on scrutiny of these rates by age groups, it was noted that in males, both TGR and VGR kept increasing up to the age of 14 years and then declined whereas in females even after 14 years of age these continued to increase. This fact has been confirmed in various studies [11,12] On scrutiny of ratio of VGR and TGR it was noted that the number of cases of TGR for every case of VGR with increasing age, decreased in females. Thus, for example, in females with age equal to or more than 15 years there was one case of VGR for every case of TGR where as in males of the same age group it was one for fifty six cases. This was due to the onset of puberty followed by menstrual cycles in females [5].

d) Goitre endemicity

To define an area as endemic for goitre, different authors have suggested different criteria.

- i) De Maeyer, Lowenstein and Thilly [13] suggested that prevalence of goitre of at least grade IB in 5% or more of pre- and peri-adolescent individuals or 30% or more of grade I A among adults.
- ii) Thilly, Delange and Stanbury [5] suggested that a total prevalence goitre of 10% or more in general population.
- iii) The proceedings of the seminar on IDD held by the Director General of Health Services, have recommended that prevalence of grade II goitre should be more than 5% in the age groups of 10-19 years [2].

In the present survey, we recorded : (aa) The prevalence of goitre of grade at least Ib (i.e. Ib + II + III) was 35.9% of students in pre- and peri-adolescent age groups, (bb) The total prevalence rate was 59.8% for all the age groups examined and (cc) the prevalence of goitre grade II in 10 to 19 years age group was found to be 6.2%. Thus, Shirur was found to be endemic for goitre by the above suggested criteria.

e) The high endemicity of goitre in our study area was probably due to low iodine content in water, ranging 1.9 - 12 µg/L. Though it was suggested by Hetzel that the iodine content in water less than 2 µg/L should be considered as proof for environmental deficiency of iodine [14], in Aurangabad study the iodine content of water ranged between 9-36 µg/L [11] and in the Ghodegaon study the iodine content ranged between 1.6 - 9.8 µg/L with high rates of prevalence of goitre. From this it appears that the iodine content of water in the present study was within the "goitre range" and thus the environmental deficiency of iodine appears to be the main reason for high prevalence of goitre in Shirur area.

REFERENCES

1. Beaton GH, Bengoa JM. Nutrition and Health in perspective : an introduction. In : Nutrition in

- preventive medicine. Geneva : World Health Organisation Monograph series 1976; 62 : 11-20.
2. Proceedings of the seminar on IDD, Bangalore. 11-14 Feb. 1989, Director General Health Services, Govt of India. Nirman Bhavan, New Delhi 1989.
 3. Anonymous. Endemic goitre to Iodine deficiency disorders (Editorial). *Lancet* 1983; 2 : 1121-2.
 4. Perez C, Scrimshaw NS, Munoz JA. Technique of endemic goitre surveys. In : Endemic Goitre. Geneva : World Health Organisation. Monograph series no. 44, 1960; 369-84.
 5. Thilly CH, Delange F, Stanbury JB. Epidemiological surveys in endemic goitre and cretinism. In : Stanbury JB, Hetzel BS. Editors. Endemic goitre and Endemic cretinism. New Delhi : Wiley Eastern Ltd. 1985; 157-76.
 6. Armitage P, Berry G. Statistical methods in medical research. 2nd ed, Oxford : Blackwell Scientific Publications, 1987; 372.
 7. Karmarkar MC, Pandav CS, Krishnamachari KVAR. Principles and procedure for Iodine estimation : a laboratory manual; New Delhi, Indian Council of Medical Research, 1986; 6.
 8. Health information of India. Director General of Health Services, Ministry of Health and Family Welfare, Government of India, Nirman Bhavan, New Delhi, 1989.
 9. Bodas MK, Deshmukh PL. Goitre in Mahabaleshwar Hills. *J Indian Med Association* 1958; 31 : 487-9.
 10. Sathe PV, Dandare MP. A goitre survey in Sillod taluk, Aurangabad district, Maharashtra State. *Indian J Pub Health* 1975; 19 : 84-9.
 11. Krishnamachary KAVR. Endemic goitre : A public health problem in Maharashtra, India. *Trop Geogr Med* 1974; 26 : 147-51.
 12. Dudani TG, Natu MN. Epidemiology of endemic goitre in Ghodegaon. *Indian J Med Res* 1978; 68 : 980-9.
 13. DeMaeyer EM, Lowenstein FW, Thilly CH. The control of endemic goitre. Geneva : World Health Organisation 1979.
 14. Hetzel BS. The story of Iodine Deficiency. An international challenge in nutrition. Delhi : Oxford Press, 1989.