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RESEARCH ARTICLE

ASSESSMENT OF THE MAGNITUDE OF GOITER IN THE AGE GROUP OF 6-12 YEARS CHILDREN IN DISTRICT LADAKH (JAMMU & KASHMIR)

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ABSTRACT

The effect of Iodine deficiency disorders includes goitre and brain damage. Goiter is prevalent worldwide and in India; it is also widely prevalent

Aim: According to the World Health Organisation, a total goiter rate of more than 5% in school children (6-12) should signal the presence of public health problem. As such no study estimating IDD prevalence at all India level is available. So, the present study was undertaken & is a Cross- Sectional Study conducted in department of Community Medicine, SKIMS Medical College, Srinagar between June 2012 to July 2012. The study was conducted to find out the magnitude of goiter in the age group of 6-12 years in district Ladakh & to propose recommendations for the said problem.

Subject and Methods: 2699 subjects were screened. Two-stage cluster sampling was used to select the study sample. In the first stage, thirty clusters were selected based on probability proportionate to the size of the target population in different zones. A sample of 90 children (45 boys & 45 Girls) of age group of 6-12 years from the school and out of school/household of selected village/ward was selected. The number of children per cluster was based on the estimated prevalence of 30% with 95% confidence interval.

Results: 30% children had G1 goiter and 1.9% children had G2 goiter. Prevalence varied with sex and age. The prevalence of G1 in boys was higher (34.9%) than girls (25.1%) & prevalence of G2 goiter was 1.8% in boys and 2% in girls. Total goiter rate calculated by summing prevalence of G1 and G2 was 36.7%, in males which is more as compared to females (27.1%).

Conclusion: The results of the present study have indicated that iodine deficiency continues to be a health problem. So, monitoring of iodine content of salt for at distributor level & at consumer should be done.

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INTRODUCTION

Goiter is the name given to the enlargement of the thyroid gland. One of the most important and well known global nutritional problems is iodine deficiency (ID). An estimated population of 1000 million is at risk because they live in an environment where the soil is depleted of iodine^[1]. Worldwide about 600 million people have goiter and 230 million have some degree of brain damage (6 million have cretinism) caused by the effects of iodine deficiency in pregnancy^[2]. According to the world health organization (WHO), a total goiter rate of more than 5% in school children (6-12) should signal the presence of public health problem^[3]. The most important single cause of iodine deficiency is inadequate iodine intake. Goiter is prevalent worldwide and in India; it is also widely prevalent with different states giving different rates of prevalence. As such no study estimating IDD prevalence at all India level is available on children although a few region wise studies are available. As per ICMR report on Micronutrient Profile in India (2004) the prevalence is 9.98%. These figures are from ICMR project running from 1997 to 1999.^[4] In J&K the figures also vary from one place to another. The data available for J&K shows that 14 out of 15 districts are endemic for IDD. The prevalence in Srinagar district was to the extent of 4.46% in the same

age group. A study by Zargar *et al.*^[5] in Budgam area in the age group of 5-15 years found the prevalence to be 44% in males and 33.8% in females in school going children. The previous study (2003-2004) by Department of Community Medicine, Govt Medical College Srinagar in Srinagar district in the age group of 6-12 years found the total goiter prevalence was to the extent of 15.27 % (17% in girls & 13.67% in boys).^[6] Because of the widely prevalent situation in J&K state the present study was contemplated. Leh with an area of 45110 Sq Km makes it largest district in the country in terms of area. It lies between 32 to 36 degree North latitude and 75 degree to 80 degree East longitude. The district is bounded by Pakistan occupied Kashmir in the West and China in the north and eastern part and Lahul Spiti of Himachal Pradesh in South East. It is at a distance of 434 Kms from Srinagar and 474 Kms from Manali. Leh district comprises of Leh town and 112 inhabited villages and one un-inhabited village. The total population of Leh district is 1.17 lacs. Ladakh is a part of Jammu & Kashmir State in north of India consisting of two districts Leh and Kargil. Leh with an area of 45110 Sq Km makes it largest district in the country in terms of area. It is situated between 32 degree to 36 degree North Latitude and 75 degree to 80 degree East Longitude. As per census of 1981 the population of the district is 0.684 lacs, which is estimated to have risen to 0.895 lacs during 1991. Population growth rate of 31.08% has been recorded during the decade 1971-81 in the district. As per 1981 census 87.25% population is residing in

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the rural area. The biggest ethnic group is Buddhist having 81.18% of population followed by Muslims with 15.32% and Hindus with 2.99%. The main working force account for 43.55% to the total population where as marginal workers account for 6.84 % and non-workers 49.61%. The main occupation engaging the working force is cultivation (58.48%), agriculture labour (7.36%), household industry (0.34%) and other works (33.32%)

Objectives

- To assess the magnitude of goiter in the age group of 6-12 years in district Ladakh
- To propose recommendations for the said problem.

METHODOLOGY

The study was a cross-sectional study done in district Ladakh conducted over a period of one month from 10th June to 10th July 2012. A team of doctors was deputed for the study. The team comprised both experienced and young doctors from Skims Medical College. To standardize the various procedures and maintain uniformity in the procedures one day training was provided to all the investigators. 2700 subjects were screened. The subjects were aged from 6-12 years. Two-stage cluster sampling was used to select the study sample. In the first stage, thirty clusters were selected based on probability proportionate to the size of the target population in different zones. Thirty clusters were selected to ensure a valid estimate of the prevalence of the problem. A sample of 90 children (45 boys & 45 girls) of age group of 6-12 years from the school and out of school/household of selected village/ward was selected. The number of children per cluster was based on the estimated prevalence of 30% with 95% confidence interval [7]. Data was collected using a specially designed questionnaire, including information about name, zone, school, exact age of the child and sex. Clinical examination of the thyroid gland of each child was done through inspection and palpation. Classification of goiter grading was based on the criteria endorsed by the WHO/United Nations Children Fund/ International Council for Control of Iodine Disorders, which is as follows:

0=no palpable or visible goiter

1=a mass visible in the neck that is consistent with an enlarged thyroid that is palpable or visible with neck in extended position but not in neutral position. It also moves up in the neck or swallowing.

2=a swelling in the neck that is visible in a neutral position and is consistent with an enlarged thyroid when the neck is palpated.

The sum of grades 1& 2 is taken as total goiter rate. Data entry and analysis was done in SPSS-17 by specially trained doctor from the Department.

Observations

The total children surveyed were 2699 in the 30 cluster (schools) of district Ladakh with 90 children in each cluster. These accounted for about 1472 Boys and 1227 girls. The full details are depicted in the following Table 1. Prevalence varies with age. The highest and lowest prevalence of G1 was found at the age of 6 (27.5%) and 9 (17.1%) but G2 prevalence was highest at the age of 12 years (4.3%).

DISCUSSION

The total children surveyed were 2699 in the 30 clusters of district Ladakh with 90 children in each cluster. These accounted for about 1472 Boys and 1227 Girls. Goiter is still a big public health problem in various districts of Kashmir valley as well as Ladakh division.

Table 1. AGE and sex distribution

		SEX		Total	
		Male	Female		
AGE	6	Count	190	177	367
		% within AGE	51.8%	48.2%	100.0%
		% within SEX	12.9%	14.4%	13.6%
		% of Total	7.0%	6.6%	13.6%
	7	Count	189	145	334
		% within AGE	56.6%	43.4%	100.0%
		% within SEX	12.8%	11.8%	12.4%
		% of Total	7.0%	5.4%	12.4%
	8	Count	236	166	402
		% within AGE	58.7%	41.3%	100.0%
		% within SEX	16.0%	13.5%	14.9%
		% of Total	8.7%	6.2%	14.9%
	9	Count	179	177	356
		% within AGE	50.3%	49.7%	100.0%
		% within SEX	12.2%	14.4%	13.2%
		% of Total	6.6%	6.6%	13.2%
	10	Count	227	153	380
		% within AGE	59.7%	40.3%	100.0%
		% within SEX	15.4%	12.5%	14.1%
		% of Total	8.4%	5.7%	14.1%
	11	Count	221	197	418
		% within AGE	52.9%	47.1%	100.0%
		% within SEX	15.0%	16.1%	15.5%
		% of Total	8.2%	7.3%	15.5%
	12	Count	230	212	442
		% within AGE	52.0%	48.0%	100.0%
		% within SEX	15.6%	17.3%	16.4%
		% of Total	8.5%	7.9%	16.4%
Total		Count	1472	1227	2699
		% within AGE	54.5%	45.5%	100.0%
		% within SEX	100.0%	100.0%	100.0%
		% of Total	54.5%	45.5%	100.0%

Table 2. Age and grade of goiter

		GRADE			Total	
		Grade 0	Grade 1	Grade 2		
AGE	6	Count	260	101	6	367
		% within AGE	70.8%	27.5%	1.6%	100.0%
		% within GRADE	12.8%	17.0%	8.8%	13.6%
		% of Total	9.6%	3.7%	.2%	13.6%
	7	Count	270	61	3	334
		% within AGE	80.8%	18.3%	.9%	100.0%
		% within GRADE	13.3%	10.3%	4.4%	12.4%
		% of Total	10.0%	2.3%	.1%	12.4%
	8	Count	323	70	9	402
		% within AGE	80.3%	17.4%	2.2%	100.0%
		% within GRADE	15.9%	11.8%	13.2%	14.9%
		% of Total	12.0%	2.6%	.3%	14.9%
	9	Count	286	61	9	356
		% within AGE	80.3%	17.1%	2.5%	100.0%
		% within GRADE	14.0%	10.3%	13.2%	13.2%
		% of Total	10.6%	2.3%	.3%	13.2%
	10	Count	296	71	13	380
		% within AGE	77.9%	18.7%	3.4%	100.0%
		% within GRADE	14.5%	11.9%	19.1%	14.1%
		% of Total	11.0%	2.6%	.5%	14.1%
	11	Count	295	114	9	418
		% within AGE	70.6%	27.3%	2.2%	100.0%
		% within GRADE	14.5%	19.2%	13.2%	15.5%
		% of Total	10.9%	4.2%	.3%	15.5%
	12	Count	306	117	19	442
		% within AGE	69.2%	26.5%	4.3%	100.0%
		% within GRADE	15.0%	19.7%	27.9%	16.4%
		% of Total	11.3%	4.3%	.7%	16.4%
Total		Count	2036	595	68	2699
		% within AGE	75.4%	22.0%	2.5%	100.0%
		% within GRADE	100.0%	100.0%	100.0%	100.0%
		% of Total	75.4%	22.0%	2.5%	100.0%

Prevalence varies with age. The highest and lowest prevalence of G1 was found at the age of 6 (27.5%) and 9 (17.1%) but G2 prevalence was highest at the age of 12 years (4.3%).

Table 3. Sex and grade of goiter

		GRADE				Total
		Grade 0	Grade 1	Grade 2		
SEX	Male	Count	1129	304	39	1472
		% within SEX	76.7%	20.7%	2.6%	100.0%
		% within GRADE	55.5%	51.1%	57.4%	54.5%
	Female	% of Total	41.8%	11.3%	1.4%	54.5%
		Count	907	291	29	1227
		% within SEX	73.9%	23.7%	2.4%	100.0%
Total	% within GRADE	44.5%	48.9%	42.6%	45.5%	
	% of Total	33.6%	10.8%	1.1%	45.5%	
	Count	2036	595	68	2699	
	% within SEX	75.4%	22.0%	2.5%	100.0%	
	% within GRADE	100.0%	100.0%	100.0%	100.0%	
	% of Total	75.4%	22.0%	2.5%	100.0%	

Table 4. Age and Sex distribution of Goiter

AGE * SEX * GRADE Crosstabulation

		SEX						Total			
		Male			Female						
		GRADE						GRADE			
AGE		Grade 0	Grade 1	Grade 2	Grade 0	Grade 1	Grade 2	Grade 0	Grade 1	Grade 2	
6	Count	131	54	5	129	47	1	260	101	6	
	% within AGE	50.4%	53.5%	83.3%	49.6%	46.5%	16.7%	100.0%	100.0%	100.0%	
	% within SEX	11.6%	17.8%	12.8%	14.2%	16.2%	3.4%	12.8%	17.0%	8.8%	
	% of Total	6.4%	9.1%	7.4%	6.3%	7.9%	1.5%	12.8%	17.0%	8.8%	
	7	Count	152	34	3	118	27	0	270	61	3
		% within AGE	56.3%	55.7%	100.0%	43.7%	44.3%	.0%	100.0%	100.0%	100.0%
		% within SEX	13.5%	11.2%	7.7%	13.0%	9.3%	.0%	13.3%	10.3%	4.4%
	8	% of Total	7.5%	5.7%	4.4%	5.8%	4.5%	.0%	13.3%	10.3%	4.4%
		Count	197	34	5	126	36	4	323	70	9
		% within AGE	61.0%	48.6%	55.6%	39.0%	51.4%	44.4%	100.0%	100.0%	100.0%
	9	% within SEX	17.4%	11.2%	12.8%	13.9%	12.4%	13.8%	15.9%	11.8%	13.2%
		% of Total	9.7%	5.7%	7.4%	6.2%	6.1%	5.9%	15.9%	11.8%	13.2%
Count		152	21	6	134	40	3	286	61	9	
10	% within AGE	53.1%	34.4%	66.7%	46.9%	65.6%	33.3%	100.0%	100.0%	100.0%	
	% within SEX	13.5%	6.9%	15.4%	14.8%	13.7%	10.3%	14.0%	10.3%	13.2%	
	% of Total	7.5%	3.5%	8.8%	6.6%	6.7%	4.4%	14.0%	10.3%	13.2%	
11	Count	175	46	6	121	25	7	296	71	13	
	% within AGE	59.1%	64.8%	46.2%	40.9%	35.2%	53.8%	100.0%	100.0%	100.0%	
	% within SEX	15.5%	15.1%	15.4%	13.3%	8.6%	24.1%	14.5%	11.9%	19.1%	
12	% of Total	8.6%	7.7%	8.8%	5.9%	4.2%	10.3%	14.5%	11.9%	19.1%	
	Count	154	62	5	141	52	4	295	114	9	
	% within AGE	52.2%	54.4%	55.6%	47.8%	45.6%	44.4%	100.0%	100.0%	100.0%	
Total	% within SEX	13.6%	20.4%	12.8%	15.5%	17.9%	13.8%	14.5%	19.2%	13.2%	
	% of Total	7.6%	10.4%	7.4%	6.9%	8.7%	5.9%	14.5%	19.2%	13.2%	
	Count	168	53	9	138	64	10	306	117	19	
Total	% within AGE	54.9%	45.3%	47.4%	45.1%	54.7%	52.6%	100.0%	100.0%	100.0%	
	% within SEX	14.9%	17.4%	23.1%	15.2%	22.0%	34.5%	15.0%	19.7%	27.9%	
	% of Total	8.3%	8.9%	13.2%	6.8%	10.8%	14.7%	15.0%	19.7%	27.9%	
	Count	1129	304	39	907	291	29	2036	595	68	
Total	% within AGE	55.5%	51.1%	57.4%	44.5%	48.9%	42.6%	100.0%	100.0%	100.0%	
	% within SEX	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
	% of Total	55.5%	51.1%	57.4%	44.5%	48.9%	42.6%	100.0%	100.0%	100.0%	

Table 5. Age and TGR

AGE * TGR Crosstabulation

		TGR		Total
		0	1	
6	Count	260	107	367
	% within AGE	70.8%	29.2%	100.0%
	% within TGR	12.8%	16.1%	13.6%
	% of Total	9.6%	4.0%	13.6%
7	Count	270	64	334
	% within AGE	80.8%	19.2%	100.0%
	% within TGR	13.3%	9.7%	12.4%
	% of Total	10.0%	2.4%	12.4%
8	Count	323	79	402
	% within AGE	80.3%	19.7%	100.0%
	% within TGR	15.9%	11.9%	14.9%
	% of Total	12.0%	2.9%	14.9%
9	Count	286	70	356
	% within AGE	80.3%	19.7%	100.0%
	% within TGR	14.0%	10.6%	13.2%
	% of Total	10.6%	2.6%	13.2%

10	Count	296	84	380
	% within AGE	77.9%	22.1%	100.0%
10	% within TGR	14.5%	12.7%	14.1%
	% of Total	11.0%	3.1%	14.1%
	Count	295	123	418
11	% within AGE	70.6%	29.4%	100.0%
	% within TGR	14.5%	18.6%	15.5%
11	% of Total	10.9%	4.6%	15.5%
	Count	306	136	442
	% within AGE	69.2%	30.8%	100.0%
12	% within TGR	15.0%	20.5%	16.4%
	% of Total	11.3%	5.0%	16.4%
Total	Count	2036	663	2699
	% within AGE	75.4%	24.6%	100.0%
	% within TGR	100.0%	100.0%	100.0%
	% of Total	75.4%	24.6%	100.0%

Table 6. Sex and TGR

SEX	Male	Count	TGR		Total
			0	1	
SEX	Male	Count	1129	343	1472
		% within SEX	76.7%	23.3%	100.0%
		% within TGR	55.5%	51.7%	54.5%
		% of Total	41.8%	12.7%	54.5%
SEX	Female	Count	907	320	1227
		% within SEX	73.9%	26.1%	100.0%
		% within TGR	44.5%	48.3%	45.5%
		% of Total	33.6%	11.9%	45.5%
Total		Count	2036	663	2699
		% within SEX	75.4%	24.6%	100.0%
		% within TGR	100.0%	100.0%	100.0%
		% of Total	75.4%	24.6%	100.0%

Table 7. Age and sex distribution of TGR

AGE * SEX * TGR Crosstabulation

AGE		Count	SEX				Total	
			Male		Female		Total	
			TGR	TGR	TGR	TGR	TGR	TGR
6	Count	131	59	129	48	260	107	
		% within AGE	50.4%	55.1%	49.6%	44.9%	100.0%	100.0%
6	% within SEX	11.6%	17.2%	14.2%	15.0%	12.8%	16.1%	
		% of Total	6.4%	8.9%	6.3%	7.2%	12.8%	16.1%
		Count	152	37	118	27	270	64
7	% within AGE	56.3%	57.8%	43.7%	42.2%	100.0%	100.0%	
		% within SEX	13.5%	10.8%	13.0%	8.4%	13.3%	9.7%
7	% of Total	7.5%	5.6%	5.8%	4.1%	13.3%	9.7%	
		Count	197	39	126	40	323	79
		% within AGE	61.0%	49.4%	39.0%	50.6%	100.0%	100.0%
8	% within SEX	17.4%	11.4%	13.9%	12.5%	15.9%	11.9%	
		% of Total	9.7%	5.9%	6.2%	6.0%	15.9%	11.9%
9	Count	152	27	134	43	286	70	
		% within AGE	53.1%	38.6%	46.9%	61.4%	100.0%	100.0%
		% within SEX	13.5%	7.9%	14.8%	13.4%	14.0%	10.6%
9	% of Total	7.5%	4.1%	6.6%	6.5%	14.0%	10.6%	
		Count	175	52	121	32	296	84
		% within AGE	59.1%	61.9%	40.9%	38.1%	100.0%	100.0%
10	% within SEX	15.5%	15.2%	13.3%	10.0%	14.5%	12.7%	
		% of Total	8.6%	7.8%	5.9%	4.8%	14.5%	12.7%
11	Count	154	67	141	56	295	123	
		% within AGE	52.2%	54.5%	47.8%	45.5%	100.0%	100.0%
		% within SEX	13.6%	19.5%	15.5%	17.5%	14.5%	18.6%
11	% of Total	7.6%	10.1%	6.9%	8.4%	14.5%	18.6%	
		Count	168	62	138	74	306	136
		% within AGE	54.9%	45.6%	45.1%	54.4%	100.0%	100.0%
12	% within SEX	14.9%	18.1%	15.2%	23.1%	15.0%	20.5%	
		% of Total	8.3%	9.4%	6.8%	11.2%	15.0%	20.5%
Total	Count	1129	343	907	320	2036	663	
		% within AGE	55.5%	51.7%	44.5%	48.3%	100.0%	100.0%
		% within SEX	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	55.5%	51.7%	44.5%	48.3%	100.0%	100.0%

In this study we found that 22% children had G1 goiter and 2.5% children had G2 grade of goiter. Prevalence varied with sex and age. The prevalence of G1 in girls is higher (23.7%) than boys (20.7%) & prevalence of G2 goiter is 2.6% in boys and 2.4% in girls. The highest and lowest prevalence of G1 was found at the age of 6 (27.5%) but G2 prevalence was highest at the age of 12 years (4.3%). Total goiter rate calculated by summing prevalence of G1 and G2 was 26.1%, in females which is more as compared to males (23.3%). Zargar AH *et al.* (1995) found the TGR to be 52.08% with G1 in 41.95% and G2 of 10.1% in Baramullah district of Kashmir valley. The prevalence was more in males to the extent of 52.08% & in girls it was 49.23%^[8]. Their study in 1996 found the rate to be 44% in males in age group of 5-15 and 33.8% in females in Budgam area^[5]. Our figures are lower possibly because of better awareness and sustained IEC activities by the government about the use of iodized salt and possibly because the age group included was lower. Kapil U *et al.* (2003). In their study in school children aged 6-12 years which in Bharatpur district of Rajasthan found the rate to be 7.2%. Grade 1st goiter was seen in 7% and Grade 2nd goiter in 0.2% of children. As for as sex is concerned the rates of G1 goiter was 5.7% and 7.9% in girls and boys respectively.^[9] Chandra AK *et al.* (2001) in their study in children aged 6-15 years found the TGR to be 21.6% with G1 in 20.2% and G2 to be 1.4%^[10]. Brahmabhatt (2000) in their study in Dang and Baroda districts of Gujarat found the TGR to be 29.6% with G1 in 29.2% and G2 in 0.4%^[11]. Our figures correlate well with their findings. Results of our study are different from that of Bhardwaj *et al.* (1997) who found the TGR to be 20.5% with G1 in 17.8 and G2 in 2.7% of children aged 6-12 years. The rate was found to be 39.3% in boys and 18% in girls.^[12]

Summary

- Total children (6-12 years) surveyed - 2699
- Prevalence of G1 goiter – 22%.
- Prevalence of G2 goiter- 2.5%
- Prevalence varies with both age and sex.
- Prevalence was higher in girls (23.7%) than boys (20.7%).
- Prevalence of G2 is 2.6% in boys and 2.4% in girls.
- The highest prevalence of G1 was found at the age of 6 (27.5%).
- Total goiter rate (TGR) which is the sum of grade. 1st and grade 2nd was found to the extent of 24.6%.
- In males TGR prevalence was (23.3%) which is less as compared to females (26.1%).

Conclusion and Recommendations

Goiter is still a major public health problem in J & K although notable decrease in the magnitude of the problem has occurred in few years. In this connection we would like to suggest the following measures.

- A Goiter cell needs to be established and strengthening of the same with expertise from community medicine department to monitor the situation of Iodine Deficiency Disorders in the State
- Current iodine deficiency is depicted by urinary iodine levels. In this connection proper lab facilities for urinary iodine excretion as well as for checking the iodine content of salt needs to be set up.
- It is also essential to set up one district level IDD monitoring laboratory for iodine content of salt and Urinary iodine excretion for monitoring proper implementation of the IDD control programme.
- Salt production units to be made available at state level so that the consumers have the access to fresh salt and the environmental loss of iodine is checked and kept at the minimum.

- Food and drug control organization should make it sure that the salt available in the market is iodised and the salt packets are not older than five to six months.
- Sustained IEC (information, education and communication) involvement should be ensured so that people are made aware about the consumption of iodized salt. Help of field publicity wing of the information Department of J & K and Health Education Bureau also needs to be taken. To intensify the IEC activities a communication package by way of video films, posters/danglers and radio/TV spots need to be finalized

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REFERENCES

1. Hetzel BS. The control of iodine deficiency. American journal of public health, 1993, 83:494-5.
2. World health organization; Micronutrient deficiency information system project. Global prevalence of iodine deficiency disorders. Geneva, World health Organization, 1993 (MDIS working paper, No.1).
3. Indicators of assessing iodine deficiency disorders and their control through salt iodization. Geneva, World Health Organization, 1994 (Document No.WHO/NUT/94.6).
4. Toteja GS and Padam Singh "Micronutrient Profile of Indian population" ICMR publication 2004.
5. Zargar AH, Shah JA, Masoodi SR, Laway BA, Sha NA, Mir MM. Prevalence of goiter in school children in Budgam (Kashmir Valley). Indian journal of Prev. Soc. Med; 1996a, 27:52-58.
6. Masoodi MA, Rafiq M *et al.* (Unpublished data Srinagar district 2003-2004 submitted to Asst. Director Planning H&ME Civil Secretariat J&K.
7. E.M. Demaeyer, F.W.Lowenstein, C.H.Thilly, The Control of Endemic Goiter WHO: 80.
8. Zargar AH, Shah JA, Mir MM, Laway BA. Prevalence of goiter in school children in Kashmir valley, India. American journal of Clinical Nutrition, 1995,62(5):1020-1021.
9. Kapil U, Singh P, Pathak P, Singh C. Assessment of iodine deficiency disorders in district Bharatpur Rajasthan. Indian Padiatrics, 2003, 40(2):147-149.
10. Chandra AK, Ray I. Dietary supplies of iodine and thiocyanate in the etiology of endemic goiter in Tripura. Indian journal of Padiatrics, 2001, 68(5):399-404.
11. Brahmabhat S, Brahmabhatt RM, Boyages SC. Thyroid ultrasound is the best prevalence indicator for the assessment of iodine deficiency disorders; a study in rural/tribal school children from Gujarat(western India). European Journal of Endocrinology, 2000, 143(1):37-46.
12. Bharadwaj AK, Nayar D, Ramachandran S, Kapil U, assessment of iodine deficiency in district Bikaner, Rajasthan. Indian Journal of Maternal and Child Health, 1997, 8(1):18-20.
