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ORIGINAL ARTICLE

A PREVALENCE STUDY OF IODINE DEFICIENCY DISORDER IN CHILDREN OF PRIMARY SCHOOLS IN GANDHINAGAR DISTRICT

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ABSTRACT

Objective: To assess the magnitude of IDD in Gandhinagar region and also assess the salt consumption patterns in the region.
Study Design: It is a Cross-sectional study conducted in primary schools of both urban and rural areas. Clinical examination of study population for goiter, laboratory assessment of casual urine sample for urinary iodine and estimation of Iodine in salt samples were done. School children in the age group of 6-12 years were selected for study using WHO 30-cluster methodology. During the school survey, 10 salt samples were collected from the students (preferably from all age group) and tested on the spot with UNICEF kit. Iodine concentration recorded as 0, <15, > 15. Fourteen Samples of Urine were obtained from students for Iodine estimation from each school.
Results: An overall goiter prevalence of 7.75% was observed in the district. Females had a prevalence of 7.68% and males 7.82%. 78.57 percent of subjects had urinary iodine excretion >100mcg/l with 21.43% having moderate -mild iodine deficiency. In Gandhinagar region, 93.2% of households consume powdered salt with 90.5% powdered salt samples having an iodine content of greater than 15 ppm.
Conclusion: Iodine deficiency remains a public health problem in kalol and dehgam taluka and proper administrative action to enhance universal iodinization is recommended.

Key words: Iodine Deficiency Disorder, Prevalence, goiter, school age, Urinary Iodine excertion

INTRODUCTION

Iodine is one of the essential micronutrients required for the normal mental and physical well being of human. Iodine deficiency occurs when iodine intake falls below recommended levels. Iodine deficiency is an ecological phenomenon occurring naturally in many parts of world. The erosion of soils in many areas is done for agricultural production, over-grazing by livestock and tree - cutting for firewood, which ensures a continued and increasing loss of iodine from the soil. Available ground water and locally grown plants in these areas also lacking in iodine.

Iodine deficiency resulting from inadequate dietary iodine intake is causally related to a spectrum of diseases collectively referred to as iodine deficiency disorders (IDDs)[1]. These include preventable conditions such as impaired mental function, goitre, hypothyroidism, cretinism, and retarded physical development; iodine deficiency also causes increased child mortality. Iodization of salt is widely regarded as the most effective and sustainable long term

public health measure for the prevention and control of IDDs.

The Govt. of India took a policy decision to iodate the entire edible salt in the country by 1992. The program commenced in 1986 in phased manner[2]. All states and cities have been advised to ban sale of non-iodised salt under Prevention of Food adulteration Act.

Iodine Deficiency Disorders (IDD) is a public health problem in India. Iodized salt is one of the approaches to control the problem had been implemented for about two decades.

To assess the prevalence of Iodine deficiency disorders current resurvey was carried out as per the recent 'Revised Policy Guidelines on National Iodine Deficiency Disorders Control Programme', October 2006,by N R H M, I D D & Nutrition Cell, D G H S, Ministry of health & F W, G.O.I. New Delhi. Clinical examination, iodine estimation in urine as well as raw salt at consumer level and from the shops was done.[3]

Iodine status assessment requires conducting a cross-sectional survey of a *representative* sample of the entire target population. The recommended survey method is multistage "proportionate to population size" (PPS) cluster sampling. This method has been in use for many years for the evaluation of immunization (EPI) coverage, and can be applied to many other health indicators.

The school-based PPS cluster sampling method is recommended as the most efficient and practical approach for performing an iodine status or an IDD prevalence survey.

METHODOLOGY

Research Methodology for conducting IDD Resurvey has been mentioned in the National guidelines. Following strategy was carried out in Resurvey for IDD in Gandhinagar District.

Survey was done amongst school children registered at various primary schools run by zilla Panchayat and from the dropouts among the community. Village wise list of population for the entire district was obtained from the CDHO. Also list containing number of students enrolled in schools per village was obtained from the District Education office. Cumulative total of village wise population was calculated then 30 clusters were selected by cluster sampling technique, first cluster was selected by random number method. As per the guidelines from GOI, 70 children in the age group of 6 – 12 years were selected for the survey per cluster (equal proportion from each gender and each age group, i.e. 7 male and 7 female in each age group in each cluster). Remaining 28 children were attempted to get selected from community. Out of which 14 were male and 14 were female in each cluster.

School Survey

Survey began from school in the village selected by cluster sampling and covered all children in age group of 6-12 years till the 70 sample size is achieved. During the survey, investigators ensured equal representation of both gender, i.e. 35 male and 35 female students in each cluster. If desired sample size is not achieved in one school, then children from the village were examined to complete the sample size. Goiter was assessed by palpation method and graded as grade 0, I and II. During the school survey, 10 salt samples were collected from the students (preferably from all age group) and tested on the spot with UNICEF kit. Iodine concentration recorded as 0, <15, > 15. Fourteen Samples of Urine were obtained from students for Iodine estimation. These samples were collected in plastic bottles (50 ml capacity with screw cap with Toludine as preservative) and a label showing the details. These samples were sent to Government Medical College, Surat for quantitative estimation of iodine in urine at the earliest. Remaining 28 children were selected and examined for goiter from the community in the particular village. The male female proportion was maintained in each age group. Study was carried out in rural population only; city and urban area were excluded from study. Students were examined by clinical method (Thyroid palpation). In each cluster 98 students were examined so sample size for each district was 2940 out of which male and female proportion were taken in equal number so, 1470 male children and 1470 female children were studied for clinical examination. As per protocol 14 samples of urine were collected from each cluster, from 7 male & 7 female children. From every cluster salt samples from the market were purchased unanimously and checked on the spot and 20 gm. of salt were packed in sealed polythene bag (PDU shop, Anganwadi center, Mid-day meal, provision store in village) and results were recorded. As per the guidelines, a team of 2 members, one tutor/resident/intern as clinical expert and one resident

doctor/Intern/Medical Social Worker, to assist in survey was formed. One Tutor/A.P. was designated as Team leader and coordinator for IDD Resurvey. Data were collected in pre-designed and pre-tested Performa. Data analysis was done and tabulated data are presented here.

Training Program

A brief training session was arranged for participating doctors in the Community Medicine Department, B. J. Medical College, Ahmedabad. Team members were explained about detailed research methodology and practical aspect of survey regarding palpation of goitre with example and salt testing and collection of urine samples, Performa etc.

Urine analysis report for the samples of Gandhinagar district was carried out at Govt. medical college, Surat.

OBSERVATIONS

Clinically, 7.75 % school children, with pick being in the age group 8-9 years were found to have goiter. The sex wise difference was not found to be significant. Taluka wise analysis suggested highly significant difference of goiter prevalence (X^2 =30.25, p<0.001). Kalol taluka was having prevalence of 16.32%. Age wise analysis of UIE (Urinary Iodine excretion) though did ot reveal significant difference, the findings corroborated well with the clinical findings.

Table 1: Age and Grade Specific Prevalence af Goitre in Gandhinagar District

Age	Grade 1	Grade 2	Total	Total examined	Prevalence rate (%)
6	24	3	27	420	6.42
7	29	3	32	420	7.61
8	37	2	39	420	9.28
9	37	3	40	420	9.52
10	27	2	29	420	6.90
11	32	2	34	420	8.09
12	24	3	27	420	6.42
Total	210	18	228	2940	7.75

Table 2: Sex and Grade Specific Prevalence of Goitre in Gandhinagar District

Sex	Grade 1	Grade 2	Total	Total examined	Prevalence rate (%)
F	108	5	113	1470	7.68
M	102	13	115	1470	7.82
Total	210	18	228	2940	7.75

TABLE 3: Goitre Prevalence Rate in Various Talukas of Gandhinagar District

Taluka	Children Examined	Goiter cases	Prevalence Rate(%)
Dehgam	784	63	8.03
Gandhi nagar	980	76	7.75
Kalol	196	32	16.32
Mansa	784	53	6.76
Chandk heda	196	04	2.04
Total	2940	228	7.75

Overall goiter prevalence was found to be 7.75%(228/2940) in school children clinically. Maximum affected were students of 9years of age(9.52%). Prevalence was more among males (7.82%) as compared to females (7.68%). The taluka wise analysis revealed that Kalol taluka had very high prevalence (16.32%) , almost double as compared to other talukas of district. Chandkheda taluka had problem under control (2.04%) with rate < 5%. The salt samples revealed that out of 93.2% iodised salt samples , 90.5% had iodine content of >=15ppm. The age wise maximum Urinary Iodine Excretion was found in 10 year age students, while minimum value was observed in 9 years. This finding corroborates well with the finding of highest goiter prevalence on clinical examination found in age group 9 years. (14 urinary samples were not included for analysis where quantity was not sufficient.) The median UIE was found to be 165 mcg/l.

Table 4: Goitre Prevalence Rate among Males and Females In Various Talukas of Gandhinagar District

Taluka	Sex	Grade 1	Grade 2	Total cases	Total Children examined	Prevalence Rate (%)
Dehgam	Female	30	00	30	392	7.65
	Male	31	02	33	392	8.41
G'nagar	Female	34	01	35	490	7.14
	Male	32	09	41	490	8.36
Kalol	Female	14	01	15	98	15.30
	Male	16	01	17	98	17.34
Mansa	Female	27	02	29	392	7.39
	Male	23	01	24	392	6.12
Chandkheda	Female	03	01	04	98	4.08
	Male	00	00	00	98	0.00

Table 5: Profile of Salt Sold at Shop (n=74)

Profile	Salt sample (%)
Salt characteristic	
Branded	67 (90.5)
Unbranded	7 (9.5)
Salt type	
Crystal	05 (6.8)
Powdered	69 (93.2)
Claim of iodisation by manufacturer/shopkeeper	
Iodized	69 (93.2)
Non iodized	05 (6.8)
Iodine level	
0	05 (6.8)
<15	02 (2.7)
>=15	67 (90.5)
Batch no.	
Yes	57 (77.0)
No	17 (23.0)
Logo	
Yes	62 (83.8)
No	12 (16.2)
Address of manufacturer	
Yes	64 (86.5)
No	10 (13.5)

DISCUSSION

Total prevalence of goiter was 7.75%.This is almost 50% as compared to findings of Sambit Das et al. [4] in their study , which detected it to be 15.1%. Though the findings by Imtiyaz A bhat et al. are comparable with the finding , as they have detected the prevalence of goiter to be of 11.9% in Jammu region, with a range from 3.5 to 21.2% . [5] The study prevalence rate is more comparable with international study, a study in Tanzania by Assey et al., where the prevalence rate was found to be 6.9% . It should be remembered that Tanzania has Iodinization of salt since last 12 years, a period comparable with India. [6] However, the state of Jharkand has, as mentioned by B.K. Patro et al., very low prevalence of Goiter(0.9%). [8] The prevalence rate of Goiter as mentioned by Chudasama RK et al. in Rajkot district of Gujarat, 8.8%, is little higher than gandhinagar district. [9]

Table 6: Age wise analysis of Urinary Iodine excretion

Age (years)	Urinary Iodine Excretion		
	>100 mcg/l (%)	<100 mcg/l (%)	Total
6	38 (77.55)	11 (22.45)	49
7	47 (78.33)	13 (21.67)	60
8	40 (85.10)	07 (14.9)	47
9	35 (71.42)	14 (28.58)	49
10	51 (91.07)	05 (8.93)	56
11	55 (78.57)	15 (21.43)	70
12	64 (85.33)	11 (14.67)	75
Total	330 (78.57)	76 (21.43)	406

X^2 =9.04, p=0.1711 at Df=6.

As per age groups the prevalence is highest (9.52%) in age group of 9 year, where as lowest (6.42%) in age group of 6 & 12 years. Sambit Das et al. had detected higher prevalence among adolescents (13 to 16 yr) as compared to young children (6 to 12 yr) (17.7 and 13.9%, *P*=0.03). Imtiyaz et al also had found the prevalence to be higher in 9-12 year age group.

The prevalence was found to be more in males (7.82%) as compared to females(7.68%). While in

Jammu, The prevalence of goiter was higher in females than in males (16.12% vs 10.10%).

The prevalence was found highest in Kalol taluka which is 16.32% . This finding is corroborated by the fact that nearly 60% salt samples collected from shops in Kalol taluka had <15ppm iodine concentration.

Though overall ,90.5% of all salt samples from shops had >=15 ppm of Iodine, which is less than the findings of Sambit Das et al who reported it to be 98.1% but far better than 70.9% detected in salt samples collected from shops by B.K. Potra et al.[8]

On Urinary Iodine Excretion analysis, 21.43% of students had biochemical iodine deficiency of mild to moderate severity as urinary iodine excretion was <100 mcg/l. The prevalence was max. in 9year age group and it corroborates well with clinical goiter prevalence finding.

The median UIE was found to be 165 mcg/l. This is far better than the findings in Surat (90mcg/l) , valsad and Panchmahal (70 mcg/l) [7] as well in region of Jammu (96.5 mcg/l). The result is comparable with result in jharkhand, where the median UIE level is 173.2 mcg/l. Median UIE was 170 mcg/l in females while it was 160 mcg/l in males, which corroborates well with sex wise goiter prevalence.

Hence it is concluded that prevalence rate in Kalol taluka is comparatively high. So Promotion of iodized salts should be increased in this taluka is recommended. Attention is also required to be paid in age group 8-9 year having higher prevalence rate. As this age marks the beginning of adolescence, their physical and psychological care is necessary. The measures necessary to increase availability of iodised salt at shops through food adulteration act should be confirmed.

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