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Clinico-Biochemical Study of Iodine Nutritional Status of Tribal Communities of Santhal Pargana Region of Jharkhand, India

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Iodine nutritional status of the tribal communities under different age-group *viz*., 6-12, 13-18, 19-39 and 40 yr and above of Dumka district of Santhal Pargana Division of Jharkhand, India, has been studied. Urinary iodine excretion levels and serum protein-bound iodine levels were estimated. Iodine content of the common salt samples consumed by the tribals was determined. Goiter prevalence among the target population was also assessed. Over all median urinary iodine excretion level was found to be at 13.49 µg/dL and median serum protein-bound iodine level was at 5.1 µg/dL. 76 % of the common salt samples contained iodine at 15 ppm and above. Total goiter prevalence was found to be at 3.25 %. The results suggest that there is no biochemical iodine deficiency and the goiter prevalence is at very mild level in the target population. The tribals, however, should be further encouraged to consume iodized salt.

Key Words: Iodine deficiency disorder, Goiter prevalence, Tribal nutrition, Community nutrition, Iodine nutritional status.

INTRODUCTION

Iodine deficiency disorder (IDD) is one of the major public health problems in India[1-3]. The major manifestations of iodine deficiency disorder are abortion, stillbirth, goiter, brain damage and impaired physical and mental development. Experiments with iodized salts have yielded good positive results in the prevention of iodine deficiency disorder[4]. However, the rural folk, particularly the tribal communities, due to their low socio-economic status, illiteracy and social isolation, are likely to lag behind in the control of iodine deficiency. Poor nutritional status and related complications have generally been observed among the tribal communities[5,6]. In view of this we have presently studied the urinary iodine excretion levels, serum protein-bound iodine levels, iodine content of the common salt samples and the goiter prevalence among the tribal communities of Dumka district of Santhal Pargana Division of Jharkhand. The aim of the study is to unfold the iodine nutritional status of the tribals so that the efficacy of salt iodisation programme can be checked and the dimension of iodine deficiency disorder threat can be assessed.

EXPERIMENTAL

A survey was conducted into the tribal habitats of Dumka district of Santhal Pargana Division. On the basis of survey, such clusters were identified which were rather isolated from the main town. Adopting purposive sampling method 800 tribals, involving both sexes and comprising of 200 subjects from each of the age-group *viz*., 6-12, 13-18, 19-39 and 40 and above years, were randomly selected for clinical examination of enlargement of thyroid gland or goiter by palpation method[7]. When the thyroid lobe found was larger than the examinee's thumb it was considered as goitrous. Out of the clinically examined subjects, 80 subjects, comprising of 20 from each of the age-groups, were randomly selected for studying urinary iodine excretion levels. Similarly 40 subjects comparing 10 from each of the age-groups, were randomly selected for studying the serum protein-bound iodine level. Blood samples were collected from the subjects with the help of a pathologist after their prior consent or consent of the parents in case of children. All precautions required for iodine estimation were taken. From among the tribal habitats surveyed, 60 samples of common salt were randomly collected from different families comprising of 20 samples collected in each of the three seasons *viz*., winter (Nov-Feb), summer (March-June) and rainy (July-Oct).

Estimation of urinary iodine level, serum protein-bound iodine level and iodine content of common salt samples: The urine samples were collected in sterilized plastic containers, little amount of toluene was added as a preservative to each sample and were preserved in refrigerator till analysis. The iodine content of the urine was estimated by dry ashing method in presence of sodium carbonate and then iodine present in the ash was measured by ceric-arsenite system[8].

Serum protein-bound iodine was determined by adopting standard method[9]. The principle of the method consisted in precipitating protein from the serum by zinc sulphate and sodium hydroxide, washing and incinerating the precipitate in alkaline condition and then extracting iodide with water. From the iodide solution so obtained, iodide was estimated by the action of arsenite and ceric sulphate in an acid medium. Iodine content of the common salt samples was estimated by iodometric method[10].

RESULTS AND DISCUSSION

Data of urinary iodine excretion level, serum protein-bound iodine level, iodine content of common salt samples and goiter prevalence among the target population are recorded in Tables 1-4, respectively.

The urinary iodine excretion level indicates the average iodine consumption of the community. This is because body's 90 % iodine is excreted through urine. It is generally accepted that the iodine content in urine samples, collected at random from 40 subjects in a locality, represent the valid estimate about the iodine intake of the general population of that locality[11]. Presently, the urinary iodine levels have been expressed in four categories (Table-1) to show proper distribution of iodine excretion. The over all iodine excretion level shows that 65 % of the tribal population studied have iodine level at 10 µg/dL or above. Only 25 % population showed mild iodine deficiency (5.0 - < 10 µg/dL range) while a meagre 10 % reflected moderate iodine deficiency. The trend remained more or less the same in all the age-group. Median urinary iodine excretion level, in different age-groups as well as of all samples (13.49 µg/dL), indicate that there is no biochemical iodine deficiency.

Serum protein-bound iodine level gives an index of thyroid abnormalities and is more useful in hypothyroidism. As such this parameter would also be useful in the assessment of iodine deficiency. Presently, 90 % of samples showed serum protein-bound iodine level in the normal range *i.e*., 4.0-8.0 µg/dL, suggesting euthyroid state and no iodine deficiency. In different age-groups also the iodine level was found to be mostly in

TABLE-1
URINARY IODINE EXCRETION LEVELS OF TRIBAL COMMUNITIES OF DUMKA DISTRICT OF SANTHAL PARGANA DIVISION (JHARKHAND, INDIA)

Age-group (yrs.)	Sample studied	Urinary Iodine Excretion Level (µg/dL)				Median urinary iodine excretion level (µg/dL)
		< 2.0	2.0 - < 5.0	5.0 - < 10.0	10 and above	
6 - 12	20	0	1	7	12	11.35
13- 18	20	0	2	3	15	13.69
19- 39	20	0	1	6	13	13.56
40 and above	20	0	3	5	12	12.68
Total	80	0	7	21	52 (65 %)	13.49

TABLE-2
SERUM PROTEIN-BOUND IODINE LEVELS OF TRIBAL COMMUNITIES OF DUMKA DISTRICT OF SANTHAL PARGANA DIVISION (JHARKHAND, INDIA)

Age-group (yrs.)	Sample studied	Serum Protein-bound Iodine level (µg/dL)			Median serum protein bound iodine level (µg/dL)
		< 4.0	4.0-8.0	> 8	
6-12	10	1	9	0	5.0
13-18	10	0	10	0	6.0
19-39	10	1	9	0	5.2
40 and above	10	2	8	0	5.0
Total	40	4	36 (90 %)	0	5.1

TABLE-3
IODINE CONTENT OF COMMON SALT SAMPLES CONSUMED BY TRIBAL COMMUNITIES OF DUMKA DISTRICT OF SANTHAL PARGANA DIVISION (JHARKHAND, INDIA)

Season of collection	Sample collected	Iodine Content of Common Salt (in ppm)	
		< 15 ppm	15 ppm and above
Winter (Nov-Feb)	20	4	16
Summer (March-June)	20	3	17
Rainy (July-Oct)	20	7	13
Total	60	14	46 (76 %)

TABLE-4
GOITER PREVALENCE AMONG TRIBAL COMMUNITIES OF DUMKA DISTRICT OF SANTHAL PARGANA DIVISION (JHARKHAND, INDIA)

Age-group (yrs.)	Population studied	Goiter affected population	Percentage of Goiter affected population	Severity as public health problem
6-12	200	4	2.0	Very mild
13-18	200	6	3.0	Very mild
19-39	200	7	3.5	Very mild
40 and above	200	9	4.5	Very mild
Total	800	26	3.25	Very mild

normal range (Table- 2). The age-group wise as well as over all median values of serum protein-bound iodine level were found to be at normal level, indicating normal iodine nutritional status.

A study of the iodine content of common salt samples (Table-3), collected in different seasons from the tribal habitats indicate that 76 % samples have iodine content ranging from 15 ppm and more. The recommended salt iodine level is 15 ppm[12]. Only 24 % samples have iodine content below 15 ppm. Observing season wise, the samples collected in the rainy season reflect comparatively a bit more samples with less than 15 ppm iodine content. This might be due to communication problem in this season in fetching iodized salt. However, even in this season majority of samples (65 %) contained optimum iodine level. Thus the iodine intake of the study population seem to be at required level.

Iodine deficiency status is generally indicated by the goiter prevalence in the community, particularly among the school age children. Presently, we have found a total goiter prevalence of 3.25 % among the study population. This amounts to goiter as a very mild public health problem. Age-group wise too, the prevalence varied from 2.0-4.5 % with lowest in 6-12 year age-group and highest in 40 year and above age-group, presenting goiter only at very mild severity level. Increasing consumption of iodized salt seems to have improved the goiter scenario over the years in this belt.

Conclusion

The present study suggest that, the tribal belt of Dumka district of Santhal Pargana region can be considered as very mild endemic goiter belt. There is no biochemical iodine deficiency. However, a slight prevalence of goiter suggest that the tribals should be further encouraged to consume iodized salt. As an additional precaution and check, some other goiterogenic factors may be traced for. Level of goiterogenic compounds *viz*., thiocyanate or thiocynate like compounds in the usual tribal foods *viz*., cabbage, sweet potato, bamboo shoots, cauliflower, radish, mustard, araceae, *etc*. may be assessed. These goiterogenic compounds interfere in the thyroid gland with the organification of iodine and formation of active thyroid hormones[13]. Selenium deficiency might also be checked for, because the iodine and selenium metabolisms are interrelated. The conversion of T4 to T3 is hastened by selenium containing deiodinase enzyme.

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