

## GOITER IN RURAL AREA OF ALIGARH DISTRICT

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( Received on July 11, 2000 )

**Abstract :** The survey of iodine deficiency disorder (IDD) and an inquiry about intake of goitrogenic items in two villages of the Aligarh district with a population of 1819 was done. Out of 1152 subjects examined, 348 had goiters but no other abnormality related to the IDD could be found in these subjects. The goiter positivity was 30.2% with visible goiter (grade II & III) rate 8.5%. Six of the subjects had multi nodular goiter of grade III. Urinary iodine levels in 316 of the goitrous subjects were lower ( $4.939 \pm 1.593 \mu\text{g/dL}$ ,  $M \pm SD$ ,  $P < 0.001$ , Median  $4.9 \mu\text{g/dL}$ ) than 50 urban inhabitants ( $6.638 \pm 1.372 \mu\text{g/dL}$ ). Through in most of the cases (83.9%) T3, T4 and TSH were within normal range, in 35% of the 69 from whom the blood samples were drawn, T3 levels  $>150\text{ng/dL}$  and in 41% of the cases TSH levels  $>3.5\text{mU/L}$  was seen.

As in most of the goitrous subjects T3, T4, TSH levels were within normal limits, only iodine deficiency could not be the causative factor for the goiter in 30.2% (severe endemia) of the total population of these two villages. Consumption of millets by the villagers, known to contain goitrogens along with the iodine deficiency in the food and drinking water appears to be responsible for the higher goiter rate in these villagers.

**Key words :** endemic goiter      urinary iodine      dietary goitrogens

### INTRODUCTION

In India endemic goiter is known for years to be prevalent in Sub Himalayan region. Uttar Pradesh, a northern state of India, falls within this region. The reason often ascribed for higher

goiter prevalence rate in these areas is erosion of upper layer of soil by floods, which result in lower levels of iodine in the soil. The survey of endemic goiter and iodine deficiency has been done in 29 districts of Uttar Pradesh falling in Sub Himalayan and plains, twenty-four

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of them have been reported endemic for IDD (1).

Though Aligarh district has been shown on the IDD map along with Delhi both having similar endemia (2), we have not come across any literature on IDD survey from Aligarh District. An IDD Survey from Delhi showed 29% goiter prevalence rate (1), while goiter survey of school children from two localities of Delhi showed 55.2 and 54.7% prevalence rate (3). In view of higher endemicity reported from Delhi, a plain region, we planned an IDD and dietary survey in Aligarh along with estimation of thyroid hormones and urinary iodine.

## METHODS

The present study was conducted in two nearby villages, Surajpur and Nagla Jat of Atrauli tehsil of Aligarh district. The population of two villages was 1819. Out of these, 1152 subjects consisting of 573 males and 579 females were examined for goiter, cretinism, deaf mutism and neurological abnormalities. Standard methods were used for examination of thyroid and grading of goiter (4). History of intake of goitrogenic food items grown in this area like millets, cabbage, turnip, mustard leaves, revealed that staple diet of the subjects for 4–5 months of the year consisted of millets (Bajra and Maize) and cabbage and mustard leaves in winters. The goitrous

subjects were randomized and after informed consent 69 blood samples and 316 morning urine samples of goitrous subjects were collected under aseptic conditions. Sodium Azide (1%) was added to the urine samples. Blood and Urine samples were transported at 4°C to the laboratory, serum was separated and these along with 50 urine samples of nongoitrous subjects of Aligarh City were stored at -20°C till the estimation was done.

Estimation of thyroid hormones and TSH was done by Radioimmunoassay (RIA kits BARC Mumbai) Estimation of urinary iodine was done by using ceric-arsenite reaction with slight modification (5). All the reagents used for urinary iodine estimation were of analytical grade. Student 't' test was used for statistical analysis.

## RESULTS

In this study it was found that out of 1152 subjects examined, 348 had goiter without any other manifestation of iodine deficiency. Thus the goiter positivity rate was 30.2%. Goiter positivity was higher in females (37.65%) than the males (22.68%). The total goiter positivity in school children (age 6–12 years) was found to be 43.3% while it was highest (46.7%) in pubertal age group (13–18 years) with as high as 59.78% in pubertal age group girls. In schoolgirls (6–12 years) goiter positivity

was 48.41% while in schoolboys of the same age group goiter positivity was 38.88% (Table I).

Looking upon the distribution of goiter size in Table II, it is obvious that out of all the subjects examined only 8.5% (98 subjects, 36 males and 62 females) had visible goiter while 21.7% has grade I goiter. Of the goiterous subjects, 71.84% had grade I and rest 28.16% had visible goiter (grade II and III). Six of the female subjects above the age of 5 years had multi-nodular goiter while remaining females and all of the males had diffuse enlargement of the gland. No

other IDD abnormality was detected neither was there any evidence of clinical hypo or hyper-thyroidism in these cases.

Urinary iodine levels in goitrous subjects were in the range of 0.2–8.8 µg/dL ( $M \pm SD$ ,  $4.939 \pm 1.593$ ,  $P < 0.001$ , Median 4.9 µg/dL) while nongoitrous urban inhabitants had urinary iodine in the range of 5.0–9.2 µg/dL ( $6.638 \pm 1.372$  µg/dL). Urinary iodine levels in 51.2% of the goitrous subjects was  $< 5$  µg/dL, remaining i.e. 48.8% of the goitrous subjects had urinary iodine levels in the range of that of nongoitrous urban subjects.

TABLE I: Showing age and sex wise goiter positivity.

Age group (years)	Male			Female			Total (%) positivity
	n	Goiter positive	Percent positive	n	Goiter positive	Percent positive	
0–5	118	12	10.16	92	11	11.95	10.9
6–12	144	56	38.88	126	61	48.41	43.3
13–18	90	30	33.33	92	55	59.78	46.7
>18	221	32	14.47	269	91	33.82	25.1
Total	573	130	22.68	579	218	37.65	30.2

TABLE II: Showing age and sex wise distribution of goiter size.

Age group (years)	Male Grade			Female Grade		
	I	II	III	I	II	III
0–5	10	2	0	11	0	0
6–12	35	16	5	42	14	5(2)
13–18	23	6	1	38	10	7(2)
>18	26	5	1	65	20	6(2)

Figures in parenthesis indicate cases of multi-nodular goiters.

Estimation of T3, T4 and TSH showed that 83.9% of the goitrous subjects had normal levels of the hormones. Of the cases showing any abnormality T3, T4 were subnormal in 12.9% and 6.5% of the goitrous subjects. In these goitrous cases T3 levels were in the range of 67–69 ng/dL and T4 levels were 2.0–2.9 µg/dL. In the goitrous cases having normal T3 and T4, T3 levels in 35% of the cases were >150 ng/dL. TSH was >3.5 mU/L in 41% of goitrous subjects. In two of the patients TSH levels were above normal (8.0 and 12.5 mU/L) suggesting biochemical hypothyroidism in some patients.

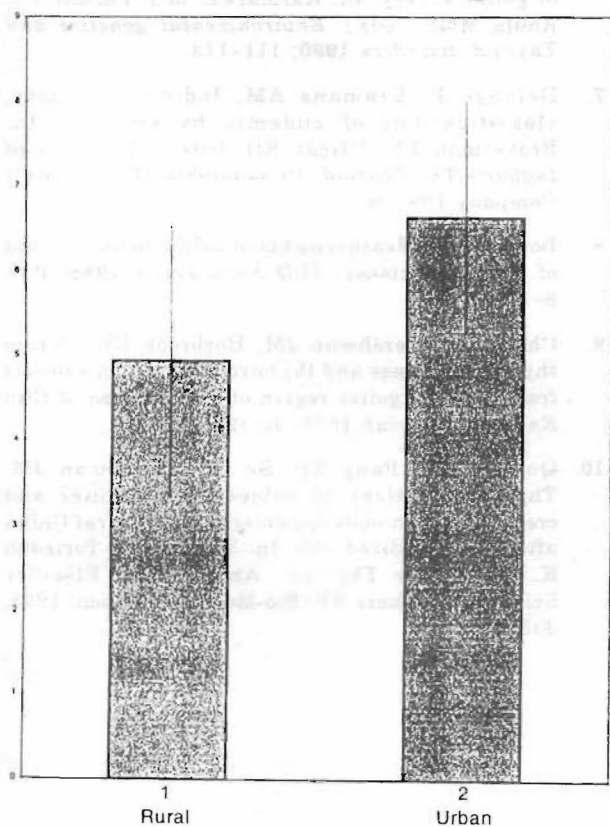


Fig. 1: Urinary Iodine in Rural and Urban subjects.

## DISCUSSION

With limited resources a judgmental survey like present one is recommended in the first phase (6). This judgmental sample survey in two villages shows goiter positivity in 30.2% of the population, indicating IDD endemia of severe degree (7). Although determination of iodine in soil and drinking water was not taken up in this study, degree of decrease in urinary iodine levels in spot urine sample (<5 µg/dL) in 51.2% of the goitrous subject indicate low iodine intake and moderate (median urinary iodine 2.0–4.9 µg/dL) level of iodine deficiency in the area (8). Moreover absence of cretinism as well as other IDD related abnormalities, TSH levels >3.5 mU/L in 41% cases and T3 >150 ng/dL in 35% of cases are also in accordance with characteristics of mild to moderate degree of iodine deficiency in the population (9). Since urinary iodine (median 4.9 µg/dL) indicates just borderline moderate degree of endemicity whereas goiter positivity rate (30.2%) indicates severe degree of endemia, only low iodine intake by the subjects cannot explain this shift from moderate degree of iodine deficiency in the area to severe degree of goiter positivity. The intake of millets and other known dietary goitrogens seems to play a crucial role in the shift from moderate degree of iodine deficiency to severe degree of goiter endemicity. Presence of goiter in the subjects with urinary iodine levels in the range similar to the urban nongoitrous subjects also suggests role of dietary goitrogens, in goitrogenesis (7), (10).

As observed in this study, the highest goiter positivity (41.8%) in pubertal age (10–16 years) girls have been reported in a survey of the population from a village of Mewat area of district Faridabad of Haryana. Though the authors have not given any reason for highest goiter positivity in this age group it has been reported that peak goiter prevalence occurs during puberty and from the age of 10 years, higher prevalence is observed in girls than in the boys (7).

For majority of the people of the villages iodine deficiency and consumption of goitrogens may not be of any consequence and concern except slight disfiguration of the neck, it is of paramount importance for the pregnant women and neonates. Hence, preventive measures like promotion of intake and monitoring of sale of iodized salt in the area and minimization of consumption of millets containing dietary goitrogens is recommended.

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