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Study of Serum Thyroid Stimulating Hormone Level Among Individuals in An Iodine Deficient Region of Upper Assam- A Hospital Based Study

KEYWORDS: Iodine,Micronutrient,thyroid stimulating hormone

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ABSTRACT *BACKGROUND:*
Iodine is an essential micronutrient required for synthesis of thyroid hormones.Jorhat,Golaghat and Sivasagar districts of upper Assam belong to the Sub Himalayan iodine deficient belt with large scale floods every year during the rainy seasons.Inhabitants of this region are at risk of developing altered thyroid status due to iodine deficiency in their food,if not supplemented adequately.Thyroid stimulating hormone (TSH) secreted by the anterior pituitary is regarded as one of the best indicators of thyroid hormone activity.With this background,a cross sectional observational study has been undertaken to evaluate the thyroid status of the population of Jorhat,Golaghat and Sibsagar districts by examining their TSH levels.Subjects selected for the study are apparently euthyroid individuals visiting Jorhat Medical College Hospital from March 2014 to September 2015.
RESULTS AND OBSERVATION:
A total of 1314 cases of both sexes belonging to different age groups were studied. The mean TSH value obtained is 2.27μIU/L ±1.69μIU/L. For females it is 2.33μIU/L±1.73μIU/L and for the males is 2.19μIU/L ±1.64μIU/L.
6.925% of the cases studied have values >5μIU/L. The results are comparable with studies from non-iodine deficient areas.

Introduction:
Thyroxine (T4) and triiodothyronine (T3) are the two active thyroid hormones. They play critical roles in cell differentiation during development and maintain metabolic homeostasis. Synthesis and secretion of thyroid hormones are under control of thyroid stimulating hormone (TSH) of the anterior pituitary. Under normal conditions,TSH level in blood vary according to thyroid hormone levels. High TSH level indicates lowered thyroid activity and vice versa. Thus blood TSH concentration is a useful physiological marker of thyroid hormone activity[1]Increased TSH levels lead to hypertrophy of the thyroid gland and in extreme cases manifest as hypothyroid goitre.

Iodine is the essential micronutrient required for synthesis of thyroid hormones. Plants and water derive iodine from the top soil reserves, which is subsequently acquired by the animal kingdom. Flood prone and hilly regions of the world are subjected to leeching of the top soil during rainy season, rendering these regions deficient in iodine. Inhabitants of such regions suffer from Iodine deficiency disorders(IDD) due to lack of adequate dietary availability of iodine and resulting in inadequate thyroid hormone synthesis.

Thyroid hormones are essential for intellectual and physical development of an individual.Children born to hypothyroid mothers often result in stunted growth,cretinism and have lower IQ scores [2] People living in areas affected by severe iodine deficiency may have an intelligence quotient of upto about 13.5 points below that of those from comparable communities in areas where there is no iodine deficiency.[3] Iodine deficiency and the resultant hypothyroidism increases the risk of still births,abortions,increased perinatal deaths ,infant deaths and congenital anomalies.[4]

Globally IDD is a major public health problem. Over 2 billion people worldwide is affected with IDD.[5] It is estimated that in India alone ,more than 200 million people are at risk of Iodine deficiency and 71 million suffer from goiter and other IDD[6]

Hypothyroidism due to iodine deficiency still remains the most common cause of preventable mental deficiencyin the world today.[7] Iodinization of edible salt is an effective measure to control IDD in iodine deficient regions .In 1983-84,Govt. of India adopted a policy to achieve universal iodization of edible salt by 1992[8] In 1998,edible salt iodization was made compulsory and sale of non iodized salt was banned. However,in the year 2000 it was revoked considering compulsion in such matters of individual choice desirable[9]

Jorhat Medical College Hospital is a tertiary care teaching hospital.It caters to the patients from Sivsagar,Jorhat and Golaghat districts of upper Assam.All these districts are heavily flood prone. The Brahmaputra and its tributaries lashes these districts with flood every year during the rainy monsoon months.

Thus with this background, the present study is undertaken to examine the thyroid status of the people of this flood affected region belonging to the sub Himalayan iodine deficient belt by estimating serum TSH levels in individuals visiting Jorhat Medical College Hospital without any apparent thyroid related problems or complaints,critically anlyse the findings and compare with observations made in other similar studies.

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Materials and methods:
Study design: cross sectional hospital based

Cases:
A total number of 1314 subjects visiting Jorhat Medical College Hospital ,both male and female,were randomly selected,without any apparent thyroid related problems belonging to different age,were estimated for serum TSH levels.

***Exclusion criteria*:**
1)Pregnancy.

2)Patients with diabetes mellitus,hypertension,fever,renal failure,liver cirrhosis,malignant neoplasm and psychological abnormality

3)On medications for thyroid disorders

Study Time:
Between March 2014 and September 2015.

Specimen collection for tests:
Collected 2cc of venous blood in sterile empty vial from each of the study subjects maintaining all routine precautions.

Allowed the samples to clot and serum was separated.

Then serum was shifted to storage tubes and was tested within four hours of collection at room temperature.

Haemolysed samples were discarded.

Estimation:
It was carried out in Access Immuno Assay Systems (Beckman Coulter) at the clinical Biochemistry wing of Central Clinical Laboratory, Jorhat Medical College Hospital.

Assays:
The Access TSH assay is a two site immunoenzymatic ("Sandwich") assay.

Calibration:
Regular calibrations were done every 28 days

***Quality control*:**
QC material simulate the characteristics of patient samples are commercially available and supplied by the manufacturers- Beckman Coulter, were used.

Quality control materials were run in every 24 hours time for authenticity of the reports.

These QC materials cover at least two levels of the analyte. The test results were accepted only when quality control results were found to be within acceptable ranges.

Results :
Results of the tests were determined automatically by the system's software. The amount of analyte in the sample was determined from the measured light production by means of calibration data.

Statistical analysis:
Independent sample t test in SPSS 16 version.

RESULTS
1.Overall Mean/SD/Range of TSH values of the study population groups (in μIU/L)

Mean 2.27

SD 1.69

Min 0.01

Max 10.65

Range 10.64

Mean/SD/Range for females (in μIU/L)

Mean 2.33

SD 1.73

Max 10.65

Min 0.03

Range 10.62

Mean/SD/Range for males (in μIU/L)

Mean 2.19

SD 1.64

Max 9.91

Min 0.01

Range 9.9

Note: Difference between above two groups are statistically insignificant with P value =0.127 (which is > 0.05)

2.Table showing number of cases and average TSH values amongst different age groups

Age group (years)	Number of cases n=1314	Mean TSH (μIU/L)
<12	26	2.65
12 to <20	122	2.23
20 to <40	581	2.36
40 to <60	411	2.22
≥60	173	2.02

3. Table showing Average TSH level among different age groups (Male vs Female)

Age groups (years)	Mean TSH level (μIU/L)		P Value
	MALE	FEMALE	
<12	2.85	1.822	0.227
12 - <20	2.23	2.24	0.964
20 - <40	2.31	2.39	0.561
40 - <60	2.08	2.36	0.124
≥60	1.97	2.08	0.698

Note: Statistically comparison between Males & Females are insignificant with all the values >0.05

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4. Table showing number of cases and their relative prevalence with TSH levels >5 µIU/L and <0.3 µIU/L in males and females.

TSH level (µIU/L)	Male (n=578)	Female (N=736)
<0.3	17 (2.94%)	24 (3.26%)
>5	40 (6.92%)	51 (6.93%)

DISCUSSION:

The present study was carried out on 1314 apparently euthyroid individuals (both male and female) of different age groups from a known iodine deficient region (Jorhat,Golaghat and Sivasagar districts of Upper Assam) showed mean TSH value to be 2.27µIU/L±1.69µIU/L. This finding is complete to similar other studies elsewhere[10,11,12]

In our study mean±SD TSH values in females (2.33µIU/L±1.73µIU/L) was little higher than the males (2.25µIU/L±1.63µIU/L).Similar finding is also reported by Aghini-Lombardi F,et.al.[13]

When TSH levels in different age groups were examined in relation to sex,no statistically significant result was obtained on comparison across the different age groups. However,an increasing trend of mean TSH values was observed in females as age advances till it is 60 years.The values are also higher than their male counterparts without any statistical significance.

In our study we have considered 5µIU/L as the upper limit of normal TSH level.Upper limit of TSH normal value is a matter of intense debate,still this value is comparable to various studies conducted worldwide [11,12,13,14,15,16,17,18,19,20].In the present study,91 (6.925%) cases had TSH levels >5µIU/L.On further analysis,51(6.93%) were females and 40 (6.92%) were male subjects.Thus,TSH values above 5µIU/L does not show any sex preference in the present study.

TSH values above 5µIU/L is an important indicator of subacute hypothyroidism.In fact,subacute hypothyroidism is considered to be the most prevalent thyroid disorder affecting 3-15% of the adult population and is a matter of serious morbidity.[12,21].This prevalence of higher TSH value in our study was conducted in a iodine deficient region. But the results of the study shows a very similar pattern of TSH values obtained in non-iodine deficient region. Even though our study subjects consisted apparently euthyroid subjects, the similarity of prevalence of higher TSH level cases with studies of iodine sufficient region gives a reflection of a good thyroid status of the population of this region. This is an important observation. Probably, awareness against iodine deficiency disorders is the cause of this encouraging observation which is definitely an outcome of sustained and result oriented efforts of the Govt. and NGOs against IDD.

However, it is too early to comment. There is definitely a scope for an elaborate, community based study on thyroid status among the population of this region.

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