ORIGINAL RESEARCH PAPER

Biochemistry

KEY WORDS: T3,T4,TSH,Adolescent

THYROID HORMONE STATUS IN EARLY AND LATE ADOLESCENT MALES OF AN IODINE DEFICIENT ZONE OF ASSAM

Dr.Reetwik Kumar Dutta* Department of Biochemistry,Jorhat Medical College,Jail Road,Jorhat,Assam.Pin-785001*Corresponding Author

Saurabh Borkotoki Professor And Head, Department of Biochemistry,Jorhat Medical College

Dr. Uttara Borkotoki Associate Professor, Department of Microbiology,Jorhat Medical College

ABSTRACT

Adolescence,the vulnerable growing period creates increased demands for energy and of nutrients. Nutrition and physical growth are integrally related.Like increase in recommended amounts of other dietary elements, dietary requirement of the micro-mineral Iodine also increases during growth.Iodine is required for thyroid hormone synthesis.Flood prone region are deficient in Iodine as the micromineral is leeched away from the top layer of such soil. Deficient Iodine intake and thyroid hormone status of body are thus related directly.In the present study, among the 203 apparently healthy adolescent male population of Mising community (the community with highest percentage population wise) living in Majuli,a flood prone river island in Assam, the thyroid hormone status measuring T3, T4 and TSH was evaluated. The subjects were mostly euthyroid and Serum TSH level was significantly higher in late adolescent males than early adolescent female (P value <0.05).The study implied effects of iodine deficiency in a flood prone region, on the serum TSH leves in apparently healthy male subjects and importance of measuring serum TSH as a physiological marker in differential diagnosis of adolescent health disorders.

Introduction:

Adolescence is a period of life with specific health and developmental needs and rights. WHO defines adolescents as any person aged 10-19 years. [1]

The manifest gulf in experience that separates younger and older adolescents makes it useful to consider this second decade of life as two parts: early adolescence (10–14 years) and late adolescence (15–19 years). [2]

During adolescent pubertal age, changes in thyroid functions and an increase in thyroid volume occur as an adaptation to body and sexual development. Hypothyroidism diagnosed late in prepubertal years, usually due to Hashimoto's thyroiditis, can cause a delay of puberty or incomplete isosexual precocity (increased testis volume in boys without adrenarche).[3]

Pubertal gynaecomastia is a frequent phenomenon occurring in 20-40% of otherwise healthy adolescent boys.[4]

Thyroid hormones have profound effects on cardiovascular function, including on blood pressure. Recent studies have shown that childhood hypertension can lead to adult hypertension. Therefore, adequate blood pressure control is important from early life. [5]

Taking into account the above considerable points a study was undertaken to measure the thyroid hormone (T3,T4 and TSH) status among the adolescent(10-19 years) male population of the Mising community living in Majuli,a heavily flooded iodine deficient zone,of Assam.

Materials And Methods:

Permission/clearance from the Institutional Human Ethics Committee was obtained prior to commencement of the study.

CRITERIA FOR SELECTION OF STUDY POPULATION:

The study was a Cross-Sectional community based Study and it was carried out among Mising tribal population of Majuli district of Assam, in the adolescent age group (10-19 yrs) male subjects . 203 number of subjects were included in the study for testing the serum T3,T4 and TSH levels.

A community development block of Majuli District was selected by simple random process. In the Block, Study population were selected from the villages having the tribal Mising population (the community with highest percentage by population in the area) by systemic random process and thus every 15th adolescent male Mising tribal subject was chosen to include in the study. During the house visits, purpose of visit and procedure of testing were explained first. An informed consent for participating in the test was recorded.

Inclusion criteria:

1. Subject of age group 10 to 19 years.
2. Subject of male sex in the age group
3. Subject who are permanent inhabitant of Majuli.
4. Subject belonging to Mising tribe

Exclusion criteria:

1. Subject below 10 yrs and above 19 yrs and female subjects were excluded
2. Subject with personal or family history of thyroid disorders like goiter, hypothyroidism, hyperthyroidism
3. Subject with presence of any fever, hypertension, renal failure, diabetes, hepatic cirrhosis, malignant neoplasm, psychological abnormality and other acute or chronic illness
4. Subject on medication for thyroid disorders.

COLLECTION OF BLOOD SAMPLE:

Under all aseptic and antiseptic conditions 2cc of venous blood was collected from each subject from a suitable peripheral vein (preferably antecubital vein) by venepuncture using a sterile disposable syringe and immediately transferred to sterile clot vial. Samples were allowed to clot and serum was separated. Then the vials containing serum was stored and transported in ice boxes till they reached Biochemistry wing of Central Clinical Laboratory,JMCH and Estimation was carried out in Access Immuno Assay Systems (Beckman Coulter).Quality control (QC) was run regularly and results were accepted when QC was within normal limits.

Results and Observation:

Table 1: Comparison of T3, T4 and TSH in different age group of the subjects

Age group (years)	T3(ng/ml)	T4(µg/dl)	TSH(µIU/dl)
	Mean ± sd	Mean ± sd	Mean ± sd
(Early adolescent) 10- <15 (n=81)	1.26±0.20	9.00±0.72	2.34±0.89

(Late adolescent) 15 – 19 (n=122)	1.23±0.22	8.80±1.13	2.92±1.60
Unpaired t value	0.9861	1.413	2.970
P value	0.3253	0.1591	0.0033
Inference	Not significant	Not significant	Significant (p value <0.05)

From the above Table of comparison of T3, T4 and TSH in different age group of the subjects, it is seen that the mean T3 value is insignificantly higher in early adolescents (1.26±0.20) than late adolescents (1.23±0.22), also the mean values of T4 was higher in early adolescents (9.00±0.72) than late adolescents (8.80±1.13) and was statistically not significant and when the TSH level was compared, there was increase in late adolescents(2.92±1.60) than early adolescents (2.34±0.89), and it was statistically significant (p value <0.05).

Table 2: No. of subjects having subclinical hypothyroidism

	Subclinical hypothyroidism	Hypothyroidism	Subclinical hyperthyroidism	Hyperthyroidism
(early adolescent) 10-<15yrs	2	-	-	-
(late adolescent) 15-19 yrs	18	-	-	-

From the above Table it was seen that, of all the study population, 2 subjects of early adolescence and 18 subjects of late adolescence suffered from subclinical hypothyroidism.

Table 3: Comparison of subclinical hypothyroidism (SCH) in early male and late male adolescent:

	Early Male	Late Male	P value (Fisher's Exact Test)
Number of subjects with SCH	2	18	0.0034
Number of subjects without SCH	79	104	

Using Fisher's Exact Test, the significance of subclinical hypothyroidism was tested in early and late adolescent population and significantly (p value < 0.05) higher number of subjects having subclinical hypothyroidism was found in late adolescent males.

Statistical Analysis: Statistical analysis was done using MS-Excel and online graph pad instat software.

DISCUSSION:

In the study population the mean± SD T3 (ng/ml) values were 1.26±0.20 and 1.23±0.22 in early and late adolescent respectively. None of the changes were statistically significant, relatively high T3 values were found in the younger populations.

In the the study population the mean±SD T4 (µgm/dl) values were 9.00±0.72 and 8.80±1.13 in early and late adolescence respectively.These changes were statistically not significant, relatively high T4 values were found in the younger populations.

In the study population the mean±SD TSH (µIU/ml) values were 2.34± 0.89 and 2.92± 1.60 in early and late adolescents respectively.. These changes were statistically significant, significantly higher TSH values were found in the late adolescent populations.

In the present study T3, T4 values decreased relatively in the late adolescence than the early one. These pattern of variation is in T3,T4 of present study population is comparable with the different literature of Carabulea G et al [6],Kaloumenou I et al[7],Elmlinger MW et al[8]and Radicioni A F et al [9]

In the present study TSH increased significantly in the late adolescence than the early one.. The studies of Thakur C et al[10] and Kaur G et al[11] done in known iodine deficient Indian regions and the studies of Dambal AA[12]Kumari T et al[13] done to see the age and gender specific changes in healthy individuals of different ages of India are comparable to the present study . Different ethnicity, geographical location, slight differences in the age groups compared and amount the iodine intake are some of the reasons for the similarities and dissimilarities of these findings to the present study.

Evaluation of serum T3,T4 and TSH categorises the results into clinical conditions Subclinical Hypothyroidism(High TSH,Normal T3,T4)Hypothyroidism (HighTSH ,Normal/lowT3, lowT4), Subclinical Hyperthyroidism (Low TSH,Normal T3,T4)and Hyperthyroidism (low TSH,High/Normal T3,T4).[14] The reference range in the present study laboratory were as such -T3 (0.87-1.78 ng/mL), T4(6.09-12.23µg/dL) and TSH (0.34-5.0µIU/ml). Results were analysed clinically based on these normal range values of the parameters.[15,16] In the present study higher number(18 numbers) of subclinical hypothyroid subjects were found in late adolescents than early adolescents (2 numbers). The present study population showed iodine deficiency induced change patterns were in T3,T4 and TSH levels. Further, elder adolescents with poor thyroid function than the younger ones suggested an effect of duration of iodine deficiency and physiological variations from adolescence to adulthood. Our findings are comparable to studies of Mahanta A[17] ,Begum F[18] .

CONCLUSION:

9.85% Subclinical hypothyroid cases were found among the healthy adolescent male subjects of the present study. The percentage of thyroid abnormality in the total adolescent male community would be obviously high if goitre and thyroid related cases were also included in the study people implying thyroid hormone abnormality lies in the studied population in an undiagnosed manner. Awareness of iodinated salt consumption in the iodine deficient flood zone, inclusion of TSH measurement in differential diagnosis of t diseases suffered by the population and larger population based study on thyroid hormone related parameters is thus advocated.

REFERENCES

1) Csikszentmihalyi M.Adolescence.[internet]www.britannica.com
2) Focus on Early and late adolescence.[internet]www.unicef.org
3) Weber G, Vigone MC, Stroppa L, Chiumello G. Thyroid function and puberty .J PediatrEndocrinolMetab. 2003 Mar;16Suppl 2:253-7.
4) Mieritz MG, Sorensen K, Aksglaede L, Mouritsen A et al.Elevated serum levels of free triiodothyronine in adolescent boys with gynaecomastia compared with controls.Eur J Endocrinol. 2014 Aug;171(2):193-8. doi: 10.1530/EJE-13-0847
5) Park BH, Baik SJ, Lee HA, Hong YS, Kim HS et al.The association of thyroid hormones and blood pressure in euthyroidpreadolescents. Jpediatr Endocrinol Metab. 2016 Apr;29(4):459-64.
6) Carabulea G, Bughi S, Klepsch I, EşanuC.Circulating FSH, LH, GH, testosterone, TSH, T3, T4, prolactin and insulin in boys during puberty. Endocrinologie. 1980 Apr-Jun;18(2):109-14.
7) Kaloumenou I, Duntas LH, Alevizaki M, Mantzou E, Chiotis D et al .Gender, age, puberty, and BMI related changes of TSH and thyroid hormones in schoolchildren living in a long-standing iodine replete area.HormMetab Res. 2010 Apr;42(4):285-9. doi: 10.1055/s-0029-1246184. Epub 2010 Jan 29.
8) Elmlinger MW, Kühnel W, Lambrecht HG, Ranke MB.Reference intervals from birth to adulthood for serum thyroxine (T4), triiodothyronine (T3), free T3, free T4, thyroxine binding globulin (TBG) and thyrotropin (TSH). ClinChem Lab Med. 2001 Oct;39(10):973-9.
9) Radicioni AF, Tahani N, Spaziani M, Anzuini A, Piccheri C, Semeraro A, Tarani L, LenziA.Reference ranges for thyroid hormones in normal Italian children and adolescents and overweight adolescents. J Endocrinol Invest. 2013 May;36(5):326-30.
10) Thakur C, Saikia T C and Yadav R N S. Total Serum Levels of Triiodothyronine (T3) Thyroxine (T4) and Thyrotropine (TSH) in School going Children of Dibrugarh District: An Endemic Goiter Region Of Assam. Indian J PhysiolPharmacol. 1997; 41(2): 167-170
11) KaurG,KalsotraL,Sadhoo A K. Age and Sex Related Changes in Thyroid Functions in Normal Healthy Subjects of Jammu Region. JK SCIENCE. 2007; Vol. 9(3):132-136
12) DambalAA,PadakiS,HerurA,KashikuntiSV,ManjulaR,GurupadappaK.Thyroid status in Relation to Age and Gender- A cross Sectional Study.MRIMS J Health Sciences. 2013;1(2):37-40
13) Kumari T, PrasadA,Sinha K K, Bharti M L G, SatyamK.Age and sex specific thyroid hormone profile in euthyroidsubjects. J Biochem Tech .2015. 6(3): 1008-1012
14) American association of Clinical Chemistry.T3:understanding your tests.Jan 26 2008.[internet]www.labtestsonline.org
15) Beckman Coulter Access 2 Immunoassay System Instruction for use for in vitro diagnostic use.Printed in USA:Beckman Coulter Ireland.inc;2012.
16) Beckman Coulter Access 2 Immunoassay System reference manual. Printed in USA:Beckman Coulter Ireland.inc;2011.
17) Mahanta A, Choudhury S, Choudhury SD.Prevalence of hypothyroidism in Assam: A clinic-based observational study. Thyroid Res Pract 2017;14:63-70
18) Begum F.A Hospital based study on Thyroid Dysfunction based on estimation of TSH & Thyroid Hormones.Sch J App Med Sci. November 2015; 3(8E):3096-3102