

Clinico Epidemiological Profile of Thyroid Function Disorders in Adolescents Attending a Tertiary Care Centre

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Abstract

Background: Thyroid gland disorders represent the most common endocrinopathies in paediatric age group. Thyroid function disorders are unique from other disorders because of ease of diagnosis.

Objective: To study the clinical profile of thyroid disorders among adolescent age group. **Method:** 150 adolescents who visited JSS Hospital, Mysuru during the stipulated time period were included in the study. Detailed history, physical examination was done and thyroid profile was analyzed using ECLIA - Electro- chemiluminescence immunoassay analyzer in the fully automated hormone Analyzer ROCHE411601. **Results and Discussion:** The least common abnormalities observed were primary hypothyroidism (2%) & hyperthyroidism (2%). Thyroid disorders were detected in 21.3% of study population out of which 56% were females & 43.75% were males. In overweight children TSH abnormalities were observed in 23% of study subjects. **Conclusion:** Thyroid disorders were detected in 21.3% of study population out of which 56% were females & 43.75% were males. Thyroid disorders were more common in females with male to female ratio of 0.7:1.

Keywords: Adolescents, Thyroid disorders, hypothyroidism, hyperthyroidism.

Introduction

Normal thyroid gland function is critical for early neurocognitive development as well as for growth.^[1] Thyroid gland disorders represent the most common endocrinopathies in paediatric age group. The etiological factors & clinical presentation of thyroid abnormalities in children & adolescents differ from that in adults. Early diagnosis and treatment of thyroid disorders is of utmost importance, especially in infants to prevent cognitive impairment & developmental delay.^[2] It has been estimated that about 42 million people in India suffer from thyroid disorders.^[3]

Increase in thyroid hormone production & secretion is called as hyperthyroidism. It accounts for 10 -15% of thyroid disorders in children³ & is characterized by elevated T3, T4 levels and reduced TSH levels with the most common cause being Grave's disease. Clinical features of hyperthyroidism include palpitations, weight loss, sleep disturbances, diarrhoea, poor scholastic performance, excessive sweating, hair loss, tremors, goitre. Whereas, hypothyroidism is caused due to decreased production & secretion of thyroid hormones & is characterized by elevated TSH and reduced T3, T4. Clinical features of hypothyroidism include constipation, weight gain, menstrual irregularities, muscle

weakness, dry skin, myxedema, short stature. It can be congenital or acquired.

Thyroid function disorders are unique from other disorders because of ease of diagnosis. History, clinical examination, laboratory tests all have equal importance in the evaluation of thyroid disorders.

Serum TSH is the most sensitive test for the detection of primary thyroid dysfunction. About 53% of subjects with subclinical hypothyroidism will be positive for anti-TPO antibodies³. Ultrasound is an important tool to identify the position of the normal thyroid gland.^[3]

Adolescence is the phase of life between childhood and adulthood, from ages of 10 -19 years. It is an unique stage of human development and an important time for laying the foundations of good health.^[4]

Adolescents experience rapid physical, cognitive and psychosocial growth. As thyroid disorders peak during adolescence and mostly goes undetected, there is a need for evaluation of thyroid functions in this age group. Hence, early identification & initiation of treatment can help improve the psychosocial well- being. As there is paucity of information on thyroid function disorders in adolescents, there is a need to evaluate thyroid functions in adolescents.

Materials and Methods

This cross sectional analytical study was conducted among adolescents between the age of 10-19 years who attended the Department of Paediatrics at JSS Hospital, a tertiary care centre in Mysuru, Karnataka, India. Duration of study was 18 Month. Consecutive Sampling technique was used. Permission for conducting the study was taken from JSS University Ethical Committee. Written and informed consent was taken from the parents of the children involved in the study.

Sample size calculation-The sample size was calculated based on the literature⁵, absolute precision of 5% and 5% alpha error, as 149.

Using the formula Sample size: $\frac{Z^2 \cdot p(1-p)}{d^2}$

d^2

is equal to 149,

where Z = Standard value,

p: expected proportion d: absolute precision

1- α /2: desired confidence level.

Inclusion Criteria

Adolescents aged 10-19 years who came to a tertiary care center.

Exclusion Criteria

Adolescents with known thyroid disorders on treatment. Adolescents with other endocrinopathies like diabetes.

Adolescent patients with underlying thyroid disorder, secondary to Down syndrome, Turner syndrome etc.

Method of collection of data

The selected adolescents were subjected to the following:

Full history taking and detailed clinical examination

Current and past medication history, specifically regarding thyroid medications.

Anthropometric assessment: Height was measured using a stadiometer. Weight was measured using a weighting machine. BMI was calculated using formula weight/(height)².

□According to WHO Classification subjects were classified according to their body mass index into⁶.

<18.5	Underweight
18.5–24.9	Normalweight
25.0–29.9	Pre-obesity
30.0–34.9	ObesityclassI
35.0–39.9	ObesityclassII
≥40	ObesityclassIII

Vitals of each study subject was recorded.

Reference values of Thyroid hormones, TSH were as follows³ which were in line to laboratory values in JSS Hospital Mysuru :

T3 : 1.23 - 3.23 nmol/L

T4 : 4.2 – 13 mcg/dl

TSH : 0.5 – 5.5 microIU/L

Based on thyroid profile study subjects are classified into⁵

Primary hypothyroidism - TSH >5.5µIU/L & T3 <1.23nmol/L or T4

<4.2µg/dl.

Subclinical hypothyroidism - TSH >5.5µIU/L and normal T3, T4.

Primary Hyperthyroidism - TSH <0.5µIU/L and T3 >3.23 or T4 >13 µg/dl.

Subclinical hyperthyroidism with TSH <0.5µIU/L & normal T3 and T4.

E) Euthyroid with Normal TSH, T3, T4. & prevalence of thyroid disorders was estimated based on the above data.

Sample Collection & Tests

Under aseptic conditions, 3mL of venous blood was collected in a plain red vacutainer and sent for analysis of serum TSH, TOTAL T3, TOTAL T4 levels.

Thyroid Profile was analyzed using ECLIA (Electro-chemiluminescence immunoassay

Analyzer) in the fully automated hormone Analyzer ROCHE411601.

Statistical Analysis

Data Collected was entered in Microsoft Excel & was analysed using SPSS version 23 software.

Summary statistics was done by means of proportions for categorical/binary variables and mean, median, Standard deviation, Inter Quartile Range (IQR) for continuous variables. P-value of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

Results

Among the subjects of our study 123 (82%) were between 10 - 14 years & 27 (18%) were between 15 - 19 years. The mean age was 12.76 ± 1.92 years. In our study subjects 42.75% were males and 57.3% were females. Sex ratio being 0.7: 1 [M: F].

Table 1: Distribution according to age

Age	Frequency	Percentage
10 - 14 years	123	82%
15 - 19 years	27	18%
Total	150	100%
Mean age: 12.76 ± 1.92 years		

In our study subjects 77.3% were asymptomatic, 8.6% had weight gain, cold intolerance was seen in 6%, dermatological manifestations were observed in 5.3%, headache was seen in 4%, menstrual irregularities were seen in 3.3%, diarrhoea, constipation, decreased appetite were seen in 1.3% each, diaphoresis was observed in 2%, weight loss, heat intolerance, generalized weakness was seen in 0.6% each.

Table 2: Clinical presentation of study population

Clinical presentation	Frequency	Percentage
Asymptomatic	116	77.3%
Weight gain in last 2 months	13	8.6%
Weight loss in last 6 months	1	0.6%
Cold intolerance	9	6%
Heat intolerance	1	0.6%
Diarrhoea	2	1.3%

Constipation	2	1.3%
Dermatological manifestation (hair loss, dryness of skin)	8	5.3%
Decreased appetite	2	1.3%
Menstrual irregularities	5	3.3%
Headache	6	4%
Generalised weakness	1	0.6%
Diaphoresis	3	2%

Family history of hypothyroidism was noted in only 2% of the study subjects and the remaining 98% had no family history of thyroid disorders.

Table 3: Distribution according to family history

Family history	Frequency	Percentage
Yes	3	2%
No	147	98%
Total	150	100%

Mean pulse was 86.12 ± 10.66 /bpm, the mean systolic blood pressure was 104.49 ± 7.06 mm of Hg and diastolic blood pressure was 66.45 ± 5.18 mm of Hg in the study participants. Vitals of all the subjects were within normal limits.

Table 4: Vitals among study subjects

Vitals	Mean \pm SD	Minimum	Maximum
Pulse (bpm)	86.12 ± 10.66	70	112
SBP (mm of Hg)	104.49 ± 7.06	90	120
DBP (mm of Hg)	66.45 ± 5.18	54	80

In the study subjects the mean height was 143.48 ± 10.09 (cm) & mean weight was 41.07 ± 8.69 (kg). In none of the study subjects short stature was noted.

In our study subjects - 38% were underweight, 53.3% had normal BMI and 8.7% were overweight. The mean BMI was 19.91 ± 3.68 .

Table 5: BMI among study subjects

BMI	Frequency	Percentage
<18.5 (Underweight)	57	38%
18.5-24.9 (Normal)	80	53.3%
25-29.9 (Overweight)	13	8.7%
≥ 30 (Obese)	-	-
Total	150	100%
Mean BMI: 19.91 ± 3.68		

There was no association ($p = 0.09$) between TSH levels and males and a significant association ($p = 0.01$) was obtained between TSH and females suggesting females are more prone to thyroid disorders.

Table 6: Prevalence of thyroid function disorders according to the gender among study subjects

Parameter	Totalsubj ects	Male s	Frequencyinma les	Femal es	Frequencyinfema les
Subclinicalhypothyroid ism	21	9	42.8%	12	57%
Primaryhypothyroidis m	3	0	0%	3	100%
Subclinicalhyperthyroid ism	5	4	80%	1	20%
Primaryhyperthyroidis m	3	1	33.3%	2	66.6%
Totalsubjectswiththyroid function disorders	32	14	43.75%	18	56%

Among the study subjects, 21 had subclinical hypothyroidism out of which 57% were females & 42.8% were males. In the study participants, primary hypothyroidism was seen only in females. 3.3% of our study population had subclinical hyperthyroidism with 80% being males. Primary hyperthyroidism was seen in 3 subjects with 66.6% in females & 33.3% in males. Weight gain was noted in most of the subjects with subclinical hypothyroidism.

Discussion

Thyroid disorders are one of the most common endocrine disorders. As thyroid hormones are crucial for physical as well as neurocognitive development, any abnormality in their function leads to impaired growth, poor neurodevelopmental outcome, menstrual abnormalities & relative vitamin deficiencies. Environmental & nutritional factors attribute to development of thyroid disorders.^[7] Changes in thyroid

hormonal status will affect body weight, heart rate, blood pressure & sleep pattern.

In the present study, 82% of subjects were between 10-14 years, 18% between 15-19 years of age. The mean age of study population was 12.76 years.

In a study done by S.Shalitinet al⁸ done in obese children & adolescents in Israel mean age was found be to 9.85years. A study done by Lakshinarayanagopaliah et al.^[5] in paediatric population for prevalence of thyroid disorders mean age was found to be 11.12 years.

Table 7: Comparision of various studies on thyroid disorders

Authors	Year	Place	Most prevalent thyroiddisorder
Present	2022	India	Subclinicalhypothyroidism
CarmonaCarmonaCA1etal ³¹	2018	Columbia	Subclinicalhypothyroidism
LakshminarayanaGopaliah R, et al ²⁸	2016	India	Subclinicalhypothyroidism

A study done in Kerala.^[5] concluded that thyroid function abnormalities were more common in adolescents than children.

Subclinical hypothyroidism and hyperthyroidism were found to be more common in adolescents, whereas overt

hypothyroidism was found to be more prevalent in children.

In our study subclinical hypothyroidism(14%) was found to be the most prevalent thyroid disorder. Thyroid disorders were more common in females according to our study. In a study done by LakshminarayanaGopaliah R, et al.^[5] regarding the prevalence of thyroid dysfunction, subclinical hypothyroidism was most prevalent with 2.1 times higher in females compared to males. In our study female to male ratio is 1.3:1.

In our study subclinical hyperthyroidism is 2nd most common thyroid dysfunction noted, which was more prevalent in males compared to females. Male to female ratio was 4:1. Contrary to our study, a study done in Kerala.^[5] showed hyperthyroidism as the 3rd most prevalence thyroid disorder with female to male ratio being 7:1.

In a study done in Israel⁸, prevalence of TSH abnormalities were found to be similar in pubertal & pre-pubertal children

Conclusions

Family history of hypothyroidism was seen in 2% of study subjects. Thyroid disorders were detected in 21.3% of study population out of which 56% were females & 43.75% were males. Thyroid disorders were more common in females with male to female ratio of 0.7:1.

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