



## Evaluation of Thyroid Function Among Adolescents with Goitre

### KEYWORDS

1) Adolescent Goitre 2) Adolescence and Thyroid 3) Adolescence and Hypothyroidism

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**ABSTRACT** 30% of world population is adolescent. Marked changes in thyroid function occur during puberty as an adaptation to body and sexual development. Therefore disorders affecting the thyroid gland are common in adolescents occurring approximately in 3.7% of adolescents between the age group of 11 and 18 years. Puberty is a crucial period of hormonal interactions in a human life cycle. Thyroid hormone plays an important role during puberty. This study was done in adolescence children between the age of 11 and 18 yrs. Clinical examination of thyroid gland and biochemical investigations of thyroid function were done. Clinical features of hypo and hyperthyroidism were assessed and correlated with the thyroid profile. Results suggested Significant Thyroid dysfunction noted in Adolescents with Goitre. Adolescent Goitre was more common in Females than in males. Euthyroid status was the commonest thyroid function noted in Adolescents with Goitre. Hypothyroidism was the significant thyroid dysfunction noted with Adolescent Goitre. Except for a few, most clinical features to suggest thyroid dysfunction were not statistically significant. Hence thyroid screening is recommended in all Adolescents with Goitre.

### INTRODUCTION:

In India, 22.5% of population falls in adolescent age group. [1] 30% of world population is adolescent. [2] Marked changes in thyroid function occur during puberty as an adaptation to body and sexual development. [3] Therefore disorders affecting the thyroid gland are common in adolescents occurring approximately in 3.7% of adolescents between the age group of 11 and 18 years. [4] All forms of adolescent Goitre are more common in females than males. [5] Among females, the high risk groups are adolescents, pregnant and lactating women. Many simple Goitres regress spontaneously, others undergo periods of growth and regression, resulting ultimately in large nodular thyroid glands later in life. Patients with Goitre may be euthyroid, hypothyroid or hyperthyroid. Euthyroid Goitres by far are the most common. Puberty is a crucial period of hormonal interactions in a human life cycle. Thyroid hormone plays an important role during puberty. Puberty tends to be delayed in hypothyroid adolescent in proportion to the retardation in the bone age, although in longstanding severe hypothyroidism sexual precocity has been described. Female adolescents need special care as thyroid hormones play its role in the cellular metabolism, growth and development. Thyroid dysfunction can adversely affect somatic and sexual growth and development during puberty. [6] The etiology and clinical presentation of thyroid disorders in adolescents substantially differ from that in adults. Early recognition and treatment of these problems can help to minimize their adverse effects. There are a few cross sectional studies on thyroid hormone profile among adolescents with Goitre. [7] This study was planned to assess the biochemical thyroid function among adolescent patients with Goitre.

### MATERIALS AND METHODS:

#### Selection Criteria:

1. Adolescents with Goitre.
2. Both Male and Female.
3. Age group of 11-18 years

#### Exclusion Criteria:

1. Adolescents with Goitre on thyroid medications.
2. Previously on any antithyroid medications.
3. Any illness affecting thyroid status.
4. Adolescents who have undergone any thyroid surgery.

#### Methods:

Typed Questionnaire was given to all patients under selection criteria.

All questions were asked in single sitting during their first visit

Questionnaire included demographic parameters, educational status, food habits, and details on age of onset of menarche.

Each patient's history was noted on a proforma. It includes age, sex, thyroid size, duration of swelling, and signs and symptoms associated with thyroid dysfunction.

Local examination of thyroid gland, including inspection and palpation of the thyroid and neck was also done.

Goitre size was graded according to World Health Organization (WHO) criteria [8] as given below:

1. Grade 0: Absent Goitre.

2. Grade 1: Goitre palpable but invisible with the normal position.
3. Grade 2: Goitre visible with neck in a normal position.
4. Grade 3: Large Goitre perceptible at a distance.

**Evaluation:**

Evaluation was made with clinical and biochemical parameters (free T4 and serum TSH) of thyroid gland. FT4 was estimated with radio immuno assay (RIA) and Serum TSH was estimated in a sensitive immunometric assay.

The thyroid function in adolescents with Goitre was categorized as:

Euthyroid: Goitre with a normal thyroid function.

Hypothyroidism: Diagnosed with low serum FT4 levels and elevated serum TSH levels .

Subclinical Hypothyroidism: Subclinical hypothyroidism was diagnosed if serum FT4 levels was normal and serum TSH was elevated (>5.5mIU/L).

Hyperthyroidism: Hyperthyroidism was diagnosed with high FT4 levels and Low serum TSH levels.

Subclinical Hyperthyroidism: Subclinical hyperthyroidism was diagnosed if low TSH (<0.1mIU/L) level was detected in the presence of normal FT4 levels.

The analysis of thyroid hormone levels distribution was carried out using Microsoft SPSS for windows (v11.5), statistical package for social science. Chi-square test was applied to test the significance of difference between two arbitrary

ANNEXURE 1 provides the relationship of the following parameters studied among the sample population with respect to Thyroid status of the children.

		Euthyroid		Thyroid Dysfunction				Total	
		No	%	Hypothyroid		Hyperthyroid		No	%
Goitre	Grade 1	10	16.7	3	5	0	0	13	21.7
	Grade 2	22	36.7	3	5	1	1.7	26	43.3
	Grade 3	17	28.3	2	3.3	2	3.3	21	35
Sex	Male	15	25	2	3.3	1	1.7	18	30
	Female	34	56.7	6	10	2	3.3	42	70
Socio Economic Status	Lower Middle	5	8.3	1	1.7	1	1.7	7	11.7
	Upper Lower	41	68.3	1	1.7	2	3.3	44	73.3
	Lower	3	5	6	10	0	0	9	15
School Performance	Good	21	35	1	1.7	1	1.7	23	38.3
	Average	25	41.7	1	1.7	2	3.3	28	46.7
	Poor	0	0	6	10	0	0	6	10
	Working	3	5	0	0	0	0	3	5
Weight	Normal	40	66.7	4	6.7	2	3.3	46	76.7
	Increase	5	8.3	3	5	0	0	8	13.3
	Decrease	4	6.7	1	1.7	1	1.7	6	10
		Euthyroid		Thyroid Dysfunction				Total	
		No	%	Hypothyroid		Hyperthyroid		No	%
Appetite	Normal	47	78.3	4	6.7	2	3.3	53	88.3
	Increase	1	1.7	1	1.7	1	1.7	3	5
	Decrease	1	1.7	3	5	0	0	4	6.7
Type of Salt	Iodized	28	46.7	1	1.7	2	3.3	31	51.7
	Non iodized	15	25	6	10	1	1.7	22	36.7
	Mixed	6	10	1	1.7	0	0	7	11.7

groups. A value of p < 0.05 was considered significant.

**RESULTS & OBSERVATIONS :**

TABLE NO 1 explains the breadth of the 1) Age, 2) Height, 3) Weight, and 4) BMI of the study population.

**TABLE NO 1**

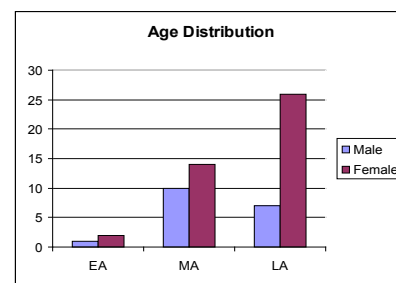
	Number	minimum	maximum	mean
Age (in years)	60	11	18	16.18
Height (cms)	60	135	166	155.25
Weight (kg)	60	36	62	50.75
BMI	60	16.9	33	20.8

The Age distribution and the Adolescent status distribution are given in TABLE NO 2, & FIGURE NO 1

**TABLE NO 2**

	MALE		FEMALE		TOTAL	
	No	%	No	%	No	%
EA ( 10-13 Years)	1	1.66	2	3.33	3	5
MA (14-16 years)	10	16.66	14	23.33	24	40
LA ( 17-18 Years)	7	11.66	26	43.33	33	55
	18	30	42	70	60	100

**FIGURE NO 1**



Sleep Duration	Normal	47	78.3	7	11.7	3	5	57	95
	Abnormal	2	3.3	1	1.7	0	0	3	5
Heat Intolerance	Yes	5	8.3	1	1.7	1	1.7	7	11.7
	No	44	73.3	7	11.7	2	3.3	53	88.3
Cold Intolerance	Yes	3	5	5	8.3	0	0	8	13.3
	No	46	76.7	3	5	3	5	52	86.6
Sweating	Normal	42	70	5	8.3	2	3.3	49	81.7
	Inc	4	6.7	1	1.7	1	1.7	6	10
	Dec	3	5	2	3.3	0	0	5	8.3
TOTAL		49	81.7	8	13.3	3	5	60	100
		Euthyroid		Thyroid Dysfunction				Total	
				Hypothyroid		Hyperthyroid			
		No	%	No	%	No	%	No	%
Skin Changes	Yes	6	10	3	5	1	1.7	10	16.7
	No	43	71.7	5	8.3	2	3.3	50	83.3
Increased Tools Freq	Yes	3	5	1	1.7	1	1.7	5	8.3
	No	46	76.6	7	11.6	2	3.3	55	91.7
Constipation	Yes	6	10	3	5	0	0	9	15
	No	43	71.7	5	8.3	3	5	51	85
Tachycardia	Yes	11	18.3	1	1.7	1	1.7	13	21.7
	No	38	63.3	7	11.6	2	3.3	47	78.3
Involuntary Movement	Yes	2	3.3	0	0	1	1.7	3	5
	No	47	78.3	8	13.3	2	3.3	57	95
TOTAL		49	81.7	8	13.3	3	5	60	100
Menstruation (For Females only)	Regular	22	53.5	0	0	2	5	24	58.5
	Irregular	11	27	6	14.5	0	0	17	41.5
TOTAL		33	80.5	6	14.5	2	5	41	100

1. Goitre
2. Sex
3. Socio Economic Status
4. School Performance
5. Weight
6. Appetite
7. Type of Salt
8. Sleep Duration
9. Heat Intolerance
10. Cold Intolerance
11. Sweating
12. Skin Changes
13. Increased Tools Frequency
14. Constipation
15. Tachycardia
16. Involuntary Movements
17. Menstruation in Females

Marked changes in thyroid function occur during puberty as an adaptation to body and sexual development. [3] Puberty is a crucial period of hormonal interactions in a human life cycle. [6] Therefore disorders affecting thyroid gland are common in adolescents, occurring to an estimate of 3.7% adolescents between ages 11 and 18 yrs. [4]

In our study, 60 adolescent patients with Goitre were included from age group of 11 to 18 years with mean age of 16.18 yrs. The present study signifies that the Goitre prevalence was increased with increase in age i.e. 55% of patients belonged to the Late adolescence.

Of the 60 adolescents patients with Goitre, there were 18 (30%) male patients and 42 (70%) female patients. Of the 42 female patients, 34(81%) were Euthyroid and 8 (19.1%) patients had thyroid dysfunction.

The observations in this study revealed there is significant predominance of grade 2 Goitre - 26 (43.3%) patients. (p value < 0.05).

Analysis on thyroid function in the study showed Euthyroid status in 49 (81.6%) and thyroid dysfunction in 11(18.3%) which included 8 (13.3%) Hypothyroid and 3 (5%) Hyper-

thyroid patients. The incidence of hypothyroidism was more than thrice as compared to hyperthyroidism.

Again, in the category of Hypothyroidism under thyroid dysfunction, female preponderance was observed where female to male ratio was approximately 3:1.

41 (83.5%) of our Euthyroid patients belonged to Upper Lower class of socioeconomic status and 6 (75%) of 8 Hypothyroid patients belonged to Lower group of socioeconomic status which was statistically significant (p value < 0.001) when compared to Euthyroid group.

However 6 (75%) Hypothyroid patients and 2 (66.7%) Hypothyroid patients had poor school performance which was statistically significant (p value < 0.001) when compared to Euthyroid.

A statistically significant observation that 6 (75%) of the patients with Hypothyroidism consumed non iodized salt, reinforcing the importance of iodine intake.

In the study, all the 6 (100%) Hypothyroid patients had irregular menstrual periods. This was statistically significant (p value <0.001), proving the association of menstrual abnormalities with Hypothyroidism.

5 (62.5%) Hypothyroid patients in our study were intolerant to cold and statistical significance between cold intolerance and Hypothyroidism were high.

In our study, 3 (37.5%) Hypothyroid patients had decreased appetite and 1 (33.3%) Hyperthyroid patients had increased appetite which was not statistically significant (p value > 0.05).

Of the 8 hypothyroid patients in our study, 3 (37.5%) patients had weight gain and 1 (33.3%) Hyperthyroid patients had weight loss. However there is no statistical significance in the relationship noticed between weight and thyroid dysfunction noted in our study (p value >0.05)

3 (37.5%) of our study patients with Hypothyroidism had constipation which was statistically not significant.

One (33.3%) Hyperthyroid patient had increased stool frequency which was not statistically significant (p value > 0.05).

Only one (33.3%) Hyperthyroid subject had increased sweating which was not statistically significant. There is no statistical significance between sweating and Hyperthyroidism.

In our study, the two of the hypothyroid patients (25%) had decreased sweating and it is not statistically significant. The reason for this could be the small sample size or small percentage of patients with thyroid dysfunction.

One among the (33.3%) Hyperthyroid patient had shiny skin and 3 of the (37.5%) Hypothyroid patients had dry, coarse skin changes. The difference between the skin changes and thyroid dysfunction was not significant.

One (33.3%) Hyperthyroid subject in our study had tachycardia and this was not statistically significant.

Our study showed no significant association between the involuntary movements and thyroid dysfunction.

Of the 60 subjects (adolescents with Goitre) in our study, 11(18.3%) patients had thyroid dysfunction. Those subjects with thyroid dysfunction who were hypothyroid, menstrual irregularities, cold intolerance and poor school performance were the clinical features that had a significant association. Among the adolescents with Goitre who were Hyperthyroid (3 patients), 2 (66.7%) patients had average school performance which was statistically significant. The other clinical features such as sleep pattern, skin changes, tachycardia etc in those subjects with thyroid dysfunction were not statistically significant. The socioeconomic status was classified according to modified Kuppuswamy scale for socioeconomic status.

The results of the statistical analysis of the data given in ANNEXURE 1 could be well summarized as given below.

The following clinical factors shows high level of significance w.r.to the Thyroid functions

1. School Performance ( Hypothyroid Only)
2. Type of Salt (Iodized)
3. Menstrual abnormality ( Hypothyroid Only)
4. Cold Intolerance

The following clinical factors did not show any significant relationship w.r.to the Thyroid functions.

1. Sleep Pattern
2. Appetite
3. Weight
4. Constipation
5. Stool Frequency
6. Sweating
7. Hot Intolerance
8. Skin Changes
9. Tachycardia
10. Involuntary Movements

TABLE NO 3 shows the relationship of individuals with hy-

pothyroidism with its associated clinical features.

TABLE NO 3

Clinical Features	No. of Hypothyroid Patient	Percentage %
Sleep disturbance	1	12.5
Menstrual irregularities	6	100
Decreased appetite	3	37.5
Increased weight	3	37.5
Constipation	3	37.5
Decreased sweating	2	25
Cold intolerance	5	62.5
Thick Skin	3	37.5

TABLE NO 4 shows the relationship of individuals with hyperthyroidism with its associated clinical features.

TABLE NO 4

Clinical Features	No. of Hyperthyroid patients	Percentage %
School performance:		
Average	2	66.7
Poor	-	-
Increased appetite	1	33.3
Decreased weight	1	33.3
Increased stool frequency	1	33.3
Increased sweating	1	33.3
Heat intolerance	1	33.3
Thin skin	1	33.3
Involuntary movements	1	33.3
Exophthalmos	1	33.3
Tachycardia	11	33.3

Most of our subjects with thyroid dysfunction had only one or two clinical features to suggest hypo or hyper thyroidism and there was no subject in thyroid dysfunction, who did not have any clinical feature at all. Therefore it is recommended that, biochemical thyroid function to be done to all adolescent patients with Goitre even if they present with one clinical feature suggestive of thyroid dysfunction.

**LIMITATIONS**

1. Study population is small.
2. Study being done in a non endemic goitrous region at sea level.
3. Present study did not further investigate the goitrous patients other than thyroid function tests.

**CONCLUSION**

1. Significant Thyroid dysfunction was noted in Adolescents with Goitre
2. Adolescent Goitre was more common in Females than in males
3. Euthyroid status was the commonest thyroid function noted in Adolescents with Goitre
4. Hypothyroidism was the significant thyroid dysfunction noted with Adolescent Goitre
5. Except for a few, most clinical features to suggest thy-

roid dysfunction were not statistically significant.

6. Hence thyroid screening is recommended in all Adolescents with Goitre.

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