



THYROID STIMULATING HORMONE AS MARKER IN THE DIAGNOSIS OF SUB CLINICAL THYROID DISORDERS

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Abstract: Disorders of the thyroid gland are among the most frequent endocrine conditions that clinicians estimate and treat. Such as hyperthyroidism or hypothyroidism which affects mostly adults in India. Mildly elevated or decreased serum thyroid stimulating hormone [TSH] or thyrotropin levels are the most common abnormalities related to thyroid function. The present study undergone to determine the relationship between serum T₃, T₄ and TSH levels from the samples both in sub clinical hypothyroidism and sub clinical hyperthyroidism patients with normal healthy controls under the age group level between 20-65 years. By using Elisa method, the parameters T₃, T₄ & TSH have been extensively studied on individuals of each disorder and healthy controls. Among these, TSH is a valuable predictive marker for the subclinical hypothyroid and subclinical hyper thyroid disorders.

Keywords: TSH, T₃, T₄, Subclinical hypothyroidism, Subclinical hyperthyroidism

INTRODUCTION

The thyroid is placed away inside the lower part of the neck enclosed around the trachea and makes it readily accessible to both inspection and palpation. It is a butterfly-shaped organ with two lobes connected by an isthmus [1] [2]. The normal gland is surrounded by a delicate fibrous capsule and weighs 15 to 25 g. Four parathyroid glands, which produce parathyroid hormone, are located in the posterior region of each pole of the thyroid [3]. Thyroid function is indispensable for every cell in the human body. It is responsible for regulation of the thyroid axis: Thyroid stimulating hormone [TSH] secreted by the thyrotrope cells of the anterior pituitary, plays a pivotal role in the control of the thyroid axis and serves as the most useful physiologic marker of thyroid hormone action which carry out bodily functions including the synthesis and storage of hormones that regulate metabolism, heart rate, body temperature, and tissue growth [4]. The thyroid gland is implicated in metabolic homeostasis in adults. It carries out this through secretion of two hormones, thyroxine [T₄] and triiodothyronine [T₃] and is regulated by thyroid stimulating hormone [TSH]. Hypothyroidism is the under-secretion of thyroid hormones [5][6], while hyperthyroidism is the over-secretion of these hormones [7][8].

Subclinical hypothyroidism is defined as a high TSH and normal T₃/T₄, and subclinical hyperthyroidism as having a low or undetectable TSH and normal T₃/T₄. Symptoms of over hypothyroidism are small and unclear and may include fatigue, feeling cold, hair loss, dry skin, weight gain, constipation and poor

concentration [9]. If over hypothyroidism is permissible to progress due to lack of treatment then myxedema coma, a life-threatening condition can occur. Myxedema coma [10] is generally seen in the elderly and may be precipitated by factors that impair respiration; it is marked by hypothermia, hypoventilation, decreased level of consciousness, and sometimes seizures and death. Where as in overt hyperthyroidism symptoms include palpitations, fatigue and sweating, weight loss, hyperactivity, and heat intolerance [11][12]. Thyroid storm is a life-threatening condition that results from an acute illness superimposed on undiagnosed or under-treated hyperthyroidism [13]. It is accompanied by fever, delirium, seizures, and coma.

MATERIALS AND METHODS

Sample design: This study was conducted and all these samples of patients were collected from Clinical Laboratory of Biochemistry through the Departments of Endocrinology in the ASRAM'S hospital at Eluru, Andhra Pradesh. Which focuses on the 30 samples are of subclinical Hypothyroidism, 20 samples are of subclinical Hyperthyroidism of both sex and equal sex matched 20 controls are included after obtaining their consent from people aged between 20-65 years. Surgery related to thyroid, using drugs, Diabetes, Hyper tension, alcohol, and smoking related samples are excluded.

Laboratory methods: 3 ml of intravenous blood is collected in the test tube from controls and subclinical thyroid disorder cases. It is allowed to clot and then

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centrifuged at 2000-3000 rpm for 5 min and serum was separated. These serum samples were stored in -20°C in vials. Upon sample collection, the serum T_3 and T_4 were estimated by competitive ELISA, and serum TSH is estimated by sandwich ELISA methods based on the principle of competitive binding.

Statistical analyses: We analyzed data for comparison between controls & subclinical thyroid disorders with using the weights assigned to the individuals sampled to represent the population by using mean, standard deviation and standard error of the mean along with probability [P value] and t [test value] were calculated statically.

RESULTS AND DISCUSSION

Table.1: Estimation of TSH, T_4 & T_3 in normal healthy controls:

SNo	SEX (M/f)	AGE (yrs)	TSH Normal range: (0.36.2mIU/dl)	T_4 Normal range: (4.4- 11.6 $\mu\text{g/dl}$)	T_3 Normal range (70-200ng/dl)
01	M	45	3.0	6.7	128
02	F	53	2.0	8.9	128.9
03	F	18	1.9	6.6	130
04	F	46	1.6	6.7	166.15
05	F	30	1.0	6.1	109
06	F	24	3.7	4.9	80
07	F	24	2.7	7.9	77
08	M	58	3.1	6.6	104
09	F	29	4.6	6.9	96
10	F	39	4.0	7.9	97
11	M	50	2.8	7.6	95
12	F	29	2.0	8.4	93
13	M	40	1.9	5.0	88
14	F	24	1.5	7.9	108
15	F	26	3.3	9.5	102
16	F	45	3.3	8.1	111
17	F	22	3.6	5.8	92
18	F	14	3.6	6.7	94
19	F	50	2.8	8.1	132
20	F	19	4.1	8.1	95
	MEAN		2.825	7.220	106.303
	SD		0.983	1.225	21.408
	SEM		0.220	0.274	4.787

Table.2: Estimation of TSH, T_4 & T_3 in cases of subclinical hypothyroidism

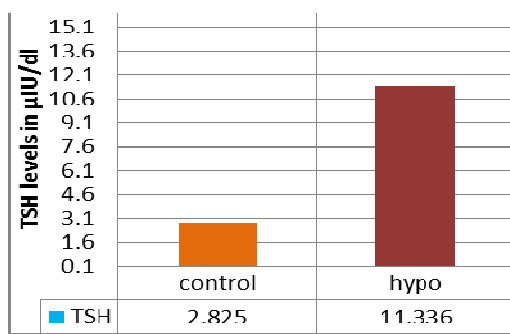
S.No	SEX (M/f)	AGE (yrs)	TSH Normal range: (0.36.2mIU/dl)	T_4 Normal range: (4.4- 11.6 $\mu\text{g/dl}$)	T_3 Normal range (70-200ng/dl)
01	F	48	6.9	8.9	112
02	F	32	11.6	8.4	95
03	F	40	18.2	5.9	124
04	M	65	8.1	4.8	115
05	F	18	12.9	4.4	138
06	F	42	8.9	7.7	106
07	F	25	16.	8.5	107
08	M	44	11.	8.4	80
09	F	35	9.3	2.8	90
10	F	22	19.2	5.4	104
11	F	55	18.8	5.8	92
12	M	45	21.5	4.7	117
13	M	7	7.1	7.2	86
14	F	24	16.8	5.7	83
15	F	60	7.4	8.4	95
16	F	45	7.44	6.1	152
17	F	45	12.8	9.5	124
18	F	43	8.74	9.7	143.82
19	M	32	15	10	154.4
20	F	32	7.82	6.8	126.97
21	F	57	7.54	7.3	112.99
22	F	23	7.5	4.1	160.7
23	M	14	7.4	7.5	116
24	F	33	8.3	5.9	75
25	F	30	9.3	8.9	120
26	F	42	13.3	6.4	11
27	F	40	7.6	7.8	74
28	F	23	9.0	5.4	92
29	F	43	12.9	7.0	152
30	F	59	10.78	5.9	81.32
	MEAN		11.336	6.843	111.407
	SD		4.295	1.807	24.407
	SEM		0.784	0.330	4.543

Table.3: Estimation of TSH, T₄ & T₃ in cases of subclinical hyperthyroidism

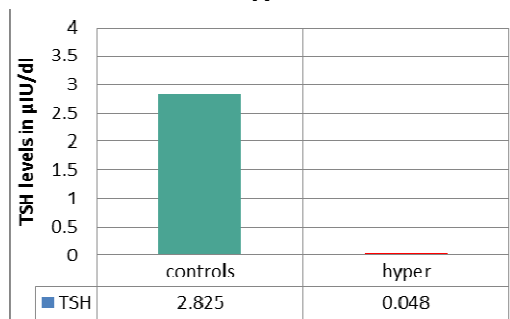
S.No.	SEX (M/f)	AGE (yrs)	TSH Normal range: (0.36.2mIU/dl)	T ₄ Normal range: (4.4- 11.6 µg/dl)	T ₃ Normal range (70-200ng/dl)
01	F	57	<0.01	7.7	98
02	F	63	<0.01	11.5	105
03	F	28	<0.01	8.8	102
04	F	35	<0.01	5.3	86
05	F	29	0.1	7.6	118
06	F	40	<0.01	9.6	99
07	F	17	0.23	11.2	111.6
08	M	36	<0.01	10.9	175
09	M	37	<0.01	9.2	70
10	M	35	<0.01	8.2	175
11	F	28	<0.1	9.6	188
12	F	48	0.21	9.8	91.4
13	F	42	0.01	7.9	195.4
14	F	48	<0.01	9.8	151
15	M	49	<0.01	7.7	98
16	F	40	<0.01	8.5	71
17	M	45	<0.1	8.7	121.7
18	M	41	<0.01	9.1	119.6
19	M	55	<0.1	8.6	125.8
20	M	52	<0.1	9.4	116.5
MEAN			0.048	8.956	120.9
SD			0.074	1.589	41.805
SEM			0.018	0.397	10.451

Table.4: Comparison between control & subclinical thyroid cases

CASE	SUBCLINICAL HYPOTHYROIDISM			SUBCLINICAL HYPERTHYROIDISM		
	TSH Mean±SD	T ₄ Mean±SD	T ₃ Mean±SD	TSH Mean±SD	T ₄ Mean±SD	T ₃ Mean±SD
CONTROL GROUP (n = 20)	2.8±0.9	7.2±1.2	106.3±21.4	2.8±0.9	7.2±1.2	106.3±21
SUBCLINICAL DISORDERS (n = 50)	11.3±4.2	6.8±1.8	111.4±24.4	0.0±0.07	8.9±1.5	120.9±41.8
t-value	8.6	0.8	0.7	11.2	3.7	1.3
P value	P<0.0001	P<0.419	P<0.4568	P<0.0001	P<0.0007	P<0.1834
Inference	Statistically Highly Significant	Statistically insignificant	Statistically insignificant	Statistically Highly Significant	Statistically insignificant	Statistically insignificant

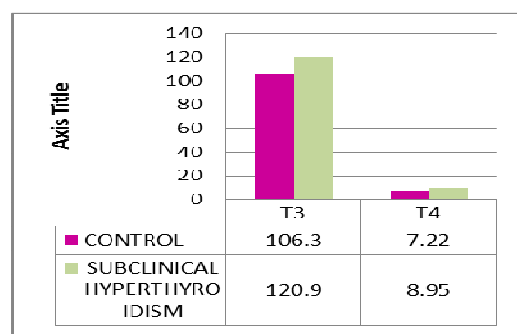


A

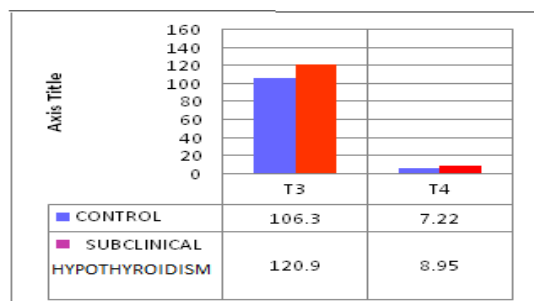


B

Figure.1: Image showing comparison of TSH levels between controls and A) subclinical hypothyroidism B) subclinical hyperthyroidism cases



A



B

Figure.2: Image showing the Comparison of T₃ and T₄ levels between controls and A) subclinical hyperthyroidism B) subclinical hypothyroidism cases

As per the results obtained and tabulated as shown above, it is seen that in hypothyroidism cases there is increased serum TSH levels (11.3 ± 4.2), where as serum T_3 (111.4 ± 24.8) and T_4 (6.8 ± 1.8) lies within the normal range. When compared to controls the serum TSH levels (2.8 ± 0.9) are elevated, where as serum T_3 (106.3 ± 21.4) and T_4 (7.2 ± 1.2) levels are almost normal when compared with controls. In which there is a statistically significant increased values are obtained in the case of serum TSH only with a p-value ($p < 0.0001$). Whereas, T_3 and T_4 levels are decreased but this is not statistically significant ($p < 0.4568$, $p < 0.4190$).

Contrarily, in the cases of hyperthyroid patients there is a decreased serum TSH level, whereas T_3 and T_4 levels lies within the normal range in the serum. Serum TSH levels 0.0 ± 0.07 , T_3 level are 8.9 ± 1.5 , T_4 levels are 120.9 ± 41.8 respectively. When compared to controls these TSH levels are decreased and on the other side both T_3 and T_4 levels are within the normal range. In the hyperthyroid cases, the serum TSH levels are decreased significantly ($p < 0.0001$), whereas the T_3 ($p < 0.183$) and T_4 ($p < 0.007$) levels are not significantly altered.

CONCLUSION

In the present study, the sample size includes 50 samples of both sub clinical hypothyroidism [30] and sub clinical hyperthyroidism [20] patients with 20 normal healthy controls of both age and sex samples were considered. It had undergone through the biochemical approach to identify the association of serum TSH levels. These are raised in sub clinical hypothyroidism and decreased in the sub clinical hyperthyroidism. But, in both cases, serum T_3 and T_4 levels are within the normal range. This shows measurement of TSH levels is necessary in the diagnosis of sub clinical thyroid disorders. Hence, all these studies concluded that TSH concentration is the most important predictor. TSH is the most sensitive test for the detection of subclinical hypo or hyperthyroidism and that the diagnosis & therapeutic intervention at the subclinical level itself prevents overt thyroid disorders,

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