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Electrocardiographic Changes in Patients of Hyperthyroidism in tertiary care hospital of South Gujarat: A cross sectional study

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Abstract
Background: *Thyroid dysfunction encounter in day to day practice in medicine. There are various ECG change happen in thyroid dysfunction. Electrocardiography is a cheap easily available tool to assess cardiac status of patients with thyroid dysfunction.*
Material and Methods: *The present study included 60 cases hyperthyroidism patients presenting with signs and symptoms of hyperthyroidism were randomly selected for the study from departmentof Medicine,conducted in Government Medical College And New Civil Hospital, Surat. Serum free T3, T4, and thyroid-stimulating hormone were done. Twelve lead ECG was done in each patient.*
Results: *Result shows that 78% of patient had abnormal ECG while 22% had normal ECG. There was sinus tachycardia was found in 78.33% cases. Left ventricular hypertrophy in 21.67% cases. Atrial fibrillation in 8.33% cases.ST-T changes in 11.66% cases and Right atrial enlargement in 3.33% of cases.*
Conclusion: *Sinus tachycardia is most common abnormality (78.333%) in ECG seen in Hyperthyroidism.*
Key word: *Hyperthyroidism, electrocardiogram*

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I. Introduction

Thyroid hormone has innumerable physiological effects causing alteration is essentially all metabolic pathways and organs.The thyroid hormone effects myocardium by its direct effects as well as by its peripheral action. Thyroid hormone hasimportant physiological effects on the cardiovascular system (1)
Effects of Thyroid Hormone On Cardiovascular System
1. Upregulate catecholaminesreceptors
2. Increases the heartrate
3. Increases the force of cardiac contraction
4. Increases strokevolume
5. Increases cardiacoutput

Thyroid plays an important role in orchestration of various metabolic functions in the body and thus thyroid disorders affect each and every organ out of which heart is particularly sensitive to its effects. Therefore, it is not surprising that thyroid dysfunction can produce dramatic cardiovascular effects, often mimicking primary cardiac disease.

Cardiovascular symptoms are an integral clinical feature of patients with hyperthyroidism. Most patients experience palpitations resulting from increases in the rate and force of cardiac contractility. The increase in heart rate results from a decrease in parasympathetic stimulation and an increase in sympathetic tone. Heart rates higher than 90 beats/min at rest and during sleep occur commonly, the normal diurnal variation in heart rate is blunted, and the increase during exercise is exaggerated. Many hyperthyroid patients experience exercise intolerance and exertional dyspnea, caused in part by skeletal and respiratory muscle weakness low vascular resistance and increased preload compromise the cardiac functional reserve, which cannot rise further to accommodate the demands imposed by sub maximal or maximal exercise(2)

II. Materials &Methods

The present study included 60 cases hyperthyroidism patients presenting with signs and symptoms of hyperthyroidism were randomly selected for the study from department of Medicine, Government Medical College and New Civil Hospital, Surat. Participants were examined for signs and symptoms of hyperthyroidism. Serum free T3, T4 and thyroid-stimulating hormone were done. Twelve lead ECG was done in each patient.Verbal consent was taken from the participants after they were explained about the study in a language they could understand.

Data analysis: Data were processed and analyzed using SPSS (version 23).
Study Design: Cross sectional study
Study Location: This was a tertiary care teaching hospital based study done in Department of General Medicine,at Government Medical College, Surat ,Gujarat
Study Duration: 1st April 2021 to 31st July 2021.
Sample size: 60 patients.
Inclusion criteria
1) Newly diagnosed patients with deranged thyroid profile of hyperthyroidism.
2) Detected patients not on treatment.
Exclusion criteria
1) Patients with known cardiac disease.
2) Patients with COPD, severe anemia, diabetes mellitus or any other endocrinal disorders.

III. Result

The study comprises of 60 patients suffering from hyperthyroidism. The mean age of study subjects was 29.3 years (range 18 to 42 years). In patients suffering from hyperthyroidism weight loss is the commonest symptom. The most common sign was tachycardia in hyperthyroidism. Goiter was present in 38 % cases. Sinus tachycardia (78.33 %) was the commonest ECG finding.

Table 1: Common Clinical Feature found in Hyperthyroidism

Clinical Feature	**No of Patients (n=60)**	**Percentage**
Weight loss	48	80.00
Heat intolerance	44	73.33
Weakness	42	70.00
Sweating	29	48.33
Anxiety	26	43.33
Hair loss	18	30.00
Tremor	10	16.67

Table 2: Incidence of Abnormal ECG finding with relation to TSH in Hyperthyroidism

TSH level(MIU/ml)	No. of Patients	Abnormal ECG	Percentage
1.5-2	16	11	68.75
0.5-1.4	31	26	83.87
<0.5	13	12	92.30

Table 3: Electrocardiographic changes in hyperthyroidism

No.	ECG FINDING	No. in cases	Percentage
1	Sinus tachycardia	48	78.33
2	Left ventricular Hypertrophy	13	21.67
3	Atrial fibrillation	5	8.33
4	ST-T changes & T wave inversion	7	11.66
5	Right atrial enlargement	2	3.33

IV. Discussion

The manifestations of thyroid dysfunction are protean. The advent of better investigative modalities and sensitive chemiluminescence assays has made possible the early detection of thyroid diseases. The present study was undertaken to investigate the effect of thyroid disorders on cardiac status. Patients were examined clinically, biochemically and cardiac status was assessed by electrocardiography.

Many electrocardiographic abnormalities have been described in hyperthyroidism including sinus tachycardia, atrial and ventricular extrasystoles, atrial fibrillation, A-V blocks and abnormal ventricular repolarisation. Ventricular tachycardia and fibrillation are rare. Sinus tachycardia is the common finding in hyperthyroidism. Northcote et al studied 10 thyrotoxic patients; their mean heart rate was 104.45 bpm [3].

Trivalle et al have reported an incidence of 71% in patients greater than 70 years of age and 96% in patients below 50 years of age [4]. The incidence of sinus tachycardia was 78.33 % in the present study in which age of patient ranged from 18-40 years. The finding of present study is at par with other studies. Left ventricular hypertrophy was found in 13 patients (21.67 %) in present study. Sandler et al and Goel and Hanson etal found increased amplitude of QRS complex and left ventricular hypertrophy in hyperthyroidism [5, 6]. Atrial fibrillation is commonly reported in patients of hyperthyroidism and it is reported in 10 % to 22% of hyperthyroid patients. Gordan and Soley et al found atrial fibrillation in 20 (14.2%) of the 140 patients of hyperthyroidism they studied. The prevalence of

thyrotoxic atrial fibrillation increases with age and is more common in men. In the present study, atrial fibrillation was found in 5 (8.33%). Thus the results of present study is similar to the study of Gordan and Soley et al [7].

T wave inversion or flattening in one or the other leads may occur in hyperthyroidism. In some patients, T wave abnormalities disappeared after the treatment of thyrotoxicosis and this has been attributed to thyrotoxic interstitial myocarditis. In the present study, 7 patients had ST-T changes including T wave inversion and ST-T depression. 2 patients had changes of right atrial enlargement secondary to pulmonary hypertension.

V. Conclusion

Cardiovascular manifestations are common in Hyperthyroidism. Electrocardiography is a cheap easily available tool to assess cardiac status of patients with thyroid dysfunction. Sinus tachycardia is most common abnormality (78.333%) in ECG seen in hyperthyroidism.

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