European Journal of Molecular & Clinical Medicine

ISSN 2515-8260 Volume 9, Issue 4, Summer 2022

ORIGINAL RESEARCH

TO EVALUATE THE ROLE OF ELECTROCARDIOGRAPHIC, USG AND ECHOCARDIOGRAPHY IN HYPOTHYROIDISM

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ABSTRACT :

Aim: *To evaluate the role of Electrocardiographic, USG and Echocardiography in hypothyroidism*

Material and methods: *All patients were subjected to a detailed clinical history, clinical examination, and blood investigation including blood group, complete blood count, renal function test, liver function test, thyroid function test, ECG, 2D echo, and USG neck after obtaining informed written consent and clearance from the institutional scientific and ethical committee. The current gold standard for care calls for a TSH assay of the third generation. Automated platforms using state-of-the-art immunometric assays were used to conduct the TSH testing.*

Results: *The severity of hypothyroidism ranged from moderate (48.75%) to severe (31.25%) to mild (20%). Sinus bradycardia (32.5%) was the most prevalent ECG abnormality, followed by ST-T alterations (21.25%), while 21.25 % of patients had normal ECGs. USG neck was normal in 26.25% patients. Among abnormal USG , thyroiditis constitute 31.25% and was the most common usg neck finding in the study population. 2D ECHO finding was normal in 27.5% patients. Among abnormal 2D echo reports, diastolic dysfunction constitute 37.5% of the study population and was the most common 2D echo finding in the study population.*

Conclusion: *The findings of this research highlight the significance of assessing individuals with primary hypothyroidism for cardiovascular abnormalities, which might lead to timely therapies that enhance clinical outcomes.*

Keywords: *Electrocardiographic, USG and Echocardiography, hypothyroidism*

Introduction

Thyroid disorders manifest as either excessive hormonal activity or symptoms caused by a lack of hormone production, or as swelling caused by a neoplastic process or by pressure effects. Hypothyroidism is caused by the thyroid glands insufficient secretion of thyroid hormones or by its complete lack of activity. The prevalence of hypothyroidism among other endocrine diseases is constantly increasing. It is more common in women than in men. Idiopathic hypothyroidism is more common in women over the age of 40. Hypothyroidism is typically permanent and progressive. Treatment, on the other hand, is almost always completely successful and allows the patient to live a completely normal life. Because of the prominence of these cardiac-related findings, early observers wrongly concluded that thyrotoxicosis was a disease that originated inside the heart. However, there is now significant evidence for both direct and indirect effects of thyroid hormones on the myocardium. The rapid and occasionally irregular heart rate, hot skin, bounding pulses, and hyperdynamic precordium were all mentioned in the earliest description of thyrotoxicosis. [1] The consequences of hypothyriodism on the cardiovascular system are similar yet fundamentally distinct. Hypothyroidism may cause bradycardia, low voltage complexes, ST-T wave abnormalities, and atrioventricular and intraventricular conduction issues. Extrasystoles and ventricular tachyarrhythmias have been described in hypothyroidism, with ventricular tachyarrhythmias associated with a prolonged QT interval. [2]

Ultrasonography (USG) is an unrivalled diagnostic technique for evaluating the thyroid. Thyroid Causes Evaluation of a palpable thyroid nodule or suspected thyroid enlargement is included in the scope of USG', as is the workup of unintentionally found thyroid nodules. Despite certain limitations, fine needle aspiration biopsy (FNAB) is the gold standard for characterisation of thyroid nodules, whereas USG is the gold standard for nodule detection and characterization.[3] In the present study, the results of electrocardiography, neck ultrasonography, and echocardiography were analysed and associated with thyroid disorders.

Material and methods

Eighty people with hypothyroidism were involved in this research. Patients who were hemodynamically unstable; those with preexisting lung disease (such as COPD, asthma, or pleural disease); those with a history of cardiovascular disease; those with pacemakers or other metallic intravascular devices; those with a history of cancer; those who were pregnant; and those who were diagnosed with diabetes were all disqualified from participation.

Methodology

All patients were subjected to a detailed clinical history, clinical examination, and blood investigation including blood group, complete blood count, renal function test, liver function test, thyroid function test, ECG, 2D echo, and USG neck after obtaining informed written consent and clearance from the institutional scientific and ethical committee. The current gold standard for care calls for a TSH assay of the third generation. Automated platforms using state-of-the-art immunometric assays were used to conduct the TSH testing. However, the measurement of thyroid-stimulating hormone lacks a universally accepted benchmark at the present time.[3] with the use of an electrocardiograph with several recording channels. The machine was used to print an electrocardiogram at a speed of 25mm/s with a calliberation of 10mm. Siemens Acuson X 300 and Siemens X 600 colour Doppler USG equipment with a linear array high frequency (3-12 MHz) transducer were used for the scans of the neck. Thyroid sonography findings included thyromegaly, echogenicity, vascularity, and the presence of any nodules. If nodules were found, we classified them as single or many and assessed their size. Characterization was skipped over for nodules under 5 mm in size. Echogenicity, nodule form, nodular borders, nodule contents, nodule calcifications, and nodule vascularity were all used to describe nodules bigger than 5mm. Thyroid cancer patients who had lesions agreed to FNAC. The following factors were considered for patient assessment using USG: Multinodular goitre with thyroiditis, Multinodular goitre, Thyroiditis, Colloid goitre, Carcinoma, and Normal. Specialized screening for systolic and diastolic dysfunction, pericardial effusion, and interventicular thickness was performed using 2DECHO in each instance. The Canadian consensus criteria were used to diagnose diastolic dysfunction. For each of the 5 categories, patients were classified if they satisfied at least 4 of the requirements. Similar to prior research, systolic time intervals were used to determine the presence of systolic dysfunction. In electrocardiograms, the interval between the R wave and the aortic valve opening is referred to as the pre-ejection period (PEP). It's the pause between when the heart's electrical system and mechanical system are both active. PEP in men is 105msec while in females it is 110msec. If the number is more than 0.76, systolic dysfunction is assumed to be present.

Statistical analysis

SPSS Inc. (Statistical Package for the Social Sciences), Chicago, IL, USA, version 25.0 was used to conduct the statistical analysis. Numbers of occurrences and percentages were used to describe qualitative factors. When comparing qualitative factors, the Chi-square test was used. Association risk variables were analysed using multivariate analysis and logistic regression. The quantitative data were shown as a mean SD. The significance level, or "P" value, was calculated, and a result below 0.05 was deemed to be significant.

Results

Cases were highest among those aged 35–45 and those aged 25–35 (together making up 57.5% of the total), then those aged 45–55 (21.25%), those aged 55+ (13.75%), and those aged 25–24 (7.5%). The average ages were 36.778.88 years. There were almost 5.15 times as many women as there were men.

Most participants (687.50%) were overweight, followed by 21.25 % who were obese, and just 10 % who were at a healthy weight (normal).

Table 1: Demographic profile of the patients

Age Group(in years)	**Number**	**%**
below 25	6	7.5
25-35	19	23.75
35-45	27	33.75
45-55	17	21.25
above 55	11	13.75
Gender		
Male	13	16.25
Female	67	83.75
BMI		
18.5-24.9	8	10
25-29.9	55	68.75
>30	17	21.25

The severity of hypothyroidism ranged from moderate (48.75%) to severe (31.25%) to mild (20%).

Table 2: Severity of hypothyroidism in study population

Severity of hypothyroidism	**Number**	**%**
Mild	16	20
Moderate	25	31.25
Severe	39	48.75

Sinus bradycardia (32.5%) was the most prevalent ECG abnormality, followed by ST-T alterations (21.25%), while 21.25 % of patients had normal ECGs.

Table 3: ECG of study population

ECG Findings	**Number**	**%**
Normal	17	21.25
Sinus bradycardia	26	32.5
Low voltage	9	11.25
Prolonged Qtc	2	2.5
ST-T changes	17	21.25
VPC'S	9	11.25

USG neck was normal in 26.25% patients. Among abnormal USG, thyroiditis constitutes 31.25% and was the most common USG neck finding in the study population.

Table 4: USG neck of study population

USG neck Findings	**Number**	**%**
Normal	21	26.25
Thyroiditis	25	31.25
Colloid goitre	18	22.5
Multinodular goitre	2	2.5
Carcinoma	6	7.5
Multinodular goitre with thyroiditis	8	10

Table 5: 2D echocardiography of study population

Findings	**Number**	**%**
Normal	22	27.5

Systolic dysfunction	9	11.25
Pericardial effusion	15	18.75
Diastolic dysfunction	30	37.5
IVS thickness	4	5

2D ECHO finding was normal in 27.5% patients. Among abnormal 2D echo reports, diastolic dysfunction constitutes 37.5% of the study population and was the most common 2D echo finding in the study population.

Discussion

Cases were highest among those aged 35–45 and those aged 25–35 (together making up 57.5% of the total), then those aged 45–55 (21.25%), those aged 55+ (13.75%), and those aged 25–24 (7.5%). The average ages were 36.778.88 years. There were almost 5.15 times as many women as there were men. The results of an age and sex predominance analysis were statistically significant in the present investigation. The findings jibe with a research by Bagcchi et al.[4] who found that the prevalence of hypothyroidism was greatest in those between the ages of 46 and 54 (13.1%) and lowest in those between the ages of 18 and 35 (7.5%). The prevalence of hypothyroidism in the Indian population was reported to be 10.95 percent by Unnikrishnan et al.[5]; this condition was more common in females than in males by a ratio of 15.86 percent to 5.02 percent. Velayutham et al.[6] found that 11% of people had increased TSH, with 9.7% having moderate elevation. Conclusion: Thyroid dysfunction is widespread among young women in south India (1.3% of the sample group had low TSH). Thyroid disorder affected 1 in 8 young women, with modest TSH increase being the most frequent anomaly. Patients in the research by Shashikanth et al.[7] were mostly between the ages of 31 and 40, and women predominated across all age ranges. Most medical textbooks, including the 20th edition of Harrison's Textbook of Internal Medicine, noted a similar demographic profile, with women making up around 76% of the overall population and males making up just 24%. Most participants (687.50%) were overweight, followed by 21.25 % who were obese, and just 10 % who were at a healthy weight (normal). Milionis et al.[8] examined 736 euthyroid individuals, 616 females, and 118 males, and found that 70.9% were overweight or obese (BMI > 25), 39.0% were obese (BMI > 30), and 17.2% were seriously obese (BMI > 35). Serum TSH within the normal range was found to have a positive and significant association with BMI in a cross-sectional and longitudinal study conducted by Jordeet al[9], which included 6164 subjects (2813 males) who attended the fifth Troms study in 2001 and in 1867 subjects (873 males) who attended both the fourth Troms study in 1994/1995 and the fifth Troms study. 4649 people were studied by Laurberg et al[10] 4082 were included in the analyses due to their obesity (defined as a body mass index of 30 or more). Patients in this research had hypothyroidism in varying degrees, with 48.75% having moderate hypothyroidism, 31.25& being severely hypothyroid, and 20% having mild hypothyroidism. Results from the research by Shashikanth et al.[7] indicated that 25 (50%) of the 50 recruited patients were moderately hypothyroid. Twenty (40%) were diagnosed with moderate hypothyroidism, while 5% had severe hypothyroidism. Twenty individuals (20%) out of the whole study group had normal ECG readings. Sinus bradycardia (32.5%) was the most prevalent ECG abnormality, followed by ST-T alterations (21.25%), while 21.25 % of patients had normal ECGs. The results matched those of a research by Shashikanth et al., which found that ECGs were normal in 18 of 45 patients (or 35%). In up to 30% of individuals with aberrant ECG, low voltage complexes and bradycardia were seen. Just 4% were LBBB, while 14% were RBBB. Sinus bradycardia was found to be the most prevalent result (30%) in the research by Verma et al.[11] , Tiwari, et al.[12] observed that 35.5% of patients had sinus bradycardia on their electrocardiograms, 16.6% had low voltage complexes, 7.8% had T Wave inversions, 4.4% had RBBBs, and 2.2% had QTc prolongations. Forty-one percent of those with USG of the neck had normal results. Thyroiditis was the most prevalent abnormal USG neck finding in this research, accounting for 31.25 percent of all thyroid abnormalities. The findings of this investigation are consistent with those of a previous study by Anupriya et al.[13], which found that ultrasonography is a very effective diagnostic technique for a variety of thyroid illnesses, including thyroiditis, multinodular goitre, and malignant disorders. Jiskra[14], and Potlukova et al.[15] found that in a hypothyroid patient, the thyroid USG may result in cost savings because the measurement of antithyroid antibodies is unnecessary if a typical autoimmune

pattern is present on thyoid ultrasound, indicating Hashimoto's thyroiditis. Diffuse thyromegaly was shown to be the most prevalent radiological finding in USG in a research conducted by Sudharsan et al.[16] Multinodular goitre was the second most frequent abnormality. In just 27.5% of cases did abnormalities show up on 2D ECHO. According to the research by Shashikanth et al.[7] 37.5% of the study population had aberrant 2D echo reports, with diastolic dysfunction being the most prevalent 2D echo result. Tiwari et al.[12] found that. One third of the participants in the research showed normal echocardiographic readings.

Conclusion

The findings of this research highlight the significance of assessing individuals with primary hypothyroidism for cardiovascular abnormalities, which might lead to timely therapies that enhance clinical outcomes.

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