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Thyroid Dysfunction And Cardiovascular Risk: A Cross-Sectional Study In Newly Diagnosed Patients

Mujeeb Ur Rehman[1], Irfan Ullah[2], Muhammad Nadeem[3],Muhammad Hussain Afridi[4],Muhammad Abbas[5], Amjad Ali[6]

Assistant Professor Department of Diabetes and Endocrinology Lady reading hospital, Peshawar
Assistant Professor Department of Diabetes and Endocrinology, Lady Reading Hospital, Peshawar
Assistant Professor Department of Medicine Lady Reading Hospital, Peshawar
Associate Professor Department of Diabetes and Endocrinology HMC Peshawar
Prof Department of Medicine Bacha Khan Medical College Mardan
Prof Department of Medicine Bacha Khan Medical College Mardan

Corresponding Author: Irfan Ullah
Email: dr.irfan.ktk255@gmail.com

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Abstract- Background:

Background:

Cardiovascular physiology receives substantial changes because of thyroid dysfunction because hypothyroidism and hyperthyroidism affect lipid metabolism and blood pressure and cardiac performance. Regular cardiovascular screenings of newly identified thyroid patients help prevent serious complications from occurring. At the time of initial thyroid dysfunction diagnosis studiers have generated scarce data about patient cardiovascular risk profiles.

Objectives:

To evaluates the cardiovascular risks present in newly detected thyroid dysfunction patients to assess if early changes in metabolic and hemodynamic conditions are statistically significant.

Study design: A prospective study.

Place and duration of study. Department of Diabetes and Endocrinology Lady reading hospital Peshawar from Jan 2022 to Dec 2022

Methods:

One hundred patients with newly diagnosed thyroid dysfunction received entry into the study through a Prospective Study design targeted at participants between ages 18 to 60. The study measured serum thyroid hormones in addition to blood lipid levels and body mass index (BMI) and recorded blood pressure outcomes. Both ECG abnormalities and Framingham risk scores were determined as part of the study. The study team conducted their analysis through SPSS version 26. Analysis used $p < 0.05$ as the significance level together with independent t-tests and chi-square tests.

Results:

100 individuals with female participants accounting for 74 (61.7%) persons and male participants making up 46 (38.3%). Study participants averaged 42.5 years in age with standard deviation of 11.3 years. Among the participants 68 patients had hypothyroidism while 52 had hyperthyroidism. Total cholesterol levels along with LDL cholesterol

levels and diastolic blood pressure readings proved higher in hypothyroid patients than in hyperthyroid patients according to statistical analysis (p=0.002, p=0.01, and p=0.04 respectively). Among the patient group 34 percent showed ECG changes which included either sinus bradycardia or tachycardia. Hypothyroid patients exhibited a greater average Framingham risk score when compared to normative values (p=0.03) demonstrating increased cardiovascular risk during diagnosis.

Conclusion:

Patients diagnosed with newly discovered thyroid dysregulation especially those affected by hypothyroidism demonstrate important changes to their cardiovascular risk element measurements. Newly treated thyroid dysfunction patients need immediate cardiovascular evaluation because they present with elevated cholesterol together with abnormal ECG findings plus increased Framingham scores. Eightfold prevention starts with timely identification and management of such risks to prevent future cardiovascular disease manifestations. Causing better patient outcomes in the long term will be possible by integrating regular cardiac screening during initial thyroid dysfunction testing.

Keywords:

Thyroid dysfunction, cardiovascular risk, hypothyroidism, hyperthyroidism

Introduction:

The body's metabolism and cardiovascular system and lipid balance together with its entire physiological function depend heavily on thyroid hormones. The cardiovascular system encounters major changes because of hypothyroidism and hyperthyroidism through active reactions and additional pathways. Triiodothyronine (T3) serves as the active thyroid hormone that controls myocardial contractility and cardiac rate together with systemic blood vessel resistance. Thyroid hormone level modifications of any extent can trigger cardiovascular dysfunction [1]. Patients with hypothyroidism experience the combined effects of bradycardia and elevated peripheral vascular resistance together with diastolic hypertension and dyslipidemia revealing elevated low-density lipoprotein (LDL) and total cholesterol levels. The changes in metabolism increase the probability of developing atherosclerosis and leading to coronary artery disease (CAD) [2]. The heart output becomes higher in hyperthyroidism because this condition increases oxygen needs of the heart tissue and causes arrhythmic atrial fibrillation which makes individuals vulnerable to blood clot formation [3]. Subclinical thyroid dysfunction exists at stages where healthcare providers frequently fail to detect the condition but it remains linked to cardiovascular complications. Multiple scientific studies such as those conducted in Rotterdam and Framingham have proven that thyroid dysfunction raises cardiovascular vulnerability primarily among older patients [4,5]. Medical organizations should khaki cardiovascular screening during thyroid disease diagnosis to avoid delaying necessary interventions. A large number of newly diagnosed thyroid dysfunction patients remain asymptomatic regarding cardiovascular symptoms but show signs through biochemical or electrocardiographic tests [6]. The assessment of cardiovascular risk elements including lipid profile analysis blood pressure assessment and ECG evaluation can reveal important data about necessary preventive interventions following a thyroid disease diagnosis. Early risk stratification benefits from the Framingham Risk Score because this methodology provides standardized methods to quantify patients' cardiac event risks during the upcoming decade [7]. Patients in resource-limited areas present with late thyroid disorder diagnoses thanks to the scarcity of endocrine services which creates additional cardiovascular risks in these patients. Studies that study this topic exist internationally but developing nations have little available data [8]. The purpose of this investigation is to analyze the cardiovascular risk status among patients diagnosed with thyroid dysfunction within a tertiary medical facility. This study evaluates cardiovascular risk profiles through lipid level analysis combined with blood pressure assessment and Electrocardiographic examination as well as Framingham scoring to quantify possible early cardiovascular change detection at thyroid diagnosis. We plan to evaluate which group among hypo- and hyperthyroid patients faces a greater immediate cardiovascular risk [9]. This study offers potential evidence to justify including cardiovascular screenings at the beginning of thyroid disorder treatment methods.

Methods:

The study was carried out as a Prospective study within the Department of Diabetes and Endocrinology Lady reading hospital Peshawar from Jan 2022 to Dec 2022. Thyroid dysfunction patients under 60 years old participated in the study with their selection done following consent approval. The medical staff diagnosed the patients through TSH and free T3 and free T4 laboratory tests following American Thyroid Association guidelines. Diagnosis screening included cardiovascular tests which measured blood pressure in addition to ECG analysis and tests for fasting lipid levels and Framingham Risk Score assessment. All demographic data and medical background information was recorded through the established questionnaire format. The Institution Review Board granted ethical clearance for this study.

Inclusion Criteria:

Adults in the age group of 18–60 years received study inclusion based on their newly diagnosed primary hypothyroidism or hyperthyroidism and absence of cardiovascular disease and thyroid hormone therapy background.

Exclusion Criteria:

The study excluded patients diagnosed with diabetes and those with known cardiac disease and pregnancy or chronic kidney disease and liver disease as well as patients receiving lipid-lowering drugs, antihypertensive treatment or hormone replacement therapy.

Data Collection:

Case record forms with structured features served as the data collection method. The participants received a standard set of assessments including thyroid examinations and blood tests as well as tests for blood pressure and lipids and electrocardiograms and Framingham Risk Score assessments. Thyroid-specific treatment had not started when healthcare providers conducted all procedures during diagnosis.

Statistical Analysis:

The analysis was conducted through SPSS version 24.0. The mean values with standard deviation represent the continuous variables in this study. The study employed independent t-tests together with chi-square tests for variable comparisons between hypothyroid and hyperthyroid groups. The analysis designated a p-value less than 0.05 as statistically significant for all tests.

Results:

A total of 100 patients were included in the study, comprising 74 females (61.7%) and 46 males (38.3%). The mean age was 42.5 ± 11.3 years. Among them, 68 (56.7%) were diagnosed with hypothyroidism and 52 (43.3%) with hyperthyroidism. Patients with hypothyroidism showed significantly higher mean serum total cholesterol (213.4 ± 38.7 mg/ld.) and LDL levels (142.1 ± 31.5 mg/ld.) compared to the hyperthyroid group (total cholesterol 176.2 ± 34.5 mg/ld.; LDL 112.6 ± 27.3 mg/ld.), with p-values of 0.002 and 0.01 respectively. Diastolic blood pressure was also elevated in hypothyroid patients (84.6 ± 9.2 mmHg) compared to hyperthyroid individuals (78.3 ± 7.1 mmHg, p=0.04). Sinus bradycardia was observed in 21 hypothyroid patients (30.8%) while sinus tachycardia was present in 26 hyperthyroid patients (50%). The mean Framingham Risk Score was significantly higher in the hypothyroid group (10.2 ± 3.4) than in the hyperthyroid group (7.6 ± 2.9; p=0.03). These findings suggest a higher early cardiovascular risk burden in hypothyroid patients even before treatment initiation.

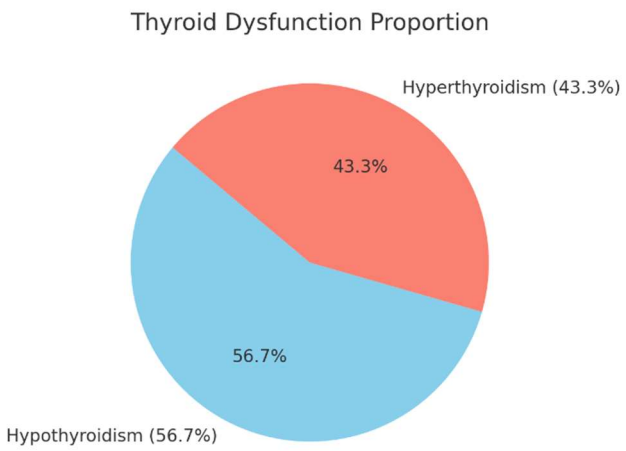

Table 1: Demographic Characteristics of the Study Population

Characteristic	Value
Total patients	120
Mean age (years)	42.5 ± 11.3
Gender - Female	74 (61.7%)
Gender - Male	46 (38.3%)

Table 2: Distribution of Thyroid Dysfunction

Thyroid Dysfunction Type	Number of Patients	Percentage (%)
Hypothyroidism	68	56.7%
Hyperthyroidism	52	43.3%

Table 3: Comparison of Cardiovascular Risk Markers Between Hypothyroid and Hyperthyroid Patients

Parameter	Hypothyroidism	Hyperthyroidism	p-value
Total Cholesterol (mg/ld.)	213.4 ± 38.7	176.2 ± 34.5	0.002
LDL (mg/ld.)	142.1 ± 31.5	112.6 ± 27.3	0.01
Diastolic BP (mmHg)	84.6 ± 9.2	78.3 ± 7.1	0.04
Framingham Risk Score	10.2 ± 3.4	7.6 ± 2.9	0.03
ECG Abnormalities	Bradycardia (30.8%)	Tachycardia (50%)	—

Discussion

A cross-sectional study between newly diagnosed thyroid dysfunctional patients and cardiovascular markers revealed hypothyroidism produced significant elevations of total cholesterol along with LDL cholesterol while diastolic blood pressure and Framingham risk scores increased. Study findings confirm what previous studies have established about thyroid diseases and their heart-related effects. Multiple study demonstrated how hypothyroid patients reveal unfavorable lipid profile data. Total and LDL cholesterol values rose in hypothyroid patients according to O'Brien et al.'s study due to thyroid hormone deficiency that impaired LDL receptor activity and hepatic cholesterol removal [10]. The authors Dundas and Brent showed that thyroid hormone status below clinical thresholds lead to lipid profile

changes that increase the risk of atherosclerosis [11]. Our findings revealed that hypothyroid patients experienced a higher occurrence rate of diastolic hypertension. The findings of this study agree with those documented in the Colorado Thyroid Disease Prevalence Study because hypothyroidism patients display elevated peripheral vascular resistance that results in higher diastolic pressure readings [12]. The regulatory components of blood pressure depend on thyroid hormones because these elements affect endothelial function alongside nitric oxide production and vascular tone capabilities [13]. The medical condition of the thyroid manifested through noticeable electrocardiographic alterations. Study recorded hypothyroid patients with an increased occurrence of sinus bradycardia yet hyperthyroid patients developed sinus tachycardia. Karalee and Dillan proved that Thyroid hormone T3 controls cardiac ion channel expression and β-adrenergic receptor functioning to alter heart rhythm strength [14]. An analysis of our study revealed that patients with hypothyroidism exhibited considerably higher Framingham Risk Scores compared to other participants. Study by Redondo et al. revealed that people with untreated subclinical hypothyroidism experience higher rates of coronary heart disease and adverse cardiovascular events [15]. The data reveals cardiovascular disease can activate during the stage where signs of thyroid dysfunction have not appeared yet. Patients with hyperthyroidism in our study population showed specific cardiovascular abnormalities including sinus tachycardia together with decreased diastolic pressure yet these manifestations did not affect their calculated Framingham scores. Study data from the HUNT study shows that hyperthyroidism raises the possibility of arrhythmias yet consistently increases only long-term cardiovascular risk when individuals develop other health conditions [16]. Early cardiovascular assessment should be part of the diagnosis process for thyroid dysfunction patients according to our study findings. The study by Bondi and Cooper shows how combined endocrine-cardiovascular evaluation helps to improve patient results and develops specific treatment plans [17]. The endocrine society recently adopted guidelines which recommend both lipid testing and ECG monitoring of thyroid patients to prevent future heart complications [18].

Conclusion:

The presence of thyroid dysfunction especially hypothyroidism leads to greater cardiovascular risks in individuals who have recently received their diagnosis. The discovery of cardiovascular issues during diagnosis assessments enables health professionals to begin necessary interventions that may stop long-term negative effects from developing. Endocrine and cardiac evaluations need to be integrated for successful patient management to succeed.

Limitations:

Due to its employ of an observational study design this study did not permit studyers to establish cause-effect relationships. The study used a moderate participant sample while collecting information from one specific medical center which could affect the study's broad application. No extensive cardiovascular outcome data existed in combination with insufficient control of dietary elements and physical activity effects.

Future Directions:

Study needs to follow subjects over time in order to determine what happens to their cardiovascular system when they have thyroid dysfunction. Future studies should examine both the therapeutic value and gender-based cardiovascular effects of immediate lipid-control treatment in hypothyroid patients. Wider trials performed across various medical centers help increase the overall validity of the study results.

Abbreviations

1. BMI Body Mass Index
2. BP Blood Pressure
3. CAD Coronary Artery Disease
4. ECG Electrocardiogram
5. LDL Low-Density Lipoprotein

6. mg/ld. Milligrams per Deciliter
7. mmHg Millimeters of Mercury
8. SPSS Statistical Package for the Social Sciences
9. T3 Triiodothyronine

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Authors Contribution

Concept & Design of Study: **Mujeeb Ur Rehman[1]**
Drafting: **, Irfan Ullah[2], Muhammad Nadeem[3]**
Data Analysis: **Muhammad Hussain Afridi[4]**
Critical Review: **Muhammad Abbas[5], Amjad Ali[6]**
Final Approval of version: **All Mantion Authors Approved the Final Version.**

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