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ORIGINAL RESEARCH

Evaluation of Cardiovascular profile among patients with hypothyroidism

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Abstract

Background: Hypothyroidism is characterized by insufficient levels of thyroid hormone, which can arise from various causes and present with diverse symptoms. The significance of thyroid hormones in maintaining the normal operation of the heart and vascular system, along with the effects of their level variations on cardiovascular performance, has been a focal point of research. Hence; the present study was conducted for evaluating cardiovascular profile among patients with hypothyroidism**.**

Materials & methods: A cohort of 200 patients diagnosed with primary hypothyroidism was recruited for the study. All participants were aged 18 years or older. Comprehensive demographic information, clinical features, and laboratory assessments—including complete blood counts, thyroid function tests, lipid profiles, electrocardiograms (ECG), echocardiograms (ECHO), and treatment regimens—were systematically recorded. Primary hypothyroidism was characterized by a deficiency in thyroid hormones resulting from dysfunction of the thyroid gland. Overt hypothyroidism was identified by reduced serum levels of free thyroxine (T4) and triiodothyronine (T3), accompanied by elevated thyroid-stimulating hormone (TSH) levels. In contrast, subclinical hypothyroidism was defined by elevated TSH levels while maintaining normal serum concentrations of free T4 and T3. The cardiovascular profiles of all participants were thoroughly assessed.

Results: Mean age of the patients was 45.9 years. 60.5 percent of the patients were males. 55 percent of the patients were of rural residence. Significant ST-T changes were seen in ECG in 30.5 percent of patients. Hypertension was seen in 38 percent of the patients. 26 percent of the patients were diabetic. ECHO changes were seen in 23 percent of the patients. Dyslipidemia was seen in 40.5 percent of the patients.

Conclusion: The recognition, reduction, and oversight of the primary risk factors linked to hypothyroidism, coupled with the encouragement of a healthy lifestyle, ought to be emphasized as a crucial approach to lessening the impact of cardiovascular disease in the general population.

Key words: Cardiovascular, Hypothyroidism

Introduction

Hypothyroidism is characterized by insufficient levels of thyroid hormone, which can arise from various causes and present with diverse symptoms. This condition is primarily divided into two categories: primary and secondary (or central) hypothyroidism. In cases of primary hypothyroidism, the thyroid gland fails to produce sufficient thyroid hormone. Conversely,

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secondary or central hypothyroidism, which is less frequently encountered, occurs when the thyroid gland is functioning normally, but the underlying issue lies within the pituitary gland or hypothalamus. If left untreated, hypothyroidism can lead to increased morbidity and mortality rates. In the United States, the predominant cause of hypothyroidism is autoimmune thyroid disease, specifically Hashimoto thyroiditis; however, on a global scale, iodine deficiency in the diet remains the leading cause.[1- 3]

Hypothyroidism can be categorized into four distinct types: primary, secondary, tertiary, and peripheral. Primary hypothyroidism arises from an insufficient level of thyroxine (T4), while secondary hypothyroidism is attributed to a lack of thyroid-stimulating hormone (TSH). Peripheral hypothyroidism, on the other hand, results from a deficiency in thyrotropin-releasing hormone. Both secondary and tertiary hypothyroidism are collectively referred to as central hypothyroidism. It is noteworthy that central and peripheral forms of hypothyroidism, which occur outside the thyroid gland, are infrequently encountered.[4, 5]

The significance of thyroid hormones in maintaining the normal operation of the heart and vascular system, along with the effects of their level variations on cardiovascular performance, has been a focal point of research. Hypothyroidism is associated with a reduction in cardiac output, compromised left ventricular function, and heightened vascular resistance. Additionally, research indicates that both subclinical and overt hypothyroidism are linked to a greater occurrence of cardiovascular risk factors, including dyslipidemia, hypertension, and endothelial dysfunction, all of which elevate the likelihood of developing cardiovascular disease (CVD).[6, 7]Hence; the present study was conducted for evaluating cardiovascular profile among patients with hypothyroidism.

Materials & methods

The current research aimed of evaluating cardiovascular profile among patients with hypothyroidism.A cohort of 200 patients diagnosed with primary hypothyroidism was recruited for the study. All participants were aged 18 years or older. Comprehensive demographic information, clinical features, and laboratory assessments—including complete blood counts, thyroid function tests, lipid profiles, electrocardiograms (ECG), echocardiograms (ECHO), and treatment regimens—were systematically recorded. Primary hypothyroidism was characterized by a deficiency in thyroid hormones resulting from dysfunction of the thyroid gland. Overt hypothyroidism was identified by reduced serum levels of free thyroxine (T4) and triiodothyronine (T3), accompanied by elevated thyroid-stimulating hormone (TSH) levels. In contrast, subclinical hypothyroidism was defined by elevated TSH levels while maintaining normal serum concentrations of free T4 and T3. The cardiovascular profiles of all participants were thoroughly assessed.All the results were compiled in Microsoft excel sheet and were analyzed by SPSS software. Chi- square test, Mann-Whitney U test and student t test were used for assessment of level of significance.

Results

Mean age of the patients was 45.9 years. 60.5 percent of the patients were males. 55 percent of the patients were of rural residence. Significant ST-T changes were seen in ECG in 30.5 percent of patients. Hypertension was seen in 38 percent of the patients. 26 percent of the patients were diabetic. ECHO changes were seen in 23 percent of the patients. Dyslipidemia was seen in 40.5 percent of the patients.

Table 1: Demographic data

Variable	Number	Percentage
Mean age (years)	45.9	
Males	121	60.5

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Females	79	39.5
Rural residence	110	55
Urban residence	90	45

Table 2: Incidence of significant ST-T changes in ECG

ST-T changes	Number	Percentage
Present	61	30.5
Absent	139	69.5
Total	200	100

Table 3: Incidence of diabetes and hypertension

Variable	Number	Percentage
Diabetes	52	26
Hypertension	76	38

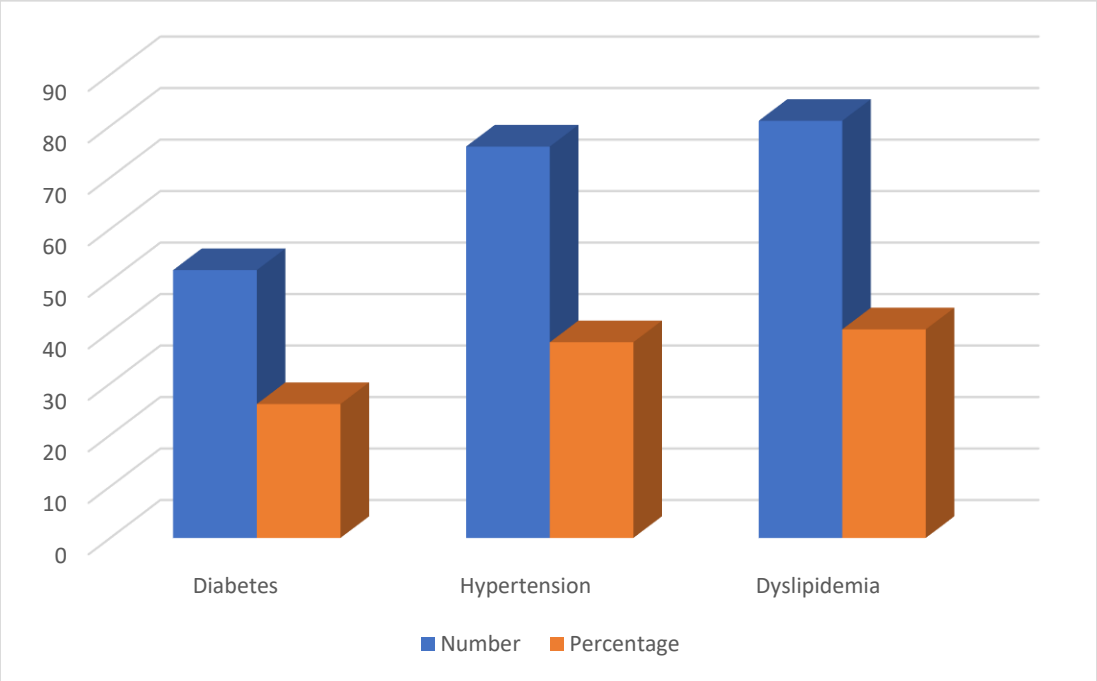
Table 4: ECHO Changes

ECHO changes	Number	Percentage
Mild	23	11.5
Moderate	21	10.5
Absent	154	77
Total	200	100

Table 5: Incidence of dyslipidemia

Dyslipidemia	Number	Percentage
Present	81	40.5
Absent	119	59.5
Total	200	100

Graph 1: Incidence of diabetes, hypertension and dyslipidemia



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Discussion

Hypothyroidism is characterized by inadequate levels of thyroid hormones in circulation. It can be classified into two categories: primary hypothyroidism, which originates from dysfunction of the thyroid gland itself, and secondary hypothyroidism, which arises from issues within the pituitary gland or hypothalamus. This review of evidence is centered on the management strategies for primary hypothyroidism. Primary hypothyroidism is prevalent, affecting up to 5% of the general population, with a notably higher prevalence among women and the elderly. The symptoms associated with this condition are often non-specific, develop gradually, and may persist for an extended period even after biochemical parameters appear to normalize. The standard approach to diagnosing hypothyroidism involves conducting thyroid function tests, primarily measuring thyroid-stimulating hormone (TSH) and free thyroxine (FT4) levels. Treatment typically begins with oral levothyroxine (LT4) to restore FT4 and TSH levels to within the established reference range.[7- 9]The primary risk factor associated with hypothyroidism is a personal or familial history of autoimmune disorders, including conditions such as celiac disease and type 1 diabetes. Additional risk factors for this condition encompass genetic syndromes like Down and Turner syndrome, relative selenium deficiency, and both inadequate and excessive iodine consumption, as well as childhood obesity. On a global scale, iodine deficiency remains the leading cause of hypothyroidism; however, in regions where iodine levels are sufficient, autoimmune thyroiditis emerges as the main contributor, followed by iatrogenic factors, medications, and disorders affecting the pituitary and hypothalamus. The clinical manifestations of hypothyroidism can range from mild to severe, potentially life-threatening symptoms, influenced by various factors including the timing of symptom onset, gender, age, and any pre-existing thyroid conditions. Common symptoms include fatigue, weakness, intolerance to cold, weight gain, constipation, periorbital edema, and dry, coarse skin.[10- 12]

Mean age of the patients was 45.9 years. 60.5 percent of the patients were males. 55 percent of the patients were of rural residence. Significant ST-T changes were seen in ECG in 30.5 percent of patients. Hypertension was seen in 38 percent of the patients. 26 percent of the patients were diabetic. ECHO changes were seen in 23 percent of the patients. Dyslipidemia was seen in 40.5 percent of the patients. A review showed a CV benefit of L-T4 treatment in patients with SCH (TSH > 10 mIU/L and thyroid autoantibody-positive), since CV events decreased and quality of life improved.[13] Based on a meta-analysis of 16 studies with SCH, hormonal therapy ameliorated several surrogates of endothelial function and arterial stiffness [total cholesterol and LDL-c level, C-reactive protein (CRP), brain natriuretic peptide (BNP), and flow-mediated dilatation (FMD)], suggesting a potential positive impact of L-T4 on the CV system.[14] The small experimental study of Niknam et al. supports these results, demonstrating an increase in FMD in young patients with SCH compared to controls.[15]In addition, a meta-analysis of 12 clinical trials, where SCH patients were treated with L-T4, demonstrated an improved profile of atherosclerosis and CV risk, secondary to significant reduction of CIMT values and lipid levels.[16]Sawarthia P et al. conducted a study to investigate the cardiovascular alterations in individuals diagnosed with hypothyroidism. The research included a cohort of 68 patients, with an average age of 41.93 ± 15.36 years and a mean body mass index (BMI) of 24.64 ± 4.30 kg/m². Among the participants, 57 (83.8%) were female, while 11 (16.2%) were male. The average thyroid-stimulating hormone (TSH) concentration recorded in this population was 11.48 ± 22.02 mIU/mL. The predominant symptoms experienced by the participants were fatigue or weakness, reported by 67.6% of the cohort, followed by dyspnea at 42.6%. The mean pulse rate was 81.50 ± 16.16 beats per minute, with systolic and diastolic blood pressures averaging 112.76 ± 7.05 mmHg and 70.68 ± 7.46 mmHg, respectively. Pallor emerged as the most frequently observed clinical sign, noted in 22.1% of the subjects. Electrocardiogram (ECG) analysis revealed low voltage

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complexes in 25% of the cases, with T wave inversion occurring in 23.5%. Additional ECG abnormalities included bradycardia (10.3%), right bundle branch block (7.4%), and QRS prolongation (2.9%). Echocardiographic assessments indicated that 21 patients (30.8%) exhibited grade 1 left ventricular diastolic dysfunction, and two patients (2.94%) presented with pericardial effusion. Notably, there was a significant elevation in TSH levels among the study participants. It is recommended that patients displaying abnormal ECG and echocardiographic results, in the absence of other cardiovascular anomalies, undergo evaluation for hypothyroidism to enhance patient care outcomes.[17]

Conclusion

The recognition, reduction, and oversight of the primary risk factors linked to hypothyroidism, coupled with the encouragement of a healthy lifestyle, ought to be emphasized as a crucial approach to lessening the impact of cardiovascular disease in the general population.

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