

Original Research Article

Study of cardiac manifestations in hypothyroid patients admitted in tertiary care centre

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ABSTRACT

Background: Hypothyroidism is the most common pathological hormone deficiency. To study various cardiac manifestations in overt and subclinical hypothyroidism.

Methods: The cross-sectional analytic study is carried out on 60 patients of hypothyroid subjects in indoor facility of general medicine department in SMIMER hospital.

Results: This study shows positive correlation between thyroid stimulating hormone (TSH) level, electrocardiogram (ECG) and echocardiographic findings. In this study, there is female predominance, ECG findings most commonly suggestive of sinus bradycardia and ECHO findings are most commonly suggestive of diastolic dysfunction with pericardial effusion.

Conclusions: The early recognition and early initiation of treatment of hypothyroidism may helpful to lowering heart changes as hypothyroidism is reversible cause for cardiac manifestation.

Keywords: Thyroid, Hypothyroidism, Thyroid stimulating hormone, Electrocardiogram, Echocardiography

INTRODUCTION

Hypothyroidism is the most common pathological hormone deficiency. Pathology of the thyroid gland (Primary hypothyroidism) accounts for over 99.5% of cases of thyroid gland failure and <0.5% result from disorder of the pituitary gland or hypothalamus (central hypothyroidism). Overt hypothyroidism refers to cases in which the serum thyrotropin (TSH) concentration is elevated and serum T4 (free thyroxine) is below the reference range, while subclinical hypothyroidism is defined as an elevated serum TSH value, associated with a serum free T4 within the reference range. Haemodynamic alterations in hypothyroidism cause narrowing of pulse pressure, prolongation of circulation time and decrease in blood flow to tissues. In severe primary hypothyroidism the cardiac silhouette is enlarged and heart sounds decrease in intensity due to pericardial effusion.¹ Cardiovascular findings of hypothyroidism are more

subtle. Signs and symptoms of hypothyroidism include mild degree bradycardia, diastolic hypertension, a narrowed pulse pressure, cold intolerance and quiet precordium. Pericardial effusion can occur in hypothyroidism consistent with observation that patient has an increase in volume of distribution of albumin and a decrease in lymphatic clearance function.² Hypothyroidism is associated with decreased cardiac contractility, decreased cardiac output and coronary artery disease. A variety of case reports demonstrated that hypothyroidism may cause prolongation of QT interval. They can develop protein rich pericardial effusion.³ The heart is an organ sensitive to the action of thyroid hormones and measurable changes in cardiac performance are detected with small variation in thyroid hormone serum concentration.⁴ In hypothyroidism and myxoedema, reversible diastolic abnormalities have been reported. In a 2D echo study asymmetric septal hypertrophy was found. Presence of prolonged ventricular relaxation time in

hypothyroid patients have been confirmed. As hypothyroidism is often associated with hypercholesterolemia, coronary artery disease is common in this population.⁵ Subclinical hypothyroidism is associated with impaired left ventricular diastolic function at rest, systolic dysfunction on effort and enhanced risk for atherosclerosis and myocardial infarction.⁶ The objective of this study is to study various cardiac manifestations in overt and subclinical hypothyroidism.

METHODS

The cross-sectional analytic study includes 60 patients of hypothyroid subjects admitted in the general medicine department in SMIMER hospital. According to available data, around 4-5 patients of hypothyroidism come to SMIMER under department of medicine every week, but considering the exclusion criteria, around 2-3 patients every week are eligible and around 60 every six months. As period of data collection is six months (September 2020 to February 2021), we are expecting sample size according to this. Participants who gave written informed consent are included in this cross-sectional analytical study which was conducted for period of 8 months which include 6 months for data collection and 2 months for data entry and data analysis. Ethical approval was obtained from Institutional ethical committee. Patients included are newly diagnosed hypothyroidism with TSH >5IU/ml and hypothyroid patients not on treatment. Patients excluded are those with age <12 years and on an arrhythmic drugs and patients with known cardiac disease - congenital heart disease, rheumatic heart disease, ischemic heart disease. All the subjects gave an informed consent after detailed procedure of clinical examination and the non-invasive technique

was explained to them. A brief history, height, weight, age, sex and findings of general, systemic, ECG and echocardiography are entered in the patient information chart giving a separate ID for each subject. Clinical examination consists of both general physical and systemic examination. In general examination particular attention is given to the presence or absence of pallor, oedema, skin changes and hair loss. A detailed examination of cardiovascular system is carried out in each hypothyroid patient with electrocardiogram and echocardiogram. Statistical test was applied using Open Epi Statistical package for social sciences (SPSS) software.

RESULTS

In present study, 60 patients of hypothyroidism are studied clinically and by electrocardiography and echocardiography.

This study included 21.77% patients with subclinical and 78.33% patients with overt hypothyroidism. The ratio of male: female is 1:2.75 as shown in Table 1.

Among general symptoms of hypothyroid patient's weight gain was commonest symptom being present in 63.33% patients followed by easy fatigue. The general symptoms of hypothyroid patients are as shown in Table 2.

Among cardiovascular symptoms breathlessness was commonest symptom being present in 23.33% patients followed by palpitation. The cardiovascular symptoms of hypothyroid patients are as shown in Table 3.

Table 1: Age wise distribution.

Types of hypothyroidism	Male		Female		Total	
	No	%	No	%	No.	%
Subclinical hypothyroidism	4	25	9	20.45	13	21.77
Overt hypothyroidism	12	75	35	79.54	47	78.33
Total	16	100	44	100	60	100

Table 2: General symptoms of hypothyroid patients.

General symptoms	Males		Females		Total	
	No.	%	No.	%	No.	%
Weight gain	10	62.5	28	63.63	38	63.33
Easy fatigue	5	31.25	28	63.63	33	55
Decreased appetite	6	37.5	13	29.54	19	31.66
Constipation	8	50	9	20.45	17	33
Excessive sleep	6	37.5	7	15.9	13	21.66
Cold intolerance	6	37.5	5	11.6	11	18.33
Voice change	1	6.06	6	13.6	7	11.66
Depression	0	0	7	15.90	7	11.66
Hair loss	0	0	3	6.81	3	5

Table 3: Cardiovascular symptoms of hypothyroid patients.

Cardiovascular symptoms	Male		Female		Total		P value
	No.	%	No.	%	No.	%	
Breathlessness	2	12.5	12	27.27	14	23.33	0.178
Palpitation	2	12.5	10	22.72	12	20	0.034
Chest pain	1	6.25	2	4.54	3	5	0.000

Table 4: Systemic examination of hypothyroid patients.

Systemic examination	Males		Females		Total	
	No.	%	No.	%	No.	%
Muffled heart sound	0	0	4	9.09	4	60.67
Variable heart sound	1	6.25	1	2.27	2	3.33
Delayed ankle jerk	2	12.5	5	11.36	7	11.67

Table 5: Electrocardiographic changes in hypothyroidism.

ECG changes	Male		Female		Total		P value
	No.	%	No.	%	No.	%	
Sinus bradycardia	7	43.75	15	34.09	22	36.6	0.9474
Low voltage Complex	4	25	9	20.45	13	21.67	0.9812
ST-T changes	3	18.75	8	18.18	11	18.33	0.7437
Axis deviation	1	6.25	4	90.09	5	8.33	0.8603
Prolonged PR	0	0	2	4.54	2	3.33	0.9568
RBBB	0	0	2	4.54	2	3.33	0.9568

Table 6: Echocardiography studies in hypothyroidism.

Echocardiography changes	Male		Female		Total		P value
	No.	%	No.	%	No.	%	
Diastolic dysfunction	5	31.25	14	9.09	19	31.66	0.7857
Pericardial effusion	2	12.5	14	9.09	16	26.67	0.2435
Left ventricular hypokinesia	2	12.5	7	15.9	9	15	0.9348
LVH	2	12.5	3	6.81	5	8.63	0.8603

A total 6.67% patients had muffled heart sound, 3.33% had variable heart sounds and 11.67% has delayed ankle jerk. The systemic examination of hypothyroid patients is as shown in Table 4. Among ECG changes, sinus bradycardia was commonest being present in 36.6% patients. The Electrocardiographic changes in hypothyroid patients are as shown in Table 5.

Diastolic dysfunction (31.66%), pericardial effusion (26.67%) being commonest echocardiographic changes in hypothyroid patients. In a study by Verma in 1995 it was seen that 27% of patients had diastolic dysfunction.⁷ The echocardiographic changes in hypothyroid patients are shown in Table 6.

DISCUSSION

In present study, most of the hypothyroid patients have weight gain, easy fatigue, decreased appetite, constipation

and excessive sleep. These patients have also complained of breathlessness and palpitation. On auscultatory examination of cardiovascular system, muffled heart sound most commonly seen. The incidence of all echocardiographic findings increases as the severity of the disease increases, i.e. maximum incidence is found in the most severely affected group of patients. Present study, diastolic dysfunction is the commonest echo finding followed by pericardial effusion. Pericardial effusion was present in 32.5% patients in Hardisty et al Rawat et al study showed relatively increased thickness of left ventricle which was found in 8.63% of patients in present study.^{8,9} Verma et al concluded from his study that pericardial effusion and diastolic dysfunction was seen in significant cases of hypothyroidism.¹⁰ Gupta et al found significant increase in interventricular septum (IVS) and left ventricular posterior wall (LVPW), whereas in our study 8.63% patients had LVH.¹¹ Among ECG changes, sinus bradycardia was commonest being present in 36.6%

patients. Al-Farttoosi et al found in their study that sinus bradycardia was the commonest ECG finding in hypothyroid patients.¹² By comparing the electrocardiographic and echocardiographic changes, with respect to duration and severity of the disease and to see which of them is a better predictor of diastolic dysfunction and pericardial effusion in hypothyroidism, so that the patients can be identified at an earlier stage of the disease, as early recognition and treatment of hypothyroidism leads to prolonged survival and improved quality of life. The limitations of study are sample size was too small and patients could not be followed up to look for the resolution of cardiac changes after achievement of euthyroid state and also we could not do newer ultrasonic echo to detect subtle changes as the facility is not available in our setup and financial constraint in our patients to get it done from outside.

CONCLUSION

Majority patients of hypothyroidism were in the age group 20-40 years with female preponderance. Among cardiovascular symptoms breathlessness was the commonest symptom, followed by palpitation, chest pain. Among ECG changes, sinus bradycardia was commonest followed by low voltage complexes, ST-T changes, long QT, Axis deviation, prolonged PR and RBBB. Diastolic dysfunction, pericardial effusion being commonest echocardiographic changes followed by left ventricular hypokinesia and LVH.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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