

## Original Research Article

# Clinical study of cardiovascular involvement in patients with hypothyroidism

U. Kishan, J. Gopala Krishna\*

Department of General Medicine, RVM Institute of Medical Sciences and Research Centre, Lakshmakkapally, Mulugu, Siddipet, Telangana, India

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**\*Correspondence:**

Dr. J. Gopala Krishna,

E-mail: [jgkrishna.k4@gmail.com](mailto:jgkrishna.k4@gmail.com)

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### ABSTRACT

**Background:** Hypothyroidism is usually associated with the involvement of the cardiovascular system in the form of the cardiac abnormalities. The Research data on this has been found to be limited. The dysfunction of the cardiac caused by hypothyroidism is usually reversible. Objective was to study the incidence of cardiac abnormalities in patients with hypothyroidism.

**Methods:** Total 40 confirmed cases of hypothyroid disease were included in the present study. General investigations, ECG, ECHO was done in all the patients to assess for cardiovascular involvement. The data was entered in the Microsoft Excel worksheet and analysed using proportions.

**Results:** One fourth of the patients were found to have the bradycardia. The Delayed ankle jerk was seen in 67.5% of the cases and the next common CNS manifestation was the hoarseness of the voice. 30% of the case had normal ECG findings. 40% of the cases had the bradycardia. 35% of the cases had the low voltage complexes. 32.5% of the cases had the normal ECHO reports. 27.5% of the cases had the pericardial effusion. Same proportion of the cases were found to have the diastolic dysfunction. But most of them had the dysfunction and the severe cases were found to be very few. Only two patients had IVS thickness.

**Conclusions:** Majority of the cases of the hypothyroidism in the present study were found to have the cardiovascular involvement. This points towards the importance of the early diagnosis of hypothyroidism and the prevention of complications like the cardiovascular system and the central nervous system involvement.

**Keywords:** Diastolic dysfunction, Electrocardiogram, Echocardiogram, Hypothyroidism, Low-density lipoproteins, Pericardial effusion

### INTRODUCTION

Reduced secretion of thyroid hormones in the body leads to a clinical syndrome called hypothyroidism. Long term neglected and untreated hypothyroidism can affect process of the metabolism in the body. It has been estimated that overall prevalence of hypothyroidism being 2% in females and 0.1% to 0.2% in males. Thus, more in females compared to males. The effects on the metabolism can lead to dysfunction of most of the body organs.<sup>1</sup>

Like other systems in the body, hypothyroidism also affects the cardiovascular system. Effect on cardiovascular system is more marked. This leads to very high incidence of complications and also the deaths. Patients with hypothyroidism can even develop coronary heart disease.<sup>2</sup>

If the treatment for hypothyroidism is started, these complications can be reversed. Hypothyroidism manifests itself in all organ systems and these are largely

independent of the underlying disorder but are a function of the degree of hormone deficiency.<sup>3</sup>

The cardiovascular abnormalities of thyroid hormones are quite dramatic. The CVS manifestations of hypothyroidism include Decreased contractility, decreased heart rate, increased systemic vascular resistance, increased capillary permeability (pericardial effusion). ECG changes include sinus bradycardia, PR prolongation, low amplitude of P waves and QRS complex, ST segments alteration, T inversion or flattening. This may be due to pericardial effusion and rarely RBBB, LBBB or complete heart block can be seen. All these disappear on treatment. ECHO shows a high frequency of asymmetric septal hypertrophy and apparent obstruction to LV outflow tract suggesting idiopathic hypertrophic sub aortic stenosis.<sup>4</sup>

In the past, treatment of patients with myxoedema and heart disease, particularly coronary artery disease, was very difficult because levothyroxine replacement was frequently associated with exacerbation of angina, heart failure or myocardial infarction. Now that coronary angioplasty and coronary artery bypass surgery are available, patients with myxoedema and coronary artery disease can be treated surgically first and more rapid thyroxine replacement therapy will then be tolerated.<sup>5</sup>

Pulmonary function-In the adult, hypothyroidism is characterized by shallow, slow respirations and impaired ventilatory responses to hypercapnia or hypoxia. Respiratory failure is a major problem in patients with myxedema coma. Zwillich in 1975 described that in severe hypothyroidism.<sup>6,8</sup>

This study is aimed at studying the cardiovascular involvement in hypothyroidism.

## METHODS

The present study was carried out at Department of General Medicine, Asram Medical College and Hospital, Eluru. The patients attending medical OPD/admitted in medical ward and having symptoms suggestive of hypothyroidism and, thyroid function suggestive of hypothyroidism were included in present study. This study was carried out between From November 2018 to August 2019. Total number of 47 patients had clinical and biochemical evidence of hypothyroidism. Out of 47 patients, only 40 patients became the part of study while 7 refused to participate in the study. These 40 patients were further screened for evidence of cardiovascular involvement.

### Inclusion criteria

- Hypothyroid patients which include,
- Newly diagnosed patients,
- Not on treatment.

### Exclusion criteria

- Old patients with hypothyroidism
- Currently taking treatment for hypothyroidism.

Detailed history was taken, followed by clinical examination to detect various signs of hypothyroidism, as per proforma attached. All the patients in this study had some or other clinical features of hypothyroidism and diagnosis of which was proved by thyroid function tests.

### Investigations

Following investigations were done in all the cases included in present study

- Haemoglobin, TC, DC, ESR, peripheral smear examination
- Urine routine -sugar, albumin, microscopy
- Random blood sugars
- Blood urea
- Serum creatinine
- Lipid profile
- A standard 12 lead ECG
- T3, T4, TSH
- ECHO-colour Doppler study

T3, T4 and TSH levels were also estimated for all the patients included in the present study.

### Echocardiography

#### Instrument features

2D Echocardiograph with Color Doppler, continuous wave Doppler with transesophageal facility and having a transducer of 2.5 MHz with VCR, printer, ECG gating facility of Hewlett Packard make. Various modes used in ECHO are the following:

- M - Mode ECHO
- Two dimensional- ECHO
- Doppler -ECHO
  - Pulse wave
  - Continuous doppler
- Color Doppler

By using ECHO each case was specially screened for systolic and diastolic dysfunction and pericardial effusion. Canadian consensus criteria were used to assess diastolic dysfunction A value >0.76 is taken as the diagnosis of systolic dysfunction. Patients were categorized into two groups, either with or without systolic dysfunction.<sup>7</sup>

### Statistical analysis

The data was entered in the Microsoft Excel worksheet and analyzed using proportions.

## RESULTS

Incidence of cardiovascular involvement in patients with hypothyroidism. There were 40 patients which were included in the present study as per the inclusion and exclusion criteria laid down for the present study. Out of these 40 patients with hypothyroidism after thorough investigations related to the involvement of the cardiovascular system, 27 i.e. 42.2% were found to have the cardiovascular manifestations. Thus, the incidence of cardiovascular involvement in patients with hypothyroidism was found out to be 42.2% (Table 1).

**Table 1: Incidence of cardiovascular involvement in patients with hypothyroidism.**

Variables	Number	%
Number of patients with hypothyroidism	40	100
Number of patients with cardiovascular involvement	27	42.2

**Table 2: Distribution of study subjects as per the systemic examination findings.**

Systemic examination findings	Number	%
CVS	Cardiomegaly	3 7.5
	Diminished heart sounds	10 25
CNS	Hoarse voice	16 40
	Delayed relaxation phase of ankle jerk	27 67.5

Distribution of study subjects as per the systemic examination findings. A total of 13 patients were found to have cardiovascular abnormalities on systemic examination. Among them three i.e. 7.5% were found to have cardiomegaly on systemic examination. Ten i.e. 25% were found to have diminished heart sound. A total of 16 patients with hypothyroidism i.e. 40% were found to have hoarse voice which indicated involvement of central nervous system. 27 patients were found to have delayed relaxation phase of ankle jerk which indicated involvement of central nervous system (Table 2).

**Table 3: Distribution of study subjects as per the lipid profile parameters.**

Lipid profile parameters	Normal	Increased	Less than normal	Total
Total cholesterol	34	6	0	40
HDL	7	0	33	40
LDL	29	11	0	40
TG	0	40	0	40

Distribution of study subjects as per the lipid profile parameters. Out of 40 patients with hypothyroidism, 34

patients had normal total cholesterol and six had increased total cholesterol. Out of 40 patients with hypothyroidism, seven patients had normal HDL and 33 had less than normal value. Out of 40 patients with hypothyroidism, 29 had normal LDL, 11 had increased LDL. Out of 40 patients with hypothyroidism, all 40 had increased TG values (Table 3).

**Table 4: Distribution of study subjects as per ECG changes.**

ECG changes	Number	%
Normal	12	30
Bradycardia	16	40
Low voltage complexes	14	35
STT changes	10	25
Left bundle branch block	2	5
Right bundle branch block	3	7.5

Distribution of study subjects as per ECG changes. 12 patients have shown normal ECG. Bradycardia was seen in 16(40%) of the cases. Low voltage complexes were seen in 14(35%) of the cases. STT changes were seen in 10(25%) of the cases. Left bundle branch block was seen in only two cases. Right bundle branch block was seen only in three cases. Thus, the most common ECG abnormality was bradycardia (Table 4).

**Table 5: Distribution of study subjects as per ECHO findings.**

ECHO findings	Number	%
Normal	13	32.5
Systolic dysfunction	3	7.5
Diastolic dysfunction	Mild	9 22.5
	Moderate	2 5
	Severe	0 0
IVS thickness	2	5
Pericardial effusion	11	27.5

Distribution of study subjects as per ECHO findings. Echo findings are normal in 32.5% cases. Pericardial effusion is next common finding seen in 11 cases accounting to 27.5%. Diastolic dysfunction seen in 27.5%, majority of them being mild dysfunction. No cases found to have severe diastolic dysfunction. IVS thickness found in only in 2 cases (Table 5).

Distribution of study subjects as per involvement of CVS in hypothyroidism. 16 patients had bradycardia. 9 patients had hypertension. Three patients had cardiomegaly, 14 patients had low voltage complexes. Ten patients had STT changes, 10 patients had DHS. Three patients had systolic dysfunction. Eleven patients had diastolic dysfunction. Two patients had IVST. Thus, the most common cardiovascular morbidity found in the patient with hypothyroidism was bradycardia followed by low voltage complexes (Table 6).

**Table 6: Distribution of study subjects as per involvement of CVS in hypothyroidism.**

Involvement of CVS	Number	%
Bradycardia	16	40
Hypertension	9	22.5
Cardiomegaly	3	7.5
Low voltage complexes	14	35
STT changes	10	25
DHS	10	25
Systolic dysfunction	3	7.5
Diastolic dysfunction	11	27.5
Pericardial effusion	11	27.5
IVST	2	5

## DISCUSSION

Delayed relaxation of the ankle jerk was the most common finding present in 67.5% of the patients which correlates well with the description in most standard textbooks of endocrinology 1 and in various studies by Lambert EH et al.<sup>8</sup> On cardiovascular examination, cardiomegaly was found in 7.5% of the patients, diminished heart sounds in 10 patients accounting for 25% of the total, indicating probability of pericardial effusion, 13 female (43.3%) and 5 male (50%) pts had anaemia. All of them were with normocytic normochromic type. There was increase of total cholesterol (15%), LDL (32%), VLDL (75%), triglycerides (100%) and decrease of HDL (82.5%).

ECG was normal in 12 patients (30%). 70% of the cases had abnormal ECG findings. 35% of the cases had low voltage complexes. 40% of the cases had bradycardia. 5% of the cases had left bundle branch block. 7.5% of the cases had right bundle branch block. Similar findings were reported by Varma R et al, and Nikoo MH et al.<sup>4,9</sup> Data wise 32.5% of the cases had normal ECHO reports. 27.5% of the case had pericardial effusion. But Verma R et al, in their study found a very rate of pericardial effusion which was documented as 45%.<sup>9</sup> Thus, author found low rates of pericardial effusion. 27.5% of the cases had diastolic dysfunction. Among these patients of hypothyroidism with diastolic dysfunction, majority had mild type. Verma R et al, in their study reported similar findings as per the present study of 27% of the cases had diastolic dysfunction.<sup>9</sup> Author noted that 7.5% of the cases had systolic dysfunction. Forfar JC et al, observed from their study similar results.<sup>10</sup>

As per this study, patients with higher serum TSH levels (severe hypothyroidism) had a greater number of patients with cardiovascular involvement (40 %). Involvement of various systems in hypothyroidism depends on duration, onset and severity of hypothyroidism. In this study sample of patients is less, so definite conclusion cannot be drawn. In order to show relation between levels of

TSH and Involvement of cardiovascular system a study should be done in larger number of patients.

## CONCLUSION

Majority of the cases of the hypothyroidism in the present study were found to have the cardiovascular involvement. This points towards the importance of the early diagnosis of hypothyroidism and the prevention of complications like the cardiovascular system and the central nervous system involvement.

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