ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Cardiac Manifestations in Hypothyroidism – A Cross Sectional Study.

Sureshbabu KP, Gireesh, and Ameetkumar Oswal*

Department of General Medicine, Sri Siddhartha Medical College and Hospital, Tumkur, Karnataka, India.

ABSTRACT

Hypothyroid patients present clinically with a myriad of symptoms and signs which are nonspecific. As a result patient are diagnosed lately. This study was conducted in order to identify the cardiac manifestations of hypothyroidism at a very early stage. The study included 100 patients with newly detected hypothyroidism and old under-controlled hypothyroidism. These patients were subjected to history and clinical examination, investigations like thyroid profile, Electrocardiography, Echocardiography & lipid profile. In this study there was an overall female preponderance of 87%. 52% were in age group 21-40 yrs. Mean age was 40yrs. Abnormal ECG in 31%, abnormal ECHO in 23%, Diastolic hypertension in 21%, Dyslipidemia in 41%, pericardial effusion in 4%, Ischemic heart disease in 2% and Anaemia in 25% were seen in the study. Also it was seen that subclinical hypothyroid patients who presented with few symptoms also had cardiac changes. As these changes seen were significant, it is advised to subject hypothyroid patients for fasting lipid profile, Electrocardiography and Echocardiography when necessary. Also it is seen that with treatment these changes are reversible.

Keywords: Hypothyroidism, Electrocardiography, Echocardiography, Diastolic hypertension, Lipid profile, Ischemic heart disease.

Corresponding author

ISSN: 0975-8585

INTRODUCTION

The thyroid gland is one of the largest of the endocrine glands, situated in the anterior part of the neck weighing 15-20 grams. The thyroid secretes two major hormones, thyroxine (T4-93%) and triidothyronine (T3-7%) [1].

The most common functional disorder of the thyroid gland is hypothyroidism. Hypothyroidism is a cluster of clinical manifestations resulting from thyroid hormone deficiency or more rarely, from their impaired activity at tissue level.

Overt hypothyroidism refers to cases in which the serum TSH concentration is elevated and serum T_4(free thyroxin) is below the reference range, while subclinical hypothyroidism (SCH) is defined as an elevated serum TSH value, associated with a serum free T_4 within the reference range [2].

Primary hypothyroidism accounts for over 99% of cases due to thyroid gland failure and < 1% result from disorder of the pituitary gland or hypothalamus (central hypothyroidism) [2].

The prevalence of hypothyroidism as evident by demographic studies in India, shows a considerable figure of 3.9% overall, with higher fraction in women than men. The prevalence of subclinical hypothyroidism is 9.4% of which 11.4% in women & 6.2% in men [3].
Studies from Mumbai have suggested that congenital hypothyroidism is common in India, the disease occurring in 1 out of 2640 neonates, when compared with the worldwide average value of 1 in 3800 subjects [3].

Thyroid hormones have a profound effect on a number of metabolic processes in virtually all tissues and hence virtually every tissues in the body is affected to a greater or lesser extent by thyroid hormone deficiency, the heart being particularly sensitive to its effect [2].

A wide range of cardiovascular complications are associated with hypothyroid state ranging from systolic/diastolic dysfunction to accelerated atherosclerosis, isolated diastolic hypertension, coronary artery disease (CAD), pericardial diseases and overt cardiac failure [4]. Inadequate number of studies and elusive nature of diagnosis of cardiovascular manifestations in hypothyroidism due to less prominence of symptoms and signs; attracted a great deal of investigatory endeavour.

This study aims at studying the cardiovascular aftermath in hypothyroid patients by electrocardiography, lipid profile and echocardiography.

The completely reversible nature of these complications, after starting treatment is well known; hence the study aims at assessing cardiac manifestations, timely diagnosis and meticulous management of the disease.

ISSN: 0975-8585

AIM :

To study the cardiac manifestations in hypothyroidism.

OBJECTIVES:

- To study the clinical profile of cardiac system in hypothyroidism.
- To study the various ECG and Echocardiographic changes in hypothyroidism.
- To study the lipid profile in hypothyroidism.

MATERIALS AND METHODS

SOURCE OF DATA: 100 Subjects under the study included, out-patient and in-patient hypothyroid cases coming to Sri Siddhartha Medical College and Hospital, Tumkur.

STUDY DURATION: 1st September 2012 to December 2013.

INCLUSION CRITERIA:

All the cases of hypothyroidism – diagnosed by clinical evaluation and confirmed by serum TSH, total T4 and total T3 level, including new cases and old under-controlled hypothyroid cases.

EXCLUSION CRITERIA:

- Those with congenital heart disease, rheumatic heart disease, hypertension, known IHD, diabetes mellitus, history of smoking and alcohol intake, COPD.
- Patients on lithium, oral contraceptives, steroids and amiodarone.

INVESTIGATIONS:

1. T3, T4, TSH.
2. Haemoglobin, Total count, Differential count, Erythrocyte sedimentation rate.
3. Random blood sugar.
4. Urine routine and microscopy.
5. Blood urea.
6. Serum creatinine.
7. Lipid profile.
8. A standard 12 lead ECG (Electrocardiography).
9. ECHO (Echocardiography).

T3, T4, TSH LEVELS: 3ml of early morning fasting samples containing plain clotted blood were collected and sent for estimation. The hormonal assay was done by chemiluminescence assay.

ISSN: 0975-8585

Echocardiography- Diastolic dysfunction was assessed by means of the Canadian consensus criteria.

STUDY DESIGN - A cross sectional clinical study.

ETHICAL CLEARANCE - The clearance for the study was obtained from the ethical committee of Sri Siddhartha Medical College and Hospital, Tumkur, Karnataka, India.

CONSENT FORM - An informed consent was taken from all the participants.

RESULTS

Out of 100 cases, 62% had clinical hypothyroidism and 38% had subclinical hypothyroidism. Female preponderance was seen in 87% of total cases (Table -1).

Table -1
Hypothyroidism and sex distribution

Hypothyroidism	Female	Male	Total (%)
Clinical Hypothyroidism	51	11	62
Subclinical Hypothyroidism	36	2	38
TOTAL	87	13	100

Patients were between age group of 18–70 yrs. 52% were in age group 21-40 yrs. Mean age was 40yrs (Table-2).

Table -2
Age distribution

Age group (years)	Frequency (%)
18-20	6
21 - 30	26
31 - 40	26
41 - 50	21
51 - 60	14
61 - 70	7
Total	100

The most common presenting symptom in clinical hypothyroidism was easy fatiguability 74%; others were weight gain, menorrhagia, aches and pains, dry skin, chest pain, breathlessness and swelling of lower limbs (Table- 3).

ISSN: 0975-8585

Table -3 Symptoms of Clinical hypothyroidism (62)	
	Frequency (%)
Easy fatiguability	74
Weight gain	50
Aches & pains	46.77
Menorrhagia	35.5
Dry skin	19.35
Intolerance to cold	12.9
Swelling of limbs	29
Puffiness of face	22.5
Chest pain	20.9
Breathlessness	19.35

Even subclinical hypothyroidism cases presented with few symptoms common being easy fatiguability, mennorhagia, aches and pains & weight gain (Table- 4).

Table -4 Symptoms of subclinical hypothyroidism (38)	
	Frequency (%)
Easy fatiguability	39.5
Menorrhagia	31.5
Aches & pains	31.5
Weight gain	23.7
Breathlessness	21
Swelling of limbs	21
Dry skin	7.8
Intolerance to cold	7.8
Chest pain	7.8

On general examination; thyromegaly was found in 37%, dry skin in 16%, bradycardia in 4%, diastolic BP >90mmhg in 21% and lower limb edema in 22% (Table-5).

Table -5 Signs			
Signs	Clinical Hypothyroidism (62)	Subclinical Hypothyroidism (38)	Total (%)
BMI > 25 kg/m2	33	22	55
Dry Skin	11	5	16
Thyromegaly	22	15	37
Lower Limb Edema	16	6	22
Pulse Rate < 60/min	4	0	4
Diastolic BP >90 mmHg	14	7	21

Lipid analysis showed increase in total cholesterol in 41%, low density lipoproteins in 39% and triglycerides in 10% (Table-6).

ISSN: 0975-8585

Table -6 Lipid profile (mg/dl)			
	Clinical Hypothyroidism	Subclinical Hypothyroidism	Total (%)
Serum cholesterol>200	30	11	41
LDL >130	26	13	39
TG > 200	8	2	10
HDL <40	5	6	11

ECG was abnormal in 31% cases with commonest finding being T wave changes in the form of inversion or flattening in 31%, bradycardia in 4%, low voltage complex in 2% and ST segment changes in 5% (Table-7).

Table -7 ECG changes			
ECG changes	Clinical Hypothyroidism	Subclinical Hypothyroidism	Total (%)
T wave (flat/ inverted)	23	8	31
Bradycardia	4	0	4
Low voltage complex	2	0	2
ST segment changes	4	1	5

ECHO was abnormal in 23% cases; commonest being left ventricular diastolic dysfunction (LVDD) mild to moderate in 19%, pericardial effusion in 4%, left ventricular hypertrophy in 5%, and regional wall motion abnormalities (RWMA) in 2% (Table-8).

Table -8 ECHO changes			
ECHO changes	Clinical Hypothyroidism	Subclinical Hypothyroidism	Total (%)
LVDD	12	7	19
Pericardial effusion	4	0	4
RWMA	2	0	2
LVH	4	1	5
Systolic dysfunction	3	0	3
EF <50	3	0	3

Patients with increasing levels of TSH values had more abnormal ECG and echocardiography findings. Dyslipidemia and diastolic hypertension was also found to be more in them (Table-9).

Table -9: Correlation of serum TSH value and the abnormalities					
TSH Value (µIU/ml)	Number of cases	ECG CHANGES	ECHO CHANGES	Dyslipidemia	Diastolic HTN
5.0 - 10.0	38	8	6	12	7
10.1 - 100.0	44	12	10	16	11
>100.0	18	11	7	13	3
Total	100	31	23	41	21

ISSN: 0975-8585

Overall changes seen in cardiac parameters in this study; ECG changes in 31%, ECHO changes in 23%, Diastolic hypertension in 21%, Dyslipidemia in 41%, Anaemia in 25% and Ischemic heart disease in 2% (Table10).

Table -10
Changes seen during study

Hypothyroidism	ECG CHANGES	ECHO CHANGES	Diastolic HTN	Dyslipidemia	Anaemia	IHD
Clinical Hypothyroidism	23	17	14	29	17	2
Subclinical Hypothyroidism	8	6	7	12	8	0
Total	31	23	21	41	25	2

Total 29 cases were known hypothyroid those were poorly controlled with treatment among them 10 had ECG changes, 4 had ECHO changes, 8 had Diastolic hypertension, 13 had Dyslipidemia, 17 had Anaemia and 1 had IHD (Table-11).

Table -11
Changes seen in known Hypothyroid cases

Known Hypothyroidism	Total	ECG CHANGES	ECHO CHANGES	Diastolic HTN	Dyslipidemia	Anaemia	IHD
Total	29	10	4	8	13	8	1
Clinical Hypothyroidism	17	6	4	5	9	3	1
Subclinical Hypothyroidism	12	4	0	3	4	5	0

DISCUSSION

The present study was conducted at Sri Siddhartha Medical College and Hospital, Tumkur. Total numbers of patients were 100. Study period being Sept 2012 to December 2013 (16 months).

AGE DISTRIBUTION: Patients were in the age group of 18-70 yrs. With 52% in age group of 21-40 yrs.

SEX DISTRIBUTION: In this study, an overall female preponderance was seen i.e. 87% compared to 56.3% in Mulki Shilpa etal [5] and 73.3% in Vishwanath etal [6] (Table-12).
In this study, prevalence of subclinical hypothyroidism was 38%.

Table-12
Sex distribution

Present Study (n=100)	Mulki Shilpa etal[5] 2012 (n=32)	Vishwanath etal[6] 2007 (n=30)
87%	56.3%	73.3%

ISSN: 0975-8585

SYMPTOM ANALYSIS: In present study 62% had easy fatiguability compared to 28.5% in Shashi etal[7] and 69.75 % in Watanakunakorn study [8], 13% had chest pain in present study compared to 3.3% in Shashi etal and 8.25 in Watanakunakorn study, 31% had weight gain in present study compared to 18% in Shashi etal and 47% in Watanakunakorn study (Table-13).

Table-13
Symptom analysis

Symptom	Present Study (n=100) %	Shashi etal[7] 2006 (n=30) %	Watanakunakorn[8] 1965
Easy fatiguability	62	28.5	69.75
Chest pain	13	3.3	8.25
Breathlessness	12	3.3	12.5
Swelling of limbs	26	46.5	-
Weight gain	31	18	47

PHYSICAL FINDINGS: 4% had bradycardia in present study compared to 7% in shashi etal & 30% in Vishwanath etal [6], 21% had diastolic hypertension in present study compared to 13.3% in Shashi etal and 23% in Vishwanath etal, 37% had thyromegaly in present study (Table-14).

Table-14
Physical signs

SIGN	Present Study (n=100) %	Shashi etal[7] 2006 (n=30) %	Vishwanath etal[6] 2007 (n=30) %
Bradycardia	4	7	30
Diastolic HTN	21	13.3	23
Thyromegaly	37	-	-

ECG CHANGES: 4% had bradycardia in present study compared to 6.6% in Shashi etal, 2% had low voltage complex in present study & 40% in Shashi etal [7], 31% had T wave changes in present study & 23.3% Shashi etal (Table-15).

Table-15
ECG changes

Changes	Present Study (n=100) %	Shashi etal[7] 2006 (n=30) %
Bradycardia	4	6.6
Low voltage complex	2	40
T wave changes	31	23.3
ST segment changes	5	3.3

ECHO CHANGES: 19% had diastolic dysfunction in present study compared to 21.4% in Mulki etal[5] & 26.67% in Vishwanath etal [6]; 3% had systolic dysfunction, 5% had LVH, 2% had regional wall motion abnormalities & 4% had pericardial effusion in present study (Table-16).

Table-16 ECHO changes			
Changes	**Present Study (n=100) %**	**Mulki Shilpa etal[5] 2012 (n=32) %**	**Vishwanath etal[6] 2007 (n=30) %**
Diastolic dysfunctn	19	21.4	26.67
Systolic dysfunctn	3	-	6.67
LVH	5	-	-
RWMA	2	-	-
Pericardial effusion	4	-	-

LIPID PROFILE: In this study, dyslipidemia was found in 41% of subjects which is very significant and known. Most common abnormalities were increase in total cholesterol and LDL cholesterol. Similar results were documented in the study by Shekhar etal [9]. Incidence of IHD in this study was 2%; compared to that in Shashi etal [7] 3.3%.

CONCLUSION

The hypothyroid patients present clinically with a myriad of symptoms and signs which are nonspecific. Hence a high index of suspicion is the key for the early diagnosis of hypothyroidism.

Hypothyroid patients have several cardiac risk factors like bradycardia, diastolic hypertension, diastolic dysfunction, dyslipidemia. Studies have shown that with treatment all the above mentioned risk factors improve.

The identification of hypothyroid patients is an important individual and public health issue. Early diagnosis and correction of hypothyroidism is necessary; so that early effects on cardiac system can be minimized.

REFRENCES

[1] Guyton AC and Hall JE. Thyroid Metabolic Hormones. Chapter 76. In: Guyton AC and Hall JE, editors. Text book of Medical Physiology. 11th ed. Pennsylvania: Saunders Elsevier; 2006: p 931-943.

[2] Brent GA, Larsen PR and Davies TF. Hypothyroidism and Thyroiditis. Chapter 12. In: Kronenberg HM, Melmed S, Polonsky AS and Larsen PR. Williams Text book of Endocrinology. 11th ed. Philadelphia: Saunders Elsevier; 2007: p 377-387.

[3] Menon UV, Sundaram KR, Unnikrishnan AG, Jayakumar RV, Nair V, Kumar H. J Indian Med Assoc. 2009; 107: 72-7.

[4] Klein I and Danzi S. Circulation. 2007; 116: 1725-1735.

[5] Mulki Shilpa, et al. Cardiovascular manifestations of hypothyroidism. Thesis submitted to RGUHS 2012. 72.

[6] Vishwanath, et al. Cross sectional study of cardiovascular manifestations of hypothyroidism. Thesis submitted to RGUHS 2007. 54.

[7] Shashi, et al. A study of cardiovascular changes in newly detected hypothyroid patients. Thesis submitted to RGUHS 2006. 65.

[8] Watana kunakorn C, Robert EH, Titus CE. Arch Intern Med 1965; 116: 183-89.
[9] Ravi Shekhar, et al. Biom Res 2011; 22 (4): 471-474
[10] Park YJ, Lee YJ, Choi SI, Chun EJ, Jang HC and Chang HJ. European J Endocrinol 2011; 165: 115–121.
[11] Razvi S, Weaver JU, Vanderpump MP, and Pearce SH. J Clin Endocrinol Metab. 2010; 95: 1734–1740.
[12] Sharma R, Sharma TK, Kaushik GG, Sharma S, Vardey SK and Sinha M. Clin Lab 2011; 57(9-10):719-24.