



“A CLINICAL STUDY OF CARDIOVASCULAR MANIFESTATIONS OF NEWLY DETECTED HYPOTHYROIDISM PATIENTS”

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ABSTRACT Hypothyroidism has significant cardiovascular manifestations. Overt and sub clinical hypothyroidism both are associated with cardiovascular dysfunction and with an increased risk of cardiovascular disease.

Objectives To study the clinical profile of cardiovascular system in hypothyroidism.

Methods One Hundred Twenty cases of newly detected primary hypothyroidism were studied from Dec 2015 to Nov 2017. Data was collected from One Hundred Twenty patients both outpatient and inpatient in this period, treated at Osmania General Hospital, Hyderabad

Results There were 120 patients, 63.3% had symptoms less than 3 months duration. Cardiovascular symptoms were present in less number of patients. Bradycardia was observed in 7% of the patients. Stage1 hypertension was noticed in 13.3% (diastolic blood pressure). Low voltage complexes in electrocardiogram were present in 40% study group. Pericardial effusion was present in 16.6% patients.

KEYWORDS : Hypothyroidism; Cardiovascular Changes; Pericardial Effusion; Diastolic Blood Pressure.

INTRODUCTION

The thyroid gland is the first endocrine gland to appear in the foetus. The thyroid gland develops from the median bud of the pharynx (the thyroglossal duct), which passes from the foramen caecum at the base of the tongue to the isthmus of the thyroid¹

The thyroid gland maintains the level of metabolism in the tissues that is optimal for their normal function²

Thyroid hormones stimulate the Oxygen consumption of most of the cells in the body, help regulate lipid and carbohydrate metabolism and are necessary for normal growth and maturation³.

Thyroid hormone also modifies the expression of other ion channels. Such as Na⁺/K⁺ - activated ATPase, Na⁺/Ca⁺⁺ exchanger, and some voltage - gated K⁺ channels, thereby coordinating the electrochemical and mechanical responses of the myocardium⁴.

Thyroid hormone produces changes in cardiac inotropism and chronotropism more rapidly than would be expected from regulation of gene expression, which usually take minutes to hours to be phenotypically and functionally appreciable, the sensitivity of the cardiovascular system of adrenergic stimulation does not seem to be substantially altered in these conditions⁵

In contrast sympathetic activation that has been consistently reported in hypothyroid patient may play a role in sustaining high diastolic blood pressure. Acute deficiency of thyroid hormones may impair smooth muscle relaxation which may lead to central arterial stiffness⁶.

Hypothyroidism may also be the sole cause of heart failure. A low heart rate, decreased myocardial contractility, and increased peripheral resistance, can all lead to low cardiac output. Further left ventricular filling may be impaired by the simultaneous presence of left ventricular hypertrophy, abnormal relaxation, and bradycardia. Heart failure may occur when peripheral metabolic demand cannot be matched by an adequate cardiac output. Heart failure is however, more common in patients with underlying cardiac disease⁷.

Staging of hypothyroidism⁸

Chu and Capro [2001] have divided the disease in following stages:
Stage a : Earliest from characterized by positive TRH test and represented by the state of normal FT₄ accompanied by a TSH level slightly above a given individual's set point but within the population reference range.

Stage b: Mild elevation of TSH from 5-10μU/ml

Stage c : Prominent elevation above 10μU/ml stage b and c have similar clinical presentation

Stage d: Overt thyroid failure defined by low FT₄ and elevated TSH usually much higher than 10 μU/ml.

AIM & OBJECTIVES

To study the clinical profile of cardiovascular system in hypothyroidism. To know the benefits of early diagnosis and correction of hypothyroidism in minimizing cardiovascular effects. To study the various ECG and Echocardiographic changes in hypothyroidism. To study the lipid profile in hypothyroidism

MATERIAL & METHODS

One Hundred Twenty cases of newly detected primary hypothyroidism were studied from Dec 2015 to Nov 2017. Data was collected from One Hundred Twenty patients both outpatient and inpatient in this period, treated at OGH Hospital, Hyderabad. Those patients who were found or suspected to be suffering from hypothyroidism on clinical evaluation and confirmed by serum TSH, T₄ and T₃ levels estimation were taken for the study. All the patients were followed up till time of discharge.

RESULTS

This study was conducted at OGH Hospital, Hyderabad for a period between December, 2015 and November 2017. One Hundred Twenty cases of newly detected hypothyroidism were selected for the study, after applying inclusion and exclusion criteria shown in the materials and methods. The observations and results of the study are presented here.

Age and Sex Distribution

Distribution of cases according to age and sex in the study population (n=120)

Age in years	Male	%	Female	%	Total	%
17-27	4	14.3	24	26.1	28	23.3
27-37	4	14.3	36	39.1	40	33.3
37-47	8	28.5	8	8.7	16	13.3
47-57	0	0	12	13.0	12	10.0
57-67	8	28.6	8	8.7	16	13.3
67+	4	14.3	4	4.4	8	6.8
Total	28	100	92	100	120	100

Maximum number of patients were in the age group of 27-37 years (33.3%), followed by age group of 17-27 years (23.3%). Mean age of the patients was 42.45 years (SD=15.7).

In the study group, 28 out of 120 patients (23.3%) were males and the remaining the 92 patients (76.7%) the females resulting in the male: female ratio of 1:3.2.

Cardiovascular symptoms in the study population (n=120)

Sl. No.	Symptoms	Male	%	Female	%
1	Chest pain	04	14.3	0	0
2	Breathlessness	0	0	04	4.3
3	Effort intolerance	08	28.5	04	4.3
4	Palpitations	0	0	04	4.3

The most common symptoms in the present study were generalized weakness and lethargy (89.1%) and pains in muscles and joints (77.4%) this is followed by facial puffiness (63.9%) and Hoarseness of voice in (57.4%) skin changes seen in (59%) cold intolerance (41.6%) slow in physical and physical activities (25.8%) constipation (20.8%) and weight gain in (18%).

Effort intolerance in (28.5%) male patients and (4.3%) in female patients chest pain was reported in only four male patients (14.3%), Breathlessness in only four female patients (4.3%) and palpitations seen in only four female patients.

Pericardial Effusion (PE) in the study population (n=120).

Pericardial effusion	Male	%	Female	%	Total	%
Absent	20	71.4	80	87	100	79.2
Present	08	28.6	12	13	20	20.8
Total	28	100	92	100	120	100

DISCUSSION

During the study period one hundred and twenty cases of hypothyroidism were newly detected. Out of which 92 were females and 28 male patients. These patients were studied for a period between December 2015 to November 2017 on basis of history, clinical signs, symptoms and investigations and recorded in the proforma.

Patients were in age group of 17-70 years, with 33.3% in age group of 3rd decade (27-37 years). Mean age of patient was 42.45 years \pm 15.7 years. In this study mean age was 42.45 \pm 15.7 years compared to Streeten D.H.P et al study where the mean age was 49.8 \pm 2.5 years.

The most common symptoms in the present study were generalized weakness and lethargy (89.1%) and pains in muscles and joints (77.4%) this is followed by facial puffiness (63.9%) and Hoarseness of voice in (57.4%) skin changes seen in (59%) cold intolerance (41.6%) slow in physical activities (25.8%) constipation (20.8%) and weight gain in (18%).

Systolic and diastolic dysfunction was noticed respectively in 6.7% and 3.3% study group. Altered lipid profile was present in 16.7% (S. cholesterol) and 53.4% (S. Triglycerides)

Comparison study of cardiovascular symptoms

Sl. No.	Symptoms	Present study	Watanakunakorn 1965 ⁹	Ameet Kumar Oswal et al 2014 ⁷
1	Chest pain	3.3%	8.25%	13%
2	Breathlessness	3.3%	12.5%	12%
3	Effort intolerance	28.5%	-	-
4	Palpitations	3.3%	-	-

Effort intolerance in (28.5%) male patients and (4.3%) in female patients chest pain was reported in only four male patients (14.3%), Breathlessness in only four female patients (4.3%) and palpitations seen in only four female patients. In Present study, 3.3% had chest pain compared to 13% in Ameet Kumar Oswal et al study and 8.25% in Watanakunakorn C, et al study. 3.3% had breathlessness compared to 12% in Ameet Kumar Oswal et al study and 12.5% in Watanakunakorn et al study^{9,10}.

In Ramesh K et al (2016) study showed cardiomegaly in 7.5% patients, bradycardia in 40% patients, low voltage complexes in 35% patients, RBBB in 7.5% patients, LBBB in 5% patients. A study showed pericardial effusion in 27.5% of patients. Echo findings were normal in 32.5% cases. Pericardial effusion was next common finding seen in 11 cases accounting to 27.5%. Diastolic dysfunction was seen in 27.5%, majority of them being mild dysfunction. No cases were found to have severe diastolic dysfunction. IVS thickness was found in only in 2 cases¹¹.

In Shashi Kanth M et al (2015) study showed Cardiomegaly on chest x-ray was seen in four male patients (14.3%) and four female patients (4.3%). Thus only 8 of the 120 patients in the study group (6.7%) showed cardiomegaly. Study showed mean and standard deviation of Total Cholesterol as 195 \pm 17.34, HDL as 30.06 \pm 5.2, LDL as 142 \pm 4.472, VLDL as 43.8 \pm 3.03, Triglycerides as 213 \pm 25.4. Present study showed mean and standard deviation of Total Cholesterol as 206.7 \pm 30.9, HDL as 54.12 \pm 6.26, LDL as 108.63 \pm 28.17, Triglycerides as 206.2 \pm 50.78. Pericardial effusion 18%, Diastolic dysfunction was seen in 18%, Systolic dysfunction was seen in 4%. No

cases were found to have severe diastolic dysfunction. IVS thickness was found in 10% cases¹²

In Rawat B et al (2003) study showed that 11 out of 20 patients (55%) of cardiac tamponade. There was striking correlation between severity of disease and pericardial effusion¹³.

CONCLUSION

- 1) 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.
- 2) Cardiovascular changes are less commonly associated with newly detected hypothyroidism.
- 3) Pericardial effusion occurs in a low percentage of newly detected hypothyroid patients.
- 4) The occurrence of pericardial effusion in hypothyroidism is significantly related to the duration of the disease; hence the need for early diagnosis of hypothyroidism.
- 5) There is no relation between thyroid profile and occurrence of pericardial effusion in hypothyroid patients.
- 6) X-ray chest is not a reliable tool of the diagnosis of pericardial effusion.
- 7) Altered lipid profile was found in the hypothyroid patients.
- 8) Quite a significant number of patients were in pre-hypertension group. Various life style modification can be advised preventing them going for stage I hypertension.
- 9) The identification of hypothyroid patients is an important individual and public health issue.
- 10) Early diagnosis and correction of hypothyroidism is necessary; so that early effects on cardiovascular system can be minimized

REFERENCES

- 1) Barry KB, Berlcovitz, Patricia Collins. Neck - Thyroid gland. Chapter 31 in the Gray's Anatomy, 39th Edition, Churchill Livingstone 2005; 560-564
- 2) Guyton C, Arthur. John E Hall. Thyroid Metabolic Hormones. Chapter 76. In text book of Medical Physiology, 11th edition, Saunders 2006; 931-943.
- 3) Reed Larsen P, Terry F Davies, Ian D Hay. Thyroid physiology and Diagnostic evaluation of patients with thyroid disorders, Chapter 10, and Hypothyroidism and Thyroiditis, Chapter 12, Williams Text book of Endocrinology, 10th Edition. W.B. Saunders Company 2003; 331-355, 423-446.
- 4) Serafino Fazio, Emiliano A. Palmieri, et al. Effects of Thyroid Hormone on the cardiovascular system. Recent progress in Hormone Research 2004; 59: 31-50.
- 5) Irwin Klein, KaieOjamaa. Thyroid Hormone and the Cardiovascular System. N Engl J. Med. 2001; 334: 7: 501-508)
- 6) Obuobie J. Smith, Evans LM, et al. Increased Central Arterial Stiffness in Hypothyroidism. JCEM 2002; 87(10): 4662-4666)
- 7) Danzi S, Klein I. Thyroid hormone and the cardiovascular system. Minerva Endocrinol 2004; 29: 139-50)
- 8) Agarwal NK, Unnikrishna AG, Singh SK, et al. Sub clinical hypothyroidism. IJEM 2003; V(1): 38-42)
- 9) Watanakunakorn C, Robert EH, Titus CE. Myxoedema. Arch Intern Med 1965; 116: 183-89
- 10) Ameet Kumar Oswal et al. Research Journal of Pharmaceutical, Biological and Chemical Sciences : RJPBCS 2014 5(3) P966-975
- 11) Ramesh K et al, A Study of cardiovascular involvement in Hypothyroidism, IAIM ,2016; 3(5) 74-80).
- 12) Shashi Kanth M et al, India Journal of basic and applied medical research: March 2015: Vol-4, Issue-2, P.111-116).
- 13) Rawat B et al, An echo cardiographic study of cardiac changes in Hypothyroidism and response to treatment. Kathmandu University Medical Journal (2003) Vol. 2, No. 3, Issue 7, 182- 187).