

A CLINICAL STUDY OF CARDIOVASCULAR CHANGES IN HYPOTHYROIDISM

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ABSTRACT

Background- Hypothyroidism is a clinical syndrome resulting from deficiency of thyroid hormones, which in turn results in generalised slowing down of metabolic processes.¹ Hypothyroidism is second most common endocrinopathy next to diabetes mellitus. Apart from other complications Cardiovascular complications² are the most profound and reproducible clinical findings associated with thyroid disease. The cardiovascular complications ranges from functional systolic/diastolic dysfunction to overt heart failure and coronary artery disease. Hypothyroidism leads to changes in cardiac contractility, myocardial oxygen consumption, cardiac output, blood pressure and systemic vascular resistance. A variety of case reports demonstrated that hypothyroidism may cause prolongation of QT interval. They can develop protein rich pericardial effusion.⁶ Hypothyroidism is an important individual and public health issue. The completely reversible nature of these complications is well known that lead to the need of this study to assess the Cardiovascular parameters in newly diagnosed hypothyroid patients and patients on treatment by performing various investigations including Echocardiography.

Aims & objectives- To evaluate the echocardiographic changes in newly diagnosed patients and patients who are taking treatment. To find out the incidence of cardiac dysfunction in newly diagnosed hypothyroid patients and the patients who are on treatment.

Material & methods- 25 newly detected hypothyroidism and 25 known cases of hypothyroidism who are on treatment for less than 4 months were taken for study, Cases were undergone for cardiovascular examination including electrocardiography and echocardiography. All patient's examination records were collected by using structured schedule (Case Report Form) and data entered in Microsoft Excel Sheet and analysed by using SPSS Software.

Results- Hypothyroidism is more common in females as compare to male. Majority of study population (34%) belonged to 21-40 years of age group. Most common clinical symptoms found were easy fatigability (62%), body swelling (42%), weight gain (38%) BMI more than 25 (34%) and dry skin (32%). Among 50 cases 30 (60%) cases had normal electrocardiographic changes.⁷ normal Echocardiographic study was observed in 20(40%) of cases. Most common Echocardiographic finding was Grade-I & Grade-II diastolic dysfunction that was found in 16 (32%) cases. Other abnormal finding were pericardial effusion found in 10% cases, Increased LV thickness (8%) and LVH (8%) followed by systolic dysfunction.

Conclusion- This study suggest that it is very important to evaluate patients of primary hypothyroidism for cardiovascular changes. prior cardiovascular investigation should be performed to improve the clinical outcomes.

Keywords- Hypothyroidism, coronary artery disease, complication, Echocardiography.

INTRODUCTION

Hypothyroidism is a common endocrine disorder resulting from deficiency of thyroid hormone. Thyroid hormones have relevant effects on cardiovascular system. Many symptoms and signs recognized in patients with hypothyroidism are due to altered action of thyroid hormone on heart and vascular system, and the related hemodynamic derangements. The cardiovascular signs and symptoms of thyroid disease are some of the most profound and clinically relevant findings that accompany both hyperthyroidism and hypothyroidism. It has long been recognized that some of the most characteristic and common signs and symptoms of thyroid disease are those that result from the effects of thyroid hormone on the heart and

cardiovascular system¹³⁻¹⁵ Although it is well known that hyperthyroidism can produce atrial fibrillation, it is less well recognized that hypothyroidism can predispose to ventricular dysarrhythmias¹⁶ In almost all cases these cardiovascular changes are reversible when the underlying thyroid disorder is recognized and treated. Thyroid hormone effects on the heart and peripheral vasculature include decreased Systemic vascular resistance and increased resting heart rate, left ventricular contractility, and blood volume. In hyperthyroidism, these combined effects increase cardiac output 50% to 300% higher than in normal individuals. In hypothyroidism, the cardiovascular effects are diametrically opposite and cardiac output may decrease by 30% to 50%. It is important to

recognize, however, that the restoration of normal cardiovascular hemodynamics can occur without a significant increase in resting heart rate in the treatment of hypothyroidism.¹⁷ There are only few studies done in our country to assess the cardiovascular parameters in hypothyroid patients. This study was done to assess the Cardiovascular parameters in new hypothyroid patients by ECG and Echocardiography.

Study aimed to find out cardiovascular changes in newly diagnosed hypothyroid patients and patients who are on treatment for less than 4 months by Cardiovascular examination including ECG and Echocardiography.

Patients of hypothyroidism presents with tiredness, weakness, dry skin, feeling cold, hair loss, constipation, hoarse voice, menstrual disturbance, signs include dry coarse skin, puffy face, bradycardia, delayed ankle relaxation etc. 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 pericardium.³ 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. Hypothyroidism is associated with decreased cardiac output and accelerated atherosclerosis and coronary artery disease. They can develop protein rich pericardial effusion. Subclinical hypothyroidism occurs in 10 - 15% of general population. Of these, symptomatic hypothyroid affects about 2% of adult women and about 0.1% to 0.2% of adultmen.^{5,6} There is evidence of decreased nitric-oxide mediated vascular relaxation in patients with subclinical hypothyroidism, as demonstrated by abnormal flow mediated vasodilatation. Hypothyroidism decreases endothelial-mediated vasodilatation and vascular compliance and thus, elevated diastolic blood pressure. Overall incidence of Hypothyroidism was 0.375 per 1000 and Incidence of Cardiovascular involvement in these patients was 67.5%. Hypothyroidism is an important individual and public health issue. Reversible nature of such complications is well known. Thus, the need of this study is to assess the CVS parameters in newly diagnosed hypothyroid patients and patients on treatment by ECG and ECHO.

MATERIAL & METHODS

This was an observational study conducted in the Department of Medicine N.S.C.B. Medical College & Hospital Jabalpur (M.P.) India during March 2017 to August 2018. 25 newly diagnosed patients with primary hypothyroidism and 25 patients who were on treatment attending NSCB Hospital, Jabalpur (M.P.) who fulfilled the inclusion criteria were included in study.. The study was done after approval from the institutional ethics committee. An informed consent was taken from the patients prior to inclusion in the study. Inclusion Criteria: Hypothyroid patients which included.

a) Newly diagnosed primary hypothyroid patients.

b) Age 12 and above.

C) patients who are treatment for less than 4 months

Exclusion Criteria

a) Patients with known cardiac disease.

b) Patients with Chronic obstructive pulmonary disorder,

severe anaemia. diabetes mellitus or any other endocrinal disorder.

c) Patients taking medications that alter the thyroid function

like beta blockers, lithium, oral contraceptive pills, steroids, amiodarone. etc.

STATISTICAL ANALYSIS

Mean and SD were used to interpret the data. The data obtained was analyzed by statistical methods using SPSS software.

RESULTS

Out of all 50 cases 34 (64%) cases were between 21-40 years of age. In this group 22 (44%) cases were newly diagnosed hypothyroidism while 12 (24%) cases were cases who are on treatment. Next common age group was 41-60 years in which total 13 (26%) cases reported in which 11 (22%) cases were cases who are on treatment while 2 (4%) cases were reported as new cases. Cases were divided into 2 groups, newly diagnosed (25 cases), cases on treatment (25 cases). In 25 cases of cases on treatment 6 (24%) cases were male, while 19 (76%) cases were female. In newly diagnosed patients of hypothyroidism 5 (20%) cases were male while 20 (80%) cases were female. The male: female ratio was 1:4. Cases were divided into 2 groups, newly diagnosed (25 cases), cases on treatment (25 cases). In 25 cases of cases on treatment 6 (24%) cases were male, while 19 (76%) cases were female. In newly diagnosed patients of hypothyroidism 5 (20%) cases were male while 20 (80%) cases were female. The male: female ratio was 1:4. There was no statically significant difference between two groups of hypothyroidisms when compared for sex ratio ($p > 0.05$). more signs and symptoms were found in newly diagnosed hypothyroid cases. In this easy fatiguability was most common symptoms which was found in 62% of hypothyroidism case. Next common finding was body swelling or edema which accounted for 42% of cases followed by weight gain (38%) and BMI > 25 found in 34% of cases. Other finding were dry skin, menstrual disturbance and neck swelling that were found in 32%, 16% and 12% of the cases respectively. Above table shows that Echocardiographic finding was normal in 20 (40%) hypothyroid cases in which 12 were on treatment. Most common abnormality in Echocardiographic finding was Diastolic Dysfunction grade I and grade II found in total 16 (32%) cases. Next common finding was pericardial effusion found in 5 (10%) cases which out of them 4 were newly diagnosed cases and 1 was old case. Other common finding were increased IV thickness + LVH

found in 8% of cases. Both systolic dysfunction and RWMA were found only in 1 (2%) of cases.

There is statistically significant value ($p < 0.05$) was found in newly diagnosed cases of hypothyroid cases

where Echocardiographic finding were Diastolic Dysfunction Grade-II and Pericardial Effusion ($p < 0.05$).

Table-1 Age wise distribution of cases

S. No	Age	Cases on treatment	Newly diagnosed cases	Total
1.	<20	0(0%)	1(2%)	1(2%)
2	21-40	12(24%)	22(44%)	34(68%)
3	41-60	11(22%)	2(4%)	13(26%)
4	>60	2(4%)	0(0%)	2(4%)
5.	Total	25(50%)	25(50%)	50(100%)

Table -2 sex wise Distribution of cases

S. No	Sex	Cases on treatment	Newly diagnosed cases	Total
1	Male	6(12%)	5(22%)	11(10%)
2	Female	19(38%)	20(78%)	39(40%)
3	Total	25(50%)	25(50%)	50(100%)

Table-3 Distribution of cases on the basis of clinical presentation

S. No	Clinical presentation	Cases on treatment (n=25)	Newly diagnosed cases (n=25)	Total (n=50)
1	Easy Fatiguability	17(34%)	14(28%)	31(62%)
2	Dry Skin	7(14%)	9(18%)	16(32%)
3	Body swelling	10(20%)	11(22%)	21(42%)
4	Weight gain	10(20%)	9(18%)	19(38%)
5	Cold intolerance	4(8%)	3(6%)	7(14%)
6	Menstrual disturbance	4(8%)	4(8%)	8(16%)
7	Neck Swelling	4(8%)	2(4%)	6(12%)
8	BMI>25	9(18%)	8(16%)	17(34%)

Table -4 Distribution of cases according to Echocardiographic changes

S. No.	Echo findings	Grade	Newly diagnosed Case(n=25)	Cases on treatment (n=25)	Total	Chi square analysis
1	Normal		12(24%)	8(16%)	20(40%)	P=0.77
2	Diastolic dysfunction	G1	4(8%)	4(8%)	8(16%)	P=1
3		G2	2(4%)	6(12%)	8(16%)	P=0.05
4		G3	0(0)	0(0)	0(0)	P=1
5		G4	0(0)	0(0)	0(0)	P=1
6	Pericardial effusion		4(8%)	1(2%)	5(10%)	P=0.042
7	Increased thickness	IV	2(4%)	2(4%)	4(8%)	P=0.480
8	RWMA		0	1(2%)	1(2%)	P=0
9	Systolic dysfunction		1(2%)	0(0%)	1(2%)	P=0
10.	LVH		0	3(6%)	3(6%)	P=.157

DISCUSSION

our study more than 60% cases were found to have clinically significant cardiovascular changes. The study population consisted of males and females between the ages of 15- 65 years (Table 1). Overall, there was preponderance of female patients consisting of 90% of total study population (Table 2). In our study sex ratio (female: male) was observed to be 4:1. In our study normal Echocardiographic Study was found in 40% cases while in study done by Shashikant et al (2015)³³ it was 50%, Ramadevi et al (2016)³¹ 42% Shrivastava et al (2017)⁴⁰, 35% & Ramesh et al (2016)²⁶ 32.5% respectively. This study of normal echocardiography is approximately similar and consistent to study done by above authors. In our study LV diastolic dysfunction was observed in 32% cases. Similar result was observed in study done by Shashikant et al (2015)³³ 18%, Ramadevi et al (2016)³¹ 16%, Shrivastava et al (2017)⁴⁰ 20% and in Ramesh et al (2016)²⁶ it was 22.5% respectively.

In this study diastolic dysfunction observed in maximum number of abnormal echo study as compared to other study this could be due to the cases taken in the study which have more sign and symptoms of heart failure like Fatigue body swelling and increased body weight which is more common in female patients. In present study Pericardial effusion was observed 10% cases done by Shashikant et al (2015)⁷ reported 18%. Ramadevi et al (2016)¹² 24% Shrivastava et al (2017)⁷, 16.6% & Ramesh et al (2016)⁹ 27.5% respectively. A relatively low incidence of pericardial effusion was observed in present study. This may be due to earlier detection of hypothyroidism in the present days as result of routine use of thyroid function tests. Nevertheless, in a patient with undiagnosed pericardial effusion, hypothyroidism should be ruled out. In present study Systolic dysfunction was observed 2% cases. This finding consistent with other study done by Shashikant et al (2015)⁸ reported 4% Ramadevi et al (2016)⁹ 0% Shrivastava et al (2017)¹⁰ 0%, Ramesh et al (2016)¹¹ 7.5%. In present study increase IVS thickness was observed 8% cases. This finding is consistent with other study done by Shashikant (2015)³⁸ 10% Ramadevi et al (2016)³¹ 3%, Shrivastava et al (2017)¹⁰ 11.1% & Ramesh et al (2016)⁹ 5%. In present study regional motion wall abnormality was observed in 1(2%) case. In study done Shashikant et al (2015)³³ reported 10%. Ramadevi et al (2016)¹² 3%, Shrivastava et al (2017)¹⁰ 11.1% & Ramesh et al (2016)⁹ 5%. The result of present study is not consistent with this study probably due to the echocardiographic study is performed in 2D echo machine.

CONCLUSION

This study suggests that it is very important to evaluate patients of primary hypothyroidism for cardiovascular changes that prior investigation could be performed to improve the clinical outcomes. Any unexplained pericardial effusion should be screened for hypothyroidism. Also all patients who were found to

have the ECG and Echocardiographic changes as reported above should be screened for presence of hypothyroidism.

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