



## Pattern of Various Echocardiographic Abnormalities in Hypothyroidism

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### ABSTRACT

**BACKGROUND-** Hypothyroidism is a very widespread disease and their effects on alteration of cardiovascular homeostasis are well known. Echocardiographic changes are one of them and same what we are going to assess here in our study so if we could know the frequency of their occurrence we can keep those in mind while dealing a case of hypothyroidism and can early diagnose them and can intervene on time.

**AIMS AND OBJECTIVES-** To assess the prevalence of pattern of various echocardiographic abnormalities in newly diagnosed patients of hypothyroidism and whether there is any difference in their occurrence between overt and subclinical hypothyroid group.

**MATERIALS AND METHODS-** A cross-sectional, observational study in which two hundred newly diagnosed patients of hypothyroidism were studied in GMC & Hamidia Hospital Bhopal which were divided into two subgroups overt (OH) and subclinical hypothyroidism (SH) among which various echocardiographic abnormalities were compared.

**RESULTS-** In our study we found that all abnormal findings in CDECHO are more prevalent in OH group than in SH, with a normal echo study observed in 66.5% cases. There is statistically significant difference observed among two groups in pericardial effusion and increased IVSD thickness but not in diastolic dysfunction.

**CONCLUSION-** By keeping these in mind we should evaluate a hypothyroid patient for these changes if he or she is having cardiac symptoms related to these or vice-versa so that they can be addressed adequately in the form of proper treatment earlier than the usual diagnosis because all these alterations are reversible by their own after a patient becomes euthyroid.

**Keywords:** echocardiography, hypothyroidism, diastolic dysfunction, pericardial effusion

### INTRODUCTION

Hypothyroidism is one of the most common endocrinal problems encountered in our clinical practice. The cardiovascular signs and symptoms of thyroid disease are some of the most profound and clinically relevant findings that accompany both hyperthyroidism and hypothyroidism. Many symptoms and signs recognized in patients with hypothyroidism are due to altered action of thyroid hormone on heart and vascular system<sup>[1,2,3]</sup> includes effect on SVR, heart rate, left ventricular contractility which are manifested as accelerated atherosclerosis,

ventricular septal hypertrophy, diastolic hypertension, increased systemic vascular resistance, impaired cardiac contractility, diastolic dysfunction, decreased cardiac output and pericardial effusion. The physiological chronotropic response and normal tension of the heart muscle in diastolic phase depend on the proper expression of tri-iodothyronine in the heart cells and its stimulating influence on Na<sup>+</sup> K<sup>+</sup> ATPase and Ca<sup>2+</sup> ATPase in endoplasmic reticulum. Moreover, proper tri-iodothyronine expression in the cardiac muscle affects the number of  $\beta$ -adrenergic

receptors and their sensitivity to catecholamines. The good thing is that in almost all cases these cardiovascular changes are reversible when the underlying thyroid disorder is recognized and treated.

**MATERIALS AND METHODS:** Observational cross-sectional study was conducted on 200 newly diagnosed hypothyroid patients came to medicine OPD, GMC and associated Hospital Bhopal. Based upon their symptoms, signs and relevant clinical examination all those suspicion of hypothyroidism and also met the inclusion criteria (not having previous cofounding disease like any cardiac or pulmonary disease, diabetes, hypertension, smoker, liver or renal pathology, active infection, pregnant women, on antithyroid drugs, steroids, beta blockers) ordered for T3,T4,TSH by ELISA. Those patients who had TSH value more than 5.5microIU/ml have been selected and a written informed consent is taken

#### Observation and Results:

about the participation in the study after which divided in two groups based on their thyroid profile. Patients having raised TSH (>5.5microIU/ml) but normal T3 (08-2.1ngm/ml) and T4 (5-13microgm/dl) are considered subclinical hypothyroid and patients having raised TSH(>5.5microIU/ml)and T3 or/and T4 are considered overt hypothyroid. CDECHO was done using “My LAB Seven, serial No. 200051, Mod No. 6400, software version-7.1” with adult probe/transducer (SP2430) of 1-4Hz frequency by a cardiologist. The assessment used MS Excel 2007, MS word 2010 and statistical calculations were done by Epi-info 7 software. The variables were expressed using percentages and wherever necessary Mean  $\pm$ SD for quantitative data. The simple statistical test chi-square was performed for comparison between two groups and p-value less than 0.05 was taken as significant.

TABLE NO.1

CHARACTER	OVERT HYPOTHYROIDISM PATIENTS (n=90)	SUBCLINICAL HYPOTHYROIDISM PATIENTS (n=110)	p –VALUE.
Sex (M/F)	19/71	20/90	0.7332
Age (in years)	36.82 $\pm$ 7.94	36.53 $\pm$ 7.10	0.4463
BMI (kg/m <sup>2</sup> )	25.40 $\pm$ 3.71	22.60 $\pm$ 1.91	0.0000*
Pericardial effusion	22.22%	7.27%	0.0047*
Diastolic dysfunction	18.89%	8.18%	0.0531
Increased IVSD	27.78%	5.45%	0.0000*

(\*) shows statistically significant values; p<0.05.

Above table shows the spectrum of clinical variables of the patients in our study who were grouped among overt and subclinical hypothyroidism. The quantitative data are shown by Mean  $\pm$ SD (standard deviation) and the categorical data by the percentage (%).the significance is shown by p-value in the last coloum.

TABLE NO.2

#### Distribution of Patients by Pericardial Effusion

Hypothyroid status	PERICARDIAL EFFUSION				TOTAL
	absent		present		
Overt	77.78%	70	22.22%	20	90
subclinical	92.73%	102	7.27%	8	110
TOTAL		172		28	200

The present study shows 22.22% of overt hypothyroid patients whereas only 7.27% of subclinical hypothyroid patient have pericardial effusion. Most of the patients in subclinical group (92.73%) have no effusion reported. The difference between two groups is statistically significant ( $p=0.0047$ ).

**TABLE NO.3****Distribution of Patients by Diastolic Dysfunctional**

Hypothyroid status	DIASTOLIC DYSFUNCTION						TOTAL
	Absent		Mild		Moderate (grade 2)		
			(grade 1)				
Overt	81.11%	73	11.11%	10	7.78%	7	90
Subclinical	91.82%	101	6.36%	7	1.82%	2	110
TOTAL		174		17		9	200

The study shows 18.89% overt hypothyroid patients have diastolic dysfunction in which 11.11% have grade 1 and 7.78% are of grade 2 severity. Whereas in subclinical group it present only in 8.18% patients, 6.36% being in grade 1 and 1.82% (2 patients only) in grade 2. The difference between the two group is statistically non-significant ( $p=0.0531$ ).

**TABLE NO. 4****Distribution of Patients by Interventricular Wall Diastolic (Ivwd) Thickness**

Hypothyroid status	INTERVENTRICULAR WALL DIASTOLIC (IVWD) THICKNESS				TOTAL
	Increased		Normal		
Overt	27.78%	25	72.22%	65	90
subclinical	5.45%	6	94.55%	104	110
TOTAL		31		169	200

The study shows in overt study group 27.78% and in subclinical group only 5.45% patients having increased IVWD thickness rest of the patients shows no change in the interventricular wall thickness.

The difference between two groups is statistically significant ( $p=0.000$ ).

**DISCUSSION:** The prevalence of hypothyroidism in current study according to sex follows traditional pattern of female predominance in all 200 patients (80.50% female versus 19.50% male). But the distribution of sex between two groups is not statistically significant ( $p=0.7332$ ). The mean age in OH is  $36.82 \pm 7.94$  while in SH it is  $36.53 \pm 7.10$  showing not much difference. Most SH patients (91.82%) having their BMI in normal range while a large fraction of patients (37.78%) in OH are overweight or obese. In a previous study[4] about

64% cases had changes observed in echocardiographic examination, the most common finding being Diastolic Dysfunction seen in 20% cases followed by Pericardial Effusion and Increased IVSD thickness in 16.6% cases each. Initial assessment in the same study done by Prashant et al<sup>[4]</sup> revealed a normal Echocardiography in 35% of patients whereas in another study it was 32.5% by Ramesh et al but in our study it is 66.5%. In the study done by Prashant et al pericardial effusion(PE) was found in 16.6% cases whereas it was 18% in a study by Shashikanth<sup>[5]</sup> and there was a striking correlation between severity of disease and pericardial effusion. Here in our study, we found PE in about 14% patients in which 22.22% was in OH and 7.27% in SH group, the difference is statistically significant(0.0047). Diastolic dysfunction in a study

by R.Verma<sup>[6]</sup> and Shashikanth<sup>[5]</sup> was reported in 27% & 18% patients respectively, whereas in our study this was found in 13% patients, 18.89% in OH and 8.1% in SH group but the difference is insignificant ( $p=0.05351$ ). Various walls of ventricles also changes in dimension due to alterations in the cardiovascular hemodynamics. We took the interventricular septal wall thickness in diastole (IVSD) in our study. Increased IVSD thickness is found in 16.6% by Preshant et al<sup>[4]</sup> and in 10% by shashikanth<sup>[5]</sup> whereas in our study increased thickness is found in a total of 15.5% patients, 27.78% in OH & 5.45% in SH which is very significant ( $p=0.000$ ).

**CONCLUSION:** From our study this can be concluded that cardiovascular parameters are definitely affected by hypothyroid state which is correlated with the severity of the condition. We found that all abnormal findings in CDECHO are more prevalent in OH group than in SH, with normal echo study observed in 66.5% cases. There is statistically significant difference among two groups in all variables taken in the study except diastolic dysfunction although the prevalence observed is just double in OH group in comparison of SH. So the chance of developing these complications should be kept in mind while dealing with a new case of hypothyroidism or during its natural history or if there is under-treatment state so that we can order the relevant investigation and if comes to be abnormal can treat the condition (the hypothyroidism, hence the pathology will automatically remitted) earlier before sufferings of patient increase. Also true is the vice-versa that is if one finds any of the complication sited in our study during the clinical practise, he or she should screen the patient for thyroid status if even a little suspicion arises. This all will lead to a reduction in unexplained morbidity related with the hypothyroidism.

**LIMITATIONS:** Cross sectional nature and small sample size was the main limitations of the present study. A further large case-control study has to be performed in the future to confirm the results of this present study.

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**ETHICAL APPROVAL:** The study was approved by the Institutional Ethics Committee, GMC Bhopal.

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