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Investigational Profile in Case of Subclinical Hypothyroidism and its Effect on Cardiovascular System

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Abstract: ***Introduction: Subclinical hypothyroidism (also known as compensated hypothyroidism or mild hypothyroidism) is a condition associated with a raised serum concentration of thyroid stimulating hormone (TSH) but a normal serum free thyroxine (FT4).1 Hypothyroidism leads to hypercholesterolemia due to increased level of LDL cholesterol. Aim: to determine ECG, ECHO and lipid profile changes in case of subclinical hypothyroidism. Methodology: This was a cross sectional observational study conducted on 40 patients at outpatient medicine department of SSG hospital, Vadodara. Results: In majority of patients, total cholesterol, HDL, LDL and VLDL were deranged. Triglycerides were within normal limits.24 (60.00%) patients had grade 1 LV diastolic dysfunction. No abnormality was detected in only 16 out of 40 patients (40.00%). Conclusion: There is association between Lipid Profile changes and 2D Echo changes. There is no major ECG change in patients with subclinical hypothyroidism. Subclinical Hypothyroidism can be considered as independent risk factor of cardiovascular system morbidity.***

Keywords: Hypothyroidism, lipid profile, cardiac changes,

1. Introduction

Subclinical hypothyroidism (also known as compensated hypothyroidism or mild hypothyroidism) is a condition associated with a raised serum concentration of thyroid stimulating hormone (TSH) but a normal serum free thyroxine (FT4).1 Prevalence of subclinical hypothyroidism is 6 - 8% in women (10% over 60 year of AGE) and 3% in men.

Though subclinical hypothyroidism can affect various organ system Cardio vascular system is a major target.2, 3, 4 Hypothyroidism produces a decrease in myocardial contractility, pericardial effusion, increase in left ventricular mass and prolonged duration of contraction and relaxation. When lasting more than 6 - 12 months, SH may be associated with an atherogenic lipid profile, a hypercoagulable state, a subtle cardiac defect with mainly diastolic dysfunction, impaired vascular function, and reduced submaximal exercise capacity. The deviation from normality usually increases with serum TSH level ('dosage effect' phenomenon).[5, 6]

Hypothyroidism leads to hypercholesterolemia due to increased level of LDL cholesterol, Total cholesterol and trigylcerides. Restoration of euthyroidism by levothyroxine (LT4) treatment may correct the lipid profile and cardiac abnormalities, especially in patients with an initially higher deviation from normality and higher serum TSH levels.7, 8 Importantly, a strong association between SH and atherosclerotic cardiovascular disease, independent of the traditional risk factors, has been recently reported in a large cross - sectional survey (the Rotterdam Study). However, whether SH confers a high risk for cardiovascular disease, and whether LT4 therapy has a long - term benefit that clearly outweighs the risks of overzealous treatment in these individuals, The current study was planned to determine ECG, ECHO and lipid profile changes in case of subclinical hypothyroidism.

2. Methodology

This was a cross sectional observational study conducted on 40 patients at outpatient medicine department of SSG hospital, Vadodara. Following were the inclusion and exclusion criteria.

Inclusion Criteria: Any patients having subclinical hypothyroidism attending OPD of medicine department with age more than 18 years.

Exclusion Criteria: The following patients were excluded from the study

1) Patients with known cardiac disorder
2) Patients who had hypertension
3) Diabetes mellitus,
4) Renal failure
5) Pregnancy
6) Hyperthyroidism on treatment
7) Cholesterol lowering agents and on drugs like Amiodrane, lithium & levothyroxine
8) Age less than 18 years

3. Results

40 patients with subclinical hypothyroidism were included in the study. ECG findings, ECHO findings and lipid profile were noted.36 (90.00%) patients were females and 4 (10.00%) patients were males.

Table 1: Distribution of demographic characteristics of study subjects

Demographic characteristics	Frequency	Percentage
Gender		
Female	36	90.00%
Male	4	10.00%
Age(years)		
Mean±SD	35.9±11.6	
Median(25th-75thpercentile)	35(27.25-45.25)	
Range	18-65	

Table 2: Descriptive statistics of thyroid profile of study subjects

Thyroid Profile	Mean± SD	Median (25th-75th percentile)	Range
Serum TSH (mIU/mL)	7.8±1.18	7.7(7.075-8.425)	5.6-9.8
Free T3 (pg/mL)	3.83 ±0.36	3.8(3.548-4.12)	3.12-4.43
Free T4 (ng/dL)	1.3±0.23	1.34(1.115-1.462)	0.86-1.67

Mean value of serum TSH (mIU/mL), free T3 (pg/mL) and free T4 (ng/dL) of study subjects was 7.8 ± 1.18, 3.83 ± 0.36 and 1.3 ± 0.23 with median (25^{th} - 75^{th} percentile) of 7.7 (7.075 - 8.425), 3.8 (3.548 - 4.12) and 1.34 (1.115 - 1.462) respectively.

Table 3: Distribution of lipid profile of study subjects

Lipid Profile	Frequency	Percentage
Total cholesterol (mg/dL)		
Deranged	23	57.50%
Normal	17	42.50%
Mean±SD	204.32±41.21	
Median (25^{th}-75^{th} percentile)	207.5(167.75-238.25)	
Range	125-278	
Triglyceride(mg/dL)		
Deranged	19	47.50%
Normal	21	52.50%
Mean±SD	144.05±50.83	
Median (25^{th}-75^{th} percentile)	142(99.75-169)	
Range	74-278	
HDL(mg/dL)		
Deranged	26	65.00%
Normal	14	35.00%
Mean±SD	41.5±12.16	
Median (25^{th} -75^{th} percentile)	37(33.5-48.25)	
Range	28-79	
LDL(mg/dL)		
Deranged	21	52.50%
Normal	19	47.50%
Mean±SD	121.33±46.43	
Median(25^{th}-75^{th} percentile)	112.5(89.338-163.55)	
Range	49.4-215.6	
VLDL(mg/dL)		
Deranged	14	35.00%
Normal	26	65.00%
Mean±SD	29.38±14	
Median(25^{th}-75^{th} percentile)	23.3(18.75-33.2)	
Range	14.8-59	

In majority of patients, total cholesterol, HDL, LDL and VLDL were deranged. Triglycerides were within normal limits.

Table 4: Distribution of 2D Echo of study subjects

2DEcho	Frequency	Percentage
No abnormality detected	16	40.00%
Grade1LVdiastolicdysfunction	24	60.00%
Total	40	100.00%

24 (60.00%) patients had grade 1 LV diastolic dysfunction. No abnormality was detected in only 16 out of 40 patients (40.00%).

Table 5: Distribution of ECG of study subjects

ECG	Frequency	Percentage
No abnormality detected	35	87.50%
Low voltage complexes	1	2.50%
Sinus brady cardia	3	7.50%
Sinus tachy cardia	1	2.50%
Total	40	100.00%

In majority (35 (87.50%)) of patients, no abnormality was detected in ECG findings followed by sinus bradycardia (3 (7.50%)). Low voltage complexes and sinus tachycardia was seen in only 1 out of 40 patients (2.50%) each.

Distribution of grade 1 LV diastolic dysfunction was comparable with lipid profile. (**Total cholesterol (mg/dL):** - Deranged (56.52%) vs Normal (64.71%) (p value=0.601), **Triglyceride (mg/dL):** - Deranged (73.68%) vs Normal (47.62%) (p value=0.093), **HDL (mg/dL):** - Deranged (57.69%) vs Normal (64.29%) (p value=0.685), **LDL (mg/dL):** - Deranged (52.38%) vs Normal (68.42%) (p value=0.301) and **VLDL (mg/dL):** - Deranged (64.29%) vs Normal (57.69%) (p value=0.685).

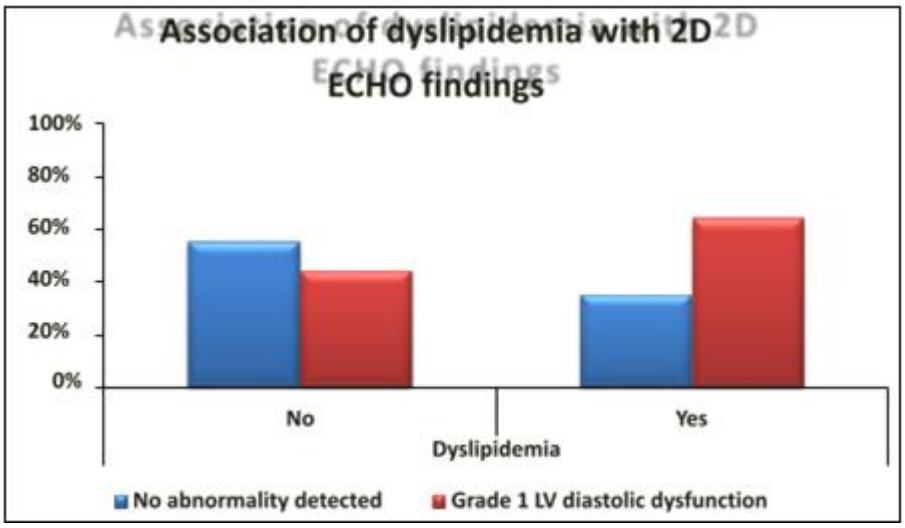

Figure 1: Association of dyslipidemia with 2D ECHO findings

Table 6: Association of lipid profile with ECG findings

Lipid profile	No abnormality detected (n=35)	Abnormal (n=5)	Total	P value
Total cholesterol(mg/dL)				
Deranged	19(82.61%)	4(17.39%)	23(100%)	0.373*
Normal	16(94.12%)	1(5.88%)	17(100%)	
Triglyceride(mg/dL)				
Deranged	15(78.95%)	4(21.05%)	19(100%)	0.172*
Normal	20(95.24%)	1(4.76%)	21(100%)	
HDL(mg/dL)				
Deranged	23(88.46%)	3(11.54%)	26(100%)	1*
Normal	12(85.71%)	2(14.29%)	14(100%)	
LDL(mg/dL)				
Deranged	18(85.71%)	3(14.29%)	21(100%)	1*
Normal	17(89.47%)	2(10.53%)	19(100%)	
VLDL(mg/dL)				
Deranged	12(85.71%)	2(14.29%)	14(100%)	1*
Normal	23(88.46%)	3(11.54%)	26(100%)	

***Fisher's exact test**

4. Discussion

Dyslipidemia in overt hypothyroidism is clearly established, and studies have shown beneficial effects of treatment with levothyroxine on dyslipidemia in these subjects.

However, studies on the effects of SCH on lipid profile and beneficiary effects of treatment in these patients are controversial. Hence, this topic is still open for further studies. There was female preponderance in the study with 90% female and 10% male which is comparable with study conducted by Mubashir Alam Khan et al.[9]

In study conducted by Manoj Kumar et al10, 87 patients with subclinical hypothyroidism (SCH) and 101 age and sex matched euthyroid controls were evaluated which showed following results: Total cholesterol (TC) and low density lipoprotein (LDL - C) are higher in patients with subclinical hypothyroidism (SCH) as compared to euthyroid individuals. Other lipid like Triglycerides (TG) and very low density lipoprotein cholesterol (VLDL - C) may be marginally elevated whereas high density lipoprotein cholesterol (HDL - C) may be slightly reduced in these patients as compared to euthyroid individuals which are comparable with my study.2D Echo findings of my study showed that 60% of patients have grade 1 LV diastolic dysfunction which was comparable with study conducted by Haridose Sripriya Vasudevan et al11 in which a total of 84 patients with newly diagnosed drug naïve hypothyroidism were selected, of which 80 patients who fit the inclusion criteria of age >18 years of age, with subclinical hypothyroidism thyroid - stimulating hormone (TSH) >5.5 µ IU/ml with normal FT4 and FT3), or overt hypothyroidism were included which also showed similar results

5. Conclusion

Subclinical hypothyroidism have deranged lipid profile in form of raised Total Cholesterol and LDL and low HDL.2D Echo in patients of subclinical hypothyroidism shows Grade 1 LV diastolic dysfunction. There is association between Lipid Profile changes and 2D Echo changes. There is no major ECG change in patients with subclinical hypothyroidism. Subclinical Hypothyroidism can be considered as independent risk factor of cardiovascular system morbidity.

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