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ORIGINAL RESEARCH

Cardiovascular Risk Assessment of Patients with Subclinical Hypothyroidism, Including Framingham Score, hsCRP, ECG &2D Echo

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ABSTRACT

Background: Hypothyroidism is usually a progressive disease impacting almost all the bodily functions. Hypothyroidism is diagnosed when low levels of the thyroid hormones result in elevated levels of thyroid-stimulating hormone (TSH), whereas subclinical hypothyroidism (SCH) is diagnosed when TSH levels are elevated above the upper limit of the assay reference range with normal thyroid hormone levels. As the heart is the main target of thyroid hormone activity, hypothyroidism may precipitate or aggravate heart failure, influencing heart rate and blood pressure (BP) while increasing cardiovascular (CV) stiffness and also cardiomegaly. Subclinical hypothyroidism can cause changes in cardiovascular function same as observed in overt hypothyroidism there by indicating that cardiac effects progress from subclinical disease through overt hypothyroidism.

Aims and objectives: To study the effect of subclinical hypothyroidism on clinical, biochemical and cardiac profile in the patients aged between 18 to 80 years in tertiary care centre.

Materials and methodology: The present cross-sectional study was conducted in the department of General Medicine by recruiting the patients aged between 18 to 80 years, willing to give consent and are newly diagnosed subclinical hypothyroidism patients among in-patients and out-patients attending Rajarajeswari Medical College and Hospital.

Results: Out of 100 patients included in our study, 74 patients were found to be at lower risk, 26 patients at intermediate and high risk. . Age, Obesity and Co-morbid conditions has significant positive association with the CVS risk. Moderately significant changes were observed in the ECG and 2D Echo changes among the patients with high-risk category than those with low and intermediate risk.

Conclusion: All the study subjects were at risk of developing cardiovascular complication in their future based on the Framingham Risk Score. Although, the incidence of SCH was found to be common among young age group, the CVS risk score was increased with the age. Hence, we advocate that all the patients diagnosed with SCH must be screened for CVS risk assessment to initiate the early treatment and avoid the further complications.

Keywords: Subclinical hypothyroidism, thyroid-stimulating hormone, cardiac profile, Framingham Risk Score.

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INTRODUCTION

Hypothyroidism is usually a progressive disease impacting almost all the bodily functions. Primary Hypothyroidism is diagnosed when low levels of the thyroid hormones result in elevated levels of thyroid-stimulating hormone (TSH), whereas subclinical hypothyroidism (SCH) is diagnosed when TSH levels are elevated above the upper limit of the assay reference range with normal thyroid hormone levels.[1] Hypothyroidism affects between 4% and 10% of the population, and the prevalence of subclinical hypothyroidism is reported to be as high as 10% in various studies.[2,3]

The well-established all independent risk factors for cardiovascular disease are high body mass index, hypertension, diabetes and dyslipidaemia. Whereas hsCRP is known to be a useful predictor of cardiovascular risk.[4,5]

It is often used for prognosis and risk scoring. Even subclinical hypothyroidism is found to increase these risk factors and hence the cardiovascular diseases. Also, recent researchers have tried to find out whether CRP is elevated in subclinical hypothyroidism.[6]

As the heart is the main target of thyroid hormone activity, hypothyroidism may precipitate or aggravate heart failure, influencing heart rate and blood pressure (BP) while increasing cardiovascular (CV) stiffness and also cardiomegaly.[5] Subclinical hypothyroidism can cause changes in cardiovascular function same as observed in overt hypothyroidism there by indicating that cardiac effects progress from subclinical disease through overt hypothyroidism.[7]

Many clinical researches have shown that the most frequently encountered cardiac abnormality in subclinical hypothyroidism is left ventricular diastolic dysfunction.[6-8] Despite the intuitive appeal of the relationship between elevated TSH levels or SCH and adverse cardiovascular (CV) outcomes, it remains unclear whether variations in thyroid hormone levels within the normal range are also associated with mortality endpoints.[9] The optimal TSH cut-off values and clinical significance of these subclinical abnormalities are even more controversial. Typically, the treatment of SCH is considered only for patients who are pregnant, infertile, exhibit associated symptoms, or have a high risk of progression to overt hypothyroidism. Although there is a high prevalence of SCH, the evidence supporting screening for this disorder and the benefits and risks of its treatment remain controversial. Therefore, the primary goal of the present clinical study was to assess current evidence regarding SCH and its cardiovascular effects and to evaluate the mechanisms that are likely to underlie this relationship.

AIMS AND OBJECTIVES

To study the effect of subclinical hypothyroidism on

- Clinical: signs and symptoms
- Biochemical investigation profiles such as hsCRP, Lipid profile
- Cardiac profile: ECG and 2D Echo

In the patients aged between 18 to 80 years in tertiary care centre.

MATERIALS AND METHODOLOGY

The present cross-sectional study was conducted in the department of General medicine department by recruiting the patients aged between 18 to 80 years willing to give consent and are newly diagnosed subclinical hypothyroidism patients among inpatients and outpatients attending RajarajeswariMedical College and Hospital.

Inclusion criteria

- Patients willing to participate in the study

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- All the individuals of both gender aged between 18 to 80 years newly diagnosed subclinical hypothyroidism patients.
- Well controlled diabetics and hypertensive patients diagnosed with SCH.

Exclusion criteria

- Patients who are already on treatment for hypothyroidism
- Patients with TSH >10
- Cases of known and newly diagnosed overt hypothyroidism
- Any other thyroid related illness in past
- Known cases of cardiovascular diseases such as IHD/RHD/CHD with previous history of thyroid dysfunction
- Patients with any other concomitant and severe illness which might alter the thyroid hormone levels
- Pregnant and lactating females

Method of data collection

- Clinical examination and laboratory measurements
- Clinical data including BMI, Blood pressure and family history of dyslipidemia and Diabetes.
- Thyroid Hormone tests were done by chemiluminescent immunometric assay.The subjects were screened according to Framingham Criteria between the TSH range of 4.510mU/l

Risk Level†	Initiate Treatment If:	Primary Target (LDL-C)	Alternate Target
High FRS ≥20%	• Consider treatment in all *(Strong, High)*	• ≤2 mmol/L or ≥50% decrease in LDL-C *(Strong, Moderate)*	• Apo B ≤0.8 g/L or • Non-HDL-C ≤2.6 mmol/L *(Strong, High)*
Intermediate FRS 10-19%	• LDL-C ≥3.5 mmol/L *(Strong, Moderate)* • For LDL-C <3.5 mmol/L consider if: • Apo B ≥1.2 g/L • OR Non-HDL-C ≥4.3 mmol/L *(Strong, Moderate)* • *Men ≥50 and women ≥60 with 1 risk factor: low HDL-C, impaired fasting glucose, high waist circumference, smoker, hypertension*	• ≤2 mmol/L or ≥50% decrease in LDL-C *(Strong, Moderate)*	• Apo B ≤0.8 g/L or • Non-HDL-C ≤2.6 mmol/L *(Strong, Moderate)*
Low FRS <10%	• statins generally not indicated	• statins generally not indicated	• statins generally not indicated
Statin-indicated conditions**	• *Clinical atherosclerosis** • *Abdominal aortic aneurysm* • *Diabetes mellitus* *Age ≥ 40 years* *15-Year duration for age ≥ 30 years (DM1) Microvascular disease* • *Chronic kidney disease (age ≥ 50 years) eGFR <60 mL/min/1.73 m2 or ACR > 3 mg/mmol*		

Image: Risk stratification by Framingham scoring

- Informed consent
- All the patients fulfilled selection criteria and were explained about the details of the disease process, options of treatment, ultimate outcome, possible effects, complications and chance of recurrence in both procedure and a written informed consent was obtained before the enrolment.
- Sample size: Sample of convenience. Due to COVID 19 surge during our study period, the case collection was interrupted. However, we had recruited 100 newly diagnosed SCH patients between 1st Jan 2021 to 30th Dec 2021.
- After obtaining the Ethical committee clearance from the Institution Ethics committee, Rajarajeshwari Medical College and Hospital, all the patients suspected of hypothyroidism

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were screened by subjecting them for thyroid profile, after which the subjects fulfilling the above inclusion criteria were selected for the study. Each subject was made one visit to the study hospital during which detailed medical history, physical examination, systemic examinations and relevant investigations were carried out.

- General physical examination including vitals such as pulse rate, blood pressure, Systemic examination of cardiovascular, abdomen, nervous system, and respiratory system were done. Patients were examined, investigated and evaluated for subclinical hypothyroidism and also cardiac risk by Framingham score was assessed.
- The essential investigations as part of our study included,

1. T3, T4, TSH
2. Lipid Profile
3. BMI
4. hsCRP
5. ECG and
6. 2D Echo

- Sample size -100
- Sample size calculation
- Yamane equation (for population size)
- (Sample size)n=N
- 1+Ne2
- Where N=population size
- E=margin of error
- For 95%confidencelevel,margin error =0.05

RESULTS

All the tabulated results were subjected for Framingham Risk Score assessment. Each component was given the score based on the criteria; the total score was calculated. After analyzing the data, we observed that few of the parameters varied widely among the patients who were found to be higher cardiac risk. Hence, we divided the patients into two groups. low risk group as Group A, and intermediate risk, higher risk score as Group B. Based on the analyzed score, we found that out of 100 SCH patients included, 74 patients (74%) were at lower risk (Group A), 26 patients (26%) were of intermediate and high risk (Group B).

- All the demographic as well as laboratory investigations were compared between these two groups and represented as table, as well as graphs as represented below.

Table 1: Distribution of age

Parameters	**Group A**	**In %**	**Group B**	**In %**
Minimum age	28		48	
Maximum age	53		64	
Average age	45.63 ±6.8		62.4± 3.4	
P value	**<0. 01**			
28 to 37 years	34	34%	0	0.0%
38 to 47 years	30	30%	4	4%
48 to 57 years	10	10%	14	14%
58 to 67 years	0	0.0%	8	8%

- We did not find any patients aged between 28 to 3 7 years in Group B and none among Group A were aged between 58 to 67 years. 34(34%) in group A were aged between 28

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to 37, 30 (30%) 38 to 47 years and the rest 10 (10%) were aged between 48 to 57 years. Whereas in Group B, 4 patients were aged between 38 to 47 years, 14 were aged between 48 to 57 years and 8 patients were 58 to 67 years.

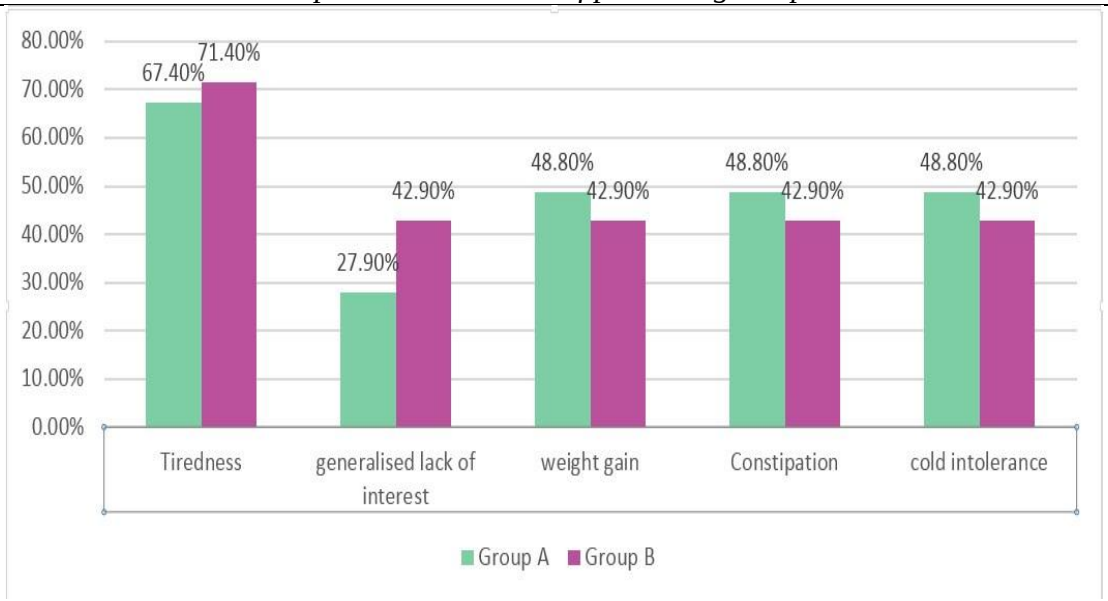
- The average age of the patients in Group A was 45.63±6.8 years and Group B it was 62.4±3.4 years. We found that this difference was significant. Hence, we can assess that the patients aged >47 years are at high risk of developing CVS events if they develop subclinical hypothyroidism. Whereas we could also analyse that subclinical hypothyroidism is most common among the patients aged <47 years.

Table 2: Distribution of gender among the study population

Gender	Group A	In%	Group B	In %
Male	29	39.2	9	34.7
Female	45	608	17	65.3

Out of 100 recruited patients, there were 45 (60.8%) female and 29(39.2%) male patients in group A, whereas in Group B, 17 (65.3%)female and 9(34.7%) male subjects, clearly indicating female preponderance.

Graph 1 : Distribution of presenting complaints



In the above graph, Group B, 22/26 (84.6%) had complained about tiredness and 6 (23%) each had generalized lack of interest, weight gain, constipation and cold intolerance.

Table 3: BMI Distribution

Parameter	Group A	Group B	P value
Average	24.35±4.1	25.8±9.3	0.48
Lean: <18.5	Nil	Nil	
Normal: 18.5 to 22.9	22 (29.8%)	Nil	
Overweight: 23 to 24.9	52(70.2%)	10(38.4%)	
Obese: >24.9	0	16 (61.5%)	
P value	0.0002		

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Above table explains the distribution of BMI between the two groups. We can see that none of the patients had lean BMI. Whereas 22 (29.8%) in group A has normal BMI and 52(70.2%) were overweight and none were obese, whereas in group B 38.4% were overweight, 61.5% were obese and none had normal BMI clearly indicating intermediate or high risk patients according to Framingham score, the patients were either obese or overweight.

Graph 2: Distribution of history of diabetes

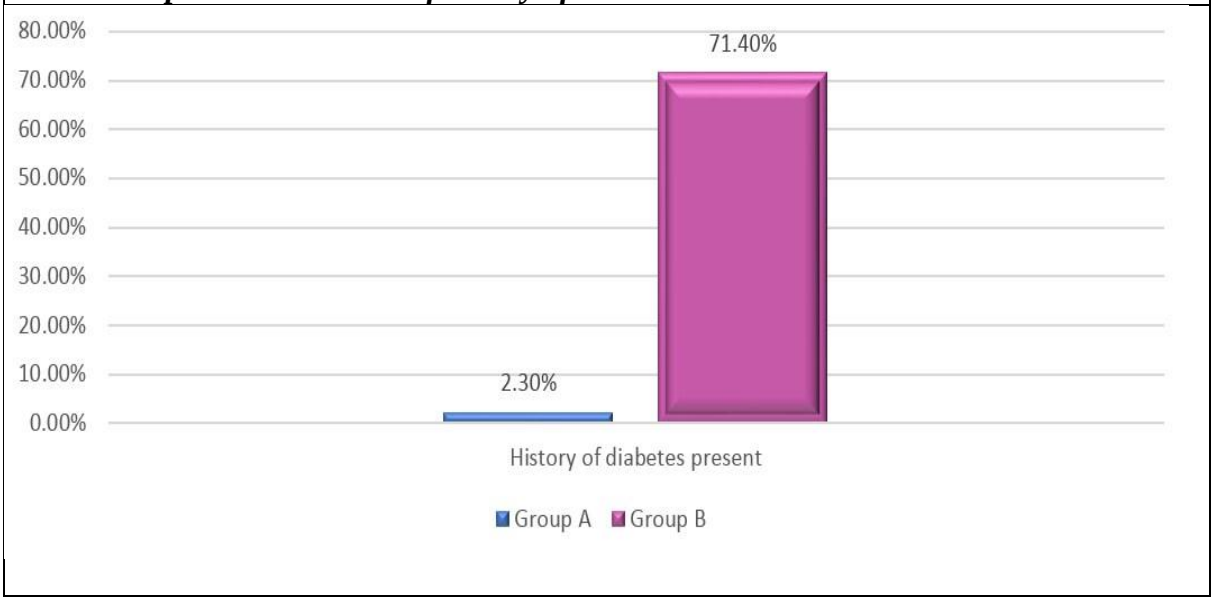

Table 4: Distribution of systolic BP				
Parameter	**Group A**	**In%**	**Group B**	**In%**
<120	6	8.1	0	0
121-130	46	62.1	3	11.5
131-140	12	16.2	16	61.5
141-150	0	0	4	15.3
Average SBP	122.37 + 62.5		139.3 +12.8	
P Value <0.001				

In group B, 3 had their SBP <131 mmHg. Whereas 16 (61.5%) of them had SBP between 131 to 140 and the rest 4(15.3%) patients had SBP between 141 to 150 mmHg. Whereas in Group A, 6 (8.1%), <120, 46 (62.1%), <130 and 12 (162%) < 140 SBP, The average SBP of the patients in Group A was 122.37±62.5 mmHg and of group B was 139.23±12.8. There was significant difference between the average SBP between two groups.

Table 5: Distribution of DBP				
Parameter	**Group A**	**In%**	**Group B**	**In%**
<70	0	0	0	0
71-80	43	58.1	0	0
81-90	31	41.8	22	84.6
91-100	0	0	4	15.4
Average DBP	78.54+12.6		80.89+8.1	
P Value <0.001				

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In group B, 22(84.6%) and 4 (15.38%) had their DBP between 81- 90 and 91-100 mm Hg respectively, whereas in group A , 43(58.1%) of the population had DBP between 70—80 mm Hg, followed by 31 (41.8%) DBP in the range of 81-90 mm Hg.

Table 6: Distribution of ECG / 2D Echo findings				
Parameter	**Group A**	**In%**	**Group B**	**In%**
ECG Normal	44	59.4	6	26
ECG Abnormal	30	40.5	10	43.4
P Value 0. 21				
2D Echo Normal	46	62.1	9	39.1
2D Echo Abnormal	28	31.8	14	60.8
P Value 0.066				

Table 7: Distribution of average components of lipid profile and CRP					
Parameter	**Group A**		**Group B**		**P Value**
	Mean	**SD**	**Mean**	**SD**	
Average CHL	189.81	46.75	237.14	23.85	<0.001
Average LDL	127.63	18.82	170	14.5	<0.001
Average TGL	125.98	23.89	165.43	18.86	<0.001
Average HDL	71	6.75	53.95	9.86	<0.001
CRP	10	3.5	10	2.5	0.13

Above is the distribution of lipid profile and the CRP between two groups. All the parameters have been presented as mean and SD. The average cholesterol in group A and B was 189±46.75 and 237.14±23.85 respectively. The average LDL as 127.63±18.82 and 170±14.5 in group A and B respectively. Average TGL was 125.98±23.89 and 165.43±18.86 in group A and B respectively. The average HDL in group A and B were 71±6.75 and 53.95±9.86 respectively. The parameters of lipid profile were significantly higher among Group B except HDL, which was higher among Group A.

The CRP between two groups was 10±3.5 and 10±2.5 respectively in group A and group B. We did not find any significant different in CRP levels.

DISCUSSION

Subclinical hypothyroidism (SCH) has been one of the most common findings in general population, with female predominance. Subclinical hypothyroidism is postulated to affect the Cardiovascular system in several ways[10].Perturbation of the lipid profile is thought to be due to effects of an altered adipokine profile on low-density lipoprotein (LDL) receptor affinity and lifespan and inadequate T3-mediated signaling leading to lower levels of cholesterol ester transfer protein which is responsible for LDL to HDL conversion[11]. Decreased nitric oxide production and sensitivity of vascular endothelial cells, along with decreased thermogenesis, are thought to be partly responsible for the elevated systemic vascular resistance seen. Also, the evidences have suggested that managing these patients with L thyroxine have reduced the risk of CVS complications[12]

Those factors along with altered myocyte intracellular calcium handling leading to cardiac diastolic dysfunction are postulated to be responsible for the increased morbidity due to congestive heart failure seen. Endothelial dysfunction along with altered pro/anticoagulant factors are considered most likely to be the cause of increased risk of embolic events.[13,14] Also,

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we came across many evidences which had explained the ECG changes and haemodynamic changes associated with subclinical hypothyroidism but none of the clinical trials have conducted the study by considering cardiac risk assessment tool.

Hence, we conducted a study to analyze the associated clinical, biochemical and cardiovascular risks among patients diagnosed with SCH based on the Framingham Risk Score. Although **Kim EJ et al** assessed 10-year cardiovascular risk among the patients with SCH in their study based on Framingham heart criteria, they had considered the patients with TSH >10 also, the present study is different than that as we had analyzed and stratified our study population based on Framingham heart criteria for 10-year cardiovascular risk, only among the patients whose TSH is between 4 to 10 µU/ml.[15]

We observed that few of the parameters varied widely among the patients who were found to be at higher cardiac risk based on the Framingham Risk Score. Hence, we divided the patients into two groups, low risk as Group A and those with intermediate and higher risk as Group B. Based on the analyzed score, we found that out of 100 patients included, 74 patients were found to be at lower risk, 26 patients intermediate and at high risk. So, the number of patients in group A was 74 and Group B was 26 patients.

We did not find any patients aged between 28 to 37 years in Group B and none among Group A were aged between 58 to 67 years. 34 (39.5%) each in group A were aged between 28 to 37 years and 30 (30%) between 38-47 years, the rest 10 (20.9%) were aged between 48 to 57 years. Whereas in Group B, 4(15.3%) of 26 patients, 14 (538%) were aged between to 48 to 57 years, and the rest 8 (307%) were aged between 58 to 67 years. The minimum and maximum age of the patients in group A was 28 and 53 whereas in group B, it was 48 and 64 respectively.

The average age of the patients in Group A was 45.63±6.8 years and Group B it was 62.4±3.4 years. We found that this difference was significant. Hence, we can assess that the patients aged >47 years are at high risk of developing CVS events if they develop subclinical hypothyroidism. Whereas we could also analyze that subclinical hypothyroidism is most common among the patients aged <47 years. Another study by **Gourmelon R et al** also reported that the incidence of SCH is common among younger patients than elders [16]. Even another clinical study by **Nair SN et al** has found that the average age of their patients with SCH being 49±15.1 years, which is almost similar to our findings.[10]. Similarly, one of the recent epidemiological survey by **Unnikrishnan AG et al** also had reported that 46 ± 14.68 years was the average age of the patients diagnosed with hypothyroidism.[17]

They further have stated that this could be due to the symptoms manifesting in elders will be coinciding with other age-related pathologies, hence there might be chances of missing the incidence of SCH among them. So, they stated that it is important to screen them by suggesting the thyroid profile. The same was observed in a clinical study conducted by **Deshmukh V et al**[18]With respect to the cardiac risk, similar to our observation, **Tayal B et al** also had reported that the common age group of thyroid disorders associated with CVS risk being 52±17 years.[19] Out of overall 38 male and 62 female patients, patients in the study population, in Group A, 29/74 (39.2%%) were males and 45/74 (60.8%%) were females. In group B, 9/26 (34.7%) were males and 17 (65.3%%) were females. This finding was in consistent with the study taken by **Tayal B et al(20)** was supported by another evidence **UnnikrishnanAG et al, Nair SN et al** and **Deshmukh V et al** also. [10,17,18]

In the present study, tiredness was the most common symptom in both groups. In group A, (67.4%) of them had complained of tiredness followed by 21 each with weight gain, constipation and cold intolerance. The rest 12 patients had complained of generalized lack of interest. Whereas in group B, (71.4%) had complained about tiredness and (42.9%) each had generalized lack of interest, weight gain, constipation and cold intolerance. We found that (25.6%) of the patients had presented with palpitation and (9.3%) with pallor in Group A. Symptomatology of our study was almost similar to the findings of **Goyal V et al ,**tiredness was the common finding among patients with SCH and 27% of their patients had odema. Also,

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bradycardia was one of the common findings in their study among the patients with hypothyroidism.[20]

There were significantly higher number of obese patients in Group B. As our observation, **Goyal V et al** also reported the significant association between the SCH patients and weight gain.[20]This observation was also complimented by **Sami A et al** who has stated that increased TSH is associated with weight gain and further associated risks[21], They have also explained that there will increased LDLs and TGs due to metabolic effect of TSH leading thereby the cardiovascular risks.

Only two patients in group A had given the history of diabetes whereas in group B, 12 out of 26 (46.1%) had given the history of diabetes. Here the patients with history of Diabetes was significantly higher among the high risk group 74.1%. than intermediate risk (16.6%) score. Similar to our findings, **Nair SN et al** also has observed prevalence of DM was comparatively higher among cases than controls in their study but they had not done subgroup analysis among the SCH patients with CVS risks and without CVS risks.[10] Also, a clinical evidence **Asvold BO et al** had stated that patients with high TSH among SCH are at higher risk of developing increased BP in future.[22]Contrast to our observations, **Duan Yu et al** did not find any correlation between the CVS risks and the incidence of comorbid conditions among the SCH patients in their study.[23]

As per our observation, in Group A, 6 (8.1%) of the patients had their SBP <120, 46 (62.1%) between 120-130, 12 (16.2%) between 131-140 mm Hg, none above 140, with an average SBP of 122.37 mm Hg.

In group B, none had their SBP <120 mmHg. Whereas 3 (11.5%) had 120-130, 16 (61.5%), between 130-140, and 4 (15.3%) had 141-150 mm Hg SBP, with an average SBP of 139.3mm Hg, indicating a statistically significant (p value < 0.001) between the groups.

In group A, 43(58.1%) of the population had their DBP between 70 to 80 mmHg followed by 31 (41.8%). Whereas in group B, 22 (84.6%) and 4 (15.4%) had their DBP between 81 to 90 and 91 to 100 mmHg respectively.

The average DBP of patients in Group A and B were 78.54±12.6 and 86.59±8.1 respectively, with the significant difference of p <0.001. In group A, 39/43 (90.7%) of the patients had observed with HR between 60 to 100, followed by 3 (7%), >100 and the rest one patient had HR <60 bpm. Whereas in Group B, all the seven patients had their HR between 60 to 100. The average HR was 75.12±9.9 and 76.57±7.85 in Group A and Group B respectively, with no statistically significant difference. This observation was inconsistent with the findings of **Duan Yu et al** and **Walsh JP et al** who had reported that there was no association between blood pressure with SCH but they had not done subgroup analysis.[23,24] Whereas the metaanalysis by **CaiYF et al** had observed that SCH is strongly associated with increased blood pressure and hence the related cardiovascular events[25]. Even the clinical analysis by **Canbolat PI et al** had observed that SCH has been one of the independent risk factors for hypertension but the average TSH among their study samples was 10±5.1.[26]

About the distribution of lipid profile and the CRP between two groups: All the parameters have been presented as mean and SD. The average cholesterol in group A and B was 189.81±46.75 and 237.14±23.85 respectively. The average LDL was 127.63±18.82 and 170±14.5 in group A and B respectively. Average TGL was 125.98±23.89 and 165.43±18.86 in group A and B respectively. The average HDL in group A and B were 71±6.75 and 53.95±9.86 respectively. The parameters of lipid profile were significantly higher among Group B except HDL, which was higher among Group A.

The CRP between two groups was 10±3.5 and 10±2.5 respectively in Group A and group B. We did not find any significant difference in CRP levels. Even the analysis by **Sami A etal** also have explained the same outcome among the patients with increased TSH.[21]. Various clinical studies had been determined that this deranged lipid profile is the major concern among the SCH patients because of which they are tend to develop the Cardiovascular risks in future.

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In group A, (59.6%) of the patients had normal ECG and (31.9%) had abnormal ECG. Whereas (63.8%) of them were found with normal 2D echo findings and the rest (21.3%) with abnormal 2D echo.

In group B, (42.9%) of them had normal ECG and (57.1%) had abnormal ECG. (57.1%) had abnormal 2D echo findings in Group B, though there was no highly significant difference found, we could observe the moderate significant of p 0.066.

Out of 30 patients with abnormal ECG in Group A, 12 (12.8%) had sinus bradycardia and six each had low voltage waves and T wave inversion. Two were found to be having flat T wave, QTc prolongation and slow progression of T waves. Whereas in Group B, 4/8 (50%) had sinus bradycardia and two were presented with low voltage waves and QTc prolongation. Similar to our study, **Tayal B et al** also had observed that the patients with subclinical hypothyroidism had significantly slower heart rate but they had reported comparatively higher QTc than euthyroid patients. Also, they observed that the ECG changes are significant among female patients[(19)].Also, **Zhang et al** had found that QRS complex, increased QT interval and Bradycardia were the most common ECG changes observed with hypothyroid patients, being positively associated with TSH levels. They had even observed J wave pattern in one of their patients[(27)].**Araque KA et al** had reported a patient with high TSH level with T wave inversion which had corrected after 8 weeks of thyroid supplementation.[(28)]**Jadhav et al** was another hospital based cross sectional clinical study with similar objective of ours had reported that Mean QTc interval was significantly increased among the patients with SCH but there was no significant change observed with average PR and QRS intervals.[(29).]

Similarly, **Galetta F et al** also observed similar changes in ECG of the patients with SCH and it was significantly associated with the increased TSH.[(30)]

CONCLUSION

By the above discussion, we can analyze that SCH has major impact on cardiovascular health. SCH has been commonly associated with, Obesity, Diabetes, Dyslipidemia, higher Systolic & Diastolic BP, all responsible for increased Framingham Score. We also could demonstrate abnormal ECG & 2D findings though of marginal significance. All these are responsible for increased cardiovascular mortality & morbidity in SCH patients. Hence, screening and managing the patients accordingly is the important aspect among the patients with SCH.

BIBLIOGRAPHY

1. Danzi S, Klein I. Thyroid disease and the cardiovascular system. *Endocrinology MetabClin North Am.* 2014;43:517–28.
2. Kiein I, Ojamaa K. Thyroid hormone-targeting the heart. *Endocrinology.* 2001;142:11–2.
3. DuntasLH, Chiovato L. Cardiovascular Risk in Patients with Subclinical Hypothyroidism. EurEndocrinol. 2014 Aug;10(2):157-160.
4. Akil L, Ahmad HA. Relationships between obesity and cardiovascular diseases in four southern states and Colorado. J Health Care Poor Underserved. 2011;22(4 Suppl):61-72.
5. Habib SS, A Al Masri A. Relationship of high sensitivity C-reactive protein with presence and severity of coronary artery disease. Pak J Med Sci. 2013 Nov;29(6):1425-9.
6. Suh S, Kim DK. Subclinical Hypothyroidism and Cardiovascular Disease. EndocrinolMetab (Seoul). 2015 Sep;30(3):246-51.
7. KahalyGJ, Dillmann WH. Thyroid hormone action in the heart. Endocr Rev. 2005 Aug;26(5):704-28.
8. Mohr-Kahaly S, Kahaly G, Meyer J. KardiovaskuläreWirkungen von Schilddrüsenhormonen [Cardiovascular effects of thyroid hormones]. Z Kardiol. 1996;85 Suppl 6:219-31.
9. Vargas-Uricoechea H, Sierra-Torres CH. Thyroid hormones and the heart. HormMolBiolClinInvestig. 2014 Apr;18(1):15-26.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

10. Nair SN, Kumar H, Raveendran M, Menon VU. Subclinical Hypothyroidism and Cardiac Risk: Lessons from a South Indian Population Study. Indian J EndocrinolMetab. 2018 Mar-Apr;22(2):217-222.
11. Rizos CV, Elisaf MS, Liberopoulos EN. Effects of thyroid dysfunction on lipid profile. Open Cardiovasc Med J. 2011;5:76-84.
12. GluvicZM, Obradovic MM, Milovanovic EMS, Zafirovic SS, Radak DJ, Essak MM et al. Regulation of nitric oxide production in hypothyroidism. Biomed Pharmacotheraphy. 2020;124:1-8
13. Dillmann W. Cardiac hypertrophy and thyroid hormone signaling. Heart Fail Rev. 2010 Mar;15(2):125-32.
14. Niknam N, Khalili N, Khosravi E, Nourbakhsh M. Endothelial dysfunction in patients with subclinical hypothyroidism and the effects of treatment with levothyroxine. Adv Biomed Res. 2016 Mar 16;5(1):38-42.
15. Kim EJ, Lyass A, Wang N, . et al. Relation of hypothyroidism and incident atrial fibrillation (from the Framingham Heart Study). *Am Heart J*. 2014. January; 167 1: 123– 6
16. Gourmelon R, Donadio-Andréi S, Chikh K, Rabilloud M, Kuczewski E, Gauchez AS et al. Subclinical Hypothyroidism: is it Really Subclinical with Aging? Aging Dis. 2019 Jun 1;10(3):520-529
17. Unnikrishnan AG, Kalra S, Sahay RK, Bantwal G, John M, Tewari N. Prevalence of hypothyroidism in adults: An epidemiological study in eight cities of India. Indian J EndocrinolMetab. 2013 Jul;17(4):647-52.
18. Deshmukh V, Behl A, Iyer V, Joshi H, Dholye JP, Varthakavi PK. Prevalence, clinical and biochemical profile of subclinical hypothyroidism in normal population in Mumbai. Indian J EndocrinolMetab. 2013 May;17(3):454-9.
19. Tayal B, Graff C, Selmer C, KragholmKH, Kihlstrom M, Nielsen JB et al. Thyroid dysfunction and electrocardiographic changes in subjects without arrhythmias: a crosssectional study of primary healthcare subjects from Copenhagen. BMJ Open. 2019 Jun 21;9(6):e023854.
20. Goyal V, Goyal S, A study of electrocardiographic changes in thyroid disorders : Int J Med Res Rev 2016;4(4):486-490.
21. Sami A, Iftekhar MF, Rauf MA, Sher A. Subclinical Hypothyroidism among local adult obese population. Pak J Med Sci. 2018 Jul-Aug;34(4):980-983.
22. Asvold BO, Bjøro T, VattenLJ. Associations of TSH levels within the reference range with future blood pressure and lipid concentrations: 11-year follow-up of the HUNT study. *Eur J Endocrinol.* 2013;169:73–82
23. Duan Yu, Peng W, Wang X. et al. Community-based study of the association of subclinical thyroid dysfunction with blood pressure. *Endocrine.* 2009;35:136–142.
24. Walsh JP, Bremner AP, Bulsara MK. et al. Subclinical thyroid dysfunction and blood pressure: a community-based study. *ClinEndocrinol (Oxf)* 2006;65:486–91.
25. CaiYF, Shi JP. Meta analysis on the relationship between subclinical hypothyroidism and the levels of systolic blood pressure. *Zhonghua Liu Xing Bing XueZaZhi.* 2011;32:55–9.
26. Canbolat PI, Belen E, Bayyigit A, Helvaci A, Kilickesmez K. Evaluation of Daily Blood Pressure Alteration in Subclinical Hypothyroidism. ActaCardiol Sin. 2017 Sep;33(5):489494.
27. Zhang Y, Post WS, Cheng A, Blasco-Colmenares E, TomaselliGF, Guallar E. Thyroid hormones and electrocardiographic parameters: findings from the third national health and nutrition examination survey. PLoS One. 2013 Apr 12;8(4):e59489.
28. Araque KA, Smith MJ, Walsh BM. T-wave inversions on ECG as primary manifestation of Hashimoto's disease. Case report. BMJ. 2016;1:1-4
29. Jadhav V, KammarKF. Electrocardiographic changes in subclinical hypothyroidism. Natl J Physiol Pharm Pharmacol 2020;10(06):488-490.

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30. Galetta F, Franzoni F, Fallahi P, Rossi M, Carpi A, Rubello D, Antonelli A, Santoro G. Heart rate variability and QT dispersion in patients with subclinical hypothyroidism. Biomed Pharmacother. 2006 Sep;60(8):425-30