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A study of lipid profile (total cholesterol, tgl, ldl) among clinical hypothyroids and subclinical hypothyroids

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***Abstract*---**Background: Thyroid diseases are the commonest endocrine disorders in the world. Thyroid hormones are among the most imperative humoral factors involved in setting the basal metabolic rate on a long rate on a long term basis in target tissues such as liver, heart. Kidney and brain. The prevalence of subclinical thyroid dysfunction is higher than that ofovert thyroid dysfunction. In general hypothyroidism is associated with hyper cholesterolemia mainly due to elevation of LDL –C levels. This study was done on the lipid profile among clinical and sub clinical hypothyroids. Materials and methods: A total of 400 subjects were analyzed to get a total of 50 clinical hypothyroids pts; 50 subclinical and 50 healthy individuals based on their thyroid profile and detailed history. Patients were taken from outpatient department at KIMS and RF with respect to inclusion and exclusion criteria and lipid profile was measured. Results: In hypothyroidism, it was observed that in hypothyroidism, there is hypercholesterolemia, increased triglycerides and LDL levels which is more in clinical hypothyroids compared to subclinical hypothyroids. Conclusion: We conclude that hypothyroidism causes worsening of dyslipidemia, more in clinical hypothyroid than in subclinical hypothyroid patients.

***Keywords*---**Dyslipidemia, hyper-cholesterolemia, Thyroid diseases, Thyroid hormones.

Introduction

Hypothyroidism is a common form of thyroid disease which is highly prevalent in India, with 1 in 10 people in the country diagnosed with the condition. It is estimated thatmore than 200 million people at a minimum have thyroid disease worldwide. The prevalence of thyroid dysfunction in adults in the general

population ranges from 1 to 10% . Thyroid disease prevalence increases with age and is more common in women. The prevalence of hypothyroidism varies from 0.9 to 17.5% in India. The prevalence of subclinical thyroid dysfunction is higher than that of overt thyroid dysfunction. Thyroid hormones are involved in the regulation of basal metabolic state and in oxidativemetabolism.

Aims and objectives

To estimate and compare serum total cholesterol, high density lipoproteins, triglycerides, LDL i.e., lipid profile in subclinical versus clinical hypothyroidism.

Materials and Methods

Design of the Study: It is a case control study.

Patient selection:

For this study a total of 400 subjects were analyzed to get a total of 50 clinical hypothyroid patients, 50 subclinical hypothyroid patients and 50 healthy individuals based on their thyroid profile and detailed history. Patients were taken from outpatient department at KIMS and RF.

Inclusion Criteria:

Recently detected or poorly controlled hypothyroid patients.Age eligible for the study --------20 years to 60 years.
Males and females were taken in 1: 1 ratio.

Exclusion Criteria:

Patients with any other metabolic abnormalities, hypertension, diabetes mellitus, renal and hepatic disorders were excluded from the study. Other conditions like pregnancy and lactation were also excluded. Subjects taking drugs effecting thyroid hormone levels and lipid profile levels were also excluded.
Clinical history was taken from all the subjects participating in the study. General examination of these patients including weight, height, heart rate and blood pressure measurement was done and recorded in a structured protocol format.

Ethical Clearance:

Before commencement of the work, ethical clearance was obtained from the Institutional Ethics committee. Written consent was taken from cases and control subjects.

Study was carried out under 3 groups: Group A: 50 normal healthy individuals
Group B: 50 diagnosed cases of subclinical hypothyroidism Group C: 50 cases of clinical hypothyroidism
General health characteristics such as age, smoking status etc. were investigated by aself-administered questionnaire.

Collection of blood sample:

About 5ml of fasting venous blood from all subjects was collected aseptically from antecubital vein into clot activator containing vaccutainers. Serum was then separated by centrifugation at 3000 rpm for 10 minutes and was kept at $4^{O}C$ until analysis was carried out.

Parameters measured:

- TRIGLYCERIDES (TG) GPO trinder method
- TOTAL CHOLESTEROL (T CHO) – CHOD – PAP method
- HIGH DENSITY LIPOPROTEINS (HDL) – PHOSPHO TUNGSTIC ACID method
- LOW DENSITY LIPOPROTEINS (LDL) – FRIEDEWALD Formula

Review of Literature

In general, overt and sub clinical hypothyroidism is associated with hypercholesterolemia mainly due to elevation of LDL- C levels, whereas HDL-C levels are normal or even elevated. Levels of total and LDL cholesterol tend to increase, as the thyroid function declines. Therefore, hypothyroidism constitutes a significant causeof secondary dyslipidemia.

Basher Ahmad Laway.et. al. in 2014 conducted a study to assess difference in lipid profile parameters between subjects with and without subclinical hypothyroidism in North Indian population and observed high total cholesterol, triglycerides and VLDL concentration.

Liu XL..et. al.in 2014 performed a meta-analysis to investigate the association between subclinical hypothyroidism and lipid profiles. Meta-analysis suggested that the serum total cholesterol, LDL, TG were significantly increased in patients with subclinical hypothyroids compared with euthyroid individuals.

Ting Jin and Xiaochun Teng gave an update on lipid metabolism and thyroid levels in 2014. In it he stated that in overt hypothyroidism, serum levels of total cholesterol, LDL levels are slightly increased normal or decreased Lipoprotein an Apo Bremnant of VLDL and chylomicron levels are increased Manoj Kumar. et.al. in 2016 conducted a study with an aim to assess lipid abnormalities in patients of subclinical hypothyroidism and investigated the relationship between lipid profile and TSH. It was found that total cholesterol and LDL cholesterol were higher in patients with subclinical hypothyroidism compared to euthyroid

patients. Other lipids like TG and VLDL were marginally elevated but HDL may be slightly decreased in these patients as compared to euthyroids. A positive correlation between LDL and total cholesterol with TSH was observed.

Another study on serum lipid profile in subclinical hypothyroidism was conducted by Vishwal Indravadan Patel. et.al. in 2016.It was found that cholesterol and LDL were higher and HDL was lower in subclinical hypothyroidism as compared to healthy controls. A significant correlation was found between the levels of TSH and serum cholesterol and a significant correlation was found between levels of TSH and HDL.

In the year 2016, a study was conducted to assess the levels of lipid parameters in patients with thyroid dysfunction and to study the association between thyroid dysfunction and lipid profile by Sangeeta N. et al. From the study it was concluded that total cholesterol, LDL concentration, Triglycerides were significantly increased while HDL concentration was decreased in patients with hypothyroidism as compared to control group.

Sashi A and Sharma N conducted a study to investigate the contributory role of clinical and subclinical hypothyroidism in causing dyslipidemia. The patients with clinical hypothyroidism exhibited a significant increase in concentration of total cholesterols, LDL, TG whereas HDL showed decrease in concentration in comparison to euthyroid controls. Subclinical hypothyroid patients revealed significant increase in concentration of total cholesterols, LDL, TG and non-significant decrease in HDL.

Indu Prasad. et.al.conducted a study on serum lipid status in subclinical hypothyroidism and found that dyslipidemia is more common in subclinical hypothyroidism as compared to controls. Further it was observed that there is TSH dependent increase in total cholesterol, LDL, VLDL and TG levels.

Observation and Results

Table showing comparison of mean total cholesterol (mg/dl)among controls, subclinical and clinical hypothyroids

S.No	Controls	Subclinical Hypothyroidism	Clinical Hypothyroidism
1	162	232	257
2	190	190	201
3	175	200	182
4	169	185	199
5	180	190	224
6	156	210	257
7	171	240	273
8	184	260	190
9	160	200	274
10	172	190	255
11	184	200	212
12	190	150	242

13	171	190	261
14	230	210	198
15	150	190	244
16	169	230	200
17	180	250	164
18	171	170	198
19	155	200	279
20	179	155	213
21	150	245	220
22	169	175	270
23	189	180	214
24	156	222	279
25	174	200	194
26	196	195	200
27	164	175	222
28	159	150	253
29	174	240	267
30	181	180	241
31	150	260	250
32	175	270	217
33	156	250	280
34	169	190	249
35	173	200	232
36	154	200	214
37	145	198	229
38	170	170	230
39	168	150	257
40	150	200	211
41	145	140	200
42	160	170	240
43	190	210	219
44	178	190	259
45	138	250	264
46	130	210	211
47	170	240	201
48	174	170	209
49	140	160	240
50	140	230	282
Mean	167.70	201.2	231.54
S.D	17.68	32.38	29.99
p	>0.10	0.004	>0.10

Table showing comparison of mean triglycerides (mg/dl) amongcontrols, subclinical and clinical hypothyroids

S.No	Controls	Subclinical Hypothyroidism	Clinical Hypothyroidism
1	124	198	255
2	132	154	182
3	89	172	170
4	123	243	192
5	120	165	220
6	129	241	241
7	142	174	162
8	112	159	114
9	105	210	182
10	116	144	240
11	124	195	237
12	145	201	201
13	97	121	245
14	119	200	220
15	137	198	250
16	124	210	234
17	99	195	200
18	98	149	250
19	101	135	180
20	124	200	197
21	104	215	200
22	116	165	212
23	88	214	242
24	124	154	250
25	116	190	180
26	97	180	170
27	121	220	260
28	100	198	230
29	89	200	212
30	76	124	190
31	98	201	180
32	124	235	240
33	132	219	250
34	90	200	260
35	105	173	242
36	140	224	234
37	90	201	280
38	88	212	202
39	101	210	220
40	107	180	217
41	110	195	280
42	110	147	219
43	170	154	200
44	120	199	204

45	121	220	270
46	119	169	250
47	98	183	230
48	95	159	200
49	96	140	210
50	115	190	208
Mean	112.6	186.71	218.36
S.D.	18.289	29.8	33.35
P	>0.10	0.006	>0.10

Table showing comparison of mean hdl(mg/dl) among controls,subclinical and clinical hypothyroids

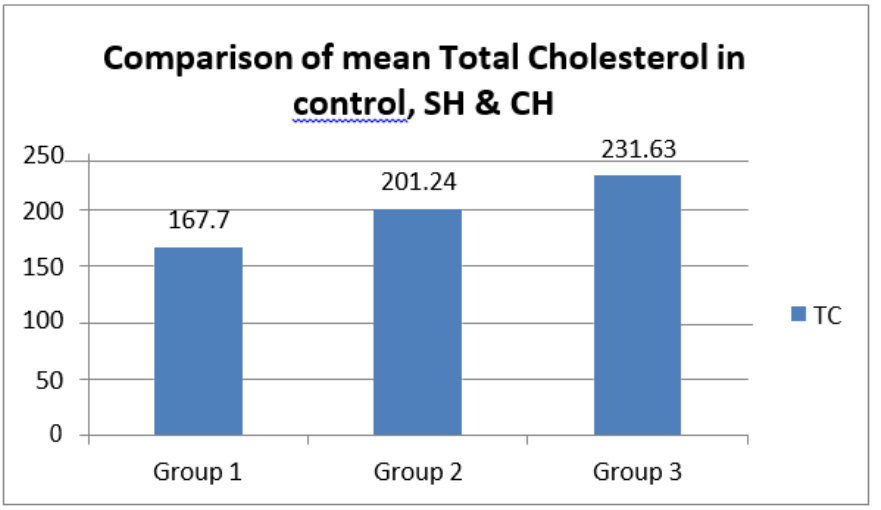
S.No	Controls	Subclinical Hypothyroidism	Clinical Hypothyroidism
1	40	25	42.81
2	45	29	40
3	46	30	37
4	49	40	35
5	50	42	30
6	44	24	44
7	53	20	35
8	50	25	40
9	42	25	37
10	45	40	32
11	42	20	45
12	50	44	42
13	49	24	47
14	38	20	30
15	48	20	38
16	48	20	39
17	45	25	44
18	42	43	45
19	40	31	42
20	45	40	40
21	45	48	40
22	45	37	44
23	40	45	47
24	44	50	50
25	40	49	43
26	42	25	39
27	41	30	40
28	40	40	35
29	39	35	37
30	47	36	39
31	45	30	32

32	49	42	44
33	53	49	49
34	40	40	37
35	44	25	35
36	35	29	43
37	40	25	44
38	44	43	49
39	42	47	48
40	40	25	44
41	40	35	45
42	40	29	39
43	44	31	44
44	42	30	40
45	44	25	39
46	44	31	42
47	48	38	47
48	44	29	44
49	40	30	40
50	44	27	39
Mean	43.92	32.44	40.85
S.D	3.94	8.56	4.84
p	0.028	>0.10	>0.10

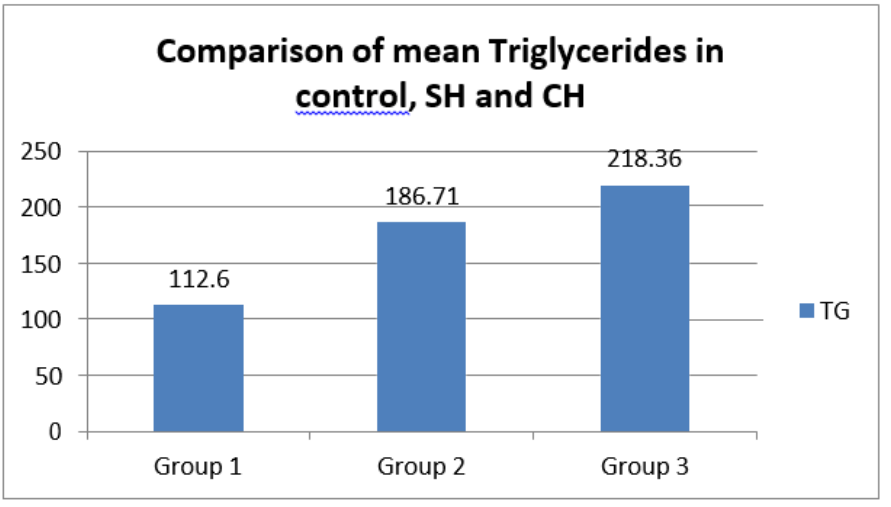
Table showing comparison of mean ldl(mg/dl) among controls,subclinical and clinical hypothyroids

S.No	Controls	Subclinical Hypothyroidism	Clinical Hypothyroidism
1	97.2	167.4	163.13
2	118.6	130.2	124.46
3	111.2	135.6	110.98
4	93.4	96.4	125.58
5	106	115	150
6	86.2	137.8	164.8
7	89.6	85.2	205.6
8	111.6	203.2	127.2
9	97	133	200.6
10	103.8	121.2	175
11	117.2	141	119.6
12	111	65.8	159.8
13	102.6	141.72	165
14	168.2	149.98	124
15	74.6	130.4	156
16	96.2	168	114.2
17	115.2	156	80
18	109.4	97.2	100
19	94.8	142	201
20	109.2	75	133.6
21	84.2	154	140

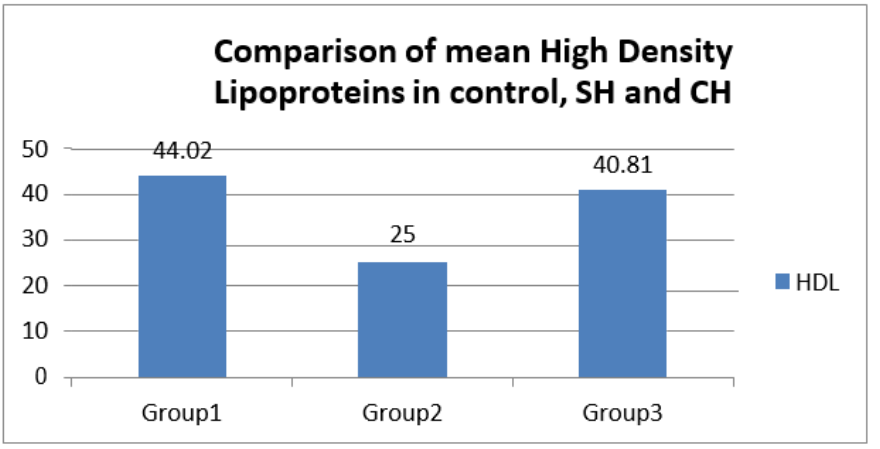
22	100.8	105	183.6
23	131.4	92.2	118.6
24	87.2	161.2	179
25	110.8	113	115
26	134.6	134	127
27	98.8	101	130
28	99	70.4	172
29	117.2	165	187.6
30	118.8	119.2	164
31	85.4	189.8	182
32	101.2	181	125
33	76.6	157.2	181
34	111	110	160
35	108	140.4	148.6
36	91	126.2	124.2
37	87	132.8	129
38	108.4	84.6	140.6
39	105.8	61	165
40	88.6	139	123.6
41	83	66	99
42	98	111.6	157.2
43	112	148.2	135
44	112	120.2	178.2
45	69.8	181	171
46	62.2	145.2	119
47	102.4	165.4	108
48	111	109.2	125
49	80.8	102	158
50	73	165	201.4
Mean	101.26	131.45	146.975
S.D	18.095	35.056	30.402
p	0.087	>0.10	0.03



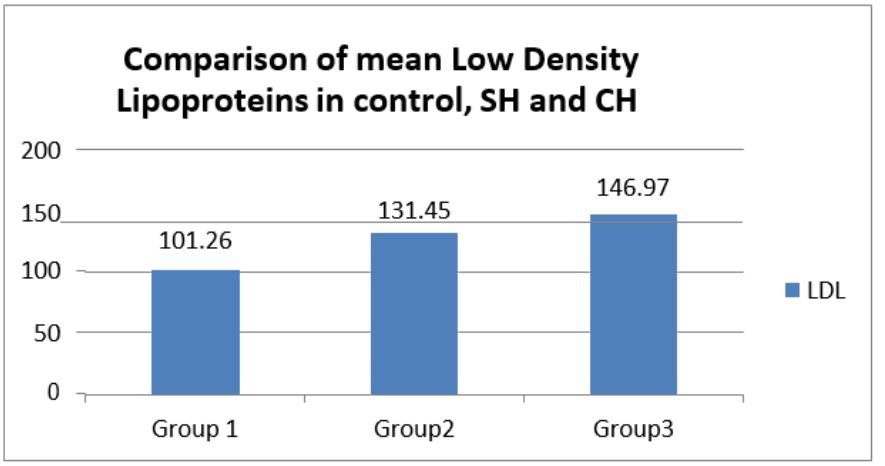
Group 1→Controls : Group 2→Subclinical Hypothyroids (SH):Group 3→Clinical Hypothyroids (CH)



Group 1→Controls : Group 2→Subclinical Hypothyroids (SH):Group 3→Clinical Hypothyroids (CH)



Group 1→Controls : Group 2→Subclinical Hypothyroids (SH):Group 3→Clinical Hypothyroids (CH)



Group 1→Controls : Group 2→Subclinical Hypothyroids (SH):Group 3→Clinical Hypothyroids (CH)

Discussion

Thyroid disease in its various forms is common, affecting some 5% of the population. Hypothyroidism is more common than hyperthyroid state and carcinoma of thyroid. Yet majority of them remain undiagnosed and untreated.
In general, subclinical hypothyroidism and clinical hypothyroidism is associated with hypercholesterolemia. Elevations in total cholesterol and LDL cholesterol may occur in hypothyroidism due to several changes in the synthesis, metabolism and mobilization of the lipids. Dyslipidemia is a common finding in the patients with thyroid disease explained by the adverse effects of thyroid hormones in almost all the sets of lipid metabolism. When the thyroid hormone levels drop, the liver no longer functions properly and produces excessive amounts of triglycerides, fatty acids and cholesterol. In Hypothyroidism, lipoprotein lipase activity in the adipose tissue is reduced as a result of which there is higher level of triglycerides. Thyroid hormones also effect cholesterol

ester transfer protein (CETP) and hepatic lipase activity which is decreased in hypothyroidism. This causes changes in HDL levels. In hypothyroidism, there is a down regulation of LDL receptor gene and decreased number of LDL receptor Level. This caused delayed clearance of LDL leading to an increased level of LDL which in turn leads to hypercholesterolemia. Lingidi Jhansi Laxmi et .al from their study concludedthat hypothyroidism showed a higher levels of serum total cholesterol, LDL and TG. Significantly higher levels of T Cho, LDL, TG in subclinical hypothyroids compared to controls was observed by Adriana Santi ,Marta M .M.F Duarte et .al. The present study also yielded similar results. It has been observed that total cholesterol was highest in clinical hypothyroids followed by subclinical hypothyroids. Total cholesterol increased in clinical hypothyroids and also in subclinical hypothyroids when compared to controls.

Triglycerides were also found to be increased in clinical hypothyroids when compared to subclinical hypothyroids. Subclinical hypothyroids showed an increase in triglycerides when compared to controls. As per our study LDL was found to be highest in clinical hypothyroids followed by subclinical hypothyroids when compared withcontrols.

Summary

Hypothyroidism is a clinical syndrome caused due to decreased thyroid activity. In hypothyroidism, there is hypercholesterolemia, increased triglycerides and LDL levels which is more in clinical hypothyroids compared to subclinical hypothyroids. Alterations in thyroid function will cause changes in lipid levels. This leads to oxidative stress. A very high production of ROS and oxidative stress in hypothyroidism is due to increase lipid peroxidation and failure of antioxidant defence mechanism. Screening for lipid profile can be helpful in overall management of hypothyroidism. Dyslipidemia correction and antioxidant supplementation along with correction of hypothyroid states can decrease the morbidity and enhance the prognosis.

Conclusion

Thus we conclude that hypothyroidism causes worsening of dyslipidemia, more in clinical hypothyroids than in subclinical hypothyroid patients.

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