Original Research Article

Effect of hypothyroidism on lipid profile of type 2 diabetic patients

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ABSTRACT

Background: Hypothyroidism is an endocrine disorder resulting from deficiency of thyroid hormones, and Diabetes is a metabolic disorder that share the phenotype of hyperglycaemia. Both the endocrinopathies have been found to be associated with dyslipidaemia and atherosclerosis that result into various complications. Our aim was to assess the difference of dyslipidaemia in patients suffering from hypothyroidism with diabetes as compared to diabetes alone.
Methods: Study was conducted in department of medicine in SGRDIMSR, Sri Amritsar. A total of 120 patients were enrolled for the present study, the one who presented to hospital from January 2018 to August 2019 diagnosed with diabetes mellitus type 2. The patients were divided into two groups. 60 patients having type 2 diabetes without hypothyroidism (control group). 60 patients having type 2 diabetes with hypothyroidism (study group). Fasting lipid profile were performed in both the groups and were analysed for the study.
Results: Dyslipidaemia was seen more in study group as compared to control group with mean cholesterol of 488.3(±144.43) and mean triglyceride levels of 354.30(±128.57) in study group as compared to control group with mean cholesterol and triglyceride levels of 179.7(±81.47) and 177.08(±118.18) with p-value of 0.001 and 0.01 respectively which were significant. Also, obesity and diabetic complication were more in patients of dual endocrinopathies as compared to diabetes alone which were also significant statistically.
Conclusions: From our study it is concluded that type 2 diabetes with hypothyroidism causes more dyslipidaemia as compare to type 2 diabetes alone. So proper screening of thyroid profile of type 2 diabetic patients and its correction helps in achieving better lipidemic control which further prevent complications.

Keywords: Dyslipidaemia, Hypothyroidism, T2DM

INTRODUCTION

Hypothyroidism is a common endocrine disorder resulting from deficiency of thyroid hormone.[1] Diabetes mellitus refers to a group of common metabolic disorders that

share the phenotype of hyperglycaemia. The metabolic dysregulations associated with diabetes mellitus cause secondary pathophysiological changes in multiple organ systems which result in various complications, responsible for the morbidity and mortality associated with the disease. Diabetes mellitus (DM) affects all the cells due to metabolic dysregulation leads to pathological changes in multiple organ system which further causes long term complications.[2]

Both type 2 diabetes mellitus and hypothyroidism have been found to be associated with dyslipidaemia and atherosclerosis and both may have causative relation with macro-vascular complications in patient with type 2 diabetes mellitus (hypertension, ischemic heart disease, and peripheral vascular disease).

Diabetic dyslipidaemia is characterised by high triglyceride concentrations, low high-density lipoproteins

(low HDL), normal low density lipoprotein cholesterol concentration (LDL-c), but LDL particles are small and dense. It is well known that alterations in thyroid functions result in changes in composition and transport of lipoproteins. In general overt and subclinical hypothyroidism is associated with hypercholesterolemia mainly due to elevation of low density lipoproteins (LDL) cholesterol levels, whereas high density lipoprotein (HDL) concentration is usually normal or even elevated.[3]

The objective of the study was to assess the effect of hypothyroidism on lipid profile of diabetic patients and to compare with the lipid profile of diabetic patients alone.

METHODS

A cross-sectional study was conducted in 120 patients T2DM visiting OPD/Indoor of SGRDIMSR, Sri Amritsar from January 2018 to August 2019.

A detailed history and examination were done on the patients and patients were investigated for presence of diabetes. Then all the patients were subjected to thyroid function tests and were divided into two groups according to thyroid parameters.

Group A - 60 subjects having diabetes with no thyroid dysfunction.
Group B - 60 subjects having diabetes with hypothyroidism.

Fasting lipid profile of all the patients were carried out and was assessed in two groups.

Inclusion criteria

- Age >40 year.
- Patients with type 2 diabetes with hypothyroidism.
- Patients with type 2 diabetes with no thyroid dysfunction.

Exclusion criteria

- Age <40 years.
- Critically ill patients.
- Patients on life support measures.
- Those unable to give informed consent.
- Type 1 diabetic patients.
- Patients on steroids.
- Patients on lipid lowering drugs.
- Those who use medication that effect thyroid function.

Patients were verified with inclusion and exclusion criteria. All patients and their relatives were informed about the study in their vernacular language, written consent was taken. A detailed history of each patient along with complete clinical examination was done.

Apart from routine biochemical tests which include CBC, LFT, RFT were performed in all the patients. Other biochemical parameters such as fasting and post prandial glucose levels and glycosylated haemoglobin (HbA1C) levels were recorded. Then all the patients were subjected to thyroid function tests, fasting lipid profile were performed in both the group of patients and lipid profile were analysed for the study. All reference values were taken from ADA guidelines and Harrisons principle of Internal medicine.

This study was carried out after approval from hospital ethical committee and obtaining informed consent from patients or their relatives. The data from the present study was systematically collected, compiled and statistically analysed to draw relevant conclusions using SPSS Statistics-20 version. The observations were tabulated in the form of mean±standard deviation (SD). Continuous variables were analysed using analysis of variance (ANOVA). In parametric data, student-t test was used. Quantitative variables were correlated using chi-square test. The data was analysed and level of significance was determined as its 'p' value with p<0.05 as significant, p<0.001 as highly significant and p>0.05 as non-significant.

RESULTS

The age of patients in this study conducted varied between 40-85 years in both the study and control groups with a mean age of 57.86±9.55 years and 59.20±14.38 years respectively.

In this study conducted 22 patients i.e. 36.7% were male and 38 patients i.e. 63.3% were female in study group and that of control group 25 patients i.e. 41.7% were male and 35 patients i.e. 58.3% were female (Table 1).

Table 1: Gender distribution of study and control group.

Sex	Group 1 (DM)		Group 2 (DM+Hypothyroid)		Total
	N	%	N	%	
Males	25	41.7	22	36.7	47
Females	35	58.3	38	63.3	73
Total	60	100.0	60	100.0	120

$x^2 = 0.315$; df = 1; p = 0.575; Not Significant

In this study group out of total 60 cases 19 patients are of subclinical hypothyroidism, 41 were of overt hypothyroidism, out of both the groups i.e. Sub clinical hypothyroidism and overt hypothyroidism 73.6% and 92.6% presented with tiredness, 57.8% and 65.8% presented with weight gain, 47.3% and 75.6% presented with cold intolerance, 31.5% and 80.4% presented with constipation, 78.9% and 95.1% presented with hair loss, 68.4% and 82.9% presented with dry cold skin,15.7% and 26.8% presented with loss of libido respectively (Table 2).

Table 2: Clinical feature at presentation of patients with hypothyroidism.

Clinical symptoms	Subclinical hypothyroid (n -19)		Overt hypothyroid (n- 41)	
	N	%	N	%
Tieredness	14	73.6	38	92.6
Weightgain	11	57.8	27	65.8
Cold intolrence	9	47.3	31	75.6
Constipation	6	31.5	33	80.4
Hoarse voice	0	00.0	2	0.04
Hair loss	15	78.9	39	95.1
Dry cold skin	13	68.4	34	82.9
Loss of libido	3	15.7	11	26.8

Table 3: Correlation of duration of diabetes of study and control group (in years).

Group		N	Mean±SD		p-value
Duration of Diabetes (in years)	Study group	60	11.0800	5.26382	0.042*
	Control group	60	8.8000	5.79585	

Table 4: Retinopathy in two groups.

Retinopathy	Group 1 (DM)		Group 2 (DM+Hypothyroid)		Total
	N	%	N	%	
Retinopathy	14	23.3	22	36.7	36
No retinopathic changes	46	76.7	38	63.3	84
Total	60	100.0	60	100.0	120

$x^2 = 2.540$; df = 1; p = 0.111; Not Significant

In this study conducted 17 patients i.e. 26.7% and 15 patients i.e. 25% were alcoholics in study and control group respectively and that of 43 patients i.e. 73.3% in study group and 45 patients i.e. 75% in control groups were nonalcoholic which was statistically non-significant with p-value of 0.68.

The mean duration of diabetes was 11.08±5.26 years in study group and 8.80±5.79 years in control group which was found to be significant statistically (p-value 0.042) which shows that patients in study group had diabetes for a longer duration, mean FBS in study group was 92.51±31.49 and that of control group was 109.11±43.78 which was highly significant with p value of 0.019 (Table 3).

The mean systolic blood pressure was 126.33±22.60 mmHg in study group and 125.20±21.71 mmHg in control group which was found to be nonsignificant statistically with a p-value of 0.78. The mean diastolic blood pressure was 79.21±14.14 mmHg in study group and 76.38±13.02 mmHg in control group which was found to be non-significant statistically with a p-value of 0.25.

In this study conducted, there were 22 patients i.e. 36.7% in study group and 14 patients i.e. 23.3% in control group were found to have retinopathic changes and that of 38 patients i.e. 63.3% in study group and 46 patients i.e. 76.7% in control group were found to have no retinopathic with p-value of 0.11 which was statistically insignificant (Table 4).

In study group, 23 patients i.e. 38% were have micro albuminurea and 22 patients i.e. 37% were have macro albuminurea and 15 patients i.e. 25% were have no nephropathic changes. In control group, 39 patients i.e. 65% were have micro albuminurea and 9 patients i.e. 15% were have macro albuminurea and 12 patients i.e. 20% were have no nephropathic changes which was found to be statistically significant with p-value of 0.007 (Table 5).

In this study conducted 20 patients i.e. 33% in study group and 18 patients i.e. 30% in control group were have sensory neuropathy, 11 patients i.e. 18.3% in study group and 8 patients i.e. 13.3% in control group were have motor neuropathy, 12 patients i.e. 20% in study group and 7 patients i.e. 11.6% in control group were have mixed neuropathy, 17 patients i.e. 28.3% in study group and 27 patients i.e. 45% in control group were have no neuropathy which was statistically in significant with p-value of 0.244 (Table 6).

In Study group, mean BMI was 29.05±4.05 and that of control group was 26.20±3.67 which was highly significant with p-value of 0.001.

That means obesity is more in study group as compared to control group (Table 7).

In this study conducted mean cholesterol in study group was 488.3±143.43 and that of control group 179.7±81.47 which was found to be significant statistically with a p-value of 0.001 (Table 8).

In this study conducted mean triglyceride in study group was 354.30±128.57 and that of control group was 177.08±118.18 which was found to be significant statistically with a p-value of 0.01 (Table 9).

In this study conducted mean triglyceride in study group was 354.30±128.57 and that of control group was 177.08±118.18 which was found to be significant statistically with a p-value of 0.01 (Table 9). In this study conducted mean LDL was 190.68±250.43 in study group and 118.35±202.33 which was found to be insignificant statistically with a p-value of 0.84 (Table 11).

Mean VLDL was 33.03±29.93 in study group and 28.76±29.38 in control group with p-value of 0.43 which was insignificant (Table 12).

Table 5: Nephropathy in two groups.

Nerphropathy	Group 1 (DM)		Group 2 (DM+Hypothyroid)		Total
	N	%	N	%	
Microalbuminurea	39	65.0	23	38	62
Macroalbuminurea	9	15.0	22	37	31
No nephropathy	12	20.0	15	25	27
Total	60	100.0	60	100.0	120

x2 = 9.914; df = 2; p = 0.007; Significant

Table 6: Neuropathy in two groups.

Neuropathy	Group 1 (DM)		Group 2 (DM+Hypothyroid)		Total
	N	%	N	%	
Sensory n	18	30.0	20	33.3	38
Motor n	8	13.3	11	18.3	19
Mixed n	7	11.6	12	20.0	19
No neuropathic changes	27	45.0	17	28.3	44
Total	60	100.0	60	100.0	120

x2 = 4.167; df = 3; p = 0.244; Not significant

Table 7: Mean BMI in two groups.

Group	N	Range	Mean	±SD	't' value	p value
Group 1	60	18.90 - 32.0	26.20	3.67	4.057	<0.001**
Group 2	60	18.90 - 39.0	29.05	4.05		

**p<0.001; Highly significant

Table 8: Mean s. cholesterol in two groups.

Group	N	Range	Mean	±SD	't' value	p value
Group 1	60	72 -362	179.7	81.84	14.47	<0.001**
Group 2	60	101 - 792	488.3	143.43		

**p<0.001; Highly significant

Table 9: Mean serum triglyceride in two groups.

Group	N	Range	Mean	±SD	't' value	p value
Group 1	60	44 - 674	177.08	118.18	7.86	<0.001**
Group 2	60	18 - 719	354.30	128.57		

**p<0.001; Highly significant

Table 10: Mean HDL in two groups.

Group	N	Range	Mean	±SD	't' value	p value
Group 1	60	8.4 -96	38.18	16.73	1.13	0.257;NS
Group 2	60	2.9 -198	43.13	29.26		

NS: p >0.05; not significant

Table 11: Mean LDL in two groups.

Group	N	Range	Mean	±SD	't' value	p value
Group 1	60	22 - 1621	118.35	202.33	1.74	0.84;NS
Group 2	60	27 - 337	190.68	250.43		

NS: p >0.05; Not Significant

Table 12: Mean VLDL in two groups.

Group	N	Range	Mean	±SD	't' value	p value
Group 1	60	10 - 225	28.76	29.38	0.78	0.43;NS
Group 2	60	2 - 227	33.03	29.93		

NS: p >0.05; Not Significant

DISCUSSION

In present study, the age of all the included patients varied between 40-85 years in both study and control groups with a mean age of 57.86±9.55 years in Study group and 59.20±14.38 years in Control group. In Study group, 22 patients i.e. 36.7% were male and 38 patients i.e. 63.3% were female and that of control group 25 patients i.e. 41.7% were male and 35 patients i.e. 58.3% were female. A similar comparative study was conducted in USA in total 150 patients out of which 75 were Type 2 diabetic only and 75 were Type 2 diabetic with hypothyroidism, from September 2010 to October 2012. Lipid profile was assessed in both the groups. The mean age (years) in Study group and control group was 53.06±10.93 and 56.12±11.754, respectively. About 66% were males and 34% were females in both the groups.[4]

In present study, the mean systolic blood pressure was 126.33±22.60 mmHg in Study group and 125.20±21.71 mmHg in Control group which was found to be insignificant statistically with a p-value of 0.78. The mean diastolic blood pressure was 79.21±14.14 mmHg in Study group and 76.38±13.02 mmHg in Control group which was found to be insignificant statistically with a p-value of 0.25.

A study conducted in China in Henan province people Hospital on a total of 400 patients with diabetes and hypothyroidism exhibited higher levels of systolic blood pressure and a higher prevalence of hypertension compared to patients with diabetes alone. (all P<0.05) which was in consistent with present study.[5]

In this present study, the mean duration of diabetes was 11.08±5.26 years in Study group and 8.80±5.79 years in Control group which was found to be significant statistically with a p-value of 0.042 and that of mean HbA1C levels in study group was 10.23±2.67 and that of control group was 9.66±2.17 which was statistically significant with p-value of 0.02. A similar comparative study conducted in Tiawan in 2017 found that mean duration of diabetes was 13.11±3.11 years and that of mean HbA1C was 11.10±1.50 in study group and in control group mean duration of diabetes was 10.41±6.71 years and that of mean HbA1C was 8.20±2.61 with a p-value of 0.001 and 0.01 respectively. Which was consistent and supports this current study.[6]

There were 36 patients out of 60 (60%) and in Control group, 25 patients out of 60 (41.6%) were overweight and obese with mean BMI of 29.05±4.05 and that of control group mean was 26.20±3.67 which was found to be significant statistically with a p-value of 0.001. In a study conducted in Italy the mean BMI (kg/m2) in diabetic patients was 25±5.51 and that of type 2 diabetes with hypothyroidism was 30.97±9.92 (p-value<0.0001) which was statistically significant.[7] While in a study conducted in Netherland the mean BMI (kg/m2) in study and control groups was 24.3±3.7 and 25.9±4.2 respectively (p-value <0.0001) which was statistically significant.[8] Both these studies support the results of present study.[7,8]

In present study, micro-vascular complications like nephropathy was present in 48 patients out of 60 in Study group and 45 patients out of 60 in Control group with p-value of 0.007 which was significant with mean UACR of 610.00±151.4 in study group and that of control group was 583.14±183.8. In a study conducted in Brazil they found that patients who were suffering from diabetes along with thyroid disorder UACR values were more impaired as compared to UACR values in diabetic patients with a p value of 0.001 which was also statistically significant, which supports present study.[9]

In present study, retinopathy was present in 22 patients i.e. 36.7% in study group and 14 patients i.e. 23.3% in control group, whereas 38 patients i.e. 63.3% and 46 patients i.e. 76.7% in study and control group respectively were have no retinopathic changes. These results in this study were statistically insignificant with p-value of 0.111, Neuropathy was found in 43 out of 60 patients i.e. 71.6% in study group and 33 out of 60 patients i.e. 55% in control group these results were not significant as p-value comes out to be 0.244. In a study conducted in Prince Charles hospital, UK in 2010 they found that patients with diabetes mellitus and thyroid disorder were found to have more micro-vascular complications as compare to patients who were diabetic alone, in there study retinopathy was present in 66 patients out of 100 i.e. 66% in study population and that of 49 patients out of 100 i.e. 49% in control population which was significant with p-value 0f 0.002, and that of neuropathy was also found more in study group as compared to control group i.e. 79 patients out of 100 i.e. 79% were have neuropathy in study group and 51 patients out of 100 i.e. 51% in control group were have neuropathy with p-value of 0.003 which was also significant. Both the results of this study does not support this study. The cause of in significant results in this study was due to difference in diabetic duration and also levels of HbA1C were seen more in some patients of groups.[10]

In present study, the mean total cholesterol (mg/dL), the mean triglycerides (mg/dL), the mean HDL cholesterol (mg/dL), the mean LDL cholesterol (mg/dL) and mean VLDL cholesterol (mg/dl) in Study group and Control group were 488.3±143.43, 354.30±128.57, 43.13±29.26, 190.68±250.43, 33.03±29.93 and 179.7±81.47, 177.08±118.18, 38.13±16.73, 118.35±202.33, 28.76±29.38 respectively which was found to be highly significant statistically. While in a study conducted in Iran, the mean total cholesterol (mg/dl), the mean triglycerides (mg/dl), the mean HDL cholesterol (mg/dl), the mean LDL cholesterol (mg/dl) and the mean VLDL cholesterol (mg/dl) in both groups were 350.3±100.3, 306±123.6, 28.5±12.0, 210.75±78.9, 34.7±11.0 and 126.68±28.44, 100.4±36.3, 42.6±19.0, 108±34, 23.7±10.6 respectively which was found to be significant statistically (p-value 0.001) which is consistent with present study.[11]

CONCLUSION

In this study, it is concluded that dyslipidaemia was more in patients suffering from diabetes with hypothyroidism as compared to diabetic patients alone. Also, patients with dual endocrinopathies were more overweight and have more diabetic related complications as compared to diabetic alone. So proper screening of lipid profile and timely treatment of hypothyroidism and dyslipidaemia helps to delay and reverse these complications.

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