J. Dhaka National Med. Coll. Hos. 2013; 19 (02): 4-8

Original Article

A Study On Lipid Profile Status In Hypothyroid Patients And Its Consequences

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Abstract :

This cross-sectional study was conducted to compare lipid profile status in hypothyroid patients attending at indoor and outpatient Department (OPD) of Medicine and Endocrinology, Sir Salimullah Medical College & Mitford Hospital, Dhaka over a period 6 months from March to September 2008. A total of 80 patients (of which 30 patients formed the control group) aged 12 to 60 years, not taking thyroxin in the last 3 months and not taking lipid lowering agents were included in the study. Patients with secondary hypothyroidism, chronic renal failure, liver diseases, pregnancy, dyslipedamia (with or without lipid lowering agents) were excluded from the study. Data collected on variables of interest were analyzed using Chi-squared (χ^2) or Fisher's Exact Probability tests, Student's t-test and person correlation co-efficient test was done to see the correlation of lipid profile with the severity of hypothyroidism.

The mean value of TSH, total cholesterol, low-density lipoprotein cholesterol (LDL-C) and triglyceride in case group were significantly higher than those in control group but the mean high density lipoprotein cholesterol (HDL-C) was lower in case group compared to control group. The findings of the study indicate that THS shows positive correlation with total cholesterol, LDL cholesterol and triglyceride ($r = 0.025$, $p = 0.865$, $r = 0.258$, $p = 0.071$ and $r = 0.078$, $p = 0.589$ respectively) and HDL cholesterol exhibiting a negative correlation ($r = -0.055$, $p = 0.704$). These results confirm that thyroid dysfunction is common, and may be associated with adverse health outcomes.

Introduction :

Hypothyroidism is a clinical syndrome resulting from a deficiency of thyroid hormones, which in turn results in a generalized slowing down of metabolic process.[1] It is a common metabolic disorder in general population.[2] The thyroid dysfunction increases with age, especially in women.[3]

Hypothyroidism is associated with many biochemical abnormalities. An association between thyroid dysfunction and dyslipidemia was first reported in 1930.[4] Deceased thyroid secretion greatly increases the plasma concentration of cholesterol because of decreased rate of cholesterol secretion in the bile and consequent diminished loss in the feces due to decreased number of LDL receptors on liver cells.[5] Decreased activity of LDL receptors resulting in decreased receptor-mediated catabolism of LDL and LDL is the main cause of the hypercholesterolemia observed in hypothyroidism.[6] Thus hypothyroidism constitutes a significant cause of secondary dislipidemia.[7]

Serum concentration of high density lipoprotein (HDL) cholesterol was reported to be higher among newly

diagnosed hypothyroid patients whereas serum concentration of HDL cholesterol were significantly lower among euthyroid and previously reported hypothyroid cases who were on thyroid replacement therapy.[8] HDL cholesterol level was found reduced in some studies on hypothyroid patients.[9] Decreased thyroid secretion greatly increases the plasma concentration of triglycerides.[5] it is due to decreased activity of lipoprotein lipase (LPL), which results in decreased clearance of triglyceride lipoproteins.[2] Multiple epidemiologic studies have demonstrated a strong relationship between serum cholesterol and coronary heart disease (CHD). Randomized controlled clinical trials have unequivocally documented that lowering plasma cholesterol reduces the risk of clinical events due to atheroselerosis.[10] So early diagnosis and proper management significantly reduce the mortality and morbidity of dyslipidemia cardiovascular diseases.

Many studies were done regarding the biochemical status of hypothyroid patients including lipid profile and its consequences in developed countries but there is no such study in our population. So, we have designed this study in our population for evaluation of lipid profile status in hypothyroid patients and its consequences like ischaemic heart disease (IHD), Cerebrovascular disease (CVD), Peripheral Vascular Disease (PVD) etc.

Objectives :

The present study was conducted to address the following objectives

1. To evaluate of lipid profile patterns in hypothyroid patients.
2. To see the consequences of hyperlipidemia in hypothyroid patients such as Ischaemic Heart Disease (IHD), Cerebrovascular Disease (CVD), Peripheral Vascular Disease (PVD) at the time of presentation.

Materials & Methods :

It was a cross-sectional comparative study. The study was conducted in the Indoor and Out patient Department (OPD) of Medicine & Endocrinology, Sir Salimullah Medical College & Mitford Hospital, Dhaka during the period from March to September 2008. A total of 80 subjects were selected for the purpose of the study. Of them 50 patients who presented with signs and symptoms of hypothyroidism were taken as cases, while another 30 subjects who seemed to be healthy were taken as control. Newly diagnosed adult hypothyroid patients irrespective of sex who are not taking thyroxin in last three months and not taking lipid lowering agents were included.

Results :

The purpose of the study was to find out lipid profile status in hypothyroid patients and its consequences. The findings of the study obtained from data analysis are presented below.

Age distribution hat highest frequency of cases (46%) ranged from 31 – 40 years and the least frequency (6%) from below 50 years. The age group ≤30 years comprised of 24% and 41 – 50 years 24%. The control group had highest frequency (33.3%) in age ≤30 years and least frequency (10%) in >50 years. The age category 31 – 40 months and 41 – 50 years formed 30% and 26.7% respectively. The mean age was somewhat higher in controls than that in cases (37.9 ± 10.9 vs. 37.3 ± 8.9). There was no significant difference between the groups in terms of age (p = 0.804).

For this study, in case group the male and female ratio was of roughly 1:6, while that in control group was 1:1.

Table I shows the Body mass index of the patients depicts that majority of the patients in both case (86%) and control group (93.3%) were normal BMI (18.9 – 24.9 kg/m^2). Fourteen percent of cases were overweight (>25 kg/m^2) and 6.7% of controls were under weight (≤18.9 kg/m^2). The mean BMI was significantly higher in case group than that in control group **(23.5 ± 1.7 vs. 20.8 ± 1.4, p < 0.001).** (Table I).

Table I. Comparison of BMI between groups (n = 80)

BMI (kg/m^2)	Group		p-value
	Case (n = 50)	Control (n = 30)	
Under weight (≤18.9 kg/m^2)	00	2(6.7)	
Normal (18.9 – 24.9 kg/m^2)	43(86.0)	28(93.3)	
Over weight (>25 kg/m^2)	7(14.0)	00	
Mean ± SD	23.5 ± 1.7	20.8 ± 1.4	<0.001

#Chi-square (χ^2) **Test** was employed to analyse the data; Figures in the parenthesis denote corresponding %;

The socioeconomic condition between groups shows, in case group, majority (92%) of patients was middle

class and 8% poor. In contrast, in control group, all of the patients were middle class. No significant difference was found between groups with respect to socioeconomic status (p = 0.153).

Table II shows the comparison of clinical consequences between groups. Out of 50 patients in case group, 2% had past history of stroke, 4% of ischemic heart disease (IHD) and 6% of received anti-anginal drug. None of the patients in control group had such history. There was no significance difference between groups with respect to history of past illness as evident by (p = 0.625, p = 0.388 and p = 0.239 respectively)

Table II. Comparison of clinical consequences between groups (n = 80)

Past illness	Group		p-value
	Case (n = 50)	Control (n = 30)	
History of stroke*	1(2.0)	00	0.625
History of IHD*	2(4.0)	00	0.388
History of anti-anginal drug*	3(6.0)	00	0.239

* Data were analysed using **Fisher Exact Test;** Figures in the parenthesis denote corresponding percentage.

Table III shows the family history of illness of the the study patients showed that only 1(2%) patient in case group had family history of stroke, 22% ischemic heart disease and 16% received anti-anginal drug. Significant difference was found between groups in terms of history of IHD and anti-anginak drug (p = 0.625 and p = 0.021 respectively) (Table III).

Table III. Comparison of family history of illness between groups (n = 80)

Family history of illness	Group		p-value
	Case (n = 50)	Control (n = 30)	
History of stroke*	1(2.0)	00	0.625
History of IHD#	11(22.0)	00	0.006
History of anti-anginal drug#	8(16.0)	00	0.021

#Chi-square (χ^2) **Test** was employed to analyse the data;* Data were analysed using **Fisher Exact Test;** Figures in the parenthesis denote corresponding percentage.

Table IV shows the investigations of the study patients .mean value of TSH, total cholesterol, low-density lipoprotein cholesterol (LDL-C) and triglyceride in case group were significantly higher than those in control group (62.2 ± 27.4 vs. 2.1 ± 0.7 mIU/L, p <0.001; 239.4 ± 30.8 vs. 157.8 ± 28.1 mg/dl, p<0.001; 191.8 ± 38.3 vs. 80.5 ± 15.5 mg/dl, p <0.001 and 221.8 ± 64.9 vs. 111.0 ± 20.7 mg/dl, p<0.001 respectively) but the mean high density lipoprotein cholesterol (HDL-C) was lower in case group compared to control group (38.0 ± 8.3 vs. 50.2 ± 12.1 mg/dl, p < 0.001). The mean FT_4 was 3.8 ± 1.8 pmol/L in case group (Table IV).

Table IV. Comparison of investigations between groups (n = 80)

Investigations	Group		p-value
	Case (n = 50)	Control (n = 30)	
TSH (mIU/L)	62.2 ± 27.4	2.1 ± 0.7	<0.001
Total cholesterol (TC) (mg/dl)	239.4 ± 30.8	157.8 ± 28.1	<0.001
LDL cholesterol (mg/dl)	191.8 ± 38.3	80.5 ± 15.5	<0.001
Triglyceride (TG) (mg/dl)	221.8 ± 64.9	111.0 ± 20.7	<0.001
HDL cholesterol (mg/dl)	38.0 ± 8.3	50.2 ± 12.1	<0.001
FT_4 (pmol/L)	3.8 ± 1.8		Not computable

#**Student's t-Test** was done to analyse the data and were presented as **mean ± SD**.

Table V demonstrates the correlation between lipid profile and TSH level in case group. Total cholesterol, LDL cholesterol and triglyceride with the THS level also increases proportionately shows evidence of positive correlation (r = 0.025, p = 0.865, r = 0.258, p = 0.071 and r = 0.078, p = 0.589 respectively). While with the rise of HDL cholesterol the THS level decreases thus exhibiting a negative correlation between the two variables (r = -0.055, p = 0.704). From the data it is observed that none of the lipid profile was significantly correlated with TSH levels.

Table V. Correlation of lipid profile and TSH levels in case

Correlated variables		Correlation co-efficient (r)	p-value
Independent (X)	Dependent (Y)		
Total cholesterol	TSH	0.025	0.865
HDL cholesterol	TSH	-0.055	0.704
LDL cholesterol	TSH	0.258	0.071
Triglyceride	TSH	0.078	0.589

* Correlation is significant at 0.05 level

Discussion:

The mean age was somewhat higher in controls than that in cases (37.9 ± 10.9 vs. 37.3 ± 8.9 years). Although, the difference did not reach significance (p = 0.804). Majority (84%) of cases were female compared to 50% in controls. The mean BMI was significantly higher in case group than that in control group (23.5 ± 1.7 vs. 20.8 ± 1.4, p < 0.001). Forty eight (96%) of cases were married compared to 80% of controls. Majority (92%) of cases and all of controls were middle class. Nearly three quarter (72%) of patients in case group was housewife compared to 46.7% in control group. Fariduddin[11] reported that the mean age 34.4 ± 11.2 in patients group and 37.7 ± 5.7 years in control group. Eighty three percent of the patients group were female than that in 50% in control which was correlated with our study. Reza[12] observed that the mean age was significantly higher in case group than that in control (47.7 ± 14.5 vs. 42.6 ± 17.8; p = 0.340). Jawed[13] found that the mean age 49.21±12.47 years, BMI 30.36±5.8, 74 females and 21 males in case group compared with age 48.80±11.00 years, BMI 30.51 ± 04.7, 54 females and 24 males in control group. Akbar[14]and his colleagues noted that the mean BMI was identical between case and control group (29.5±5.3 vs 30.6±5.6 kg/m^2, p = 0.20).

In the present study, two percent of patients had past history of stroke, 4% of ischemic heart disease (IHD) and 6% of received anti-anginal drug. Agarwal[15] observed that 1(3%) patients had prior history of stroke, 7% of IHD and 5% prior history of taking anti-anginal drug which was nearly consistent with our study.

According to this result, one (2%) patient had family history of stroke, 22% ischemic heart disease and 16% received anti-anginal drug. None of the patients had such family history of illness in control group. The findings by **Danzi**[16] demonstrated that 9% of patients had family history of stroke, 17% IHD and 11% received anti-anginal drug.

The mean value of TSH, total cholesterol, low-density lipoprotein cholesterol (LDL-C) and triglyceride in case group were significantly higher than those in control group (62.2 ± 27.4 vs. 2.1 ± 0.7 mIU/L, p <0.001; 239.4 ± 30.8 vs. 157.8 ± 28.1 mg/dl, p<0.001; 191.8 ± 38.3 vs. 80.5 ± 15.5 mg/dl, p <0.001 and 221.8 ± 64.9 vs. 111.0 ± 20.7 mg/dl, p<0.001 respectively) but the mean high density lipoprotein cholesterol (HDL-C) was lower in case group compared to control group (38.0 ± 8.3 vs. 50.2 ± 12.1 mg/dl, p < 0.001). The mean FT_4 was 3.8 ± 1.8 pmol/L in case group. Fariduddin[11] and his associates observed that mean TSH, total cholesterol, LDL cholesterol, triglyceride and HDL cholesterol in case group 60.0 ± 31.7 mIU/L, 231.6 ± 62.9 mg/dl, 152.4 ± 59.4 mg/dl, 186.9 ± 95.3 mg/dl and 41.4 ± 3.8 mg/dl respectively compared to 1.6 ± 1.4 mIU/L, 146.9 ± 23.6 mg/dl, 70.6 ± 25.6 mg/dl, 100.5 ± 36.2 mg/dl and 56.3 ± 11.5 mg/dl respectively which was almost consistent with our study. Reza[12] also exhibited the mean TSH, total cholesterol, LDL cholesterol, triglyceride and HDL cholesterol in case group compared with control group (10.3 ± 17.9 vs. 2.1 ± 1.1 mIU/L, p<0.05; 262.6 ± 67.9 vs. 197.9 ± 38.8 mg/dl, p<0.05; 169.0 ± 45.0 vs. 120.6 ± 49.0 mg/dl, p<0.05; 190.1 ± 90.8 vs. 149.0 ± 92.1 mg/dl, p = 0.114 and 46.3 ± 6.5 vs. 50.5 ± 12.6 mg/dl, p = 0.127 respectively). Akbar[14] reported that the mean TC, TG, LDL and HDL were homogeneously distributed between groups (5.5 ±1.2 vs. 5.4±1.1, p = 0.3; 1.9±1.3 vs. 1.5±.9, p = 0.4, 3.2±1.1 vs. 3.3±0.8, p = 0.9 and 1.2±0.4 vs. 1.1±0.2, p = 0.1 respectively) which was not consistent with the present study.

The findings of the study indicate that THS shows positive correlation with total cholesterol, LDL cholesterol and triglyceride (r = 0.025, p = 0.865, r = 0.258, p = 0.071 and r = 0.078, p = 0.589 respectively) and HDL cholesterol exhibiting a negative correlation (r = -0.055, p = 0.704). A recent study of Fariduddin[11] reported that TSH showed positive correlation with total cholesterol (r =0.276, p = 0.041), with LDL cholesterol (r = 0.306, p = 0.022) and with triglyceride (r = 0.002, p = 0.986) and negative correlation with HDL cholesterol (r = -0.070, p= 0.610) which was consistent with our findings.

Conclusion :

The prevalence of abnormal thyroid function in Bangladesh and the significance of thyroid dysfunction remain controversial. Abnormal thyroid function has multiple implications for public health. However, the magnitude of the problem is not entirely known, nor is the exact relationships to other health problems well delineated. Biochemical screening for thyroid dysfunction is of paramount importance in all dyslipidemic patients, as well as in all patients with unexpected improvement or worsening of their lipid profile. From this study it can be concluded that hypothyrodism is associated with lipid disorders that are characterized by normal or lightly elevated total cholesterol levels, increased LDL-chol, Triglyceride (TG) and lower HDL-chol.

Limitation Of Study:

This was a single center study conducted over a short period with a limited number of samples. More extensive study is needed in future.

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