Original Article

Studies on lipid profile in patients with non insulin dependent diabetes mellitus

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Abstract

Diabetes mellitus is a global health problem and is associated with abnormalities of lipids and lipoprotein metabolism in variable frequency. The aim of the present work was to study the lipid abnormalities in NIDDM patients. Dyslipidaemia is of special interest because to compare it between male and female NIDDM patients and as well as to see the impact between women of reproductive age group and post menopausal women. For this purpose total serum cholesterol, triglyceride, LDL-C, HDL-C and LDL/HDL ratio were determined of a total number of 160 subjects. Out of these 80 subjects were diabetic and 80 were non-diabetic control subjects of both sexes. In this study, the total serum cholesterol levels were higher in NIDDM than control subjects and showed significant statistical difference (P<0.05) between control and NIDDM subjects. The serum triglyceride levels were found higher amongst diabetics as compared to the normal healthy controls and showed statistically significant difference (P<0.05). Higher LDL-C levels were showed in NIDDM and revealed significant difference (P<0.05) in comparison to control non-diabetic subjects and NIDDM patients. HDL-C levels were found decreased in patients with NIDDM compared to controls. The findings in the patients with NIDDM between male and female revealed no significant difference (P>0.05) in mean TC, TG, HDL-C and LDL-C between male and female diabetic patient in unpaired t-test. With improvement of diabetic control some improvement of the lipid abnormalities can be achieved. Most studies have shown that improvement of lipid abnormalities occur with proper glycaemic control in patients with NIDDM. The atherosclerotic process in the diabetic patient is indistinguishable from that seen in the non-diabetic population but it begins earlier and is more severe. Risk factors associated with atherosclerosis in the non-diabetic subject appear to have a similar relation to coronary heart disease among diabetics. Further studies are necessary to confirm the present suggestions, studies involving more number of subjects, estimation of Hb AIC.

Introduction

Diabetes mellitus (DM) is a clinical syndrome characterized by hyperglycaemia due to absolute or relative deficiency of insulin[1]. Lack of insulin whether absolute or relative, affects the metabolism of carbohydrate, protein, fat, water and electrolytes. Diabetes mellitus is a global health problem and its incidence is rising. However, the prevalence of diabetes varies in different parts of the world. This seems to be due to differences in both the genetic and environmental factors. It was estimated that in the year 2000, 150 million people worldwide had diabetes and this is expected to be doubled by 2010.

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In Bangladesh (1996) the prevalence rate of type-2 diabetes was found 5.2% and assumed to be more than 10 million in the year 2005[2]. Another study in Bangladesh has shown that about 5% of the population above 15 years of age are affected with diabetes, which is similar to prevalence in other non-industrialized countries and 2.4 million out of 60 million adult people are suffering from diabetes in Bangladeshi[3].

DM is broadly classified into NIDDM (relative deficiency of insulin) and IDDM (absolute deficiency of insulin). NIDDM is by far the most prevalent form of diabetes world wide, forming more than 95% of all cases of diabetes in many developing countries. NIDDM is a major cause of morbidity and mortality, primarily from macrovascular disease, although NIDDM subjects are also likely to develop the specific complications of diabetes namely retinopathy, nephropathy and neuropathy. NIDDM is almost certainly a heterogeneous mixture of conditions characterized by hyperglycaemia, a variable mixture of insulin resistance and insulin hyposecretion and lack of dependence of exogenous insulin to maintain life. The main proposed aetiological factors in NIDDM are genetic (almost 100% concordance rate for NIDDM in identical twins), race (migrants people from the Indian subcontinent have higher NIDDM rates than local indigenous populations in all parts of the world), obesity and physical inactivity[4].

In diabetes the plasma cholesterol level is usually elevated and this plays a role in the accelerated development of the atherosclerotic vascular disease, which is a major long-term complication of diabetes in humans[5]. It was observed that the rise in plasma cholesterol level is due to an increase in the plasma conc. Of VLDL and LDL, which may be due to increased hepatic production of VLDL or decreased removal of VLDL and LDL from the circulation. Study also found that in NIDDM, the most common patterns of lipid abnormalities are hypertriglyceridemia and reduced HDL cholesterol levels. DM itself doesn't increase levels of LDL, but small dense LDL particles found in NIDDM are more atherogenic because they are more easily glycated and are susceptible to oxidations.

Recent studies have demonstrated that diabetic patients experienced a two to three fold increase in cardiovascular morbidity and mortality as well as increased cerebrovascular mortality. Atherosclerosis is more common in NIDDM compared to IDDM[6]. It has been estimated that men with diabetes have about a two fold increased risk of death from IHD. This risk is increased to four fold in case of women when compared to age and sex matched population due to loss of relative protection from atherosclerosis by female sex hormones prior to menopause[7]. Obesity enhances atherosclerosis because of raised serum cholesterol, TG and LDL-C levels and HDL-C has also been reported to be contributory factor. In obese patients with NIDDM, a distinct diabetic dyslipidemia is characteristic of the insulin resistance syndrome. Its features are high serum triglyceride level, a low HDL cholesterol and a qualitative change in LDL particles, producing a smaller dense LDL whose membrane carries supranormal amounts of free cholesterol. Since a low HDL cholesterol is a major feature predisposing to macrovascular disease[8].

Some studies found that after menopause women develops coronary atherosclerosis much faster, that is why men with NIDDM have a two fold increased risk whereas women have fourfold increased risk of CHD9. Another study reported that risk of CHD in diabetic females are related with age, reproductive and hormonal status as well as HDL-C, triglycerides. Other studies also suggested that smoking stimulates oxidation of LDL particles, which results in significant increase in TG and fall in HDL-C and is thought to be due to insulin resistance[9].

From the above findings it may be concluded that dyslipidemia is a common feature of NIDDM and thus patients of NIDDM are more prone to develop atherosclerosis. But whether NIDDM related lipid abnormalities vary between male and female, has not yet been studied among Bangladeshi population. Therefore, data on lipid profile of Bangladeshi NIDDM patients by sexes are not available. In our population diabetes and serum lipid status are often not well controlled, due to reasons like ignorance, low-socio-economic status and false beliefs regarding treatments,__ Hence it is noted that in our population complications of diabetes are more common as compared to the west. The long-term complications of diabetes put a heavy burden on the patient, his family and society, by increasing disability and decreasing work output at individual, social and national level. So, knowledge about diabetes and it's complications are especially important in a country like Bangladesh where resources are Deager and limited. Efforts, therefore, should be directed at the management of the disease as well as prevention of the complications.

Objectives

To study the lipid status in patients of non-insulin dependent diabetes mellitus both in male and female and to compare the impact of sex variation on lipid status.

Methods and materials

The prospective consecutive and cross sectional study was done in the Department of Physiology, Rajshahi Medical College, Rajshahi, Bangladesh (during the period of January 2005 and December 2005).

The study was conducted on diabetic patients randomly selected at Diabetes Center, Rajshahi. A total number of 80 diabetic subjects of both sexes and different durations of the disease were included in this study as study subjects. On the other hand 80 non-diabetic healthy subjects of both sexes were selected as control. The age range of the subjects were within 40-65 years. Both the diabetic (study) and control subjects were matched by their age, sex and socioeconomic status.

Selection criteria:

Inclusion criteria: a) The age range of 40 to 65 years. b) Had no any coexisting disease associated with hyperlipidaemia e.g. hypothyroidism, renal disease or hepatic disorders. c) Were not ketotic in case of diabetics (absence of clinical signs & ketone bodies in urine). d) Had no complications of diabetes e.g. nephropathy, retinopathy etc. e) Had no family history of diabetes in case of controls. Exclusion criteria: Those diabetic patients who were suffering form IDDM or whose age was below 40 or above 65 were excluded. Similarly patients suffering from diabetes with complication like hypertension, ischemic heart disease or kidney disease were also excluded from the study. At the time of assessment none was on drugs known to affect lipid metabolism other than insulin or oral hypoglycaemic agents.

The total serum cholesterol, triglyceride, LDL-C, HDL-C and LDL/HDL ratio were determined of a total number of 160 subjects. Out of these 80 subjects were diabetic and 80 were non-diabetic of both sexes (control). A Questionaire was developed and all the data were collected regarding this study from 160 subjects.

Results and discussion:

The findings in the patients with NIDDM between male and female: Analysis revealed no significant difference ($P>0.05$) in mean TC, TG, HDL-C and LDL-C between male and female diabetic patient in unpaired t-test. P value reached from unpaired t-test, s: Significant ($p<0.05$), ns: Insignificant ($p>0.05$). In the present study significantly higher serum triglyceride levels were found in NIDDM patients when compared to their normal healthy counterparts (Table-1.1). Statistically no significant difference in TG level was observed between male and female NIDDM patients.

In this study we observed a higher LDL cholesterol in NIDDM patients in comparison to non diabetic control subjects (Table 1.1).In our study HDL-C has been found to be decreased in patients with NIDDM compared to controls. Most studies have shown a decrease in serum HDL cholesterol in NIDDM patients in comparison to non-diabetic subjects with same age and sex (Table 1.1).

According to therapeutic observation no statistically significant difference in serum triglyceride, TC, HDL-C and LDL-C were observed between our oral and insulin treated NIDDM patients. Serum lipid profile was similar in our male and female diabetic patients.(Table 1.2)

Our findings did not revealed any significant difference in mean TC and TG between smoker and non-smoker male diabetics. But significant differences were observed in HDL-C and LDL-C levels between these two groups (Table-1.3).

Our female diabetic patients when grouped as <_ 45 years and > 45 years did not show any statistically

Table-1.1: Fasting blood glucose, serum lipid and lipoproteins in NIDDM and non-diabetic control subject both sex.

	Control (n=80)		NIDDM (n=80)		P value
	Mean	±SD	Mean	±SD	
Fasting blood glucose (mmol/L)	4.7	±0.7	8.2	±2.6	0.001s
Total cholesterol (mmol/L)	4.8	+0.9	5.3	±1.0	0.003"
Triglyceride (mmol/L)	1.6	±0.6	2.2	±1.0	0.0015
HDL –C (mmol/L)	1.0	+0.1	0.9	±0.2	0.0015
LDL –C (mmol/L)	3.1	±0.8	3.4	±0.9	0.030'
	Control (n=80)		NIDDM (n=80)		P value
	Mean	±SD	Mean	±SD	
Fasting blood glucose (mmol/L)	4.7	±0.7	8.2	±2.6	0.001s
Total cholesterol (mmol/L)	4.8	+0.9	5.3	±1.0	0.003"
Triglyceride (mmol/L)	1.6	±0.6	2.2	±1.0	0.0015
HDL –C (mmol/L)	1.0	+0.1	0.9	±0.2	0.0015
LDL –C (mmol/L)	3.1	±0.8	3.4	±0.9	0.030'
LDL/HDL	3.2	±1.0	4.2	±1.7	0.0015

Table- 1.2: Significant relation of TC, TG, HDL-C and LDL-C to sex (NIDDM)

	Male (n=40)		Female (n=40)		P value
	Mean	±SD	Mean	±SD	
Total cholesterol (mmol/L)	5.0	±0.9	5.1	±1.1	0.27815
Triglyceride (mmol/L)	1.9	±0.9	1.8	±0.9	0.476n,
HDL -C (mmol/L)	0.9	±0.2	0.9	±0.2	0.285 n,
LDL -C (mmol/L)	3.2	±0.8	3.4	±1.0	0.753 n,

ns-not significance

Table- 1.3: Lipids status of the study subjects on the basis of the smoking habits.

	Non-smoker (n=64)		Smoker (n=26)		P value
	Mean	±SD	Mean	±SD	
Total cholesterol (mmol/L)	5.0	±1.0	5.2	±0.9	0.187 n,
Triglyceride (mmol/L)	1.9	±0.9	1.9	±0.7	0.889n,
HDL -C (mmol/L)	1.0	±0.2	0.8	±0.2	0.0015
LDL -C (mmol/L)	3.2	±0.9	3.5	±0.7	0.023'

Table- 1.4 : Lipids status of the female NIDDM patients by age.

	<45 year (n=26)		>45 year (n=44)		P Value
	Mean	±SD	Mean	±SD	
Total cholesterol (mmol/L)	5.0	±0.9	5.2	±1.2	0.3451'
Triglyceride (mmol/L)	1.7	±0.7	2.0	±0.9	0.16 1 ns
HDL -C (mmol/L)	0.9	±0.2	1.0	±0.2	0.62015
LDL -C (mmol/L)	3.3	±0.8	3.4	±1.1	0.556 ns

Conclusion

It can be concluded that lipid abnormalities exist in NIDDM are related to glycaemic control. With improvement of diabetic control some improvement of the lipid abnormalities can be achieved. Most studies have shown that improvement of lipid abnormalities occur with proper glycaemic control in patients with NIDDM. The atherosclerotic process in the diabetic patient is indistinguishable from that seen in the non-diabetic population but it begins earlier and is more severe. Risk factors associated with atherosclerosis in the non-diabetic subject appear to have a similar relation to coronary heart disease among diabetics.

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