Lipid Profile as Early Predictor of Complication in Diabetes Mellitus

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Abstract
Aim: *To establish that lipid profile is important marker and can be used to predict severity of diabetes mellitus and onset of complications.*
Design: *Retrospective study done at Darbhanga Medical College, Bihar from December 2004- January 2009.*
Materials and Methods: *100 patients with diabetes mellitus having age between 20yrs to 60 yrs age were included in the study. Among these there were 62 %(n=62) male patients and 38% (n=38) female patients with diabetes mellitus.*
24 control cases were investigated in similar manner. Among these there were 66% (n=16) males and 33 %(n=8) females.
After taking informed consent, their serum samples were assessed for blood glucose level 2 hours after 50 gm oral glucose, fasting total cholesterol (TC), triglycerides (TG), low density lipoprotein cholesterol (LDL) , high density lipoprotein cholesterol (HDL) and VLDL(very low density lipoproteins) by using standard biochemical methods.
The values of various parameters of lipid profile were statistically analyzed in diabetic patients and control group.
Results
1. *Lipid profile in control group:*
- *Serum triglyceride level ranged from 40-128mg% with mean value of 86.33 ± 24.13 S.D.*
- *Serum HDL level ranged from 55-75mg/100ml with mean value of 65 mg/100ml.*
- *Serum total cholesterol level ranged from 150-250mg/100ml with mean value 200mg/100ml*
- *Serum LDL level ranged from 87-144.4 mg/100ml with mean value of 115.7mg/100ml.*
- *Serum VLDL level ranged from 8-37mg/dl with mean value of 22.8mg/100ml.*
- *Mean value of serum triglyceride in male (n=16) and that in female (n=8) were 84.34 ± 27.78 S.D. and 91.2 ± 16.95 S.D. respectively.*
2 .*Lipid profile in diabetes mellitus patients:*
- *Serum triglyceride level ranged from 88-226mg% with mean value of 136.50 ± 30.88 S.D.*
- *Serum HDL level ranged from 28-48 mg/100ml with mean value of 38 mg/100ml.*
- *Serum total cholesterol level ranged from 205.4-294.4 mg/100ml with mean value of 249.9*
- *Serum LDL level ranged from 135-225mg/dl with mean value of 180.3mg/100ml*
- *Serum VLDL level ranged from 17.6-45.2mg/100ml with mean value of 31.4mg/dl*
- *Mean serum total cholesterol, triglyceride; HDL, VLDL AND LDL concentration was 226±23, 40±7, 35±6 and 148±26*
3. *Lipid profile level and duration of illness:*
- *Serum triglyceride levels are higher in patients with duration of illness more than 4 yrs (138mg% ± 26.75 S.D. and 147.1mg% ± 22.19 S.D.) as compared to those whose duration of illness was less than 4 years (*

126.3mg% ± 24.66 S.D. and 113.8 ± 14.49 S.D.)

1. *Lipid profile level and severity of illness:*
    Severity was decided on basis of ketone bodies in urine and levels of blood sugar.
    *   *Serum triglyceride, total cholesterol, LDL and VLDL level was significantly raised in diabetics with ketoacidosis (n=14) with mean value of 179.42mg% ± 28.93, 263.1 mg%,199.5 mg% and 54.7 mg% than that of diabetics without ketoacidosis (n=86) with mean value of 129.86mg% ± 26.65, 249.9mg%, 150.3mg% and 26.6 mg %.*

Keywords: *Lipid profile, diabetes mellitus*

Introduction

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The classical clinical presentation is polyurea, polydipsia and polyphagia. Sometimes it is asymptomatic and diagnosed either or routine checkup or investigation for symptoms or complications of diabetes.

Diabetes causes biochemical alteration in the body as a whole particularly metabolic disorder involving carbohydrate and lipid. Diabetic dyslipidaemia includes not only quantitative lipoprotein abnormalities, but also qualitative and kinetic abnormalities that, together, result in a shift towards a more atherogenic lipid profile. The primary quantitative lipoprotein abnormalities are increased triglyceride levels and decreased HDL-cholesterol levels. Qualitative lipoprotein abnormalities include an increase in large, very low-density lipoprotein (VLDL) and LDLs, glycation of apolipoproteins and increased susceptibility of LDL to oxidation. The main kinetic abnormalities are increased VLDL production, decreased VLDL catabolism and increased HDL catabolism. In addition, even though LDL-cholesterol levels are normal it has decreased turnover, which is potentially atherogenic. Although the pathophysiology of diabetic dyslipidaemia is not fully understood, the insulin resistance and relative insulin deficiency observed in patients with type 2 diabetes are likely to contribute to these lipid changes, as insulin plays an important role in regulating lipid metabolism.

Morphologically the changes are formation of atheromatous patches, microaneurisms, weakening and rupture of blood vessels and the most dreaded thrombosis leading to infarction of organ. Diabetes is often associated with triopathy i.e. neuropathy, nephropathy and retinopathy.

Insulin promotes lipogenesis, inhibits lipolysis and is required for the activation of lipoprotein lipase. Thus in insulin deficiency lipogenesis is inhibited, free fatty acid is mobilized and lipoprotein lipase activity may be deficient.

So it is evident that the presence and amount of different lipoprotein may reflect the severity of diabetes mellitus and help in predicting the impending danger.

This study analyses the lipid profile in patients with diabetes mellitus in relation to age, sex, duration and severity of illness.

Material and Methods

Material

In this study 100 cases of diabetes mellitus were included in the study. The cases were taken from different outpatient and inpatient ward of Darbhanga Medical College and Hospital, Leheriaserai.

Care was taken in selection of cases and those with complications, which are known to cause high lipid profile levels like hepatic disorders, ischaemic heart disease, hypothyroidism, pregnancy, uraemia, massive albimunuria and patients on drugs like steroids and oral contraceptive pills were excluded.

Estimation of serum lipid profile, blood sugar after 50 gm of oral glucose and ketone bodies were done in control group and in patients with diabetes mellitus.

Sampling

After overnight fasting, in morning cases were asked to evacuate their bladder and 2 ml of venous blood was collected by means of a dry sterilized

syringe in dry sterile vial and allowed to clot at room temperature.

Methods
1. Serum glucose estimation by GOD/POD method.
2. Determination of total cholesterol by CHOD / PAP method.
3. Determination of serum triglycerides by GPO/PAP method.
4. Determination of HDL-Cholesterol by PEG/CHOD –PAP method.
5. Serum LDL-Cholesterol was calculated by Freidewald's Formula.

Statistical Calculation
The values of serum lipid profile were statistically analyzed by determining the mean and standard deviation (S.D).

Observation and Results
The study group included 100 patients with diabetes mellitus having age between 20yrs to 60 yrs age. Among these there were 62 % (n=62) male patients and 38% (n=38) female patients with diabetes mellitus.

24 control cases were investigated in similar manner. Among these there were 66% (n=16) males and 33% (n=8) females.

Table no -1 Showing age distribution of control and test group

Age groups(years)	Test cases	Controls
<25	6	2
25-34	18	10
35-44	18	8
45-54	28	2
>54	30	2
Total	100	24

In test series maximum number of cases belonged to age more than 45 years (58%) while in control maximum number of cases were between 25-44 years (75%).

Table no 2 Showing sex distribution of control and test group

Group	Male	Female	Total	Range in years
Control	16	8	24	22-55
Test	62	38	100	18-88

Table no 3 Showing lipid profile in different age group of control

Age group in years	No of cases	Serum triglyceride	Total cholesterol	HDL cholesterol	LDL cholesterol	VLDL cholesterol
<25	2	102	225	47	129.6	20.4
25-34	10	66.66	180	50	103	16.5
35-44	8	103.25	212	50	125	20.6
45-54	2	80	190	50	108	16.0
>54	2	108	185	50	103.4	21.6

No definite correlation exists between the levels of serum triglyceride in different age groups. However slight difference in levels can be observed among age groups 25-34 and 35-44 years.

Table no 4 Showing serum triglyceride and HDL cholesterol in different age group of controls

Age group in years	Male					Female				
	No of cases	Triglyceride (mg%)		HDL Cholesterol		No of cases	Triglyceride (mg %)		HDL Cholesterol	
		Range	Mean	Range	Mean		Range	Mean	Range	Mean
<25	0	-	-	-	-	2	102	102	75	75
25-34	8	40-92	66.75	65-70	67.5	2	66	66	65	65
35-44	4	88-128	108	60-68	64	4	97-100	98.5	55-60	57.5
45-54	2	80	80	66	66	-	-	-	-	-
>54	2	108	108	60	60	-	-	-	-	-
Overall	16	40-128	84	60-70	65	8	66-102	84	55-75	65

There is no definite correlation in different age group of both sexes. However males between age group 35-44 years showed slightly higher value of mean serum triglyceride level (108mg%) in comparison to that of female (98.5mg%)

Table no 5 Showing blood sugar level 2hrs after 50 gm of oral glucose and fasting serum lipid profile level in control and test group

Group	No of cases	Blood sugar(mg%)		Serum triglyceride (mg%)		Serum total cholesterol		Serum HDL		Serum LDL		Serum VLDL	
		Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
control	12		119.16	40-128	86.33	160-240	200	55-75	65	87-144.4	115.7	8-37.6	22.8
Test	50	163-424	242.3	88-226	136.5	205.4-294.4	249.9	28-48	38	135-225.6	180.3	17.6-45.2	31.4

It is clear from this table that serum lipid profile levels are raised in test group in comparison to control group.

Table no 6 Showing blood sugar level 2 hrs after 50 gm of oral glucose and fasting serum lipid profile level in diabetes with ketosis and diabetes without ketosis

Group	No of cases	Blood sugar(mg%)		serum triglyceride		Serum total cholesterol		Serum HDL		Serum LDL		Serum VLDL	
		Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
Diabetes without ketosis	86	163-437	228.6	88-226	129.86	205.4-294.4	249.9	28-48	38	135-225.6	180.3	17.6-37.6	27.6
Diabetes with ketosis	14	274-341	329.7	151-200	179.42	232.2-294	263.1	28-35	31.5	180-219	199.5	24.2-45.2	34.7

It can be seen that lipid profile levels in diabetes with ketosis is more than those without ketosis.

Table no 7 Showing the relation of serum lipid profile levels with duration of illness

Group	No of cases	Blood sugar(mg%)		serum triglyceride		Serum total cholesterol		Serum HDL		Serum LDL		Serum VLDL	
		Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
<1yr	44	163-424	226.3	88-158	126.3	205.4-294.4	249.9	36-48	42	140-205	172.5	17.6-31.6	24.6
1-4 yr	26	190-230	206.3	88-137	113.8	208.6-287	247.8	28-43	35.5	135-215	175	18-37.6	27.8
5-9 yr	30	181-437	261.5	92-150	138	248-275	261.5	32-45	38.5	173-205	189	18.4-32.2	25.8
>9yr	20	182-336	229.3	100-180	147.1	217-294	255.5	32-44	38	163-225	194.4	21.6-36.6	29.8

This shows that serum triglyceride levels are higher in cases with duration of illness more than four years.

Summary and Conclusion
- Serum triglyceride levels are higher in patients with duration of illness more than 4 yrs (138mg% ± 26.75 S.D. and 147.1mg% ± 22.19 S.D.) as compared to those whose duration of illness was less than 4 years (126.3mg% ± 24.66 S.D. and 113.8 ± 14.49 S.D.)
- Serum triglyceride, total cholesterol, LDL and VLDL level was significantly raised in diabetics with ketoacidosis (n=14) with mean value of 179.42mg% ± 28.93 , 263.1 mg%,199.5 mg% and 54.7 mg% than that of diabetics without ketoacidosis (n=86) with mean value of 129.86mg% ± 26.65, 249.9mg%, 150.3mg% and 26.6 mg %.
- Hence lipid profile is important marker and can be used to predict severity of diabetes mellitus and onset of complications.

Conflicts of Interest
The authors declare that there is no conflict of interests regarding the publication of this paper.

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