Lipid Profile In Diabetes Mellitus

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Abstract: <u>Background:</u> The prevalence of diabetes is rapidly rising all over the world. India is not an exception. Alteration of serum lipids & complications is significant in diabetics which lead to micro and macrovascular diseases. <u>Aims & Objective:</u> To know the lipid profile pattern in diabetic patients.To identify high risk group so that they can be treated early for preventing complications. <u>Method:</u> Total 200 OPD & indoor diabetic patients visiting at Sir Takhtsinhji General Hospital, Bhavnagar from June 2014 to May 2015 were selected using certain criteria. <u>Results:</u>Type I patients have onset of Diabetes at an early age with longer duration but they have normal lipid profile. Type 2 patients have onset of Diabetes at late age but they have elevated levels of Triglyceride, Cholesterol, LDL, VLDL with low HDL. Obesity is common in NIDDM.Females having higher lipid profile values than males. Uncontrolled Diabetic patients are more dyslipidemic. <u>Interpretation & Conclusion:</u> Type 1 diabetic patients have longer duration of disease. Type 2 diabetic patients having altered profile, having more risk for complications like atherosclerosis, Coronary Heart Disease etc. Control of Diabetes is necessary for controlling lipid profile & complications. [S S ROY NJIRM 2016; 7(4):8-13]
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Introduction: The prevalence of diabetes is rapidly rising all over the world. Current estimates are that there are at least 382 million people living with diabetes worldwide of which two third are in developing countries. The total number of people with diabetes is predicted to rise to 592 million by 2035.

Indian Scenario: India is being called the diabetic capital of the world.According to diabetes atlas published by the International Diabetes Federation(IDF) and The World Health Organization (WHO), it has been predicted that by the year 2025, the maximum prevalence of diabetes would be in Indiaand every 4th diabetic will be an Indian[1,2].

Need for Study: The relationship between alteration of serum lipids and vascular complications is more significant in diabetics than in the general population.The most common alteration of lipoprotein in diabetes mellitus is hypertriglyceridaemia, elevation in Very low density lipoprotein (VLDL) concentration & may have increased Low density lipoprotein (LDL) production as well. The above mentioned lipid abnormalities will lead to microvascular and macrovascular diseases in diabetic patients.Diabetes is associated with increased incidence of atherogenesis& Coronary artery disease by a factor two to four. Plasma cholesterol value is a strong predictor of Ischaemic heart diseases.Hypertension is twice as frequent in these patients.Increased prevalence of neuropathy, nephropathy & retinopathy is noted in these patients.

Aims & Objectives of Study: To know the lipid profile pattern (Serum cholesterol, triglycerides, High density lipoprotein (HDL), LDL and VLDL) in diabetes mellitus patients.To evaluate lipid profile in normal subjects & subjects with diabetes mellitus in different age groups and genders.To compare the lipid profile in controlled and uncontrolled diabetes mellitus subjects.

Diagnostic criteria for Diabetes Mellitusare takenas per American diabetes association: Diagnosis and Classification of Diabetes Mellitus. Diabetes Care January 2006[3].

Methodology: The study was conducted from June 2014 to May 2015 on 200 Diabetic patients of which 100 were insulin dependant (Type 1 or IDDM) & 100 were non insulin dependent (type 2 or NIDDM) patients,attending OPD or indoor, whose lipid profiles were available through Bio-chemistry Dept. laboratory in Sir Takhtsinhji General Hospital, Bhavnagar & who fit into the criteria mentioned below. Another group of 50 apparently healthy subjects as a control group was studied. They were primarily diagnosed by History, Clinical examination and further evaluated by biochemical investigations according to the IRB approved proforma. The subjects in control group were selected from the staffs working in Biochemistry & Pathology department and people coming for their physical fitness at Sir T. Hospital, Bhavnagar.

•Inclusion Criteria: All clinically diagnosed cases of diabetes mellitus were taken for case study and age sex matched individuals for controls.

•Exclusion criteria:

-Chronic alcoholism, Smoking,

-Any systemic disease

-Chronic use of medicine e.g. Glucocorticoids,

Lipid lowering agent.

-Pregnancy

-Familial dyslipidaemia

-Person who denied giving consent.

•Risks: -There is no significant risks to the patient due to this study.

Outcome Measures: Obesity was calculated by using BMI. Aseptically collected first morning urine measured for sugar & albumin by URISTIX.Fasting blood sample were collected for estimation of Fasting blood sugar (FBS), Lipid profile, creatinine and glycosylated haemoglobin (HbA1c). Post prandial blood samples were collected 2 hrs after meal. Following Laboratory Investigations were done in study group and control group and values were expressed in mg/dl. Blood samples so collected were analyzed on ILAB-650 fully auto analyzer at Clinical Biochemistry Section, Laboratory services Sir T. Hospital, Bhavnagar. Results were analyzed following criteria set by WHO, American diabetic association (ADA), National Cholesterol Education Program – Adult Treatment Panel III (NCEP-ATP III).NCEP criteria[4] are as follows-

Name of Test	Desirable(mg/dl)	Borderline (mg/dl)	High(mg /dl)
Total Cholesterol	<200	200-239	≥240
Triglyceride	<150	150-199	≥200
HDL	≥60	40-59	<40
LDL	<129	130-159	≥160

-Serum VLDL (calculated as Triglyceride/5)

Statistical Analysis: The results achieved will be statistically assessed using Student T test when required & P value calculated.

Results : Age & Gender Distribution- Age distribution shows that IDDM occur in early age group while NIDDM occur in later age group with slight male preponderance in both (Table-1). Samples are gender matched with P =0.56 (>0.05) & P= 0.82 (>0.05) for IDDM and NIDDM respectively.

Table-1 Age & Gender Distribution in IDDM, NIDDM& Control

Age	IDDM		NIDDM		Control	
	Male	Female	Male	Female	Male	Female
0-9	00	00	00	00	00	00
10-19	05	07	00	00	01	03
20-29	23	12	00	00	08	05
30-39	19	13	03	03	02	06
40-49	08	08	14	14	06	05
50-59	04	01	23	19	07	03
60-69	00	00	10	09	02	01
≥70	00	00	02	03	01	00
Total	59	41	52	48	27	23

Table-2: Obesity And Diabetes Mellitus

Obesity	IDDM			NIDDM			Control		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Obese (BMI≥30)	04	05	09	35	36	71	00	00	00
Overweight (BMI 25-<30)	23	12	35	15	12	27	00	00	00
Non-Obese(BMI <25)	32	24	56	02	00	02	27	23	50
Total	59	41	100	52	48	100	27	23	50

Obesity And Diabetes - 71% Subjects of NIDDM were reported obese and 27% are overweight while only 9% of subjects of IDDM were obese and 35% are overweight (table-2).

Lipid Profile among IDDM, NIDDM - The table No. 3 shows, no IDDM subjects but 45% NIDDM subjects showed high serum cholesterol level (≥ 240mg/dl), while only (14%) IDDM & 27% NIDDM subjects showed borderline high serum cholesterol level (200-239 mg/dl). 28% NIDDM subjects but 86% IDDM and all control subjects shows S. cholesterol at desirable level (< 200 mg/dl).

Table No. 3: Comparision of Lipid Profile among IDDM, NIDDM and Control groups

Lipid Profile(mean value)		IDDM(n=100)	NIDDM(n=100)	Control(n=50)
S. Cholesterol (mg %)	<200	86	28	50
	200-239	14	27	00
	≥240	00	45	00
S. Triglyceride (mg %)	<150	95	21	50
	150-199	03	06	00
	≥200	02	73	00
S. HDL (mg %)	<40	12	40	00
	40-59	85	60	44
	≥60	03	00	06
S. VLDL (mg %)	<40	98	27	50
	≥40	02	73	00
S. LDL (mg %)	<100	30	00	48
	100-129	32	08	02
	130-159	19	10	00
	≥160	19	82	00

Thus significantly high value of S. Cholesterol (>200 mg/dl) found in subjects with NIDDM (P<0.001) as compared to subjects with IDDM (P<0.05).

Similarly, all control subjects & 95% of IDDM subjects showed normal (<150 mg%) serum triglyceride level, while only 21% of NIDDM subjects showed normal level. 3% IDDM and 6% NIDDM subjects showed serum triglyceride level borderline high (150-199 mg/dl) and 73% NIDDM subjects but no IDDM subject showed high serum triglyceride level (≥200 mg/dl).
In NIDDM, subjects with high S. Triglyceride (≥150mg/dl) is significant (P<0.001) while in IDDM (P>0.05), it is not significant.

As per NCEP guidelines, HDL ≥60 mg/dl are considered to offer some protection against coronary heart disease. 3% IDDM subjects, 6% Controlled subjects and no NIDDM subjects showed this value. In contrast, HDL <40 mg/dl is considered to be a significant independent risk factor for coronary heart disease, which is seen in 40% NIDDM subjects and only 12% of IDDM subjects.

Serum HDL level found low (<40 mg/dl) in subjects with NIDDM (P <0.001) & in IDDM (P <0.05) is significant as compared to controlled subjects also Serum HDL level found high (≥60mg/dl) in subjects with NIDDM (P <0.001) & in IDDM (P <0.05) which is significant as compared to controlled subjects.

S. VLDL level was within normal limit in 98% of IDDM subjects, while 27% of NIDDM subjects showed normal level. S. VLDL level was significantly high in 73% of subjects with NIDDM but only in 2% IDDM subjects.Serum VLDL level found high (≥40 mg/dl) in subjects with NIDDM (P <0.001) & in IDDM (P <0.05) is significant as compared to controlled subjects.

As per NCEP guidelines, serum LDL level was high (≥160mg %) in 82% of NIDDM subjects, while only 19% of IDDM subjects showed higher value. Serum LDL level found high (≥160 mg/dl) in subjects with NIDDM (P <0.001) & in IDDM (P <0.05) is significant as compared to controlled subjects.

Gender wise distribution of Lipid profile in both IDDM and NIDDM- In gender wise distribution of Lipid profile in IDDM all the values of lipid profile were within normal limit in both sexes. Female shown slight higher level of Cholesterol, S. Triglyceride, S. HDL, S. VLDL and S. LDL level as compared to male (table-4).

In NIDDM, both the sexes had shown higher value, but in female, Cholesterol, S. Triglyceride, S. HDL, S. VLDL and S. LDL level were higher as compared to males.

Discussion: After analysis of the data revealed from the study it is observed that there is typical pattern of distribution among IDDM and NIDDM cases of the study parameters.

Age distribution: In the present study, mean age for cases of IDDM were 31.07±10.19 yrs., while mean age for NIDDM were found 52.15±9.63 yrs. J.Nagpal et al5 found mean age for NIDDM was 53.6 years. Similar age distribution was observed byGerald et al 6in which they found mean age 37 yrs in IDDM and 60 yrs in NIDDM. Catherine C. Cowie et al also reported Median was 32 years for IDDM, 64 years for NIDDM, which match with our findings.

Table-4: Gender wise distribution of Lipid profile in both IDDM and NIDDM patients

Lipid Profile (mean value)	IDDM		NIDDM	
	Male	Female	Male	Female
S. Cholesterol (mg %)	176.88	177.29	234.48	256.58
S. Triglyceride (mg %)	115.75	116.98	200.92	204.75
S. HDL (mg %)	49.98	50.56	38.04	42.06
S. VLDL (mg %)	23.15	23.40	40.19	40.95
S. LDL (mg %)	124.00	125.00	168.56	174.19

Controlled and uncontrolled diabetes and lipid profile- In both IDDM and NIDDM subjects with uncontrolled (HbA1c ≥7 %) diabetes showed higher values of S. Cholesterol, S. Triglyceride, S. VLDL, S. LDL and lower values of S. HDL as compared to controlled diabetes (table-5).

Table-5: Effect Of Controlled And Uncontrolled Diabetes OnLipid Profile

Lipid Profile (mean value)	IDDM		NIDDM	
	Controlled	Uncontrolled	Controlled	Uncontrolled
S. Cholesterol (mg %)	156.21	192.14	196.77	291.41
S. Triglyceride (mg %)	86.74	137.62	153.75	241.27
S. HDL (mg %)	54.07	47.43	46.75	34.64
S. VLDL (mg %)	17.35	27.52	30.75	48.25
S. LDL (mg %)	88.67	150.29	157.84	181.81

Gender Distribution: Diabetes Mellitus was slightly more common in males than females. In IDDM 59% were males , in NIDDM 52% were males. Similar, observations were found by Gale EA & Gillespie KM[7].KL Ramaiya et al[8] also observed that diabetes is more frequent in men than in women in India. S. Del Prato et al[9] reported a similar male preponderance with M:F = 7:2 in NIDDM & 5:2 in IDDM.

Obesity: In present study 98% of NIDDM subjects were reported obese or overweight. Which is comparable with a study by Gatineau Mary et al[10] showing 90% of adults with type 2 diabetes are overweight or obese. Similar observation were reported by J.Nagpal et al [5],Gerald et al[6], J. Guy et al [11],Maahs et al [12], Kanagalakshmi K. [13],& Perez et al[14].

Lipid profile: Mean value of Serum total cholesterol in IDDM was 177.05 mg/dl as compared to mean value of control is 158.08 mg/dl suggesting that in IDDM, S. Cholesterol is within normal limit. Significant elevation of S.Cholesterol level is seen in NIDDM patients as compared to control.(Mean 249.77 mg% v/s. 158.08 mg%.).

IDDM patients have mean serum Triglyceride value 116.25 mg/dlagainst mean value of control=115.5 mg/dl whereas in NIDDM group it was significantly high, man value 202.76 mg/dl.
S. HDL level remains within normal limit in IDDM subjects (mean 50.22 mg/dl) as that of control (mean 50.38 mg/dl). Similarly, the mean value of S.HDL level in NIDDM subjects was lower (39.97mg/dl) than the same corresponding value in control subjects.

The mean S. VLDL in IDDM (23.25mg/dl) was similar to that of control subjects (23.1 mg/dl). But the mean value of S. VLDL in NIDDM (40.55 mg/dl) was increased significantly as compared to control subjects (23.1 mg/dl).

The mean value of S.LDL in IDDM subjects (124.41 mg/dl) was slightly high as compared to control subjects (87.18mg/dl). Whether it was also found that in NIDDM subjects mean S. LDL was significantly

higher as compared to that of control subjects.These results are well compared with those of Lassenius et al.[15], Feitosa et al. [16], Eckel R et al [17],Tangvarasittichai et al[18], Pushparaj et al [19]& Agarwal P.et al[20].

Gender wise variation: S. cholesterol, S. Triglyceride, S.LDL, S. VLDL and S.HDL were higher in NIDDM females than in males. These observations are well correlated with Kanagalakshmi K. [10,] Nikkila et al [21], Soedamah et al [22], Abdel-Aal et al[23] .

Comparison among controlled & uncontrolled IDDM & NIDDM patients: In both lDDM and NIDDM subjects with uncontrolled diabetes had higher values of S.Cholesterol, S.Triglyceride, S. LDL,VLDL and low value of S.HDL as compared to subjects with controlled diabetes. Similar observation was found by , J. Guy et al [11] , Pushparaj et al[19] , Ahmed et al ,Nikkila et al [21] & Ladeia A.M et al [24] in subjects with IDDM.

Conclusion: From history it is seen that, subjects with IDDM have onset of Diabetes at an early age while those with NIDDM have onset at later age.Prevalence of obesity is common in NIDDM subjects than IDDM subjects.NIDDM subjects are dyslipidemic, which is characterized by elevated S.Triglyceride, S. Cholesterol, S.LDL, S.VLDL with low HDL. But IDDM subjects have normal lipid profile.Females having higher lipid profile values than males in both groups. Control of Diabetes plays significant role in alteration of lipid profile, as subjects with uncontrolled Diabetes mellitus are more dyslipidemic than their controlled counterparts.At last it can be concluded that Diabetes is a metabolic derangement affecting not only sugar but also lipid metabolism involving various systems of body. As IDDM patients have longer duration of disease, they are more prone for complications like Diabetic retinopathy etc, whereas NIDDM patients having altered lipid profile, having more risk for complications like Coronary Heart Disease. Control of Diabetes is necessary for controlling lipid profile and complications.

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