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Dr. Jatin Lungater
Assistant Professor, Medicine
Dept., Shree M.P. Shah GMC,
Jamnagar, Gujarat, India.

Dr. Mehul Kaliya
Assistant Professor, Medicine
Dept., Shree M.P. Shah GMC,
Jamnagar, Gujarat, India.

Dr. Mittal Rathod
Tutor, Community medicine
Dept., Shree M.P. Shah GMC,
Jamnagar, Gujarat, India.

Dr. Ajay Tanna
Assistant Professor, Medicine
Dept., Shree M.P. Shah GMC,
Jamnagar, Gujarat, India.

Dr. Manish Mehata
Professor & Head, Medicine
Dept., Shree M.P. Shah GMC,
Jamnagar, Gujarat, India.

Correspondence
Dr. Jatin Lungater
Assistant Professor, Medicine
Dept., Shree M.P. Shah GMC,
Jamnagar, Gujarat, India.

Dyslipidemia in diabetes: A cross sectional study

Dr. Jatin Lungater, Dr. Mehul Kaliya, Dr. Mittal Rathod, Dr. Ajay Tanna, Dr. Manish Mehata

Abstract

Background: Diabetes is commonly associated with abnormalities in plasma lipids and lipoprotein levels commonly referred to as “dyslipidemia. About 50% of all diabetic patients have dyslipidemia. Lipid abnormalities are more common in type 2 diabetes than in type 1 diabetes. Thus present study was conducted with primary objective of finding alternations of lipid profile in diabetes mellitus patients.

Methods: The study was carried out at a tertiary government medical hospital in Jamnagar city during period of 1 year among 160 patients.

Results: Type-2 DM subjects were dyslipidemic, which was characterized by elevated S. Triglyceride, S. Cholesterol, S. LDL, S. VLDL, with low HDL; such dyslipidemia was not significant in Type-1 Subjects. The complications mainly cardiovascular of Diabetes Mellitus have Major role in much of diabetes related morbidity & mortality.

Conclusion: The important impact of dyslipidemia on complications requires undivided attention throughout the course of disease.

Keywords: Dyslipidemia, Lipid Profile, DM Type-I, DM Type-II

1. Introduction

During year 2004 total prevalence of diabetes in India was 37.7 million and total mortality due to diabetes was 1.09 lac and expected to rise to 69.9 million by 2025 unless urgent preventive steps are taken [1].

Diabetes mellitus (DM) refers to a group of common metabolic disorders that share the phenotype of hyperglycemia. Several distinct types of DM are caused by a complex interaction of genetics and environmental factors. Depending on the etiology of the DM, The metabolic deregulation associated with DM causes secondary path physiologic changes in multiple organ systems that impose a tremendous burden on the individual with diabetes and on the health care system [2].

Diabetes is commonly associated with abnormalities in plasma lipids and lipoprotein levels commonly referred to as “dyslipidemia”. About 50% of all diabetic patients have dyslipidemia. Lipid abnormalities are more common in type 2 diabetes than in type 1 diabetes [3].

Close examination of lipoprotein metabolism in diabetes mellitus is important because of relationship of lipoproteins to atherosclerosis and high incidence of early atherosclerotic complication and death among persons with diabetes.

Even as the causes of increased cardiovascular risk in type 2 diabetes are multifactorial, an atherogenic lipid profile characterized by elevated triglycerides and low levels of high-density lipoprotein (HDL) cholesterol are few major modifiable factors contributing progressively in cardiovascular risk [4-5].

The risk of CHD is 2-3 times higher in diabetics than in non-diabetics. CHD is responsible for 30-50% of deaths in diabetics over the age of 40 years in industrialized country [6].

It is proven that early detection of dyslipidemia and reducing LDL-C 40% coronary event will reduce by 22% [7].

2. Objectives: The primary objective of the study was to study the alternations of lipid profile in diabetes mellitus patients and secondary objectives were as following: To find out

prevalence of dyslipidemia in diabetes mellitus; to study pattern of dyslipidemia in diabetes mellitus; & to effective early detection and treatment of dyslipidemia to reduce morbidity & mortality.

3. Materials and Methods

3.1 Study Area and Design: The study was carried out at a tertiary government medical hospital in Jamnagar city during period of 1 year.

3.2 Patients Selection Criteria: Total one hundred sixty patients of Diabetes Mellitus were selected for this study, amongst which, sixty patients were of Type-1 and one hundred patients were of Type-2 irrespective of age, sex, type of diabetes, duration of diabetes with purposive sampling technique.

3.3 Samples and Investigations: Venous blood samples were taken from fasting and 2hr postprandial diabetic patients. Investigations carried out were, blood glucose

fasting and 2 hrs postprandial blood glucose and fasting lipid profile including TC, TG, HDL-C, LDL- C and very low density lipoprotein cholesterol (VLDL-C). Serum TC was determined by an enzymatic (CHOD- PAP) colorimetric method [8] and TG were determined by an enzymatic (GPO-PAP) method [9]. HDL-C was estimated by a precipitant method [10] and LDL-C by was estimated by using Friedewald’s formula [11] as has been shown below: $LDL-C = TC - HDL-C - (TG/5)$, where TG/5 is approximately equal to VLDL-C. Plasma glucose was determined by using the glucose oxidase enzymatic method [12].

Dyslipidemia (abnormal lipid profile) was defined using the National Cholesterol Education Programme – Adult Treatment Panel III (NCEP – ATP III) (National Cholesterol Education Programme, 2002) criteria as shown in table (13). Normal values of fasting lipid profile were taken as TC desirable <200mg/dl, TG <150 mg/dl, HDL-C > 40 mg/dl, LDL-C near optimal <130 mg/dl.

ATP III Classification of LDL-C, TC, HDL-C and TG (mg/dL) [13]

LDL-Cholesterol	Interpretation
<100	Optimal
100-129	Near optimal/above optimal
130-159	Borderline high
160-189	High
>190	Very high
Total Cholesterol	Interpretation
<200	Desirable
200-239	Borderline high
>240	High
HDL- Cholesterol	Interpretation
<40	Low
>60	High
Triglyceride	Interpretation
<150	Normal
150-199	Borderline high
200-499	High
>500	Very high

4. Results

Table: 1: Sociodemographic profile of Study Subjects

Age Group	DM	Type 1 DM		Type 2 DM	
		Male	Female	Male	Female
0-9	00 (00%)	00 (00%)	00 (00%)	00 (00%)	00 (00%)
10-19	03 (5%)	03 (5%)	04 (6.6%)	00 (00%)	00 (00%)
20-29	12 (20%)	12 (20%)	06 (10%)	00 (00%)	00 (00%)
30-39	10 (16.6%)	10 (16.6%)	06 (10%)	03 (03%)	03 (03%)
40-49	08 (13.3%)	08 (13.3%)	08 (13.3%)	14 (14%)	14 (14%)
50-59	02 (3.3%)	02 (3.3%)	01 (1.6%)	23 (23%)	19 (19%)
60-69	00 (00%)	00 (00%)	00 (00%)	10 (10%)	09 (09%)
> 70	00 (00%)	00 (00%)	00 (00%)	02 (02%)	03 (03%)
Total	35 (58%)	35 (58%)	25 (42%)	52(52%)	48 (48%)
Family history					
Positive	03 (5%)	03 (5%)	05 (8%)	20 (20%)	21 (21%)
Negative	32 (53%)	32 (53%)	20 (34%)	32 (32%)	27 (27%)
Total	35 (58%)	35 (58%)	25 (42%)	52 (52%)	48 (48%)

In the present study age distribution of type 1 DM found in early age group while type 2 DM occur in later age group with slight male preponderances in both. Majority of cases i.

e. 41% of Type 2 showed positive family history, in contrast, Type1 cases showed only 13% of positive family history.

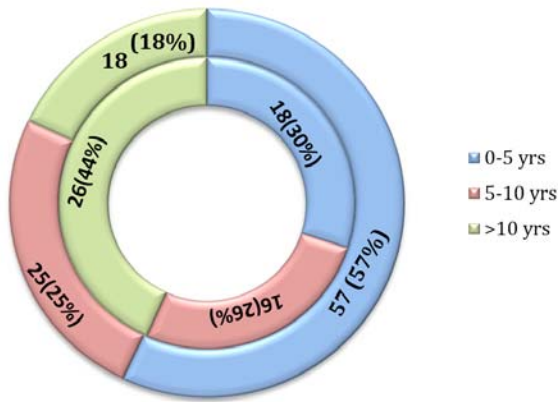


Chart 1: Duration of Diabetes

*Inner circle showing Type 1 DM and outer circle showing Type 2 DM.

At the time of present study, duration of diabetes mellitus since 0-5 yrs, 5-10 yrs and more than 10 yrs were in 18%, 16%, 26% in Type 1 DM and 57%, 25%, 18% in Type 2 DM respectively.

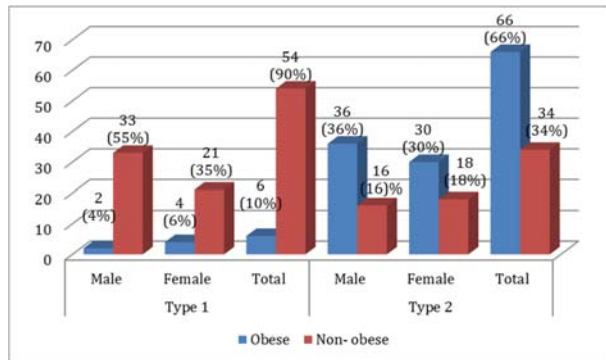


Chart 2: Obesity in Diabetes

Subject of Type 2 DM 66% were reported obese while only 10% of subjects of Type 1 DM were obese.

Table 2: Lipid Profile of Study subjects

S. Cholesterol (mg %)	Type 1 DM	Type 2 DM
<150	05 (8.3%)	00 (00%)
151-250	50 (83.3%)	28 (28%)
251-300	05 (8.3%)	45 (45%)
301-350	00 (00%)	19 (19%)
351-400	00 (00%)	08 (08%)
S. Triglyceride (mg %)		
10-190	57 (95%)	26 (26%)
191-250	03 (05%)	26 (26%)
250-300	00 (00%)	34 (34%)
301-350	00 (00%)	11 (11%)
>350	00 (00%)	03 (03%)
S. HDL (mg %)		
<34	00 (00%)	30 (30%)
35-60	57 (95%)	70 (70%)
>60	03 (05%)	00 (00%)
S. VLDL (mg %)		
20-40	57 (95%)	27 (27%)
>40	03 (05%)	73 (73%)
S. LDL (mg %)		
40 to 100	14 (23.4%)	03 (03%)
101 to 160	34 (56.6%)	19 (19%)
>160	12 (20%)	78 (78%)

Majority of Type 2 DM patients i.e. 72% showed high serum cholesterol level, while only (12%) of Type 1 showed high serum cholesterol level.

5% of Type 1 DM subjects showed high (>190 mg %) serum triglyceride level, while 74% of Type 2 subjects showed significant high value of S. Triglyceride.

Among Type 2 DM subjects 30% had lower HDL while none of Type 1 DM subject had lower HDL value.

S. VLDL level was within normal limit in 95% of Type 1 DM subjects, while only 27% Type 2 DM subjects showed normal level. S.VLDL level was significantly high in subject with Type 2 DM while in Type 1 DM, it remained within normal range.

Serum LDL level was high (>160 mg %) in 78% Type 2 DM subjects, while only 19% of Type 1 DM subjects showed higher value. Highly significant increase of S. LDL level reported in Type 2 subjects as compared to significant rise in Type 1.

5. Discussion

❖ Age distribution

As observed in the present study, 67% cases of TYPE 1 DM were found in age group of 20-39 yrs of age, while 70% of cases of TYPE 2 DM were found in age group of 40-59 yrs of age. Similar age distribution was observed by Gerald *et al.* (1981) [14]. Similar age distribution was observed by Dhaval *et al.* (2001) [15].

❖ Gender distribution

In present study it was found that Diabetes Mellitus was slightly more common in males than females. In TYPE 1 DM, 59% were males and in TYPE 2 DM, 52% were males. Similar observations were found by Yoshisuke *et al.* (1977) [16]. Similar observations were found by Dhaval *et al.* (2001) [15]. In some countries (e.g. U. K.) the overall male: female ratio is about equal, while in South East Asia an excess of male diabetes has been observed however it is open to question.

❖ Family history

In present study, positive family history was obtained in 41% of cases of Type 2 DM and in 13% of cases of TYPE 1 DM, which suggests hereditary influence playing an important role of genetics in TYPE 2 DM than TYPE 1DM.

❖ Obesity

Obesity is an extremely important environmental influence, playing a role in the pathogenesis of TYPE 2 DM. In present study 66% of TYPE 2 DM subjects were reported obese in comparison of TYPE 1 DM subjects in which only 10% were obese. Similar observation were reported by Gerald *et al.* (1981) [14]. Similar observation were reported by Dhaval *et al.* (2001) [15]

❖ Duration of diabetes mellitus

44% cases of TYPE 1 DM had duration > 10 yrs. While only 18% cases of TYPE 2 had duration > 10 yrs. Gerald *et al.* (1981)¹⁴ had similar observations, they found most of the TYPE 1 DM cases had duration > 15 yrs and TYPE 2 DM cases had duration <10 yrs.

❖ S. Cholesterol in Diabetes mellitus

72% of type-2 diabetes subjects showed high serum cholesterol level while only 12% subjects of type-1 diabetes

showed high serum cholesterol level. Thus significantly high value of S. cholesterol found in type-2 diabetes subjects as compared to type-1 diabetes subjects. Dhaval *et al.* (2001)^[15] had similar observation.

❖ **S. TGs in Diabetes mellitus**

95% of Type-1 DM subjects showed normal serum triglyceride level while only 26% of Type-2 DM subjects showed normal level and other higher level. Significantly higher value of S. triglyceride level found in type-2 subjects while in type-1 subjects it is not significantly high. Similar observation found in study of Dhaval *et al.* (2001)^[15].

❖ **S. HDL in Diabetes mellitus**

30% of Type 2 DM showed lower S.HDL level. The findings are similar in Dhaval *et al.* (2001)^[15] study. HDL is protective cholesterol.

❖ **S. VLDL in Diabetes mellitus**

S. VLDL was within normal limit in 95% Type-1 DM subjects while 27% of Type-2 DM subjects showed normal level. As compared to Dhaval *et al.* (2001)^[15] study these observations are similar.

❖ **S. LDL in Diabetes mellitus**

S. LDL level was high in 78% in Type-2 DM subjects while only 19% of Type-1 DM subjects showed higher level. These observations are similar to Dhaval *et al.* (2001)^[15] study.

6. Conclusion

Subjects with Type -1 DM had onset of Diabetes at early age while those with Type -2 DM had onset at later age. Mainly Type-2 DM subjects had relation with risk factors such as positive family history and obesity. While Type-1 subjects usually have no relation with such risk factors. Type-2 DM subjects were dyslipidemic, which was characterized by elevated S. Triglyceride, S. Cholesterol, S. LDL, S. VLDL, with low HDL; such dyslipidemia was not significant in Type-1 Subjects. The complications mainly cardiovascular of Diabetes Mellitus have Major role in much of diabetes related morbidity & mortality. The important impact of dyslipidemia on these complications requires undivided attention throughout the course of disease.

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