

Original article:

Prevalence of diabetic dyslipidaemia in younger age group

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Abstract:

Background: The commonest cause of mortality & morbidity in Type 2 diabetes is cerebrovascular accident & coronary artery disease. The study shows that only good blood glucose control, along with BP control in Type 2 diabetic patients cannot reduce mortality & morbidity due to cerebrovascular accident & coronary artery disease; but dyslipidaemia & life style modification is the cornerstone to reduce mortality & morbidity for those events. Dyslipidaemia in diabetes mellitus is a common accompaniment. Prevalence of lipid profile abnormality may not uncommon in young Type 2 diabetics which is common in elderly Type 2 diabetic patients. **Aims:** The aim of the study is to look after the prevalence of dyslipidaemia in younger age group & to compare it with elderly age group with the same anthropometric parameters. **Methodolgy:** A prospective cohort study was undertaken to find out the prevalence of diabetic dyslipidemia in younger and adult age group among patients attending Medical OPD & Diabetic clinic in M.G.M. Medical college & L.S.K. Hospital, Kishanganj, Bihar & to compare it between young and adult age group. **Results:** In the present study majority of patients of older age group have high LDL and low HDL in comparison to younger age group. Increased triglyceride level is not significantly high. **Conclusion:** Aggressive therapy of diabetic dyslipidemia will probably reduce the risk of CHD in patients with diabetes. Primary therapy should be directed first at lowering LDL levels & improving HDL levels.

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Introduction:

Diabetes is the common cause of mortality & morbidity in all over the World. The global prevalence of Type 2 diabetes will be double between 1995 & 2025, to 270 million people with the greatest number of cases being expected in China & India¹. Type 2 diabetes is the common form of diabetes accounting for 85% – 95 % of all cases of diabetes worldwide, and affecting 5% - 7% of the World's population. Increased prevalence of type 2 diabetic patients has been reported among overweight & obese persons as a consequence of unhealthy lifestyle². the prevalence of Type 2 diabetes in India is up to 20% in adult population in some urban areas. The commonest cause of mortality & morbidity in Type 2 diabetes is cerebrovascular accident & coronary artery disease. The study shows that only good blood glucose

control, along with BP control in Type 2 diabetic patients cannot reduce mortality & morbidity due to cerebrovascular accident & coronary artery disease; but dyslipidaemia & life style modification is the cornerstone to reduce mortality & morbidity for those events. Dyslipidaemia in diabetes mellitus is a common accompaniment.

Diabetic dyslipidemia is increased VLDL / serum triglycerides decreased HDL average levels of LDL but with a predominance of small, dense LDL Diabetic dyslipidemia is due, largely, to insulin resistance, insulin resistance increases hepatic secretion of VLDL → preferential formation of small, dense LDL increases HDL catabolism (cholesterol ester transfer protein dependent effect) decreases LPL activity.³ Diabetic dyslipidemia typically comprises moderately increased triglyceride, low high density

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lipoprotein cholesterol (HDLc), a predominance of small dense LDL particles (phenotype B), and increased apolipoprotein B (apoB), with low density lipoprotein cholesterol (LDLc) concentrations comparable to those of a background population.⁴⁻⁶ The management of diabetic dyslipidemia should aim for all the lipoprotein abnormalities identified and is based upon a stepwise type of treatment, starting with lifestyle modifications and improvement of glycemic control. Lipid-lowering drugs should be used when targets are not met with the previous measures.⁷ The management of Type 2 diabetes not only depends upon blood glucose control & blood pressure control, but life style management like obesity, exercise & also lipid profile management. Type 2 DM is becoming common in younger age group and the management is not depended upon blood glucose control only as mentioned and lipid profile abnormality is common in Type 2 diabetic patients. Prevalence of lipid profile abnormality may not uncommon in young Type 2 diabetics which is common in elderly Type 2 diabetic patients. Because younger age groups require longer

survival compared to elderly patients to reach their target life. So for longer survival of younger age Type 2 diabetic patients; management of lipid profile abnormality definitely takes an important role. The

compare it with elderly age group with the same anthropometric parameters. The United Kingdom Prospective Diabetes Study (UKPDS) demonstrates that controlling lipids and blood pressure may be significantly more effective in preventing CVD than is controlling hyperglycemia.^{8,9}

Materials & Methods:

Type of the study:

A prospective cohort study was undertaken to find out the prevalence of diabetic dyslipidemia in younger and adult age group among patients attending Medical OPD & Diabetic clinic in M.G.M. Medical college & L.S.K. Hospital, Kishanganj, Bihar & to compare it between young and adult age group.

Study Population and sampling frame:

Young people below 25 years & adult of age group above 60 years were the target population in this study.

Eligibility of the study population:

1) Inclusion Criteria:

Below 25 yrs. of age group & above 60 years of age group patients were taken for study as Type 2 diabetic

Proposed Therapeutic Goals for Men and Women with Type 2 Diabetes

Lipid Fractions	Ideal goal (mg/dL)
Total cholesterol	≤170
LDL cholesterol	<100 ^a
HDL cholesterol	≥45 for men ≥55 for women
Triglyceride	≤200
Non-HDL cholesterol	<130

LDL, low-density lipoprotein; HDL, high-density lipoprotein.

^a Optional goal for very-high-risk individual: <70.¹⁰

Degree of Risk of Coronary Heart Disease by Lipoprotein Level (mg/dl) in Type 2 Diabetes

Risk	LDL	HDL		Triglyceride
		Men	Women	
High	≥130	<30	<45	≥400
Borderline	100-129	35-45	45-55	200-399
Low	<100	>45	>55	<200

HDL, high-density lipoprotein, low-density lipoprotein.¹⁰

cardiovascular & cerebrovascular risk, required good control of lipid profile abnormality other than blood glucose, blood pressure & obesity control. The aim of the study is to look after the prevalence of dyslipidaemia in younger age group & to

patients those who were on oral hypoglycemic agent (Glimepiride 1-2 mg daily & metformin 1 gm daily) for more than 6 months & have good blood glucose control (HbA_{1c} <6.5%) . They had normal pancreatic function (lipase, amylase) & normal Ultra

Sonography of pancreas. All patients were euthyroid.

2) Exclusion Criteria:

1. No subjects were on hypolipidemic drugs.
2. Alcoholic Type 2 diabetic patients being excluded from the study.
3. Type 2 diabetic patients with noncomparable anthropometric measurements being excluded from the study.

Case Defining Criteria Used:

Diabetic Dyslipidemia : Diabetic dyslipidemia is increased VLDL / serum triglycerides decreased HDL average levels of LDL but with a predominance of small, dense LDL Diabetic dyslipidemia is due, largely, to insulin resistance. Insulin resistance increases hepatic secretion of VLDL → preferential formation of small, dense LDL increases HDL catabolism (CETP dependent effect) decreases LPL activity.¹⁰

Validity and Reliability:

The schedule was presented before the experts of the relevant departments of the M.G.M. Medical College, Kishanganj (i.e., Biochemistry and Medicine & Ethical Committee) .

Extensive literature search and expert endocrinologists opinion obtained regarding the case defining criteria's , diagnosis and parameter to establish validity and reliability of the measurement and its measuring instrument.

Biochemical Parameter:

Blood sample collection:

Blood sample was collected from the ante cubical vein with proper asepsis. Fluoride containing vials were used for collection of sample for plasma glucose estimation and for Lipid profile plain vials were used. Sample transferred to the Department of Biochemistry with in 2 hours maintaining cold chain.

Subjects were selected after filling up the questionnaire. The study subjects also were asked to get prepare themselves as per advice, before the blood samples were drawn.

At the initial steps, the Serum was separated by centrifugation and then subsequent investigation procedure was followed.

A. Estimation of Fasting Blood Sugar:

Principle:

Glucose is oxidized to gluconic acid and hydrogen peroxide in the presence of glucose oxidases. Hydrogen peroxide further reacts with phenol and 4-

aminoantipyrine by the catalytic action of peroxidase to form a red colored 'quinoneimine dye complex'. Intensity of the color formed is directly proportional to the amount of glucose present in the sample.¹¹

B. Estimation of Triglyceride :

Principle:

Lipoprotein lipase hydrolyses triglycerides to glycerol and free fatty acid. The glycerol formed with ATP in the presence of glycerol kinase forms glycerol 3 phosphates, which is oxidized by the enzyme glycerol phosphate oxidase to form hydrogen peroxide. Hydrogen peroxide further reacts with phenol and 4-aminoantipyrine by the catalytic action of peroxidase to form a red colored 'quinoneimine dye complex'. Intensity of the color formed is directly proportional to the amount of triglycerides present in the sample.¹²

C. Estimation of Cholesterol :

Principle:

Cholesterol esterase hydrolyses esterified cholesterols to freecholesterol. The free cholesterol is oxidized to form hydrogen peroxidewhich further reacts with phenol and 4-aminoantipyrine by the catalyticaction of peroxidase to form a red colored quinoneimine dye complex. Intensity of the color formed is directly proportional to the amount of cholesterol present in the sample. Cholesterol Esterase.¹³

D. Estimation of HDL Cholesterol :

Principle:

When the serum is reacted with the Polyethylene Glycol contained in the precipitating reagent, all the VLDL and LDL are precipitated. HDL remains in the supernatant and is then assayed as a sample for cholesterol using standard cholesterol reagent.¹⁴

Data Analysis:

Data analysis was done using SPSS 10. Package.

Table 1 Distribution of total cholesterol of the study population

Total Cholesterol (mg/dl)	Frequency	Percent	Mean	Std. Deviation
Desirable (<200)	44	44.0	171.68	17.80
Borderline High (200-239)	14	14.0	211.21	8.60
High (≥240)	42	42.0	333.38	56.32
Total	100	100.0	245.13	85.59

Limitations of the Study:

1. Maturity Onset Diabetes in Young (MODY) could not be excluded totally due to lack of proper investigating tools.
2. Thorough diet survey could not be done due to time constraint.

Results & analysis:

Table 1 Shows that 44 % of the study population have desirable cholesterol level, 14 % are in borderline and 42 % have high cholesterol level.

Table 2: Distribution of total cholesterol according to age

Age Group	Total Cholesterol			Total
	Desirable	Borderline High	High	
<25	36 72.0%	12 24.0%	2 4.0%	50 100.0%
>60	8 16.0%	2 4.0%	40 80.0%	50 100.0%
Total	44 44.0%	14 14.0%	42 42.0%	100 100.0%

Pearson Chi-Square= 59.342, df= 10, p.value = 0.00

Table 2 Shows that 4 % of less than 25 years age group have high total cholesterol level & 80 % of study population of above 60 years of age group have high total cholesterol level. The prevalence of total cholesterol significantly increases with increase in age (p<0.05).

Table 3: Distribution of total cholesterol according to their residence

Area	Total cholesterol			Total
	Desirable	Borderline High	High	
Urban	24 (38.1%)	6 (9.5%)	33 (52.4%)	63 (100.0%)
Rural	20 (54.1%)	8 (21.6%)	9 (24.3%)	37 (100.0%)
Total	44 (44.0%)	14 (14.0%)	42 (42.0%)	100 (100.0%)

Pearson Chi-Square= 8.155, df= 2, p.value = 0.017

Table 3 Shows that in rural area 54.1 % study population have desirable total cholesterol level. In urban area (38.1%) desirable total cholesterol level is decreasing. The difference is statistically significant (p<0.05).

Table 4: Distribution of total cholesterol according to income

Income	Total cholesterol			Total
	Desirable	Borderline High	High	
<2000	17 (65.4%)	7 (26.9%)	2 (7.7%)	26 (100.0%)
>2000	27 (36.5%)	7 (9.5%)	40 (54.1%)	74 (100.0%)
Total	44 (44.0%)	14 (14.0%)	42 (42.0%)	100 (100.0%)

Table 5: Distribution of LDL cholesterol in Study population According to age group

Age Group	LDL cholesterol					Total
	optimal	very high	near optimal	borderline high	high	
<25	36 (72.0%)	0(0%)	12 (24.0%)	0(0%)	2(4.0%)	50 (100.0%)
>60	8 (16.0%)	37(74.0%)	1(2.0%)	2 (4.0%)	2(4.0%)	50 (100.0%)
Total	44 (44.0%)	37 (37.0%)	13 (13.0%)	2 (2.0%)	4 (4.0%)	100 (100.0%)

Pearson Chi-Square= 66.126, df = 4 p.value =0.000

Pearson Chi-Square= 17.689, df= 2, p.value = 0.000

Table 4 Shows that Total cholesterol is increasing in higher income group (54.1%) than low income group (7.7%). The result is highly significant (<0.05).

Table 5 Shows that 74% of study population more than 60 years age have very high LDL cholesterol level and no people of less than 25 years have very high LDL cholesterol level. The comparison is highly significant (<0.05).

Table 5: Distribution of HDL cholesterol according to age-group

Age Group	HDL cholesterol			Total
	low	Normal	high	
<25	2 4.0%	42 84.0%	6 12.0%	50 100.0%
>60	42 84.0%	8 16.0%	0 .0%	50 100.0%
Total	44 44.0%	50 50.0%	6 6.0%	100 100.0%

Pearson Chi-Square= 66.484 df=2.,p.value =0.000

Table 5 Shows that 12 % of less than 25 years age group have high HDL and only 6% of more than 60 years age group have high HDL. The comparison is highly significant (<0.05).

Table 6: Distribution of triglycerides in the study population according

To age-groups

Age Group	TG			Total
	normal	borderline high	high	
< 25	2 4.0%	11 22.0%	37 74.0%	50 100.0%
>60	0 0%	7 14.0%	43 86.0%	50 100.0%
Total	2 2.0%	18 18.0%	80 80.0%	100 100.0%

Pearson Chi-Square= 3.339 df=2, p.value = 0.188

Table 6 Shows that 74% of less than 25 years age group have high triglyceride level & 86% of more than 60 years age group have high triglyceride level. The result is statistically insignificant (>0.05).

Comparison of diabetic dyslipidemia among different

Age groups:

In our study total cholesterol is high in >60 years age group (Mean 304.42) than <25 years (Mean 185.84) and triglyceride is high in >60 years age group (Mean 296.2) than <25 years (Mean 225.04) and LDL is high in >60 years age group (Mean 215.64) than <25 years (Mean 89.14). HDL is low in > 60 year age group (Mean 29.5) than <25 years (Mean 51.52).

A) Comparison of total cholesterol between young & adult groups.

In our study 4 % of less than 25 years age group have high total cholesterol level & 80 % of study population of above 60 years of age group have high total cholesterol level. The prevalence of total cholesterol significantly increases with increase in age (p<0.05). Lipid values, especially high-density lipoprotein cholesterol, hypertension, and other CHD risk factors were more strongly associated with CHD than glucose status.¹⁵ The Framingham Data¹⁶ shows that the relationship between total cholesterol level and all-cause mortality was positive (ie, higher cholesterol level associated

with higher mortality) at age 40 years, negative at age 80 years, and negligible at ages 50 to 70 years. The result is similar to us.

B) Comparison of total cholesterol between people of rural & urban area

We found in rural area 54.1 % study population have desirable total cholesterol level. In urban area (38.1%) desirable total cholesterol level is decreasing. The difference is statistically significant (p<0.05).

C) Comparison of total cholesterol between people of high & low income group

Total cholesterol is increasing in higher income group (54.1%) than low income group (7.7%). The result is highly significant (<0.05). People of urban area and of high income group have unhealthy food habits. A Controlled Clinical Trial of a Diet High in Unsaturated Fat in Preventing Complications of Atherosclerosis¹⁷ shows that diet which lowers serum cholesterol concentration can prevent overt complications of coronary heart disease and other manifestations of atherosclerosis.

We found in rural area 54.1 % study population have desirable total cholesterol level. In urban area (38.1%) desirable total cholesterol level is decreasing. The difference is statistically significant (p<0.05).

D) Comparison of LDL cholesterol between young & adult groups:

In our study 74% of study population more than 60 years age have very high LDL cholesterol level and no people of less than 25 years have very high LDL cholesterol level. The comparison is highly significant (<0.05). However in diabetics this LDL fraction contains a greater proportion of small, dense LDL particles which are believed to be more atherogenic.^{18, 19}

E) Comparison of HDL cholesterol between young & adult groups:

12 % of less than 25 years age group have high HDL and only 6% of more than 60 years age group have high HDL. The comparison is highly significant (<0.05). Increased LDL & low HDL in diabetic dyslipidemia is found in study in Mexico by Carlos A. Aguilar-Salinas et al.²⁰

F) Comparison of Triglyceride between young & adult groups:

74% of less than 25 years age group have high triglyceride level & 86% of more than 60 years age group have high triglyceride level. The result is statistically insignificant (>0.05). In our study the TG level is not significant, however elevated levels of plasma triglycerides (TG) and reduced concentrations of HDL cholesterol are very common in patients with diabetes, particularly NIDDM.²¹

A significant component of the risk associated with type 2 diabetes is thought to be because of its characteristic lipid “triad” profile of raised small dense low-density lipoprotein levels, lowered high-density lipoprotein, and elevated triglycerides (TGs).²²

Longitudinal epidemiology has pointed to the importance of raised plasma triglycerides and low HDL Cholesterol as a risk factor for coronary disease in diabetic subjects and there is supportive evidence for aggressive management of lipid disorders in type 2 diabetes.²³⁻²⁶

Conclusion:

In the present study majority of patients of older age group have high LDL and low HDL in comparison to younger age group. 74% of less than 25 years age group have high triglyceride level & 86% of more

than 60 years age group have high triglyceride level high. Total cholesterol is increasing in higher income and urban area group than low income group and rural area.

Diabetes mellitus increases the risk for atherosclerotic vascular disease. The risk is greatest in people who have other known risk factors, such as, dyslipidaemia, hypertension, smoking and obesity. There is a twofold to fourfold excess risk of coronary artery disease in type 2 diabetes mellitus compared with non-diabetic patients. Indeed, 75–80% of adult diabetic patients die of coronary artery disease, cerebrovascular disease, peripheral vascular disease or a combination of these conditions. Patients with type 2 diabetes can have many lipid abnormalities, including hyperchylomicronaemia, elevated levels of very low-density lipoprotein cholesterol (VLDL-C), low-density lipoprotein cholesterol (LDL-C) and triglycerides; and low levels of high-density lipoprotein cholesterol (HDL-C). Lipid abnormalities may be the result of the unbalanced metabolic state of diabetes (i.e., hyperglycaemia and insulin resistance) and improved control of hyperglycaemia does moderate diabetes-associated dyslipidaemia. In type 2 diabetes the major disturbances in lipoprotein metabolism are reflected by an increase in plasma triglyceride and a low HDL Cholesterol with normal or near normal LDL Cholesterol levels.

Aggressive therapy of diabetic dyslipidemia will probably reduce the risk of CHD in patients with diabetes. Primary therapy should be directed first at lowering LDL levels & improving HDL levels.

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