A Cross-Sectional Investigation of Lipid Profiles in Newly Diagnosed Type 2 Diabetics

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Abstract

Aim: The aim of this study was evaluate the lipid profile abnormalities in newly diagnosed type 2 diabetics.

Material and methods: A cross-sectional study were carried out to determine the lipid profile levels in newly diagnosed type 2 diabetics in the Department of General Medicine, Shri Krishna Medical College and Hospital, Muzaffarpur, Bihar, India for 15 months. A total of 200 newly diagnosed type 2 diabetics were enrolled in our study.

Results: In our study, 96 (48%) participants had normal serum triglycerides levels which is <150 mg/dl whereas 104 (52%) participants had an abnormal level of serum triglycerides. Among the 104 (52)participants with abnormal triglycerides, 30.5% had borderline high levels (150-199mg/dl), 19.5% had high levels (200-499 mg/dl) and 2% participants had very high triglycerides (≥500 mg/dl.In our study, among the 200 participants, 142 (71%) participants had desirable total Cholesterol levels of <200mg/dl, 51 (25.5%) had borderline high levels of 200- 239mg/dl and 7 (3.5%) had high total cholesterol levels of ≥240mg/dl and 31% of participants had near optimal levels of LDL, 35.5% had borderline high levels of LDL, 12% had high levels of LDL and 1% had very high levels of LDL.

Conclusions: Deranged lipid profiles are quite prevalent in type 2 diabetics with females having higher triglyceride levels. Recognition of such elevated triglyceride levels in even newly diagnosed type 2 diabetics will help in better prevention of associated cardiovascular disease.

Keywords: Cardiovascular disease, Hypertriglyceridemia, Type 2 diabetes, Lipid profile.

Introduction:

Diabetes (T2DM) and related cardiovascular complications are major public health challenges worldwide. Individuals with T2DM have two- to four-fold increased risk of coronary artery disease (CAD), the leading cause of death among people with T2DM[1].

Dyslipidemia and hypertension are major modifiable risk factors for T2DM and related CAD, which account for more than 87% of disability in low- and middle-income countries[2]. Furthermore, prediabetes (an intermediate metabolic state between normoglycemia and T2DM)

has also been found to be associated with an increased risk for cardiovascular disease[3]. Lipid abnormalities in patients with diabetes, often termed "diabetic dyslipidemia", are typically characterized by high total cholesterol (T-Chol), high triglycerides (Tg), low high density lipoprotein cholesterol (HDL-C) and increased levels of small dense LDL particles. Low density lipoprotein cholesterol (LDL-C) levels may be moderately increased or normal. Lipid abnormalities are common in people with T2DM and prediabetes[4] but the pattern of the different lipids may vary between ethnic groups, economic levels, and access to health care[5]. As early as 1988, it was described a multifactorial metabolic abnormality consisting of insulin resistance with compensatory hyperinsulinaemia, type 2 diabetes mellitus (T2DM), essential hypertension and hypercholesterolaemia[6,7]. Today, however, the World Health Organization (WHO) and International Diabetes Federation (IDF) use the term "Metabolic Syndrome" to describe this clustering of conditions[8]. The term diabetic dyslipidemia comprises a triad of raised triglycerides, reduced high density lipoprotein (HDL) and excess of small, dense low-density lipoprotein (LDL) particles. The lipid abnormalities are prevalent in diabetes mellitus because insulin resistance or deficiency affects key enzymes and pathways in lipid metabolism[9]. Micro- vascular and macro-vascular complications, including cardiovascular disease (CVD), retinopathy, nephropathy, and neuropathy, occur due to chronic uncontrolled hyperglycemia in diabetics[10,11]. It has been proposed that the composition of lipid particles in diabetic dyslipidemia is more atherogenic than other types of dyslipidemia[12]. The causal association between atherosclerosis and dyslipidemia is well established. In diabetes the associated hyperglycemia, obesity and insulin changes highly accelerate the progression to atherosclerosis[13,14]. In a recent study, it was observed significant trends for rising risk of coronary heart disease, stroke and all-cause mortality in relation to higher levels of baseline HbA1c in more than 11,000 participants in the Atherosclerosis Risk in Communities Study. For HbA1c categories of <6.5% and ≥ 6.5%, there was a significant association between fasting blood glucose levels and coronary heart disease, stroke or death from any cause[15]. It was attempted to correlate blood glucose levels with serum lipid profile parameters in previous studies 2 and it is clear that HbA1c values are lower in individuals with a decreased risk of micro-vascular complications[15].

In the present study, we have aimed to study the lipid profile abnormalities in newly diagnosed type 2 diabetics; as such an assessment will enable earlier detection and treatment of these lipid profile derangements thereby minimizing the cardiovascular morbidity and mortality that these can ensue.

Material and methods:

A cross-sectional study was carried out to determine the lipid profile levels in newly diagnosed type 2 diabetics in the Department of General Medicine, Shri krishna Medical College and Hospital, Muzaffarpur, Bihar, India for 15 months. A total of 200 newly diagnosed type 2 diabetics were enrolled in our study.

Inclusion criteria

- All patients who have been diagnosed as having type 2 diabetes mellitus within the last 3 months using the ADA (American Diabetes Association) criteria
- Sex: Both males and females.

Exclusion criteria

- Type 1 diabetics
- Patients on antipsychotic medications
- Patients with active hypothyroidism
- Patients with Cushing's syndrome were excluded from the study.

All procedures and interventions have been established only after obtaining adequate/ appropriate consent in a prescribed form. Ethical clearance has been obtained from the Ethical clearance committee chaired by the Principal Indira Gandhi institute of medical science, in a prescribed certificate. Upon enrollment in the study, written consent was obtained and duly signed by the patients in a prescribed format. After inclusion in the study in each case a thorough history was taken followed by a detailed examination and the observations were recorded.

Results

Table 1 shows the age distribution of the participants in the study. The maximum number of patients belonged to the age group of 40-50 years (50.5%) and the least number belonged to the age group 20-30 years. The Table 2 shows the gender distribution of the participants of our study. Among the total participants, 80 (40%) were males, and 120(60%) were females.

According to ATP III classification 96 (48%) participants had normal serum triglycerides levels which is <150 mg/dl whereas 104 (52%) participants had an abnormal level of serum triglycerides. Among the 104 (52) participants with abnormal triglycerides, 30.5% had borderline high levels (150-199mg/dl), 19.5% had high levels (200-499 mg/dl) and 2% participants had very high triglycerides (≥500 mg/dl). Among the participants in the study, 22% male and 30% female participants had above normal triglyceride levels. The above stacked bar chart shows

that most participants had normal triglyceride levels. The total number of female participants who had abnormal triglycerides are higher than the male participants According to the NCEP ATP III criteria, HDL levels ≤40 is considered low for males and ≤50 is considered low for females. Based on this criterion, in our study, 49.5% participants had low HDL and 50.5% participants had normal HDL. The Gender distribution showed that 37 male participants (37.38%) and 62 female participants (62.52%) had low HDL.

In our study, among the 200 participants, 142 (71%) participants had desirable total Cholesterol levels of <200mg/dl, 51 (25.5%) had borderline high levels of 200-239mg/dl and 7 (3.5%) had high total cholesterol levels of ≥240mg/dl. Among the participants who had elevated cholesterol levels, a female predominance was noted with30.83% of participants who had borderline high cholesterol levels being female Among the total participants, according to the NCEP- ATP III criteria, 62 (31%) participants had an optimal level of LDL of which 24 (36.70%) participants were males and 38 (61.30%) were females. 72 (36%) had near optimal levels of LDL and 28(38.88%) participants were males and 44(61.11%) were females. 40 (20%) had borderline high levels of LDL out of which 17 (42.5%) participants were males and 23 (57.5%) were females. 24(12%) had high levels of LDL of which 10 (41.67%) were males and 14 (58.33%) were females. 4 (4%) participants had very high levels of LDL of which 2 (1) was male and (50%) was female.

Table 1: Gender distribution among the participants

Gender	No.=200	Percentage
Male	80	40
Female	120	60

Table 2: Age distribution among the participants.

Age	No. of patients n=200	Percentage
Below 30	4	2
30-40	45	22.5
40-50	101	50.5
Above 50	50	25

Table 3: Serum Triglycerides

Serum Triglycerides	Male =80	Female=120	Total	Percentage
Normal (<150mg/dl)	36	60	96	48
Borderline high (150-199 mg/dl)	27	34	61	30.5
High (200- 499mg/dl)	15	24	39	19.5

Table 4: Serum HDL – distribution

Serum HDL	Male =80	Female=120	total	Percentage
Normal	37	62	99	49.5
Low HDL	43	58	101	50.5

Table 6: Serum cholesterol levels distribution

Serum cholesterol levels	Male =80	Female=120	Total	Percentage
Normal	62	80	142	71
Border line	14	37	51	25.5
High	4	3	7	3.5

Table 7: LDL levels- distribution

LDL levels	Male =80	Female=120	Total	Percentage
Optimal levels	24	38	62	31
Near optimal levels	28	44	72	36
Borderline high	17	23	40	20
High	10	14	24	12
Very high	1	1	2	1

Discussion

Out of the 200 participants of our study, all were type 2 diabetics diagnosed in the past 3 months. Overall gender distribution of the study population revealed that 40% were males and 60% were females. The higher proportion of females in this study may be due to the nature of the population seeking admission to our hospital. A similar female predominance was noted in a study done by Deepa et al comprising of 26001 participants[16]. Among the 200 participants, 75 % were less than 50 years and 25% were more than 50 years. Among them, majority of patients were in the age group of 40-50 years which is 50.5%. A similar study done by Nahar et al involving 200 participants also showed majority of participants in the between 40-50 years[17]. In our study, 104(52%) participants had high triglycerides i.e., ≥150mg/dl according to NCEP ATP III criteria and 96 (48%) had normal triglycerides. A study done by Bharadwaj et al, in North India showed that hypertriglyceridemia was present in 42.7% of subjects who were diabetics[18]. In our study, authors found that among the 104 participants with abnormal triglycerides, 30.5% had borderline high levels (150-199mg/dl), 19.5% had high levels (200-499 mg/dl) and 2% participants had very high

triglycerides (≥500 mg/dl). In our study, 22% male and 30% female participants had above normal triglyceride levels. A study done in four selected regions of India showed that 29.5% had hypertriglyceridemia with the highest prevalence in Chandigarh and the common risk factors being obesity, diabetes and dysglycemia[19].

In our study, among total 200 participants, 49.5% had low levels of HDL cholesterol and of these, 62 (62.62%) were females and 37 (37.38%) were males. In a study down by Karadag et al to assess prevalence of metabolic syndrome in cardiac patients and it was found that the most prevalent paramenter was found to be low HDL (69%). The result quite similar to our study shows that low HDL is one of the important risk factors for cardiovascular diseases[20].

In our study, 31 (31%) had optimal levels of LDL (<100mg/dl) and 69% had elevated LDL levels. A study by Ogbera showed that elevated LDL levels was the most commonly documented lipid abnormality in patients with metabolic syndrome[21].

High LDL levels is one of the risk factors for developing cardiovascular complications and such elevated levels are seen even in newly detected type 2 diabetics as seen in our study. Our study also showed that 71% of participants had desirable levels of total cholesterol of <200mg/dl while 29% had raised levels. A study done by Joshi et al in India regarding the prevalence of dyslipidemia has shown 13.9% of their subjects had hypercholesterolemia and Tamil Nadu has the highest rates of hypercholesterolemia[19].

Conclusion

In our present study, more than 50 per cent of diabetics were found to have hypertriglyceridemia and elevated LDL levels. This suggests that such high levels of dyslipidemia are seen even during the early stages and newly detected diabetics as well. These are likely to play a major role in the development of cardiovascular diseases and cerebrovascular accidents among the diabetic patients.

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