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Original Research Article

Dyslipidaemia pattern amongst diabetic patients visiting a tertiary care hospital in Eastern Odisha

Surendra Nath Behera[1], Shubhransu Patro[2]*

[1]Department of General Medicine, Hi-Tech Medical College, Utkal University, Bhubaneswar, Odisha, India
[2]Department of General Medicine, Kalinga Institute of Medical Sciences, KIIT University, Bhubaneswar, Odisha, India.

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***Correspondence:**
Dr. Shubhransu Patro,
E-mail: shubhransu@rediffmail.com

ABSTRACT

Background: With controlled blood sugar levels, the occurrence of dyslipidaemia can be reduced. Due to poor awareness and literacy being a major concern, there is an association in the incidence of dyslipidaemia and cardiovascular risk. Routine and timely observations can help health care professionals to reduce the future risk.
Methods: The current study was initiated at the Department of Medicine, KIMS, Bhubaneswar (Odisha). It included in total 669 patients, who were assigned into two groups: Group 1(Diabetic) included 364 patients and Group 2 (Non-diabetic) included 305 patients. The study patients were screened using a pretested structured questionnaire. The plan and checklist were linked by unique identification code (ID). Data was gathered in a friendly atmosphere after obtaining informed consent.
Results: In the current study, all characteristics of diabetes were correlated with each parameter and it was found that disproportionate body mass index, high waist girth was correlated with incidence of cardiovascular disease (CVD). Literacy is one of the factor found intermediate responsible for CVD. The more educated, the more advances in current lifestyle is observed whereas due to illiteracy, awareness about health issues is less and both together result in increased incidence of CVD.
Conclusions: Dyslipidaemia should be promptly diagnosed and treated aggressively to reduce the rate of morbidity and mortality in diabetic patients.

Keywords: Cardiovascular risk, Cardiovascular disease, Diabetic, Morbidity, Mortality

INTRODUCTION

The rise in the rate of diabetes and dyslipidaemia is a universal health issue, its prevalence varies depending on numerous aspects like different genetic predisposition, socioeconomic status, cultural diversity, fast changing lifestyle, and ethnic characteristics.A major percentage of cases resulting in cardiovascular mortality and morbidity is due to the dyslipidaemia seen among diabetic patients. Different category of dyslipidaemia are triglycerides higher than ≥150mg/dl, low levels of High-Density Lipoprotein (HDL) cholesterol (<40mg/dl in men or < 50mg/dl in women), higher values in Low-Density Lipoprotein (LDL) cholesterol (≥130mg/dl) and high plasma total cholesterol (≥200mg/dl).[1,2]

As per the ICMR INDIAB study (2011), an approximate of 62.4 million people with diabetes and 77.2 million individuals with pre-diabetes are diagnosed in India. With a large population of diabetes patients, India ranks next to China in number of diabetes patients worldwide, which is estimated by World Health Organization (WHO) and

International Diabetics Federation. Every 3 out of 4 diabetics suffer from dyslipidaemia.[3] In diabetic patients with dyslipidaemia, 3-4 times heightened cardiovascular (CV) risk is noticed as compared to dyslipidaemia without diabetes.[4]

This is due to the fact that the metabolic abnormalities caused by diabetes induce vascular dysfunction that predisposes the patient to atherosclerosis. The major cv risk factor for Myocardial Infarction (MI) is dyslipidaemia.[5]

In diabetic complications, dyslipidaemia plays a significant role that results in atherosclerosis. Atherosclerosis is due to mechanisms like oxidative modification of lipoproteins, formation of lipoprotein immune complexes, non-enzymatic glycation of proteins, lipoprotein aggregation, disturbances of cell replication and growth factors and propensity to thrombosis, etc.

This study was done to assess the prevalence of dyslipidaemia as a cardiovascular risk factor amongst patients with diabetes (both Type 1 and Type 2) in and around Bhubaneswar (Odisha).

METHODS

The objective of the study was to assess the prevalence of dyslipidaemia as a cardiovascular risk factor amongst patients with diabetes (both Type 1 and Type 2) in and around Bhubaneswar (Odisha).

Study design

The study was conducted at Department of Medicine, K.I.M.S, Bhubaneswar (Odisha). The duration of this Cross-sectional study was one year. Informed consent was obtained from all the patients.

Study population

This study included total 669 patients, who were assigned to two separate groups: Group 1 (Diabetic) included 364 patients [Type 1 - 27 (7.42%), Type 2 - 337 (92.58%)] and Group 2 (Non-diabetic) included 305 patients.

Inclusion criteria

Patients aged between 18-70 years were included.

Exclusion criteria

Patients who were less than the age of 18 years, those with cardiovascular diseases, pregnancy and acute illness were excluded.

Data collection

The study patients were screened using a pretested structured questionnaire. The plan and checklist were linked by unique identification code (ID). Those patients, who were reluctant and refused to participate, were excluded from the study. Collection of data was done in a friendly atmosphere after obtaining informed consent. Some time was spent, at the beginning, on informal discussions with the aim of gaining the confidence of the study patients. Data with respect to socio-demographic characteristics, age, sex, socioeconomic status, per capita monthly income, family size, duration of diabetes, co-morbidity, history of cardiovascular disease, family history of diabetes, dietary habits, tobacco and alcohol use, physical activity etc., were collected.

Diabetic patients were questioned in detail regarding the past treatment. The blood pressure, Body Mass Index (BMI), height, weight, waist circumference, etc., were recorded. Other investigations like fasting blood sugar and 2hour post prandial blood sugar, blood cholesterol, lipid profile etc., were all part of the usual investigations prescribed by the treating physician.

Weight measurements were in kilograms (kg) using the WHO weighing scale (Health-O-Meter, USA) at a precision of 0.1kg with the study patients minimally dressed. Height and waist circumference were recorded in centimeter (cm). The patients were asked to remove the shoes and in erect position at a precision of 0.1 cm, the height was measured. At the midpoint of the line between the lowest border of the thoracic cage and anterior superior iliac spine. waist circumference was measured. Blood pressure was measured using a mercury sphygmomanometer with a cuff deflation rate of 2mmHg. Measurements in each arm in sitting position with a 10-minute interval period that was averaged was recorded.

For laboratory measurements, blood samples were drawn at the clinic after post night fasting of 10–14 hours. The patients attending the clinic were advised to come on an empty stomach for the determination of Fasting Blood Glucose (FBG) and lipid profile.

FBG, serum total cholesterol, HDL-C and triglycerides were recorded using the hem analyzer machine (Human, USA) and appropriate reagents. Freidwald formula was used to calculate the LDL-C. Urine samples were also obtained. Urine dipstick was done for presence of albuminuria.[6-8]

Laboratory samples were collected by a trained laboratory technician at the laboratory, KIMS, which were analyzed. The principal investigator has supervised the data collection process in the department.

RESULTS

Total of 669 patients were involved in this study, who were assigned into two groups: Group 1 (Diabetic) included 364 patients and Group 2 (Non-diabetic) included 305 patients. Amongst the diabetic group (Group 1) 57.69% patients had raised triglycerides (TG) values (i.e. ≥150 mg/dl), 45.87% patients had raised VLDL values (i.e. >30mg/dl), 37.36% patients had lower HDL values (i.e. <40 mg/dl), 31.04% patients had raised total cholesterol values (i.e.≥ 200mg/dl) and 25% patients had raised LDL values (i.e. ≥ 130mg/dl). In diabetes group 89.83% patients had dyslipidaemia and 10.16% patients had normal lipid profile (Figure 1). In this group, maximum patients diagnosed had elevated TG values when compared to other parameters of dyslipidaemia in cm.

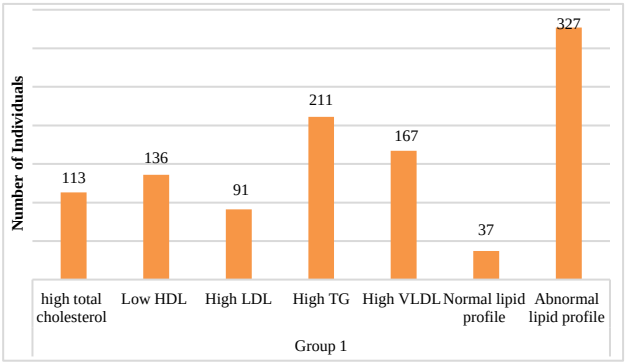

Figure 1: Lipid profile distribution among diabetic group.

However, in Non-diabetes group (Group 2) 46.55% patients had lower values of HDL 39.01% patients had raised Very Low-Density Lipoprotein (VLDL) values, 28.52% patients had raised cholesterol values, 18.68% patients had raised LDL values and 18.03% patients had raised TG values. In Non-diabetes group 76.06% patients had dyslipidaemia and 23.93% patients had normal lipid profile (Figure 2). In this group, maximum patients were identified with abnormal HDL values followed by VLDL.

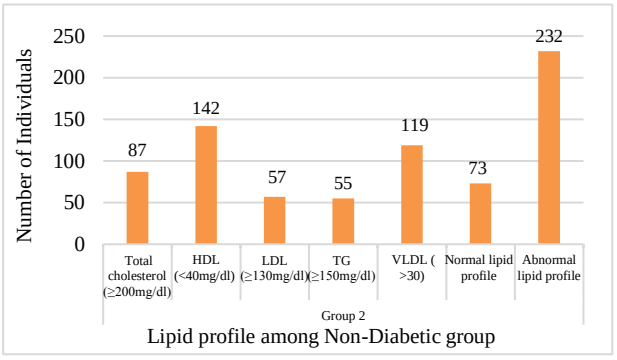

Figure 2: Lipid profile distribution among Non-Diabetic group.

During the study, the role of obesity, one of the risk factor of lifestyle diseases was also assessed. It was found that diabetic group had more number of obese patients compared to the non-diabetic population (Figure 6). The obesity was assessed based on the BMI measurement. Also, waist circumference one of the parameter to assess obesity was considered during the study, wherein female patients outnumbered the male population in obesity in both diabetic and non-diabetic group (Figure 3).

The prevalence of diabetes is more evident as age progresses from the present study where 58.51% of the diabetic population were ≥ 50 years of age (Figure 4).

In the diabetic group, following parameters were further considered, which are as follows: 81.04% of patients had FBS ≥ 126 mg/dL, 72.25% had 2hr.PPBS ≥ 200 mg/dL and 95.05% had HbA1C of >6.5% (Figure 5).

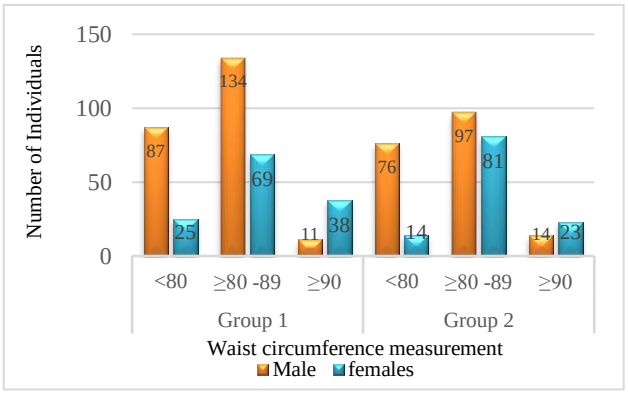

Figure 3: Waist circumference comparison between both sexes.

More number of female patients were obese in both Diabetic as well as non-diabetic groups.

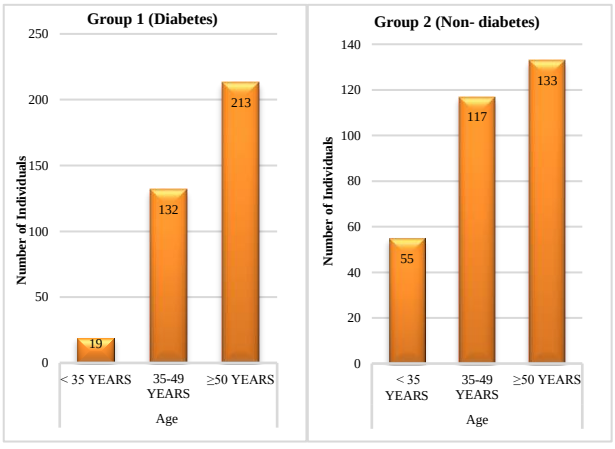

Figure 4: Diabetes prevalence versus non-diabetic age comparison.

In group 1, 58.51% patients were ≥ 50 years & in group 2, 43.60% patients were ≥ 50 years.

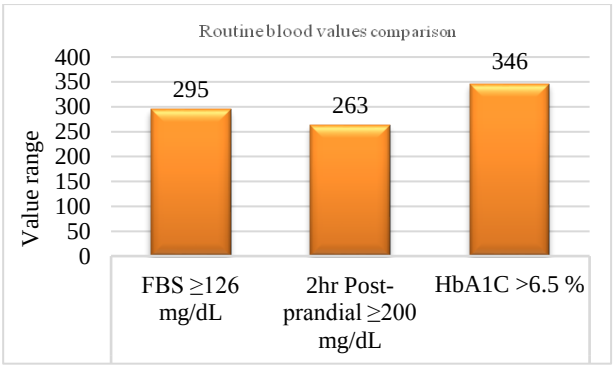

Figure 5: FBS, PPBS and HbA1C level.

81.04% of patients had FBS ≥ 126 mg/dl., 72.25% had PPBS ≥ 200 mg/dl. and 95.05% had HbA1C of >6.5%.

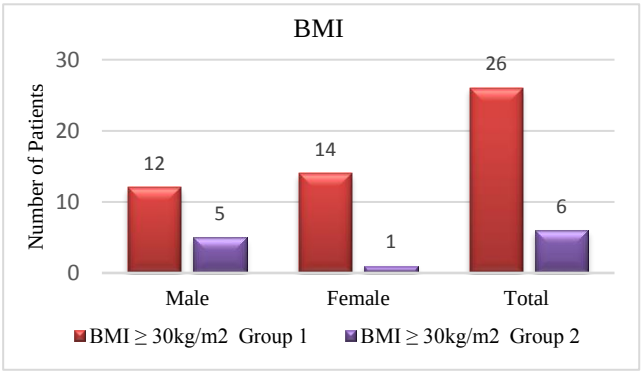

Figure 6: Comparison of BMI in both Diabetic and Non-diabetic group.

Greater numbers of patients were obese in Group 1(Diabetes) as compared to Group 2 (Non-diabetes) (Unit- kg/m^2). It was observed that 36.81% of the diabetic population had higher level of education, which on further assessment proved that changing lifestyle in the educated population is one of the major contributory factor for dyslipidaemia, CVD and other risk factors (Figure 7).

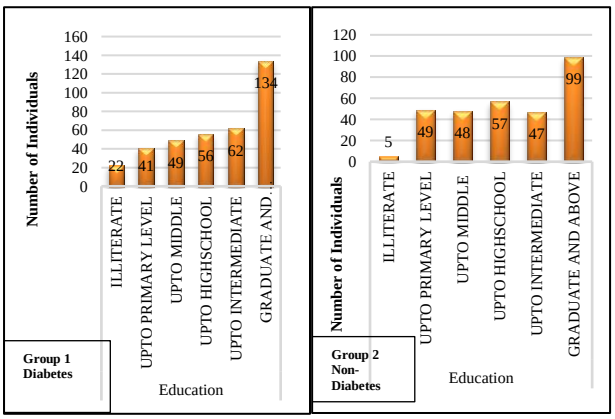

Figure 7: Literacy comparison among both groups.

Individuals with family history of diabetes and hypertension in either of the parents or both the parents should take necessary steps as they are more prone to become hypertensive or diabetic as age progresses (Figure 8).

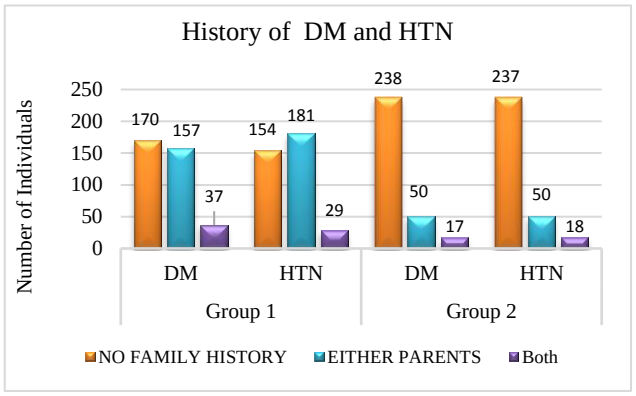

Figure 8: Comparison of both groups with history of diabetes and hypertension

Diabetes and Hypertension were associated with previous family history.

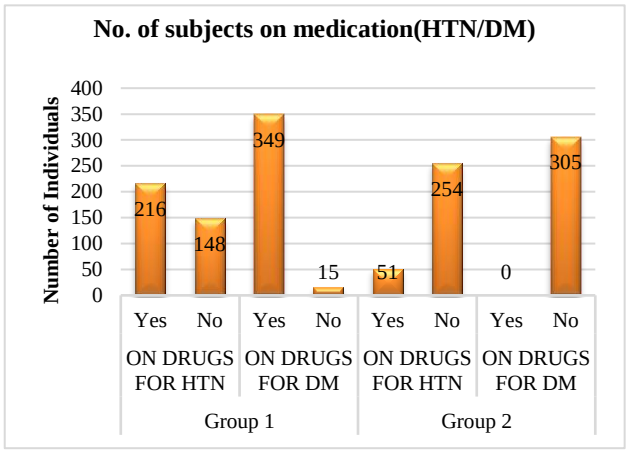

Figure 9: Comparison of medication among both groups.

The chart above shows that 59.34% hypertensive patients and 95.87% diabetic patients were on medication in the Diabetic group, while 16.72% hypertensive patients were on medication in the Non-diabetic group.

From the study, prevalence of diabetes versus monthly income can be summarized as follows: 6.31% of the diabetic population had a monthly income of INR 2500-5000, 15.38% with a monthly income of INR 5000-10000, 12.36% earned a monthly income of INR 10000-15000, 23.35% with a monthly income of INR 15000-20000 and 42.03% had a monthly income of INR ≥ 20000 (Figure 10 and 11).

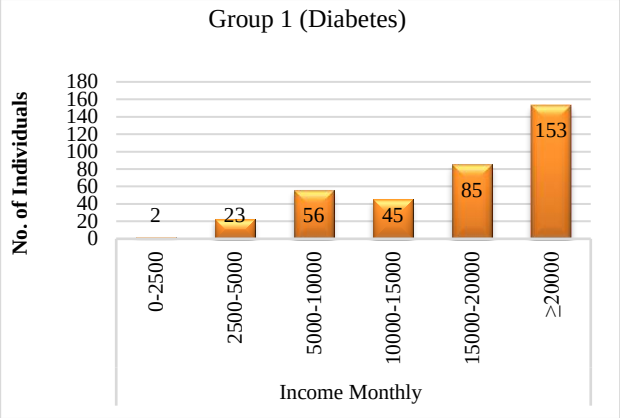

Figure 10: Income distribution among the diabetic group.

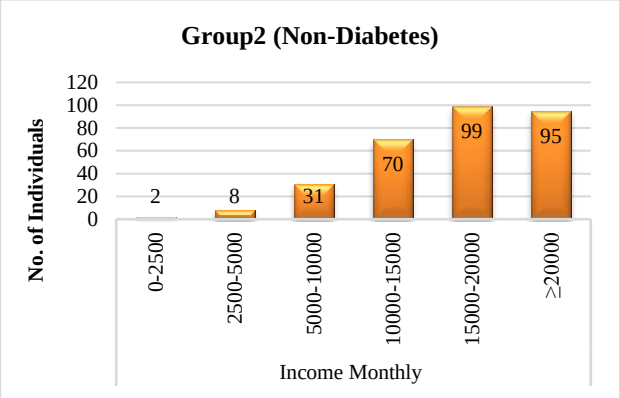

Figure 11: Income distribution among non-diabetic group.

DISCUSSION

Improper intake of food and its metabolism is hampered in diabetes mellitus; due to high sugar levels, metabolism and catabolism at cellular level is not up to the mark.[9] Hence retention of catabolic products and incomplete metabolic products in blood stream is observed. Some of them may conjugate with lipids and proteins and accumulate in several parts of organ systems.

The following important findings were observed in a study conducted in patients attending the diabetic clinic at a hospital in India, like higher prevalence of hypertension (90%), central obesity (50%), high total cholesterol (40.9%), high LDL (27.3%), low HDL (45.5%), and high triglyceride levels (59.1%) in the Coronary Artery Disease (CAD) group of the study.[10]

Similar findings can be observed in a sixteen-year follow-up study in Framingham, where it was found that diabetics in general show an increased morbidity and mortality from all cardiovascular causes. Insulin-treated diabetic women showed the greatest relative mortality from coronary heart disease. Diabetics were found to have higher lipid values, more hypertension and more obesity, even prior to diagnosis.[11] Diabetes mellitus magnifies the risk of cardiovascular morbidity and mortality. The abnormal metabolic state that accompanies diabetes causes arterial dysfunction. The relevant abnormalities include chronic hyperglycemia, dyslipidaemia, and insulin resistance.[12]

Numerous epidemiological studies have shown a link between diabetic dyslipidaemia, which is further characterized by hypertriglyceridemia; lower levels of HDL cholesterol and associated co-morbid risks.[13] High risk of retention of low density lipoproteins is known to occur around the blood vessels and capillaries; which lead to high incidence of cardiac diseases. Raised levels of triglycerides were detected in diabetic patients which is highly predisposing to cardiac disease.

Glucose reduction with lifestyle modification and drugs in people with diabetes, especially if started early, can delay progression to microvascular complications. Although evidence is mixed from trials on the macrovascular benefits of intensive glucose lowering, long-term glycemic control and lowering blood pressure and serum cholesterol also reduce the risk of adverse cardiovascular outcomes. However, the effectiveness of these interventions at the population level has been slight, both because many diabetes cases remain undiagnosed and because adherence to treatment is typically lower in general populations than in those enrolled in clinical trials.[14] In patients with poorer glycemic control, levels of TG rich lipoproteins are higher.[15]

In the current study, all characteristics of diabetes were correlated with each parameter and it was found that disproportionate body mass index, high waist girth were correlated with incidence of CVD. Literacy is one of the factor found intermediate responsible for CVD. The more educated, the more advances in current lifestyle is observed whereas due to illiteracy, there is lesser health awareness, and both together result in an increased incidence of CVD.

Our research reveals that maximum patients had dyslipidaemia in the Diabetic group in relation to Non-diabetic group. In diabetic group, abnormal triglyceride values and in Non-diabetic group, abnormal HDL values were the most common pattern of dyslipidaemia observed. We observed that lipid control rates went down with increasing age. CVD can be prevented by proper health care, education and counseling of patients. Screening of all patients who have diabetes mellitus for lipid profile and appropriate measures may decrease the risk. High blood triglyceride level is a marker to detect CVD. High concentration of VLDL is a key factor for CVD.

CONCLUSION

Dyslipidaemia in diabetes continues to be a great clinical challenge and it should be promptly diagnosed and

aggressively treated to reduce rate of death in diabetic patients. Diagnosis of dyslipidaemia correlation with CVD amongst diabetic patients should incorporate some further tests (Angiography, Color Doppler test, ECG, etc.).

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Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

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