

Research Article**Assessment of Lipid profile and Glycated Hemoglobin in Newly Diagnosed type 2 Diabetes Mellitus in Rural Population of Indore, M.P, India****Roshan Alam^{1*}, Mohammad Aleem², Saba Khan³, Shah Mohammad Abbas Waseem⁴**¹Associate Professor, Department of Biochemistry, Integral Institute of Medical Sciences, Integral University, Lucknow, U.P – 226026, India²Associate Professor, Department of Radio-diagnosis, Integral Institute of Medical Sciences, Integral University, Lucknow, U.P – 226026, India.³Assistant Professor, Department of Biochemistry, Index Medical College Hospital and Research Centre, Indore, M.P- 452016, India⁴Assistant Professor, Department of Physiology, Integral Institute of Medical Sciences, Integral University, Lucknow, U.P – 226026, India***Corresponding author**

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Abstract: Prevalence of dyslipidemia in type 2 diabetes mellitus patients is higher and positively correlated with BMI. The present study was designed to assess the glycemic control and lipid profile in newly diagnosed type 2 diabetes mellitus in rural population of Indore. The study was conducted on 100 newly diagnosed type 2 diabetes mellitus patients (male- 70, female- 30) mean age 45.50 ± 4.8 years and the control groups consisted of 80 healthy individuals (male-60, female-20) mean age 42.35 ± 2.4 years. Analysis of various biochemical parameters was performed by standard kit methods. Fasting and postprandial blood sugar, HbA1c and lipid profile were compared in type 2 diabetics and control subjects and also compared according to BMI in diabetic patients. Statistical analysis was done by unpaired t-test. The fasting and postprandial blood sugar, total cholesterol, triglycerides, LDL, VLDL, HbA1c were significantly increased and HDL was significantly decreased in diabetics compared to control subjects ($p < 0.001$). All the lipid parameters were significantly increased in group 2 except HDL which was significantly decreased compared to group 1. Both males and females showed increased incidence of dyslipidemia /hyperlipidemia with increasing BMI. Reduction in BMI and early detection of dyslipidemia and its treatment are key factors to achieve good glycemic control to prevent microvascular and macrovascular complications in type 2 diabetes mellitus patients..**Keywords:** BMI (body mass index), Dyslipidemia, Glycated hemoglobin, Lipid profile

INTRODUCTION

Diabetes is a heterogeneous group of syndromes characterized by an elevation of fasting blood glucose that is caused by a relative or absolute deficiency in insulin. Diabetes mellitus is the leading cause of adult blindness and amputation, and a major cause of renal failure, heart attacks, and strokes [1].

The chronic hyperglycemia of diabetes has been found to be associated with long term damage, dysfunction and failure of various organs, especially the eyes, nerves, kidneys, heart & blood vessels. 50% diabetic patients die of cardiovascular disease [2, 3].

The lipid abnormalities are prevalent in type 2 Diabetes Mellitus because the key enzymes and pathways in lipid metabolism are affected due to insulin resistance or deficiency [4]. Diabetic dyslipidemia is a well-recognized and modifiable risk factor. The

management of dyslipidemia is a key element in the multifactorial approach in order to prevent CVD in individuals with type 2 diabetes [5]. Apart from dyslipidemia, elevated HbA1c has also been regarded as an independent risk factor for CVD in subjects with or without diabetes. Each 1% increase in absolute HbA1c has been found to show 18% increase for cardiovascular disease [6]. The present study was designed to assess the glycemic control and lipid profile in newly diagnosed type 2 diabetes mellitus in rural population of Indore.

MATERIALS AND METHODS

The criteria used for selection of both diabetes and normal controls were performed by well-established diagnostic criteria as recommended by WHO and serum lipid reference as mentioned by National Cholesterol Education Programme (NCEP) Adult Treatment Panel III (ATP III). The present study

was conducted on 100 newly type 2 Diabetes mellitus patients (male- 70, female -30) with mean age of 45.50 ± 4.8 years and the control group consisted of 80 healthy individuals (male- 60, female-20) with mean age of 42.35 ± 2.4 years. Diabetic patients were further classified on the basis of BMI and HbA1c. Diabetic subjects were only on oral hypoglycemic drugs. The study groups (patients and control) were non-smokers and non-alcoholics and were not suffering from any other chronic disease. The study was approved by the Institute Ethics Committee, Index Medical College Hospital and Research Centre, Indore, India and informed consent was obtained from all the cases and control subjects. Blood samples were collected in plain vacutainers without any anticoagulant and whole blood collected with EDTA from diabetic patients and control subjects for the estimation of various biochemical parameters.

- Fasting and postprandial blood sugar was estimated by method of GOD-POD Trinder P [7]
- HbA1c by kit method (ERBA diagnostics Mannheim GmbH)
- Total cholesterol by kit method (ERBA diagnostics Mannheim GmbH)
- TG by kit method (ERBA diagnostics Mannheim GmbH)
- HDL by kit method (ERBA diagnostics Mannheim GmbH)
- LDL calculated by Friedwald formula [8]
LDL= Total Cholesterol-(HDL+TG/5).
- BMI = Weight in Kg/Height in meter²

All data were expressed as mean \pm SD. Unpaired student's t-test was used for between group comparisons. Differences were considered of statistical significance when the p-value was $p < 0.05$.

RESULTS AND DISCUSSION

The study was conducted on 100 newly diagnosed type 2 diabetes mellitus patients (male- 70, female- 30) mean age 45.50 ± 4.8 years and the control groups consisted of 80 healthy individuals (male-60, female-20) mean age 42.35 ± 2.4 years. The demographic and biochemical parameters in type 2 diabetes mellitus patients and control subjects are depicted in Table 1. Blood sugars FBS mg/dl (135.48 ± 14.51), PPBS mg/dl (175.32 ± 15.23) was significantly higher in type 2 diabetes mellitus patients as compared to control group FBS mg/dl (98.67 ± 10.21) PPBS mg/dl (118.89 ± 12.42) $p < 0.001$. HbA1c% (8.21 ± 1.61) was significantly higher in patients as compared to control 5.35 ± 0.98 $p < 0.001$. All the lipid parameters (mg/dl) TC (191.89 ± 14.33 $p < 0.0001$), TG (189.98 ± 25.50 ; $p < 0.0001$), VLDL (38.19 ± 5.09 ; $p < 0.0001$), LDL (111.55 ± 5.35 ; $p < 0.001$), non-HDL (151.51 ± 10.71 ; $p < 0.001$) was significantly higher in patients as compared to control TC (180.52 ± 15.65), TG (140.45 ± 20.12), VLDL (33.09 ± 4.24), LDL (98.65 ± 4.19) and non-HDL (131.74 ± 8.43); while, HDL (mg/dl) 42.15 ± 3.89 was significantly lower in patients when compared to control group (45.78 ± 4.78 ; $p < 0.001$). Table 2 shows the comparison of biochemical parameters in group 1 (BMI < 25 kg/m²) and group 2 (BMI > 25 kg/m²). HbA1c was significantly higher in group 2 (8.58 ± 1.42) as compared to group 1 (7.89 ± 1.80); $p < 0.05$. Similarly lipid parameters (mg/dl) TC (195.29 ± 15.42); $p < 0.01$, TG (198.82 ± 27.86); $p < 0.001$, VLDL (39.76 ± 5.57); $p < 0.001$, LDL (114.32 ± 5.6); $p < 0.001$ and non-HDL (157.61 ± 11.17); $p < 0.001$ was significantly higher in group2 as compared to group 1 TC (188.50 ± 13.24), TG (183.15 ± 23.15), VLDL (36.63 ± 4.61), LDL (108.78 ± 5.10) and non-HDL (145.71 ± 9.71). In contrast HDL was significantly higher in group1 (43.09 ± 3.53) as compared to group2 (41.21 ± 4.25); $p < 0.01$.

Table 1: Demographic and biochemical parameters in newly diagnosed type 2 diabetes mellitus and control subjects

| Parameters | Type 2 DM N=100 | Control N= 80 | p-value |
|--------------------------|--------------------|--------------------|------------|
| Age (years) | 45.50 ± 4.8 | 42.35 ± 2.4 | |
| Sex (M/F) | 70/30 | 60/20 | |
| BMI (kg/m ²) | 28.21 ± 3.84 | 23.14 ± 3.12 | < 0.001 |
| Hemoglobin (gm/dl) | 14.39 ± 2.50 | 15.08 ± 2.81 | < 0.052 |
| FBS (mg/dl) | 135.48 ± 14.51 | 98.67 ± 10.21 | < 0.001 |
| PPBS (mg/dl) | 175.32 ± 15.23 | 118.89 ± 12.42 | < 0.001 |
| HbA1c (%) | 8.21 ± 1.61 | 5.35 ± 0.98 | < 0.001 |
| T C (mg/dl) | 191.89 ± 14.33 | 180.52 ± 15.65 | < 0.0001 |
| HDL (mg/dl) | 42.15 ± 3.89 | 45.78 ± 4.78 | < 0.001 |
| TG (mg/dl) | 189.98 ± 25.50 | 140.45 ± 20.12 | < 0.0001 |
| VLDL (mg/dl) | 38.19 ± 5.09 | 33.09 ± 4.24 | < 0.0001 |
| LDL (mg/dl) | 111.55 ± 5.35 | 98.65 ± 4.19 | < 0.001 |
| Non-HDL (mg/dl) | 151.51 ± 10.71 | 131.74 ± 8.43 | < 0.001 |

Values are expressed as mean \pm S.D N= number of subjects; 'p' < 0.05 was considered significant. NS= not significant

Table 2: Biochemical parameters in Group 1 and Group 2

| Parameters | Group 1: (BMI < 25kg/m ²) N=50 | Group 2: (BMI > 25 kg/m ²) N=50 | p-value |
|-----------------|---|--|---------|
| Sex (M/F) | 33/17 | 37/13 | |
| HbA1c (%) | 7.89±1.80 | 8.58±1.42 | < 0.05 |
| TC (mg/dl) | 188.50±13.24 | 195.29±15.42 | < 0.01 |
| HDL (mg/dl) | 43.09±3.53 | 41.21±4.25 | < 0.01 |
| TG (mg/dl) | 183.15±23.15 | 198.82±27.86 | < 0.001 |
| VLDL (mg/dl) | 36.63±4.61 | 39.76±5.57 | < 0.001 |
| LDL (mg/dl) | 108.78 ± 5.10 | 114.32 ± 5.6 | < 0.001 |
| Non-HDL (mg/dl) | 145.41±9.71 | 157.61±11.17 | < 0.001 |

Values are expressed as mean ± S.D N= number of subjects; 'P' <0.05 was considered significant. NS= not significant

Diabetes mellitus is a metabolic disorder affecting the population worldwide. Diabetes increased progressively with the increase in BMI [9]. In the present study the BMI was higher in type 2 diabetes mellitus patients as compared to control. Similarly FBS, PPBS, HbA1c, TC, TG, VLDL, LDL were also found to be significantly higher in patients as compared to control with significant lower level of HDL in patients. These findings were in agreement with the previous studies by Wexler *et al.* [10]. Furthermore the comparison between group1 and group2 showed significant increase in the levels of serum TC, TG, LDL, and VLDL in group2 as compared to group 1. These results are in accordance with the study of EL-Hazmi MAF *et al.* [11], Naheed T and Akbar N [12] and Sindelka G *et al.* [13]. Bijilani *et al.* found HDL to be significantly lower in obese diabetic when compared to normal weight diabetics [14].

CONCLUSION

Weight reduction, life style modifications and early detection of dyslipidemia/ hyperlipidemia and its treatment are key factors to achieve good glycemic control so as to prevent microvascular and macrovascular complications in type 2 diabetes mellitus patients.

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