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ORIGINALARTICLE

Assessment of atherogenic indices in type 2 diabetes mellitus patients

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ABSTRACT:

Background: Diabetes mellitus comprises a cluster of metabolic disorders caused by either a complete or partial lack of insulin secretion or by resistance to its effects. The present study was conducted to assess atherogenic indices in type 2 diabetes mellitus patients. **Materials & Methods:** 58 type 2 diabetes mellitus patients of both genders were selected. The lipid profile was evaluated using an enzymatic assay, and the atherogenic indices—atherogenic index of plasma, cardiac risk ratio, and atherogenic coefficient were calculated. **Results:** The mean BMI was 26.4±3.2 and 22.4±5.6, BSL-F was 170.2±11.4 and 92.5±11.6, BSL-PP was 264.2±43.2 and 107.2±41.2, HbA1c was 8.4±2.1 and 5.1±1.6, insulin was 14.1±5.2 and 11.8±2.4 and HOMA-IR was 5.4±1.4 and 2.6±1.2 in group I and group II respectively. The difference was significant (P< 0.05). The mean triglyceride was 160.4±2.2 and 116.2±19.4, total cholesterol was 186.2±31.4 and 160.8±11.5, HDL-C was 42.1±2.3 and 48.5±3.1, LDL-C was 115.2±9.4and 96.2±6.4, VLDLwas 31.6±6.3 and 23.5±3.2, LDL/TG was 0.72±0.2 and 0.81±0.9, LDL/HDL-C was 2.9±0.5 and 1.3±0.8, TG/HDL-C was 3.7±1.2 and 2.1±1.1 and non-HDL-C was 145.9±35.2 and 120.6±17.4 in group I and group II respectively. The difference was significant (P< 0.05). **Conclusion:** Lipoprotein ratios and atherogenic indices, especially AIP, are not typically included in lipid profiles. In patients who are more likely to develop coronary artery disease, such as those with uncontrolled diabetes mellitus and dyslipidemia, they serve as superior indicators in evaluating cardiac risk.

Keywords: Diabetes mellitus, HOMA-IR, total cholesterol

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INTRODUCTION

Diabetes mellitus comprises a cluster of metabolic disorders caused by either a complete or partial lack of insulin secretion or by resistance to its effects.[1] This disease, which is not transmissible, is spreading quickly across the globe.Rapidly industrializing Asian countries that are adopting modern lifestyles are confronted with the significant problem of having the highest number of diabetes sufferers, with a prevalence of 69.2 million. In 2011, the International Diabetes Federation (IDF) estimated that 366 million people globally had diabetes. This estimate was based on a review of 565 data sources, including 170 from 110 countries. The IDF also projected that this number would rise to 552 million by 2030.[2] Patients with diabetes exhibit impaired insulin secretion and diminished cellular response.[3]

Diabetic dyslipidemia is characterized by elevated triglycerides and low-density lipoprotein (LDL-C), along with a frequent reduction in high density lipoprotein (HDL-C).[4] These lipid abnormalities can manifest independently or alongside other metabolic disorders. Patients with diabetes exhibit a CAD risk that is 2 to 3 times greater, a 4-fold increase in the likelihood of dying from an acute myocardial infarction, and a post-myocardial infarction morbidity risk that is twice as high when compared to those without diabetes.[5] There are several markers that can be used for evaluating cardiovascular risk, such as Apo-lipoproteins, C-reactive protein, and the marker of Insulin Resistance (IR).[6] Nonetheless, they are expensive and not subjected to regular testing to assess patients' vulnerability to cardiovascular disease.[7]The present study was conducted to assess atherogenic indices in type 2 diabetes mellitus patients.

MATERIALS & METHODS

The study was carried out on 58 type 2 diabetes mellitus patients of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. type 2 diabetes mellitus patients were put in group I and healthy controls in group II, The lipid profile was evaluated using an enzymatic assay, and the atherogenic indices—atherogenic index of plasma, cardiac risk ratio, and atherogenic coefficientwere calculated.Anthropometric measurements such as height in centimetres, weight in kilograms, and body mass index (BMI) was calculated as weight in kilograms divided by squared height in metres (weight in kg/height in m2). For normal weight, BMI is 18.5 to 24.9 Kg/ m2, for overweight BMI is 25 to 29.9 Kg/m2 and for obese 30 or more.Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Diabetic profile in both groups

Parameters	Group I	Group II	P value
BMI	26.4±3.2	22.4±5.6	0.04
BSL-F	170.2±11.4	92.5±11.6	0.01
BSL-PP	264.2±43.2	107.2±41.2	0.01
HbA1c	8.4±2.1	5.1±1.6	0.02
Insulin	14.1±5.2	11.8±2.4	0.03
HOMA-IR	5.4±1.4	2.6±1.2	0.02

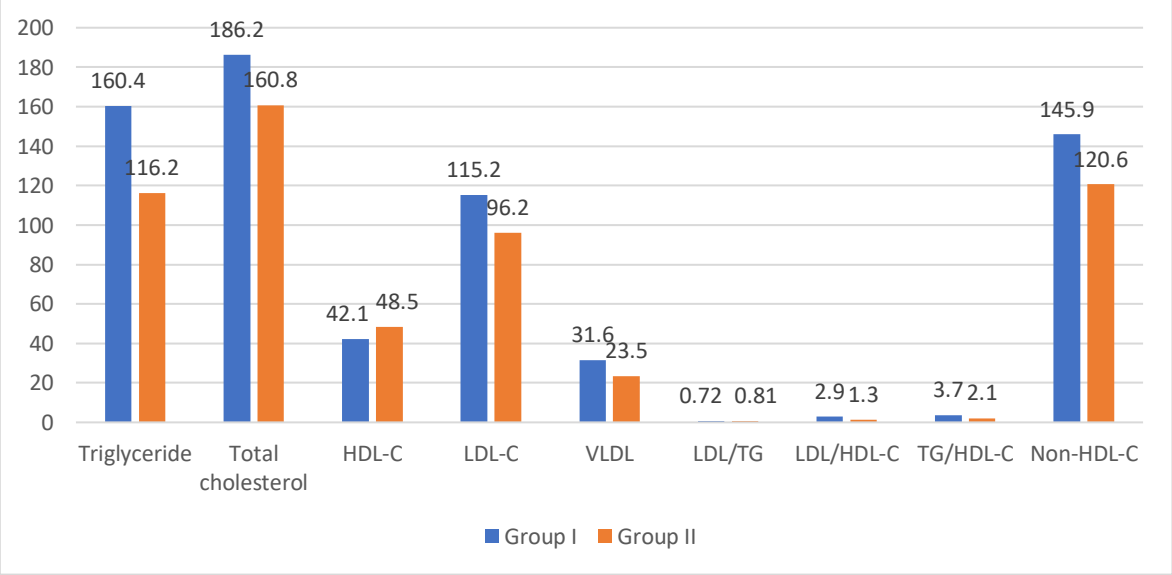
Table I shows that mean BMI was 26.4±3.2 and 22.4±5.6, BSL-F was 170.2±11.4 and 92.5±11.6, BSL-PP was 264.2±43.2 and 107.2±41.2, HbA1c was 8.4±2.1 and 5.1±1.6, insulin was 14.1±5.2 and 11.8±2.4 and HOMA-IR was 5.4±1.4 and 2.6±1.2 in group I and group II respectively. The difference was significant (P< 0.05).

Table II Cardiovascular disease risk factors

Parameters	Group I	Group II	P value
Triglyceride	160.4±2.2	116.2±19.4	0.05
Total cholesterol	186.2±31.4	160.8±11.5	0.04
HDL-C	42.1±2.3	48.5±3.1	0.03
LDL-C	115.2±9.4	96.2±6.4	0.02
VLDL	31.6±6.3	23.5±3.2	0.01
LDL/TG	0.72±0.2	0.81±0.9	0.05
LDL/HDL-C	2.9±0.5	1.3±0.8	0.01
TG/HDL-C	3.7±1.2	2.1±1.1	0.02
Non-HDL-C	145.9±35.2	120.6±17.4	0.05

Table II, graph I show that mean triglyceride was 160.4±2.2 and 116.2±19.4, total cholesterol was 186.2±31.4 and 160.8±11.5, HDL-C was 42.1±2.3 and 48.5±3.1, LDL-C was 115.2±9.4and 96.2±6.4, VLDLwas 31.6±6.3 and 23.5±3.2, LDL/TG was 0.72±0.2 and 0.81±0.9, LDL/HDL-C was 2.9±0.5 and 1.3±0.8, TG/HDL-C was 3.7±1.2 and 2.1±1.1 and non-HDL-C was 145.9±35.2 and 120.6±17.4in group I and group II respectively. The difference was significant (P< 0.05).

Graph I Cardiovascular disease risk factors



DISCUSSION

Diabetes Mellitus (DM) is a metabolic disorder characterized by hyperglyceamia resulting from a variable interaction of hereditary and environmental factors due to defects in insulin secretion, insulin inaction, or both.[8]There are two types of DM (Type 1 and Type 2) depending on the availability or non-responses of the insulin. Relevant abnormalities found in diabetes mellitus are chronic hyperglycemia, dyslipidemia and insulin resistance. Previous authors have reported increased levels of total cholesterol, triglycerides as well as LDL-cholesterol but decreased levels of HDLcholesterol in diabetes.[9] Dyslipidemia is one of the major cardiovascular disease (CVD) risk factors and plays an important role in the progress of atherosclerosis, the underlying pathology of CVD. The prevalence of dyslipidemia in type 2 diabetes is double with respect to the general population.[10]The

present study was conducted to assess atherogenic indices in type 2 diabetes mellitus patients.

We found that mean BMI was 26.4±3.2 and 22.4±5.6, BSL-F was 170.2±11.4 and 92.5±11.6, BSL-PP was 264.2±43.2 and 107.2±41.2, HbA1c was 8.4±2.1 and 5.1±1.6, insulin was 14.1±5.2 and 11.8±2.4 and HOMA-IR was 5.4±1.4 and 2.6±1.2 in group I and group II respectively. Abou-Seif MAet al[11]investigated the relationship among diabetes mellitus, trace elements status, advanced glycation end products (AGEs), advanced oxidation protein products (AOPP), lipid profiles, antioxidant status, nitric oxide and pancreatic amylase activity in the sera of 55 non-insulin-dependent diabetes mellitus (NIDDM; 35 with microvascular complications and 20 without vascular complications), 40 insulin-dependent diabetes mellitus (IDDM; 25 with microvascular and 15 without microvascular complications), and 20 nondiabetic healthy control subjects.SOD, CAT and Cp activities were decreased whereas serum alpha-amylase activity was increased in two types of DM in comparison to the corresponding activities of the control subjects. The plasma levels of MDA, NO and Cu were increased but GSH, Zn, Mg and Ca levels were significantly diminished in diabetic patients as compared to the controls. The averages of total cholesterol (CHOL), triglyceride (TG) and low-density lipoprotein-cholesterol (LDLc) were higher in both types of diabetes mellitus in comparison to the control subjects. The mean value of high-density lipoprotein-cholesterol (HDLc) was lower in both types of diabetes mellitus. Further, the mean values of AGEs and AOPP were elevated in diabetic patients vs. control. These parameters are significantly higher in NIDDM patients when compared to the IDDM subjects. Slight but not significant differences in these parameters were observed in patients with diabetic complications when compared to that of without diabetic complications.

We found that mean triglyceride was 160.4±2.2 and 116.2±19.4, total cholesterol was 186.2±31.4 and 160.8±11.5, HDL-C was 42.1±2.3 and 48.5±3.1, LDL-C was 115.2±9.4and 96.2±6.4, VLDLwas 31.6±6.3 and 23.5±3.2, LDL/TG was 0.72±0.2 and 0.81±0.9, LDL/HDL-C was 2.9±0.5 and 1.3±0.8, TG/HDL-C was 3.7±1.2 and 2.1±1.1 and non-HDL-C was 145.9±35.2 and 120.6±17.4 in group I and group II respectively. Yadav et al[12] in their study determined the prevalence of metabolic syndrome (MetS) in people with type 2 diabetes mellitus (T2DM). This cross-sectional study involved 700 type 2 diabetic subjects from the urban areas of Gwalior Chambal region (Central India). Subjects in the age group of 28- 87 yrs were included in the study. Type I diabetics, pregnant ladies and those with chronic viral and bacterial infections and serious metabolic disorders were excluded from the study. Fasting blood glucose, Blood lipids (T-cholesterol, triglyceride, HDL-cholesterol) were assessed and anthropometry blood pressure were measured from all the subjects. The Prevalence of metabolic syndrome was found to be 45.8%, 57.7% and 28% following NCEP-ATPIII Criteria, IDF and WHO definitions, respectively. Using all the three definitions the prevalence was higher in women in all age groups. ATP III and IDF criteria showed good agreement (k 0.68) compared to ATP III with WHO (k 0.54) and IDF with WHO (k 0.34) criteria. Highest prevalence was observed following IDF definition.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that lipoprotein ratios and atherogenic indices, especially AIP, are not typically included in lipid profiles. In patients who are more likely to develop coronary artery disease, such as those with uncontrolled diabetes mellitus and dyslipidemia, they serve as superior indicators in evaluating cardiac risk.

REFERENCES

1. Dobiás˘ová M, Frohlich J. The plasma parameter log (TG/HDL-C) as an atherogenic index: correlation with lipoprotein particle size and esterification rate in apoBlipoprotein-depleted plasma (FER HDL). Clin Biochem. 2001;34:583-88.
2. Mohan V, Pradeepa R. 1-Epidemiology of diabetes in different regions of India. Health Administrator. 2009:XXII(1& 2):01-18.
3. Regmi P, Gyawali P, Shrestha R, Sigdel M, Mehta KD, Majhi S: Pattern of dyslipidemiaintype2diabeticsubjectsinEasternNepal.JNepalAsso c Med Lab Sci 2009,10(1):11–13.
4. Selvin E, Steffes MW, Zhu H, Matsushita K, Wagenknecht L, Pankow J, CoreshJ,BrancatiFL:Glycatedhemoglobin,diabetes,and cardiovascular risk in nondiabetic adults. N Engl J Med 2010,362:800–811.
5. Deepa M, Farooq S, Datta M, Deepa R, Mohan V. Prevalence of metabolic syndrome using WHO, ATPIII and IDF definitions in Asian Indians: The Chennai Urban Rural Epidemiology Study. Diabetes Metab Res Rev.2007;23(2):127-34.
6. Nahar S, Rahman MZ, Ullah M, Debnath BC, Sultana N, Farhad CMRQ. Prevalence of Metabolic Syndrome in Newly diagnosed Type 2 Diabetes Mellitus. Cardiovase J.2011;4(1):17-25.
7. Bharadwaj S, Misra A, Misra R, Goel K, Bhatt SP, Rastogi K et al. High Prevalence of abdominal, intraabdominal and subcutaneous adiposity and clustering of risk factors among urban Asian Indians in north India. PLos One.2011;6(9):24362.
8. Karadag MK, Akbulut M. Low HDL levels as the most common metabolic syndrome risk factor in heart failure. Int Heart J. 2009Sep;50(5):571-80.
9. Ogbera AO. Prevalence and gender distribution of the metabolic syndrome. DiabetolMetab Syndr.2010;2(1):1.
10. Mahato RV, Gyawali P, Raut PP, Regmi P, Khelanand PS, Dipendra RP, GyawaliP: Associationbetweenglycaemiccontrolandserumlipidprofile in type 2 diabetic patients: glycated haemoglobin as a dual biomarker. Biomed Res 2011,22(3):375–380.

11. Abou-Seif MA, Youssef AA: Evaluation of some biochemical changes in diabetic patients. Clin Chim Acta 2004,346:161–170.
12. Yadav D, Mahajan S, Subramanian SK, Bisen PS, Chang CH, Prasad GBKS. Prevalence of metabolic syndrome in Type 2 diabetes mellitus using NCEP-ATP III, IDF and WHO definition and its agreement in Gwalior Chambal region of central Indian. Glob J Health Sci. 2013;5(6):142-55.