Scholars Journal of Applied Medical Sciences (SJAMS)
Abbreviated Key Title: Sch. J. App. Med. Sci.
ISSN 2320-6691 (Online)
ISSN 2347-954X (Print)

A Unit of Scholars Academic and Scientific Society, India
www.saspublishers.com

Medicine

Assessment of Lipid Peroxide and Lipid Fractions in Type 2 Diabetics with and Without Glycemic Control

Dr. Patnam Giri[1], Dr. K. Ramesh[2*]
[1]Civil Assistant Surgeon, TVVP Area Hospital, Patancheru, Telangana, India
[2]Associate Professor, Department of General Medicine, Maheshwara Medical College& Hospital, Patancheru, Telangana, India

Original Research Article

***Corresponding author**
Dr. K. Ramesh

Article History
Received: 10.03.2018
Accepted: 18.03.2018
Published: 30.04.2018

DOI:
10.36347/sjams.2018.v06i04.033

Abstract: Diabetes mellitus is a Heterogenous and chronic metabolic disorder with a rapidly increasing prevalence globally. Oxidative stress may play a crucial role in pathophysiology of type 2 diabetes mellitus by increasing insulin resistance or impairing insulin secretion. To assess the lipid fractions and lipid peroxidation or MDA in type 2 diabetes mellitus cases with and without glycemic control and non-diabetics. A total 250 cases with type 2 diabetes mellitus and 250 age and sex matched control subjects with fasting glucose level ranging from 70-100mg were recruited. Blood serum was used to measure blood glucose levels, lipid fractions and lipid peroxidation. In uncontrolled diabetic patients fasting (224.36) and postprandial blood glucose levels (299.18) were highly significant than in controlled diabetic cases (121.03 in fasting, 188.88 in postprandial). Mean serum MDA levels are significantly higher in uncontrolled diabetic patients (5.12) as compared with controlled diabetic patients (4.49). Study suggests importance of assessing the markers of oxidative stress and antioxidant capacity along with the other routine investigations in diabetic patients for initiating antioxidant therapy and the need for novel methods to both prevent and treat this pandemic.

Keywords: Diabetes mellitus, Lipid fractions, lipid peroxidation, Oxidative stress.

INTRODUCTION

Diabetes mellitus, a multifactorial metabolic syndrome accounts to number of disorders happens with deficiency of insulin secretion [1]. Diabetes mellitus is no longer considered as an epidemic; it has turned in to a pandemic and has become an alarming health hazard of current century [2].

In India, 10% of urban population and 2% of rural population with age of above 35 years have been found prone to diabetes [3].

Increased oxidative stress is a most accepted parameter in the pathophysiologic development and progression of diabetes and its associated complications [4-6]. Diabetes is usually associated with increased free radical emission or diminished antioxidant defense [7-11].

The estimation of lipid peroxide along with lipid profile in the diabetes is very useful as it may serve as a useful monitor to judge the prognosis of the patient. The detection of risk factor in the early stage of the disease will help the patient to improve and reduce the morbidity rate. With above literature support the present study was designed to assess lipid fractions and lipid peroxidation in type 2 diabetes patients.

MATERIALS AND METHODS

The present study was conducted in Department of General Medicine, Maheshwara Medical College and Hospital during April 2016 to September 2017. A total 250 cases with type 2 diabetes mellitus were recruited and 250 age and sex matched control subjects of both sexes with fasting glucose level ranging from 70-100mg between age group of 35-70 years were included.

After the institutional research committee approval, all the participants were instructed to fast overnight and venous blood was discharged from cases and control subjects with all aseptic precautions. After meal, a second blood samples were withdrawn in a similar way for measurement of post prandial blood glucose level Collected blood was stored at room temperature and allowed to clot and the centrifuged at 3000rpm for 10minutes. The separated serum was used to measure blood glucose levels, lipid fractions and lipid peroxide (MDA) in type 2 diabetes mellitus cases

and control subjects. Extracted data was tabulated in windows XL sheet and was assessed by using SPSS software. Statistical difference between two groups were evaluated by student's' test.

RESULTS

This study has a total 250 type 2 diabetic patients and 250 ages, sex matched non diabetic control subjects between age group 31-65 years. Majority cases were under age group 41-50 years (56.8%) (Table 1). Among the diabetic cases (n=250), 130 cases had uncontrolled diabetes and 120 cases had controlled diabetes.

Table-1: Age and Sex distribution

Age (In Years)	Sex		Total	Percentage
	Male	Female		
31 – 40	28	16	44	17.6%
41 – 50	80	62	142	56.8%
>51 years	40	24	64	25.6%

Table-2: Fasting and post prandial blood glucose level in diabetic cases and non-diabetics

Blood Glucose levels	Diabetic cases (n=250)	Non-diabetics (n=250)	'p' Value
Fasting levels	166.24 ± 59.12	90.01 ± 18.24	p < 0.001
Post prandial levels	229.61 ± 73.25	112.76 ± 14.80	p < 0.001

The fasting and postprandial blood glucose levels were significantly high in diabetic cases than non-diabetic control subjects (Table 2). In uncontrolled diabetic patients fasting and postprandial blood glucose levels were highly significant than controlled diabetic cases (Table 3).

Table-3: Correlation between Fasting and post prandial blood glucose levels in diabetics with and without glycaemic control

Blood glucose levels	Uncontrolled Diabetes(n = 130)	Controlled Diabetes(n = 120)	'p' value
Fasting glucose levels (mg/dl)	224.36 ± 52.82	121.03 ± 18.54	p < 0.001
Post prandial glucose levels (mg/dl)	299.18 ± 69.78	188.88 ± 35.75	p < 0.001

Table-4: Lipid fractions in diabetic cases and non-diabetics

Lipid fractions	Diabetics cases	Non-diabetics
Total Cholesterol (mg/dl)	218.72 ± 46.19	178.80 ± 27.38
Triglyceride (mg/dl)	260.24 ± 101.54	143.27 ± 37.43
HDL (mg/dl)	41.02 ± 10.18	46.17 ± 6.28
LDL (mg/dl)	131.76 ± 42.01	104.38 ± 22.37
VLDL (mg/dl)	49.98 ± 19.78	28.46 ± 6..80
Phospholipids (mg/dl)	255.64 ± 32.86	226.28 ± 20.45
Total lipid (mg/dl)	828.22 ± 188.90	608.34 ± 79.74
'p' Value	<0.001	

Table-5: Correlation of lipid fractions in diabetics with and without glycaemic control

Lipid fractions	Uncontrolled Diabetes	Controlled Diabetes	'p' value
Total cholesterol (mg/dl)	236.02 ± 51.28	221.74 ± 42.46	p > 0.05
Triglyceride (mg/dl)	281.14± 100.40	238.46 ± 89.38	p > 0.05
HDL-cholesterol (mg/dl)	41.32 ± 9.14	40.92 ± 9.38	p > 0.05
LDL-cholesterol (mg/dl)	126.43 ± 48.06	127.01 ± 46.22	p > 0.05
VLDL-cholesterol (mg/dl)	57.64 ± 18.54	50.72 ± 18.28	p > 0.05
Phospholipid (mg/dl)	258.30 ± 38.88	252.44 ± 33.72	p > 0.05
Total lipid (mg/dl)	880.02 ±188.64	834.14 ± 168.82	p > 0.05

The mean value of MDA was significantly increased in diabetic group as compared to non-diabetic subjects and was high in diabetics when compared to the non-diabetics (Table 5).

Table-5: Correlation of lipid peroxide in diabetics with and without glycaemic control and non-diabetics

	Lipid Peroxide (MDA) (nmoles/ml)	'p' value
Diabetics	4.98 ± 1.01	-
Non-diabetics	2.36 ± 1.23	-
Controlled diabetes	4.49 ± 0.68	$p < 0.05$
Uncontrolled diabetes	5.12 ± 0.98	$p < 0.05$

DISCUSSION

Diabetes mellitus is a metabolic disorder characterized by hyperglycaemia and action of endogenous insulin or its insufficiency of secretion. The present study comprises 250 type 2 diabetic cases and 250 age and sex matched control subjects. All the participants were between age group 31-65 years and majority cases were between 41-50 years (56.8%) (Table 1). Among the diabetic cases (n=250), 130 cases had uncontrolled diabetes and 120 cases had controlled diabetes.

In this study, the fasting and postprandial blood glucose levels were highly significant in diabetic cases than non-diabetic control subjects (Table 2). A study by Falko JN *et al*. stated that blood glucose levels were significantly higher in diabetics as compared to non-diabetics [12]. In uncontrolled diabetic patients fasting (224.36) and postprandial blood glucose levels (299.18) were highly significant than in controlled diabetic cases (121.03 in fasting, 188.88 in postprandial) (Table 3).

In this study, the mean value of total cholesterol, serum triglyceride, LDL, VLDL, phospholipids, total lipids in diabetic group were significantly increased as compared to nondiabetics ($P<0.001$). Mean value of serum HDL cholesterol was significantly decreased in diabetic group as compared to nondiabetics ($P<0.05$) (Table 4). The results of this study indicating that insulin increases the number of LDL receptors, so chronic insulin insufficiency might be associated with a diminished level of LDL receptor which leads to increase in LDL particle and result in the increase in LDL cholesterol in diabetes. High level of total cholesterol, triglyceride, LDL-cholesterol and low HDL-cholesterol may be due to the obesity, increase calorie intake and lack of muscular exercise in the patients of type 2 diabetes [13, 14].

MDA is a stable end product of free radicals induced by lipid peroxidation. Thus MDA serves as a reliable marker for the assessment of free radical induced damage to tissues. In diabetic patients a major factor that is responsible for enhanced free radical generation is hyperglycemia through auto-oxidation of glucose; it may be an important risk factor for cardiovascular disease in diabetics [15]. In this study the mean value of MDA was significantly increased in diabetic group as compared to non-diabetic subjects (Table 5). Serum total cholesterol, triglyceride, HDL-cholesterol, VLDL cholesterol, phospholipids and total lipid are higher and LDL-cholesterol is lesser in uncontrolled diabetic patients than in controlled diabetics. Mean serum MDA levels are significantly higher in uncontrolled diabetic patients (5.12) as compared with controlled diabetic patients (4.49) ($p < 0.05$).

CONCLUSION

There are a number of factors that have an effect on an individual oxidative status such as age, sex, body composition, smoking status, diet, physical activity and strength of the defence mechanism. The results of present study concluding that the marker of free radical induced injury i.e. malondialdehyde may appear early in the type 2 diabetes, before the development of secondary complications. The study therefore suggests the importance of assessing these markers of oxidative stress and antioxidant capacity along with the other routine investigations in diabetic patients for initiating antioxidant therapy in addition to primary and secondary preventive measures to migrate the divesting consequences of diabetes leading to coronary heart disease. After controlling blood glucose, in diabetic patients, the lipid status can be improved and oxidation of lipids can be prevented by supplementing the antioxidants rich components of the diet and thus further diabetic events can be avoided.

REFERENCES

1. Lal SS, Sukla Y, Singh A, Andriyas EA, Lall AM. Hyperuricemia, high serum urea and hypoproteinemia are the risk factor for diabetes. Asian J Med Sci. 2009; 1(2):33-34.
2. Barnett DM, Krall LP. Joslin's diabtes mellitus. Khan CR, Weir GC, King GL, Jacobson AM, Moses AC, Smith RJ, editors (Spanish edition). New York (NY): Lippincott, Williams and Wilkins: 2007.
3. Raman PG. Diabetes mellitus in India. The J of General medicine. 2002; 14(1): 5-9.
4. Ceriello A. Oxidative stress and glycemic regulation. Metabolism 2000; 49(2, Suppl 1):27–29.

5. Baynes JW, Thorpe SR. Role of oxidative stress in diabetic complications: A new perspective on an old paradigm. Diabetes 1999; 48:1–9.
6. Baynes JW. Role of oxidative stress in development of complications in diabetes. Diabetes 1991; 40:405–412.
7. Chang KC, Chung SY, Chong WS, Suh JS, Kim SH, Noh HK, Seong BW, Ko HJ, Chun KW. Possible superoxide radical-induced alteration of vascular reactivity in aortas from streptozotocin-treated rats. J Pharmacol Exp Ther 1993; 266(2):992–1000.
8. Young IS, Tate S, Lightbody JH, McMaster D, and Trimble ER. The effects of desferrioxamine and ascorbate on oxidative stress in the streptozotocin diabetic rat. Free Radic Biol Med 1995; 18(5):833–840.
9. Halliwell B, Gutteridge JM. Role of free radicals and catalytic metal ions in human disease: An overview. Meth Enzymol 1990; 186:1–85.
10. Saxena AK, Srivastava P, Kale RK, Baquer NZ. Impaired antioxidant status in diabetic rat liver.Effect of vanadate. Biochem Pharmacol 1993; 45(3):539–542.
11. McLennan SV, Heffernan S, Wright L, Rae C, Fisher E, Yue DK, Turtle JR. Changes in hepatic glutathione metabolism in diabetes. Diabetes 1991; 40(3):344–348.
12. Falko JM, Parr JH, Simpson RN, Wynn V. Lipoprotein analyses in varying degrees of glucose tolerance: comparison between non-insulin-dependent diabetic, impaired glucose tolerant, and control populations. The American journal of medicine. 1987 Oct 1;83(4):641-7.
13. Das S, Samal KC, Tripathy BB. Factors influencing plasma lipids and lipoprotein cholesterol of Indian-NIDDM. J. Dia. Assoc. Ind. 1992;32(2).
14. Walter RM, Uriu-Hare JY, Olin KL, Oster MH, Anawalt BD, Critchfield JW, Keen CL. Copper, zinc, manganese, and magnesium status and complications of diabetes mellitus. Diabetes care. 1991 Nov 1;14(11):1050-6.
15. Wei M, Gaskill SP, Heffner SM, Stern MP. Effects of diabetes and level of Glycemic on all-cause and cardio-vascular mortality the San Antonia Heart Study. Diabetes Cause. 1998; 21:1167–72.