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Original Research Article

Association of Serum Visfatin and Oxidative Stress Markers in T2DM Patients

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Abstract

Background &Method: The aim of this study is to study the association of Serum Visfatin and Oxidative stress markers in T2DM Patients. Out of 100 subjects selected, 50 were of T2DM, and 50 Normal healthy subjects which served as control group. All subjects with T2DM were diagnosed by the criteria of American Diabetes Association. Each and every participant received prior counselling regarding diabetes, causes, symptoms, complications etc. All the subjects were informed of the objectives of the study prior to registration.

Result: In our study we found 71% male whereas 29% female. In our study we found maximum no in age group of 41-50 i.e. 44%.We found mean of Serum Visfatin 22.7794±3.402 in our study & PP Sugar mg/dl 127.4300±14.49922.

Conclusion: The present study found an association between visfatin levels, MS and oxidative stress. Authors suggest that serum visfatin could be used as a predictive marker for T2DM Patients and its higher levels are associated with oxidative stress.

Keywords: Serum, Visfatin, oxidative stress markers &Type2 Diabetes Miletus.

Introduction

Visfatin is a 52 kDa multifaceted molecule, which was detected and recognised as a new adipocytokine by Fukuhara A et al., in 2005 [1]. The name "visfatin" is used to refer to this protein as it is present in visceral fat and produced by adipose tissue. It is also known as Pre-B-cell Colony-Enhancing Factor (PBEF) or Nicotinamide Phosphoribosyl Transferase (NAMPT). Visfatin is originally produced by visceral fat tissue in obese animals and humans. It is associated with obesity and with Type 2 Diabetes Mellitus (T2DM) [2] and has an important role in pancreatic β-cell function and in the production of inflammatory cytokines. NAMPT is the rate-limiting enzyme in the retrieve pathway of Nicotinamide Adenine Dinucleotide (NAD) biosynthesis from nicotinamide. As visfatin is regulating the NAD metabolism so, it might control fundamental cellular processes [3]. It also activates insulin receptors and has insulin-mimetic effects. Obesity is widely heterogeneous and

includes >30% of the obese population are metabolically healthy [4]. The pathogenesis of MS in adults is complex. Therefore, the link between circulating level of visfatin and MS is difficult to establish. However, several studies reporting that MS patients have higher concentrations of visfatin than normal subjects. Insulin resistance leads to MS, which is activated by inflammatory cytokines such as IL-6 [5]. Adipose tissue behaving as an endocrine organ produce adipocytokines. As visfatin is secreted by visceral fats, it has been assumed that its levels are associated with the amount of visceral fats. However, no consistent results have been obtained yet [6].

As a developing country, India faces the rising threat of non-communicable diseases, while still struggling to control communicable diseases. Increases in life expectancy and improved standards of living coupled with a sedentary lifestyle have led to an explosion of lifestyle diseases in the past few decades. Diabetes mellitus takes centre stage in this scenario, due to its high prevalence and its impact on society, not just in terms of mortality and morbidity but also due to its impact on the economy[7]. Diabetes mellitus is no new disease, recorded as 'madumeha' in ancient Indian texts, and has been on the rise in recent times. A glimpse at numbers will shed some light on the impact of the disease. Currently, there are 415 million people suffering from diabetes worldwide, of which India's share is a little under 70 million. The prevalence of diabetes among the adult population is an alarming 9.3% in India. The International Diabetes Federation (IDF) has projected that by the year 2040, over 123 million people will suffer from diabetes in India, which amounts to an adult prevalence rate of 10.1%. An exponential increase in urbanisation, decrease in physically active labour and changes in diet have contributed to the rise in prevalence of diabetes and other non-communicable diseases. The economic impact of diabetes in the country is significant too; it is expected to cost $150 billion in the period from 2012 to 2030[8,9&10].

Material & Method

Study population and design:

This study was conducted in the department of Biochemistry at the Sanotsh medical college & Hospital, Ghaziabad (U.P.). It is an observational case control study. Over 100 individuals from the Outpatient Department of Medicine at the Sanotsh Medical College in Ghaziabad participated in the current study. Out of 100 subjects selected, 50 were of T2DM, and 50 Normal healthy subjects which served as control group. All subjects with T2DM were diagnosed by the criteria of American Diabetes Association. The study commenced after obtaining due approval from Institutional Ethical committee. Each and every participant received prior counseling regarding diabetes, causes, symptoms, complications etc. All the subjects were informed of the objectives of the study prior to registration. All subjects were given full disclosure of the study's benefits and drawbacks before providing their written consent.

Inclusion and exclusion criteria employed for selection of subjects

Inclusion criteria	Exclusion criteria
Type 2 diabetes subjects • Males and females with type 2 diabetes mellitus in the age group of 35 to 55 years. • Subjects having body mass index (BMI) between 18.5 and 40. • Elevated blood glucose levels (fasting blood glucose ≥ 126 mg/dl and postprandial blood glucose ≥ 200 mg/dl). • Participants in the study must be willing to follow the procedure and give written informed consent.	**Type 2 diabetes subjects** • Those with any kind of chronic illness or diseases or disorders • Pregnant females and lactating women were excluded from the study. • Those on steroid therapy for other ailments. • Those addicted to alcohol or other drugs.
Healthy Volunteers • Male or female subjects aged 35 to 55 years with sound health (age matched to subjects with T2DM)	**Healthy Volunteers** • Those with any kind of chronic illness or diseases or disorders • Those addicted to alcohol or other drugs

Collection of Blood Samples:

Whole blood samples: For the determination of reduced glutathione and glycosylated hemoglobin, respectively, fresh whole blood samples of 0.05ml and 0.1ml were thoroughly mixed with 0.95 and 0.9 ml of distilled water.

Separation of Plasma: The samples were allowed to stand at room temperature, centrifuged (6000 rpm x 15 min x 4°C) and plasma was collected in to plastic tubes.

Hemolysate Preparation: The plasma and buffy coat were removed from whole blood. To obtain a cell pellet, the red blood cells were suspended in 2ml normal saline and centrifuged (3000 rpm x 10 min x 4°C). The cell pellet was washed three times with normal saline (PCV). Haemolysate was made by mixing 0.1 ml of PCV suspension with 1.9 ml of cold distilled water, and it was kept at 4°C.

3.4 Nature and type of samples used for various investigations

S.No	Nature and type of sample used	Investigations done
1.	Fresh whole blood	1. Glycosylated hemoglobin 2. Reduced glutathione 3. Isolation of DNA
2.	Fresh hemolysate	1. Oxidative stress markers
3.	Fresh plasma	1. Plasma Glucose
4.	Stored plasma	1. Lipid profile 2. Kidney function 3. Liver function

The Estimation of oxidative stress markers i.e. Superoxide dismutase (SOD) (Winterbourn *et al*., 1975) and Catalase(Sinha, 1972)

Results

Table 1: Demographic Distribution based on gender among diabetic & non-diabetic subjects

S. No.	Sex Type2DM	No.	Percentage (%)
1	Male	71	71
2	Female	29	29

In our study we found 71% male whereas 29% female.

Table 2: Age Distribution

S. No.	Age(Years)	No.	Percentage (%)
1	30-40	14	14
2	41-50	44	44
3	51-60	32	32
4	61-70	10	10

In our study we found maximum no in age group of 41-50 i.e. 44%.

Table 3: BMI in diabetes & non-diabetes

BMI kg/mt2	26.2272	3.54532	20.00	37.61

Table 4: biochemical parameters in diabetic and non-diabetic subjects

N=100	Mean	Std. Deviation	Minimum	Maximum
Sex	50.5000	29.01149	1.00	100.00
Age	49.6300	8.22862	35.00	67.00
BMI kg/mt2	26.2272	3.54532	20.00	37.61
Catalase Unit/ ml	12.2454	1.62178	9.21	16.73
SOD unit/mg protein	6.4312	2.69250	3.39	16.74
LPO (nmol MDA/ml)	2.3905	1.07534	.51	4.39
HbA1C %	5.4100	.59586	2.40	6.40
FOS mg/dl	92.7000	7.88490	78.00	112.00
PP Sugar mg/dl	127.4300	14.49922	96.00	166.00
Serum Visfatin	22.7794	3.402	13.58	29.4

We found mean of SOD unit/mg protein 6.4312±2.69250, LPO (nmol MDA/ml) 2.3905±1.07534 in our study & Serum Visfatin 22.7794±3.402

Discussion

Visfatin molecule has multifaceted features whose circulating levels are enhanced in metabolic disorders [9]. In the present study, significantly higher levels of visfatin have been found in obese MS cases relative to both control and obese cases without MS. The present results also indicated that serum concentration of visfatin increases along with the increasing BMI and are correlated positively with WC and lipid parameters. The results of the present study are in agreement with previous studies done, that showed higher levels of visfatin in MS cases as compared to controls [9]. However, there have been contradictory results in the association between visfatin and obesity. Some of the studies found that serum visfatin levels are associated with obesity and visceral fat and not with subcutaneous fat when certificating sex and age-matched subjects. Moreover, high visfatin levels in obese patients were found

to be reduced after weight loss [10]. Conversely, Shoelson SE et al., found that visfatin levels were significantly lower in obese subjects . On the other hand, Berndtey J et al., in another study found a positive correlation between visfatin levels and measures of obesity as WC and BMI [11].

Oxidative Stress is associated with unbalanced levels of adipokines involved in the development of the MS. It happens as a result of the high production of pro-oxidants that exceeds the ability of the antioxidant system to remove them from circulation [12]. Central adiposity may contribute to OS due to visceral fat deposition and higher free-fatty acid flux through the portal circulation. In addition, peripheral insulin resistance may be associated with mitochondrial dysfunction and overproduction of pro-oxidants that can harm or alter proteins and lipids [13]. It has been suggested that oxidative stress is increased due to fat accumulation in MS patients [14-21].

Conclusion

The present study found an association between visfatin levels, MS and oxidative stress. Authors suggest that serum visfatin could be used as a predictive marker for T2DM Patientsand its higher levels are associated with oxidative stress.

References

1. Fukuhara A, Matsuda M, Nishizawa M, Segawa K, Tanaka M, Kishimoto K, et al. Visfatin: a protein secreted by visceral fat that mimics the effects of insulin. Science. 2005;307(5708):426-30.
2. Berndt J, Klöting N, Kralisch S, Kovacs P, Fasshauer M, Schön MR, et al. Plasma [2]visfatin concentrations and fat depot-specific mRNA expression in humans. Diabetes. 2005; 54(10):2911-6.
3. García-Fuentes E, García-Almeida JM, García-Arnés J, García-Serrano S, Rivas-Marín J, Gallego-Perales JL, et al. Plasma visfatin concentrations in severely obese subjects are increased after intestinal bypass. Obesity. 2007; 15(10):2391-5.
4. Rabe K, Lehrke M, Parhofer KG, Broedl UC. Adipokines and insulin resistance. Mol Med. 2008;14(11-12):741.
5. Romacho T, Sánchez-Ferrer CF, Peiró C. Visfatin/Nampt: an adipokine with [5]cardiovascular impact. Mediators Inflamm. 2013;2013:946427.
6. Galassi A, Reynolds K, He J. Metabolic syndrome and risk of cardiovascular [7]disease: a meta-analysis. Am J Med. 2006;119(10) :8 12-19.
7. Shah, Y.M., Matsubara, T., Ito, S., Yim, S.-H., and Gonzalez, F.J. Intestinal Hypoxia-Inducible Transcription Factors Are Essential for Iron Absorption following Iron Deficiency. Cell Metab. 2009; 9: 152–164.
8. Day, S.M., Duquaine, D., Mundada, L.V., Menon, R.G., Khan, B.V., Rajagopalan, S., and Fay, W.P. Chronic iron administration increases vascular oxidative stress and accelerates arterial thrombosis. Circulation. 2003; 107: 2601–2606.
9. Messner, D.J., Rhieu, B.H., and Kowdley, K.V. Iron Overload Causes Oxidative Stress and Impaired Insulin Signaling in AML-12 Hepatocytes. Dig. Dis. Sci. 2013; 58: 1899–1908.
10. Robertson, R.P., Harmon, J., Tran, P.O.T., and Poitout, V. β-Cell Glucose Toxicity, Lipotoxicity, and Chronic Oxidative Stress in Type 2 Diabetes. Diabetes. 2004; 53: S119–S124.
11. Takebayashi K, Suetsugu M, Wakabayashi S, Aso Y, Inukai T. Association between plasma visfatin and vascular endothelial function in patients with type 2 diabetes mellitus. Metabolism. 2007; 56(4):451-8.
12. Dogru T, Sonmez A, Tasci I, Bozoglu E, YilmazMI, Genc H, et al. Plasma visfatin levels in patientswith newly diagnosed and untreated type 2 diabetes mellitus and impaired glucose

tolerance. Diabetes Res Clin Pract. 2007; 76(1): 24-9.
13. Berndt J, Kloting N, Kralisch S, Kovacs P,Fasshauer M, Schon MR, et al. Plasma visfatin concentrations and fat depot-specific mRNA expression in humans. Diabetes. 2005; 54(10):2911-6.
14. Fukuhara A, Matsuda M, Nishizawa M, Segawa K, Tanaka M, Kishimoto K, et al. Visfatin: a proteinsecreted by visceral fat that mimics the effects ofinsulin. Science. 2005; 307(5708): 426-30.
15. Jain SK, Levine SN, Duett J, Hollier B. Reduced vitamin E and increased lipofuscin products in erythrocytes of diabetic rats. Diabetes. 1991; 40(10): 1241-44.
16. Blasiak J, Gloc E, Drzewoski J, Wozniak K, Zadrozny M, Skórski T, et al. Free radical scavengers can differentially modulate the genotoxicity of amsacrine in normal and cancer cells. Mutat Res Toxicol Environ Mutagen. 2003;535(1):25- 34.
17. Zaki M, Kamal S, Basha WA, El-Toukhy S, Yousef W, El-Bassyouni HT, et al. Assessment of DNA damage in obese premenopausal women with metabolic syndrome. Gene Reports. 2018;10:42-46.
18. El Marnissi S., Eljaoudi R., Bousliman Y., & Ait El Cadi, M. Dosage des Inhibiteurs de la calcineurine en Transplantation rénale. Journal of Medical Research and Health Sciences, 2023; 6(4): 2490–2502.
19. Anwar GM, Motawei AA, Ibrahim A, Galal A, Salama HM, Aly AA, et al. Serum. visfatin level in obese Egyptian children and adolescents and its relation with metabolic syndrome. Med Res J. 2015;14(2):53-58.
20. Hilali N, Kocyigit A, Demir M, Camuzcuoglu A, Incebiyik A, Camuzcuoglu H, et al. DNA damage and oxidative stress in patients with mild preeclampsia and offspring. Eur J Obstet Gynecol Reprod Biol. 2013; 170(2):377-80.
21. Fasshauer M, Blüher M, Stumvoll M, Tönessen P, Faber R, Stepan H. Differential regulation of visfatin and adiponectin in pregnancies with normal and abnormal placental function. Clin Endocrinol (Oxf). 2007; 66(3):434-39.