

Visfatin as a Biomarker for Early Detection of Gestational Diabetes Mellitus

SYED BAKHT RUIDAR¹, MAZHAR MUSHTAQ², SYED ALI RAZA³, FARHANA MUKHTAR⁴, TALHA REHMAN⁵, WANG NING⁶

¹Endocrinologist, Tehsil Headquarter Hospital Wari, Dir Upper

²Associate Professor - Basic Medical Sciences, Sulaiman Al Rajhi University, KSA

³Assistant Professor, Department of Medicine, Dr Ziauddin Hospital, North Nazimabad, Karachi

⁴Associate professor, chemical pathology, Sheikh Zayed hospital Lahore

⁵Pharmacology Department, Gujranwala Medical College

⁶Chief Physician, Department of Endocrinology and Diabetes, The first affiliated Hospital of Xinjiang Medical University, Urumqi, China

Corresponding author: Syed Ali Raza, Email: dr.ali.raza@hotmail.com

ABSTRACT

Objective: The current study aims to determine whether an increase in visfatin level resulted in Gestational Diabetes Mellitus (GDM) in pregnant females.

Study Design: Retrospective Study

Place and Duration: Department of Medicine, Dr. Ziauddin Hospital, North Nazimabad, Karachi, From November 2021 to April 2022.

Methods: In this study, 83 pregnant females aged 18-46 years were included. After obtaining informed written consent, detailed demographic data were recorded. Gestational age and gravidity among all females were recorded. Previous history and frequency of GDM were assessed. Blood samples were taken to determine the concentration of visfatin and glucose levels. SPSS 24.0 was used to analyze all data.

Results: In this study, the mean age was 29.11±8.42 years, and the mean BMI was 26.2±3.32 kg/m². The mean gestational age was 34.11±4.33 weeks. Most of the cases were from rural areas and had poor socio-economic status. We found that 44 (53.01%) subjects had gestational diabetes mellitus while 39 (46.9%) had no diabetes. The visfatin level in patients with gestational diabetes was higher, 4.2±7.124, compared to non-diabetes cases, 1.4±1.432, with a p-value<0.003.

Conclusion: Ultimately, we determined that visfatin levels were considerably elevated in gestational diabetes mellitus beginning in the first trimester of pregnancy. An innovative biomarker for GDM detection is increased visfatin levels during pregnancy.

Keywords: Visfatin, Gestational Diabetes, Pregnant Females

INTRODUCTION

Several adipokines, including resistin, adiponectin, IL-6, leptin, TNF, and visfatin, play crucial roles in regulating blood glucose, lipid, and energy metabolism, which can lead to an aberrant metabolic cascade in the cardiovascular, reproductive, and immunological systems. [1] Visfatin's unique mechanism of action on insulin resistance causes GDM by setting off a cascade of signal transduction similar to insulin's, such as the stimulation of kinase of tyrosine kinase and the initiation of protein kinase B, but in a manner distinct from insulin GDM. [1] Atherosclerosis, obesity caused by visceral fat, type II diabetes mellitus, renal dysfunction, beta cell functional impairment, metabolic syndrome, and tumour proliferation are all diseases that have been linked to visfatin. Visfatin, which is affected by glucose intolerance, may be elevated or lowered during pregnancy. Age, gynecological changes, and diabetogenic variables all have a role in the development of GDM, which is caused by a combination of factors such as particular gene mutations, imbalance of placental hormones, and cell damage. Most cases of GDM occur late in pregnancy, between the 24th and 28th week. Fetal and maternal health may be adversely affected by GDM [3,4], particularly in the areas of metabolism and cardiovascular health.

Diagnosis of fetal growth in GDM is typically delayed until the latter part of the second trimester, putting the developing foetus at risk from intrauterine metabolic abnormalities and epigenetic modifications. Many studies have shown that newborns with metabolic abnormalities are at a higher risk for developing various diseases later in life. Reduced pregnancy complication rates can be achieved with early detection and treatment of gestational diabetes. That's why it's so important to be able to anticipate and diagnose GDM as early in pregnancy, or even before conception, as feasible. [5]

Various monikers, including "Pre-B-cell colony-enhancing factor 1" (PBEF1) and "nicotinamide phosphoribosyl transferase," have been used to refer to visfatin in the scientific literature (NAMPT). For humans and mice, PBEF1 is a protein found in visceral adipose tissue that plays a role in the rate-limiting stage of the nicotinamide (NAD+) salvage pathway. To facilitate NAD+ production, this route converts nicotinamide to nicotinamide

mononucleotide. [6,7] In addition to being expressed in subcutaneous and visceral adipose tissue, visfatin is also expressed in placental tissue but at much lower levels. Glucose levels in the blood have a significant impact on the release of visfatin in humans. Increased visfatin levels are linked to obesity in part because the hormone has an insulin-like action when it binds to insulin receptor-1, leading to hypoglycemia via processes that slow glycogenolysis and enhance glucose consumption. In addition, high levels of visfatin in the blood are associated with metabolic syndrome, cardiovascular disease, and type 2 diabetes [8-10].

If not discovered and treated promptly, visfatin may have a role in the onset of gestational diabetes and exacerbate its complications. A worsening of sickness and the development of maternal and foetal problems might be averted with immediate risk factor modification and intervention. This study aimed to compare the visfatin levels of pregnant women who developed GDM to those who developed the disease later in pregnancy and who had an otherwise normal OGTT.

MATERIAL AND METHODS

This retrospective study was conducted at the Department of Medicine, Dr Ziauddin Hospital, North Nazimabad, Karachi, From November 2021 to April 2022 and comprised of 83 pregnant females. After obtaining informed written consent, they were included in the study. Females with abnormalities in pregnancy and those who did not provide written permission were excluded from this study.

18-46 years were the age of females. As part of the standard antenatal care, the mother's blood pressure and gestational age were recorded, and a history of any prior pregnancies or family history of diabetes was noted. Venepuncture was used to obtain the fasting blood samples, which were analysed for glucose and visfatin levels. Pregnant women with a positive family or personal history of diabetes mellitus (DM) and women without a DM history were divided into two groups (cases and controls) based on their blood glucose levels. A 75 gm oral glucose load was administered, and the patient's plasma glucose level was measured again after two hours to confirm the diagnosis of GDM. Cases of GDM were

considered definitive, with levels above 7.8 mmol/L. Serum visfatin levels were measured in both the patients and controls. The eNamp/PBEF ELISA kit for visfatin from Alpco Diagnostics was used to quantitatively quantify the levels of visfatin in the maternal serum using ELISA.

SPSS-24 was used to conduct the statistical analysis. Mean SD was obtained for continuous variables like serum visfatin, while frequencies and percentages were derived for categorical variables, including body mass index, gestational age, and parity. Serum visfatin was compared between groups of pregnant women using a two-tailed Student's t-test, and differences at the p 0.05 level were considered significant.

RESULTS

The mean age of the patients was 29.11 ± 8.42 years, and they had a mean BMI 26.2 ± 3.32 kg/m². The mean gestational age was 34.11 ± 4.33 weeks. Most of the cases were from rural areas and had poor socio-economic status. The majority of the patients were multigravida. (Table-1) similarly large proportion of our subject was with GDM. (Figure-1)

Table-1: Demograph and history of previous pregnancy in the studied subjects.

Variables:	Frequency	Percentage
Mean age (years)	29.11±8.42	
Mean BMI (kg/m ²)	26.2±3.32	
Mean gestational age (weeks)	34.11±4.33	
Area of living:		
Rural	51	61.4
Urban	32	38.6
Poor Socio-economic status:		
Yes	49	59.04
No	34	40.96
Gravidity:		
Primipara	37	45.6
Multigravida	46	55.4

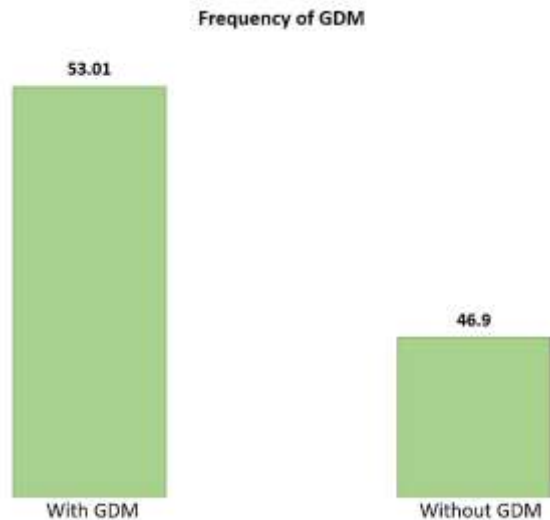


Figure-1: Frequency of GDM in the studied cases were 44 (53.01%) cases had GDM while 39 (46.9%) were without GDM.

The level of visfatin in patients with gestational diabetes was higher at 4.2 ± 7.124 as compared to non-diabetes cases, 1.4 ± 1.432 with p-value < 0.003 . (Table-2)

Table-2: Visfatin level among all cases.

Variables	With GDM	Without GDM
Blood Glucose (mmol/l)	13.2±2.34	6.7±1.27
Glycosylated hemoglobin (%)	7.16±0.34	3.97±1.20
Serum visfatin (ng/ml)	4.2±7.124	1.4±1.432

DISCUSSION

Many studies have shown that visfatin plays a significant role in the onset of type II Diabetes Mellitus. [11,12] Raised blood visfatin levels in women who go on to develop GDM have just recently been recognized. [13] Although the source for circulating visfatin in diabetes and obesity is fatty tissue, some other research supports the idea that placenta may be linked to elevated blood levels of visfatin in diabetes. During the normal course of pregnancy, the opposition to insulin increases physiologically, so many studies suggest that visfatin possesses insulin-mimetic qualities. This facilitates visfatin to bind to insulin receptors and increase subcellular utilization of glucose thus, leading to the conclusion by Liang et al., that provides an association to metabolic disorders of lipids, insulin, and glucose in GDM. [14] Our work confirms that visfatin levels begin to rise during the first trimester of pregnancy and continue to rise until the near term. No correlation exists between this and being a primigravida and multigravida.

Increased visfatin levels in type 2 diabetes may represent decreased action of visfatin on the receptor of target cells, resulting in disruption of sugar and lipid homeostasis and ultimately the development of type 2 diabetes. [15] One study demonstrates that placental material, mesenchymal cells, amniotic epithelial, parietal decidua, and chorionic cytotrophoblastic cells all had higher expression of visfatin receptors in GDM, suggesting that placental tissue may be a source of visfatin excess secretion. [16] Consistent with previous studies in the field, we discovered a stronger correlation between GDM and increased serum visfatin concentrations in obese and overweight women with high BMI compared to normal and underweight women. In our study, the visfatin level in patients with GDM was higher 4.2 ± 7.124 , as compared to non-diabetes cases at 1.4 ± 1.432 with p-value < 0.003 .

Placental growth factor (PIGF) has been suggested as an early sign of GDM, both on its own and in conjunction with plasma (PAPP-A), in a previous analysis by Huhn et al. [17], however, this research yielded conflicting results. Despite including 158 pregnant women and showing higher blood PIGF levels in expecting women with GDM, the study was conducted between 24 and 28 weeks of gestation and did not give information if PIGF is a valid early marker [18]. A more recent study including PIGF is by Gorkem et al. A short clinical investigation conducted by Nuzzo et al. and published very recently [19] found no change in PIGF, sFit1, or the sFit1/PIGF ratio among GDM pregnant women and strong people.

Recent research has demonstrated that an increase in visfatin weeks before the beginning of gestational diabetes may be of the predictive accuracy of the onset of illness that is inconsistent with the mother's other features. Our finding is consistent with a previous study that discovered elevated visfatin levels weeks before a clinical diagnosis of the condition. [20] Since determining the difference between GDM and non-GDM serum visfatin levels is difficult in medical and obstetrics, several studies have turned to less intrusive methods of diagnosing GDM, such as saliva testing. They have identified a substantial difference between the two groups. [21] Consistent with our findings and supported by worldwide literature, earlier research has focused chiefly on the intricate connection between serum visfatin and Type 2 Diabetes Mellitus; however, attention has recently shifted to GDM in obese women.

CONCLUSION

Ultimately, we determined that visfatin levels were considerably elevated in gestational diabetes mellitus beginning in the first trimester of pregnancy. An innovative biomarker for GDM detection is increased visfatin levels during pregnancy.

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