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Original Research Article

Prospective Analysis of Serum Ferritin Levels in Diabetic Patients at a Tertiary Care Hospital

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ABSTRACT

Background: Type 2 diabetes mellitus (DM2) is an important health problem worldwide. Raised Serum ferritin may be related to the occurrence of long-term complications of diabetes, both micro vascular and macro vascular. The present study was conducted to evaluate serum ferritin levels in diabetic patients.

Material & Methods: The present observational study was conducted in Department of General Medicine, Katuri Medical College and Hospital, Guntur, Andhra Pradesh (India) among 150 diabetic patients and an equal number of age and gender matched controls. Patients were evaluated with detailed history, meticulous examination and laboratory investigations i.e. Serum Ferritin levels, fasting and postprandial blood glucose, and glycosylated Hemoglobin levels. The collected data was analyzed using IBM SPSS and p-value < 0.05 was considered significant.

Results: In the present study the difference between mean age of both groups was non-significant. The FBG, PPBG, Glycated haemoglobin, serum ferritin levels in the diabetic cases was found to be higher than that in the control group and it was statistically highly significant (p<0.01). In cases with type 2 diabetes mellitus it was seen that the highest serum ferritin levels (i.e. 248.56±8.46 ng/mL) were found in the cases with the highest HbA1C % levels of >10.51%. On the contrary, cases with the HbA1C % range of 6.00-7.50 % had the lowest serum ferritin levels of 88.14±46.45ng/mL. It was also observed in the present study that serum ferritin levels showed a positive correlation with HbA1c%, that was statistically significant.

Conclusion: The FBG, PPBG, Glycated haemoglobin, serum ferritin levels in the diabetic cases were found to be higher than that in the control group. Serum ferritin levels were higher in the cases with a higher HbA1c%. Therefore, it can be concluded that serum ferritin levels showed a positive correlation with HbA1c%.

Keywords: Serum Ferritin Levels, HbA1c, Diabetic Patients.

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INTRODUCTION

Diabetes Mellitus (DM) is one of the most common endocrine disorders around the world, affecting about 366 million people in 2011, although this number is expected to rise to 552 million by the year of 2030.[1] Type 2 DM accounts for approximately 90% of all diabetic patients. It can lead to serious complications including myocardial infarction, stroke, end stage renal disease, retinopathy, and foot ulcers.[2] The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of different organs, especially the eyes, kidneys, nerves, heart, and blood vessels.[3] Iron is known to have active role in several processes including oxidative stress, formation of toxic free radicals, lipid peroxidation, and endothelial dysfunction.[4] However, with the discovery of novel disorders of iron metabolism, it is obvious that iron overload, irrespective of the cause, results in an increased incidence of type 2 diabetes. The role of iron in the pathogenesis of diabetes is suggested by 1) an increased incidence of type 2 diabetes in diverse causes of iron overload and 2) reversal or improvement in diabetes (glycemic control) with a reduction in iron load achieved using either phlebotomy or iron chelation therapy. A causative link with iron overload is suggested by of the improvement in insulin sensitivity and insulin secretion with frequent blood donation and decreased iron stores.[5,6] A study report from Finland suggested a positive association between serum ferritin level and DM which has consequently encouraged investigating iron as a risk factor for DM.[7] Serum ferritin is an excellent biomarker of body iron stores and has been proposed as a component of the insulin resistance syndrome. In addition, excess iron deposition in the liver may cause insulin resistance by interfering with the ability of insulin to suppress hepatic glucose production.[8,9] The present study was conducted to evaluate serum ferritin levels in diabetic patients.

MATERIALS & METHODS

The present observational study was conducted in Department of General Medicine, Katuri Medical College and Hospital, Guntur, Andhra Pradesh (India) to evaluate serum ferritin levels in diabetic patients. Before the commencement of the study ethical clearance was taken from the Ethical Committee of the institute and

informed consent was taken from the participants after explaining them the study. 150 diabetic patients and an equal number of age and gender matched controls selected randomly were included in the study. Patients were evaluated with detailed history, meticulous examination and laboratory investigations. Since serum ferritin is an acute phase reactant and may be elevated in presence of inflammation, an attempt was made to minimize this potential source of confounding by excluding those patients with suspected infection, inflammation and liver disease and with positive CRP levels. Most of the patients were selected when they had come for treatment for diabetes. Patients receiving iron supplements, patients with anemia (Hemoglobin levels less than 12g/dl in women and less than 13g/dl in males) or receiving treatment for anemia in the past three months, patients with history of blood donation in the last three months, with diagnosed type 1 diabetes mellitus, patients who do not give consent to the study, pregnant women, patients with hepatic disorders, renal disorders, malignancies, acute infections, fever, myocardial infarction, bleeding disorders or on medication with possible influence on serum ferritin levels were excluded from the study. To find out the influence of body iron stores on various biochemical parameters, both diabetics and controls underwent the following biochemical investigations: Serum Ferritin levels, fasting and postprandial blood glucose, and glycosylated Hemoglobin (Hb) levels using standard methods. Under all aseptic and antiseptic conditions 5 ml of blood sample was collected from each subject from a suitable peripheral vein (preferably antecubital vein) by venipuncture using a sterile disposable syringe and divided into a sterile empty vial and an EDTA vial. EDTA vials are used for estimation of glycated hemoglobin. The rest of the sample was then allowed to stand for some time and then centrifuged for separation of serum. This serum was used for estimation of the other parameters. Serum ferritin was measured by MAG-16 kit, which is a immunoradiometric assay kit of the sandwich type based on two monoclonal antiferritin antibodies: one 125Ilabelled anti-ferritin antibody in liquid phase and other monoclonal antiferritin antibody is coupled to magnetizable cellulose. Blood glucose was determined by the GOD-POD method (glucose oxidase peroxidase method, Randox reagent) and glycosylated hemoglobin by the Ion-Exchange Resin method (Tulip group). The collected data was analyzed with IBM SPSS. All tests were considered statistically significant if the p-value was< 0.05.

Table 1: Comparison of means of the anthropometric and biochemical characteristics between the test and control groups.

Parameters	Control group	Diabetic group	p value
Age (years)	54.75+10.26	55.47+9.55	>0.05
FBG (mg/dL)	87.45±11.32	171±63.45	< 0.01
PPBG (mg/dL)	116.38±14.49	272.05±98.78	< 0.01
Glycated haemoglobin (%)	5.15±0.68	9.06±2.12	< 0.01
Serum ferritin (ng/mL)	46.47±21.56	155.33±74.85	< 0.01

Table 2: Mean and standard deviation of serum ferritin in different levels of HbA1 C%.

HbA1C Range (%)	Mean±SD Ferritin (ng/mL)	p-value
6.00-7.50	88.14±46.45	<0.05
7.51-9.00	116.10±18.34	<0.05
9.01-10.50	177.16±36.45	<0.01
≥ 10.51	248.56±8.46	<0.05

RESULTS

In the present study it was observed that the mean age of control group was 54.75years whereas of diabetic group it was 55.47. The difference between mean age of both groups was non-significant. The mean level of FBG in diabetic cases was found to be 87.45±11.32mg/dL and in the control group it was found to be 171±63.45mg/dL. The FBG levels in the diabetic cases was found to be higher than that in the control group and it was statistically highly significant (p<0.01). The mean level of PPBG in diabetic cases was found to be 116.38±14.49mg/dL and in the control group it was found to be 272.05±98.78mg/dL. The PPBG levels in the diabetic cases was found to be higher than that in the control group and it was statistically highly significant (p<0.01). The mean level of Glycated haemoglobin in diabetic cases was found to be 9.06% and in the control group it was found to be 5.15%. The Glycated haemoglobin levels in the diabetic cases was found to be higher than that in the control group and it was statistically highly significant (p<0.01). The mean level of serum ferritin in diabetic cases was found to be 155.33±74.85ng/mL and in the control group it was found to be 46.47±21.56 ng/mL. The serum ferritin levels in the diabetic cases were found to be higher than that in the control group and it was statistically highly significant (p<0.01).

In the present study, in cases with type 2 diabetes mellitus it was seen that the highest serum ferritin levels (i.e. 248.56±8.46 ng/mL) were found in the cases with the highest HbA1C % levels of >10.51%. On the contrary, cases with the HbA1C % range of 6.00-7.50 % had the lowest serum ferritin levels of 88.14±46.45ng/mL. Hence, the cases with a higher HbA1c% had a higher serum ferritin level. It was also observed in the present study that serum ferritin levels showed a positive correlation with HbA1c%, that was statistically significant.

DISCUSSION

Recent studies have demonstrated that increased body iron stores are associated with the development of glucose intolerance, gestational diabetes, type-2 DM and insulin resistance syndrome.[10-14] In the present study the difference between mean age of both groups was non-significant. The FBG,PPBG, Glycated

haemoglobin, serum ferritin levels in the diabetic cases was found to be higher than that in the control group and it was statistically highly significant ($p<0.01$). In cases with type 2 diabetes mellitus it was seen that the highest serum ferritin levels (i.e. 248.56±8.46 ng/mL) were found in the cases with the highest HbA1C % levels of >10.51%. On the contrary, cases with the HbA1C % range of 6.00-7.50 % had the lowest serum ferritin levels of 88.14±46.45ng/mL. It was also observed in the present study that serum ferritin levels showed a positive correlation with HbA1c%, that was statistically significant**.**

A study conducted on 9,486 participants out of total 16573 individuals in the United State by Ford et al in 1999 reported that serum ferritin levels were lowest in non-diabetic, higher in pre-diabetic and highest in diabetic patients.[15]

Similarly, a study from China by Liu et al. found an increase in the HOMA-IR values in parallel to the increases in serum ferritin levels and the decrease in insulin secretion from the pancreas.[16]

A study carried out in Korea University Hospital from 1997 to 1998 by Kim et al showed that the value of serum ferritin was higher in the type 2 diabetes patients than the control subjects. They concluded that serum ferritin can be employed as a marker of not only glucose homeostasis but also insulin resistance both in type 2 diabetic and control subjects.[17]

In a study carried out by Smotra S, et al in a tertiary care hospital in North India found that in those with increased level of Serum Ferritin, more number of patients had poor glycemic control reflected by higher levels of HbA1c % as compared to those with normal levels and was found to be statistically significant ($p< 0.05$).23 It was surmised from the study that increased Serum Ferritin levels are associated insulin resistance, poor glycemic control and also associated with complications of type-2 DM like nephropathy, retinopathy, neuropathy and hypertension.[18]

CONCLUSION

The FBG, PPBG, Glycated haemoglobin, serum ferritin levels in the diabetic cases were found to be higher than that in the control group. Serum ferritin levels were higher in the cases with a higher HbA1c%. Therefore, it can be concluded that serum ferritin levels showed a positive correlation with HbA1c%**.**

REFERENCES

1. Whiting DR, Guariguata L, Weil C, Shaw J. IDF diabetes atlas:global estimates of the prevalence of diabetes for 2011 and 2030. Diabetes Res Clin Pract. 2011;94(3):311–321. doi:10.1016/j.diabres.2011.10.029.

2. Mokdad AH, Ford ES, Bowman BA, et al. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. Jama. 2003;289:76-9.

3. American Diabetes Association Diagnosis and classification of diabetes mellitus. Diabetes Care. 2006;29(Suppl 1):S43–S48.

4. Emerit J, Beaumont C, Trivin F. Iron metabolism, free radicals, and oxidative injury. Biomedicine & pharmacotherapy = Biomedecine & pharmacotherapie. 2001; 55: 333-9.

5. Jiang R, Ma J, Ascherio A, Stampfer MJ, Willett WC, Hu FB. Dietary iron intake and blood donations in relation to risk of type 2 diabetes in men: a prospective cohort study. Am J Clin Nutr. 2004; 79:70-5.

6. Fernandez-Real JM, Lopez-Bermejo A, Ricart W. Iron stores, blood donation, and insulin sensitivity and secretion. Clin Chem. 2005;51:1201-5.

7. Canturk Z, Cetinarslan B, Tarkun I, Canturk NZ. Serum ferritin levels in poorly and well controlled diabetes mellitus. Endocr Res. 2003; 29(3):299-306.

8. Fernández-Real JM, Peñarroja G, Castro A, García-Bragado F, López-Bermejo A, Ricart W. Blood Letting in High-Ferritin Type 2 Diabetes Effects on vascular reactivity. Diabetes Care. 2002; 25(12):2249-55.

9. Moczulski DK, Grzeszczak W, Gawlik B. Role of hemochromatosis C282Y and H63D mutations in HFE gene in development of type 2 diabetes and diabetic nephropathy. Diabetes Care. 2001; 24(7): 1187-91.

10. Fernandez-Real JM, Lopez-Bermejo A, Ricart. Cross talk between iron metabolism and diabetes. Diabetes. 2002; 51: 2348-54.

11. Dmochowski K, Finegood DT, Francombe W, Tyler B, Zinman B. Factors determining glucose tolerance in patients with thalassemia major. J Clin Endocrinol Metab. 1993;77:478-83.

12. Cavallo-Perin P, Pacini G, Cerutti F, Bessone A, Condo C, Sacchetti L, et al. Insulin resistance and hyperinsulinemia in homozygous ß-thalassemia. Metabolism. 1995;44:281-6.

13. Wrede CE, Buettner R, Bollheimer LC, Scholmerich J, Palitzsch KD, Hellerbrand C. Association between serum ferritin and the insulin resistance syndrome in a representative population. Eur J Endocrinol. 2006;154(2):333-40.

14. Suvarna J, Ingle H, Deshmukh CT. Insulin resistance and beta cell function in chronically transfused patients of thalassemia major. Ind Pediatr. 2006;43:393-400

15. Ford ES, Cogswell ME. Diabetes mellitus and serum ferritin concentration among U.S.A adults. Diabetes Care. 1999; 22:1978-1981. doi: 10.2337/diacare.22.12.1978.

16. Liu BW, Xuan XM, Liu JR, Li FN, Yin FZ. The Relationship between Serum Ferritin and Insulin Resistance in Different Glucose Metabolism in Non-obese Han Adults. Int J Endocrinol. 2015:642194. doi: 10.1155/2015/642194.

17. Kim NH, Oh JH, Choi KM, Kim YH, Baik SH, Choi DS, et al. Serum ferritin in healthy subjects and type 2 diabetes mellitus. Yonsei Med J. 2000;41(3):387-92.

18. Smotra S, Kudyar R.P. Relationship between Serum Ferritin and Type-2 Diabetes Mellitus. JK Science. 2008;10(4):170-4.

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