

To Study Association Between Serum Ferritin Levels And Diabetes Mellitus In Punjab Population

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Abstract: Hyperglycaemia results in increased glycated haemoglobin (HbA1c) in red blood cells and causes releasing of free iron from the RBC during the glycation process that initiate generation of free radicals such as reactive oxygen species (ROS) which damage pancreatic β -cell, intensify inflammatory response, and accelerate oxidative damage of bio molecules. Aim of Study: To study the association between Ferritin levels and Diabetes Mellitus. Materials And Methods:- This is a Prospective study, 50 Diabetic Patients, 50 Control Patients conducted in the Department of Biochemistry, Gian Sagar Medical College and Hospital, Rajpura. Exclusion Criteria: Type 1 Diabetes mellitus, Age <18 yrs, Hemochromatosis, Chronic alcoholics, Chronic inflammatory conditions, Hepatitis, Patients with repeated blood transfusions, Iron deficiency anaemia, Hypothyroidism/Hyperthyroidism. Results: The mean serum Ferritin level was significantly increased in Diabetic patients (429 μ g/l) as compared to non-diabetic control groups (7.6 μ g/l). Conclusion: The overall results of the present study showed that the mean level of serum Ferritin was high in uncontrolled Diabetic patients as compared to control groups. For better understanding the association of Ferritin and Glycosylated Hb levels, further clinical studies with large population are needed.

Keywords: Diabetes Mellitus (DM), Glycosylated Hb (HbA1c).

INTRODUCTION

Diabetes mellitus is a metabolic disorder characterized by hyperglycemia either due to insulin deficiency or insulin resistance¹. Serum Ferritin is an acute phase reactant. Elevated iron stores may induce diabetes through either oxidative damage to pancreatic beta cells, impairment of hepatic insulin extraction by the liver or interference with insulin's ability to suppress hepatic glucose production^{2,3}. Hyperglycaemia results in increased glycated haemoglobin A1c (HbA1c) in red blood cells and causes releasing of free iron from the RBC during the glycation process that initiate generation of free radicals such as reactive oxygen species (ROS) which damage pancreatic β -cell⁴, intensify inflammatory response, and accelerate oxidative damage of bio molecules⁵.

Although iron and glucose metabolism are tightly regulated by hepcidin and insulin hormones respectively⁶, a bi-directional link exists and the deregulation of iron homeostasis impacts on the clinical course of Diabetes⁷.⁸ Ferritin is a key protein maintaining iron homeostasis⁹ and is a useful biomarker for iron storage in the body¹⁰.

Aim of study:

To know the association between Ferritin levels and Diabetes Mellitus.

MATERIAL AND METHODS

Source of Study:

This is a Prospective study, 50 Diabetic Patients, 50 Control Patients conducted in the Department of Biochemistry, Gian Sagar Medical College and Hospital, Rajpura.

Method of collection of data Study design:

Prospective Case-control study.

Exclusion Criteria: Type 1 Diabetes mellitus, Age <18 yrs, Hemochromatosis, Chronic alcoholics, Chronic inflammatory conditions, Hepatitis, Patients with repeated blood transfusions, Iron deficiency anaemia, Hypothyroidism/Hyperthyroidism.

Laboratory sample collection, analysis, and test principles:

About 3 ml of venous blood was collected in Ethylene diaminetetraacetic acid (EDTA) tubes for HbA1c determination while the SST tube was allowed for about 20–30 min at room temperature until coagulated and centrifuged for 5 min at 3000 RPM to separate serum from whole blood. FBs, Ferritin, were determined using a principle of glucose Hexokinase (HK), Electrochemiluminescent immunoassay (ECLIA) respectively.

Reference range and clinical implications of the laboratory tests:

The reference ranges for HbA1c and FBS were based on the ADA criteria as :

Healthy groups (HbA1c < 5.7% and FBS 70–99 mg/dl)

Diabetes mellitus (HbA1c $\geq$ 6.5% and FBS $\geq$ 126 mg/dl)

RESULTS

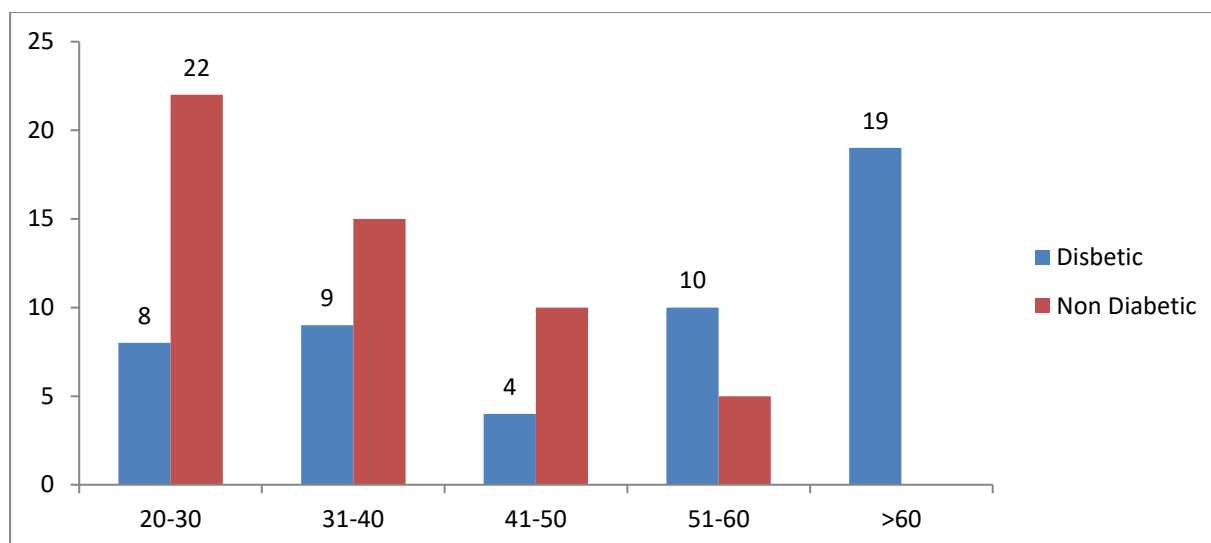


Figure No. 1: In this study among diabetic patients, 20% are in the 51-60 year age group, 38% in more than 60year age group Among non-diabetics, 44% are in the 20-30 year age group, 30% in the 31-49 year age group.

S.No	Age	Diabetic	Non Diabetic
1.	20-30	8	22
2.	31-40	9	15
3.	41-50	4	10
4.	51-60	10	5
5.	>60	19	0

Table No. 1: In this study among diabetic patients, 20% are in the 51-60 year age group, 38% in more than 60year age group Among non-diabetics, 44% are in the 20-30 year age group, 30% in the 31-49 year age group

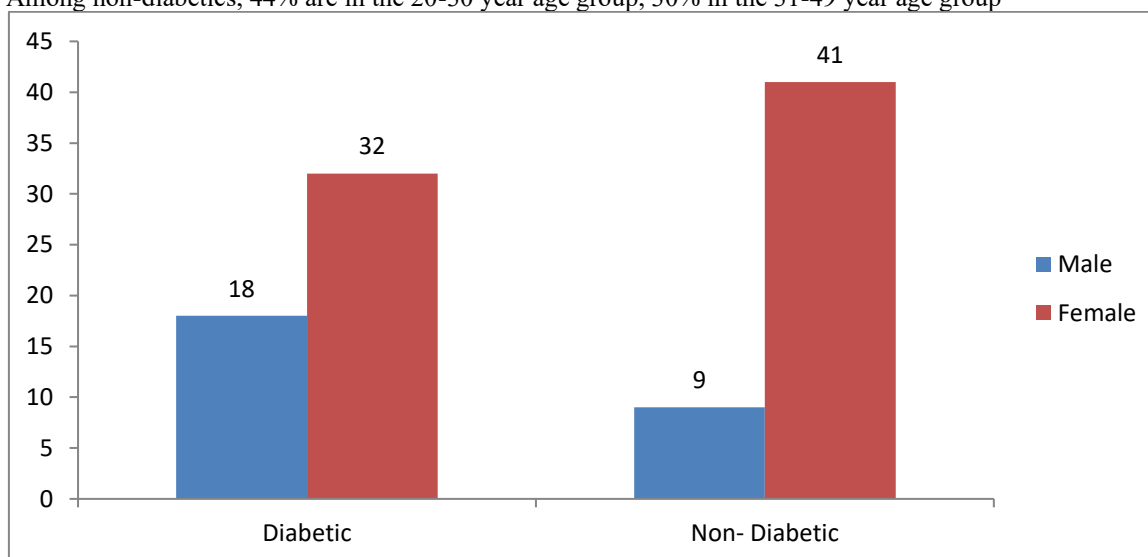


Figure No. 2: In this study among diabetics 18(36%) were male, 32(64 %) were female and among the non-diabetic population 9(18%) were male patients,41 (82%) were female patients.

S.No	Patients	Male	Female	Total
1.	Diabetic	18	32	50
2.	Non Diabetic	9	41	50
3.	Total	27	73	100

Table No. 2: In this study among diabetics 18(36%) were male, 32(64 %) were female and among the non-diabetic population 9(18%) were male patients,41 (82%) were female patients.

HbA1c%	No. of individuals	Mean Ferritin in diabetics (µg/l)
<6.5	50	7.6
6.5-9	38	33.4
>9	12	429

Table No. 3: According to our research, the mean serum Ferritin level was significantly increased in Diabetic patients as compared to non-diabetic control groups.

The finding of this study was different from a study done in Saudi Arabia that described serum Ferritin had no link with glycemic indicators and diabetic complications ¹¹ as well as contrasted with a study conducted in Ethiopia showing a significant decrease in serum Ferritin levels among T2DM patients as compared to non-diabetic control groups ¹². Even though the exact reasons remained unknown, the variation in dietary intake and follow-up care might have a greater influence on the discrepancies in serum Ferritin levels ¹³.

Conversely, our study was consistent with a studies done in India ¹⁴ and Turkey ¹⁵, which showed noticeable hyperferritinemia among uncontrolled T2DM patients when compared to controlled T2DM patients. This could be due to hyperferritinemia affecting pancreatic β-cells through oxidative stress, impairing the liver's capacity to extract hepatic insulin, interfering with insulin's ability to reduce hepatic glucose synthesis ¹⁶, and potentially leading to diabetic complications via interaction with vascular endothelial growth factor (VEGF) ¹⁷.

This study demonstrated the existence of a significant positive correlation of serum Ferritin with HbA1c, FBs, in T2DM patients. The current finding was contrasted with a study done in Iran and Iraq ¹⁸ that showed a null correlation. However, our finding was consistent with studies conducted by Shubham J, et al., Rajeev C, et al. ¹⁹ and Li S, et al. ²⁰, who found a significant correlation of serum Ferritin with glucose control. A study conducted by Sharifi and Sazandeh in Iran shows that Mean serum Ferritin was significantly higher in diabetics than in the control. According to Liang Sun Elevated Serum ferritin concentrations were associated with higher risk of type 2 diabetes in Chinese populations. Significant positive correlation between Ferritin and HbA1c in diabetic. According to a study by Bansal P shows a significant association between serum Ferritin levels and type II diabetes mellitus.

CONCLUSION

The overall results of the present study showed that the mean level of serum Ferritin was high in uncontrolled Diabetic patients as compared to control groups. For better understanding the association of Ferritin and Glycosylated Hb levels, further clinical studies with large population are needed.

REFERENCES

1. Kumar A, Goel MK, Jain RB, Khanna P, Chaudhary V. India towards diabetes control: Key issues. *AMJ* 2013;10:52
2. International Expert Committee. International expert committee report on the role of the A1c assay in the diagnosis of diabetes. *Diabetes Care*. 2009;32:1327-34
3. B.M.Fisher, B.M.Frier.Diabetes mellitus.In:Christopher Hanslett, Edwin R Chilvers, Niicholas A Boon, Nicki R Colledge, John A.A. Hunter:Davidson's Principle and Practise of Medicine.19th ed :Churchill Livingstone; 2002:649
4. Ezegbogu M, Abdulsalam K. Glycated haemoglobin (hba1c): an update on available methods. *Bayero J Pure Appl Sci*. 2018;11(1):8-14.
5. Backe MB, Moen IW, Ellervik C, Hansen JB, Mandrup-Poulsen T. Iron regulation of pancreatic beta-

cell functions and oxidative stress. *Annu Rev Nutr*. 2016;36:241-73.

6. Shetty JK, Prakash M, Ibrahim MS. Relationship between free iron and glycated hemoglobin in uncontrolled type 2 diabetes patients associated with complications. *Indian J Clin Biochem*. 2008;23:67-70.
7. Fillebeen C, Lam NH, Chow S, Botta A, Sweeney G, Pantopoulos K. Regulatory connections between iron and glucose metabolism. *Int J Mol Sci*. 2020;21(20).
8. Fernández-Real JM, López-Bermejo A, Ricart W. Cross-talk between iron metabolism and diabetes. *Diabetes*. 2002;51(8):2348-54.
9. Wang H, Li H, Jiang X, Shi W, Shen Z, Li M. Hcpidin is directly regulated by insulin and plays an important role in iron overload in streptozotocin-induced diabetic rats. *Diabetes*. 2014;63(5):1506-18.
10. Knovich MA, Storey JA, Coffman LG, Torti SV, Torti FM. Ferritin for the clinician. *Blood Rev*. 2009;23(3):95-104.
11. Alqahtani N, Ghazwani EY, Al-Qahtani AM, Elmahboub RA. Correlation of iron levels with glycemia and microvascular complications among type ii diabetes mellitus patients in najran university hospital. *J Family Med Prim Care*. 2022;11(6)
12. Wolide AD, Zawdie B, Alemayehu T, Tadesse S. Evaluation of serum ferritin and some metal elements in type 2 diabetes mellitus patients: Comparative cross-

sectional study. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy. 2016;417 – 24.

13. Bao W, Rong Y, Rong S, Liu L. Dietary iron intake, body iron stores, and the risk of type 2 diabetes: a systematic review and meta-analysis. *BMC Med.* 2012;10:1–13.

14. Tummalacharla SC, Pavuluri P, Maram SR, Vadakedath S, Kondu D, Karpay S, et al. Serum activities of ferritin among controlled and uncontrolled type 2 diabetes mellitus patients. *Cureus.* 2022;14(5).

15. Canturk Z, Çetinarslan B, Tarkun İ, Zafer Canturk N. Serum ferritin levels in poorly- and well-controlled diabetes mellitus. *Endocr Res.* 2003;29(3):299–306.

16. Raj S, Rajan G. Correlation between elevated serum ferritin and hba1c in type 2 diabetes mellitus. *Int J Res Med Sci.* 2013;1(1):12 – 5.

17. Guo L, Jiang F, Tang Y-T, Si M-Y, Jiao X-Y. The association of serum vascular endothelial growth factor and ferritin in diabetic microvascular disease. *Diabetes Technol Ther.* 2014;16(4):224–34.

18. Kuba RH, Saheb EJ, Mosa IS. Detection of iron and ferritin in diabetes mellitus type 2 patients. *Malaysian J Med Health Sci.* 2022;18.

19. Chawla R, Bhoopathi A, Punyani H. Ferritin and serum iron as surrogate markers of poor glycemic control and microvascular complications in type 2 diabetes mellitus. *Int J Diabetes Developing Ctries.* 2019;39(2):362–8

20. Li S, Chen F, Li T, Cheng Y, Huang G, Hou D, et al. Higher serum ferritins are associated with higher blood pressure: a cross-sectional study. *Medicine.* 2024;103(12).