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Original Research Article

Study of serum ferritin in type 2 DM patients in north Gujarat

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ABSTRACT

Introduction: Diabetes mellitus is a metabolic disorder in which metabolism of various trace elements is being altered. Present study has been carried out to determine association between serum ferritin and type 2 diabetes mellitus.

Aim: To analyze level of serum ferritin in type 2 diabetes mellitus patients in comparison with healthy controls.

Materials and Methods: The present cross-sectional study was carried at Clinical Chemistry Laboratory, department of Biochemistry, GMERS Medical College and Hospital, Vadnagar, Gujarat. There were 100 cases having minimum 5 years history of type 2 diabetes mellitus residing at North Gujarat. There were 100 healthy controls in this study. GOD-POD (Glucose Oxidase- Peroxidase) method was used for estimation of Glucose. Nephelometry method was used for estimation of Ferritin and HbA1c.

Results: In comparison to healthy controls; Serum ferritin level was found high in Type 2 DM patients.

Conclusion: High level of serum ferritin was found in patients of type 2 diabetes mellitus patients who have poor glycaemic control.

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1. Introduction

Prevalence of Type 2 diabetes mellitus (DM2) has continue to increase in recent decades.¹⁻⁵ It is an important health problem worldwide affecting about 8 percent of population.⁶ Serum ferritin is storage form of Iron. It is globular protein. Ferrous form of Iron enters into cells in condition of oxidative stress and changes into Ferric form which is linked to ferritin and protect the cells from free radicals.⁷ Oxidative stress is linked with impairment in glucose tolerance and insulin resistance.⁸⁻¹⁰ Higher levels of Ferritin and Iron inside cells can produce Insulin resistance and malfunction of Beta cells of Pancreas. Hyperinsulinemia because of Insulin resistance may be responsible for high level of Ferritin. Derangement in metabolism of Iron may produce resistance to insulin, hyperinsulinemia, dyslipidemia and obesity.^{11,12}

2. Materials and Methods

The present cross sectional study was carried at Clinical Chemistry Laboratory, Laboratory Services, Department of Biochemistry, GMERS Medical College and Hospital, Vadnagar, Gujarat.

2.1. Inclusion criteria

All cases and controls included in study have age more than 40 years.

2.2. Study duration

The duration of study was four months.

There were 100 cases having minimum 5 years history of type 2 diabetes mellitus residing at North Gujarat. Patients having acute infections, chronic systemic diseases, cancer, thyroid disorders, history of smoking and alcohol were excluded from study.

Pregnant ladies and lactating mothers were not included.

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Patients on Insulin were excluded.

There were 100 healthy controls in this study.

All participants were instructed to continue their usual physical activities and routine diet.

All cases were instructed to take their oral hypoglycemic drugs as per advice of physician.

Criteria for the diagnosis of diabetes mellitus¹³

Fasting Blood Sugar >126 mg/dL. Fasting is defined as no caloric intake for at least 8h.*

2 hour Post Prandial Blood Sugar > 200 mg/ dL

2.3. Laboratory samples

1. Two ml of venous blood was collected in fluoride vacutainer for estimation of glucose.
2. Four ml of venous blood was collected in plain vacutainer for estimation of Ferritin.
3. Four ml of venous blood was collected in EDTA vacutainer for estimation of HbA1c.
4. Collection of Blood was done in morning in fasting condition.
5. Samples were analyzed within two hours of collection.
6. GOD-POD (Glucose Oxidase- Peroxidase) method was used for estimation of glucose.
7. Nephelometry method was used for estimation of Ferritin and HbA1c.

2.4. Statistical analysis

Statistical analysis was done by using SPSS software version for performing student 't' test.

Probability <0.05 considered as significant.

3. Result

In the present study, 64 patients were males and 36 were females as illustrated in the Table 1. FBS(158.67±20.78), PPBS (176.19±19.84) and ferritin (202.31±17.27 in male and 105.09 ±10.66 in female) levels were significantly increased in type 2 diabetes mellitus patients compared with controls.

Table 1: Age of patients of diabetes mellitus

Age	Male	Female
41-50 yrs	13	8
51-60 yrs	32	19
61-70 yrs	19	9
Total	64	36

4. Discussion

Chronic disorders like diabetes mellitus and hypertension leads to mortality in present era. Conclusive evidences are available which clearly indicates derangement in trace elements metabolism in diabetes mellitus. Correlation

exists between serum ferritin, FBS, HbA1c and Serum Insulin.¹² Serum ferritin, a reflector of body iron stores was significantly higher in diabetic patients increased as duration of diabetes increased. This possibly reflects the subclinical hemochromatosis developing in a long standing diabetic patient.¹⁴ Increased body iron stores are possibly associated with occurrence of glucose intolerance, type-2 diabetes and gestational diabetes.^{15,16} Poorly controlled patients have hyperferritinemia and there is association between serum ferritin level and diabetic retinopathy.¹⁷ We found that high level of serum ferritin (p<0.05) is seen in patients of diabetes mellitus who have poor glycemic control which matches with other studies.^{17,18} In diabetic subjects, a positive correlation between increased serum ferritin and poor glycemic control, reflected by higher HbA1c, has been suggested.¹⁸

Table 2: Serum ferritin and HbA1c level in Healthy controls and patients of diabetes mellitus

Name of Parameter	Controls (Mean±SD) (N=100)	Diabetes Mellitus Patients (Mean±SD) (N=100)
FBS (mg/dl)	89.32 ± 9.21	158.67 ± 20.78*
PPBS (mg/dl)	108.96 ± 10.54	176.19 ± 19.84*
Ferritin (ng/ml)	In Male: 141.57 ± 14.65	In Male: 202.31 ± 17.27*
	In Female: 79.13 ± 7.42	In Female: 105.09 ± 10.66*
HbA1c (%)	4.89±0.78	7.86 + 2.03*

*p<0.05

5. Conclusion

From the present study it may concluded that high level of serum ferritin is found in patients of type 2 diabetes mellitus who have poor glycemic control which may have role in prognosis and pathogenesis of diabetes mellitus. For better understanding effect of serum ferritin in diabetes mellitus, further clinical studies are needed which should enroll large number of patients and should use higher advanced methods.

6. Conflict of Interest

None.

7. Source of funding

Self-funding was done for the study.

References

1. McKinlay J, Marceau L. US public health and the 21st century: diabetes mellitus. *Lancet*. 2000;356(9231):757-61. doi:10.1016/s0140-6736(00)02641-6.

2. Wild S, Roglic G, Green A, Sicree R, King H. Global Prevalence of Diabetes: Estimates for the year 2000 and projections for 2030. *Diabetes Care*. 2004;27(5):1047–53. doi:10.2337/diacare.27.5.1047.
3. Freid VM, Prager K, Mackay AP, Xia H. Hyattsville, Maryland: National Center for Health Statistics. In: Chartbook on Trends in the Health of Americans. Health, United States; 2003.
4. Yang W, Lu J, Weng J, Jia W, Ji L, Xiao J, et al. Prevalence of diabetes among men and women in China. *N Engl J Med*. 2010;362:1090–101. doi:10.1056/NEJMoa0908292.
5. Fox CS, Pencina MJ, Meigs JB, Vasan RS, Levitzky YS, Agostino RB. Sr Trends in the incidence of type 2 diabetes mellitus from the 1970s to the 1990s: The Framingham Heart Study. *Circulation*. 2006;113:2914–8.
6. Hughes E, Mccracken M, Roberts H, Mokdad AH, Valluru B, Goodson R, et al. Surveillance for certain health behaviors among states and selected local areas—behavioral risk factor surveillance system. *MMWR Surveill Summ*. 2006;55(7):1–124.
7. Theil EC. Ferritin: Structure, Gene Regulation, and Cellular Function in Animals, Plants, and Microorganisms. *Ann Rev Biochem*. 1987;56(1):289–315. doi:10.1146/annurev.bi.56.070187.001445.
8. Park K, Gross M, Lee DH, Holvoet P, Himes JH, Shikany JM, et al. Oxidative Stress and Insulin Resistance: The Coronary Artery Risk Development in Young Adults study. *Diabetes Care*. 2009;32(7):1302–7. doi:10.2337/dc09-0259.
9. Brudevold R, Hole T, Hammerstrøm J. Hyperferritinemia Is Associated with Insulin Resistance and Fatty Liver in Patients without Iron Overload. *PLoS ONE*. 2008;3(10):e3547. doi:10.1371/journal.pone.0003547.
10. Kim HN, Song SW. Concentrations of chromium, selenium, and copper in the hair of viscerally obese adults are associated with insulin resistance. *Biol Trace Elem Res*. 2014;158(2):152–7.
11. Jehn M, Clark JM, Guallar E. Serum Ferritin and Risk of the Metabolic Syndrome in U.S. Adults. *Diabetes Care*. 2004;27:2422–8. doi:10.2337/diacare.27.10.2422.
12. Ashourpour M, Djalali M, Djazayeri A, Eshraghian MR, Taghdir M, Saedisomeolia A. Relationship between serum ferritin and inflammatory biomarkers with insulin resistance in a Persian population with type 2 diabetes and healthy people. *Int J Food Sci Nutr*. 2010;61(3):316–23. doi:10.3109/09637480903555150.
13. Classification and Diagnosis of Diabetes: Standards of Medical Care in Diabetes-2019. *Am Diabetes Assoc Diabetes Care*. 2019;42(1):S13–S28.
14. 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. doi:10.2337/diacare.24.7.1187.
15. Fernandez-Real JM, Penarroja G, Castro A, Garcia-Bragado F, Lopez-Bermejo A, Ricart W. Blood Letting in High-Ferritin Type 2 Diabetes: Effects on vascular reactivity. *Diabetes Care*. 2002;25(12):2249–55. doi:10.2337/diacare.25.12.2249.
16. Ford ES, Cogswell ME. Diabetes and serum ferritin concentration among U.S. adults. *Diabetes Care*. 1999;22(12):1978–83. doi:10.2337/diacare.22.12.1978.
17. Canturk Z, Çetinarslan B, Tarkun İ, Canturk NZ. Serum Ferritin Levels in Poorly- and Well-Controlled Diabetes Mellitus. *Endocr Res*. 2003;29(3):299–306. doi:10.1081/erc-120025037.
18. Eschwege E, Saggi R, Wacjman H, Levy R, Thibault N, Duchateau A. Haemoglobin A1c in patients on venesection therapy for haemochromatosis. *Diabete Metab*. 1982;8:137–40.

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