

Correlation of Serum Ferritin with HbA1c Levels in Type 2 Diabetes Mellitus

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Conflict of interest: Nil

Abstract:

Background: Diabetes is a metabolic disorder characterized by hyperglycemia which is associated with rise in the HbA1c levels. Excess iron damages β -cells of pancreas due to oxidative stress which can contribute to pathogenesis of diabetes mellitus. Serum ferritin, an acute phase reactant a marker of iron stores in the body and its level is considered to be an indicator of body iron stores.

Objective: 1. To assess the serum ferritin, FBS, PPBS and HbA1c level in type 2 diabetes mellitus patients. 2. To find the correlation of serum ferritin with FBS, PPBS and HbA1c levels in this patients.

Material and Methods: This study was performed in 100 Diabetic Patients attending Dialectology OPD in Government Mohan Kumaramangalam medical college and hospital and 5ml of venous blood sample will be collected and analysed Blood sugar in fully automated chemistry analyser and HbA1c in D10 analyser and ferritin in chemiluminescent immunosorbant method. The statistical analysis was performed using SPSS version 16.

Results: There was a positive correlation between serum ferritin and Fasting sugar, postprandial sugar, HbA1c. Serum ferritin is significantly related to Fasting Sugar (P value- 0.00013) moderate positive correlation; postprandial sugar (P value- 0.00001) a moderately strong positive correlation and glycated Hemoglobin (P value-0.00001) moderate positive correlation.

Conclusion: The serum ferritin level increased in patients with type 2 diabetes mellitus and there is Positive correlation between HbA1c and serum ferritin has also been found. It indicates that in low resource setting serum ferritin can be used as a marker for glycemic control in diabetic patients it is cost effective compared to HbA1c screening.

Keywords: Blood Sugar, HbA1c, Serum Ferritin.

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Introduction

Diabetes mellitus (DM) is a major metabolic disorder and increase of Diabetic population worldwide is a major public health concern both in developing and developed countries. The metabolic syndrome is closely linked to insulin resistance and various studies indicate a link to iron overload. Increased serum ferritin, reflecting body iron overload, is often associated with measures of insulin resistance, such as elevated blood glucose and insulin levels [1].

People with type 2 diabetes mellitus develop characteristic micro vascular complications such as retinopathy, nephropathy and neuropathy. There is also increased risk of macro vascular complications such as cardiovascular, cerebrovascular and

peripheral vascular disease. The complications of diabetes mellitus are influenced not only by the duration of the diabetes mellitus but also by the average level of blood glucose along with glycated hemoglobin [2]. HbA1c is currently the investigation of choice in monitoring the treatment of diabetes mellitus [3]. Serum ferritin is an acute phase reactant and marker of iron stores in the body.

Ferritin regulates blood iron levels by releasing iron if the blood has a low iron concentration and it can help to store excess iron if the blood and tissues have a high iron concentration [4]. Elevated iron stores may induce diabetes through a variety of mechanisms, including oxidative damage to

pancreatic beta cells, impairment of hepatic insulin extraction by the liver, and interference with insulin's ability to suppress hepatic glucose production [5-7]. Elevated blood glucose and insulin levels are measures of insulin resistance which is often reflected body iron overload resulting to increased serum ferritin [8-9].

Material and Methods

This study was performed in 100 Diabetic Patients attending Diabetology OPD in Government Mohan kumaramangalam medical college and hospital and 5ml of venous blood sample will be collected and

analysed Blood sugar in fully automated chemistry analyser and HbA1c in D10 analyser and ferritin in chemiluminescent immunosorbant method.

The statistical analysis was performed using SPSS version 16.

Inclusion criteria: patient with diabetes mellitus

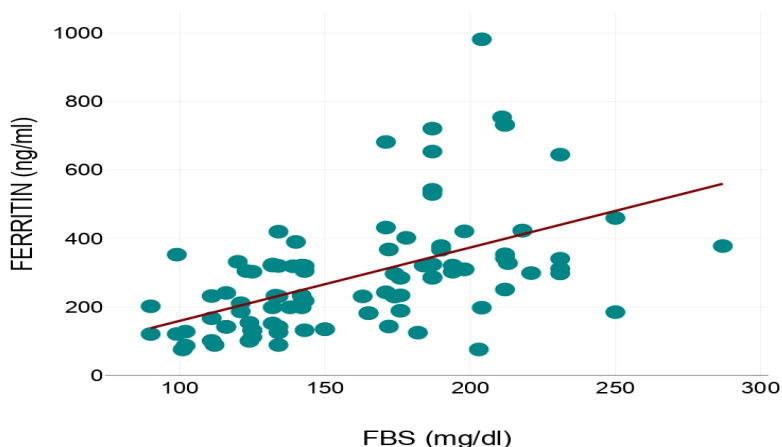
Exclusion criteria: diabetic patients with anemia, acute and chronic infections, CHF, leukemia, inflammatory disorders

Results

Table 1: Correlation of HbA1c, fasting and post prandial blood glucose with serum ferritin level

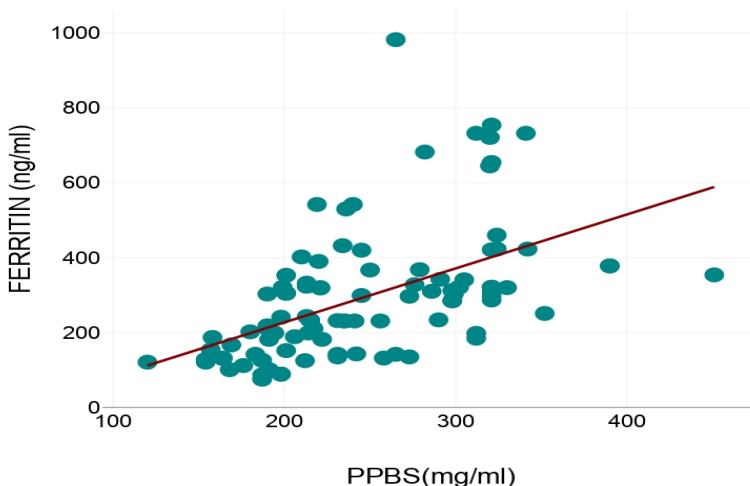
Finding	r value	P value
Correlation of HbA1c with serum ferritin level	0.4871	0.00001
Correlation of fasting blood glucose with serum ferritin level	0.4211	0.000013
Correlation of postprandial blood glucose with serum ferritin level	0.5014	0.00001

The P-Value is < .00001. The result is significant at p < .01.



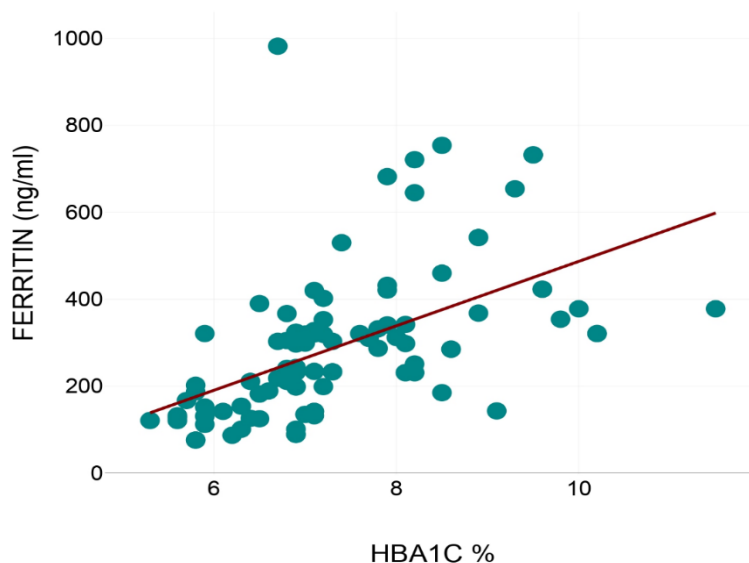
Graph 1: Correlation of fasting blood glucose level with serum ferritin

The correlation coefficient (r) between FBS and serum ferritin level is 0.4211 and this indicates that there is a moderate positive correlation between these two variables. The P value is 0.000013 which indicates that this correlation is statistically significant.



Graph 2: Correlation of postprandial blood glucose level with serum ferritin

The correlation coefficient (r) between PPBS and serum ferritin level is 0.5014 and this indicates that there is a moderately strong positive correlation between these two variables. The P value is 0.00001 which indicates that this correlation is statistically significant.



Graph 3: Correlation of PPBS with serum ferritin

The correlation coefficient (r) between HbA1C and serum ferritin level is 0.4871 and this indicates that there is a moderately positive correlation between these two variables. The P value is 0.00001 which indicates that this correlation is statistically significant.

Discussion

Increased ferritin levels are commonly due to multiple causes such as acute or chronic inflammation, alcohol consumption, liver disease, renal disease, malignancy and thyroid dysfunction while ferritin levels are decreased in iron deficiency, excess menstruation, conditions that affect intestinal absorption of iron and any internal bleeding [10].

Many studies has reveals the influences between iron metabolism and type 2 diabetes. The relationship is bi-directional; iron affects glucose metabolism, and glucose metabolism effects on several iron metabolic pathways. It is increasingly recognized that iron influences glucose metabolism, even in the absence of significant iron overload [11].

Increased iron stores may induce diabetes through a variety of mechanisms, including oxidative damage to pancreatic beta cells, impairment of hepatic insulin extraction by Liver, and interference with insulin's ability to suppress hepatic glucose production [12].

The relationship between elevated serum ferritin levels and type 2 diabetes involves an elevation in oxidative stress through the increased formation of

free radicals catalyzed by iron, which may lead to insulin resistance and hyperglycemia [13,14]. In our study Serum Ferritin had a positive correlation with FBS, PPBS and HbA1c. This reflected the link between serum ferritin and glycemic control, Cantur KZ et al [15]. Confirmed in their studies that uncontrolled diabetes patients had hyperferritinemia.

Similar findings were evident in a study done by Raj et al. (2013) in India. In diabetic subjects, a positive correlation between increased serum ferritin and poor glycaemia control, reflected by higher HbA1c, has been suggested by Eschwege et al [16].

Conclusion

In present study the serum ferritin level increased in patients with type 2 diabetes mellitus and there is Positive correlation between HbA1c and serum ferritin has also been found. Hyper ferritinemia may be one of the causes for development of insulin resistance. It indicates that in low resource setting serum ferritin can be used as a marker for glycemic control in diabetic patients it is cost effective compared to HbA1C screening.

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