

## Study of Serum Ferritin Levels in Type-2 Diabetes Mellitus

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### ABSTRACT

Diabetes Mellitus is a common endocrine disorder in world affecting 135 million in world. The study was carried out to examine the relationship between serum Ferritin and HbA1c. S. ferritin is a marker of iron overload and diabetes the study was conducted in 50 diabetes and 50 healthy volunteers attending in Balaji Medical College. S. Ferritin, Hemoglobin's, HbA1c and fasting blood sugar & PPBS were measured in blood samples. The results were analysed statistically by Chi-square test, t-test and Pearson regression coefficient test. The serum ferritin levels were significantly higher in diabetes than in control group. There was co-relation between serum ferritin and HbA1c in diabetic patients.

**Key words:** Diabetes mellitus, ferritin and HbA1c

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### INTRODUCTION

Diabetes mellitus is defined as a metabolic disorder due to complete or relative insulin deficiency characterized by chronic hyperglycaemia, disturbance of fat & protein metabolism. The insulin deficiency may either be due to defect in its secretion or action. Type 1 DM is insulin dependent & is mainly immune mediated. Type 2 DM is non -insulin dependent diabetes mellitus. Here the circulating insulin level is normal or slightly elevated or decreased, depending on the stage of the disease [1].

The global epidemic is mainly type 2 diabetes mellitus. Here the circulating level is normal or slightly elevated or decreased, depending on the stage of the disease. India leads the world with largest number of diabetic subjects earning the dubious distinction of being termed the Diabetes capital of the world. According to the Diabetes Atlas 2006 published by the International Diabetes Federation, the number of people with Diabetes in India currently around 40.9 million

is expected to rise to 69.9 million by 2025 [2,3].

Several studies have shown that there is increased oxidative stress in Diabetic patients with Iron overload [4]. Ferritin is an index of body iron stores & acts as an iron overload marker. Iron is a transition metal & a potential catalyst in cellular reaction that produces reactive oxygen species. More recently the results from prospective studies from Caucasian populations suggested that Iron overload could predict the development of Diabetes mellitus. Hence this study was done to determine the Ferritin levels in diabetic populations [5].

Diabetes Mellitus is a predominant public health concern, affecting millions of people worldwide. This is the most common endocrine disease. The disease causes substantial morbidity and mortality and long-term complications it is described as a group of metabolic disorders of multiple aetiology characterized by chronic hyperglycaemia associated with disturbances of carbohydrate, fat and protein metabolism due to absolute or relative deficiency of insulin secretion or action [6]. Diabetes mellitus is associated with significant long-term sequelae, particularly damage or dysfunction of various organs especially kidneys, eyes, nerves, heart, and blood vessels [7].

India has the largest number of diabetic patients in the world. India also has dubious distinction of being termed the 'diabetes capital of the world'. The prevalence of diabetes for all age-groups worldwide was estimated to be 2.8% in 2000 and to be 4.4% in 2030. The total number of people with diabetes mellitus is projected to rise from 171 million in 2000 to 366 million in 2030. In India, the total number of people with diabetes is projected to rise from 31.7 million in 2000 to 79.4 million in 2030. Among the diabetics, type 2 diabetes mellitus is most common [8,9]. Type 2 diabetes mellitus may range from predominantly insulin resistance with relative insulin deficiency to predominantly secretory defect with insulin resistance [10-13].

**MATERIALS AND ETHODS**

The material for the study will be collected from patients with type 2 diabetes & Healthy volunteers who fulfill the inclusion and exclusion criteria, attending the Medical OPD or getting admitted to Sree Balaji medical college and hospital, Chennai.

Sample size: A minimum of 50 cases.

50 controls. Duration of the study: 2 years.

**Sampling method**

Simple Random sampling.

**Inclusion criteria**

Fifty males and fifty females.

Age group between 35 -60 yrs.

All patients with type 2 diabetes mellitus without complications.

**Exclusion criteria**

Type 1 diabetes mellitus

Other states associated with altered serum ferritin levels like:

Chronic alcoholics.

Hepatitis.

Patients with repeated blood transfusions.

Iron deficiency anaemia.

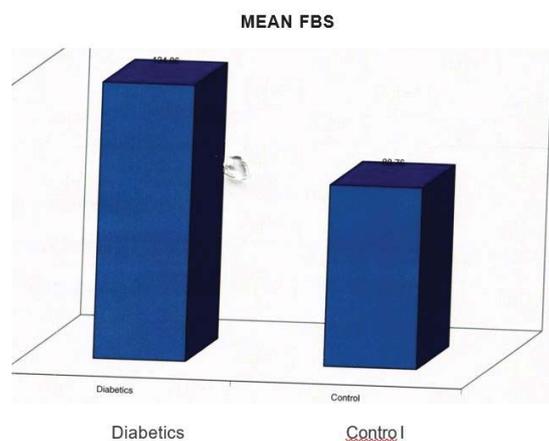
**RESULTS**

Statistical analysis was done with SPSS 15 software. Statistical tests used were "Descriptive. Chi-square test & students t- test." The mean HbA1c in diabetics is 6.846 he mean HbA1c in control is 5.384 Pearson correlation between ferritin & HbA1C is 0.34 Pearson correlation between ferritin & FBS is 0.412 Pearson correlation between ferritin & PPBS is 0.315 Pearson correlation between ferritin & HB is 0.165

The results shows that there was positive correlation between ferritin & HbA1C and ferritin & FBS. There was no correlation between HB and ferritin. There was not much significant difference of S.ferritin in either sex. he means PPBS in Diabetics is 12.30 The mean PPBS in control is 118.46 (Table 1 and Figures 1 to Figure 3).

**Table 1: Population study.**

Study population	Mean Hb (gms)	Mean Ferritin (ng / ml)	FBS (mg/dl)	PPBS (mg/dl)	Hb A1C (%)
Cases (50)	13.18	120.44	134.86	212.3	6.84
Control (50)	15	62.27	88.76	118.46	5.38



**Figure 1: The mean value of FBS in diabetics.**

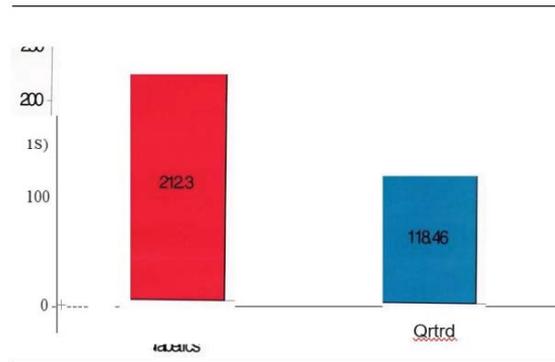


Figure 2: PPBS and diabetics.

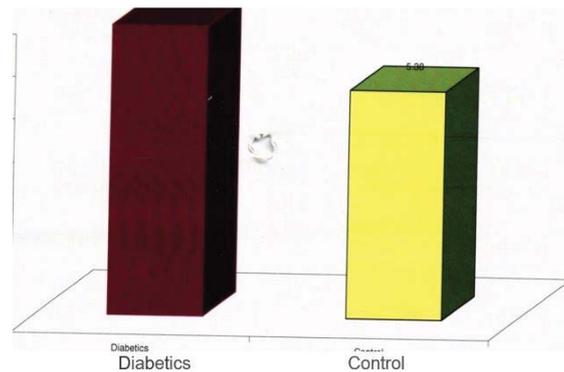


Figure 3: The mean HbA1c in diabetics.

## DISCUSSION

The relationship between HbA1C & type 2 Diabetes mellitus is controversial previously because the pathogenic mechanism remains obscure. This is a case control study investigating the relationship between HbA1c & Diabetes mellitus. Inflammation was suggested to regulate not only ferritin mRNA and protein levels but also its secretion [37]. As a result, elevated ferritin concentrations might reflect systemic inflammation in addition to elevated body iron stores [13]. Meanwhile, inflammation was postulated to be involved in the physiological mechanisms behind metabolic syndrome and diabetes.

Many studies have shown the relationship between Ferritin & Diabetes mellitus. A study conducted by Sharifi and Sazandeh in Iran shows that Mean serum ferritin was significantly higher in diabetics than in the control [14,15]. There was no correlation between serum ferritin and HbA1c in diabetic patients of either sex. 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. Have reported elaboration of Hydroxyl radical in iron overload which causes cell damage. This leads to insulin resistance - hyperinsulinemia initially followed by decrease secretion and diabetes. Deferoxamine, a chelating agent with antioxidant properties improves fasting blood glucose in chronically transfused patients of thalassemia major, thus it supports above hypothesis [5]. In the diabetic patients, a positive correlation between increased SF and poor glycemic control reflected by higher HbA1c, has been suggested by Eschwege et al. [16] According to a study by Bansal Pankaj, MD (Medicine), Associate Professor, Uttar Pradesh shows a significant association between serum ferritin levels and type II diabetes mellitus in a representative population. According to a study by Meral MERT-0 istanbul - Turkey Mean levels of serum ferritin were higher in the type 2 DM group than in the control group with Myocardial Infarction [17,18].

Positive associations between mildly increased serum ferritin concentrations and indexes of insulin resistance in both healthy subjects and patients with type 2 diabetes have been reported [11]. Elevated serum ferritin levels were associated with a greater than twofold

increased risk of development of type 2 diabetes in the Finnish population) [19,20]. A strong association between higher serum ferritin concentration and newly diagnosed type 2 diabetes was observed among a U.S. population as well [12]. Data from a large perspective nested case-control study in healthy women indicated a significantly increased risk of type 2 diabetes in women whose serum ferritin level was  $\geq 107$  ng/ml [21].

The relationship between Ferritin & Diabetes is controversial. Several studies have been done around the world. The present study was undertaken to understand the disease better. Serum ferritin, FBS, PPBS, HbA1C & Hb were measured [22,23]. The results obtained were subjected to statistical analysis. The results show that there was increase in Ferritin in Diabetics than in control. There was significant correlation between Ferritin & HbA1C. Hence further studies must be done to know the impact of Ferritin concentrations in Diabetics across India [24].

#### CONCLUSION

In conclusion, ferritin is higher in diabetics than in controls. There is correlation between serum ferritin and blood glucose control in diabetics. So, it seems that ferritin may have a role in the pathogenesis of type 2 DM. We propose that more studies need to be performed about the role of ferritin in gestational DM, and patients with impaired glucose tolerance, as cases with some degree of insulin resistance and in the pre diabetic stage.

Our results are consistent with previous research showing that elevated body iron stores confer a moderately increased risk of type 2 diabetes. This increased risk was explained by other metabolic alterations that comprise the insulin resistance-metabolic syndrome. Because of our study design, we cannot identify whether these findings reflect a causal role of elevated iron stores and plasma ferritin in diabetes risk that is mediated through elevated fasting glucose and other metabolic abnormalities, or whether elevated plasma ferritin is one more of the metabolic abnormalities appearing during diabetes development but not a causal factor for diabetes. Longitudinal studies with repeated measurements of glucose and iron metabolism parameters are needed to establish the causal

role of iron stores and plasma ferritin levels in diabetes development.

#### FUNDING

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#### ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

#### CONFLICT OF INTEREST

The authors declare no conflict of interest.

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