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Iron Homeostasis and Insulin Signaling.

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ABSTRACT

Free Iron as a Reactive Oxygen Species causes oxidative damage to the insulin signaling pathway and hence insulin resistance. So, in this context this study is aimed at finding out the meaningful association between serum iron and iron related parameters free iron, ferritin, hepcidin, TIBC and type 2 diabetes millitus. This study is to understand the influence of free iron on insulin metabolism. This is an Observational study. 50 known diabetic patients who were on regular follow up with moderate to severe diabetics were recruited. Out of 50 patients 34 patients had elevated serum ferritin and iron level. Hepcidin and TIBC levels were below the normal range. Iron is intimately related to oxidative stress. Iron through fenton reaction results in formation of toxic free radicals, which increases the efflux of iron from ferritin, results in beta cell dysfunction, affecting phosphorylation of insulin receptor proteins which increases the insulin resistance, results in increased glycation of transferrin, which decreases the ability of transferrin to bind with the ferrous iron and by this increase the serum level of free iron which stimulates increased ferritin synthesis. These studies clearly suggest that to periodically monitor iron status to have an optimum iron homeostasis to have good glycemic control.

Keywords: Iron parameters, diabetes mellitus

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INTRODUCTION

Free Iron as a Reactive Oxygen Species causes oxidative damage to the insulin signaling pathway and hence insulin resistance. So in this context this study is aimed at finding out the meaningful association between serum iron and iron related parameters free iron, ferritin, hepcidin, TIBC and type 2 diabetes mellitus.

Aims and Objectives

To understand the influence of free iron on insulin metabolism

MATERIALS AND METHOD

A total of 50 out patients from Sree Balaji Medical College & Hospital, Chennai were included in this prospective, observational study.

An informed consent, to participate in the study, was obtained from the patients, and the study protocol was approved by the local hospital ethical committee. We recruited 50 patients, who were on regular follow up for diabetic checkup.

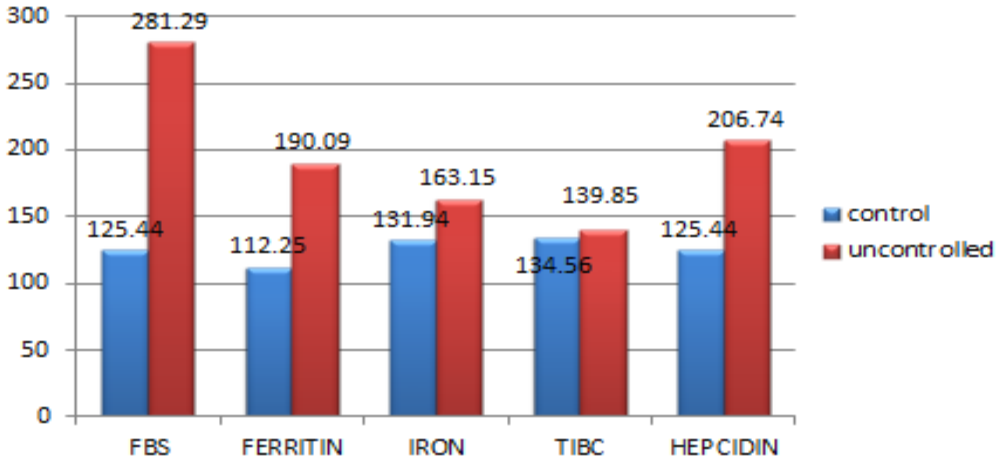
Patients with moderate to severe diabetics and controlled DM were recruited.

Iron parameters including iron, ferritin, hepcidin and TIBC were checked for all the 50 patients among which 34 patients were moderate to severe DM and 16 patients were controlled DM.

Biochemical measurements

- Ferritin by chemiluminescent immunoassay method [normal range 18- 270 ng/ml]
- TIBC- Ferrozine method [normal range 171- 504 mcg/dl]
- Iron-Ferrozine method [59- 158mcg/dl]
- Hepcidin – ELISA[8.2- 199.7ng/ml]
- FBS-GOD POD[70- 110 mf/dl]

STATISTICAL ANALYSIS



DISCUSSION

This study shows that the p value [<0.0001] is more significant for increased ferritin both in controlled and uncontrolled DM. p value is significant for iron, hepcidin and TIBC in uncontrolled DM.

Increased glycation of transferrin decreases the binding of ferrous iron [1-3]. Insulin translocate intracellular transferrin to the cell surface like GLUT4 [4-6]. Iron via fenton's reaction releases free radicals, which are capable of lipid peroxidation causing insulin resistance [7, 8].

Reactive oxygen species interfere with insulin signaling at various levels in the insulin receptor function and inhibits the translocation of GLUT4 in the plasma membrane. It is increasingly recognized that iron influences glucose metabolism, even in the absence of significant iron overload. Free iron exerts a positive feedback on ferritin synthesis, and oxidative stress increases the release of iron from ferritin [9, 10].

CONCLUSION

Several studies have been done around the world about the relationship between iron parameters & Diabetes. The results obtained were subjected to statistical analysis. The results show that there was a significant correlation between Serum Ferritin in both controlled and uncontrolled Diabetics. Iron overload and increased hepcidin is more significant in uncontrolled DM. Hence further studies with more number of populations must be done to understand the correlation better.

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