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Significance of High Serum Ferritin Level in Diabetes with Chronic Kidney Disease.

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ABSTRACT

To estimate the serum Ferritin level in Type 2 Diabetes mellitus and to determine the correlation between S.ferritin & HbA1C with chronic kidney disease. Parameters studied Hb , Ferritin, Fasting blood sugar and HbA1C. 50 outpatient Diabetic cases with chronic kidney disease from Sree Balaji Medical College & Hospital. 50 outpatient Non Diabetic cases with no renal disease from Sree Balaji Medical College & Hospital, duration 2 months, the relationship between Ferritin in Diabetes with chronic kidney disease 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. The results obtained were subjected to statistical analysis. The results show that there was increase in S.Ferritin in Diabetics with renal disease than in control. There was significant correlation between S.Ferritin & HbA1C.

Keywords: Type 2 DM, Serum Ferritin, HbA1C, Chronic kidney disease.

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INTRODUCTION

One of the major risk factors for development of CKD is diabetes. In patients with chronic kidney disease serum ferritin is a less robust marker of bioavailable iron, Hyperferritinemia is a misleading marker of iron stores in such patients. The persistent inflammatory state is common in diabetes and chronic kidney disease (CKD). Inflammation was the probable cause of increased ferritin level in about one-third of CKD patients. Anemia is common among those with diabetes and CKD and greatly contributes to patient outcomes.

Diabetes is the leading cause of chronic kidney disease (CKD) and is associated with excessive cardiovascular morbidity and mortality. Anemia is common among those with diabetes and CKD and greatly contributes to patient outcomes. Functional iron deficiency anemia is adequate tissue iron defined as a serum ferritin level ≥100 ng/ml and a reduction in iron saturation. It is more common and is strongly associated with upregulation of inflammatory cytokines and impaired tissue responsiveness to erythropoietin, which can inhibit iron transport from tissue stores to erythroblasts [1-5].

MATERIALS AND METHODS

Study population: A total of 100 out patients from Sree Balaji Medical College & Hospital, Chennai were included in this prospective, observational study. The patients were divided into two groups for comparison: Group 1-Diabetic with known chronic kidney disease patients and Group 2 – non Diabetic with no renal disease. An informed consent, to participate in the study, were obtained from the patients,and the study protocol was approved by the local hospital ethical committee.

Biochemical measurements: Hb,Ferritin,Fasting blood sugar and HbA1C**.** Blood sugar is measured by GOD/POD Enzymatic photometric method.Estimation of HbA1C by Ion exchange chromatography.Ferritin by chemiluminescent immunoassay method **.**Hb by three part analyser machine.

Normal ranges

Blood sugar-Serum/plasma Fasting 70- 110mg/Dl

Serum Ferritin- Men 18-270 nanograms per milliliter (ng/mL)
Women 18-160 ng/mL

Hemoglobin A1c levels- Non-diabetics 4% - 5.9%
Diabetics 6.5%
Diabetics at higher risk 7.5%
Hemoglobin- Male: 13.8 to 17.2 grams per deciliter (g/dL)
Female: 12.1 to 15.1 g/dL

RESULTS

Statistical analysis was done with SPSS 15 software. Statistical tests used were “Descriptives. Chi-square test & students t- test.”

STUDY POPULATION	MEAN AGE	MEAN HB	MEAN FERRITIN	FBS	HbA1C
CASES (50)	48.42	14.8	128.24	143.86	6.44
CONTROL (50)	47.48	13	60.37	84.16	5.28

DISCUSSION

This study shows the significance of serum ferritin level as an early predictor of type 2 diabetes mellitus with chronic kidney disease and its relationship with HbA1c[6].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,ferritin& Diabetes mellitus [7] with chronic kidney disease.The persistent inflammatory state is common in diabetes and chronic kidney disease (CKD) [7].

Diabetes is the leading cause of chronic kidney disease (CKD) and is associated with excessive cardiovascular morbidity and mortality [8]. Anemia is common among those with diabetes and CKD and greatly contributes to patient outcomes [9,10]. Functional iron deficiency anemia is adequate tissue iron defined as a serum ferritin level ≥100 ng/ml and a reduction in iron saturation. The latter is more common and is strongly associated with upregulation of inflammatory cytokines and impaired tissue responsiveness to erythropoietin, which can inhibit iron transport from tissue stores to erythroblasts [11]. Increased levels of inflammatory cytokines such as interleukin-6 enhance production and secretion of hepcidin, a hepatic protein that inhibits intestinal iron absorption and impairs iron transport from the reticuloendothelial system to bone marrow. In addition, erythropoietin, which normally enhances iron transport from macrophages to the blood stream, is impaired, thereby exacerbating relative iron deficiency [12].

Serum ferritin is widely recognized as an acute phase reactant and marker of acute and chronic inflammation, and is nonspecifically elevated in a wide range of inflammatory conditions,including chronic kidney disease [13], rheumatoid arthritis and other autoimmune disorders [14], acute infection, and malignancy. The elevated ferritin in these states reflects increased total body iron storage, but paradoxically, these stores are sequestered and not available for hematopoiesis, a process which contributes to the widely recognized anemia of inflammation [15]. This relative iron deficiency in inflammation and malignancy is presumed to have developed as a defense mechanism to restrict serum iron from utilization by pathogens and tumors [16,17]. Possible causes of this erythropoietin hyporesponsiveness include systemic inflammation and microvascular damage in the bone marrow [17]. However, some studies suggest that other factors (i.e., autonomic failure) may play a role in impaired erythropoietin production or secretion by failing kidneys [3,4].

In general, kidney disease in diabetes is progressive, and it has been hypothesized that anemia may contribute to progression of kidney disease [13,14]. Possible mechanisms include renal ischemia caused by reduced oxygen delivery.

The most common causes of CKD are diabetes mellitus, hypertension, and glomerulonephritis. Hyperferritinemia is commonly found in patients with chronic kidney disease regardless of their hemoglobin level, and is often considered to be related to chronic inflammatory status or neoplasias.Poorly controlled patients of DM have hyperferritinemia which co-relates with diabetic retinopathy, diabetic nephropathy and vascular dysfunction [15].

In patients with increased Serum ferritin, glycemic control is poor and there is vascular damage. Insulin resistance has been documented by Ralpha & Fronzo[7] in such patients. In our study significant correlation was found between increased Serum ferritin and diabetic nephropathy in accordance to above findings [15-17].

CONCLUSION

The relationship between Ferritin in Diabetes with renal disease 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. The results obtained were subjected to statistical analysis. The results show that there was increase in S.Ferritin in Diabetics with renal disease than in control. There was significant correlation between S.Ferritin & HbA1C.Thus persistent hyperglycemia and increased serum ferritin appears to be the primary factor in the pathogenesis of nephropathy, and tells the significance of serum ferritin level as an early predictor of type 2 diabetes mellitus with renal disease.

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