Advances in Bioresearch
Adv. Biores., Vol 13 (3) May 2022: 227-230
©2022 Society of Education, India
Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL:http://www.soeagra.com/abr.html
CODEN: ABRDC3
DOI: 10.15515/abr.0976-4585.13.3.227230

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ORIGINAL ARTICLE

Measurement of Serum Ferritins in Diabetes Mellitus

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ABSTRACT
A prevalent endocrine illness affecting 135 million people worldwide is diabetes mellitus. The goal of the study was to determine how serum Ferritin and HbAlc interacted. A marker for iron excess and diabetes is ferritin. 50 volunteers with diabetes and 50 healthy volunteers participated in the study at the Sri Lakshmi Narayana Institute of Medical Sciences. Blood samples were analyzed for ferritin, hemoglobins, HbAlc, fasting blood sugar, and PPBS. The Chi-square test, t-test, and Pearson regression coefficient test were used to statistically assess the data. Diabetes patients had considerably greater serum ferritin levels than those in the control group. In diabetic patients, serum ferritin and HbA1c were correlated.
Key words: Diabetes mellitus, ferritin and HbAlc.

Received 11.04.2022 Revised 21.04.2022 Accepted 27.05.2022

How to cite this article:
Sudharani Michael, G. Jayalakshmi. Measurement of Serum Ferritins in Diabetes Mellitus. Adv. Biores. Vol 13 [3] May 2022. 227-230

INTRODUCTION

Diabetes mellitus is a metabolic condition caused by whole or partial insulin insufficiency that is characterised by persistent hyperglycemia and disturbances in the metabolism of fat and protein. The lack of insulin may result from a problem with its action or secretion. Type 1 diabetes is mostly immune-mediated and insulin-dependent [1]. Non-insulin dependent diabetes mellitus (type 2 DM) Depending on the disease's stage, the level of circulating insulin is normal, slightly increased, or lowered [2]. Type 2 diabetes is primarily the epidemic worldwide. Depending on the disease's stage, the circulating amount in this case is either normal, slightly increased, or lowered. India has the highest percentage of diabetes patients worldwide, garnering the unfortunate title of "Diabetes Capital of the World." The International Diabetes Federation's 2006 Diabetes Atlas states that by 2025, the country of India's 40.9 million estimated diabetics will have increased to 69.9 million [3].

Numerous investigations have demonstrated that diabetic individuals with iron excess have elevated oxidative stress [4]. Iron is a transition metal and a potential catalyst in cellular reactions that create reactive oxygen species. Ferritin is a measure of body iron storage and serves as a flag for iron excess [5]. More recently, it was proposed by the findings of prospective studies conducted on Caucasian populations that iron excess could be a predictor of the onset of diabetes [6]. Thus, this study was conducted to ascertain the ferritin levels in populations of diabetics.

MATERIAL AND METHODS

SOURCE OF DATA:

Patients with type 2 diabetes and healthy volunteers who meet the inclusion and exclusion criteria and visit the medical OPD or enroll in classes at Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry, will provide the study's subject matter.

Sample size: A minimum of 50 cases & 50 controls.

Duration of the study: 2 years

METHOD OF COLLECTION OF DATA

Sampling Method:

Simple Random sampling

Inclusion Criteria:

Fifty males & fifty females. Age group between 35 -60 yrs.

All patients with type 2 diabetes mellitus without complications:

Exclusion Criteria:

1) Type 1 diabetes mellitus
2) Other states associated with altered serum ferritin levels like:

a. Chronic alcoholics
b. Hepatitis
c. Patients with repeated blood transfusions
d. Iron deficiency anaemia

ASSAY OF FERRITIN

PARTICLE ENHANCED TURBIDEMETRICALLY - IMMUNOASSAY

PRINCIPLE

The ferritin test relies on interactions between ferritin in the sample and covalently bound ferritin-targeting antibodies in latex. Turbidimetric analysis with fixed time is used to calculate ferritin levels. Turbidimetric analysis is used to calculate ferritin levels utilizing fixed time measurement with sample blank adjustment. Because of the correlation between concentration and absorbance, a multipoint calibration is possible with a measurement range of between O and 500 ng/mL. 37 degrees Celsius is being measured. The test may be carried out on many devices that enable turbidetric readings between 500 and 600 nm.

REAGENTS

Each ferritin kit contains

A-Buffer -25mL of phosphate buffer, pH: 6.7 containing protein stabilizers & 0.09% sodium azide as preservative

B- Latex reagent- 7.SmL of a suspension of latex microparticles covalently bound & anti -ferritin antibodies suspended in a neutral aqueous solution with0, 09% sodium azide as preservative.

Storage & stability

When not in use, the ferritin reagents should be kept well covered at +2 to +8 degrees Celsius.

Specimens

Human blood samples that are as fresh as feasible (stored for up to 7 days at l - 8' Celsius or deep frozen) are suitable test specimens. Centrifugation should be used to eliminate any further clotting or precipitation that develops as a result of the freeze-thaw cycle before testing. Before the test, very lipemic samples or turbid frozen samples that have been thawed must be cleared by high-speed centrifugation (lSmin at about 15,000rpm).

Calculations

6Asample-6Blank/6A Standard concentration = mg/dl of creatinine in sample, Standard-6Blank*2. Calculation formula: mg/dL*88.4mol/L. The Cyanmeth haemoglobin technique was used to quantify haemoglobin. To rule out inflammation, creatinine was assessed using Jaffe's technique and the ESR. Iron deficiency anaemia was ruled out using a peripheral smear.

RESULTS

It is debatable if ferritin and diabetes are related. Around the world, several research have been conducted. The goal of the current study was to better understand the illness. Measurements included serum ferritin, PBS, PPBS, HbAlC, and Hb. The collected findings were statistically analysed. The findings indicate that ferritin levels were higher in diabetics than in controls. The relationship between ferritin and HbAIC was highly significant. Therefore, further research must be conducted to understand the effect of ferritin concentrations in diabetics across India (Table 1). Software called SPSS 15 was used for the statistical analysis. Statistical tests used were "Descriptive. Students' t-tests and the chi-square test."

Table 1. The level of various parameters in diabetes patients

Study Population	Mean Hb (gms)	Mean Ferritin (ng/ml)	FBS (mg/di)	PPBS (mg/di)	HbA1C (%)
Cases (50)	13.18	120.44	134.86	212.3	6.84
Control (50)	15	62.27	88.76	118.46	5.38

There is a 0.34 Pearson association between ferritin and HbA1C. There is a 0.412 Pearson connection between ferritin and FBS. Ferritin and PPBS have a Pearson correlation of 0.315. The ferritin and haemoglobin Pearson correlation is 0.165. The findings demonstrate a favourable connection between ferritin and both HbAlC and FBS. The levels of HB and ferritin did not correlate. Ferritin did not significantly differ between the sexes.

DISCUSSION

Because the pathogenic mechanism is yet unknown, the association between HbA1C & type 2 Diabetes mellitus has previously generated controversy [7, 8]. This case-control research [9, 10] examines the connection between HbAlC and diabetes mellitus. Ferritin mRNA and protein levels as well as its release may be regulated by inflammation [11–14]. Therefore, in addition to increased bodily iron reserves, raised ferritin concentrations may also indicate systemic inflammation [15–18]. In the meanwhile, it was hypothesised that inflammation had a role in the physiopathological processes underlying diabetes and the metabolic syndrome [19, 20]. The link between ferritin and diabetes mellitus has been demonstrated in several investigations.

The mean blood ferritin level was considerably greater in diabetics than in the control group, according to a research by Sharifi and Sazandeh in Iran [21]. Serum ferritin and HbA1c in diabetes individuals of either sex did not correlate. Deferroxamine, a chelating drug with antioxidant characteristics, lowers fasting blood glucose levels in thalassemia major patients who receive continuous transfusions, supporting the aforementioned concept [22]. Positive correlations between modestly elevated blood ferritin concentrations and insulin resistance indices have been seen in both healthy individuals and those with type 2 diabetes [23]. In the Finnish population, elevated blood ferritin levels were linked to a more than twofold higher risk of developing type 2 diabetes [24]. A U.S. population also showed a significant correlation between greater blood ferritin levels and newly identified type 2 diabetes [25]. Women whose serum ferritin level was greater than or equal to _l07 ng/ml had a considerably higher risk of developing type 2 diabetes, according to data from a sizable prospective nested case-control study in healthy women.

CONCLUSION

In summary, diabetics have greater ferritin levels than healthy individuals. Serum ferritin and diabetics' ability to manage their blood glucose are related. Ferritin may thus play a part in the aetiology of type 2 diabetes, it would appear. The involvement of ferritin in gestational DM, patients with impaired glucose tolerance, instances with some degree of insulin resistance, and cases in the pre-diabetic stage warrants further investigation, according to our proposal. Our findings support earlier research that indicates a slightly greater risk of type 2 diabetes is associated with elevated body iron reserves. The additional metabolic changes that make up the insulin resistance-metabolic syndrome provided an explanation for this higher risk. Because of the way our study was set up, we are unable to determine whether these results show that elevated iron stores and plasma ferritin play a causal role in diabetes risk that is mediated by elevated fasting glucose and other metabolic abnormalities, or whether elevated plasma ferritin is merely one of the metabolic abnormalities that develop as diabetes progresses but is not a cause of it. To determine whether iron reserves and plasma ferritin levels have a causative role in the development of diabetes, longitudinal studies with repeated measurements of glucose and iron metabolism markers are required.

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