Original Article

THE COMPARISON OF SERUM FERRITIN CONCENTRATION BETWEEN HEALTHY PEOPLE WITH AND WITHOUT HISTORY OF FAMILY DIABETES

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ABSTRACT

Objectives: This study aims to compare serum ferritin of the first degree relatives of diabetic patients with the control group.

Methodology: This is a case control study. Thirty five adults in each group of case and control group were chosen by random technique. For each individual a questionnaire was completed and serum ferritin and fasting blood sugar concentration of the subjects were measured. Parametric and non parametric tests were used for comparing groups were appropriate.

Results: About 74.2% of subjects were female and 25.8% were males in each group. Mean frittin concentration in case group was higher than this mean among respondents in control group (63± 58.73ng/dl versus 58.07± 54.57ng/dl). The fasting blood sugar concentration in the case group was also higher than the control group (100.6± 37.38mg/dl versus 95.9± 17.02mg/dl). However these differences were not significant between the two groups. There was a significant correlation between the ferritin concentration and fasting sugar in case group.

Conclusion: Although there wasn't a significant difference in mean ferritin concentration between the two groups, the higher ferritin concentration among respondents in the case group comparing to it's concentration among respondents in control group is very important. More investigation of this type recruiting larger groups as case and control is suggested.

KEY WORDS: Diabetic Patients, Relatives, Serum Ferritin.

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INTRODUCTION

In the recent years it has been reported that iron overload can result in damage to liver, heart, endocrine organs and skeletal muscles system. The storage of Iron in pancreas has been known to cause secondary diabetes.[1] Recent experimental and epidemiologic studies have also shown a clear biologic association between iron metabolism and diabetes.[2] This association is more concerned with serum ferritin. Ferritin concentration is related to body iron stores and is influenced by several diseases.[3] Iron storage could also increase the resistance to insulin and lead to the development of type II diabetes.[4] The prevalence of glucose intolerance is also reported to be twice of type II diabetes. Studies have indicated that long term glucose intolerance might lead to hyper insulinaemia and hyper glycaemia and they will cause side effects such as obesity, hypertension, hyper lipidemia and arthrosclerosis.[5] Although glucose intolerance might be a short term phenomenon, but the development of diabetes in these patients is not unusual. Glucose

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intolerance in the elderly, obese and people with history of diabetes is more prevalent.[6] Not only glucose intolerance and hyperglycemia can react with protein and nucleic acids but also its products can decrease inflexibility and action of tissue product. Also disorder in insulin-glucose metabolism will increase free radicals. Increase of free radicals in the body lead to tissues damage and the development of the process involved in the free radicals such as diabetes, cardiovascular disease, cataract, inflammation disease and the aging process.[6] Therefore established free radicals can promote diabetes & other non communicable diseases.[6]

Although free radicals are produced naturally in the body, but the over increase is due to the oxidizing material in the blood. One of the oxidation material is iron overload thus this factor accelerates promotion of Coronary Heart Diseases (CHD).[7] Recently the iron role in the health and mutation of genes has also been evaluated.[8] Also it has been reported that the iron overload increases the risk of diabetes.[9] Researchers in a retrospective study showed that iron overload (by measuring feritin) could increase risk of diabetes mellitus by three times. Transferin receptor to feritin ratio increased risk of diabetes to 2.5 times.[9] In another study frittin concentration in diabetic patients were higher than this concentration among the healthy people, although the rate of transferin receptors showed no significant difference. This study suggested that the increased serum ferritin without a change in transfer in receptors is as a result of inflammatory problem rather than iron overload.[10]

Juka et al reported that there was a correlation between iron storage and diabetes. This theory was supported as iron storage even in large amounts does not lead to haemochromatosis and can increase the development of type II diabetes.[11]

Although metabolic disorder is reported among diabetic patients, it is not known that metabolic disorder lead to diabetes or vice versa. The results of a previous study indicated that iron load increases in offspring of patients with type 2 diabetec mellitus without any effects on glucose tolerance. Moreover ferritin concentration was related to insulin resistant which might accelerate the insensitivity to hepatic insulin.[12] Conte & etal also studied the prevalence of haemochromatosis between diabetic and control group. One point thirty four percent of diabetic patients and just 0.2% of the healthy group had haemochromatosis. Authors concluded that haemochromatosis is not diagnosed in diabetic patients but it is an indicator of the disease, and screening of patients is needed for the determination of iron storage level because haemochromatosis is associated with diabetes.[13] Measuring serum ferritin concentration and transferrin receptor as a screening test, is very important for the diagnosis of high risk people.[9] Although some studies have suggested that serum ferritin concentration is positively correlated with type 2 DM but Eshed, et al reported that iron overload is not a typical feature of DM.[14]

In this study we compared serum ferritin (iron storage) concentration between the two groups of diabetic patients, relatives and healthy people who had not any diabetic patients in their family.

METHODOLOGY

In this case-control study 35 diabetic patients files in Ali Ibn Abitaleb hospital in Rafsanjan were selected randomly from the list of diabetic patients. By referring to their home or on phone one of the relatives who were willing to participate were invited to help with data collection process. The sample size for each group was calculated based on the data reported for the mean level of serum ferritin among healthy people .Healthy people aged between 20 and 50 years were recruited in two different groups: a) diabetic patients relatives as cases and b) apparently healthy people with no diabetic relatives as controls. Subjects who had cardio vascular, cancer, diabetes, liver, inflammatory diseases and or were pregnant and for lactation women and or were younger than 20 or older than 50 years were excluded from study.

The control group was matched with the case group by age, gender, and iron consumption.

A consent form was taken from respondents after they received full description about the objective and methods of study. The questionnaire was completed for each subject and 3-5ml fasting blood was taken from them. After sample centrifuging the serum was separated and some of the serum was frozen _18oc for measuring the ferritin concentration. The serum ferritin and FBS were measured by Eliza test and Pars Azmoon kit respectively.

The data were analyzed using SPSS (V 12), parametric and non parametric tests were used where appropriate.

RESULTS

Data for eight respondents (five in control and three in case groups) was missing. The data for the remaining (30 control & 32 case) was analyzed.

In this study, 74.2% and 25.8% of subjects were female and male respectively and there was no sex ratio difference between the two groups of case and control. About one third of all respondents (32.3%) had diploma as their educational qualification and proportion of respondents based on this factor in two groups were not significantly different. In both groups, the proportion of respondents based on jobs and the place of living were similar. Information about some characteristics of respondents in two groups is presented in Table-I. Except in case of consuming grains (P<0.05), no significant difference was observed between two groups based on variables listed in Table-I. Mean serum ferrittin concentration and FBS in case and control are groups presented in Table-II. Both ferrittin concentration and FBS level in case group were higher than these amounts in control group (63± 58.73ng/dl versus 58.07± 54.57ng/dl), (100.6± 37.38mg/dl versus 95.9±17.02 mg/dl). Interestingly only in case group there was a significant correlation between Ferritin and fasting blood sugar (r=0.503, df=30, P<0,05) in different groups of respondents based on education, job and living place (city or village) ferritin concentration was not significantly different between the two groups Overall the mean serum ferritin concentration was greater in men than the women significantly (P <0.0001) (116.51 ±68.93ng/dl versus 41.17± 34.96ng/dl).

Table-I: Mean and standard division of some variables in case and control group

Variable	*Case (32 n) X±SD*	*Control (30n) X±SD*
Age (year)	30.75 ± 8.25	33.93± 9.22
Weight (Kg)	69.4 ± 11.1	66.7±11.7
Height (Cm)	161.4 ±7.2	161.8 ±6.4
Meat consumption	2.9±1.45	2.6 ±1.2
Fish consumption	2.34 ±1.03	2.37 ±1.06
Egg consumption	1.6 ±1.07	1.3 ±1.5
Legume consumption	2.6 ±0.93	2.03 ±1.24*

* P<0.05 t test

DISCUSSION

The results of the survey showed that serum ferritin (SF) and Fasting blood sugar (FBS) concentration in case group are higher than control group. There was a significant correlation between SF and FBS in case group but this correlation was not showed in the control group. Ferritin has been known as an index for body iron stores and also an inflammatory marker and is influenced by several disease.[3,15] In some epidemiological studies SF was the second strongest determinant of blood glucose (after BMI).[16] In regression models and the third strongest determinant of blood glucose (after BMI, age).[17] The probable correlation between ferritin and diabetes mellitus (DM) was considered first in 1993 by Kay et al.[17] The serum ferritin concentration has been reported to predict the incidence of type 2 diabetes.[4] Too much iron storage might increase the resistance to insulin and lead to the development of type II diabetes although there has not been

Table-II: Comparison of mean serum ferritin and FBS concentration between diabetic patients relatives and healthy people

Variables	*Case (32n) X±SD*	*Control (30n) X±SD*
FBS (mg/dl)	100.6 ± 37.4	95/9 ±17
Ferritin (ng / dl)	63 ± 58.7	58.1 ±54.6

a consensus about the real mechanism of this process.[4]

But there are different theories regarding the role of ferritin in DM. Pancreatic damage due to some degree of sub clinical haemochromatosis has been showed in some cases of diabetes.[13] Other authors has detected ferritin just as a marker of pancreatic inflammation and some have referred to it as marker for insulin resistance.[10,18] Tomoyuki, et al reported "serum ferritin concentration may be an indicator of systemic fat content and degree of insulin resistance"[19]

Recently some studies have investigated the effect chaletor such as desferal on the control of DM in thalassaemic patients.[20] Surfing on internet we found only one study similar to our study. In that study 41 children with family history of diabetes were compared with 49 children of healthy people.[12] In this study ferritin level in the experimental group was higher than the control group. The results of our study is similar to this survey.

Some surveys have compared serum ferritin in diabetic patients and healthy people. Results of these studies showed that haemochromatosis and serum ferritin were higher in diabetic patients than healthy subjects.[10,11,13,15,20] There are a few reports suggesting that subtle disturbances of iron metabolism are frequently found in patients with type 2 diabetes (DM2), but it is not known that these disturbances precede or accompany the diabeties mellitus.[12] Also in a study, the ferritin level in newly diagnosed diabetic patients were higher than diagnosed before or poor controlled patients. Researchers claimed that hyper ferritinemia is created during the of disease incidence (or appears) transiently.[21]

In conclusion, this survey confirmed that serum ferritin was higher in at high risk people for diabetes mellitus (relatives of diabetic patients). Therefore serum ferritin is a simple index and cost effective test for screening high risk people. More similar investigation as our survey among larger groups as case and control is suggested to confirm the efficacy of this screening test.

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