



IRON DEFICIENCY IN PATIENTS WITH DIABETES: CORRELATION BETWEEN SOLUBLE TRANSFERRIN RECEPTOR, FERRITIN AND SOLUBLE TRANSFERRIN RECEPTOR-FERRITIN INDEX

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ABSTRACT

The purpose of the present study is to compare parameters of iron homeostasis by evaluating the significance of the ratio sTfR/log ferritin (sTfR-ferritin index) in patients with diabetes. The patients' blood samples were taken from the University Hospital of Medical University – Plovdiv. The serum levels of sTfR (soluble transferrin receptor) and ferritin were analyzed with commercially available ELISA kits. The results obtained show a negative correlation between ferritin and sTfR ($r = -0.228$, $p = 0.043$), ferritin and sTfR-ferritin index ($r = -0.402$, $p < 0.0001$) and positive correlation between sTfR and sTfR-ferritin index ($r = 0.722$, $p < 0.0001$) in the patients with diabetes. The same parameters are investigated separating the patients according to the CRP level. In the group with increased CRP there is a negative correlation between ferritin and sTfR-ferritin index ($r = -0.847$, $p < 0.0001$). In the group with normal CRP there is a negative correlation between ferritin and sTfR ($r = -0.310$, $p = 0.03$) and a positive correlation between sTfR and sTfR-ferritin index ($r = 0.693$, $p < 0.001$). The sTfR-ferritin index showed a high correlation with ferritin in the group with increased CRP and vice versa, a high correlation with sTfR in the group with normal CRP. The parallel determination of ferritin / sTfR-ferritin index and sTfR / sTfR-ferritin index for diabetes according to CRP would allow to develop additional criteria for the evaluation of iron homeostasis in diabetes.

Key words: sTfR, ferritin, sTfR/log ferritin, diabetes, CRP

INTRODUCTION

Iron plays a significant role in the development of diabetes and its complications.

Inflammation is now believed to play a major role in the etiopathogenesis of type 2 diabetes. As ferritin levels increase in inflammatory conditions, the high serum ferritin levels that have been reported in of type 2 diabetes patients could be due to the underlying inflammatory process in addition to probable increase of iron stores (1, 2, 3, 4).

The concentration of the soluble fragment of transferrin receptor in serum, is an important

new haematological parameter. The ratio of sTfR to log SF is known as sTfR-SF index (5).

sTfR is a biochemical parameter used for the detection of iron deficiency in situations where ferritin has limited diagnostic value owing to the present chronic disease (6).

The synthesis of TfR and the iron storage protein ferritin is regulated reciprocally at the posttranscriptional level according to the cellular iron status (7).

A major advantage of TfR measurements over serum ferritin is the apparent specificity of the biological response to changes in iron status and erythropoiesis (8).

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Calculation of the ratio TfR/log ferritin (TfR-F Index) is a way of combining TfR and ferritin results. This ratio provided an outstanding parameter for the identification of patients with depleted iron stores (8).

The purpose of the present study was to investigate the informative value of sTfR-ferritin index in diabetes by searching correlations with the accepted parameters of iron homeostasis in association with presence or absence of inflammatory process.

METHODS

The study involved 81 patients with diabetes from the Clinic of Endocrinology, Medical University-Plovdiv and 41 healthy controls. The mean age of the patients was 58.6 ± 14.7 years and the mean duration of diabetes was 12.8 ± 9.6 years.

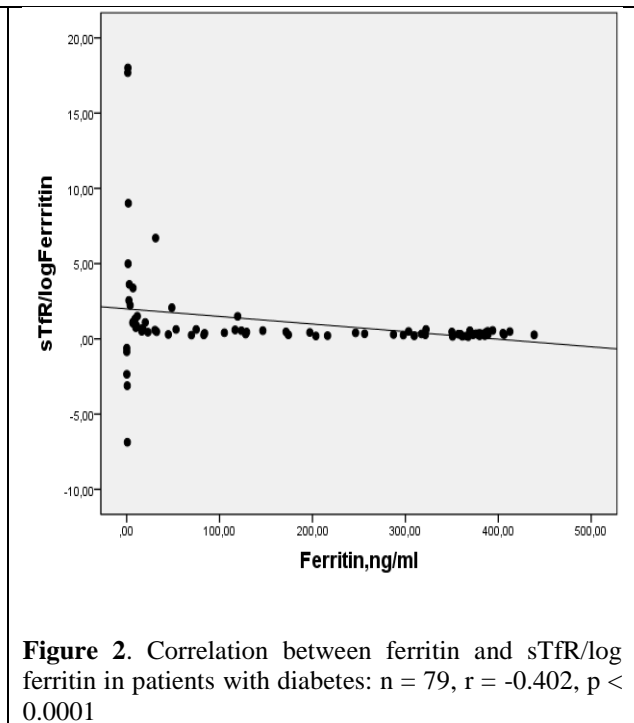
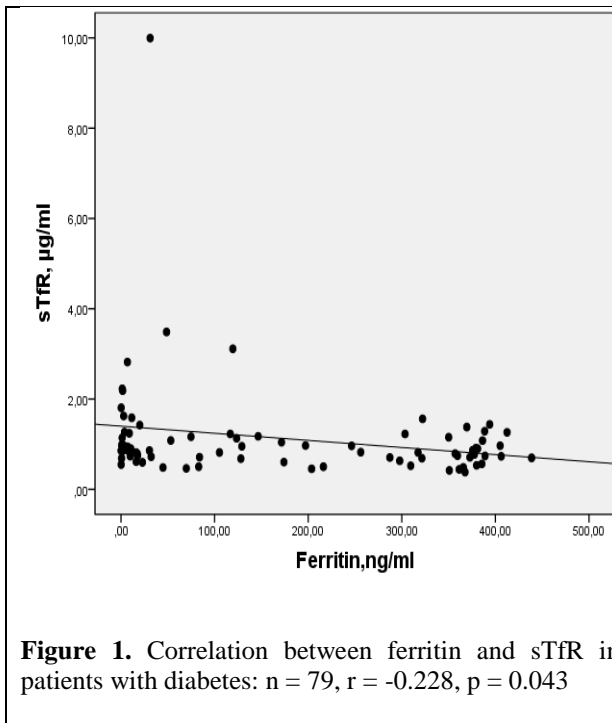
The parameters of iron homeostasis s TfR and serum ferritin were determined with ELISA kits (Bio Vendor Research and Diagnostic Products, Czech Republic, Minias Globe Diagnostics Srl, Italy). Statistical analysis was performed using SPSS version 17. The data were tested for normality using Kolmogorov-Smirnov test. Spearman correlation coefficient (r) was calculated to determine the correlations between

the variables (sTfR, ferritin and sTfR-ferritin index). Values of $p < 0.05$ were considered to be statistically significant.

RESULTS

We investigated the association between sTfR, ferritin and sTfR-ferritin index in diabetic patients. As shown on **Figure 1** there is a negative correlation between serum ferritin and sTfR ($r = -0.228, p = 0.043$). sTfR also correlates with sTfR-ferritin index ($r = 0.722, p < 0.0001$) (Fig.3). We found also a negative correlation between serum ferritin and sTfR-ferritin index ($r = -0.402, p < 0.0001$) (**Figure 2**).

The same parameters are investigated separating the patients according to the CRP level. In the group with increased CRP there is a negative correlation between ferritin and sTfR-ferritin index ($r = -0.847, p < 0.0001$) (**Figure 4**). In the group with normal CRP there is a negative correlation between ferritin and sTfR ($r = -0.310, p = 0.03$) (**Figure 5**) and a positive correlation between sTfR and sTfR-ferritin index ($r = 0.693, p < 0.001$) (**Figure 6**). The sTfR-ferritin Index showed a high correlation with ferritin in the group with increased CRP and vice versa, a high correlation with sTfR in the group with normal CRP.



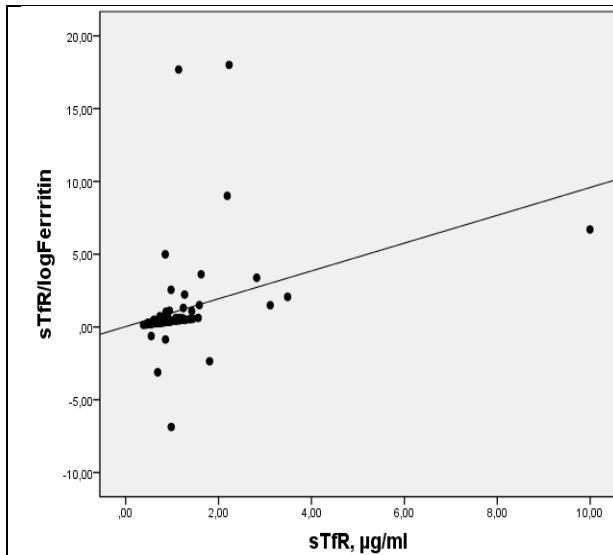


Figure 3. Correlation between sTfR and sTfR/log ferritin in patients with diabetes: n = 79, r = 0.722, p < 0.0001

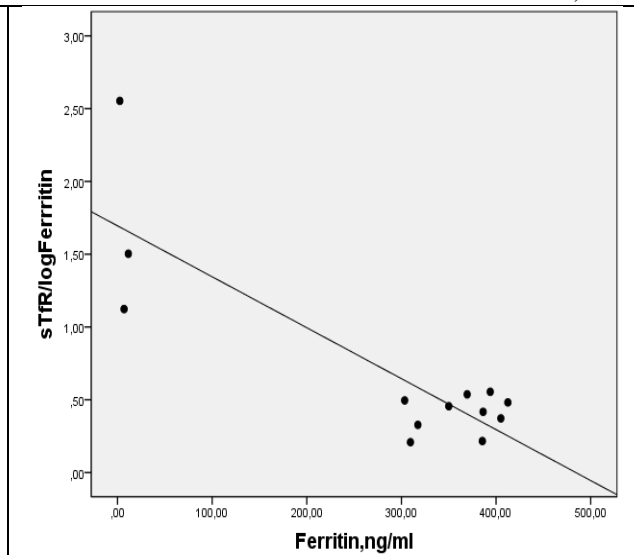


Figure 4. Correlation between ferritin and sTfR/log ferritin in patients with diabetes with increased CRP: n = 13, r = -0.847, p < 0.0001

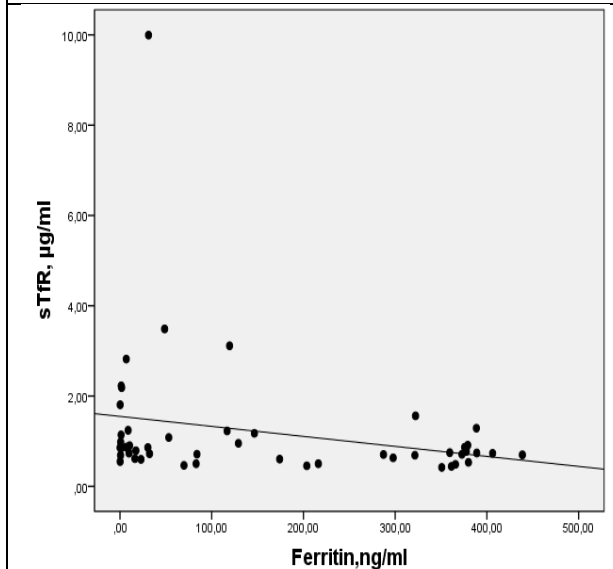


Figure 5. Correlation between ferritin and sTfR in patients with diabetes with normal CRP: n = 49, r = -0.310, p = 0.030

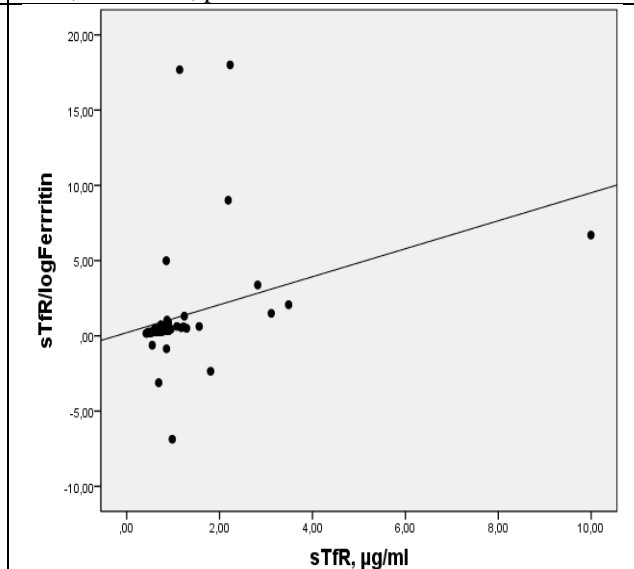


Figure 6. Correlation between sTfR and sTfR/log ferritin in patients with diabetes with normal CRP: n = 49, r = 0.693, p < 0.0001

CONCLUSIONS

In the absence of inflammatory process the sTfR-ferritin index correlates with sTfR and in inflammation - correlates with ferritin. The parallel determination of ferritin / sTfR-ferritin index and sTfR / sTfR-ferritin index for diabetes according to CRP would allow to develop additional criteria for the evaluation of iron homeostasis in diabetes.

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