



SERUM FERRITIN CORRELATED WITH DEFICIENCY OF SERUM VITAMIN B12 AND FOLIC ACID IN THALASSEMIA

Medical Science

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ABSTRACT

Objective: To measure level of deficiency of serum vitamin B12 and folic acid its correlation with serum ferritin in Thalassaemic patient.

Material and Methods: The study of investigations were done in the Biochemistry department of SMS Medical college and Hospital, Jaipur. Thirty children of Thalassaemia included in study group while thirty normal children in control group. Estimation of levels of folic acid, vitamin B12 and serum ferritin were made in autoanalyzer ADVIA Centaur XP analyzer.

Result : The analysis of Thalassaemia group compare with healthy control group show significantly low ($p < 0.001$) values. The statistical study of Thalassaemia group with healthy control group show significantly low values of ($p < 0.001$) serum folic acid, vitamin B12 level while raised values of serum ferritin in study groups. Significant negatively correlated to serum ferritin with vitamin B12 & folic acid in Thalassaemia major group. Our study found significant correlation of ferritin and vitamin B12 & folic acid deficiency in Thalassaemia.

Conclusion: The study found a significantly lower values of folic acid, vitamin B12 and higher values of ferritin level of Thalassaemia patient. Biochemical evaluation of these parameters is important in Thalassaemia patients of paediatric group. In upcoming time, it was require to study the further more mechanism of relationship between ferritin, vitamin B12, folic acid in these patients.

KEYWORDS

Vitamin B12, Ferritin & Folic acid, Thalassaemia, Hemoglobin

INTRODUCTION

Thalassaemia is autosomal inherited recessive disorder cause by impaire synthesis of globin chain and impairment produce alter hemoglobin production (Hb)¹

Thalassaemia is the common genetical disorder in worldwide, affecting approximate 200 million people around the world. The yearly incidence evaluated of symptomatic individual is 1 in 100,000 in world and 1 in 10,000 in the European country. However, many populations are lacking, particularly in areas of the world known or expected to be heavily affected². On the basis of Thalassaemia International Federation (T.I.F), 200,000 individual having Thalassaemia major are receiving regular treatment in the world³.

Around 5% population of world with a globin variant, just 1.7% have alpha, beta Thalassaemia trait. β -Thalassaemia is most common genetical transmitted hematological disorder in Indian children⁴.

α -Thalassaemia is results of deficient or absence synthesis of α globin chain, lead to excess β -chain. Synthesis of α globin is regulated by two gene on each chromosome 16. Beta Thalassaemia is results of deficient or absence synthesis of β globin chain, lead to excess α -chain. Synthesis of β globin is regulated by one gene on each chromosome 11⁵.

Diagnosis of Thalassaemia is based on severe anemia accompanied by the characteristic sign of massive ineffective erythropoiesis, profound microcytosis, hepatosplenomegaly, characteristic blood smear which is ring shaped in appearance & elevated level of HbF, HbA₂, or both. Patient required prolonged hyper transfusion therapy to maintain a packed cell volume at least 27-30% so that erythropoiesis is suppressed. In severe cases splenectomy may be done for survival.

Ferritin is a protein with weight 450 kD which consists of 24 subunits present in all type of cell. Measurement of serum ferritin level in patients for study of iron for anemia. The measure serum ferritin level have straight correlation with total quantity of iron store in body including cases of anemia in chronic disease.⁷

In our study there is correlation between ferritin and level of vitamin B12, folic acid with β -thalassaemia patient.

MATERIALS AND METHODS

The study of investigations were done in the Biochemistry department of SMS Medical college and Hospital, Jaipur. Thirty children of Thalassaemia included in study group while thirty normal children in control group. Estimation of levels of folic acid, vitamin B12 and serum ferritin were made in autoanalyzer ADVIA Centaur XP analyzer by chemiluminescence immunoassay 6-8.

Inclusion criteria were include normal liver and kidney functions test.

Exclusion criteria include use of medication which induce iron chelation such as iron chelating agent therapy, phenytoin, carbamazepine, antifolates, theophylline and diabetes mellitus, carcinoma, anemia excluded from research.

RESULTS

Our study show, Thalassaemic patient has raise ferritin level in comparison with normal healthy control. Study group show deficient values of serum folic acid and vitamin B12 levels with mean value of 3.71 ± 1.17 ng/mL and 163.6 ± 31.31 pg/mL respectively is compare with control group were 11.02 ± 3.84 ng/mL and 439.3 ± 127.6 pg/mL ($P < 0.001$) while concentration of ferritin is higher with mean value of 2144.7 ± 330.799 ng/mL in study group is compare with control group was 198.9 ± 66.95 and was statistically highly significant ($p < 0.001$).

Table-1: Coefficient of correlation between serum ferritin and folic acid & between serum ferritin and vitamin B12 in β -thalassaemia patients (Group A).

Biochemical parameters (n=30)	r*	p†
Ferritin and Folic acid	-0.198	< 0.001
Ferritin and Vitamin B12	-0.7277	< 0.001

r value: Pearson's coefficient of correlation

*Negative r value means negative correlation between the concerned parameters. † p value < 0.001 means highly significant. Pearson's correlation coefficient was calculated between the concerned parameters.

There was strong negative correlation between serum ferritin and vitamin B12 levels in these study subjects ($r = -0.7277, p < 0.001$).

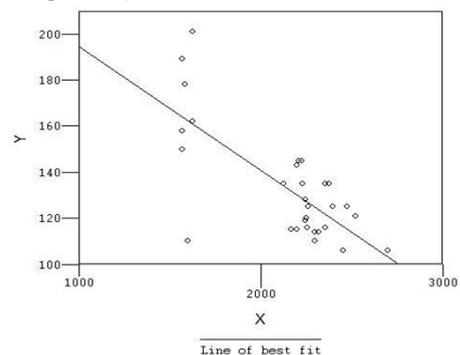


Fig no. 1- Graph showing Pearson Coefficient correlation between serum ferritin and vitamin B12 levels in these study subjects

There was a strong negative correlation was observed between serum ferritin and folic acid ($r = -0.198$, $p < 0.001$), indicates high level of significance.

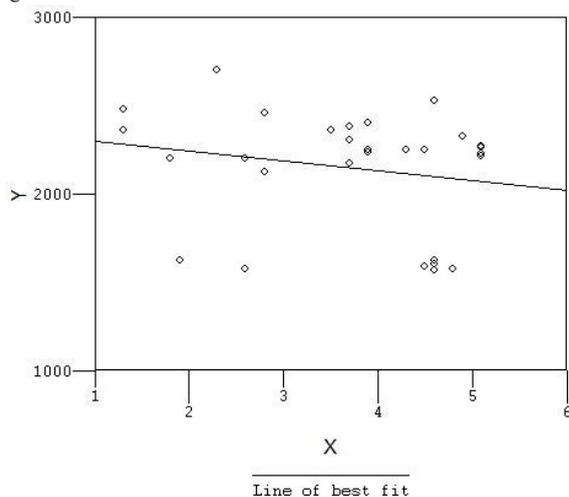


Fig no. 2- Graph showing Pearson Coefficient correlation between serum ferritin and Folic acid levels in these study subjects

Hence with increasing level of serum ferritin, there was corresponding decrease in the levels of serum vitamin B12 and folic acid.

Scatter plots representing correlation between serum ferritin and vitamin B12, and between serum ferritin and folic acid in β -thalassemia patients have been shown in Figure 1, 2 respectively.

Our studies showed that serum ferritin level of Thalassemia patient were much higher than normal healthy control. Highly significant decreased folic acid level was observed in the paediatric age group compare to control group. Our study indicate folic acid deficiency in Thalassemia subject. There was also deficiency of vitamin B12 seen in study group as compare with control group. Mean concentration of vitamin B12 decline and was highly significant in thalassaemic group. Our observations are supported by previous studies.

DISCUSSION

This was in accordance to study given by Amit Kumar Mishra et al (2013) indicating that age of patient at time of diagnosis in Thalassemia ranges from 10 months to 2 ½ years with a mean of 1 year and 4 months.³

According to a study by Crayn et al (2002), the most important PBF findings of vitamin B12 and folic acid deficiency are macrocytic RBCs and hypersegmented neutrophils⁹. This increase size of RBC may be masked by microcytosis of co-existing iron deficiency or Thalassemia. So normal MCV levels may be seen in up to one-thirds of the patient with vitamin B12 deficiency¹⁰.

The negative relationship between serum ferritin and vitamin B12 may be due to increased synthesis of HbA2 in thalassemia patients¹¹.

A study by Tamagnini GP et al (1983) also illustrated vitamin B12 deficiency in patients of beta thalassemia¹².

A study by Silva A et al with similar findings support our results¹³. Another study demonstrated salutary effect of folate administration in beta thalassaemic patients¹⁴.

This was in accordance to study given by Bandhyopadhyay et al (2013) patients show the increased serum ferritin levels even in younger age group. They observe that in 1-5 years age group average serum ferritin was 1750 ng/ml, and this increased to 3650 ng/ml in 11-15 years older patients¹⁵.

Cunningham et al (2004) reported that average serum ferritin level of beta thalassaemic patient in North America is 1696 ng/ml¹⁶. However, Choudhary VP et al (2004) reported mean serum ferritin level in India to be 6723 ng/ml¹⁷ even higher in our study.

CONCLUSION

The study found a significantly lower values of folic acid, vitamin B12

and higher values of ferritin level of Thalassemia patient. Biochemical evaluation of these parameters is important in Thalassemia patients of paediatric group. In upcoming time, it was require to study the further more mechanism for relationship between ferritin, vitamin B12, folic acid in these patient. However, therapy can be given to minimize further complication of vitamin B12 & folic acid deficiency. The trouble of poverty, low education and inadequate provision of health care are the main stumbling block in adequate treatment of Thalassemia patients of iron overload were the major complication by which the cause for morbidity and mortality in Thalassemia occurs.

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