Serum Ferritin Correlated With Deficiency of Serum Vitamin B12 and Folic Acid in Thalassemia

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Abstract

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

**Material and Methods:** The study of investigations were done in the Pediatric department of Rajendra Institute of Medical Science, Ranchi. Fifty children of Thalassemia included in study group while fifty normal children in control group. Estimation of levels of folic acid, vitamin B12 and serum ferritin.

**Result:** The analysis of Thalassemia group compare with healthy control group show significantly low (\(p<0.001\)) values. The statistical study of Thalassemi group with healthy control groups shows significantly low values of \(p<0.001\) serum folic acid, vitamin B12 level while raised values of serum ferritin study groups.

Significant negatively correlated to serum ferritin with vitamin B12 & folic acid in Thalassemia major group. Our study found significant correlation offer iron and vitamin B12 & folic acid deficiency in Thalassemia.

**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 furthermore mechanisms of relationship between ferritin, vitamin B12, folic acid in these patients.

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I. **Introduction**

Thalassemia is autosomal inherited recessive disorder cause by impaired synthesis of globin chain and impairment produce alter hemoglobin production (Hb)\(^1\).

Thalassemia 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 affected\(^2\).

Around 5% population of world with aglobin variant, just 1.7% have alpha beta Thalassemia trait. Beta Thalassemia is most common genetically transmitted hematological disorder in Indian children\(^4\).

\(\alpha\)-Thalassemia is results of deficient or absence synthesis of \(\alpha\) globin chain, lead to excess \(\beta\)-chain. Synthesis of \(\alpha\) globin is regulated by two gene on each chromosome\(^1\). Beta Thalassemia is results of deficient or absence synthesis of \(\beta\) globin chain, lead to excess \(\alpha\)-chain. Synthesis of \(\beta\) globin is regulated by one gene on each chromosome\(^1\).

Diagnosis of Thalassemia 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, HbA\(_2\) 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\(^6\).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 \(\beta\)-thalassemia patient.
II. Materials And Methods

Fifty children of Thalassemia included in study group while fifty normal children in control group. Estimation of levels of folic acid, vitamin B12 and serum ferritin were made in autoanalyzer. 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.

III. Results

Our study show, Thalassemic 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- thalassemia patients (Group A).

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<thead>
<tr>
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<th>r value: Pearson's coefficient of correlation</th>
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<td>*Negative r value means negative correlation</td>
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<td>between the concerned parameters.† p value</td>
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<td>&lt; 0.001 means highly significant. Pearson's</td>
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<td>correlation coefficient was calculated between</td>
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<td>the concerned parameters.</td>
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<td>There was strong negative correlation between</td>
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<td>serum ferritin and vitamin B12 levels in these</td>
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<td>study subjects (r = - 0.7277, p &lt; 0.001).</td>
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<tr>
<td>Ferritin and Folic acid</td>
<td>-0.198 &lt; 0.001</td>
</tr>
<tr>
<td>Ferritin and Vitamin B12</td>
<td>-0.7277 &lt; 0.001</td>
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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.

Since 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 observe 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 thalassemic group. Ourobservationsare supportedbypreviousstudies.

IV. 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 Thalassaemia ranges from 10 months to 2 1/2 years with a mean of 1 year and 4 months.8

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 neutrophils.9 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 deficiency.10

The negative relationship between serum ferritin and vitamin B12 may be due to increased synthesis of HbA2 in thalassemia patients.11

A study by Tamagnini GP et al (1983) also illustrated vitamin B12 deficiency in patients of beta thalassemia.12

A study by Silva A et al with similar findings support our results13. Another study demonstrated salutary effect of folate administration in beta thalassemic patients.14
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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 patients.\(^{15}\)

Cunningham et al (2004) reported that average serum ferritin level of beta thalassemic patient in North America is 1696 ng/ml.\(^{16}\) However, Choudhary VP t al (2004) reported mean serum ferritin level in India to be 6723 ng/ml\(^{17}\) even higher in our study.

V. 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 Thalassemic patients of iron overload were the major complication by which the cause for morbidity and mortality in Thalassemia occurs.

References

[8] Amit Kumar Mishra et al A Journal of Clinical Medicine, Volume 8 No.4 2013

Dr. Raghunandan Choudhary. “Serum Ferritin Correlated With Deficiency of Serum Vitamin B12 and Folic Acid in Thalassemia.” IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no. 11, 2019, pp 33-35.