RESEARCH ARTICLE

BIOCHEMICAL PARAMETERS AND THEIR CORRELATION WITH THE HEMATOLOGICAL PICTURE IN IRON DEFICIENCY ANEMIA

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ABSTRACT

Iron deficiency anemia (IDA) can be suspected when there is decreased haemoglobin level for age and sex; microcytic hypochromic erythrocyte morphology and reduced red cell indices ie., PCV, MCV, MCH & MCHC. Confirmation is done by biochemical tests such as serum ferritin, serum iron, percentage saturation of transferrin and serum total iron binding capacity. Serum ferritin is the single best laboratory test for the diagnosis of iron deficiency. A low serum ferritin (<15ug/L), in addition to a low hemoglobin or hematocrit, confirms the diagnosis of iron deficiency anemia. The concentration of transferrin is often estimated by measuring the total iron binding capacity. In this study, 80 patients with anemia were evaluated clinically, hematologically and biochemically for the diagnosis of IDA. It has been found that diagnosis provisionally made by clinical signs and symptoms and further confirmed by hematological picture can be supplemented by studying the degree of alteration of biochemical parameters which can act as a guide to deciding the duration and dosage of therapy, monitor improvement in signs and symptoms and prevent complications arising due to anemia.

INTRODUCTION

Anemia is a problem throughout the world with the highest prevalence rate being seen in developing countries. Two thirds of the children and women of childbearing age in most developing countries are estimated to suffer from anemia. In developing countries, every second pregnant woman and about 40% of preschool children are estimated to be anemic. Approximately 50% of cases of anemia are considered to be due to iron deficiency. Iron deficiency is the most common nutritional disorder worldwide and accounts for approximately one-half of anemia cases, accounting for more than 800 million cases. In this study, 80 patients with anemia were evaluated clinically, hematologically and biochemically for the diagnosis of IDA. The correlation of each hematological parameters was done with biochemical parameters. The anemic patients with microcytic hypochromic blood film were suggested to go for ferritin, TIBC, and iron assay for diagnosis of iron deficiency. This study is done to see the correlation between hematological and biochemical parameters in iron Deficiency anemia.

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MATERIALS AND METHODS

The present study was carried out in Gujarat Cancer Society Medical College, Hospital and Research Center, Ahmedabad. The study was approved by the institutional Ethics Committee and conducted between January 2016 and April 2016 in which 80 patients with Microcytic Hypochromic Anemia were included. Serum samples were tested for different biochemical parameters such as Ferritin, TIBC, Iron and Hematological parameters like Hb, PCV, MCV, MCH and MCHC. In data analysis, correlation between biochemical and hematological parameters is calculated by using the formula given below.

$$r = \frac{\sum_i (x_i - \overline{x})(y_i - \overline{y})}{\sqrt{\sum_i (x_i - \overline{x})^2}\sqrt{\sum_i (y_i - \overline{y})^2}}$$

The Pearson correlation coefficient is used to measure the strength of a linear association between two variables, where the value r =1 or near 1 is positive a perfect positive correlation and the value of r = -1 is negative means a perfect negative correlation. 5 ml peripheral blood was drawn by venipuncture in EDTA coated vacutainers (purple cap) and clot

activator plane vacutainers from both patients as well as controls. The samples were processed on the same day. All the blood serum samples were tested for Ferritin by Electrochemiluminescence immunoassay (ECLIA) quantitative method by using Elecsys ® Ferritin kits and Cobas e 411 chemiluminescence fully automated auto analyser. The serum samples were also tested for Iron and TIBC using Erba XL-640 autoanalyser.

RESULTS AND DISCUSSION

The present study was carried out in Gujarat Cancer Society Medical College, Hospital and Research Center, Ahmedabad. In data analysis, correlation between biochemical and hematological parameters was found to be as follows :-

		Hb	PCV	MCV	MCH	MCHC
IRON	Pearson Correlation (r)	.076	-.053	.219	.349	.141
	N	57	57	57	57	57
TIBC	Pearson Correlation (r)	-.105	.031	-.010	.038	-.008
	N	68	68	68	68	68
FERRITIN	Pearson Correlation (r)	.024	.262	.421	.478	.008
	N	94	94	94	94	94

The positive sign of the Pearson correlation coefficient concludes that there is a positive correlation between the variables iron and Hb, MCV, MCH, MCHC; that is, iron increases with increase in Hb, MCV, MCH, MCHC. A negative correlation has been found between iron and PCV; that is, iron decreases with decrease in PCV (r = -0.053).

Similarly, we obtained the following results too

1. There exists a positive correlation between TIBC and PCV, MCH that is 0.031, 0.038 respectively.
2. A negative correlation is seen between TIBC and Hb, MCV, MCHC that is -0.105, -0.010, -0.008 respectively.
3. A positive correlation is found between Ferritin and Hb, PCV, MCV, MCH, MCHC that is 0.024, 0.262, 0.421, 0.478 and 0.008 respectively.

DISCUSSION

Keeping in view the previous studies in iron deficiency anemia which uses the traditional markers for screening, this study is also reliable on those selective markers which are confirmatory for the diagnosis of iron deficiency anemia. Those include serum ferritin which is much more powerful than any other tests, TIBC and serum iron as the biochemical parameters for IDA. In this study, there is significant correlation found between the biochemical parameters and the hematological parameters from the blood test of patients with IDA. From the data it is found that serum Ferritin and Iron levels are significantly lower than their reference ranges while the Total Iron Binding Capacity is increased in these patients. It should be noted that the all hematological values are also found decreased compared to their reference values. Hematological parameters viz., Hb, PCV, MCV, MCH and MCHC show significant correlation with the biochemical parameters Ferritin and TIBC. All these hematological parameters shows a positive correlation with the Ferritin. Hb shows higher correlation (r= 0.3501) with Ferritin compared to

others. As TIBC is increased in IDA patients, it shows negative correlation with all hematological parameters. Serum Iron is positively correlated with Hb, MCV, MCH, MCHC.

Conclusion

It concludes that in iron deficiency anemia, along with changes in hematological picture, there is alteration in biochemical parameters viz., serum Iron, TIBC and serum Ferritin. Alteration in serum Iron concentration varies positively with Hb, MCV, MCHC. TIBC shows a negative correlation with hematological parameters. It varies with Hb, PCV, MCHC & a positive correlation with MCV. Serum Ferritin varies positive proportion with Hb, RBC, PCV, MCV, MCH, MCHC. Though correlation have been found between Biochemical and Hematological parameters, they have been found to be weak. Further studies may be required for more precise conclusion. Diagnosis provisionally made by clinical signs and symptoms and further confirmed by hematological picture can be supplemented by studying the degree of alteration of biochemical parameters which can act as guide to the deciding the duration and dosage of therapy, monitor improvement in signs and symptoms and prevent complications arising due to anemia.

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