

Original Research Article

Incidence of iron deficiency anaemia and it's early detection in patients with hypoproliferative anaemia presentation in a tertiary care hospital

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Received: 28 May 2018

Accepted: 05 June 2018

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ABSTRACT

Background: Iron deficiency anaemia still remains the most common cause of anaemia not only in India but also world over. According to world health report, there are 1,788,600 people in this world suffering from Iron deficiency anaemia. Iron deficiency anaemia is foremost prevalent disease-causing morbidity in world and therefore it is always absolutely necessary to detect this particular condition in early stages before the eventual development of various dreadful complications like Heart failure and Myocardial infarction. The aim of the study is to find incidence of iron deficiency anaemia in patients with hypo proliferative anaemia presentation, with a possible iron deficient state, by analyzing the haematological and biochemical parameters.

Methods: The study was conducted from November 2017 to May 2018 for a period of 6 months which included 50 subjects from both sex groups, aged 20-80 years with the diagnosis of hypo proliferative anaemia.

Results: The study results indicate that females (60%) were significantly overrepresented compared to males (40%). Of the 50 subjects 38% were in stage of negative iron balance (stage1) and 32% were in stage of iron deficient erythropoiesis(stage2) and 30% were in normal stage.

Conclusions: This Observational study showed a majority of patients with hypo-proliferative anaemia presenting at early stages of negative iron balance and iron deficient erythropoiesis thereby indicating the importance of initiating iron therapy at an early stage even without correlative iron studies.

Keywords: Hypo-proliferative anaemia, Iron deficient erythropoiesis, Negative iron balance, Serum ferritin, Serum iron, Total iron binding capacity

INTRODUCTION

Anaemia is functionally defined as an insufficient RBC mass to adequately deliver oxygen to peripheral tissues. World health organization (WHO) defines the lower limit of normal for Hb concentration at sea level to be 12.0g/dl in women and 13.0g/dl in men.

Association of anaemia with normocytic and normochromic red cells and an inappropriately low reticulocyte response (reticulocyte index<2-2.5) are hypo-proliferative anaemia's.^{1,2} Hypo-proliferative anaemia are the most common anaemia and in the clinic,

iron deficiency anaemia is the most common of these followed by the anaemia of inflammation. Iron deficiency is a leading cause of anaemia in adults and the most common nutritional deficiency in the world. Iron deficiency anaemia may be defined by cut-off haemoglobin values of 12.1g/dl in women and 13.8g/dl in men at or near sea level, with higher cut-off values at high altitude.

According to data from National Health and Nutrition Examination Surveys (NHANES) III, covering the years 1988 to 1994, the prevalence of hypoferrremia in the united states was <1% in adult men <50 years of age, 2 to

4% in adult men >50 years of age, 9 to 11% in menstruating teenagers and women and 5 to 7% in postmenopausal women.³ Prevalence of iron deficiency was also higher among people living in chronic poverty.⁴ Iron is an important micronutrient which is essential for various functions in human body. It is essential for cellular growth and differentiation, oxygen binding, transport and storage, enzymatic reactions, immune function, cognitive function, mental and physical growth etc. So, deficiency of iron due to either physiological or pathological reason can affect mental and physical growth resulting in decreased learning capacity and work productivity. Incidence of Anaemia increases with age. Iron deficiency anaemia can be suspected when there is decreased haemoglobin level for age and sex.

Three pathogenic factors are implicated in the anaemia of iron deficiency. First haemoglobin synthesis is impaired as a consequence of reduced iron supply. Second, there is a generalized defect in cellular proliferation. Third survival of erythroid precursors and erythrocytes is reduced, particularly when the anaemia is severe. When the transferrin saturation falls below ~15%, the supply of iron to the marrow is inadequate to meet basal requirements for haemoglobin production. Clinically there are three stages of iron deficiency. The first stage, also called pre-latent iron deficiency or iron depletion, represents a reduction in iron stores without reduced serum iron level.^{5,6} The second stage or latent iron deficiency is said to exist when iron stores are exhausted but the blood haemoglobin level remains higher than the lower limit of normal. Finally, in the third stage, blood haemoglobin concentration falls below the lower limit of normal and iron deficiency anaemia is apparent. Iron deficiency anaemia is a risk factor for heart failure, ischemic heart disease and other cardiovascular morbidities. Therefore, it is deemed necessary to detect IDA at early stage which can occur in the form of negative iron balance and iron deficient erythropoiesis.

The aim of the present study was to find incidence of iron deficiency anaemia in patients with hypo-proliferative anaemia presentation, with a possible iron deficient state, by analyzing the haematological and biochemical parameters.

METHODS

A prospective cross-sectional study was conducted in Narayana medical college and hospital a tertiary care hospital from November 2017 to May 2018 for a period of 6 months. All the patients attending the OP of Department of General medicine were examined and cases with anaemia clinically were enrolled in the study.

All the cases clinically diagnosed with anaemia were screened for complete blood picture. Diagnosis of anaemia was considered when Hb <13g/dl in men and <12g/dl in women in accordance with Guidelines of world health organization.⁷ All the cases selected for the

study was sent for detailed laboratory investigations including serum Ferritin level, serum Iron levels and total iron Binding capacity.

All the parameters were analyzed in an automated Beckton cell counter (USA) and standardized by controls. The reference values in normal individuals for serum ferritin in men is 18-270ng/mL and in women is 18-160ng/mL.⁸ The reference values of serum iron in males is 65-176ug/dL and in females is 50-170ug/dL.⁹

Inclusion criteria

- Patients between 20-80 years of age
- Patients with normocytic normochromic anaemia with decreased reticulocyte count.

Exclusion criteria

- Patients <20 years and >80 years of age
- Patients with increased reticulocyte count, macrocytic anaemia and microcytic anaemia, normal thyroid levels, normal serum urea and serum creatinine levels, abnormal inflammatory markers like erythrocyte sedimentation rate (ESR) and CRP.

RESULTS

In this cross sectional observational study which evaluated incidence of Iron deficiency anaemia, there were a total 50 patients with 60% males and 40% females (Table 1).

Table 1: Sex distribution of cases in the study.

Sex	Number	Percent
Male	30	60.0
Female	20	40.0
Total	50	100

Out of 50 cases, majority were in stage 1 (38%) followed in order by stage 2 (32%) of iron deficiency anaemia and 15 were in normal (30%).

Among males, 7 were in normal reference values (23.3%), 15 were in stage 1 (50%) and 8 were in stage 2 (26.67%) of iron deficiency anaemia. Among females, 8 were in normal reference values (40%), 4 were in stage 1 (20%) and 8 were in stage 2 (40%) of iron deficiency anaemia.

Most of the males predominantly presented themselves in stage 1 where most of the females predominantly presented themselves in stage (Table 2).²

There is statistically significant difference in age between the three groups ($p < 0.0001$). Of the estimated haemoglobin levels there is statistically significant difference between three groups ($p < 0.0001$).

Mean corpuscular volume among three groups was found to be less significant. Mean corpuscular haemoglobin was statistically significant among three groups. Serum

ferritin, serum iron and TIBC were statistically significant among three groups (Table 3).

Table 2: Sex wise distribution of stages of iron deficiency anaemia among cases in the study.

Parameters			Stage			Total
			Normal	Stage-1	Stage-2	
Sex	Males	Count	7	15	8	30
		% within Sex	23.3	50.0	26.7	100.0
		% within Stage	46.7	78.9	50.0	60.0
	Females	Count	8	4	8	20
		% within Sex	40.0	20.0	40.0	100.0
		% within Stage	53.3	21.1	50.0	40.0
Total	Count		15	19	16	50
	% within Sex		30.0	38.0	32.0	100.0
	% within Stage		100.0	100.0	100.0	100.0

Table 3: Variables of investigations observed in cases of the study.

Variables	Group (Mean (SD))			
	Normal	Stage 1	Stage 2	P value
Age	57.27	53.26	38.81	<0.0001
Hb	11.08	11.28	10.18	<0.0001
MCV	87.58	87.13	87.56	0.769
MCH	30.87	30.53	29.06	<0.0001
MCHC	33.53	33.42	33.8	0.420
Ferritin	143.31	17.26	14.96	<0.0001
Iron	89.20	76.29	43.59	<0.0001
TIBC	349.27	329.53	396.56	<0.0001

DISCUSSION

Over the past many years, in our hospital, most of the iron deficiency anaemia patients presented with cardiovascular morbidities like heart failure and ischemic heart disease by the time they presented with full-fledged iron deficiency anaemia with microcytic hypo chromic presentation on peripheral smear. Therefore, it was deemed necessary to detect iron deficiency anaemia at an early stage, particularly in females who tend to present very late owing to various socio-economic circumstances.

Out of 50 subjects 30 were males (60%) and 20 were females (40%) Out of 50 subjects 19 were in stage 1 iron deficiency (38%), 16 were in stage 2 iron deficiency (32%) and 15 were normal (30%). Most of the males were in stage 1 iron deficiency and females were predominantly in stage 2 iron deficiency. This indicates most of the females presented very late to the hospital when compared to males.

Two similar studies were conducted in different groups of subjects among elite athletes and hookworm infested patients, but no study was done on general population.^{10, 11}

Serum ferritin which reflects total body iron stores is routinely ordered in the evaluation of Anaemia.

An overview of diagnostic values used in evaluation of iron deficiency anaemia showed that serum ferritin was by far most specific and sensitive test for the diagnosis of iron deficiency, outperforming red cell protoporphyrin, transferrin saturation, red cell distribution width.¹²

Of all the serum tests for iron deficiency, the serum ferritin determination is the most useful and a low serum ferritin invariably signifies iron deficiency. TIBC is usually elevated when total body iron stores are low, a possible sign of iron deficiency anaemia, suggesting that total iron body stores are low.

Present study analyzed that a majority of patients with hypo proliferative anaemia presented at early stages of negative iron balance and iron deficient erythropoiesis thereby indicating the importance of initiating iron therapy even without correlative iron studies, since most of them belong to a low socioeconomic status with an inability to afford high-priced diagnostic modalities and most of them present at late stage especially females.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Nareddy VA, Varun MS, Nagabushana MV. Incidence of iron deficiency anaemia and it's early detection in patients with hypoproliferative anaemia presentation in a tertiary care hospital. *Int J Adv Med* 2018;5:828-31.