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Short Communication

Improvement of Reproductive Health by Detecting Iron-Deficiency-Anemia in Adolescent Girls of Rural Area

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Abstract

Anemia is a public health problem and the primary cause of it is dietary deficiency though sometimes genetic abnormalities of hemoglobin synthesis and parasitic infections are the added reasons. In the present investigation a total of twenty five blood samples of teen-aged girls (14-18 yrs) were collected from the hospital of health science department situated at Ambegaon, Pune for the detection of iron-deficiency anemia for the purpose of improvement of reproductive health of adolescence girls in rural area. The objective of the studies is to bring awareness of iron status among rural adolescent girls to promote their maternal as well as child health. Iron deficiency anemia was detected in 43% (38% moderate, 5% severe and no mild anemia) of the tested population by the indicators (Hemoglobin, Serum iron, TIBC and Transferrin) generally used for assessment of anemia. Complete blood count (CBC) revealed significant reduction (P>.01) in RBC count, no changes in WBC count and significant increase in Platelets count (P> 0.01-Thrombocytosis noticed). Result indicates some relationship of iron deficiency anemia to thrombopoiesis. Improved diet and iron supplement along with vitamin A and C (needed for absorption of iron) should be implemented to control iron deficiency anemia in rural area. The results revealed were as: Haemoglobin (↓), MCV (↓), MCH (↓), MCHC (↓), serum iron ((↓), TIBC (↑), transferrin saturation (↓), Platelet count (↑).

Keywords: Anemia, Hemoglobin, Public health, Vitamins

1. Introduction

Anemia is one of the most common nutritional problems in the world today. Indicator used to assess anemia is hemoglobin concentration showing the value below recommended thresholds. The main causes of anemia are dietary iron deficiency (Conrad, 2009; Ball and Bartnett, 1999; Brady, 2007). Other causes include parasitic diseases like malaria, hookworm infections etc. (Dreyfuss, *et al.,* 2000). Deficiency of vitamin A and C also plays an important role (Bloem, *et al*., 1990 and WHO, 1996) lastly inherited conditions for e.g. thalassaemia and sickle shaped anemia (Hemoglobinopathy) also affect the synthesis of hemoglobin in red blood cells (Sagone and Balcerzak, 1970). Iron deficiency anemia is prevalent among adolescence girls, children and pregnant ladies (Halterman *et al*., 2004) usually because of increased Iron requirement and decreased Iron intake.

2. Methodology

2.1 Blood Parameters (Jain, 2004)

a) Estimation of Hemoglobin- using Sahli's Hemoglobinometer
b) Determination of total erythrocyte (RBC) count-using Neubauer's Chamber and RBC Diluting Fluid.
c) Determination of RBC indices (MCV, MCH, MCHC, CI,)-using standard formulas.
d) Haematocrit values(ESR and PCV)-using Wintrobe's tubes
e) Platelet count-using Neubauer's chamber and platelet diluting fluid (1% ammonium oxalate).
f) Microscopic examination of blood smear

2.2 Assessment of ID Anemia

A) Determination of Serum Iron Level-Using Spectrophotometric Method (Stookey, 1970)

Principle: In an acidic medium transferrin bound iron dissociates into ferric ions which are reduced to ferrous ions in the presence of ascorbic acid. The ferrous iron reacts with the chromogen Ferozine® to form a blue-violet chromophore which absorbs at 595 nm. The absorbance is directly proportional to the serum iron concentration of the blood sample.

B) Total Iron Binding Capacity (TIBC)-using Spectrophotometric Method at 560nm (Levinson, 1980)

Principle: When the serum iron (SI) determination is performed, for TIBC the serum is treated with excess of ferrous ions to saturate the iron binding sites on transferrin. The excess ferrous ions get adsorbed and precipitated and the Iron content in the supernatant is measured by spectrophotometry at 560 nm to give TIBC value. When the serum iron (SI) determination is performed concurrently with the TIBC and the result subtracted from the TIBC value, the difference yields the unsaturated iron-binding capacity (UIBC), or serum transferrin not bound to iron.

C) Transferrin saturation (%) - It is the ratio of serum iron and total iron binding capacity multiplied by 100 (Haematol, 1978).

3. Results and Discussion

Results of anemia detection revealed that 38 % are showing moderately anemic (Hb< 10 gm/dL) and 5% are showing severely anemic (Hb<7gm/dL). History of the people was collected on diet and socio economic condition of the patients which revealed that 3-5% of the tested populations were suffering from parasitic infections like malarial and hook worm infection. No Hemoglobinopathy (sickle shaped anemia and thalassaemia) was reported. Socioeconomic condition of the patient was poor. Patients suffering from parasitic infections were not taken into consideration for ID anemia detection. The history of the patient revealed that they visited the hospital because of their general weakness as constant fatigue, dizziness, headache, irritability, palpitation, pallor etc.

Table 1: Complete Blood Count

Sr. No.	Blood Parameters	Normal Blood	Patient's Blood	Remark
1)	Blood smear examination under microscope	Normocytic Normochromic	Mirocytic Hypochromic	RBCs with MCV and MCHC values below normal range indicating ID Anemia
2)	Total erythrocyte count	5million/ cumm (± 10.5)	3.6 million/cumm ± 6.8)	(P<0.01) Significant
3)	Estimation of hemoglobin	10 gm/dl (±0.05)	7.1 gm/dl (± 0.03)	(P <0.01) Significant
4)	Hematocrit Values (ESR and PCV)			
	i) ESR	6 mm (± 0.06)	5.35 mm (± 0 .03)	Non-significant
	ii) PCV	43% (±1.1)	25% (± 0.9)	Significant (P<0 .01)
	ii) Platelet count	3 Lacs/microlitre (± 4.5)	4.5 Lacs /microlitre (± 6.0)	Thrombocytosis noticed (P<0.01) significant

Table 2: Determination of RBC Indices

Sr. No.	Erythrocyte Parameters	Normal Blood	Patient's Blood	Remark
1)	MCV	85 (± 2.0) cubic microns (um3)	60(±- 3.2) cubic microns (um3)	P<0.01 (significant)
2)	MCH	30.5(±1.5) pg	13.0(±-0.8) pg	P < 0.001 (significant)
3)	MCHC	35(± 1.0) %	18.5 (± 0.9) %	P<0 .001 (significant)
4)	Colour Index	1(±0.01)	0.4 (± 0.01)	P<0.01 (significant)

Table 3: Assessment of Iron Deficiency Anemia

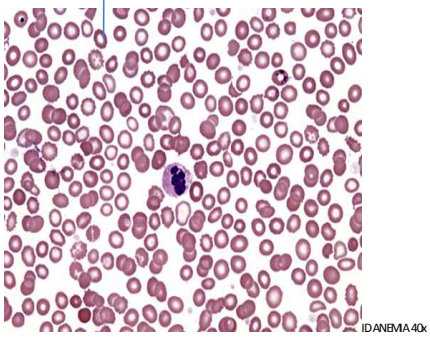
Sr. No.	Parameters Related to ID Anemia	Normal Blood	Patient's Blood	Remark
1)	Serum Iron Level	120 ug/dl (± 5.5)	75ug/dl (±3.0)	P < 0.01 significant
2)	TIBC	350 ug/dl (±9.8)	500ug/dl (±10.0)	P <0.01 significant
3)	Transferrin Saturation	32% (±2.5)	15% (±1.0)	P<0 .01 significant
4)	Fecal Occult Blood Test	Negative	Negative	No hemorrhage/ tumor in G.I Tract

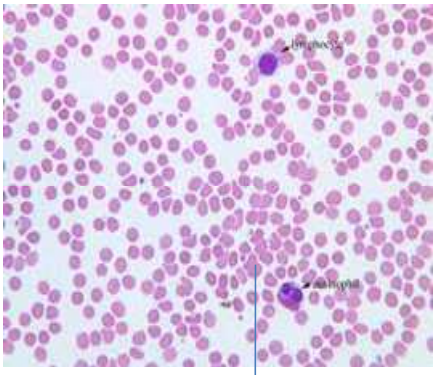
Results revealed that anemia is prevalent among adolescence girls in Ambegaon of Pune city. Blood smear examination along with the values of blood indices determine the type of anemia as Microcytic (RBC with MCV value below normal range), Hypochromic (MCHC Value below normal range), which is the characteristic features of iron deficiency anemia (Jain, 2005). Other anemias are Megaloblastic anemia (due to Folic acid deficiency-Macrocytic, Normochromic), Pernicious anemia (Macrocytic, Normochromic-due to failure in absorption of B12) and Hemolytic anemia (due to destruction of RBCs e.g. malarial infection, Hemoglobinopathies etc). Results also revealed that there was a decrease in Mean Corpuscular Hemoglobin (MCH) value which indicates depletion in iron reserves and development of iron deficiency. A low iron with a high TIBC value usually indicates iron deficiency, whereas in case of chronic diseases, both iron and TIBC go down (WHO, 2001). Iron deficiency is usually related to long term or heavy bleeding. It can also be due to increased iron requirement (in adolescence, in pregnancy), rapid growth (in children), poor diet and problem with absorption. Here the reason might be increased loss of iron due to monthly period in adolescence girls along with poor diet which cannot accommodate the loss (nutritional deficiency) or poor absorption of iron through gut epithelium. Future studies of serum transferrin receptors levels will help to detect iron deficiency more accurately. It is reported by World Health Organisation (WHO) that serum transferrin receptor levels increase progressively as the supply of iron to the tissues becomes progressively more deficient (WHO, 2001). To control ID anemia, food based approaches include improvement of dietary intake along with iron supplement. Moreover, intake of Vitamin A and C plays an important role in absorption of iron in gut epithelium. Iron deficiency anemia is reported to be associated with or without Thrombopoiesis (Akan *et. al*., 2000).

MICROSCOPIC OBSERVATIONS

- **IRON DEFICIENCY ANEMIA(40x)** **NORMAL BLOOD (40x)**

Less hemoglobin (Hypochromic)





RBCs with Anisocytosis (variation in size of RBCs) & Poikilocytosis (Abnormal shape of

Normal hemoglobin (Normochromic)

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