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Original Research Article

Study of the red cell indices, hemogram and platelet variations in anaemic (<10gm%) patients by automatic cell counter in a tertiary care centre, Ahmednagar, Maharashtra, India

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ABSTRACT

Background: Anemia is not a disease but it is the expression of underlying diseases and from the treatment point of view, it is necessary to identify the cause of anemia. The definition of anemia is as decrease in the number of red blood cells or the decreased percentage of hemoglobin in the blood. Anemia is such an important issue affecting a large population in India as well as worldwide, Hence, the present study was conducted to evaluate the red cell indices, haemogram and study the relation of platelet count with anaemia in anaemic (<10gm%) patients by automatic cell counter in Vikhe Patil Medical hospital.
Methods: It was a prospective cross-sectional study. The sample size of research project was 100 patients, included according to the inclusion and exclusion criteria.
Results: In present study, equal numbers of patients suffer from macrocytic normochromic anemia and hyperchromic anemia, that is, 8 patients of each. Out of 100 patients, 61% patients showed decreased platelet count. Maximum percentage of anaemic patients showed decreased platelet count in the range of 2.5-1.5 lakhs. Least percentage of patients (16%) showed platelet count less than 0.5 lakhs/cmm^3.
Conclusions: Screening for anaemia, treatment of anaemic women, and availability and use of food fortification (wheat flour with iron and folic acid), milk, sugar and salt with iron to build long term iron stores remains the key to reduce anemia in adolescent and pregnant women. Consumption of cheap iron-rich foodstuffs should be promoted. Effective poverty alleviation and hookworm prevention programs are also important.

Keywords: Anemia, Haemogram, Platelets

INTRODUCTION

Anemia is not a disease but it is the expression of underlying diseases and from the treatment point of view, it is necessary to identify the cause of anemia. The definition of anemia is as decrease in the number of red blood cells or the decreased percentage of hemoglobin in the blood.[1] It can also be termed as reduction of more than 10% from the normal value of total number of red blood cells, amount of circulating hemoglobin and RBC mass of a particular patient.[2] Conventionally anemia is said to be decrease in RBC, hemoglobin and hematocrit below the previously established normal values for healthy persons of the same age, gender and race and under similar environment conditions. Its clinical diagnosis is made from the history, physical examination, signs and symptoms, hemoglobin values and other procedures and findings. Functionally, it is said to be the

decrease in the oxygen carrying capacity of the blood which leads to tissue hypoxia. Morphologically anemia can be classified as microcytic hypochromic anemia which characteristically shows reduced MCV (mean corpuscular volume) values (<80fl) as well as reduced MCHC (mean corpuscular hemoglobin concentration) values (30gm/dl), normocytic normochromic which has normal MCV (82-100 FL) values, macrocytic hypochromic anemia which shows characteristic increased MCV values (>100fl) and normal MCHC. The etiological method of classification involves anemias due to impaired red cell production, hemolytic anemia due to increased red cell destruction and anemia due to blood loss in cases of trauma or injuries. In Indian anemia affects females (9.9%) more than males (7.8%).[3-8] Anemia is such an important issue affecting a large population in India as well as worldwide, hence it was planned to evaluate the red cell indices, haemogram and study the relation of platelet count with anemia in anemic (<10gm%) patients by automatic cell counter in Vikhe Patil Medical hospital.

Aim

To study the red cell indices (MCV, MCH, MCHC), hematocrit values and platelet values done by automatic cell counter in anemic patients (<10gm% hemoglobin).

Objectives

- Observe the difference between red cell indices to hemoglobin count.
- To compare the hematocrit values with hemoglobin count.
- To compare the platelet count with hemoglobin count.

Review of literature

Anemia is a global public health problem affecting both developing and developed countries with major consequences for human health as well as social and economic development. It occurs at all stages of the life cycle, but is more prevalent in pregnant women and young children. In 2002, iron deficiency anemia (IDA) was considered to be among the most important contributing factors to the global burden of disease.[9] Globally, anemia affects 1.62 billion people (95% CI: 1.50-1.74 billion), which corresponds to 24.8% of the population (95% CI: 22.9-26.7%). The highest prevalence is in preschool-age children (47.4%, 95% CI: 45.7-49.1), and the lowest prevalence is in men (12.7%, 95% CI: 8.6-16.9%). However, the population group with the greatest number of individuals affected is non-pregnant women (468.4 million, 95%). The prevalence of anemia in females (20-50 years) was 70.1%, which included 48.7% of mild, 19.9% of moderate and 1.5% of severe anemia cases. The prevalence of anemia in Males (20-50 years) was 53.2%, with 34.3% suffering from mild, 17.7% from moderate and 1.2% from severe anemia.[10] The prevalence of anemia was much more in women belonging to rural areas (86.9%, 200/230) as compared to urban areas (81.5%,220/270) (Figure 2) because of less health awareness, extreme poverty less facilities like medical services.[11] As per a study in cases with Hb<10.5 g/dL a combination of MCV<76.1fl, MCH <25.05pg, MCHC <31.35%, RDW-CV% >16.35% and RBC count <4.18 million/cumm can help in the diagnosis of iron deficiency anaemia in pregnant Indian women in the second and third trimester.[12]

METHODS

Place of study

The place of study was Padmashree Vithalrao Vikhe Patil Medical College and Hospital. The place of study was selected according to ease and access.

Method for obtaining sample size

The sample size was obtained from collecting data from 100 anaemic (<10gm% hemoglobin) patients haemogram reports visiting the central clinical laboratory as an out-patient or an in-patient.

Time utilization calendar

The study period for the research was 4 months from the date of approval of the project. The data was collected on a daily basis by visiting the central clinical laboratory in Vikhe Patil medical college.

- Time for collection of data: 3 and half months after approval from M.U.H.S.
- Time for analysis of data: 15 days after completion of data collection.

Study design

It was a prospective cross-sectional study.

Hypothesis

The hypothesis of the project was that red cell indices and platelet count help in morphological classification of anemia in patients with hemoglobin less than 10gm%, visiting Vikhe Patil medical hospital.

Feasibility criteria

All patients referred by physicians from Vikhe Patil Memorial hospital will be enrolled for the study.

Inclusion criteria

- The following patients had their hemoglobin below 10gm%.
- Their age group was adults (20-40 years).

- The patients were of either sex.
- All patients giving permission to use their haemogram report for the observational study purpose.

Exclusion criteria

- Patients with history of chronic illness, heart disorders and kidney disorders.
- Patients having hemoglobin above 10gm%.
- Haemogram results from outside of Vikhe Patil medical hospital.

Sample size

The sample size of my research project was 100 patients, included according to the inclusion and exclusion criteria.

RESULTS

Amongst data of 59, maximum number of females have their hemoglobin in the range of 10-9.1 and amongst data of 41 males, maximum number of males have their hemoglobin in the range of either 7-6.1 or 5-2.

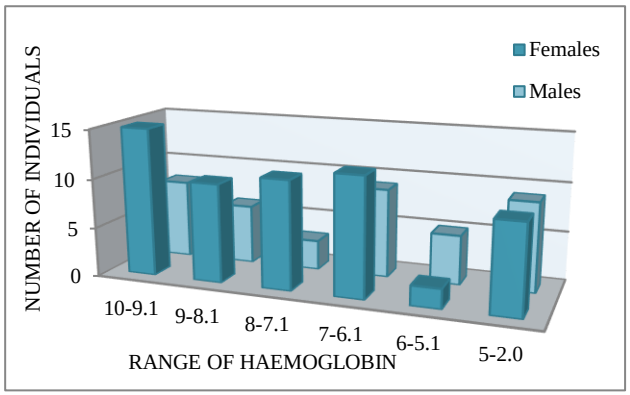
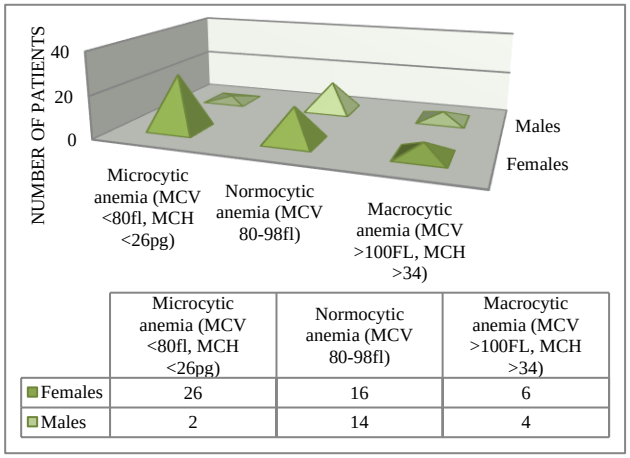


Figure 1: Comparison of number of individuals with haemoglobin in various ranges.



	Microcytic anemia (MCV <80fl, MCH <26pg)	Normocytic anemia (MCV 80-98fl)	Macrocytic anemia (MCV >100FL, MCH >34)
Females	26	16	6
Males	2	14	4

Figure 2: Morphological classification: on the basis of size of the red blood cells.

In females, microcytic anemia was seen in maximum (26 females) as cause of microcytic anemia is most commonly iron deficiency and females in India are highly prone to iron deficiency anemia and in males normocytic anemia was seen in maximum (14 males).

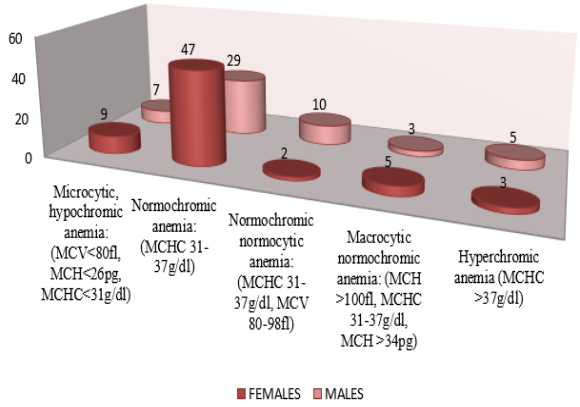


Figure 3: Morphological classification of anemia with size and shape into consideration.

Most common cause of normochromic anemia is acute blood loss, as females suffer from acute blood loss during labor process of delivering a child and adolescent girls experience menstruation, maximum number of females have shown normochromic anemia. Other causes of normochromic anemia are hereditary spherocytosis, hereditary elliptocytosis, PNH, G6PD deficiency, aplastic anemia which might be the cause of anemia in 76 (47 females + 29 males) patients.

Microcytic hypochromic anemia is seen in 17 out of 100 anemic patients. Its common causes are iron deficiency, sideroblastic, chronic disease, inflammation, lead poisoning and thalassemia trait.

Normochromic normocytic anemia shows normal shape, size and good amount of hemoglobin present in the red blood cells, still anemia persists in such individuals. It is due to chronic diseases, organ failure like renal failure, cancers like leukemia and lymphomas, granulomatous infections, aplastic anemia and sometimes due to AIDS (acquired immune deficiency syndrome).

Macrocytic normochromic anemia is seen with larger than normal size of red blood cells but normal color seen in cases of megaloblastic anemia (B_{12} or folate deficiency), alcoholism, liver disease, reticulocytosis, chemotherapy, myelodysplastic syndromes, multiple myeloma, and hypothyroidism.

Hyperchromic anemia is commonly seen in patients having high MCHC. There is no specific term as hyperchromic anemia. In spherocytosis, the MCHC is increased due to loss of membrane and the consequent spherical shape assumed by the cell.

In present study equal numbers of patients suffer from macrocytic normochromic anemia and hyperchromic anemia, that is, 8 patients of each.

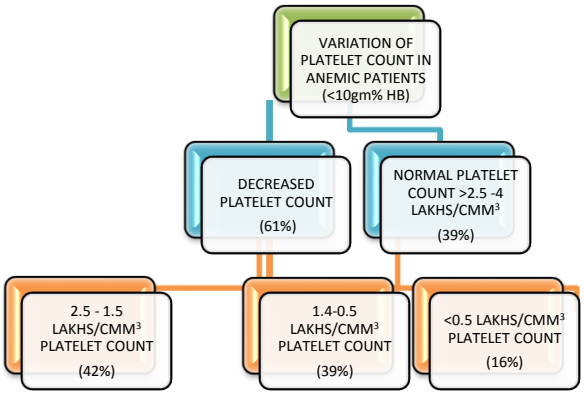


Figure 4: Percentage of patients showing variation in platelet count.

Out of 100 patients, 61% patients showed decreased platelet count. Maximum percentage of anemic patients showed decreased platelet count in the range of 2.5-1.5 lakhs. Least percentage of patients (16%) showed platelet count less than 0.5 lakhs/cmm^3.

DISCUSSION

The use of the mean corpuscular volume to classify the anemia as microcytic, normocytic or macrocytic is a standard diagnostic approach.[13] Similarly in present study anemia was classified of 100 anemic (<10gm%) patients showing majority of females suffering from microcytic anemia. The most common form of microcytic anemia is iron deficiency caused by reduced dietary intake. It is easily treatable with supplemental iron and early intervention may prevent later loss of cognitive function. Less common causes of microcytosis are thalassemia and lead poisoning. Normocytic anemia has many causes, making the diagnosis more difficult.[13]

Recent estimates of iron-deficiency anaemia show that 52% of Indian women aged 15-49 years are anemic.[18] Similarly in present study maximum females showed microcytic anemia which has its most common cause to be iron deficiency. The population group with the greatest number of individuals affected is pregnant women (41.8%).[15] In women, anaemia may become the underlying cause of maternal mortality and perinatal mortality.[16] Nearly 50 per cent of women of reproductive age and 26 per cent of men in the age group of 15-59 years are anemic.[17]

Most of the anemias are due to inadequate supply of nutrients like iron, folic acid and vitamin B_{12}, proteins, amino acids, vitamins A, C, and other vitamins of B-complex group i.e., niacin and pantothenic acid are also involved in the maintenance of hemoglobin level.[14]

Table 1: Level of hemoglobin for anaemia according to UNICEF.

Anaemia level	Hemoglobin level		
	Children	Adolescent girls	Pregnant women
Mild	8.0-10.99g/dl	10.0-11.99g/dl	8.0-10.99g/dl
Moderate	5.0-7.99g/dl	8.0-9.99g/dl	5.0-7.99g/dl
Severe	below5.0 g/dl	below 8.0g/dl	below 5.0g/dl

Source: IIPS, 2006.

According to this grading system, maximum number of females were found to be mild to moderate range (graph 1).

Inverse correlations were found between platelet counts and hemoglobin.[18] But according to our study platelet count was found to be reducing with reduction in hemoglobin count.

CONCLUSION

There is an urgent need for improving overall nutritional status of adolescents through nutrition education, community awareness and supplementation programs. The need for regular blood tests to check hemoglobin levels is emphasized. Nutrition component needs to be included in the school curriculum. Emphasis is needed for corrective measures of anemia and iron deficiency in girls before they enter into adolescent age group.

Screening for anaemia, treatment of anaemic women, and availability and use of food fortification (wheat flour with iron and folic acid), milk, sugar and salt with iron to build long term iron stores remains the key to reduce anemia in adolescent and pregnant women. Consumption of cheap iron-rich foodstuffs should be promoted. Effective poverty alleviation and hookworm prevention programs are also important. This will provide dual functions, that is, the iron stores of the mother will not deplete and the future child born to a healthy woman will have adequate amounts of iron stores. This prevention will break the continuous process of anemia from mother to child. Red cell indices are valuable in the morphologic classification of anaemias. Since different etiologic factors result in characteristically different red cell morphology, the clinician can properly plan the management of a patient with an anemia if the blood counts are interpreted according to red cell indices.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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ANNEXURE 1

INFORMED CONSENT FORM

I_____ myself/father/mother/guardian of _____ aged_____ and residence of_____ do hereby confirm that I have full knowledge of the use of my haemogram report in this project and give permission to use my haemogram report for the same.

Thumb impression/Signature of patient/father/mother/guardian

Dated: _____

Signature of investigator: _____

Date: _____

ANNEXURE 2

PERSONAL DETAILS

1. Name of the patients: _____

2. Registration no.: _____

3. Provisional Diagnosis: _____

4. Date of first visit to the OPD_____

5. IPD no. _____

6. Parameters for assessment:

i. Name of patient:

ii. Age:

iii. Sex:

iv. Hb (gm. %):

v. Platelet count (lakhs/cmm):

vi. Red cell indices:

vii. RBC (millions/cmm):

a) MCV (FL):

b) MCH (pg.):

c) MCHC (%):