Morphological Spectrum of Anemias in Pregnant Women Attending at Jhalawar Medical College

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Abstract: *Introduction: Anemia is present when haemoglobin level in the blood is below the lower extreme of the normalrange for the age and sex of the individual. The lower limit of normality is reduced during pregnancy [1]According to WHO, anemia is defined as haemoglobin levels <12.0g/dl in women and <13.0g/dl in men and<11.0g/dl in pregnancy. Aim: This hospital based study aim to find the morphological spectrum of anemias in pregnant women, their correlations with clinico - hematological profile. We apply further the reticulocyte count and various RBC indices in correlating morphology with etiology. Method: Study population (144) was selected with first come first basis technique. Pregnant women fulfilling inclusion and exclusion criteria where included in the study till sample size is achieved. The sample was venous blood collected in Obstetrics and Gynecology ward by venipunctures invacutainer containing k2 EDTA anticoagulant and was sent to central laboratory. Sample was first run into auto mated 5 – part analyzer (Sysmex XN1000) which analyses the sample and provides a print out with complete blood count, RBC indices, RDW, platelet count, PDW, scatter gram and distribution curves. Morphological typing of anemia was done using Peripheral blood film examination. Results: In overall 144 cases, majority of cases are of micorcytic hypochromic anemia (53%) followed by dimorphic anemias (21%) and normocytic normochromic anemias (16%).*

Keywords: Anemia, Morphological, Pregnant Women, Haemoglobin, RBC, CBC

1. Introduction

Haemoglobin is needed to carry oxygen and if you have too few or abnormal red blood cells, or not enough haemoglobin, there will be a decreased capacity of the blood to carryoxygen to the body's tissues. This results in symptoms such as fatigue, weakness, dizziness and shortness of breath, among others.

The optimal haemoglobin concentration needed to meet physiologic needs varies by age, sex, elevation of residence, smoking habits and pregnancy status. The most common causes of anemia include nutritional deficiencies, particularly iron deficiency, though deficiencies in folate, vitamins B12 and A are also important causes; haemoglobinopathies; and infectious diseases, such as malaria, tuberculosis, HIV and parasitic infections. [2]

Anemia is a serious global public health problem that particularly affects young children and pregnant women. WHO estimates that 42% of children less than 5 years of age and 40% of pregnant women worldwide are anemic - WHO. [3]

According to National Family Health Survey 5 (2019 - 21), the prevalence of anemia is 52.2 % in pregnant women (Rajasthan 46.3%). [4]

Nutritional deficiency in developing countries is a common cause of anemia. There are three factors contribute to the pathogenesis of vitamin and mineral deficiencies in pregnancy. Those are, Firstly, both the growing foetus and maternal tissues use the entire maternal stores of minerals and vitamins (i. e. there is an increase in demand). Secondly, in developing countries, there is a lack of vitamin and mineral supplement use or inadequate food intake during pregnancy. Thirdly, folic acid and vitamin B12 absorption are usually impaired during pregnancy. [5]

Anemia during pregnancy is a major cause of morbidity and mortality of pregnant women in developing countries and has both maternal and fetal consequences. Anemia is primarily responsible for 20% maternal deaths. [6]Maternal anemia associated with adverse pregnancy outcome such as increased rates of maternal and perinatal mortality, premature delivery, low birth weight, low APGAR scores, hampered fetal physical growth, mental impairement and infants deaths etc. Anemia may worsen by postpartum hemorrhage and anemic patients are predisposed to puerperal infections. [7].

Based on the morphology of RBCs and blood cell indices, anemia is classified intonormocytic normochromic, microcytichypochromic, macrocytic and dimorphicanemia. Each type suggests specific aetiological factors, so an evaluation of themorphology of RBCs and clinical features among pregnant women could help in the diagnosis and management of patients. [8]

2. Method

This hospital based study is approved by Ethical committee, Jhalawar Medical College.

Patient samples with hemoglobin levels indicating anemia (hemoglobin value below the WHO - reference values) were chosen for the study.

The sample was venous blood collected in Obstetrics and Gynecology ward by venipunctures in vacutainer containing k2EDTA anticoagulant and was sent to central laboratory. Sample was first run into automated 5 – part analyzer (Sysmex XN1000) which analyses the sample and provides a print out with complete blood count, RBC indices, RDW, platelet count, PDW, scattergram and distribution curves.

Morphological typing of anemia was done using Peripheral blood film examination and following classification was done. Morphological typing based on PBS was compared with typing done on RBC indices and reticulocyte count was correlated. Grading of anemias as per overall age group was done according to criteria laid down by WHO.

Table 1: The India Council of Medical Research Categories of Anaemia [9]

Category	Anemia Severity	Hemoglobin Level (gm/ dl)
1	Mild	10.0- 10.9
2	Moderate	7.0- 10.0
3	Severe	<7.0
4	Very Severe (Decompensated)	<4.0

Table 2: Reference values from Dacie's Textbook of Practical Hematology, 12th edition [10]

Parameter	Values
Hb (g/dl)	11- 14
RBC(millions/ cumm)	3.9- 5.1
HCT (%)	30- 38
MCV (fl)	72- 84
MCH (pg)	25- 29
MCHC (%)	32- 36
RDW- CV (%)	11.6- 14.0
RDW- SD (fl)	35- 45
WBC (10^3/cumm)	6- 16
PLT (Lakh/ cumm)	2- 5.5
Total	100

Morphological typing is verified with RBC indices of same EDTA sample run on automated analyzer typing based on RBC indices and RDW. Along with this, Reticulocyte count was done and correlated with morphological typing of anemia.

Clinico - hematological profile was studied with the tools of clinical features, physical examination and values pertaining to hematological parameters and PBS findings.

3. Results

In overall 144 cases, majority of cases are of micorcytic hypochromic anemia (53%) followed by dimorphic anemias (21%) and normocytic normochromic anemias (16%). Macrocytic (6%) and Hemolytic (4.1%).

Mean age of pregnant women to be affected by anemia came out to 29 years. In 26 – 30 years age group females (35.4%) were in high proportion as compared to other age groups. Multigravida dominated the study population 93 (64.58%) followed by 51 cases (35%) of primigravida.
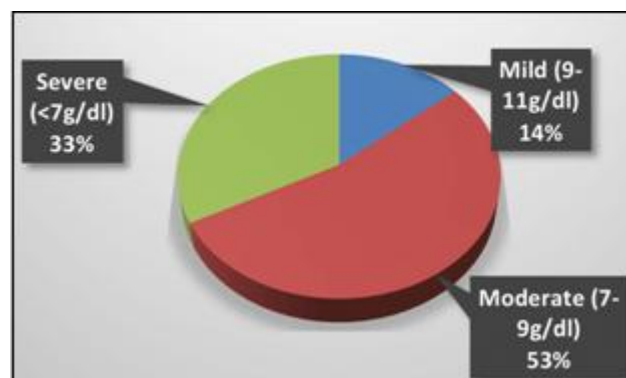
Mild & Moderate cases dominated the study population 77 pregnant female having hemoglobin level between 7g/dl to 9g/dl.
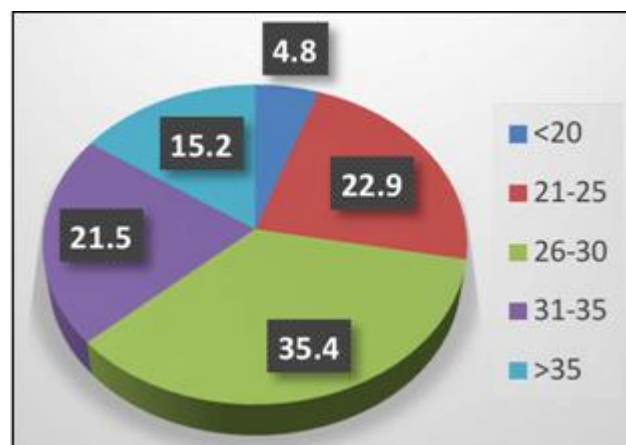
Figure: Distribution of Cases
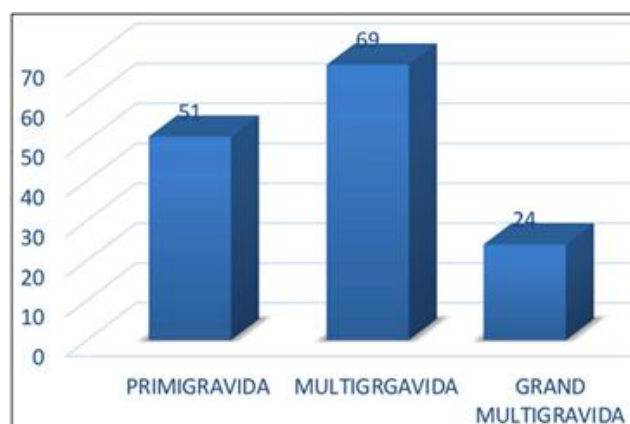
Figure 2: Distribution of case according to gravida

Figure 3: Distribution of cases according to degree of severity of Anemia

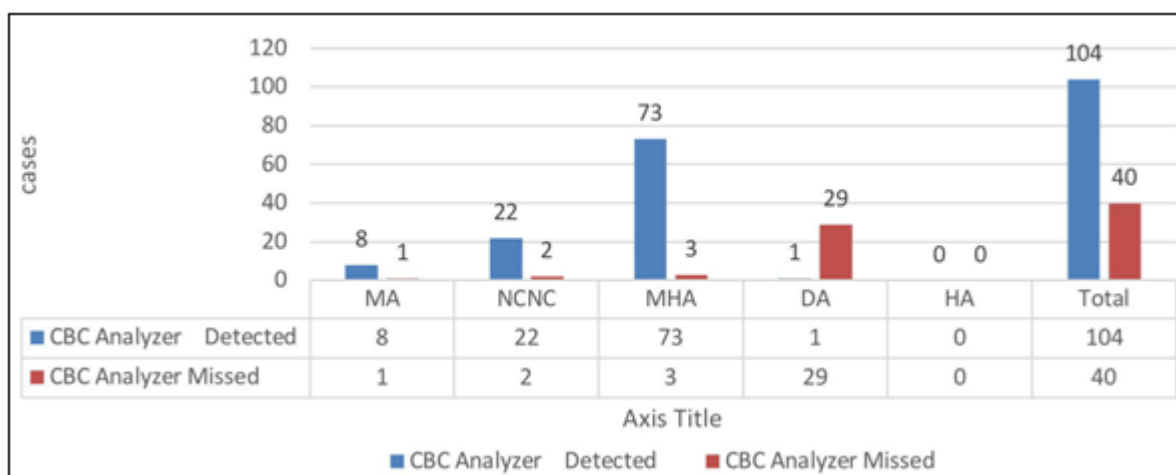**Table 3:** Morphological spectrum of anemia Using PBF examination overall in this study

PBF Typing	No. of cases	%
Normocytic Normochromic	23	16
Dimorphic	30	20.8
Hemolytic	6	4.1
Macrocytic	9	6
Microcytic Hypochromic	76	52.7
Total	144	100

Analyzer Typing	No. of cases	%
NCNC+ N RDW	19	13.2
NCNC+ R RDW	3	21.5
Macrocytic	8	5.5
MHA + N RDW	13	9
MHA+ R RDW	73	50.6
Total	144	100

Table 5: Morphological spectrum of anemia across 3 Trimester

TBF Typing	1st Trimester		2nd Trimester		3rd Trimester	
	N	%	N	%	N	%
DMA	2	2.1	12	8.3	16	11.1
HA	0	00	2	2.1	4	2.8
MA	0	0	4	2.8	5	3.5
MHA	8	5.6	24	17	45	31.3
NCNC	3	2.1	10	7	09	6.2
Total	13	100	52	100	79	100

Table 5: Shows morphological spectrum across different trimesters indicate majority of cases are microcytic hypochromic anemia (MHA) followed by dimorphism. Hemolytic cases are present only in 2nd & 3rd trimesters.

Clinical Examination of pregnant females shows with the progression of anemic pregnancy health symptoms of anemia worsens. Major issues related to anemia in pregnancy are pallor, weakness, palpitations, pedal edema and pica.

Table 6: Clinical features finding in overall patients

Clinical Features	1st Trimester		2nd Trimester		3rd Trimester	
	N	%	N	%	N	%
Pallor	1	7.63	38	26.38	67	46.52
Weakness	4	2.77	21	14.58	44	30.55
Palpitation	4	2.77	20	13.88	25	17.33
Pica	6	4.16	25	17.36	33	22.91
Pedal Edema	5	3.47	29	20.1	38	26.38

Figure 4: Concordance in PBF and CBC analyser

4. Discussion

In this study, correlation among peripheral and RBC indices - based typing was found to be in 104 cases out of 144 cases which came out as 72.3 % and discordance existed among remaining 40 cases (27.7%).

The first preliminary and very important step is to classify the anemias morphologically using peripheral blood examination for diagnosis and management of patients. Based on the PBF examination, we found that microcytic hypochromic anemia 76 cases (52.7%) followed by dimorphic anemia 30 cases (20.8%), normocytic normochromic anemia 23 cases (16%), macrocytic anemia 9 cases (6%) and lastly hemolytic anemia 6 cases (4.2%).

Simultaneously, RBC indices - based analyzer typing is also done, majority of cases are of microcytic hypochromic anemia with raised RDW (50.6%) followed by normocytic normochromic anemia with raised RDW (13.2%), macrocytic anemia (5.4%), normocytic normochromic anemia with normal RDW (21%) and microcytic hypochromic anemia with normal RDW (9%).

Paul Froom et al [11] studied 39, 759 cases and found that peripheral blood smear examination provided additional information in 13.9 % of the cases. The present study showed similar results with 27.7 % of cases having additional information provided by peripheral blood smear examination.

While in current study 53.47% cases are of moderate anemia followed by 32.63% of the cases of severe anemia and 14% mild cases.

Results are in contrast to **Dr. S. S Mega Samlyet al (2019) 12,** he compared the CBC analyzer and PBF examination in 110 anemic samples, found that majority of females showed severe anemia (44.5%) followed by moderate in 42.8% and mild in 12.7% cases. As maternal anaemia is associated with enhanced risk of still birth, neonatal deaths and LBW. The risks increased if anaemia and underweight were present simultaneously. **Andrade C. et [13]** al found that maternal anemia during pregnancy is associated with other adverse gestational outcomes.

Given that anemia is common during pregnancy, and that iron deficiency during pregnancy can compromise neuro -

development in the offspring, So proper nutrition and ante - natal checkup is necessary.

5. Conclusion

In this prospective study, morphological spectrum of anemia is studied in pregnant women found that microcytic hypochromic anemia is more prevalent in pregnancy followed by dimorphic and normocytic normochromic anemia. Peripheral blood examination enables us to visualize morphologically all abnormal RBCs which leads to a correct diagnosis of anemia with the help of Reticulocyte count and clinical features.

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