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IRON DEFICIENCY ANEMIA;

RED CELL DISTRIBUTION WIDTH (RDW) AND RED CELL INDICES IN THE PREDICTION OF AMONG HEALTHY WOMEN IN THIRD TRIMESTER OF PREGNANCY.

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ABSTRACT… Objectives: To determine the importance of the RDW and other red cell indices (MCV, HBG) in the prediction of iron deficiency anemia in third trimester of pregnancy in a tertiary care hospital of Peshawar. **Design:** Cross sectional study. **Setting:** OPD Department of Gynecology and Obstetrics Postgraduate Medical Institute, Lady reading Hospital (PGMI-LRH) Peshawar. Period: 1st August 2012- 10th Dec 2012. **Material and Methods:** A Total of 152 women attending the centre were included. Necessary information's were recorded on the questionnaire prepared in accordance with the objectives of the study. **Results:** A total of 152 women in their third trimester presenting to Gynecology and obstetrics department of Lady reading hospital Peshawar. The age range of the patient was from 20 years to 55 years with mean age of 33±3.4years.Out of total 27(18%) were primagravida. Majority of the cases 118(77.6%) were from Peshawar, 9% from charsadda, 8% nowshera etc. We also received 2 patients 1.2% from Afghanistan. Regarding financial status 57 %(87) females were in upper Class (i.e. income >20000/month) on recall. Of total 81(53%) of the females were having hemoglobin less than 11g/dl and 22% of the women had HCT<32% which as per criteria of the WHO were anemic at the time of presentation. While 29(19%) patients had low value of MCV (microcytic). Fifty five patients (36.2%) had RDW CV(%) more than 15% which points more towards the microcytic nature of anemia and more anisocytosis. **Conclusions:** Fifty five patients (36.2%) had RDW CV(%) more than 15% which points more towards the microcytic nature of anemia. While 29(19%) patients had low value of MCV (microcytic). Increased RDW is best indicator for the detection of iron deficiency anemia than MCV. Increased RDW even in the presence of normal MCV can be an early signal for iron deficiency anemia in pregnacy. Hence RDW is more reliable indicator for iron deficiency especially in pregnancy. Changes in RDW in last trimester is more significant that MCV.

Key words: RDW, MCV, HBG, Peshawar

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INTRODUCTION

Iron deficiency anemia is the common problem during pregnancy. Detection of iron deficiency early during pregnancy can reduce maternal and child mortality and morbidity. Red cell distribution width is a new routine parameter in fully automated hematology analyzer that can give the idea of early iron deficiency before other test. It gives the idea of red cell size variation which is the earliest morphologic changes in iron deficiency anemia. In prelatent and latent stage of iron deficiency MCV are normal. Whereas in latent stage Red Cell Distribution Width (RDW) would be expected to increase because of a microcytic population of cells appears in the blood[1]. The red blood cell distribution width (RDW or RCDW) is a measure of the variation of red blood cell (RBC) volume that is reported as part of a standard complete blood count. Usually red blood cells are a standard size of about 6-8 µm. Certain disorders, however, cause a significant variation in cell size. Higher RDW values indicate greater variation in size. Normal reference range in human red blood cells is 11–15%. If anemia is observed, RDW test results

are often used together with (MCV) results to determine the possible causes of the anemia. It is mainly used to differentiate an anemia of mixed causes from an anemia of a single cause[2]. RDW is elevated in accordance with variation in red cell size (anisocytosis), ie, when elevated RDW is reported on complete blood count, marked anisocytosis (increased variation in red cell size) is expected on peripheral blood smear review.

The reference range for RDW is as follows:

- RDW-CV 11-15% in adult[3]
- RDW-SD 39-46 fl[3]

Low MCV and high RDW-CV are the characteristic changes of iron deficiency anemia in pregnancy. It is recommend using of RDW and MCV in the initial classification of anemia in pregnancy[4]. If HCT (hematocrit) and HGB(hemoglobin) are low and RDW is high this means that there is a sparse amount of oxygenated blood in your system. Red blood cells actually get bigger to collect more oxygen to carry around your system. Red cell distribution width (RDW) could be a reliable index of anisocytosis with the highest sensitivity to iron deficiency[5]. The anisocytosis is observed in the automated hemogram through two parameters: RDW-CV Red Blood Cell Distribution Width measured by Variation Coeficient) and RDW-SD the same measured by Standard Deviation), which are calculated from the mean corpuscular volume (MCV), which represents the average size of erythrocytes. Together, the two parameters RDW and MCV may help in the differential diagnosis of various diseases, particularly certain types of anemia[6]. The rise in the RDW in the last trimester is significant than MCV1. The rise in the RDW is predictor of iron deficiency anemia in pregnancy.

Present study was conducted to determine the importance of RDW-CV and other RBC indicators in the detection of iron deficiency anemia in pregnancy especially in the third trimester.

METHODS

This was a cross sectional study conducted in the department of Gynecology and obstetrics Postgraduate Medical Institute, Lady reading Hospital (PGMI-LRH)Peshawar, from 1st August 2012- 10th Dec 2012.

This study was conducted through convenient (Non-Probability) sampling. A total of 152 women in their third trimester attending the Gynecology OPD of a Post graduate medical institute Lady Reading Hospital were included.

Inclusion criteria were all clients/women irrespective of symptomatology or cause for attending the Gyne/Obstetrics OPD, in their third trimester presenting to the Gynecology OPD were included.

Exclusion criteria were all cases those are post-natal or patients with other gynecological disorders (like patients with tumors of the female genital tracts, fibroids or other associated disorders. Similarly women in their first and second trimester were excluded. Similarly patient taking regular iron pills were also excluded.

Blood samples were collected from these women. The technique for the blood sampling collection was to collect three ml of venous blood by veine-puncture using disposable syringes under aseptic techniques. The blood was added in an EDTA vacutainer at concentration of 1.5mg/ml and mixed gently. Complete blood count was calculated on hematology analyzer. Anemia was labeled when the pregnant women had a hemoglobin level of < 11 g/dl in accordance with the definition of World Health Organization. Anemia was further categorized as mild, moderate and severe according to the following criteria[7].

Similarly the preliminary information's of the women regarding, age, sex, gravid, para, address, weight and socioeconomic status were recorded on the questionnaire. The data was analyzed using MS-Excel program for outcome.

RESULTS

A total of 152 women in their third trimester presenting to Gynecology and obstetrics department of Lady reading hospital Peshawar. The age range of the patient was from 20 years to

55 years with mean age of 33+3.4years. Mode of age was 30 years (table I). Forty one (27%) females were in Gravida 3 status at the time of presentation. 27(18%) were in G1 and G2 each. Majority of the women attending clinic were in age range 25-34 years 63.5%. 9.2% were in age range 20-24 years (Table I).

Age range	Number	%age
20-24	14	9.2
25-29	47	30.9
30-34	50	32.9
35-39	22	14.5
40-44	11	7.2
45-49	07	4.6
50-55	01	0.7
Grand Total	152	-

Table-I. Age range of the patients.

118(77.6%) were from Peshawar. 9% from charsadda, 8% nowshera and vice versa. We also received 2 patients 1.2% from Afghanistan table II.

Address	Number	%age
Afghanistan	02	1.3
Charsadda	14	9.2
Khyber Agency	02	1.3
Kohat	01	0.7
Malakand	01	0.7
Mohmand Agency	01	0.7
Nowshera	12	7.9
Peshawar	118	77.6
Swabi	01	0.7
Grand Total	152	-

Table-II. Belongings of the respondents.

Regarding socioeconomic status 87 (57%) females were Upper Class(with income >20000/month) on recall(table III). Of total 81(53%) of the females were having hemoglobin less than 11g/dl which as per criteria of the WHO fall in anemic group at the time of presentation. In our study 24% of the women had HCT <32%.(Table IV & V). While 29(19%) patients had low value of MCV (microcytic) table VI. Fifty five patients (36.2%) had RDW CV(%) more than 15% which points more towards the microcytic nature of anemia.

Socioeconomic status	Number	%age
Lower class (<5000/month)	38	25
Middle class (5000-20000/month)	27	17.8
Upper class (>20000/month)	87	57.2
Grand Total	152	-

Table-III. Financial status.

HB Ranges	Number	%age
4-5	01	0.7
5-6	03	2.0
6-7	01	0.7
7-8	02	1.3
8-9	13	8.6
9-10	11	7.2
10-11	50	32.9
>11	71	46.7
Grand Total	152	-

Table-IV. Hemoglobin ranges.

DISCUSSION

Red cell distribution width is a new routine parameter in fully automated hematology analyzer that can give the idea of early iron deficiency before other test. It gives the idea of red cell size variation which is the earliest morphologic

HCT Range	Count of Name	%age
17-22	03	2.0
22-27	08	5.3
27-32	26	17.1
32-37	54	35.5
37-42	44	28.9
42-47	12	7.9
47-52	01	0.7
>52	04	2.6
Grand Total	152	-

Table-V. HCT findings.

MCV Range	Number	%age
28-38	03	2.0
48-58	01	0.7
58-68	13	8.6
68-78	12	7.9
78-88	51	33.6
88-98	65	42.8
98-108	07	4.6
Grand Total	152	-

Table-VI. MCV Studies

changes in iron deficiency anemia. In prelatent and latent stage of iron deficiency MCV are normal. Whereas in latent stage Red Cell Distribution Width (RDW) would be expected to increase because of a microcytic population of cells appears in the blood. In present study 81(53%) of the females were having hemoglobin less than 11g/dl and 22% of the women had HCT<32% which as per criteria of the WHO were anemic at the time of presentation. A local study reported that the prevalence of anemia (defined by the World Health Organization as hemoglobin < 11.0 g/dL) in the study subjects was 90.5%; of these, 75.0% had mild anemia (hemoglobin from

RDW CV%	Count of Name	%age
11	04	2.6
12	15	9.9
13	42	27.6
14	36	23.7
15	24	15.8
16	08	5.3
17	05	3.3
18	08	5.3
19	04	2.6
20	03	2.0
25	01	0.7
28	01	0.7
-	01	0.7
Grand Total	152	

Table-VII. RDW CV % values.

9.0 to 10.9 g/dL) and 14.8% had moderate anemia (hemoglobin from 7.0 to 8.9 g/dL). Only 0.7% were severely anemic (hemoglobin < 7.0 g/ dL)[8].

We also found that 29(19%) patients had low value of MCV (microcytic). Fifty five patients (36.2%) had RDW CV(%) more than 15% which points more towards the microcytic nature of anemia and more anisocytosis. 27 patients 17%) had RDW SD>46%. This point is of great interest that RDW values 36% versus MCV 19%. RDW helps in early detection of the iron deficiency and can detect even very small change in the size of the RBC prior than noted on MCV findings. A high RDW values more significant in diagnosis of microcytic nature of the RBC. Further it is then correlated with other RBC indices like HBG, MCV and RBC count. The same has been reported in various studies. In a study RDW had sensitivity 82.3% and specificity 97.4%. Whereas MCV, MCH and MCHC had 29.2%, 68.1% and 15% sensitivity but specificity was 98.7%, 83.1% and 96.1% in the detection of

iron deficiency. Iron deficiency anaemia without other complicating disease could be screened out early by increased RDW when RBC indices were normal[1]. Another study found that there is a uniform increase in RDW in all cases of microcytosis. This increase always precedes prior to the changes in other indices like MCV, HBG and RBC count[9]. A study reported that hemoglobin level < or = 9.7 and a red cell distribution width (RDW) > or = 15 (in gestational age <20 weeks) predicted iron deficiency with high specificity[10]. If we can't investigate a lady for more expensive investigation these two tsts are very simple and can be conducted to predict the anemia in pregnancy in early stages. Iron deficiency anemia can be predicted in pregnancy using lower cost tests, which could be an incredibly useful tool in areas with limited resources and a high prevalence of the disease.

There is significant rise in the values of the RDW in the third trimester of pregnancy. These changes are significant than other RBC indicator. A study was conducted to see the changes in RDW between and within women changes in RDW with progression of pregnancy. The unexpected rise in the RDW during the last 4-6 weeks leading up to the onset of labor suggests increased bone marrow activity. The stimulus is unknown, but as RDW changes are highly significant there may well be a useful indicator of impending parturition. They found that RDW increased significantly (P<0.0001) between 34 weeks of gestation and the onset of labor[3]. Another study conducted on red cell distribution width (RDW), and mean corpuscular volume (MCV) in a group of healthy pregnant women at 12, 16, 20, 24, 28, 32 and 36 weeks gestation and during the latent phase of labor (39.04 +/- 1.5 weeks). They reported that MCV increased constantly during pregnancy; however, the increase was not statistically significant. RDW increased significantly at the 20th week, remained at high levels until the 32nd week and thereafter declined towards the delivery and the rise was statistically significant[11].

Hence from the discussion we concluded that RDW is best indicator for prediction of iron deficiency anemia in pregnancy. RDW must be correlated with other RBC indices to make the findings more reliable and confirmatory. The rise in the RDW in the last trimester nad near delivery is more significant that changes in MCV for diagnosis of iron deficiency anemia in pregnancy. It is recommended to conduct RDW, MCV and HBG in the antenatal care centers for early diagnosis of the anemia. These tests are affordable and reliable.

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