

Evaluation of Hematological Parameters of Sudanese Pregnant Women attending at Omdurman Al Saudi Maternity Hospital

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ABSTRACT

Background: There are subtle and substantial changes in hematological parameters during pregnancy and the puerperium total blood volume increases by about 1.5 liter mainly to supply the needs of the new vascular bed (Taylor, 1979). Pregnant places extreme stresses on the hematological system and understanding of the physiological changes that result as obligatory in order to interpret any need for therapeutic intervention. (William and Cindy 2005). Iron deficiency is the most common cause of anemia in pregnancy (Odekule 2010). As consequences various quantitative and qualitative hematological changes occur during pregnancy including cell counts, hemoglobin levels, hematocit, leucocytes, thrombocytes, red blood cells indices, morphological changes and reticulocyte production index. (Lewis *et al.* 2001).

Methods: This a case control study in which 100 pregnant women were enrolled as study group and 50 non pregnant healthy women as control subjects. The study was conducted at Omdurman Al Saudi Maternity Hospital in period from 5/3/ 2011 to 6/6/ 2011 to evaluate hematological parameters of Sudanese pregnant and to establish classification of anemia's on bases of complete blood count (CBC), reticulocyte production index (RPI) and peripheral blood picture.

Results: The study revealed that there were significant decreased in RBCs count, hemoglobin (Hb) and packed cell volume (PCV) of pregnant women compared to non pregnant women (P value <0.05) and significant decreased in mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) of pregnant women (P value <0.05). TWBCs count was increased significantly (P. value < 0.050) in contrast platelets count significantly lower than the normal control (P. value <0.05). On bases of blood picture we classified anemia's of pregnancy as normocytic normochromic 37 (37%) with RPI mean value of 0.49 ± 0.2 , microcytic hypochromic 52 (52%) with RPI mean value of 0.76 ± 0.6 , and dimorphic picture 11 (11%) with RPI of mean value 2.1 ± 0.8 .

Conclusion: We observed significant decreased in RBC count, hemoglobin, PCV, red cell indices and platelet count during pregnancy and significant increased in leukocyte count of pregnant women when compared to non pregnant women. We found the most common type of anemia among Sudanese pregnant women is microcytic hypochromic type and likely to be of iron deficiency second class is normocytic normochromic type, and less of occurrence type is dimorphic picture types with increased reticulocyte production index results from prophylaxes iron response.

Keywords: Complete blood count (CBC), Packed cell volume (PCV), Mean Corpuscular volume (MCV), Mean corpuscular hemoglobin (MCH), Mean Corpuscular hemoglobin concentration (MCHC), Reticulocyte production index (RPI)

INTRODUCTION

The majority of pregnant women with hemoglobin values of less than 10

gm/dl are suffering from iron deficiency anemia the demands of previous pregnancies render women especially

prone to iron deficiency, particularly when the interval between pregnancies is short (Firki *et al.* 2002). Physiological anemia is the term often used to describe the fall in hemoglobin concentration that occurs during normal pregnancy results from plasma volume increases above normal by the end of gestation although the red cell mass itself increases by some and still leads to a fall in hemoglobin concentration with a feature of normocytic and normochromic type of anemia (Hoffbrond *et al.* 2003). Iron deficiency and megaloblastic anemia's during pregnancy result from inadequate intake of folate and iron to meet the increase requirements of pregnancy. The prevalence of megaloblastic anemia among pregnant is varies in different populations, apparently depending on the nutritional status of the population in well nourished communities, (Firki *et al.*, 2002). It is hard to define a normal reference range for Hb during pregnancy and the limit for diagnosing anemia. The World Health Organization has suggested that anemia is present in pregnancies when Hb concentration is less than 11 g/dL. However, Red cell count and PCV values are likewise lower in pregnancy, but the other red cell indices changes little, although red cells show more variation in size and shape than in the non-pregnant state. (Milman *et al.*, 2007). White cell count increased during pregnancy with a typical reference range of 6×10^9 – 16×10^9 /L, only WBC more than 16×10^9 /L is considered abnormal (Edlestam *et al.*, 2001). By 4 weeks post-delivery, typical WBC ranges are similar to those in healthy non-pregnant women (4×10^9 – 10×10^9 /L). There has been much discussion about the normal ranges for the different types of white cells (Valdimarsson *et al.* 1983). Neutrophils contribute most to the overall higher WBC (Edlestam *et al.*, 2001). Leucocytosis relatively constant throughout gestation, markedly elevated in the hours after delivery (up to $23 \times$

10^9 /L) and back to non-pregnant values by 4 weeks post-partum. Typical pregnancy range for lymphocyte count is 1.1×10^9 – 2.8×10^9 /L, compared with the non-pregnant reference range 0.8×10^9 – 4.0×10^9 /L. Lymphocyte count is restored to normal range by 4 weeks after delivery (Firki *et al.* 2002). Myelocytes and metamyelocytes may be found in the peripheral blood film of healthy women during pregnancy and do not have any pathological significance. Platelet count decreases during pregnancy, particularly in the third trimester reported by Boehlen *et al.* 2000 termed "gestational thrombocytopenia." found to have a platelet count of less than 150×10^9 /L late in pregnancy (Anne Stiene *et al.*, 1998). None pregnant woman had complications related to thrombocytopenia and none of their babies had been affected (Levy and Murphy., 2002) (Beilin *et al.*, 2006). Thus, it has been recommended that the lower limit of platelet count in late pregnancy considered to be up to 115×10^9 /L reported by Vincelot *et al.* 2001.

MATERIALS AND METHODS

This a case control study was conducted at Omdurman Al Saudi Maternity Hospital during the period 5/3/ 2011 to 6/6/ 2011 to evaluate hematological parameters and to establish classification of anemia's of Sudanese health pregnant women. 2.5 ml of venous blood was collected from each pregnant and non pregnant woman under sterile condition and drained into E²DTA container with (Lewis *et al.*, 2006) complete blood count was estimated using automated hematological analyzer Sysmex 21.

Peripheral thin blood films were prepared and stained by Leishman stain for red cells morphological study. Some portion of red cells stained supravitaly in 1% cresyl blue stain and reticulocyt production indices were calculated. All obtained Data analyzed using statistical

package for social science (SPSS) version 11.5 using independent t test significant level set at (P value ≤ 0.05).

Ethical Considerations: enrolled pregnant women were informed about the study objectives; informed consent was obtained from each. personal information will be kept and not published or permute.

RESULTS

The study included 100 health pregnant women as study subjects with age mean 37 ± 3.0 years and 50 health non pregnant women as control subjects with age mean of 36 ± 4.3 years. There is no significant difference in age between study group and control group (P. value 0.372) – (Table 1).

Table1: Characteristics of the study population

| Pregnant women | non pregnant | P value |
|-----------------------------------|--------------|---------|
| Number | | |
| 100 | 50 | |
| Age group year (mean ± SD) | | |
| 37 ± 3.0 | 3 6 ± 3.4 | 0.372 |

Table shows the data of the age group mean ± SD for pregnant and non pregnant women

The mean of RBCs count, Hb and PCV were 3.7±0.6, 9±1.6 and 27.7±5 respectively for the study group, were significantly lower than control group (P value < 0.05) (Table 2).

Table 2: Hematological parameters of pregnant and nonpregnant women

| Parameter | Pregnant women | None pregnant women | P value |
|------------------------------|----------------|---------------------|---------|
| HB gm/dl | 9±1.6 | 12.0±0.7 | 0.001 |
| PCV % | 27.7±5 | 35.0±2.3 | 0.002 |
| RBC x10 ¹² /l | 3.7±0.6 | 4.2 ±0.3 | 0.002 |
| MCV /fl | 73.8±9.2 | 83.5±3.1 | 0.001 |
| MCH /pg | 24.4±3.4 | 28.6±1.6 | 0.001 |
| MCHC /gm/dl | 33±2.8 | 34.1±1.2 | 0.002 |
| RPI | 0.2±0.1 | 0.7±0.5 | 0.001 |
| WBC x10 ⁹ /l | 8.3±2.3 | 7.5±2.4 | 0.050 |
| Platelet x10 ⁹ /l | 212±65 | 260±66 | 0.001 |

The table shows the data as mean values ± standard deviation Significant (≤ 0.05) compared to control group (None pregnant women)

The mean of MCV was 73.8±9.2, MCH was 24.4±3.4 and MCHC was 33±2.8 were significantly lower than normal control (P. value <0.05) (Table 2). The mean of RPI of study group was 0.7±0.5 significantly higher than the mean of normal control was 0.2±0.1 (P. value 0.05) (Table 3). The mean of TWBCs count was 8.3±2.3 was significantly higher than control group (P. value < 0.050) the mean of platelets was 212±65 significantly lower than the normal control (P. value < 0.05) (Table 3).

Table3: Hematological parameters characterized pattern of anemia among pregnant women

| Parameter | Normochromic normocytic | Microcytic hypochromic | Dimorphic picture | Control |
|--------------------------|-------------------------|------------------------|-------------------|---------|
| HB gm/dl | 9.6±1.1* | 8±1.8* | 9.1±1.2* | 12±0.7 |
| PCV % | 29±3.6* | 26.2±0.7* | 26.6±3.3* | 35±2.3 |
| RBC x10 ¹² /l | 3.5±0.05* | 3.8±0.7* | 3.9±0.5* | 4.2±0.3 |
| RPI | 0.49±0.2 | 0.76±0.6 | 2.1±0.8* | 0.7±0.5 |

The table shows the data as mean values ± standard deviation.

* Significant (≤ 0.05) compared to control group (None pregnant women)

According to peripheral blood picture 37(37%) of study group were normocytic normochromic, 52(52%) were microcytic hypochromic and 11(11%) were dimorphic (Fig. 1).

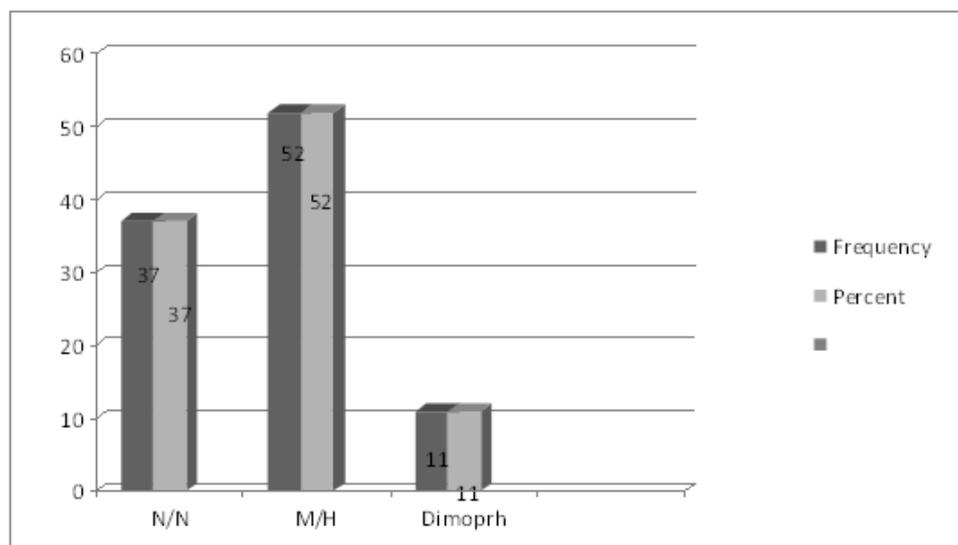


Fig. 1: Pattern of peripheral blood picture among study group- N/N = Normocytic and normochromic M/H = Microcytic and hypochromic.

The results related to normocytic normochromic showed the mean of Hb, RBCs, PCV and RPI were 9.6 ± 1.1 , 3.5 ± 0.5 , 29 ± 3.6 and 0.49 ± 0.2 . Microcytic hypochromic showed the mean of Hb, RBCs, PCV and RPI were 8.5 ± 1.8 , 3.8 ± 0.7 , 26.2 ± 5.7 and 0.76 ± 0.6 respectively. Dimorphic blood picture showed Hb, RBCs, PCV and RPI were 9.1 ± 1.2 , 3.9 ± 0.5 , 27.6 ± 3.3 and 2.1 ± 0.8 respectively.

DISCUSSION

Pregnancy causes significant changes in metabolism, fluid balance, organ function and blood circulation which are driven by estrogen and the presence of the fetus - placental unit. These dramatic changes influence a wide variety of hematological parameters. Acknowledgment of these changes is essential when interpreting the result of hematological investigation to diagnose or monitor illness in a pregnant woman. The study revealed significant decreases in RBCs count, Hb and PCV respectively

of pregnant women compared to non pregnant women (P value < 0.05). Also MCV, MCH and MCHC were significantly lower in pregnant women compared to non pregnant women (P value < 0.05). The findings are consistent with previous study which reported that the decreases in hemoglobin and red cell indices concentration are common findings during pregnancy and results from increased plasma volume combined poor iron intake (Bashiri, *et al.* 2003), (Ruchi *et al.* 2013). We found significant increased WBC count significantly higher compared to that of the controls. The finding is in agreement with previous study reported that total leukocyte count rising in early pregnancy and remained elevated through pregnancy. This may be as a result of the body building the immunity of the fetus and it is achieved by a state of selective immune tolerance, in the presence of a strong antimicrobial immunity. Similarly to the previous study reported that pregnancy leucocytosis, primarily

related to increased circulation of neutrophils in the second month of pregnancy (Rouse *et al.*, 1998).

Significant decreases in platelet count of pregnant women compared to non pregnant women (P.value<0.05) in agreement with study reported that: although platelet counts remain in the normal pregnant range in most women during uncomplicated pregnancies (Matthews *et al.*, 1990). mean platelet counts of pregnant women may be slightly lower than in healthy non pregnant women (Verdy *et al.*, 1997).

Peripheral blood picture of the study group revealed existence of three patterns of anemia's among pregnant women the majority was microcytic and hypochromic type of anemia 52(52%) with significant decreases in Hb, red cell count and PCV considered to be the highest type of anemia among pregnant women, second pattern is normocytic and normochromic type anemia was 37(37%) with significant decreases in Hb, red cell count and PCV is coming as second class, and third pattern is dimorphic picture type was 11(7.3%) with significant decreases in Hb, red cell count and PCV and significant increased RPI indicated effective of erythropoiesis which related to iron responses. Similar result reported in Pakistan by Khalil, *et al.*, 2007.

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ARABIC SUMMARY

تقييم دلالات مكونات الدم الكلية في النساء الحوامل السودانيات في مستشفى امدرمان السعودي للولادة

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المقدمة:

هذه دراسة وصفية تحليلية (حالة وحالة ضابطه) أجريت بمستشفى امدرمان السعودي للولادة في الفترة من الخامس من 2011/3/5 إلى السادس من 2011/6/6 وتهدف هذه الدراسة لتقييم دلالات مكونات الدم الكلية في النساء الحوامل.

طرق القياس:

حيث تم جمع مائة عينة دم ويريدي من النساء الحوامل في حاويات تحتوي مانع تجلط الدم K^2 EDTA كذلك تم جمع خمسين عينة دم من نساء غير حوامل كعينه ضابطه لقياس معدلات الدم الآتية : خضاب الدم، حجم كرات الدم الحمراء، عدد كرات الدم الحمراء، البيضاء والصفائح الدموية باستخدام جهاز قياس تحليل الدم الكلية الالى Sysmex21 وتم حساب قيم معدلات كرات الحمراء (Red cell indices) ومؤشر الخلية الشبكية (RPI). وتم عمل مسحة الدم الرقيقة لدراسة شكل وحجم كرات الدم الحمراء لتحديد صورة الدم المصاحبة لنمط فقر الدم عند النساء الحوامل

النتائج:

أوضحت الدراسة انخفاض في معدلات تركيز خضاب الدم وعدد وحجم كرات الدم الحمراء والصفائح الدموية في النساء الحوامل عند المقارنة مع المجموعة الضابطة بدلاله معنوية $P \text{ value} < 0.05$. بينما هنالك زيادة بدلالة معنوية في عدد كرات الدم البيضاء $P \text{ value} < 0.05$ ومؤشر الخلية الشبكية لفقر الدم ذي صورة الدم الثنائية **Dimorphic picture** كما أوضحت الدراسة حدوث ثلاث أنماط من فقر الدم في النساء الحوامل النمط الأكثر شيوعا فقر دم ذي كرات الدم الحمراء الصغيرة الباهتة 52 (52%) ثم ذي الكرات الطبيعية 37 (37%) والأقل تكرارا فقر الدم ذي صورة الدم الثنائية (11%) 11 نوصى بتحليل الدم العام وقياس الحديد قبل وبعد حدوث الحمل وعمل اختبارات خضاب الدم المرضى إذا كانت متوقعة في بعض الأحيان.