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# Puerperal haematological indices in the Nigerian

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#### Summary

Haematological indices were studied longitudinally in 84 healthy pregnant women at term and on days 1, 3, 5, 7 and 42 in the puerperium. Haemoglobin and haematocrit increased on day 1 after delivery, reduced on days 3 and 5 then started rising such that by day 42, the normal haemoglobin in African non-pregnant women was achieved. Leucocyte and neutrophil count increased significantly on day 1 but started falling thereafter and by day 5 the value had returned to normal. The lymphocyte, eosinophil and monocyte count did not show significant variation within the period of study. The platelet count in the primipara showed significant change on days 3 and 5. The variations in haemoglobin, haematocrit, leucocyte and platelet count in the puerperium were more marked in the primipara than the multipara and grandmultipara.

#### Résumé

Les indices hématologiques étaient étudiés longitudinalement à propos de 84 femmes enceintes en bonne état de santé et à terme, pendant le 1°, 3°, 5°, 7° et 42° jours dans le peurpérium. La hémoglobine et le Hématocrite ont augmenté le 1° jour après acouche-ment; ont diminué le 3° et 5° jours, et puis ils ont commencé à augmenté tels qu'au 42° jour, la hémoglobine normale dans la femme nigériane normale a été réalisée. Le nombre du leucocyte et du neutrophile a augmenté significativement le 1° jour mais il a commencé à diminuer après, tel que le 5<sup>c</sup> jour, la valeur est redevenue normale. Le recensement du lymphocyte, l'eosinophile et du monocyte n'a pas révélé de variation significative pendant la période d'étude. Le recensement des plaquettes sanguines dans la primipare a révélé un changement significatif pendant le 3° et le 5° jour. Les variations du recensement de la hémoglobine, du hématocrite, du leucocyte et des plaquettes sanguines dans le puerpérium étaient beaucoup plus marquées dans la primipare que dans la multipare et la grand multipare.

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#### Introduction

The haematological values in adult Africans have shown variation from caucasian values [1-7]. African women have lower haemoglobin (Hb), haematocrit (Hct), leucocyte and platelet counts than their caucasian counterparts.

The lower Hb and platelet count in the African may be due to malaria as well as other parasitic infections. It has been suggested that the use of medicinal herbs for the treatment of diseases in African community may be the cause of the reduced platelet count [3]. Studies on Africans of higher socio-economic class who have improved diet, less predilection to malarial attacks due to environmental factors and whose education have prevented them from the use of herbs have shown that they have similar Hb and platelet values as the caucasians [3, 7].

In pregnancy, Hb falls significantly from the first trimester to the third trimester. Leucocyte count increases while platelet count falls [8, 9]. The fall in platelet count may be due to haemodilution and increased platelet consumption [8].

The puerperium is a period when the changes that took place in pregnancy reverses and is usually within a period of days. Blood loss during delivery and in the puerperium varies in these women. Infections in the puerperium are commoner than in normal women. The haematocrit which is low in pregnancy decreases further in the first 5 days of the puerperium [10], plasma volume which is expanded in pregnancy [11] is further increased in the puerperium [12]. Taylor *et al* [10] reported that women on iron supplement in pregnancy and the puerperium had higher Hb values than those who were not treated with iron supplement in the puerperium.

This research was undertaken to provide basic haematological data in the puerperium in the Nigerian and the effect of parity on these values.

## Materials and methods

Eighty four healthy pregnant women at term attending Our Lady of Apostles Hospital, Jos were studied longitudinally in the puerperium. They were made up of 28 primipara, 28 multipara (2 - 3 pregnancies) and 28 grandmultipara (4 pregnancies and above). Two millilitres of blood was collected from them into sequestrene tubes containing EDTA as anticoagulant, at term and on days 1,3,5,7 and 42 postpartum. The subjects were bled at 8 a.m. before breakfast and tourniquet was applied to the forearm while ferrous sulphate 600mg and folic acid 5mg were given daily during pregnancy and the puerperium. Informed consent was obtained from the subjects. Haematological tests were performed within 2 hours of collecting the sample. Haemoglobin estimation was determined by cyanmethaemoglobin method and haematocrit by the micromethod. Two per cent acetic acid, coloured pale violet with gentian violet was used as diluting fluid for leucocyte count. Blood films were made and stained with Leishmans stain and 200 cells were counted for leucocyte differential. Ammonium oxalate was used as diluent for platelet count. Manual methods were used for the tests as previously described [13].

The results were compared using student's 't' test.

#### Results

Haematological indices were determined in 84 pregnant women at term and on days 1,3,5,7 and 42 in the puerperium. Twenty eight of them were primipara, 28 multipara and 28 grandmultipara. Macrocytosis associated with pregnancy was observed throughout the puerperium. Table 1 shows the values for the 84 women at term and in the puerperium (mean  $\pm$  1SD). the mean Hb at term was 118.8  $\pm$  8.5g/L but increased to 123  $\pm$  10.0g/L on day 1 and fell significantly to 108.2  $\pm$  17.2g/L on day 3 (P < 0.05). There was a steady rise from day 5 to 42. The Hct variation was similar to that of Hb. The leucocyte count at term was 6.660  $\pm$  1.610 x 10<sup>9</sup>/L and increased to 9.161  $\pm$  3.553 x 10<sup>9</sup>/L on day 1 (P < 0.001). The leucocyte values subsequently decreased such that by day 5 the leucocyte count was lower than the count at term.

The variations in neutrophil count were similar to that in leucocyte count. The lymphocyte count at term and in the puerperium did not show significant variation. Also the monocyte, eosinophil and platelet counts did not show significant variation during the period of study.

The Hb values for the primipara group at term did not change on day 2 but fell below these levels (P < 0.01) on day 3 and 5 returning to its previous values by day 7 postpartum. For the multipara group there was a significant decrease on day 3 (P < 0.01) followed by a significant increase (P < 0.05) by day 7 postpartum. The Hb of the grandmultipara group was greater (P < 0.05) on day 1 compared to its value at term. This was followed by a fall below these levels three days after delivery. These fluctuations shown in

Table 1: Puerperal haematological indices in the Nigerian at term and in the puerperium (Mean ± ISD)

Days	Hb g/L	PCV L/L	WBC	Neut	Lymph	Mono	Eos	Platelet
At	11.88	0.364	6.660	3.150	2.178	0.290	0.266	180.340
Term	±0.85	±0.026	±1.610	±1.458	±0.848	±0.173	±0.0205	±22.520
Day 1	12.35	0.377	9.161	5.506	2.240	0.363	0.278	111.220
	±1.00	±0.033	±3.553	±2.767	±1.208	±0.450	±0.033	±21.534
Day 3	10.822	0.324	8.057	4.439	2.207	0.337	0.372	190.00
	±1.71	± 0.56	±2.466	±2.291	±1.032	±0.058	±0.162	±36.808
Day 5	12.00	0.374	5.806	2.861	1.744	0.262	0.317	200.80
	±1.78	±0.073	±2.547	±2.272	±1.042	±0.214	±0.402	±47.452
Day 7	12.66	0.387	5.396	2.680	1.975	0.377	0.356	177.143
	±1.14	±0.036	±1.466	±1.332	±0.749	±0.582	±0.370	±28.412
Day 42	13.05	1.396	5.368	1.816	2.655	0.263	0.376	190.00
	±1.09	±0.038	±1.667	±0.831	±1.006	±0.150	±0.255	±36.588

$$* x 10^{9}/L$$

Fig. 1A also show variations between the groups. Thus, the Hb value for the grandmultipara was less than the value in the multipara (P < 0.05) at term with subsequent values not differing significantly from the other groups.

Haemoglobin values of the primipara group was less than the values of the grandmultipara group on day 1 and 5 (P < 0.05). The most marked change observed for Hb values was its reduction, whose peak effect was observed three days after delivery for each of the 3 groups.

The platelet counts for the 3 groups did not differ from each other (P < 0.05) at term. For the primipara, the platelet counts on days 3 and 5 were significantly higher (P < 0.05) than the values at term and the rest of the puerperium and was also greater than the corresponding day 3 and 5 values (P < 0.05) for the multipara and grandmultipara groups (Fig. 1B). The figure also shows that there were fluctuations in the values recorded with time for the multipara or grandmultipara groups although such variations were not significant (P > 0.05). Thus platelet counts for each of the groups on day 42 did not differ from their values at term while the most marked change in platelet count was the increase observed for the primipara group on days 3 and 5.



Fig.1: Mean ( $\pm$  SEM, n = 28 in each group) haemoglobin (A) and platelet count (B) measured at term. T or days 1, 3, 5, 7 and 42 after delivery for Primipara (-o-); Multipara (-o-); Grandmultipara (-\Delta-).

(A) Ordinate scale: Haemoglobin (g/L). Note the marked fall on day 3 for all the groups. (B) Ordinate scale: Platelet count (x  $10^{9}/L$ ).

\*P < 0.05 Primipara compared to Multipara

P < 0.05 Primipara compared to Grandmultipara

\*P < 0.05 Multipara compared to Grandmultipara by student's unpaired *t*-test.

The leucocyte count for the primipara at term was less than the counts on day 1 and 3 postpartum (P <0.01) but greater than the count on day 7 and 42 (P <0.05). This fluctuation was very marked (Fig. 2A). The leucocyte count for the multipara did not vary appreciably, with only the count on day 7 being significantly different (P < 0.05) from the other values. For the grandmultipara group there was an initial increase in the leucocyte count which was followed by a fall from day 3, the variations were not significantly different from each other. When changes in the leucocyte count for the 3 groups were compared, the most marked change was the large increase for the primipara group on days 1 and 3 after delivery which were markedly greater than the counts for the multipara and grandmultipara groups (Fig. 2A). Also the values above day 7 were below the previous ones although these reductions were not always significant.



Fig.2: Mean leucocyte (A) and Neutrophil (B) counts at term T or 1, 3, 5, 7 and 42 days after delivery for Primipara (-o-, n = 28); Multipara (-o-, n = 28); Grandmultipara (- $\Delta$ -, n = 28). The vertical bars represent the s.e. mean. Note the marked increase for primipara group 1 day after delivery.

(A) Ordinate scale: Leucocyte count  $(x \ 10^9/L)$  (B) Ordinate scale: Neutrophil count  $(x \ 10^9/L)$ .

\*P < 0.05 Primipara compared to Multipara

P < 0.05 Primipara compared to Grandmultipara

Figure 2 shows that the pattern for changes in neutrophil counts appear similar to those for the leucocyte counts. Thus the most marked change was the increase in neutrophil count on day 1 compared to the value at term of the corresponding values for multipara and grandmultipara groups (P < 0.01). Be-

yond day 1, the neutrophil counts progressively fell but did not differ significantly between the groups.

## Discussion

The Hb value in African females is lower than the value in caucasian females [5,6]. Platelet counts in African adults are lower than in the causasian[3,6]. In pregnancy the Hb values and platelet counts fall significantly while the leucocyte count is increased[8-10]. The fall in Hb and platelet count has been attributed to the increase in plasma volume seen in pregnancy[11, 12, 14] and is further increased in the first four days postpartum. The placenta provides more granulopoietin which may be responsible for the high leucocyte count in pregnancy[15].

The Hb value at term in this report increased on day 1 postpartum but fell markedly by the third day. Thereafter there was sustained increase, such that the value on day 5 was similar to that of day 1 and by day 42 the normal Hb value in African women had been achieved. This trend is similar to the finding in a previous report in which an increase in Hb on day 1 and a progressive fall till day 4, was observed[9]. However, they found that their subjects by day 42, did not achieve normal adult Hb value. The increase in Hb on day 1 may be due to dehydration as pregnant women are not allowed food or drink once they go into labour to avoid aspiration in case they require caesarean section. The fall in Hb in days 2 and 3 is due to plasma volume expansion which occurs rapidly in this period[11, 14]. The sustained increase in Hb from day 4 to 42 is due to a fall in hormones secreted during pregnancy which were responsible for the haemodilution.

The leucocyte count at term of  $6.660 \pm 1.610 \text{ x}$ 10<sup>9</sup>/L is within the upper limit of normal in Africans[1,2,4,6]. Taylor et al[9], reported a leucocyte count of  $10.18 \pm 1.51 \times 10^{9}$ /L at term which is the upper limit of normal in caucasian populations[12]. The leucocyte count on day 1 postpartum increased to 9.161  $\pm$  3.553 x 10<sup>9</sup>/L, a 31% increase which is similar to an increase of 32% on day 1 in a previous report[9]. This increase in leucocyte count may be due to the stress induced by labour. The leucocyte count fell rapidly such that by the fifth day postpartum, the value was similar to the value in non-pregnant women and did not show any significant variation thereafter. The rapid fall in leucocyte count may be due to the removal of stress induced by labour and loss of granulopoietin secreted by the placenta[15]. The neutrophil count variations were similar to that of the leucocyte count and were in fact responsible for the variations in leucocyte count as

the lymphocyte, monocyte and eosinophil did not show significant variations within the period of study.

The lowest platelet count was recorded on day 1 and this may be due to increased consumption of platelets to arrest bleeding at the site of placental separation from the uterus. The platelet count showed variations in the 3 groups but the significant variation was that, the platelet count for the primipara may be an attempt to arrest further blood loss as the Hb values were lowest on days 3 and 5.

Leucocytosis postpartum was more marked in the primipar than the other groups. So also was the neutrophil count particularly on days 1 and 3, but were similar to the other groups by day 7 and 42. The haematological values in African women though different from caucasian values show the same degree of variations in pregnancy and the puerperium.

Manual methods were used for all the haematological investigations and errors associated with manual methods have been extensively reviewed [12]. In Nigeria, manual methods are mainly used for haematological investigations.

#### Conclusion

The Hb, Hct and leucocyte values at term and in the puerperium show variations from the normal population. Leucocytosis is mainly due to neutrophilia. Platelet count in the primipara showed significant variation. The lymphocyte, eosinophil and monocyte count did not show significant variation within the period. The variations in Hb, Hct, neutrophil and platelet count were more pronounced in primipara than the multipara and grandmultipara.

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