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RESEARCH PAPER

COMPARATIVE STUDY ON PRE AND POST CAESAREAN SECTION HAEMATOLOGICAL PARAMETERS

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ABSTRACT

Haematological parameters have been noted as important indicators of health and hence, knowledge about its physiological and pathological is important. It is presumed that stress during caesarean section (CS) can have effect on some haematological parameters. This study therefore, is intended to investigate the effect of CS on some important haematological parameters in women booked for elective caesarean section. 10 women between the ages of 25 and 35, booked for this procedure, were involved in this study. Pre-and-Post CS blood samples were collected and analyzed using Haematology Analyzer (Swelab Alfa Automated) at St. Philomena Medical Hospital. The values were then keyed into statistical package (SPSS version 17) for statistical analysis. Results showed significant differences ($p < 0.05$) in the red cell count and some related RBC indices (hematocrit, hemoglobin concentration), platelet count and granulocyte values of the pre-and-post CS blood samples. Based on the findings of this study, it is obvious that stress during CS may cause some alterations in haematological profile of the CS mother. These differences in haematological parameters between pre and post CS may be due to the inflammatory processes and hemorrhage associated with the surgery.

Keywords: *Caesarean section, Stress, Surgery, Haematological parameters.*

INTRODUCTION

The rate of operative deliveries - both caesarean sections and instrumental deliveries (vacuum extractions and forceps), continues to rise throughout the world (Hamilton et al., 2009). Of interest however, is Caesarean section (CS); which is a surgical procedure involving incisions on a mother's abdomen and uterus to deliver one or more babies or to remove a dead fetus. According to Dencker et al. (2009) and Shields et al. (2007), the most common reasons for operative deliveries in nulliparous women are labour dystocia (failure to progress), and non-reassuring fetal status, while Laws et al. (2010) reported the most common reason in multiparous women to be previous operative delivery. By implication, this procedure is usually performed in case of obstructed labour, mal-presentation of the fetus (breech, brow and shoulder), in severe ante-partum hemorrhage (Barley, 2004) and when a vaginal delivery would put the baby's or mother's life or health at risk. However, in recent times, it has also been performed upon request for childbirths that could otherwise have been vaginal.

A 2007 World Health Organization (WHO) global survey into mode of delivery amongst 24 countries worldwide showed that the rate of all operative deliveries varied between 2.3% and 47.4%, with an average caesarean section (CS) rate of 25.7% throughout the countries involved (Souza et al., 2010). Worrying is the fact that CSs are associated with significant maternal morbidity including increased abdominal pain and postpartum haemorrhage

(Wang et al., 2010) coupled with the fact that pregnancies following CSs are associated with obstetric complications such as placenta praevia, placenta accreta and uterine rupture (Al-Zirqi et al., 2010; Hemminki 1996).

Hematological parameters have often been associated with health indices and are of diagnostic significance in routine clinical evaluation of the state of health (Patrick-Iwuanyanwu et al., 2010). Considering the modified fluidity of blood during numerous kinds of stress such as exercise (Brun et al., 1998; Brun, 2002; El-Sayed, 1998), labor (Brun et al., 1995), video film-induced emotional stress (Ehrly et al., 1986), and endogenous depression (Brun et al., 1987), this study was undertaken to study the changes in hematological parameters before and after caesarean section delivery.

MATERIAL AND METHODS

Sample size: Ten (10) pregnant women who were booked for elective caesarean section between the ages of 25-30 years in a private hospital in Benin City, Edo State, Nigeria, were involved in his study.

Subject sampling: Subjects were selected randomly from the booking list for a period of one month.

Exclusion criteria: Subject with hypertensive disease of pregnancy, diabetes and hemoglobinopathies e.g HbSS, were excluded for this study.

Procedure for blood sample collection: A rubber tourniquet was strapped on the subject's upper arm to occlude blood flow and to locate a vein at the cubital fossa. The area under the tourniquet was cleaned with cotton wool soaked with methylated spirit, while a sterilized syringe was carefully inserted into the vein to obtain blood sample. The plunger of the syringe was pulled and vacuum action draws the blood through the needle into an attached tube up to the 4ml mark and after that, the syringe was carefully removed. Half of the blood sample was transferred into an EDTA container and the other half into a container containing 3.8% of sodium citrate anti-coagulant. The blood sample collection was performed three to four hours before and after caesarean section.

Blood sample analysis: The following parameters were analysed using an Alfa autoanalyser (UK); Red Blood Cells counts (RBC), Mean Corpuscular Volume (MCV), Red Density Width (RDW%), Red Density Width (RDWa), Packed Cell Volume (PCV)/Haematocrit (Hct), Platelet count (PLT), Mean Platelet Volume (MPV), Platelet Density Width (PDW), Platelet Crit (PCT), Platelet Larger Cell Ratio (LPCR), White Blood Cells (WBC), Haemoglobin Concentration (HGB), Mean Corpuscular Haemoglobin (MCH), Mean Concentration Haemoglobin Concentration (MCHC), Lymphocyte (LYM), Granulocyte (GRAN), Mid Sized Cells (MID), Lymphocyte Percentage (LYM %), Granulocyte Percentage (GRAN %), Mixed Sized Density Percentage (MID %).

Blood analysis was performed using the Swelab analyser while Swelab Alfa diluent was used to clean the machine before and after use. The results were printed out and sent to a computer for review.

Statistical Analysis: All values were expressed in mean \pm SEM. Data were statistically analyzed using Student's t-test. A P-value of less than or equal to 0.05 was considered as significant.

RESULTS

Table 1 shows the comparative differences in Red Blood Cell count and related RBC indices in pre-caesarean and post-caesarean women. Variations in these parameters were observed. Specifically, there were significant reduction in HCT (%) and HGB (g/dl); significant increase in MCH (Pg) and MCHC (g/dl); and a non significant change in RBC ($\times 10^6/\mu\text{L}$), MCV (fL), RDWa (fL) and RDW% between the post-caesarean and pre-caesarean values.

Table 2 shows the comparative differences in the White Blood Cell count and other related WBC parameters of the pre-and-post caesarean women. There were significant increases ($p < 0.05$) in GRAN and GRAN%; a non significant increase in WBC and MID; and a non significant decrease in LYM, LYM% and MID% between the pre-and post caesarean values.

Table 3 shows the comparative differences in platelet counts and other related platelet parameters of the pre-and-post caesarean women. It was observed that PLT, MPV, PCT, PWD and LPCR increased in the post caesarean group compared to the pre-caesarean group. These differences in pre-caesarean and post-caesarean platelet indices were observed to be significant ($p < 0.05$).

Table 1: Red blood cell count and related parameters in pre-caesarean section and post- caesarean

Parameter	Pre-caesarean section	Post- caesarean section
RBC ($\times 10^6/\mu\text{L}$)	4.15 \pm 1.11	4.22 \pm 1.20
MCV (fL)	82.31 \pm 3.21	80.18 \pm 1.92
RDW _a (fL)	62.36 \pm 2.31	61.22 \pm 2.11
RDW%	11.91 \pm 1.71	11.44 \pm 0.56
Hct (%)	36.63 \pm 3.33	33.51 \pm 2.92*
HGB (g/dl)	13.11 \pm 1.74	11.29 \pm 1.63*
MCH (Pg)	20.73 \pm 1.13	23.11 \pm 1.05*
MCHC (g/dl)	25.29 \pm 2.19	27.71 \pm 3.17*

*p < 0.05 considered significant

Table 2: White blood cell and related indices in pre-caesarean section and post caesarean section

Parameter	Pre caesarean section	Post caesarean section
WBC($\times 10^3/\mu\text{L}$)	4.59 \pm 0.33	5.51 \pm 0.51
LYM	2.70 \pm 0.23	2.54 \pm 0.25
GRAN	1.48 \pm 0.15	2.53 \pm 0.36*
LYM%	58.89 \pm 1.66	57.58 \pm 2.76
GRAN%	35.36 \pm 2.71	46.11 \pm 2.67*
MID	0.41 \pm 0.06	0.44 \pm 0.08
MID%	7.77 \pm 1.40	6.61 \pm 0.93

*p < 0.05 considered significant

Table 3: Platelets parameters pre-caesarean section and post caesarean section

Parameter	Pre-caesarean section	Post-caesarean section
PLT ($\times 10^3/\mu\text{L}$)	186.70 \pm 21.36	199.10 \pm 18.54*
MPV	7.68 \pm 0.30	8.06 \pm 0.31*
PCT	0.14 \pm 0.02	0.15 \pm 0.02*
PWD	11.53 \pm 0.49	12.13 \pm 0.48*
LPCR	15.46 \pm 1.82	18.04 \pm 1.78*

*p < 0.05 considered significant

DISCUSSION

Pregnancy no doubt is an hemodynamic state with various hematologic, biochemical and anatomical adaptations. Haematological parameters are known to a large extent to reflect general health (WHO, 2004) and several studies have acknowledged that of pregnant women as one of the factors affecting pregnancy and its outcome (Klebanoff et al., 1991; Allen, 2000; Bothwell and Charlton, 1981). On the other hand, operative deliveries are associated with increased rates of maternal mortality, as well as increased rates of blood transfusions, hysterectomy and intensive care unit admissions when compared with spontaneous vaginal delivery (Souza et al., 2010).

In the present study, haematocrit and hemoglobin were observed to be higher in the pre-caesarean section phase than the post caesarean section phase. This finding is in agreement with an earlier report by Rajnee *et al.* (2010) who posited that hemoglobin concentration and other related indices decrease in post-caesarean section. However, some studies have reported that hemoglobin concentrations were not different in the pre-and-post-caesarean section (Loraine and Bell, 1963). The difference in haematocrit as shown in this study may be due to blood loss during the surgery and indeed, the reason for increased rates of blood transfusions and intensive care. In another study, RBC deformability was observed in most stressful events like labour (Brun et al., 1995), video film-induced emotional stress (Ehrly et al., 1986), and endogenous depression (Brun et al., 1987). However, these effects were not found at exercise when RBC rheology is investigated after resuspension of cells in a buffer, indicating that they are mostly due to plasma factors rather than to intrinsic RBC properties (Brun et al., 1995; Vandewalle et al., 1988).

On white blood cells and related parameters in pre and post caesarean phases, the present study showed that granulocyte and granulocyte percentage significantly increased in post CS compared to pre CS. Similar reports have been reported by Pathak et al. (1981) and Pohle (1939). Even Faas et al. (2000) did state that an increase in granulocyte count post-CS in comparison to pre-CS is due to increase in the number of neutrophils, which may probably have resulted due to blood loss. One may assert therefore, that the observed increase in granulocyte and granulocyte percentage might be due to the body's the response to blood loss during surgery and attempts to fight possible infections that may arise from it. In addition, the observed significant difference in platelet indices may also be associated with the blood loss/associated inflammatory-like process (Dixon et al., 1994).

Based on the findings of this study, it can be said that caesarean section causes an increase in hematocrit, hemoglobin concentration, platelet indices and granulocyte values. This observation may be due to inflammatory process following operative procedure in CS as well as the associated hemorrhage. It is therefore recommended that all pregnant women be hematologically optimized during ante natal clinics, because the fate of pregnancy in terms of route of delivery cannot be predicted. Moreover, these differences in haematological parameter in post CS compared to pre CS require further studies since CS have become an essential delivery option worldwide.

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REFERENCES

- Allen, L.H. (2000). Anemia and iron deficiency: effects on pregnancy outcome. *Am J Clin Nutr*; 71(5):1280S-1284S.
- Al-Zirqi, I., Stray-Pedersen, B., Forsen, L., Vangan, S. (2010). Uterine rupture after previous caesarean section. *BJOG: Intern. J. Obst. Gynaecol.*; 117 (7):809–20.
- Barley, B. (2005). Caesarean section rates and percentage breakdown. *African J.*; 111 (4): 844–50
- Bothwell, T.H. and Charlton, R.W. (1981). Iron deficiency in women: a report of the calorimeter in Gambian men. *Am. J. Clin. Nutr*; 51; 563 – 570.
- Brun, J.F. (2002). Exercise hemorheology as a three acts play with metabolic actors: is it of clinical relevance?, *Clin. Hemorheol. Microcirc.*; 26: 155–174.
- Brun, J.F., Khaled, S., Raynaud, E., Bouix, D., Micallef, J.P. and Orsetti, A. (1998). Triphasic effects of exercise on blood rheology: which relevance to physiology and pathophysiology? *Clin. Hemorheol. Clin. Hemorheol Microcirc.*; 19: 89-104.
- Brun, JF, Boulot, P., Micallef, J.P., Viala, J.L. and Orsetti, A. (1995). Physiological modifications of blood viscosity and red blood cell aggregation during labor and delivery. *Clin. Hemorheol.*; 15; 13-24.
- Brun, J.F. and Fornari, P. (1987). Modifications hémorhéologiques au cours du stress, des maladies mentales et des troubles de l'humeur. *J. Psychiat. Biol. Thérap.*; 26: 16-20.
- Dencker, A., Berg, M., Bergqvist, L., Ladfors, L., Thorsen, L.S. and Lilja, H. (2009). Early versus delayed oxytocin augmentation in nulliparous women with prolonged labour-a randomised controlled trial. *BJOG: Intern. J. Obst. Gynaecol.*; 116(4):530–6.
- Dixon, B.J., Gland, J.M. and Blaire, A.N. (1994) Variations in leucocyte count. *Br Med J*; 2:473–5.
- Ehrly, A.M., Landgraf, H., Hessler, J. and Saeger-Lorenz, K. (1986). Influence of a videofilm-induced emotional stress on the flow properties of blood. *Biorheology*; 23: 268.
- El-Sayed, M.S. (1998). Effects of exercise and training on blood rheology. *Sports Med.*; 26: 281-92.

Faas, M.M., Bouman, A., Moes, H., Heineman, M.J., Leij, L.F. and Schuiling, G. (2000). The immune response during the luteal phase of the ovarian cycle: a Th2-type response, *Fertil. Steril.*; 74: 1008–1013.

Hamilton, B.E., Martin, J.A. and Ventura, S.J. (2009). Division of vital statistics births: preliminary data 2007. *National Vital Statistics Report*; 57(12):1–23.

Hemminki, E. (1996). Impact of caesarean section on future pregnancy: a review of cohort studies. *Paed. Perinatal Epidemiol.*; 10(4):366–79.

Klebanoff, M.A., Shiono, P.H., Selby, J.V., Trachtenberg, A.I. and Graubard, B.I (1991). Anemia and spontaneous preterm birth. *Am. J. Obstet. Gynecol.*; 164. (1): 59-63.

Laws, P., Li, Z. and Sullivan, E.A. (2010). Australia's Mothers and Babies 2008. Perinatal statistics series no.24. Cat. No. PER 50. Canberra: AIHW National Perinatal Statistics Unit, 2010.

Loraine, I.A. and Bell, E.T. (1963) Hormone excretion during the normal menstrual cycle. *Lancet.* 1963;1:1340-2.

Pathak, N.R., Desai, C.A. and Chandwani, S. (1981) Hematological changes during normal menstrual cycle. *Indian J. Physiol. Pharmacol.*; 25(4):440.

Patrick-Iwuanyanwu K.C, Wegwu M.O, Ayalogu E.O, (2010). The Protective Nature of Garlic, Ginger and Vitamin E on CCl4-Induced Hepatotoxicity in Rats. *Science alert.*

Pohle, F.J. (1939)The blood platelet count in relation to the menstrual cycle in normal Women. *Am. J/ Med.*; 197: 40-47.

Rajnee, V..K., Chawla, R.C., Bijendra, K. and Binawara S.C. (2010) Haematological and electrocardiographic variations during menstrual cycle. *Pak. J. Physiol.*; 6(1)18- 21.

Shields, S.G., Ratcliff, S.D., Fontaine, P. and Leeman, L. (2007). Dystocia in nulliparous women. *Am. Family Physician*; 75 (11):1671–8.

Souza, J.P., Gülmezoglu, A.M., Lumbiganon, P., Laopaiboon, M., Carroli, G., Fawole B, Ruyan P. And WHO Global Survey on Maternal and Perinatal Health Research Group. (2010). Caesarean section without medical indications is associated with an increased risk of adverse short-term maternal outcomes: the 2004-2008.

Vandewalle, H., Lacombe, C., Lelievre, J.C. and Coussement, F. (1989). Effects of clinostatism and orthostatism on blood viscosity. *Int. J. Sports. Med.*; 10: 135-138.

Wang, B.S., Zhou, L.F., Coulter, D., Liang, H., Zhong, Y., Guo, Y.N., Zhu, L.P., Gao X.L., Yuan, W. and Gao, E.S. (2010). Effects of caesarean section on maternal health in low risk nulliparous women: a prospective matched cohort study in Shanghai, China. *BMC Pregnancy and Childbirth*; 10: 78.

WHO (2010). Global Survey on Maternal and Perinatal Health. *BMC Medicine*; 8:71.

World Health Organization (2004). Focusing on anaemia: Towards an integrated approach for effective anaemia control. Joint statement by the World Health Organization and the United Nations Children'Fund.<http://www.who.int/topics/anaemia/en/who.unicef-anaemiastatement.pdf>

AUTHORS CONTRIBUTIONS

Ozor M.O. and Omorogiuwa A. were actively involved in this study from onset to the submission of the final draft.