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RESEARCH PAPER

EFFECT OF 'INDUCED LABOUR' ON HEMORHEOLOGICAL PARAMETERS

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ABSTRACT

Augmentation of labour involving the use of exogenous oxytocin to improve uterine contraction is a common obstetric practice. Although this exogenous oxytocin is known for its effect on the uterus, little is known about its effect on other organs/physiological parameters. Hence, this study investigates the effect of oxytocin augmentation on hemorheological parameters. Ten pregnant control and 10 parturients on oxytocin augmented labour were involved in this study. Following standard laboratory procedures, blood samples were collected from the pregnant women and the samples were analysed using Swelab Alfa Automated Haematology Analyzer at St. Philomena Hospital. The data was then analysed using SPSS (version 17) and the 'student t-test' was performed. Results showed no significant difference ($p>0.05$) in the relative plasma viscosity, fibrinogen concentration, red cell count and related RBC indices between the control and the parturients. This observation may be due to the concomitant hydration provided by the oxytocin infusion. Therefore, the use of an adequate rehydration medium for augmentation of labour should be emphasized for all parturients.

Keywords: Augmented labour, Oxytoxin, Hemorheological parameter, Pregnant.

INTRODUCTION

It has been estimated that about half a million women die as a result of complications of pregnancy and child birth worldwide (WHO, 2005). An overwhelming proportion of these deaths occurs within few hours of delivery and in most cases, is due to hemorheological issues in postpartum (AbouZahr *et al*., 1998, Ripley, 1996). It has been reported that approximately 3% of vaginal deliveries is complicated by hemorheological complications ranging from vasoconstriction and blood coagulation due to poor viscosity of blood (Elbourn *et al*., 2001). It is a known fact that blood loss in postpartum ranges from 500 ml following vaginal delivery to 1000 ml following cesarean section (Anderson et al., 2007). In this regards, effort to improve maternal health has been a struggle for most governments of the world and hence the augmentation of labour.

Oxytocin has been demonstrated to increase the frequency and intensity of uterine contractions when spontaneous uterine contraction is inadequate and the progress of labor is slow. Augmentation of labor with oxytocin is a frequent intervention in modern obstetric practice (Clark et al., 2009). When labor fails to progress, oxytocin is administered to augment contractile effort and to correct dystocia with the objective on achieving a normal vaginal delivery (Clark et al., 2007). Oxytocin protocols can be categorized as high-dose or low-dose protocols depending on the initial dose and the amount and rate of sequential increases in dose. Despite the frequency with which oxytocin is used in clinical practice, there is little consensus regarding the optimal dose of oxytocin for labor augmentation (Smith and Merrill, 2006).

Although the augmentation of labour with oxytocin has not been shown to affect the rate of maternal satisfaction and postpartum haemorrhage (Akoury et al., 1991; Sadler et al., 2001), it has been shown however, that there is a significantly reduction in the length of both the first and second stages of labour (Hinshaw et al., 2008; Sadler et al., 2001) and an increase in the rate of spontaneous vaginal deliveries (Wei et al., 2009). On the other hand, studies show that it does not appear to negatively impact on fetal morbidity or mortality in both nulliparous (Akoury et al., 1991; Sadler et al., 2001; Wei et al., 2009) and multiparous women (Ben-Aroya et al., 2001). Unfortunately, uncertainty is the case as to whether oxytocin augmentation results in a statistically significant reduction in caesarean sections (Fraser et al., 1998; Sadler et al., 2001). While augmentation of labour with oxytocin has not been shown to affect uterine rupture in nulliparous women (Akoury et al., 1991; Sadler et al., 2001), uterine rupture has been associated with oxytocin use in multiparous women (Ozdemir et al., 2005).

Hemorheologically however, the influence of oxytocin in labour augumentation, remains yet to be fully understood as the alterations of the associated parameters – pressure, flow, volume, and resistances in blood vessels, especially in terms of blood viscosity and red blood cell deformation in the microcirculation, is known to play significant roles in disease processes and maternal health in general (Baskurt et al., 2007). The current study therefore, is aimed at investigating the comparative hemorheological profile of augmented and non augmented labour.

MATERIAL AND METHODS

Sample size: The sample size consists of ten (10) parturients on augmentation of labour, and 10 pregnant women (as control) in their late third trimester of pregnancy in a private hospital in Benin City, Edo State, Nigeria.

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

Exclusion category: Subject with hypertensive disease of pregnancy**,** diabetes, and Hemoglobinopathies e.g HbSS, were excluded.

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 labour was complete in both groups.

Blood sample analysis: The following parameters were analysed using an Alfa autoanalyser (UK): Red Blood Cells counts (RBC), Mean Corpuscular Volume (MCV), percentage Red Density Width (RDW%), actual Red Density Width (RDWa), Packed Cell Volume(PCV)/Haematocrit (Hct), Haemoglobin Concentration (HGB), Mean Corpuscular Haemoglobin (MCH), and Mean Concentration Haemoglobin Concentration (MCHC).

Blood analysis was performed using the Swelab analyser while Swelab Alfa dilment was used to clean the machine before and after use. The results were printed out and sent to a computer for review. Relative plasma viscosity was determined by capillary viscometry as described by Reid and Ugwu (1987), while fibrinogen concentration was determined by the clot weight method of Ingram (1961).

Statistical Analysis: All values were expressed in mean ± 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 illustrates the maternal profiles of the control and test groups in which labour was augmented using oxytocin. Observing the demographic characteristics between the groups, there were similarities between test and control as their age, religious belief, marital status, menstrual flow, cycle length, gravidity and parity fell within the same range.

Table 2 shows the different in red blood cell count and related RBC indices between control and test in which labour was augmented with oxytocin. RBC, RDWa, RDW%, Hct, HGB (g/dl) and MCH (Pg) were not different between the groups. However, MCV was slightly lower and MCHC was slightly higher in the augmented labour group than

the control group. The differences in these RBC indices (MCV and MCHC) were not statistically significant ($p>0.05$).

Table 3 shows the difference in the Relative Plasma Viscosity (RPV) and Fibrinogen Concentration (FC) in control and augmented labour groups. While the Relative Plasma Viscosity (RPV) was slightly higher in the oxytocin augmented labour group than the control, the reverse was the case for Fibrinogen concentration (FC). However, these differences were not statistically significant ($p>0.05$) between the groups.

Table 1: Demographic characteristics of the sampled subjects

Parameter	Control	Test
Age	24-30 years	25 – 30 years
Religion	All Christians	All Christians
Marital Status	All married	All married
Menstrual Flow	3-5 days	3-5 days
Cycle length	27-29days	27-30days
Gravidity	2-5	2-5
Parity	1-3	1-3

Table 2: Red blood cell count and related RBC indices between control and augmentation of labour

Parameter	Control	Augmentation of labour
RBC ($x10^6/\mu L$)	4.95 ± 0.16	4.92 ± 0.20
MCV (fL)	80.63 ± 2.72	79.58 ± 2.56
RDWa (fL)	59.76 ± 2.21	59.06 ± 1.94
RDW%	11.62 ± 0.52	11.64 ± 0.56
Hct (%)	34.76 ± 1.33	34.05 ± 1.72
HGB (g/dl)	11.58 ± 0.46	11.03 ± 0.36
MCH (Pg)	22.25 ± 0.93	22.67 ± 0.95
MCHC (g/dl)	27.52 ± 0.41	28.47 ± 0.70

*$p < 0.05$ considered significant

Table 3: Relative plasma viscosity (RPV) and fibrinogen concentration (FC) in control and augmentation of labour groups

Parameter	Control	Augmentation of labour
RPV	2.05 ± 0.16	2.12 ± 0.22
FC	4.63 ± 2.72	4.58 ± 2.71

*$p < 0.05$ considered significant

DISCUSSION

Augmentation of labour is generally an enhancement of uterine contraction and descent of the fetus with the aim of achieving vaginal delivery. It refers to the use of medication or other intervention to 'speed up' the process of labour. It may be required to assist with an abnormal or difficult labour (dystocia), or to speed up normal labour if the health of the mother or baby is at risk. Augmentation usually involves artificially increasing the frequency or strength of contractions of the uterus, with or without artificial rupture of the membranes around the baby, change in position, instrumental delivery (forceps, vaccum) and other techniques.

This study reveals that augmentation of labour with oxytocin has no effect on hemorheological parameters considering the similarity in the RBC and RBC indices herein studied between the control and test groups. This observation is justified considering the fact by Akoury (1991) and Sadler (2000) that oxytocin augmentation has not been shown to affect postpartum haemorrhage. Although the study by Akoury (1991) and Sadler (2000) is on nulliparous women, the present study is on both nulliparous and muti-parous women. Hence, oxytocin augmentation of labour may also not affect postpartum haemorrhage in multiparous women considering the findings of this study.

Mousa *et al*., (2007) had earlier noted that a swift understanding of hemorheological patterns and flow mechanics during augmented labour will help a lot in the bid to improve maternal health care. More recent study on Hemorheological maternal parameters on forty (40) augmented women by Dapper and Didia. (2006), reveals

significantly higher values of haematocrit, haemoglobin concentration, red blood cell count, whole blood, relative viscosity and relative plasma viscosity, but significantly lower values of erythrocyte sedimentation rate. However, a significant but positive correlation were observed only in the values of erythrocyte sedimentation rate (ESR), haemoglobin concentration, white blood cell count, whole blood relative viscosity and relative plasma viscosity, while analysis of both mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration showed a negative but non-significant correlation in Hemorheological parameters amongst women who had augmented labour (Dapper and Didia, 2006).

Specifically, the results of this study does show that there were no significant ($p>0.05$) changes in the red blood cell values and related RBC indices. More so the fibrinogen concentration and relative plasma viscosity in the oxytocin augmented labour group were also not statistically significant when compared to control. This is however at variance with the reports by Dapper and Didia (2006) who had earlier indicated that there were significantly higher values of haematocrit, haemoglobin concentration, red blood cell count, whole blood relative viscosity and relative plasma viscosity amongst forty (40) augmented women, but significantly lower values of erythrocyte sedimentation rates. The variance might be traceable to the influence of oxytocin-use in the augmentation of labour and since it is usually done with an infusion, parturients are adequately rehydrated.

It is recommended therefore, that parturients should be preferably augmented with oxytocin infusion to avert the increase in plasma viscosity and increased fibrinogen concentration; both of which may worsen conditions like pregnancy induced hypertension the at can put the woman and baby at risk.

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AUTHORS CONTRIBUTIONS

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