How Birth Interval and Antenatal Care Affects Postpartum Haemorrhage Prevention in Maiduguri, Nigeria

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ABSTRACT

The following work studied how birth interval and antenatal care contribute to occurence of postpartum haemorrhage and how these factors modulates the preventive efficacies of oxytocin injection and misoprostol tablets in postpartum haemorrhage. A total of 1140 pregnant women who have received either oxytocin injection or oral misoprostol in third stage of labour as a prophylaxis of postpartum haemorrhage, were enrolled within three health care facilities in Maiduguri, Nigeria. Each patient was observed at parturition and for 24 h after during which blood lost was estimated to the nearest ml. Maternal characteristics were recorded in a structured proforma. The relationship of the occurrence of PPH (blood loss > 500 ml) and mean blood loss was studied with respect to the prophylactic medication used and some obstetric factors. The occurrence of PPH in subjects that had 'inadequate' resting period (29.3 %) was higher than that of the 'adequate' resting period group (2 %). Misoprostol exhibited greater PPH prevention in the "inadequate" resting period category (83.9 versus 38.8%). The enrolees that had inadequate antenatal care exhibited higher occurrence of PPH than the adequate group (21.6 versus 16.6%). In the misoprostol medication sub-group, there was significantly (p < 0.001) higher occurrence of PPH in the "adequate ANC" category (37.6%) than in the "inadequate ANC" category (7.1%). Inadequate birth interval and inadequate antenatal care are risk factors for PPH. The relative efficacies of oral misoprostol and parenteral oxytocin significantly vary with varying level of antenatal care and birth interval.

INTRODUCTION

Globally, over half a million women die annually from causes related to pregnancy and childbirth (WHO, 2005). The single most common cause of maternal mortality is obstetric haemorrhage, generally occurring postpartum and accounting for 25-33% of world wide maternal mortality. The rate of death due to postpartum haemorrhage (PPH) varies widely in the world. The proportions range from less than 10 % in developed countries to nearly 60 % in some third world countries (AbouZahr, 1998). In Borno State, haemorrhage is the second most important cause of maternal death after hypertension (Mairiga *et al*, 2008). PPH is hence seen as a major cause of maternal mortality, particularly in the developing world, and of maternal morbidity in both the developed and the developing world (Cameron and Robson, 2006). Factors known to put a woman at higher risk for PPH include previous history of PPH; prolonged, augmented preapitate labour, pre-eclampsia; operative delivery; chorioamnionitis; or an over-distended uterus due to macrosomia, twins, or hydramnios. However, PPH generally occurs without warning and the majority of women affected present with no known risk factors (ACOG, 2006; WHO, 2007). The aim of this work is to study how birth interval and antenatal care relates with PPH occurance in Maiduguri and to determine the relative effectiveness of prevention of PPH by intravenous oxytocin or oral misoprostol within the matrix of varying maternal factors. The absence of adequate data in the literature of reports (studies or clinical experience) regarding how maternal factors affects PPH in North Eastern Nigeria, justifies the rationale for this study and establishes its significance.

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MATERIALS AND METHODS

The study was a prospective, randomised, comparative and multi-centred one, which was started in September 2007 and completed in March 2009. It was conducted in three health institutions in Maiduguri metropolitan area of Borno state. These were; the University of Maiduguri Teaching Hospital (UMTH), the Maiduguri Specialist Hospital, and Yerwa Maternal and Child Health Care Centre. Women that had uncomplicated vaginal delivery and were administered with a prophylactic dose of either oxytocin injection (10 IU) or oral misoprostol (3 x 200μg) were used for the study. Exclusion criteria included Known allergy to either of the drugs, operative delivery, history of co-morbid conditions like diabetes, mal-presentation, anaemia, antepartum haemorrhage, multiple pregnancy, and grandmultiparity (greater than six births). The study was completed with a total sample size of 1013 orally consenting (some written) enrolees.

Each patient was observed for a period of 24 h for blood loss which was quantified using calibrated kidney dishes of various sizes (100 – 1,500 ml) and measured to the nearest millilitres. Clinical measures such as surgical manipulations, blood transfusion, etc, were done by a clinician based on patients needs. The bio-data of the consenting enrolees were obtained from their clinical folders. Where some of these data were missing, oral interview was employed. The primary outcome measure was total blood loss over 24 h in ml and those $\geq$ 500 ml were classified as PPH (Yes), whereas < 500 ml were PPH (No).

Ethical approval for the conduct of the research was given by the Research and Ethical Committee of UMTH through letter referenced as ADM/TH/75/Vol.II and dated 10th September 2007. The principles of Good Clinical Practice as revised by the Imperial College London, were adhered to in the conduct of this research work. The minimum sample size for the study was calculated using the Taylors' formula at 95% confidence taking prevalence of PPH to be 50%. This gave a minimal required sample size of 385.

Those that had less than 2 years birth interval were considered to have 'inadequate resting' period while those with greater than or equal to 2 years 'adequate resting' period. Antenatal care that was started after than twentieth week was also considered 'late antenatal care'. The statistical software SPSS version 16 (SPSS Chi, Ill USA) was used for statistical analysis. Mean values were compared using student *t* test for continuous variables and chi square χ^2 test for categorical variables. The level of significance was set at p < 0.05 and at p < 0.001.

RESULTS AND DISCUSSION

Relationship of Birth Interval MBL and Incidences of PPH

Table 1 shows the occurrence of PPH in subjects that had 'adequate' resting period and those that had 'inadequate' resting period. The occurrence in the latter (29.3 %) was higher than that of the former (2 %). This was further supported by higher MBL in the ina dequate group (295.29 ± 9.80 against 283.33 ± 9.08 ml).

The Influence of Birth Interval on the Effectiveness of the Medications

Table 2 shows how the two medications fares in the two resting period groups. The control of PPH by both oxytocin and misoprostol was more effective in the enrolees that had adequate birth interval.

In the inadequate birth interval category, misoprostol offered greater prevention of PPH (83.9 versus 38.8%), while oxytocin injection showed greater protection against PPH (100 versus 93.8%) in the adequate birth interval group. The difference in occurrence of PPH between the two birth interval categories in the oxytocin medication group was statistically significant ($P_{oxy;1}$ < 0.001), while that in misoprostol group was not significant ($p_{miso;1}$ > 0.05). This finding was supported by corresponding MBL.

Discussion

There was a significant (p<0.001) difference in occurrence of PPH among the group with 'less than 2 years' birth interval (29.3%) of which the total number was 273, than in the 'greater than 2 years' birth interval group (2.0%). Similarly, the MBL value in the former group (295.29±9.80 ml), was significantly (p < 0.001) higher than in the latter group (283.33 ± 9.08 ml).

The birth interval of less than 2 years was considered as inadequate birth interval or inadequate resting period for reproductive organs (Mairiga, 2008). This was shown to be associated with higher occurrence of PPH and higher MBL in the study population.

This suggests that low birth interval is a risk factor for PPH. In line with this finding, Augustin and Jose (2000) reported that women with short intervals (< 6 months) between pregnancies are at increased risk of third trimester bleeding. Same trend was observed in the two medication sub groups of Oxytocin and misoprostol. However, the difference in the occurrence of PPH in the latter sub group (misoprostol), was not statistically significant (p = 0.077).

Although the differences in values of MBL between the adequate and inadequate populations of the two medication sub groups were both statistically significant, the difference in the oxytocin sub group was higher. These further suggest that low birth interval is a risk factor for PPH and that misoprostol is more likely to be effective in women with shorter birth intervals.

The Influence of the Degree of Antenatal Care on PPH and MBL

Table 3 shows how occurrence of PPH varies with two level of antenatal care (ANC) (adequate and inadequate). The inadequate ANC defined as initiation of formal ANC after the 20th week (Mairiga, 2007), exhibited higher occurrence of PPH than the adequate ANC group (21.6 versus 16.6%). Even though the difference in the occurrence of PPH between the two groups was not statistically significant (p > 0.05), the difference in MBL was significant (p < 0.001).

Table. 1: Relative risk of PPH in two birth interval groups.

Birth Interval (Resting Period) (years)	Occurrence of Post Partum Haemorrhage (PPH) No. (%)			Mean Blood Loss (MBL) (ml)
	No	Yes	Total	
< 2(Inadequate)	193 (70.7)	80 (29.3)	273(100.0)	295.29 ± 9.80^a
≥ 2(Adequate)	48 (98.0)	1 (2.0)	49(100.0)	283.33 ± 9.08^b
Total	241	81	322	

$P_1 < 0.001$; p value for occurrence of PPH in the various birth interval groups by chi square statistics.
$P_2 < 0.001$; p value for MBL in the various birth interval groups by Student's t-test statistics.
Means with non similar superscript implies statistically significant difference.
Duration between a previous/last birth or miscarriage and the present birth is considered inadequate if its < 2 years, and adequate if ≥ 2 years**.**

Table. 2: Occurrence of post partum haemorrhage and a measure of mean blood loss among birth interval groups (adequate and inadequate) in the two medication groups of intravenous oxytocin injection and oral misoprostol tablet.

Birth Interval (years)	Occurrence of Post Partum Haemorrhage (PPH) Number (%)				Mean Blood Loss (MBL) (ml)
	Medication Group	No	Yes	Total	
< 2	Oxytocin	31 (38.8)	49 (61.2)	80 (100.0)	$484.00 \pm 24.40^{oxy;a}$
	Misoprostol	162 (83.9)	31 (16.1)	193 (100.0)	$358.33 \pm 8.13^{miso;x}$
>= 2	Oxytocin	33 (100)	0 (0.0)	33 (100.0)	$325.00 \pm 4.48^{oxy;b}$
	Misoprostol	15 (93.8)	1 (6.3)	16 (100.0)	$200.00 \pm 0.00^{miso;y}$
Total		241	81	322	

$P_{oxy;1} < 0.001$; p value in oxytocin medication group by Chi square statistics.
$p_{miso;1} > 0.05$; p value in misoprostol medication group by Chi square statistics
$p_{oxy;2} < 0.001$; p value in oxytocin medication group by Student's t – test statistics.
$p_{miso;2} < 0.05$; p value in misoprostol medication group by Student's t – test statistics.
Means with non similar superscript implies statistically significant difference; where as those with similar superscript implies non significant difference between them.
Duration between a previous/last birth or miscarriage and the present birth is considered inadequate if its < 2 years, and adequate if ≥ 2 years.

Table. 3: Relative risk of post partum haemorrhage and a measure of mean blood loss among two categories of antenatal care.

Antenatal Care	Occurrence of Post Partum Haemorrhage	(PPH) Number (%)		Mean Blood Loss (MBL) (ml)
	No	Yes	Total	
Adequate ANC	161 (83.4)	32 (16.6)	193 (100)	325.00 ± 7.24^a
Inadequate ANC	643 (78.4)	177 (21.6)	820 (100)	390.39 ± 6.30^b
Total	804 (79.4)	209 (20.6)	1013 (100)	

$P_1 > 0.05$; p value for occurrence of PPH in the two antenatal care groups by chi square statistics.
$P_2 < 0.001$; p value for MBL between the two antenatal care groups by Student's t–test statistics.
Means with non similar superscript implies statistically significant difference.

Table. 4: Relative risk of post partum haemorrhage and a measure of mean blood loss among two categories of antenatal care in the two medication groups intravenous oxytocin injection and oral misoprostol tablet.

Antenatal Care	Occurrence of Post Partum Haemorrhage (PPH) Number (%)				Mean Blood Loss (MBL) (ml)
	Medication	No	Yes	Total	
Adequate ANC	Oxytocin	16 (100.0)	0 (0.0)	16 (100)	$320.00 \pm 0.00^{oxy;a}$
	Misoprostol	145 (81.9)	32 (37.6)	177 (100)	$325.45 \pm 7.90^{miso;x}$
Inadequate ANC	Oxytocin	225 (60.8)	145 (39.2)	370 (100)	$463.48 \pm 11.53^{oxy;a}$
	Misoprostol	418 (92.9)	32 (7.1)	450 (100)	$330.36 \pm 4.96^{miso;x}$
Total	Oxytocin	241	145	386	
	Misoprostol	563	64	627	

$P_{oxy;1} > 0.001$; p value in oxytocin medication group by chi square statistics.
$p_{miso;1} < 0.001$; p value in misoprostol medication group by chi square statistics
$p_{oxy;2} > 0.001$; p value in oxytocin medication group by Student's t – test statistics.
$p_{miso;2} > 0.001$; p value in misoprostol medication group by Student's t – test statistics.
Means with similar superscript implies non significant difference between them.

The Influence of the Degree of Antenatal Care on Effectiveness of the Medications

The relative effectiveness of misoprostol tablet and oxytocin injection in the two antenatal care categories (adequate and inadequate) is presented in Table 4. Misoprostol exhibited greater PPH prevention in the "inadequate ANC" category (92.9 versus 60.8%). On the other hand, oxytocin showed greater prevention in the "adequate ANC" category (100 versus 81.9%). The difference in occurrence of PPH between the adequate and inadequate categories of the oxytocin medication group was not significant by chi square statistics (p > 0.001). Similarly, the MBL

difference was not significant (p > 0.001) by student's t-test statistics. In the misoprostol medication group, there was significantly (p < 0.001) higher occurrence of PPH in the "adequate ANC" category (37.6%) than in the "inadequate ANC" category (7.1%). This was supported by a significant difference (p < 0.001) in MBL (325.45 ± 7.900 versus 330.36 ± 4.96 ml).

Discussion

The high occurrence of PPH in enrollees that had inadequate antenatal care suggests that late or poor ANC might be a risk factor for PPH. The hypothesis that motivated the testing of

ANC as a possible risk factor was that it would be able to offer avenue for detecting other risk factors and offer health services that would prepare the expectant mother for delivery.

In line with this thinking, the absence of regular pre-pregnancy and antenatal care means that medical risk factors that increase the risk of PPH often go undetected (El-Refaey and Rodeck, 2003; WHO, 2004). However Marilyn *et al* (1990), had earlier reported that there are substantial grounds to doubt the effectiveness of the procedures ritually performed during an antenatal visit and that it seems as if antenatal care, as part of maternal and child health (MCH) services, was exported from developed countries to developing countries because it was believed to be an appropriate and beneficial service.

They argued that the justification for exporting this service to deal with the prevailing conditions in developing countries is not apparent. In 1932, Browne and Aberd have expressed doubt as regards possible impact of antenatal care on maternal mortality (Browne and Aberd, 1932). The questions have continued to be posed and have not been answered satisfactorily, especially concerning maternal mortality and morbidity in developing countries (Browne and Aberd, 1932).

Graham (1992) and Koblinsky *et al* (1992) theorised that what is required is an improvement in socioeconomic conditions, the promotion of female education simultaneously with a broader concept of what constitutes women's health and the collation of more accurate statistics to increase understanding of the needs of women.

In a study of 348 consecutive cases of primary postpartum haemorrhage at a tertiary hospital in Nigeria, Ijaiya *et al* (2004), reported that the booking status of the patients (and hence their level and quality of ante-natal care) had no relationship with occurrence of PPH.

CONCLUSION

Short birth interval of less than two years is associated with occurrence of PPH while Level of antenatal care had demonstrated a very weak role in the occurrence of PPH. Misoprostol demonstrated higher effectiveness in preventing PPH than oxytocin, among women with less-than two years birth interval and also among those with inadequate antenatal care.

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