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Effects of uterine fundal massage on number of postpartum haemorrhage cases at a level 2 maternity hospital in the Western Cape, South Africa

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Abstract

Globally, as well as in South Africa, postpartum haemorrhage (PPH) due to uterine atony is the number one direct cause of maternal mortality associated with the postpartum period. Active management of the third stage of labour has been thought to prevent PPH in women. This study assesses uterine fundal massage in the postpartum period as part of active management of the third stage of labour (AMTSL) and its outcome on the number of PPH cases at a level 2 maternity hospital. A quasi-experimental approach was used to determine the effect of continuous uterine fundal massage, every 15 minutes for the first 2 hours after birth, on the number of PPH cases at a level 2 maternity hospital in the Western Cape. It was found that the number of PPH cases reduced from 33/426 cases in the comparison group to 23/431 cases in the experimental group, although this was not statistically significant (Chi-square test, p=0.14). There was also a reduction in the mean postpartum blood loss (not statistically significant). Potential risk factors were considered in a logistic regression model but did not change the final conclusion that the effect of the intervention did not result in a statistically significant decrease in occurrence of PPH (p=0.1039).There was insufficient evidence to reject the null hypothesis of the study. It was concluded that more studies may be necessary to add to the outcome of AMTSL intervention in the maternity setting. A number of other recommendations were made for later implementation within the clinical setting for this study.

Keywords: Active management of the third stage of labour, postpartum haemorrhage, uterine fundal massage.

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Introduction

Postpartum haemorrhage (PPH) can be defined as blood loss of at least 500 ml within 24 hours following delivery of a fetus or infant (Galazka, Heim & Maughan, 2006). Worldwide PPH is perceived to be the cause for almost a quarter of maternal deaths (World Health Organization (WHO, 2007). In South Africa 80.4% of deaths caused by PPH are estimated to be clearly avoidable, and the maternal death rate due to PPH has shown no significant change between 1999 and 2007, as reported in the Saving Mothers report (Department of Health (DoH), 2008).

Over 60% of PPH cases can be prevented by active management of the third stage of labour (AMTSL), which consists of the use of oxytocin (a uterotonic drug) immediately after birth, delivery of the placenta by controlled cord traction and massaging the uterus every 15 minutes for the first 2 hours after vaginal delivery (WHO, 2006; International Confederation of Midwives (ICM) & International Federation of Gynaecology and Obstetrics: FIGO, 2006). Genital tract trauma, retained placenta, inverted uterus, bleeding following antepartum haemorrhage and maternal bleeding disorders are all causes of PPH (DoH, 2010), but according to the WHO (2007) the most common cause of PPH is failure of the uterus to contract after childbirth, known as atonicity or atonic uterus. Attempts to identify women at risk of PPH due to atonicity have been unsuccessful, and thus all women during childbirth should be targeted for intervention (Gülmezoglu, Hill & Mathai, 2007). Research priorities however suggest that more research needs to be done on the "role of individual components of active management" (WHO, 2007). Such research might bring more light to the effect of uterine fundal massage on the prevention of PPH.

Most maternal deaths (60.6%) occur within 24 hours after birth. Ironically, this is the period in which women in developing countries are least likely to receive health care services (Nangalia & Thaddeus, 2004). There seems to be a disparity between the period of highest maternal risk, provision of maternal care and the utilisation thereof, and thus a need for postnatal care to be strengthened in order to reduce the risks for mothers associated with the postpartum period (Nangalia & Thaddeus, 2004). The lack of appropriately trained staff is associated with 17.5% of maternal deaths in South Africa that results from PPH (DoH, 2008).

PPH is a global concern, especially in developing countries with limited resources available for emergency management and resuscitation. Although taught to health practitioners, uterine fundal massage is often neglected or under-estimated as part of AMTSL and postnatal care (Ariawan et al., 2009). Much research is available on the components of AMTSL, but according to Abdel-Aleem, Abdel-Aleem and Hofmeyr (2008) little research has been done on the effectiveness of uterine fundal massage as a component thereof to prevent PPH.

The South African Maternal Death Notification System provides data on the number of deaths related to PPH, but there is a lack of data on the number of mothers affected by PPH that did not result in death, as found to be the case at this facility. Such data are needed for intervention programmes, to monitor institutional progress and ultimately avoid maternal deaths. The national lack of appropriately trained staff to perform such duties as uterine fundal massage also poses a problem, with students and assistant nurses often left with the critical task of postnatal care (DoH, 2008).

Labour ward staff seem to be aware of the usefulness of uterine fundal massage in emergency management of PPH as per hospital protocol and international guidelines, but according to Ariawan et al. (2009) tend to omit this practice as part of preventative management, possibly due to the lack in researched evidence as to its efficiency to prevent PPH resulting from an atonic uterus.

This study aimed to describe the incidence of primary PPH and associated factors in the selected facility as well as the effectiveness of uterine fundal massage on the reduction of primary PPH cases at a level 2 maternity hospital in the Western Cape, South Africa.The null hypothesis (H_o) statement that guided this study was that uterine fundal massage every 15 minutes for the first 2 hours following vaginal birth, as part of AMTSL, has no effect on the number of primary PPH cases in a maternity care setting. The alternative hypothesis (H_a) was that uterine fundal massage every 15 minutes for the first 2 hours following vaginal birth, as part of AMTSL, reduces the number of primary PPH cases in a maternity care setting.

Methodology

A quasi-experimental design with a non-equivalent control group was used for this study. It consisted of a comparison group on which the intervention was not applied as meticulously due to non specific protocol enforcing such an intervention; implementation of the intervention; and the experimental group on which the intervention was applied. On average, this facility had a vaginal birth rate of approximately 400 deliveries per month.

A non-probability sampling method was used. The technique of convenience sampling was used to determine the sample. A level 2 maternity hospital was selected where the study was approved and conducted. Approval of the study was also granted by the University of the Western Cape's Ethical Committee. Due to time constraints all women who had vaginal births at this facility during the two-month time frame of this study were included in the data, excluding births less than 500g. Baseline data were collected in July of 2011 and intervention data in August 2011. All patients who qualified to be included in the study in the month of July were assigned to the comparison group, while those patients who delivered in August and who qualified to be included in the study were assigned to the experimental group.

The facility's birth register and case-specific information of the women who had PPH were used to compile demographic and numerical data. Daily statistics compiled by the labour and postnatal wards, which included the number of PPH cases, were valuable numerical data. The newly designed postpartum observation chart on which the practice of uterine fundal massage every 15 minutes for the first 2 hours after delivery could be charted was used by the attending staff to

document the intervention. A folder audit checklist was used to determine the implementation of the intervention as documented on the postpartum observation charts.

Every birth has to be recorded in the birth register of the facility, which indicated information such as the mother's name, address, age, gravidity, parity, blood group, baby's weight, Apgar score, outcome of birth, estimated blood loss (EBL) and method of birth. Data were collected by the attending midwife and entered into the register, including the amount of blood loss in millilitres and whether the woman had PPH. The researcher used the birth register to do a document analysis and to capture the data in a table format for the comparison group and experimental group.

The midwives and the researcher captured case-specific information from the women's folders of those who had PPH. These data were completely anonymous in the comparison group. More personal case-specific data were: age, gravidity, parity, haemoglobin levels, HIV status, any medication that the mother was on, the use of antiretrovitrals, any chronic conditions, weight, outcome of birth, and method of delivery. The same case-specific data were captured in the experimental group, with the intent being to analyse this to determine any significant risk factors for PPH. The patient's folder number was included as only source of identification for the researcher in order to facilitate auditing the folders for evidence of how the intervention was implemented, after which the folder number was removed from the case-specific information sheet to ensure complete anonymity and confidentiality from there on.

Data collection

Preparation prior to commencement of this study included approaching the midwives and explaining the goal for the first phase, i.e. capturing data regarding the number of women that were affected by PPH at the facility during the specified timeframe as well as case-specific information. Training was also provided on visual EBL. Data were then collected from the comparison group during July 2011 by the midwife indicating in the birth register when a particular woman had PPH (EBL estimation in millilitres). The number of women who had PPH in the postnatal wards was captured in the daily statistics. The data captured during this phase were used as baseline data to compare the data collected in the experimental group with, in order to determine the outcomes.

Towards the end of July the midwives, nurses and nursing students were informed of the next phase of the study, which commenced in August 2011. Training was provided concentrating on prevention and management of PPH through uterine fundal massage, the technique of fundal massage and how to implement the intervention. Informative posters were posted around the labour

ward and postnatal ward to ensure awareness by staff of the study being conducted. Data were then collected for the experimental group by the midwife recording in the birth register if a particular woman had a case of PPH, and the midwife in the postnatal ward would indicate any PPH cases in her daily statistics. Case-specific information from the folders of women who had a PPH episode was also gathered. The midwives, nurses and students had to make use of the postpartum chart that was supplied to the facility to document the practice of fundal massage every 15 minutes, the condition of the uterus, and the amount of vaginal bleeding observed, etc. A patient folder audit was then done of those women who PPH to evaluate if the intervention was implemented correctly. The data captured in this phase were used to compare to those of the comparison group in order to determine the intervention's effectiveness.

The non-equivalent control group characteristic of this study was likely to have an impact on the validity. The biggest threat to internal validity in this design was selection bias. Two similar available groups were selected, i.e. the comparison group, prior the intervention and the experimental group on which the intervention was tested. The two groups might have been dissimilar at the beginning of the study, but it was possible to test statistically for differences in the group. As with validity, the reliability could also have suffered from the non-equivalent control group design.

Patient confidentiality was maintained by the patient-anonymous table format data collection tool that was used to capture data from the birth register; the anonymous case-specific information sheets and the patient-anonymous tick sheet used to audit the observation charts. Permission was requested from the health care facility and the university prior to conducting the study, and ethical approval was granted. The health care facility was also informed of its right to withdraw from participating in the study at any time. No risks to subjects were apparent during implementation of the intervention, and approval for the study to be conducted was given by an ethics committee.

Data analysis

Statistical software packages were used to capture and analyse the data. Data were captured on Statistical Packages for Social Sciences and analysed by Statistical Analysis System.

Results

The final sample size of the study included 430 births in the comparison group, and 437 in the experimental group. Births involving twins were initially included as part of the sample but were excluded (as suggested by an expert statistician) from the data analysis due to the very small number of births involving twins and

no occurrence of PPH in these cases (comparison group = 4 twin births, thus n=426; experimental group = 6 twin births, thus n=431). Descriptive statistics were used to compare the basic demographics of the two groups and suggested that the two groups were similar: age, p=0.28; gravidity, p=0.16; parity, p=0.13, head circumference, p=0.84; weight, p=0.19; gestation, p=0.91; EBL, p=0.87. The mean EBL was 264.5 ml in the comparison group and 258.4 ml in the experimental group. The differences in all parameters were not statistically significant (p=0.58) (Table 1).

Table 1: Demographic descriptive statistics

Group	N Obs.	Variable	N	Mean	Median	Std Dev.	Min.	Max
Comparison group	426	Age (years)	426	25.5	24	6.3	15	45
		Gravidity	426	2.1	2	1.2	1	8
		Parity	426	1.9	2	1.1	1	7
		Head circumference (cm)	426	33.6	34	2.4	14	39
		Weight (g)	426	3035.1	3067.5	614.4	640	4750
		Gestation (weeks)	425	38.5	40	2.9	24	43
		EBL (ml)	422	264.5	200	168.8	100	1500
Experimental group	431	Age (years)	431	25.9	26	6.2	12	43
		Gravidity	431	2.3	2	1.4	1	7
		Parity	431	2.1	2	1.3	1	7
		Head circumference (cm)	428	33.6	34	2.4	20	41
		Weight (g)	431	3078.2	3145	639.3	580	4980
		Gestation (weeks)	430	38.4	40	2.9	23	43
		EBL(ml)	431	258.4	200	152.7	100	1400

There were 33 patients of the 426 (7.7%) who had PPH in the comparison group, which decreased to 23 patients of 431 (5.3%) in the experimental group. This difference was also not statistically significant (Chi-square test, p=0.14).

Box-plots were used to display the EBL for each group, with the reference line at 500 ml (Figure 1). It was possible to approach the statistical analysis of the data

through two methods. The first involved looking at PPH as a dichotomous variable and by using Chi-square analysis to compare the two groups without considering any risk factors, or by using logistic regression for the analysis with the risk factors as covariates. The second method involved looking at EBL as a continuous variable and by using a simple *t*-test (unpaired sample) to compare the groups relative to the mean EBL, or using analysis of covariance to compare the groups with risk factors as covariates.

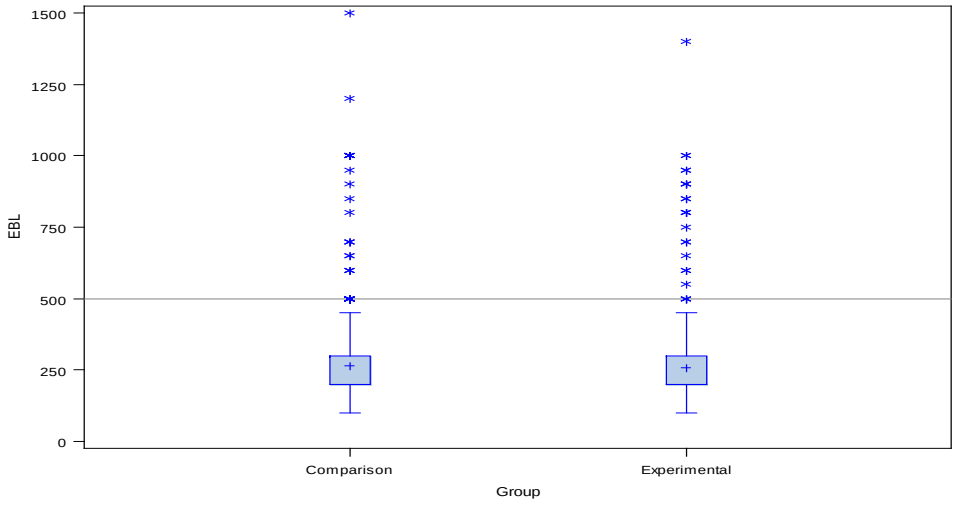

Figure 1: EBL for each group. Reference line at 500.

Preliminary analysis was done to find appropriate ways of incorporating the risk factors, which could be incorporated in linear fashion using the actual values or by grouping them into two or more categories. When EBL was looked at as a continuous variable, the group differences were so small as not to merit further investigation relative to the effect of potential risk factors.

The observation charts of the experimental group were audited to determine whether the intervention was applied correctly. There was no significant difference in the total number of massages given to those who had PPH and those who did not (p=0.2092).The percentage that did not receive the intervention at all in the experimental group, was 45.7% and the percentage of those who received the complete intervention of fundal massage every 15 minutes for the first 2 hours was 6.6%.

Potential risk factors were also considered to determine whether they are related to PPH (age, parity, head circumference, weight and gestation). Further examination of these variables suggested that looking at values above and below a certain cut-off captures the relationship better than assuming a linear relationship. The cut-offs for the variables were as follows: age >/= 32 years; parity >/= 3; head circumference >/= 33cm; weight >/= 3100g; and gestation >/= 40 weeks .In order to see if the

apparent effect of the intervention would change if the analysis accounted for these risk factors by treating them as covariates in a logistic regression model, a model was considered that included these indicator variables.

In addition to these five variables, the categorical outcomes of MOD (method of delivery) and perineum were also considered. Some categories were combined in the analysis for perineum and MOD relevant to PPH, which resulted in two categories for MOD, namely normal vertex deliveries (NVD) and other (breech; vacuum; forceps; malpresentation), and six categories for perineum, namely intact, first-degree tears, second-degree tears, episiotomies, vaginal lacerations and other (cervical tears, para-urethral tears, vaginal laceration plus para-urethral tears, third- and fourth-degree tears).Although the cut-off values for the continuous variables were suggested by the data and hence might be overly optimistic, it was noted that a logistical regression model including these covariates did not change the final conclusion that the effect of the intervention did not result in a statistically significant decrease in the occurrence of PPH. The *p*-value for the group variable was 0.1039.

It should be noted that those with and without PPH in the combined group do differ marginally relative to MOD (p=0.0160) and perineum (p=0.0354). The rate of PPH is higher with MOD other (14.3%) than with NVD (6.0%) and also with perineum other (20%).

There is thus insufficient evidence for the researcher to reject the null hypothesis that uterine fundal massage every 15 minutes for the first 2 hours following vaginal birth, as part of AMTSL, has no effect on the number of PPH cases in a maternity care setting, and hence rejects the alternative hypothesis that the intervention does have an effect on the number of PPH cases.

Discussion

The non-equivalent control group characteristic of this study was likely to have an impact on the validity and reliability, and the biggest threat in this design was selection bias. It was possible though to test statistically for differences in the group, and the analysis proved that the comparison and experimental group were statistically similar in terms of demographic data. The mean EBL between the two groups decreased by 6.1 ml and this decrease proved not to be statistically significant (p=0.14). These findings were different to that of Soltani (2010) where the mean blood loss decreased significantly, even though the incidence showed no significant decrease.

Although there was a decrease in the incidence of PPH cases in the experimental group relative to the comparison group (by 2.5%), this difference was found to not be statistically significant (p=0.14). Possible effects of certain risk factors on the

increased risk for PPH, such as parity, head circumference, gestation, weight, MOD and perineum, showed no significant relationship to PPH (p=0.1039). Similar results were found in the review done by Soltani (2010). These findings are also similar to the findings of the study by Ariawan et al. (2009); they also found that follow-up palpation was rarely done for the births observed in that study. There was no control over whether the intervention was applied correctly or not, even though observation charts for this purpose were designed and made available.

As guidelines by ICM, FIGO and WHO recommend, the intervention of sustained fundal massage every 15 minutes for the first 2 hours after birth, as part of AMTSL, did not show a statistically significant difference in the incidence of PPH.

The limitations of this study could also have played a role in the outcome. From the audit of the observation charts it was noted that the intervention was not successfully applied to the experimental group as instructed, and thus it could be speculated that it might have been a possible contributing factor to the outcome of the study. A possible reason for this might have been rapid staff rotation during the month of implementation of the intervention. New staff continually had to be informed and reminded. Agency staff, which the hospital makes use of at times of staff shortages, would also not be aware of the study. There was no actual control over whether the intervention was applied or not, even though observation charts were designed and supplied, staff members were informed, and the researcher was on duty in the labour ward at times. Another limitation to this study might result from the restricted timeframe in which the researcher was able to gather data, as well as the sampling procedure chosen to facilitate the greatest amount of data that could be captured during this short timeframe.

Although the study proved to be statistically insignificant in terms of the effectiveness of the intervention to reduce the incidence of PPH cases, the practice of uterine fundal massage, as part of AMTSL, should still be implemented as suggested by the ICM, FIGO and WHO guidelines. Results that are conclusive can only be obtained if the intervention is applied as recommended. There is, however, insufficient evidence to reject the null hypothesis of the study. Recommendations made based on the findings are that there is a need for further studies on AMTSL and its individual components; for training to be provided on AMTSL; regular meetings to be held to discuss PPH cases and measures to reduce it; and to carry out further research to determine effective management and control of PPH.

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