

Deviations from midwifery routines during
delivery and possible impact on postpartum
hemorrhage and neonatal outcome
in Buea Regional Hospital, Buea, Cameroon



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Master thesis in medicine

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Abstract

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Background: The maternal mortality ratio in Cameroon is one of the highest in the world, 590 per 100 000 live births, and has increased during the past decade. Postpartum hemorrhage (PPH) is the leading cause of maternal mortality worldwide. The neonatal mortality is also very high, 28 per 1 000 live births. WHO have published recommendations for treatment and prevention of PPH and for monitoring of the fetus during delivery.

Aim of the study: To evaluate the local application of the WHO recommendations to prevent and treat PPH and to monitor the fetus during delivery. Furthermore the aim was to compare annual statistics at Buea Regional Hospital (BRH) with the national data in Cameroon, thereby highlighting the situation and hopefully pave the way for improvements.

Method: Data was collected during seven weeks at BRH. Deliveries were observed and a protocol based on the WHO recommendations was filled in for every delivery. An additional case-control study was conducted collecting data, based on WHO recommendations, from the files of 20 PPH-cases over the last 7 months at BRH. The data was compared with 20 controls from the same period. Annual statistics was collected from BRH.

Results and discussion: The routines at BRH followed the WHO recommendations with some exceptions. Auscultation of the fetal heart rate was insufficient. Late cord clamping was in general not performed, the uterine tonus was not controlled as often as recommended and

uterotonics was not given in correct order. Problems with the use of partogram and a poor documentation of medical records was observed. Concerning BRH as a Regional hospital, annual statistics showed high rates of maternal and neonatal deaths, compared to the average in Cameroon.

Conclusion: A better pliability to the WHO recommendations at Buea Regional Hospital could decrease the number of PPH-cases, as well as maternal and neonatal deaths.

Keywords: Cameroon, Buea Regional Hospital, maternal mortality, neonatal mortality, WHO, postpartum hemorrhage, fetal heart rate.

Background

Cameroon

Cameroon is located in the west central Africa where Buea is the capital of the Southwest Region. In 2012 Cameroon had a total population of 21 700 000 people. 53 per cent of the inhabitants lived in the urban areas [1]. Due to the colonization the languages spoken in separate parts of Cameroon are french and english, and many local languages are present. Little political progress have been seen in the country and the president has been ruling since 1982.

The economic situation in Cameroon is disappointing. Even if economic growth has been reported over the last decade, the poverty rate is still high, and the economic growth is to slow to give improvements in the living condition for the average Cameroonian. The disparities between the regions have also widened [2].

In 2013 the HDI (Human Development Index) was 0.504 positioning the country at 152 out of 187 countries and territories (the rank is shared with Nigeria). The HDI is placing Cameroon in the low human development category [3].

The country has a rich soil and is rich in nature resources such as cotton, coffee, cacao, rubber and oil. Because of its richness in natural resources and that the country is ideally positioned, Cameroon could have a great trade market. But there are great infrastructural problems that not has been solved [2].

There is a lack of good data over the health status in Cameroon but the world bank report shows that Cameroon has not developed much in health over the past two decades [2]. The life expectancy at birth for males was 55 years and for females 57 years in 2012 [1].

The life expectancy has declined two years compared with the gain of five years in other Sub-Saharan countries. Cameroon has a higher maternal mortality rate than the average in Sub-Saharan Africa and the rate has increased over the past decade. 1 out of 127 are fatal and one every two hour die from complications due to pregnancy and delivery [2]. The neonatal mortality ratio is 28 out of 1 000 live births and is one of the highest in the world [4].

The under-five child mortality has declined in Cameroon but the rate is still high and the progress is lower compared to the rest of the world [2].

A big concern is the way health is paid for in Cameroon. The health services are mainly paid out of own pockets and Cameroon has one of the highest levels of out of own pocket payment in Africa and the lowest share of public spending. For example 100 per cent in the richer quintile have access to the prenatal care compared to less than 60 per cent in the poorest quintile. The same is seen in the delivery care. The richer you are the more likely you are to be assisted by qualified midwives and obstetricians. This leads to disparities between the rich and the poor quintile of the population [2].

There are also big disparities between rural and urban areas and between different regions in

the country. The public resources are not placed where they are most needed. Cameroon has 1.9 doctors per 10 000 people and that is almost twice the minimum WHO recommend. The problem is that the doctors are not equally spread in the country. They are less in the poorer parts of the country. Forty per cent of the doctors are located in the center region of Cameroon, and only 8 per cent are located in the far north province. All of this leads to higher mortality levels among the poor and rural population [2].

The sum spent per person and year on health in Cameroon is 61 USD. That's above the average in sub-Saharan Africa and includes money spent from the government, external donors and out of own pocket payments. Only 17 USD is given from the government but 8 USD of this are from different donors. In 2001 Cameroon pledged, with the rest of the countries in the African union, that 15 per cent of their annual budget should go to health care. This has never exceeded 9 per cent [2].

Cameroon has made a strategic plan for promotion and development of a mutual health insurance. The aim was that the insurance would cover 40 per cent of the population in 2015. In 2010 only 1 per cent was covered [2].

A study, conducted in Cameroon, examined the importance of quality, along with other factors such as price; income and distance contribute to the choice of health care providers. In this study it was found that these factors are of relative importance for the choice of providers in curative services. However it is uncertain how individual and family income, household wealth, distance, price and quality influence the choice of obstetrical and prenatal services in rural settings [5].

The cost for a normal delivery in a government health clinic, is 6 000 CFA (12 USD) if no complications occurs. For women in rural settings that is a high amount of money. Even so

the government health clinics are the most widely used for deliveries in both lower and upper income groups. The author concluded that the women seemed willing to pay for the quality [5].

It is of great importance to get a better health status in Cameroon because good health leads to economic growth when people can get proper education and increase the manpower.

Maternal mortality

In the 5th of the millennium development goal, improvement of maternal health, the target is to reduce the maternal mortality ratio by three quarters between 1990 and 2015 [6]. The ratio in sub-Saharan Africa has only declined by 41 per cent, between 1990 and 2010, and in 2010 sub-Saharan Africa still had one of the highest maternal mortality ratios with 500 maternal deaths per 100 000 live births globally [6]. Cameroon has a higher rate than the average Sub-Saharan Africa, 590 per 100 000 live births [1].

The definition of maternal death is the death of a woman while pregnant or within 42 days of termination of pregnancy, regardless of the site or duration of pregnancy, from any cause related to or aggravated by the pregnancy or its management, including abortions [7].

Maternal deaths are divided into direct maternal deaths that are due to complications during pregnancy, delivery or the post-partum period. The indirect maternal deaths are caused by already present sickness like malaria, HIV and iron deficiency.

The leading causes of maternal deaths globally are [8]

1. Post-partum hemorrhage (PPH) -24 per cent
2. Indirect causes -20 per cent
3. Infections -15 per cent

4. Unsafe abortions -13 per cent
5. Preeclampsia/ Eclampsia -12 per cent

Post-partum hemorrhage (PPH)

The delivery consists of separate stages. The 1st stage of the delivery is the time from when the contractions starts to full cervical dilatation (10cm). The 2nd stage is the period when the fetus descends and is delivered. The 3rd stage of the delivery is the period between the delivery of the fetus to the expulsion of the placenta.

Primary PPH is defined as bleeding ≥ 500 ml within 24 hours after delivery and severe PPH as bleeding $\geq 1\ 000$ ml in the same time interval. Secondary PPH is defined as bleeding within six weeks (up to twelve weeks) after delivery [9].

A woman has up to 1.5 liters extra blood volume during pregnancy. However, when there is an excessive bleeding the condition is getting worse quick. There is often a short pre-chock phase and hypotension is often a late symptom. For the thrombocytes to work optimally the hemoglobin value needs to be at least 10 g/L. When the woman loose up to and more than 2 liters, transfusions of plasma and erythrocytes are of importance [9].

Anemia affects half of all pregnant women. The rate of PPH is higher among those with severe antenatal anemia and the sequels of PPH are more serious for anemic women [10]. In low-income countries bleeding 500 ml can be a medical challenge because of the high prevalence of anemia. In the literature it is mentioned that the blood loss should be assessed in the relation to clinical signs and symptoms. The 500 ml limit should be considered as an alert line and the action line should be when there is a risk that the vital parameters could be negatively affected [11].

The etiology of primary PPH could be uterine atony, birth canal lacerations, uterine rupture, retained placenta or maternal coagulation disorders [9, 12]. In secondary PPH the cause is often retained placental residua or endometritis [9].

With instrumental births using ventouse or forceps there is a higher risk of birth canal lacerations, as well as fetal damage [9].

The placenta is considered as retained when it has not been expelled within 45 minutes after delivery despite active management of the 3rd stage of labor. The management of retained placenta is manual removal but if the woman is bleeding measures should be taken earlier [9].

When the uterine myometrium fails to contract and thereby fails to compress the vessels that supplies the placenta it is described as uterine atony. Atony can depend on retained placental residua that impede the uterus to fully contract. Often it is caused by “fatigue” in the myometrium due to prolonged labor or dilatation of the myometrium due to multiple birth or polyhydramnios. Multiple birth and high birth weight are two risk factors for prolonged labor. There is also a risk for atony during cesarean section because isofluran, which often is used in general anesthesia during the procedure, have a relaxing impact on the uterus. If the bladder are filled it can also contribute to the atony. Atony is more common in multiparous women [9] and causes 75-90% of all PPH cases [11].

Recommendations for prevention of PPH

World health organization, WHO, have published new and reevaluated guidelines in 2012 with recommendations for prevention and treatment of PPH. The meaning of these guidelines are to provide a foundation to develop programs needed to reduce the global burden of PPH [12].

In WHO guidelines recommendations for treatment of retained placenta are available. They recommend one additional dose of oxytocin (10IU) and controlled cord traction. WHO does

not recommend ergometrin because the drug may cause tetanic uterine contraction that would cause the uterus to contract and make it even harder to expel the placenta. Nor they recommend the use of prostaglandin E2 due to its adverse events, particularly cardiac events [12].

As additional treatment WHO recommend a single dose of antibiotics, ampicillin or first-generation cephalosporin if manual removal of the placenta is performed [12].

There are two different approaches to manage the 3rd stage of labor, “active management of labor”, discussed below, and “expectant management of labor” (EMTSL). In EMTSL the placenta is expelled spontaneously, it usually takes 10-15min. No uterotonic drugs are given but the child is often placed in contact with the mother’s nipple to induce endogen oxytocin production [9, 12].

“Active management of third stage of labor” (AMTSL) includes administration of prophylactic uterotonic drugs after delivery, controlled cord traction (CCT), early clamping and cutting of the umbilical cord and uterine massage [12, 13].

A prospective study conducted in Angola showed that AMTSL decreases the blood loss and duration of the 3rd stage of labor. In the AMTSL group 1% had a blood loss $\geq 1\ 000$ ml, in the EMTSL group there was 7.5% ($p < 0.001$). Blood loss < 200 ml was 48.9% in the AMTSL group and 15% in the EMTSL group ($p < 0.001$). The 3rd stage of labor was < 10 minutes in 89.4% of the AMTSL cases and only 5.4% in the EMTSL ($p < 0.001$) [13].

A Swedish randomized controlled trial showed the same results in blood loss. In the group receiving AMTSL 10% had a blood loss $\geq 1\ 000$ ml. In the group receiving EMTSL the number was 16.8% ($p < 0.001$) [14].

AMTSL is recommended but has been reevaluated by WHO. They recommend late cord clamping and do not recommend uterine massage as prevention.

Uterotonic drugs

According to WHO, after delivery all women should be given uterotonic drugs immediately.

The first choice of drug should be 10IU of Oxytocin. Other drugs as ergometrin/methylergometrin or fixed drug of combination by ergometrin and oxytocin should be used in places where oxytocin is unavailable [12]. In a review article they saw clear benefits with oxytocin related to indicators of blood loss such as postpartum hemorrhage and the need for therapeutic uterotonics. When comparing oxytocin to ergometrin/methylergometrin, oxytocin was associated with fewer manual removals of the placenta and less rise in the blood pressure [15].

In places where skilled birth attendants are unavailable, oral misoprostol should be the drug of choice [12]. Oxytocin is more effective in reducing PPH than oral misoprostol. However, oxytocin requires refrigeration and skills for administration. Misoprostol doesn't need refrigeration, has a low cost and is easy to administer [10].

Many studies have been made on the use of oral misoprostol in low-income countries. A randomized control study showed that oral misoprostol (600 µg) gave a reduction in the rate of acute post partum hemorrhage (from 12.0 % to 6.4 %) and in acute severe postpartum hemorrhage (from 1.2 % to 0.2 %) as well as reduction in the mean blood loss [16].

Misoprostol is also a favourable drug to use in poor-resource settings due to the low cost, stability, positive safety profile and it is easy to administer [16].

Cord clamping

WHO recommend late clamping (1-3 minutes after birth) of the umbilical cord, unless the neonate needs immediate resuscitation, then early cord clamping (<1 minute after birth) is recommended [12]. A review article published, where 15 studies were included, showed no significant difference in the maternal outcome, severe PPH or bleeding ≥ 500 ml, between

early or late clamping of the umbilical cord. No significant difference in the hemoglobin value between the two groups was seen. However, late clamping of the cord led to higher neonatal hemoglobin values 24 and 48 hours after birth and the neonatal iron stores were improved in the late cord-clamping group. With early cord clamping they were twice as likely to be iron deficient at 3-6 months of age. Even if the iron stores are improved there is a higher risk of jaundice due to the higher levels of bilirubin in the late cord clamping group [17].

Controlled cord traction

Controlled cord traction is recommended by WHO if there are skilled birth attendants available [12]. A randomized controlled trial showed that controlled cord traction led to fewer manual placenta removals, less pain and discomfort to the woman and a reduced duration of the 3rd stage of labor, compared to the group where spontaneous placental expulsion was used. There was no difference between the two groups in measured blood loss [18].

Assessment of the uterus

WHO also recommend assessment of the uterus after birth to detect early signs of uterine atony [12]. The parturient should be monitored for two hours after placental expulsion and the fundal height should be followed by palpation repeatedly. If the fundal height rises over the level of the umbilicus, bleeding due to uterine atony should be suspected [9].

Uterine massage

Uterine massage is not recommended if the woman has received uterotonic drugs with good effect. However it is one of the strong recommendations for treatment of PPH [12].

Placenta examination

The placenta should be examined after delivery to see if any parts of the placenta or the

membranes are missing. If so or the placenta is retained, uterine contraction is not effective [9] and manual removal is necessary as soon as possible.

Recommendations for treatment of PPH

Medical treatment

For treatment of PPH uterotonics should be used, oxytocin is the first drug of choice. If oxytocin is unavailable or the bleeding does not respond to oxytocin, prostaglandin drugs (including misoprostol), ergometrin/methylergometrin or fixed drug combination of oxytocin and ergometrin should be used [12].

Tranexamic acid (cyklokapron) a fibrinolysis inhibitor, should be used if the bleeding is caused by traumatic injury or if the bleeding not respond to the drugs discussed above [12].

To treat the loss of blood volume fluids should be given. Crystalloids are recommended before colloids [12]. When there is severe hemorrhage with hypovolemic shock treatment with intravenous fluid and transfusion is extremely important to reduce the risk of mortality [19].

Manual and surgical treatment

If the bleeding does not respond to uterotonic drugs, and placental residua has been excluded as a reason, the conservative interventions recommended by WHO are uterine massage and, if the bleeding is due to uterine atony, uterine balloon tamponade. Although uterine massage should be avoided as prevention of PPH it is a strong recommendation for treatment of PPH [12]. Uterine balloon tamponade is a procedure when a balloon catheter is placed in the uterine cavity through the vagina and inflated so the pressure on the uterine wall causes the bleeding to stop [9]. This procedure can be made with low costs using condoms or surgical gloves as well as with special devices [12]. Uterine packing, the procedure when for example

surgical cloths are packed in the uterus, is not recommended by WHO if the bleeding is caused by atony [12].

Surgical interventions should be performed if conservative interventions fail to stop the bleeding. WHO first recommends compression sutures (e.g. B-lynch sutures) [12]. With this technique two sutures are placed from the lower segment of uterus and around fundus and down on the opposite lower segment of uterus. The sutures are then like ‘braces’ and compresses uterus [9].

If the less invasive surgical method fails to stop the bleeding, more invasive surgical approaches such as uterine, utero-ovarian and hypo gastric vessel ligation may be tried. As last outcome, if a life-threatening bleeding proceeds, a subtotal or total hysterectomy should be performed [12].

Until appropriate care level is available WHO recommend external aortic compression to reduce the bleeding [12].

Neonatal mortality

The neonatal mortality ratio in Cameroon has not changed much during the past four years. In 2013 the number was 28 per 1 000 live births positioning the country at 150 out of 178 countries [4].

During delivery monitoring of the fetal well-being is essential in the care of labor to detect signs of asphyxia in the fetus [20]. Asphyxia is a condition with hypoxia and metabolic acidosis that threatens the function of the vital organs. The etiology is intensive uterine contractions and compression of the umbilical cord that obstruct the oxygen supply to the fetus [9].

WHO have published recommendations for monitoring of the fetus during delivery. The fetal heart rate (FHR) should be controlled every 15 to 30 minute in the 1st stage of labor and after every contraction in the 2nd stage [9, 20]. There are two methods for assessing the heart rate of the fetus, continuous with electronical surveillance, or intermittent with a monaural stethoscope (Pinard's) or Doppler.

Normal range of the fetal heart rate is 110-150 beats/min. Fetal distress should be suspected when the FHR reaches above (tachycardia) or under (bradycardia) and also when there are reduced variability and decelerations in the FHR [20].

Buea Regional Hospital

Due to the General Supervisor at Buea Regional Hospital, the hospital is drifted by the government and used to be a military (colonial) hospital. It was rebuilt and renovated by the Chinese in 2003 to the regional hospital it is today.

Buea Regional Hospital has a total of 120 beds and one outpatient department. The hospital has a surgical unit with a theatre and a ward for the patients. The medical unit is divided in a male and a female ward. There are also one emergency unit and one unit for hypertension and cardiac disorders.

The hospital also has units for family planning and a unit for infants and children. It also comprises units for dentistry, ophthalmology, diabetics, HIV/AIDS, dialysis (with hemodialysis) and a unit for autopsy. At the hospital there are also a laboratory and a pharmacy.

The maternity ward is divided in one section where the deliveries take place with four beds and two delivery rooms. There is also one public maternity ward and one private maternity ward. At the maternity ward both women that have given birth and women with gynecological disorders are cared for.

As discussed earlier all medical care in Cameroon is paid from own pockets. After personal communication with the General Supervisor, Buea Regional Hospital, a normal delivery without any complications costs 6 000 CFA (12 USD). The woman has to pay extra if e.g. more gloves or augmentation with oxytocin is needed.

A cesarean section costs 40 000 CFA (76 USD) after the costs have been subsidized by the government, before the cost was 120 000 CFA (228 USD).

The cost for measuring the hemoglobin value is 500-1 000 CFA (1-2 USD) and the cost for a full blood count is 4 500 CFA (5 USD). One unit of blood costs about 1 500 CFA (3 USD).

Aim of the study

The aim of this study was to evaluate the local application of the WHO recommendations to prevent and treat PPH and the monitoring of the fetus during delivery. Furthermore the aim was to compare annual statistics at Buea Regional Hospital (BRH) with national data in Cameroon. Due to the high neonatal and maternal mortality, where PPH is the leading cause, there was of interest to see the local routines and the possible deviations from the recommendations, thereby highlighting the situation and hopefully pave the way for improvements.

Questions at issue

- Do the routines for prevention of PPH follow the WHO recommendations? Are there any difference in preventive measurements between the deliveries that ended up in PPH and those who did not?
- Do the routines for treatment of PPH follow the WHO recommendations?
- Do the routines for monitoring the fetal heart rate differ from the WHO recommendations?

- How do the annual statistics at BRH compare with the national data of Cameroon?

Material and methods

The study was conducted during seven weeks in Buea, Cameroon and deliveries were observed at Buea Regional Hospital.

The observational study

By practical reasons collecting of the data only occurred during daytime (8am to 7pm). Due to the low numbers of deliveries during daytime the total number of women observed were only thirty. Out of this thirty cases, the 2nd and 3rd stage of labor were observed in eighteen cases. In the remaining twelve cases only the 1st stage of labor were observed.

During the deliveries a protocol based on the WHO recommendations were followed (appendix1). The first part was an observational study where every step in the delivery and check up at arrival were followed, concentrating on PPH. The second part was based on information about the baby and the third part was based on the treatment of PPH. The fourth part of the protocol was based on the antenatal care record and the last part, the fifth, consisted of questions to the woman that were asked during an interview the day after the delivery.

The capillary hemoglobin value was measured before delivery and once again the day after the delivery. Equipment used was 'Hemocue® Hb 301 system' donated by Hemocue AB, Sweden.

The case-control study

To see how the WHO recommendations for treatment of PPH were followed at BRH an

additional case-control study was conducted. This was selected also to see if there were differences in the preventive care between cases and controls. Data was collected from the files stored in the maternity ward. Files from twenty deliveries with an outcome of PPH and twenty controls (deliveries with no such bleeding) were reviewed using the same protocol as for the cases observed. The control used were the following delivery with the same parity (same number of deliveries) as the case.

Annual statistics at BRH

Annual statistics (from the 1st of October 2103 to the 1st of October 2014) on maternal mortality, PPH and neonatal deaths were collected from the maternity ward to evaluate the situation in Buea and to compare with the average in Cameroon and the world.

Statistical methods

All data was saved and descriptive analysis was performed in 'IBM SPSS Statistics version 21'. Chi square test was used to calculate p-value in Microsoft Excel version 14.4.7.

Significance level was set at $p < 0.05$.

Ethics

Every women included in the study gave their oral consent to be a part of the study and they were informed that no name would be saved and that all information should be stored confidentially.

An ethical clearance was written from the regional delegate in Buea (appendix 2).

Results

Observational study

Prophylactic malaria treatment was given during pregnancy to 23 (76.7%) women and not given to 4 (13.3%) women. (In 3 cases (10%) data were unknown). The mean of the latest hemoglobin value (in the antenatal record) was 10.8 g/dl in both the group treated and untreated.

Three of the thirty cases observed (10%) had a bleeding that was diagnosed as PPH. The cause of the bleeding for the women with PPH were cervical tear, retained placental residua and retained placenta. In these three cases the bleeding was estimated to 500ml in two of the cases and 400ml in the third case.

The mean hemoglobin value for the observed deliveries was 12.1 g/dl (9-14.2g/dl) before the delivery and 10.7 g/dl (7.3-13.7g/dl) after the delivery. (The hemoglobin value was measured in 15 cases before and after delivery).

One of the thirty deliveries observed was a twin delivery and two deliveries were instrumental deliveries. The mean birth weight of 31 neonates was 3.4kg (2.7kg-4.5kg \pm SD 0.42).

As seen in table 2, partogram was written in 23 cases (76.7%). The partogram used was a WHO modified partogram (appendix 3). In four cases the partogram was written after delivery. In 3 cases the partogram was incorrectly filled in so the midwife had to fill in a new partogram during or after delivery. In 7 cases partogram were not used. One of them ended up in PPH. The mean time from the start of the contractions to the births was 21h 30min.

No one received analgesic during the delivery at the hospital.

In 29 (96.7%) of the deliveries observed at the hospital the blood pressure was controlled at admission. No data were collected on measuring blood pressure during delivery.

Table 1. Correct auscultation of the fetal heart rate (FHR) at income and in 1st and 2nd stage

Correct auscultation of the FHR (n=30)	At income	1st stage	2nd stage
Yes	29	0	0
No	1	30	18

The method that they used at the hospital to control the FHR was intermittent auscultation with Doppler or monaural stethoscope. As seen in table 1, the FHR was controlled at income in almost every delivery observed. In 7 deliveries (23.3%) the FHR was only controlled at admission. In the 1st stage of labor only 2 deliveries (6.7%) were controlled every hour, 9 deliveries (30%) were controlled less frequently and 11 deliveries (36.7%) were controlled with varying frequencies (in one case data was missing). The 2nd stage of labor was only observed in 18 deliveries and in 7 (39%) the FHR was controlled. In none of the 7 deliveries the FHR was controlled after every contraction. During the study one neonate deceased and one nearly passed due to asphyxia.

3rd stage of labor

Table 2. The use of methods for prevention of PPH in the observational study.

The use of methods for prevention of PPH (n=30)	yes	no	unknown
Correct use of partogram	16	14	0
Administration of uterotonics	26	0	4
Late cord clamping	8	10	12
Controlled cord traction	16	2	12
Visual examination of the placenta	10	14	6
Control of the uterine contraction	23	3	4
controlled once	13		
controlled >once	5		
unknown	5		

Four cases ended up in cesarean section and no operation files were available for these cases.

The information about 3rd stage of labor for these cases is referred as unknown.

As seen in table 2, 26 cases (86.7%) received oxytocin in the 3rd stage of labor (4 cases was

cesarean section and their data are unknown) 13 (50%) of these already had oxytocin going as augmentation in 1st and 2nd stage of labor.

All 11 neonates (one twin delivery) in the deliveries where early cord clamping was performed had normal Apgar score (≥ 7) one minute after delivery.

Controlled cord traction was performed in 16 deliveries. In the two cases where controlled cord traction not was performed (6.7%) the placenta was removed manually.

The placenta and the membranes were not controlled in 14 of the deliveries observed, in only one delivery the placenta was seen to be examined. The deliveries that occurred during nighttime, 2nd and 3rd stage was not observed but the placenta and membranes were controlled in 9 deliveries due to the medical record (in the other 6 deliveries the data were unknown).

In 23 cases (76.6%) the contraction of the uterus was controlled (in 7 cases it was not (4 of these were cesarean section)). In 13 of these (57%) the contraction was only controlled once.

The mean time that the women were observed in the delivery room was 2h 42min (50min-6h) Uterine massage was performed as prevention in 16 cases (53.3%). It was not performed in 2 cases (7%) and in the rest of the 12 cases the data were unknown.

Summary of the treatment in the three PPH-cases in the observational study

All three cases received additional oxytocin (syntocinon) when the bleeding was discovered.

Two of the cases were also given methylergometrin (methergin) one of them also received misoprostol. Uterine massage was performed in two of the cases. In none of the cases intrauterine balloon tamponade or packing of the uterus was performed. External aortic compression was not used in any of the cases. One was given crystalloid and one received both crystalloid and colloid. Only one received whole blood, two units were ordinated, only one unit was given. In two of the cases exploration of the uterus was performed at the maternity ward. None were taken to surgery.

Case-control study

In the group of cases the mean age were 26.5 years, the youngest was 18 and the oldest 42 (\pm SD 6.57). In the control group the mean age was 27.6 years, the youngest 18 and the oldest 37 (\pm SD 5.73). The mean parity was 1.7 parities in both groups.

Prophylactic malaria treatment were given during the pregnancy in 5 cases (25%) and for seven of the cases the data were unknown due to missing medical records in two of the cases and no antenatal care record in five of the cases. The rest of the cases (8 cases (40%)) did not receive prophylactic malaria treatment due to the medical record.

In the control group only one file was missing and one did not have an antenatal care record.

Prophylactic malaria treatment was given to 10 controls (50%). 8 controls (40%) did not receive prophylactic malaria treatment due to the antenatal care record. No significant difference in receiving malaria prophylactic between the two groups was seen ($p=0.35$).

The mean in the latest hemoglobin value for the cases that did not receive prophylactic malaria treatment was 11.7 g/dl and for those who received prophylactic malaria treatment the mean was 10.8 g/dl. In the group of controls the mean hemoglobin value for the ones who did not receive prophylactic malaria treatment was 11.0 g/dl and for those receiving treatment 11.2 g/dl.

Three of the cases were born before arrival and the data about these deliveries are unknown.

In the case group there were two twin deliveries but no cesarean section and in the group of controls there was no twin delivery but three emergency cesarean sections and one elective cesarean section. No operation file was available in the controls with cesarean section, information about 3rd stage of labor is referred to as unknown.

There was no instrumental birth in neither the group of cases or the control group.

The mean birth weight in the case group was 3.3 kg, the lowest weight was 2.5 kg and the

highest 4.2 kg (\pm SD 0.40). In the control group the mean birth weight was 3.3 kg, the lowest weight was 2.7 kg and the highest weight 4.1 kg (\pm SD 0.43).

The cause of PPH

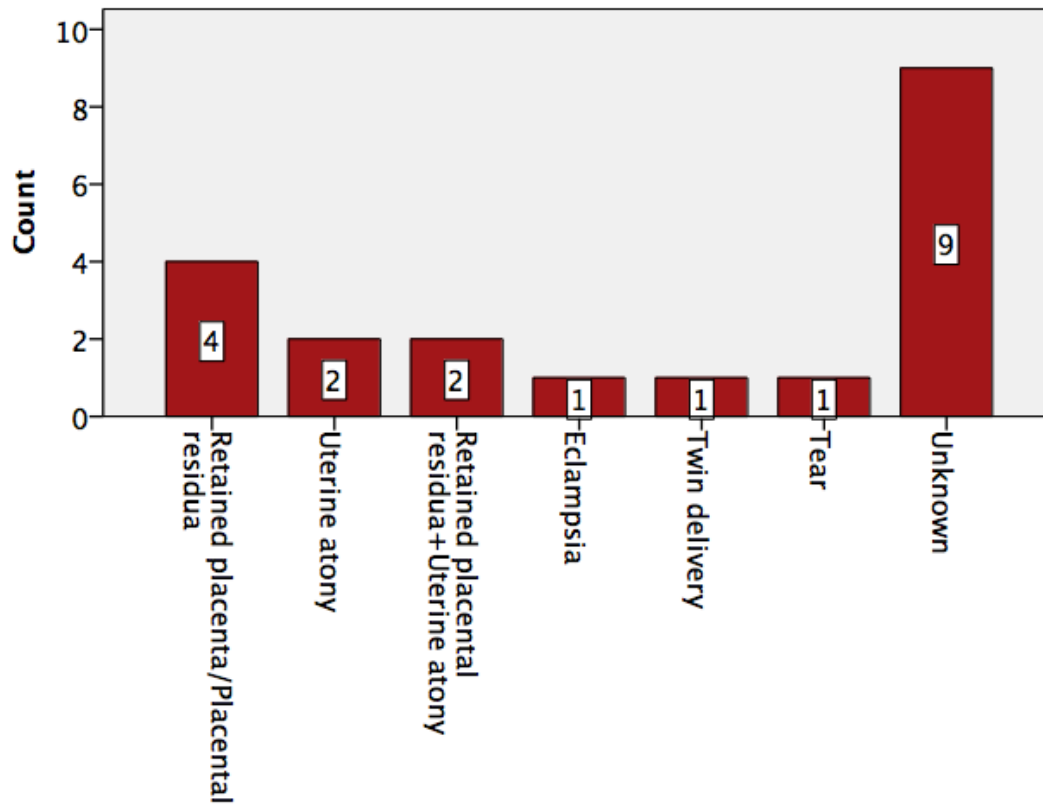


Figure 1.

The figure shows the cause of PPH in the cases in the case-control study. In 9 cases the cause is unknown. Most of the cases are caused by retained placenta or retained placental residua.

The cause of PPH in the group of cases was unknown in 9 cases (45%). In one case the bleeding was probably due to twin delivery and in another case eclampsia was the possible cause of bleeding. 4 cases had retained placenta or placental residua. 4 cases were due to uterine atony, two of them had retained placental residua. In one of the cases with uterine atony the cause due to the file was coagulation disorder. But the coagulation disorder was probably due to the great bleeding due to atony. One case had cervical tears (Figure 1).

The pattern of bleeding is illustrated in figure 2.

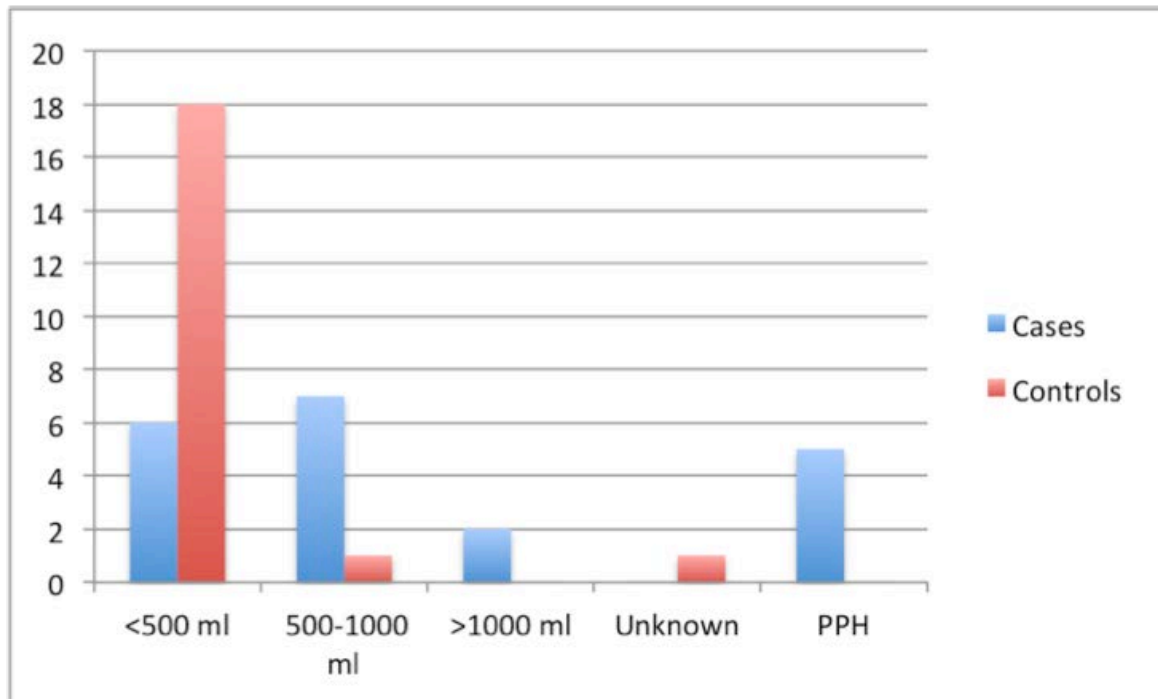


Figure 2

The figure shows the total amount of bleeding in the case-control study. Six of the cases were defined as PPH even though the bleeding was less than 500ml and one of the controls had a bleeding >500ml.

The mean blood loss in the cases with information about total blood loss was 620 ml. The highest estimated blood loss was 1 500ml and the lowest 300ml (\pm SD 208.3). In the control group the mean blood loss was 171 ml, ranging from 50-500 ml (\pm SD 108.4).

As seen in table 3, partogram was used in 11 cases (55%) and in 14 controls (70%) one of the controls with no partogram was an elective cesarean section.

The mean time, from the start of the contractions until birth, in the group of cases was 12h 59min (8h-18h 30min) and for the controls 13h 2min (4h 45min-28h 45min). In the group of cases there was 15 cases were no data was found and in the group of controls it was 9.

The mean time from arrival to birth in the case group was 6h 13min (4h 40min-7h 5min) and in the control group 8h 17min(5min-29h). Data was missing from four of the cases in the case group and in the control group no data was missing.

In 16 of the cases and 15 of the controls the blood pressure was controlled at admission. No data were collected on measuring blood pressure during delivery.

3rd stage of labor

Table 3. The use of methods for prevention of PPH in the two groups.

The use of methods for prevention of PPH (cases n=20 controls n=20)	Cases		Controls		P-value
	Yes	No	Yes	No	
The use of partogram	11	4	14	5	p=0,98 (N.S.)
Administration of uterotonics	15	0	15	0	
Visual examination of the placenta	16	0	16	0	
Control of the uterine contraction	11	5	12	4	p=0,69 (N.S.)

As seen in table 3, no significant difference was seen between the two groups in the use of methods recommended. Uterotonic drugs in 3rd stage of labor were given to 15 cases (75%) and 15 (75%) controls. In the rest of the 5 cases and controls data was missing. Information about what time after delivery the uterotonics were administered was not available in the medical records.

Information about how the placenta was expelled and what time after delivery clamping of the umbilical cord was performed were not available in the files. The placenta and the membranes were controlled in 16 cases and 16 of the controls (80%). In 4 cases and 4 controls (20%) information were not found in the medical records (Table 3).

As seen in table 3, assessment of the uterine contraction was performed in 11 of the cases (55%) and 12 of the controls (60%). In 5 cases and 4 controls it was not performed and in 4 cases and 4 controls the data were missing. Information about how often palpation of the uterus and uterine massage was made, was not available in the medical records.

Treatment of PPH

Information about external aortic compression or uterine massage as treatment was not available in the medical records.

Uterotonic drugs given

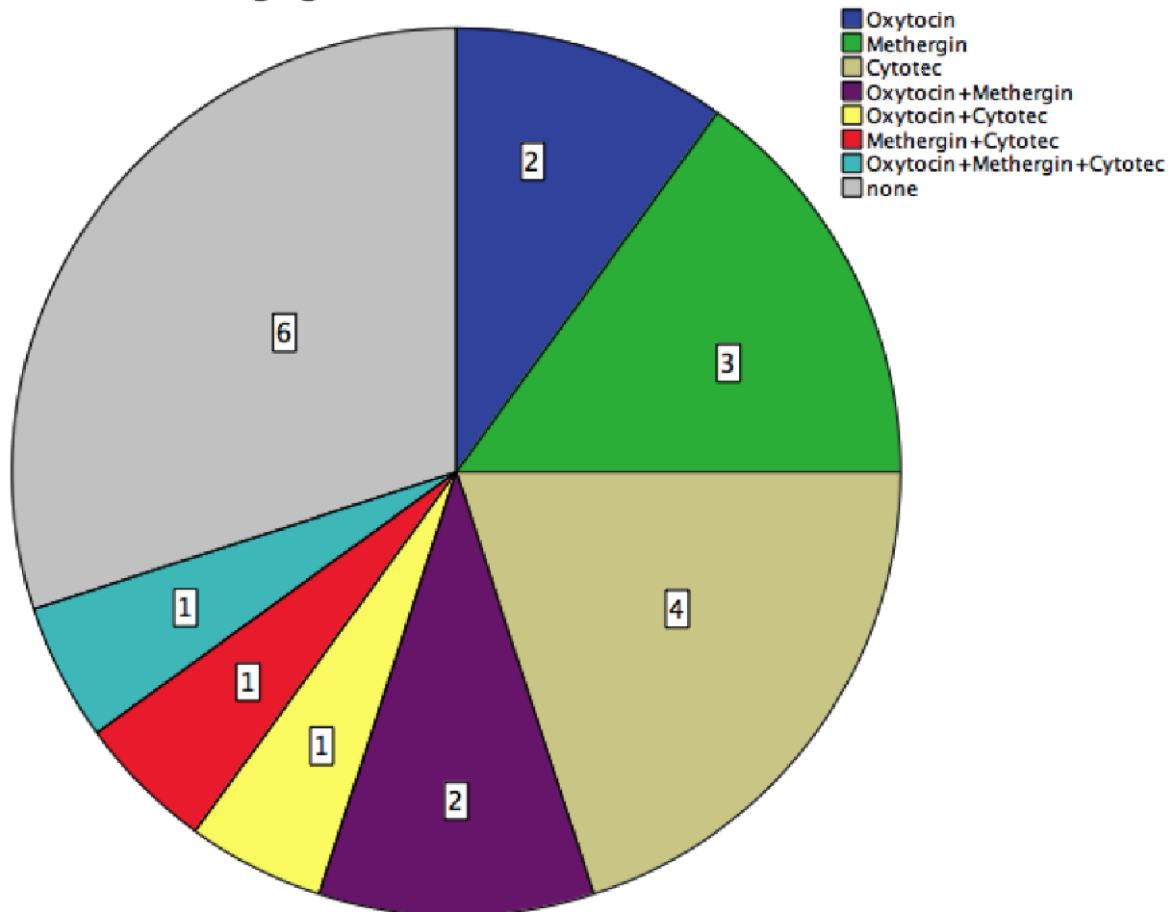


Figure 3

The figure shows the uterotonics given in each case in the case-control study. 14 cases received uterotonics, 8 cases did not receive oxytocin before other uterotonics was given and 6 cases did not receive any uterotonics.

As seen in figure 3, 14 cases (70%) received treatment with uterotonic drugs. The drugs used were syntocinon (oxytocin) i.v, methergin (methylergometrin) i.m and cytotec (misoprostol)

rectal. 8 cases were not given oxytocin before receiving other uterotonics and 6 cases (30%) did not receive any uterotonic drug. Cyklokapron (tranexamic acid) was not used.

14 cases (70%) received intravenous fluid, 9 (45%) received both crystalloids and colloids, 3 cases (15%) received only crystalloids and 2 cases (10%) were given only colloids

Information about non-surgical interventions (uterine packing and intra uterine balloon tamponade) was not available in the files.

In 7 (35%) of the cases exploration of the uterus was performed at the maternity ward. 4 cases (20%) were taken to surgery. In two of these cases exploration of the uterus was performed. One case was taken to surgery due to cervical tear that had to be repaired. The last surgery was a hysterectomy, this was a case that later died.

The blood pressure was followed in 70% (14 cases). Heart rate of the patients was followed in 55% (11 cases). The temperature was measured in 15% (3 cases).

Annual statistics at Buea Regional Hospital

The data collected from the statistics at the maternity ward showed that the total amount of deliveries was 1 032 the past year at Buea Regional Hospital.

Out of this 1 032 there were 28 cases (3%) of PPH and 5 cases (0.5%) of maternal mortality. PPH was the cause of death in three of the cases. In one of these cases uterus ruptured. The cause of death is uncertain in the other two cases. One of the cases had IUFD (intra uterine fetal death) and came in with high blood pressure. The cause of death is unclear. The most feasible is preeclampsia perhaps complicated with placental abruption. In the last case, the woman came in for an elective cesarean section and was stable after the surgery but died on the second day after the cesarean section, the cause is unknown.

At Buea Regional Hospital the total number of instrumental deliveries was seven, five with

forceps and two with ventouse.

The number of neonatal deaths was 41 cases (3.9%).

Discussion

Study limitations

By practical reasons the data was only collected during daytime. Most of the deliveries occurred during late evening, night or early morning. Thereby the number of deliveries observed came out low.

The paper files at the maternity ward at Buea Regional Hospital were stored upon shelves and sorted by month and year. In addition they had duty report books where all the deliveries and care given to the women were documented, and another book where sorted variables and statistics were written down. In some cases the handwritten text in the file compared with the books did not correspond to each other and some paper-files were missing. In addition some of the information in the paper file, e.g. the antenatal care record, could not be read anywhere else. A lot of information about the delivery was not documented and in some cases information that usually was written down, had been left out. The measurements for prevention of PPH except for the assessment of the uterine contraction and uterotonics in 3rd stage of labor were left out.

Often the women had their own books where medications and examinations were recorded, which in some cases could be read. A large part of that information was left out in the file.

The poor medical record documentation is the reason why a large part of the data collected is unknown. The cases and the controls respectively are also low in numbers and that is because the work with collecting the data was discouraged by the midwives.

Because of the small study data the data must be interpreted with caution.

Risk factors for PPH

Anemia was common in Buea. Of all women included in the study (70 women) only 13 women had a hemoglobin value above 12g/dl (in 23 the data was missing). Even though anemia affects half of all pregnant women [10] the number of anemic women in this study is higher than that.

Malaria is a common disease and a common cause of anemia in Buea. In this study we couldn't see any correlation between the hemoglobin value and prophylactic malaria treatment. In the group with cases in the case-control study the mean hemoglobin value for those who received prophylactic malaria treatment was 10.8 g/dl and slightly higher (11.7 g/dl) in the group with no prophylactic malaria treatment. Two of the cases had malaria during pregnancy, it was unclear if treatment was received. In the observed deliveries the mean hemoglobin value was the same in both groups, 10.8 g/dl. No one of the three PPH-cases observed had malaria during pregnancy.

It is plausible that, in this small study, malaria played a minor part as an etiological factor to anemia as a risk factor for PPH.

After personal communication with Håkan Lilja, associated professor and obstetrician, normally 1 out of 89 deliveries are twin deliveries. At Buea Regional Hospital two (2 out of 20) of the cases in the case-control study and one (1 out of 30) of the observed cases, that was diagnosed with PPH, were twin deliveries. This is a higher number than the average. The relative risk for bleeding is 3-4.5 times higher than for the delivery of a single fetus. The higher risk of bleeding is due to the enlarged uterus and often prolonged labor with a higher risk of uterine atony [9]. The third stage in twin deliveries should be supervised extra carefully.

Another risk factor for PPH is fetuses with high birth weight. Birth canal lacerations are more common after deliveries with big babies. The risk to get a uterine atony is also bigger due to prolonged labor and "fatigue" of the myometrium of the uterus [9]. No correlation was seen between birth weight and rate of PPH. In the case-control study the mean birth weight was 3.3 kg in both groups.

1st and 2nd stage of labor

There was no difference in the mean age or mean parity between the case and control groups.

Control of the blood pressure, temperature, heart rate frequency, assessment of the fluid intake and urine output as well as the need of support and the level of pain should be performed [20].

In 29 (96.7%) of the deliveries observed at the hospital the blood pressure was controlled at admission. In the case-control study the number was 16 of the cases and 15 of the controls.

This is of importance to detect preeclampsia.

No data were collected on measuring blood pressure during delivery.

Psyko-social support

During the delivery the midwives and the students in nursing, medicine and midwifery, that were present most of the days, supported the women. The relatives were not allowed inside the delivery room. Most of the parturient had their relatives sitting on a bench outside as support.

Research has been made on the importance of good support during delivery. Social support during delivery lead to less use of pharmacological painkillers, less surgical deliveries, lower number of postpartum depression and less discontent with the experience of the delivery [9].

When interviewing the women (observed cases) the day after delivery only one felt that she

didn't have enough support from the midwives.

Due to the WHO report, care in normal birth- a practical guide; the parturient psychological- and physiological wellbeing should be assessed regularly during the labor process and at admission.

WHO also point out that the privacy of the woman should be respected and that unnecessary persons should not be present in the labor room [20]. In Buea Regional Hospital there was four beds in the room where the women waited for the 2nd stage of labor to start. Some times the women also delivered in this room. There were two delivery rooms with one bed each. The privacy for each woman was hard to accommodate, but one of the big issues was that often there were many students present during labor without the woman's approval. This is one thing that is possible to change to reach a better privacy for the women.

Analgesia

At the hospital no one received analgesia during delivery. The women are prepared from young age that deliveries hurt and the midwives often pointed out, during labor, that deliveries are painful. Due to WHO it is of importance that the woman get support and are free to be positioned as she wants, especially during the 1st stage of labor [20]. This was not the case in the deliveries observed. If the woman had oxytocin drip going she was not allowed to leave the bed. During 2nd stage of labor, during active pushing, the women were only allowed to be in supine position. To be allowed to change position could increase the wellbeing and ease the delivery.

Auscultation of the fetal heart rate

The fetal heart rate was controlled at admission in 29 (96.7%) of the deliveries observed but

there was a low frequency of auscultation during delivery (Table 1). The fetal heart rate was never controlled every 20-30minutes in the 1st stage and after every contraction in the 2nd stage as WHO recommend [20]. The deficient control of fetal heart rate became obvious in two of the deliveries observed. In one of the cases the heart rate was only controlled three times during the 1st stage. Once at arrival, then after five, and then after two hours respectively. In the 2nd stage it was controlled only once. The 2nd stage of delivery was difficult. The woman received augmentation with oxytocin and amniotomi was performed. When the obstetrician came to check up the mother and the fetus, the duration of 2nd stage was already 2 hours and 40 minutes and the fetus did not have any audible heart sounds. The obstetrician delivered the neonate urgent with forceps and the baby luckily survived. In the other case the fetal heart rate was controlled with varying frequency during the first stage of labor but was only controlled once during the 2nd stage. When the baby was delivered it had severe asphyxia and were rushed to the operation theatre to receive oxygen, the equipment for receiving oxygen in the delivery room did not work. Unfortunately the oxygen didn't work in the operation theatre either but in the neonatal ward oxygen was given. The asphyxia was so severe that the baby died the day after the delivery and the deficient control of the heart rate was probably one contributing factor.

Instrumental deliveries

Instrumental deliveries are important when studying PPH because forceps and ventouse can damage the birth canal and the fetus. The indication to use ventouse or forceps is dysfunctional labor or threatening fetal asphyxia [9]. No correlation between PPH and instrumental birth was seen at BRH. None of the deliveries in the case-control group was instrumental. In the observational study two were instrumental but none of them had excessive bleeding. The annual statistic showed that 7 deliveries were instrumental over the

last year. After personal communication with Håkan Lilja, associate professor and obstetrician, this is a very low frequency.

The use of partogram

Partogram was used in 23 (77%) of the deliveries in the observational study and in 11 (55%) and 14 (70%) respectively in the case-control study (Table 2 and 3). The meaning of the partogram is to early detect prolonged labor and thereby avoid uterine atony and the risk of postpartum hemorrhage, and also to detect complications in birth based on the mothers blood pressure and the fetal heart rate. The use of partogram should be encourage according to WHO [20]. Even though the partogram was used, the midwives had problems with how to fill them in. In some cases the partogram was reconstructed during the delivery. The most serious problem with the use of partograms at Buea Regional Hospital was that the partogram, in 4 cases, was filled in after the delivery. The question is if all the midwives at Buea Regional Hospital were aware of the reason why partogram is important to use.

In a study conducted in Ethiopia, a retrospective review of assessment of the WHO modified partogram, the same partogram as used in Buea Regional Hospital (appendix 3), showed similar results. In that study they saw that correct completion of the partogram was low. As an example the fetal heart rate was not recorded in 41.1% and was substandard in 27.9%. Low monitoring was also seen in cervical dilation and uterine contraction. In Tanzania, Benin and Uganda similar studies showed the same [21]. At Buea Regional Hospital no fetus in the cases observed had the fetal heart rate controlled as WHO recommend.

In the study conducted in Ethiopia, the authors concluded that the findings may reflect poor management of labor or simply inappropriate completion of the instrument [21]. At Buea Regional Hospital the last seem to be the biggest issue except with controlling the fetal heart rate, which reflects poor management, the cervical dilation and uterus contraction was

monitored at the hospital but not correctly filled in. In the case-control study the delivery time was shorter among the cases than in the control group. Thus the length of the delivery probably did not influence the PPH number in this small study.

3rd stage of labor

Use of uterotonics

26 (86.7%) of the cases observed received oxytocin (syntocinon) in the 3rd stage of labor (Table 2), most of the cases directly (within 1-7min after birth), according to the WHO recommendation for prevention of PPH [12]. Oxytocin has benefits as prevention for PPH and benefits compared to ergometrin/methylergometrin [15]. Buea Regional Hospital had refrigeration for storing oxytocin and the skilled birth attendants needed for the administration [10]. There was no difference in receiving uterotonics in the group with cases or controls, 15 (75%) received uterotonics in both groups (Table 3). The number should be 100% in both part of the study. It was observed that the routine was to give uterotonics in 3rd stage of labor but in some cases the data concerning receiving uterotonics were missing, the possible reason is the poor medical record documentation.

Umbilical cord clamping

The umbilical cord was clamped early in 10 deliveries in the observational study (33.3%) late cord clamping was performed in 8 cases (26.7%) (Table 2). Research have showed that late cord clamping does not lead to any difference in maternal outcomes but the neonate gets better iron stores and hemoglobin value [17]. WHO recommend that the cord should be clamped late except if the neonate need urgent resuscitation [12]. The Apgar- score was normal (≥ 7) one minute after delivery in all the cases with early cord clamping so there was no need for urgent resuscitation.

Controlled cord traction

16 (53.3%) of the placentas in the observed deliveries was expelled with controlled cord traction (Table 2) as WHO recommend [12]. Controlled cord traction is associated with less discomfort for the woman, lower number of manual removal of the placenta and a shorter 3rd stage of labor [18]. In two cases (6.7%) manual placental removal was performed.

One of the two cases with manual removal of the placenta got PPH. WHO recommend additional oxytocin if the placenta is retained [12] and that was given to the woman. The placenta should be manually removed 45 minutes after birth [9] in this case it was done only 22 minutes after delivery. If there is a bleeding manual removal should be performed earlier [9] as in this case. Centrally in the procedure are analgesia and cervical relaxant (e.g. nitroglycerine) [9], none of these was given.

Assessment of the uterus

The parturient should be supervised for two hours after delivery and assessment of the uterus contraction should be performed repeatedly [9]. In 23 (76.6%) of the deliveries observed, the contraction of the uterus was controlled (Table 2). Even though the mean time the women were observed in the delivery room was 162 minutes, longer time than the 120 minutes recommended, [9] 57% were controlled only once. There was no significant difference between the group of cases and controls ($p=0.69$). In 11 of the cases (55%) and 12 of the controls (60%) assessment of the uterus contraction was made (Table 3). No information about how often was written in the medical records. Palpation of the uterus to assess the uterine height is a way to early detect bleeding due to uterine atony, which should be suspected when the fundal part of the uterus reaches over the level of the umbilicus [9, 12]. If the contraction is only controlled once there is a risk that uterine atony will be missed.

Uterine massage

Due to WHO recommendations uterine massage should not be performed as prevention if the woman receives uterotonics in 3rd stage of labor [12]. Even though the routine at BRH was to give oxytocin (syntocinon), 16 (53.3%) of the observed cases was given uterine massage additionally. Only 2 cases (7%) were not. Uterine massage, in addition to uterotonics, only leads to unnecessary discomfort for the woman.

We could see that the routines at Buea Regional Hospital follow the WHO recommendation for prevention of postpartum hemorrhage but not to 100% as they should, that could be explained by the poor medical care records or poor management of labor. The exceptions from the recommendations were late cord clamping, the use of uterine massage as prevention and that the uterine contraction only was controlled once in most of the cases. Late clamping of the cord and the use of uterine massage as prevention does not lead to higher risk for PPH for the women but it affect the neonates and give unnecessary pain and discomfort for the women.

Only two of the fetus in the cases observed was placed on the mothers' chest after delivery, but only for a short while. When the baby is placed in contact with the mothers nipple the endogenic oxytocin level rises and helping the uterus to contract [9, 10].

Examination of the placenta

We could see in the cases observed that after the expulsion of the placenta the midwives did not examine the placenta and membranes to see if they were intact, even though the information in the file, both in the observational study and the case-control study, was that the placenta and membranes were expelled complete and intact (Table 2 and 3). The placenta should be examined after expulsion to see if the placenta and the membranes are intact and

complete [9, 20] even if this is an uncertain estimation.

If the parturient have increased bleeding, manual exploration of the uterus should be performed [9]. At Buea Regional Hospital the routine was to perform exploration of the uterus after expulsion of the placenta to expel possible remaining placental products and blood clots. Even though that is a safe way to know that all the placental parts are expelled it causes discomfort and pain for the parturient. The risk of endometritis was limited by given all the women antibiotics (amoxicillin) to take one week after the delivery. It should be mentioned here that we have a big issue with resistance against antibiotics in the world. But it is not possible for Buea Regional Hospital to have complete sterile conditions during vaginal examination that is why the antibiotics were used.

Estimation of blood loss

The blood loss was estimated visually at the hospital. Women were delivered on a bedpan placed under their buttocks. Blood, urine, water and paper tissues were all collected in the bedpan. Estimation is the most common way to measure the blood loss because it is simple, timesaving and have a low cost. Even though it is the most common way it is not accurate. It is known that PPH are underestimated with 30-50%. The amount of bleeding is often underestimated when the volume are big and overestimated when small [11]. It was probably even harder at Buea regional hospital due to all other liquids in the bedpan.

The hemoglobin value was measured before and after delivery and the difference in the value was compared with the estimated blood loss. Cases were seen in the observational study that had the same loss in hemoglobin value but a big difference in estimated blood loss (difference in hemoglobin value 2.7 g/dl and 2.5g/dl and blood loss 500ml and 100ml respectively). That also tells us that visual estimation of the blood loss is difficult.

In the study some of the PPH cases in both the observational study and the case-control study

were defined as PPH even though the estimated bleeding was less than 500ml (Figure 2). The explanation of this is unclear. It could be due to poor medical record documentation or that the definition of postpartum hemorrhage is unclear to the midwives.

There was a drop in the hemoglobin value after the deliveries observed compared to the value before the deliveries. The mean hemoglobin value before delivery was 12.1 g/dl, ranging from 9-14.2 g/dl. After the delivery the mean value was 10.7g/dl, ranging from 7.3-13.7g/dl.

Obviously some of the women had a heavy bleeding.

Treatment of postpartum hemorrhage

External aortic compression, as WHO recommend until proper care are available [12], was not used in any of the three PPH-cases observed. In the file for the PPH-cases in the case-control study, information about these data was not available.

Use of uterotonics and intravenous fluid as treatment

The uterotonics used at Buea Regional Hospital to treat PPH were syntocinon (oxytocin), methergin (methylergometrin) and cytotec (misoprostol). Tranexamic acid (cyklokapron) was not used. Due the WHO recommendation the first choice should be oxytocin if it is available and if it fail to stop the bleeding ergometrin/methylergometrin or fixed drug combination of oxytocin and ergometrin or prostaglandin drugs (misoprostol) should be used. If all of the drugs mentioned fail to stop the bleeding tranexamic acid (cyklokapron) should be given [12].

The three PPH-cases in the observational study were all given uterotonics according to what WHO recommend. In the case-control study it was difficult to see a pattern in what order the hospital was given the uterotonics. (Figure 3) 14 cases received treatment with uterotonic drugs. 8 cases did not receive oxytocin before receiving other uterotonics even though oxytocin was available at the hospital. 6 cases did not receive any uterotonic drug at all even

though this is the first step in the treatment of PPH. The answer to why 6 did not receive any drugs could be that the definition of PPH was not clear, two of them only bled 450ml, or that the bleeding was overestimated as mentioned in research made [11]. Cyklokapron (tranexamic acid) was not used.

WHO recommend the use of crystalloid solutions over colloids to replace the volume lost due to the bleeding [12]. Research has showed that intravenous fluid and transfusion are very important therapies for severe hemorrhage with hypovolemic shock [19]. The hospital followed these recommendations. 14 cases (70%) of the PPH-cases in the case-control study did receive intravenous fluids. Two of them received only colloids. In the cases observed two received intravenous fluid, one received both crystalloid and colloid and the other only crystalloids.

Manual and surgical treatment

Uterine massage was performed in two of the three PPH-cases in the observational study. No information about uterine massage was found in the files of the PPH-cases in the case-control study. Probably it is a routine at BRH to perform uterine massage as treatment as WHO recommend [12].

The non-surgical intervention, intra uterine balloon tamponade [12] was not performed in the certain case in the case-control study that ended up in a maternal death. Even though the special advice was not available at the hospital, gloves were available to perform the procedure. It was not current to use intra uterine balloon tamponade in the rest of the PPH-cases in the study. The method is used only in cases where medical treatment is insufficient.

In 7 (35%) of the cases in the case-control study and in two of the observed PPH-cases exploration of the uterus was performed at the maternity ward. Exploration of the uterus should preferably be performed in the operation theatre with analgesia and cervical relaxant (e.g. nitroglycerine) [9]. The explorations made at the ward was done without that and analgesic. Four cases (20%) were taken to the operation theatre. In two of the cases exploration of the uterus was performed. One case was taken to surgery due to a cervical tear that had to be repaired. The other surgery was a hysterectomy, this was the case that later died. WHO recommend surgical interventions if non-surgical interventions fail to stop the bleeding. They first recommend conservative surgical approaches as compression sutures [12]. This was not performed in any of the cases at Buea Regional Hospital. Then more invasive procedures are recommended, as ligation of vessels, and as last outcome subtotal or total hysterectomy should be performed [12]. In the file for the PPH-case with hysterectomy performed there was no information about that other procedures were tried first. It could be due to poor medical record documentation or that the competence or equipment was unavailable. None of the PPH-cases observed were taken to surgery.

The high “out of own pocket” payment and poverty in Cameroon together with the relatively high prices at BRH could result in treatment below standard. One of the PPH cases in the observational study was discharged with a hemoglobin value of 6.4 g/dl. She only received one unit of blood because she didn’t have any money and her brother in law couldn’t afford more than one unit.

One death due to PPH

Among the women included in the case-control study one passed away due to PPH. The woman was multiparous and her blood pressure at admission was 127/82. It was a normal delivery and she received oxytocin in the 3rd stage of labor (no information about the other recommendations for prevention was available). The birth weight was 4.2 kg and it was the biggest baby of the deliveries in the group of PPH-cases. The Apgar score was 4 out of 10 the first minute after delivery and 9 out of 10, five minutes after delivery. Due to the file the bleeding after delivery wouldn't stop. The uterotonics given was methergin (methylergometrin) and cytotec (misoprostol). She was also given colloids as intravenous fluid and blood transfusion. The treatment failed to stop the bleeding and a hysterectomy was performed. This case reflects some of the issues they had at the hospital. The woman did not receive crystalloids which is the fluid recommended by WHO and she did not receive oxytocin before receiving methergin and cytotec as WHO recommend. The bleeding was only recorded in the medical record as PPH and no estimated blood loss was documented. WHO recommend hysterectomy as the last outcome if the bleeding continues. We cannot know if any other measurements were performed before the hysterectomy because it was not in the file. That is probably due to poor medical record documentation or because the bleeding was too massive so that there was no time for other measurements.

One possible etiology to the PPH could be uterine atony due to the high birth weight. The baby was also stressed with a low Apgar- score that could depend on a tough delivery. No signs of preeclampsia or retained placenta was noted in the file. The massive bleeding because of the atony probably led to loss of coagulation factors and the bleeding couldn't be stopped in time.

Annual statistics at Buea Regional Hospital

Comparing the data from the maternity wards statistics at Buea Regional Hospital show that they have less maternal mortality than the average in Cameroon. The average maternal mortality rate in Cameroon due to WHO statistics is 590 out of 100 000 live births [1]. The number for Buea Regional Hospital, if we assume that the mortality ratio would proceed as it had done the last year, is 485 out of 100 000 live births. The number provided by the WHO is based on the maternal deaths all over the country, even those who deliver at home and in less equipped health facilities. Even though the number is lower at Buea Regional Hospital it is still high for a regional hospital. The hospital is the biggest hospital in Buea and has at least one specialist in obstetric and skilled birth attendants. The delivery room is close to the surgery ward and acute care can be provided fast.

Out of the five maternal deaths at the hospital two was due to PPH, 40%. This number is higher than the 24% of all maternal deaths in the world [8].

The neonatal mortality rate in Cameroon was 28 per 1 000 live births in 2013, positioning Cameroon in number 150 out of 178 countries [4]. The incidence of neonatal deaths at BRH was 41 cases, roughly 40 per 1 000 live births (the frequency of twin deliveries is unknown), according to the annual statistics. This is a high number compared to the average in Cameroon and the rest of the world and is probably due to the deficient control of the fetal heart rate.

However, the national statistics is uncertain as there can be low input of data.

The data has to be treated with cautions' due to the low number of data in the study.

Further research

It would be of interest to conduct a similar study after interventions with education for the midwives too see if improvements have been achieved at BRH. Similar studies could also be performed in countries with the same situation as Cameroon, to improve the numbers of maternal and neonatal mortality globally.

Conclusion

The routines at BRH followed the WHO recommendations in prevention and treatment of PPH with a few exceptions but to a lower degree than is acceptable. Auscultation of the fetal heart rate was insufficient. Late cord clamping was in general not performed, the uterine tonus was not controlled as often as recommended and uterotonics was not given in correct order. Annual statistics showed that out of 1 032 deliveries there were five cases of maternal deaths, 485 out of 100 000 live births, and 28 cases of PPH. BRH has a lower, but still high, number compare to the average maternal mortality ratio, 590 out of 100 000 live births, in Cameroon. The hospital has skilled birth attendants, equipment and routines that follow most of WHO recommendations. The average number in Cameroon is based on all deliveries in the country, even home deliveries.

Controlling the fetal heart rate was insufficient and the number of neonatal deaths is high compared to the average in Cameroon and rest of the world and one contributory factor is probably the deficient control of the fetal heart rate.

A better observance to the WHO recommendations could decrease the number of PPH-cases, maternal deaths and neonatal deaths at Buea Regional Hospital.

Populärvetenskaplig sammanfattning (Swedish)

Mödradödlighet och dödsfall bland nyfödda är ett stort problem i världen och störst är problemet i låginkomstländerna, Afrika söder om Sahara inräknat.

Kamerun tillhör denna del av Afrika och har en högre mödradödlighet än omkringliggande länder. En av 127 graviditeter har dödlig utgång för modern, och tyvärr har siffran ökat de senaste 10 åren. Bland de nyfödda är dödligheten 28 på 1 000 levande födda. Detta är en mycket hög siffra i jämförelse med resten av världen.

Postpartum blödning, stor blödning efter förlossning, är den ledande orsaken till att mödrar dör i världen.

Världshälsoorganisationen, WHO, har tagit fram riktlinjer för hur postpartum blödning ska förebyggas och behandlas. Dessa riktlinjer är framtagna för att skapa en grund att stå på för att minska mödradödligheten i världen. Det finns även rekommendationer från WHO hur fostret ska övervakas under förlossningen.

Syftet med denna studie var att granska den lokala följsamheten av WHO:s rekommendationer för att upptäcka eventuella avvikelser och genom detta uppmärksamma situationen och förhoppningsvis bidra till minskat antal PPH-fall, en lägre mödradödlighet och mindre dödsfall bland nyfödda i Buea, Kamerun.

Förlossningar observerades under 7 veckor och ett protokoll, baserat på WHO:s rekommendationer, fylldes i för varje förlossning. Tio procent av de kvinnor som observerades fick postpartum blödning. För att se hur sjukhuset behandlade postpartum blödningar utfördes, som tillägg, en fall-kontrollstudie. Journaler från förlossningar med postpartum blödning som utgång (fallen) jämfördes med journaler från förlossningar där ingen sådan blödning uppstod (kontrollerna) för att upptäcka skillnader i de preventiva åtgärderna. För att veta hur sjukhusets siffror såg ut i jämförelse med övriga Kamerun gjordes även en beräkning på sjukhusets årliga statistik på mödradödlighet, postpartum blödning och

dödsfall bland nyfödda.

Studien visade att de rekommendationer som WHO tagit fram följdes till stor del, men med vissa undantag.

Massage av livmodern utfördes både som förebyggande och behandlande åtgärd även om WHO inte rekommenderar det som förebyggande åtgärd då det leder till onödigt obehag och smärta för modern. Navelsträngen klipptes ofta tidigt, WHO rekommenderar sen avnavling för att ge fostret bättre blodvärden.

WHO rekommenderar också att sammandragningen av livmodern efter förlossningen ska kontrolleras upprepade gånger. Detta för att tidigt upptäcka trötthet i livmoderns muskulatur som gör att den inte orkar dra ihop sig och stoppa den blödning som normalt uppstår när livmoderkakan lossnar. Sammandragningen av livmodern kontrollerades mer än en gång vid endast 5 av 23 förlossningar.

Vid behandling av postpartum blödning är livmoderssammandragande läkemedel en viktig del. Dessa är rekommenderade att ges i en viss ordning då de har olika verkan och bieffekter. I studien såg man att det inte fanns någon rutin kring i vilken ordning läkemedlen gavs.

Fostrets hjärtljud kontrollerades inte alls enligt WHO:s rekommendationer.

Utöver detta visade studien att sjukhuset hade stora problem med såväl primär dokumentation som övrig journalföring, vilket försvårade utförandet av studien.

Beräkningen av den årliga statistiken visade att sjukhuset hade fler dödsfall bland nyfödda, ca 40 per 1 000 levande födda, jämfört med den nationella statistiken i Kamerun (28 per 1 000 levande födda). Den höga siffran orsakas antagligen delvis av den bristande fosterövervakningen. Den nationella statistiken kan dock belastas av mörkertal.

Mödradödligheten på sjukhuset var 485 per 100 000 levande födda. Denna siffra är lägre än den nationella statistiken i Kamerun (590 per 100 000 levande födda) men är mycket hög för ett relativt välutrustat sjukhus med utbildad personal. Den totala frekvensen för Kamerun är

baserad på alla förlossningar, även hemförlossningar och förlossningar på mindre hälsocenter. Slutsatsen av denna studie är att Buea Regional Hospital bör kunna sänka antalet dödsfall bland nyfödda, postpartum blödningar och sin mödradödlighet genom att bättre följa WHO:s rekommendationer.

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Appendices

Appendix 1

Mother nr:

Protocol

1. The delivery

Check up at arrival

Anamnesis taken:

- ❖ No Yes
- Warning signs:
- Doctor informed:

Reason for arrival:

- ❖ Contractions Bleeding Loss of water Other

BP taken:

- ❖ No Yes /.....

Urinary sample taken to measure proteinuria:

- ❖ No Yes

Auscultation of the fetal heart rate:

- ❖ No Yes

Abdominal examination of the fetal position:

- ❖ No
- ❖ Yes
- Normal Abnormal

Abdominal examination of the strength and frequency of contractions

- ❖ No
- ❖ Yes
- Normal Abnormal

Vaginal examination:

- ❖ No
- ❖ Yes
- Manual Instrumental Sterile

1st and 2nd stage

Observation by the midwife:

- ❖ No
- ❖ Yes Interval:

Social support/outside:

- ❖ Partner Friend Family member Midwife Other

Partogram:

- ❖ No
- ❖ Yes
- Normal
- Pathological

Auscultation of the fetal heart rate:

- ❖ No
- ❖ Yes How often in 1st stage..... 2nd stage.....

Abdominal examination

- ❖ No
- ❖ Yes Interval.....

Vaginal examination:

- ❖ No
- ❖ Yes Interval.....

Fully dilated (10cm):

Control of the bladder:

- ❖ No
- ❖ Yes
- Was the bladder catheterized No Yes

Pain relief:

- ❖ No
- ❖ Yes Type:

Active management of labour:

- ❖ Oxytocin Amniotomi Other treatment:

The mothers position during labour :

Perineal protection:

- ❖ Episotomy Manual

Measuring of the blood loss:

- ❖ No
- ❖ Yes How.....

Instrumental vaginal birth:

- ❖ Forceps Ventouse
- Number of contractions:
- Time:

Contact with the obstetrician

- ❖ No
- ❖ Yes Reason:

Cesarean section

- ❖ What kind of anesthesia:

Duration of the first stage of labour (dilatation)

Duration of the second stage of labour including active pushing:

Duration of active pushing:

→Total time to delivery:

Post partum-3rd stage of labour

Uterotonic drugs:

- ❖ Which:
- ❖ Time after delivery:

Clamping of the umbilical cord: Early Late

Placental separation and expulsion:

- ❖ Minutes after delivery:
- ❖ Expectancy
- ❖ Controlled Traction
- ❖ Examination of the placenta No Yes

Controlling the contraction of uterus:

- ❖ No Yes How often:

Measuring blood loss:

- ❖ No
- ❖ Yes How:

- Volume accepted by midwife: Yes No Proceeded actions:

Abdominal massage of the uterus:

- No Yes

Inspection of the:

- ❖ Perineum/Vagina
 - No Yes
- ❖ Sfincter ani
 - No Yes

Observation post partum in the delivery room during min

Blood loss before expulsion of placenta:

Blood loss after expulsion of the placenta:

Total blood loss within 2 hours after partus:

Later blood loss:

→ Total blood loss:

The baby is placed in contact with the mothers nipple:

- ❖ No
- ❖ Yes

Breast-feeding, time after delivery:

2. The baby

Apgar score: 1min: 5min: 10min:

Gender:

Weight:

Lenght:

Circumference of the head:

Circumference of the chest:

Circumference of the abdomen:

3. Blood loss >500ml

Blood pressure followed No Yes

Temperature measured: No Yes

Controlling heart rate: No Yes

Bloodsample taken:

❖ No

❖ Yes

• Hb

• Testing bloodgroup

Intravenous fluid given:

❖ No

❖ Yes

Drugs given:

1. Oxytocin iv

2. Methergin im/iv

3. Stronger oxytocin infusion

4. Prostaglandine substances im/iv

5. Misoprostol po.

6. Cytotec rectal

7. Other.....

Cyklokapron:

Abdominal massage of the uterus :

❖ Yes No

Surgery:

❖ No

❖ Yes

• Exploration of the uterus

• Tamponade

• B-lynch suture

• Hysterectomy

4. Antenatal record

Is there an antenatal care medical record?

❖ No Yes

→Is there information about

❖ **Hb:**

No Yes (Latest value)

❖ **Fe:**

No Yes Treatment received Dose:

❖ **Folic acid:**

No Yes

❖ **BP:**

No Yes /..... (Latest value, within 1 month)

❖ **Proteinuria:**

No Yes (Latest value)

❖ **P-glucose:**

No Yes (Latest value)

❖ **Para:**

No Yes Deliveries

❖ **Earlier delivery complications:**

No Yes What:

❖ **Symphysis-Fundal height followed:**

- No Yes
- Normal Increasing Declining

❖ **Information on ultrasound examination:**

No Yes Findings.....

❖ **Medical history recorded:**

No Yes Partly

- *Malaria:* Affected Treatment received
- *HIV:* Affected Treatment received
- *Hepatitis B:* Affected Treatment received
- *Hepatitis C:* Affected Treatment received
- *Syphilis:* Affected Treatment received
- *Other disease:*

Profylactic malaria treatment given during pregnancy:

- ❖ No Yes

5. The mother

Age:

Week of pregnancy:

Civil status:

- ❖ Married Partner Single

Occupation :

- ❖ Housewife Farmer Blue collar White collar Other

Living area:

- ❖ Urban Semiurban Rural

Medical history:

- ❖ Hypertension treatment?
- ❖ Diabetes treatment?
- ❖ Malaria treatment?
- ❖ HIV treatment?
- ❖ Hepatitis B treatment?
- ❖ Hepatitis C treatment?
- ❖ Syphilis treatment?
- ❖ Other disease:

Smoking:

- ❖ No
- ❖ Yes number per day:

Alcohol:

- ❖ No
- ❖ Yes
 - How much
 - How often

Drugs:

- ❖ No
- ❖ Yes Kind of drug/drugs:
 - How much

- How often

Menstruation:

- ❖ Regular Irregular
- ❖ First day of last menstruation:
- ❖ Was the last menstruation normal: Yes No

Earlier pregnancies:

- ❖ Miscarriage
- ❖ Other determination of pregnancy:
- ❖ Delivery:
 - Week of pregnancy:
 - Hospital Home
 - Normal Instrumental
 - Sectio
 - Presentation of the baby: Head Breech Other
 - The child/children:
 - Multiple pregnancy
 - Birth weight:
 - Health status at delivery:
 - Health status now:
 - Earlier experiences of the hospital care during delivery:

This pregnancy

- ❖ **Prophylactic malaria treatment received**
- ❖ **Where you tested for**
 - Malaria? Treatment?
 - HIV? Treatment?
 - Hepatitis B? Treatment?
 - Hepatitis C? Treatment?
 - Syphilis? Treatment?
 - Other disease:

Delivery

- ❖ **When did the labor pains start?**
- ❖ **Have you seen water? When?**

- ❖ **Did you bleed a lot during the night? Clots/pooring?**
- ❖ **Were you worried at some time? For your own or your babies life? For infections, bleeding, tear or CS?**
- ❖ **What was the hardest part of the delivery?**
- ❖ **Where you left alone at some point?**
- ❖ **Did you get enough support from the midwives?**
- ❖ **Did you feel safe?**

HbBD:

HbAD:

Appendix 2

REPUBLIQUE DU CAMEROUN
Paix - Travail - Patrie
MINISTERE DE LA SANTE PUBLIQUE
DELEGATION REGIONALE
DU SUD OUEST



Tel: 33 32 22 10 General office
33 32 22 62 Regional Delegate
33 32 29 43 Drug Programme
pdph_sw@yahoo.com

REPUBLIC OF CAMEROON
Peace - Work - Fatherland
MINISTRY OF PUBLIC HEALTH
REGIONAL DELEGATION
FOR THE SOUTH WEST

BUEA the, 7th August 2014

THE REGIONAL DELEGATE

Ref: R11 /MINSANTE/SWR/RDPH/PS/ 229/72 TO:

Miss Lisa Wahlstrom
Medical Student
University of Gothenburg, Sweden

**Subject: An Administrative Authorization to Carry out a Study on the
"Deviation from Midwifery Routines during Delivery and Possible
Impact on Postpartum Haemorrhage in the Regional Hospital Buea"**

Your Application dated 1st August 2014 to carry out a study on the "*Deviation from Midwifery Routines during Delivery and Possible Impact on Postpartum Haemorrhage in the Regional Hospital Buea*" to fulfil the requirements for a Doctor of Medicine Degree was received and examined at the Regional Delegation of Public Health for the South West on Friday 5th August.

The results of your study may help to refocus the practice of midwifery in our health facilities and contribute in fight to reduce of maternal mortality in our Country.

While hoping that information obtained from in delivery rooms will be kept highly confidential and anonymous, I wish to inform you that an *Administrative Authorisation has been granted to carry out your study in Regional Hospital Buea.*

I wish to hereby call on the Administration of the Regional Hospital to give you their greatest collaboration.

My best Regards

The Regional Delegate of Public Health




Dr. Mbome Njie Victor
Dr. Mbome Njie Victor
S.W Regional Delegate of Health

Appendix 3

Name	Gravida	Para	Hospital number
Date of admission	Time of admission	Ruptured membranes	hours

200	
190	
180	
170	
160	
150	
140	
130	
120	
110	
100	
90	
80	

Fetal heart rate

200	
190	
180	
170	
160	
150	
140	
130	
120	
110	
100	
90	
80	

Amniotic fluid Moulding

10	
9	
8	
7	
6	
5	
4	
3	
2	
1	
0	

Cervix (cm) [Plot X]

Descent of head [Plot O]

Alert

Action

5	
4	
3	
2	
1	

Contractions per 10 mins

5	
4	
3	
2	
1	

Oxytocin U/L drops/min

5	
4	
3	
2	
1	

Drugs given and IV fluids

180	
170	
160	
150	
140	
130	
120	
110	
100	
90	
80	
70	
60	

Pulse ● and BP ▲ ▼

180	
170	
160	
150	
140	
130	
120	
110	
100	
90	
80	
70	
60	

Temp °C

Urine	{	protein	
		acetone	
		volume	