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*The quality of supervision
during vaginal delivery-
is there an impact on
caesarean section rate?*

**A comparative study at Kilimanjaro Christian Medical Centre
in Moshi, Tanzania**

Degree project in Medicine

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Abstract

The quality of supervision during vaginal delivery – is there an impact on caesarean section rate? A comparative study at Kilimanjaro Christian Medical Centre in Moshi, Tanzania.

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Background: An increasing caesarean section (CS) rate is seen in Africa. In a preliminary report from 2017 at Kilimanjaro Christian Medical Centre (KCMC) it was demonstrated an increased CS-rate from 40.8 in 2016 to 47 per cent last year. Inadequate use of partograph can lead to delayed diagnosis of prolonged dysfunctional labour or late detection of disproportion as well as defaulted foetal heart rate auscultation. Is it possible that this has an impact on the caesarean rate in KCMC?

Aim: To compare the documentation of supervision of mother and child during childbirth leading to vaginal delivery with that of patients ending up with a caesarean section in three groups with expected vaginal delivery.

Methods: This is a descriptive cross sectional study. Information needed for the study was collected from the delivery book, medical records and the Medical Birth Registry from women giving birth during the data collection time at KCMC.

Results: The rate of well plotted partographs was 28 per cent in total of included patients. The CS-rate was 12 per cent among the well plotted partographs and 27 per cent among the not well plotted partographs. The most seldom well plotted parameter in the partograph were pulse (13%) and temperature (47%). Cervical dilatation (86%), amniotic fluid (85%) and head descent (83%) were the most well plotted parameters. Foetal heart rate was well plotted only in 69 per cent.

Conclusion: The rate of well plotted partographs was low (28%) at KCMC. Not well plotted partographs had more than twice as high CS-rate compared to well plotted labours. The difference was not significant, perhaps due to a small study group. The importance of a well plotted partograph should be emphasized at the department.

Key words: *caesarean section rate, supervision of labour, well plotted partograph, KCMC, Tanzania*

Abbreviations

TDHS	Tanzania Demographic and Health Survey
CS	Caesarean section
WHO	World Health Organization
KCMC	Kilimanjaro Christian Medical Centre
TSH	Tanzanian Shilling
SVD	Spontaneous vaginal delivery
VBACS	Vaginal birth after caesarean section
ERCD	Elective repeat caesarean delivery
CDR	Cervical dilation rate
TGCS	Ten Group Classification System
MBR	Medical Birth Registry

Background

Maternal mortality

Reducing maternal mortality as a cause of pregnancy complication is a challenge worth fighting for. Worldwide maternal morbidity has decreased by 45 per cent over the years 1990-2013. Put into numbers this means a decrease from 380 maternal deaths per 100,000 live births to 210 per 100 000 during this period. In Sub-Saharan Africa the ratio decreased 49 per cent between 1990 and 2013 but still this region, together with Southern Asia, accounts for 86 per cent of maternal deaths globally (1). In the 2010 edition of Tanzania Demographic and Health Survey (TDHS) the maternal mortality ratio in Tanzania during a 10- year's period was estimated 454 maternal deaths per 100,000 live births. Compared to the previous study of TDHS in 2004-05 where the estimated ratio was 578 maternal deaths per 100,000 live births this points to a possible start of decrease in maternal mortality in Tanzania (2).

Caesarean Section worldwide and in sub-Saharan Africa

A study by Betrán et al. with the latest data on caesarean section (CS) from 150 countries worldwide showed a CS rate of 18.6 per cent. The region with the highest CS rate was South America with at percentage of 42.9. Africa on the other hand showed a low rate with only 7.3 per cent of CS. It is important when analysing the results to have in mind that social and cultural factors and believes implement in the CS-rate. Remarkable there was a great variation within Africa with 27.8 per cent in Northern Africa and only 3.5 per cent in sub-Saharan Africa. In Eastern Africa, Tanzania included, the CS-rate has only increased from 2.3 per cent in 1990 to 3.9 per cent in 2014 (3).

It is important to remember the fact that many women in Africa and Tanzania give birth at home. In the report from TDHS in 2010, 48 per cent delivered at home in

Tanzania. The region with highest rate of home deliveries in the country reached 69.6 per cent. In the Kilimanjaro region this number was remarkably lower with 11.9 per cent of women giving birth at home. Concerning the rural Tanzania it has been discussed about the role of both women that neglect the antenatal care and take the risk of delivering at home combined with the lack of men considering spending resources in health facility childbirth (2, 4).

Recommendations concerning Caesarean Section from WHO

It is difficult to devise an exact ideal rate for cesarean section. According to a statement by World Health Organization (WHO) in 2015 a cesarean section rate up to 10 per cent at a population level can lower mortality for both mother and child (5). Exceeding the rate of 10 per cent has not been proven to entail any other benefits or decrease mortality further.

Nevertheless an ecologic study carried out by WHO that took socioeconomic factors into consideration resulted in the following statement: “However, the association between higher rates of caesarean section and lower mortality weakened or even disappeared in studies that controlled for socioeconomic factors” (5). This means that higher rates could be accepted due to local contexts.

Kilimanjaro Christian Medical Centre and Caesarean Section ratio

Kilimanjaro Christian Medical Centre (KCMC) is a university hospital located in Moshi, north-eastern part of Tanzania. The referral hospital was established in 1971 to cover the eastern, northern and central areas of Tanzania. Department of Obstetric and Gynaecology includes obstetric unit, gynaecological unit and labour unit. In the obstetric unit stay pregnant women waiting for delivery and women already delivered. Also women with pregnancy

complications are observed here. In total the obstetric unit has 59 beds. The labour unit consists of 4 delivery cubicles and two theatres where CS are performed (6).

Generally in Tanzania healthcare is free for children under five years, pregnant women and elderly above 65 years age. In KCMC it is necessary to have a national health insurance to get the service for free. Without the insurance the patients have to cover the cost by themselves. The price for a CS is 280 000 Tanzanian Shillings (TSH), (123 USD), and for a spontaneous vaginal delivery (SVD) 50 000 TSH, (22 USD) (7). A study from Fobelets et al. studied the cost-effectiveness with Vaginal Birth After Caesarean Section (VBACS) compared to elective repeat caesarean delivery (ERCD) for low-risk women in four different countries in Europe. It was seen that VBACS was cost-effective compared to ERCD, this in low-risk women (8). The cost difference between the different methods of delivery should not be the main reason whether CS is performed or not but could be a motivation as a complement in other advantages with VBACS.

In KCMC the number of CS is high also for a university hospital and far higher than the recommendations from WHO. A previous study in 2016 showed a ratio of CS in KCMC of 40.8 per cent. The most frequently observed indications for CS were unexpected events delaying the birth progress and threatening deterioration of the fetal condition. Even if CS is a life saving procedure it comes with increased risks and complications for both mother and child not only during and after actual delivery but also during following pregnancies. Therefore careful observation and documentation of the process of labor is very important to get a basis for correct indication for the CS and hopefully lowered CS numbers (9). The following year 2017 a preliminary report from Gottlander showed a further increased CS-rate of 47 per cent at KCMC (10).

Caesarean Section and complications

The Caesarean sections can be either a planned or acute procedure. For planned caesareans indications can be maternal disease, antenatal complications, previous caesarean section, the position of the fetus or psychological. Some of the more common indications for acute caesarean section are bad progress within the childbirth, due to weak, prolonged labour or disproportion between the female pelvis and the fetal head. Another factor is threatening fetal asphyxia (11). So CS on the right indication is lifesaving but when discussing caesarean sections it is important to bear in mind that with all surgery there is a risk of short- and long-term negative consequences. Mentioned below are some of the most common complications linked to caesarean sections.

Bleeding. As the leading factor of maternal death, blood loss is something to fear in labour. Primary postpartum bleeding is defined as a loss of blood over 500 ml within 24 hours after labour. Some of the most common reasons for primary postpartum bleeding are uterine atony (insufficient contraction of the myometrium), blood loss from lacerations in the birth canal and technical problems related to the difficulty to deliver the baby from the caesarean wound. In placenta praevia, especially when covering an earlier scar, the bleeding is also increased which can lead to coagulation impairment (12). Anaemia due to malaria or worm infestation increase the risk and the difficulty to give safe blood transfusions further increases the danger (13).

Infection. CS is the most significant risk factor for postpartum infection of the mother. Women with CS have a 5-20 times higher risk for infections and infectious morbidity than women giving birth vaginally. The infections most commonly involve the urinary tract, the pelvic organs and of course the surgical wound (14).

Long-term negative consequences. Prior CS is together with increasing maternal age a significant factor for developing placenta praevia. Covering the cervix partially or totally this can present as painless, sometimes dangerous, vaginal bleeding late in the pregnancy. Placenta praevia also increases the risk of placenta accrete, a condition where the placenta grows into the myometrium. If this is diagnosed with ultrasound before labor, CS is performed. In some of these cases a hysterectomy needs to be combined with the CS (15). The risk to develop placenta praevia or placenta accrete increases with every CS (13). Another complication is uterine rupture after a prior CS, but the frequency of rupture is below 1 per cent if the actual vaginal delivery starts spontaneously (11).

It has been discussed when an indication for CS is relevant. A study in Tanzania showed that there was a lack of awareness and guidelines based on evidence when choosing CS. As a result, according to this study, many women underwent unnecessary sections (16). An analysis from Médecins Sans Frontières concerning Sub-Saharan Africa showed that the most common indication for CS were obstructed labour, malpresentation and prior CS (17). Without scientifically grounded knowledge but with a great experience in African obstetrics they state that correct use of a partograph and a second mandatory opinion would probably decrease the CS rate. Litorp et al. pointed out the low usage of instrumental vaginal delivery with high CS-rates. To decrease rates of CS it was discussed if increased use of vacuum extraction could help lowering the numbers (16).

Another interesting point of view is the psychological importance of delivering a baby vaginally. It has been shown in many studies that psychological support during delivery can lead to less usage of analgesics, lower use of instrumental intervention, decrease in children with Apgar score < 7 (a system for the newborn child based on heart beats, respiration, colour of skin, muscle tone and reflex irritability measured at 1, 5 and 10 minutes after birth) at five minutes and lower rates of CS (18). In KCMC the women in the majority of the cases deliver

by herself without support from a doula (a person who gives emotional support during labour).

Description of a Partograph

To follow the progress of labour in a proper way a partograph should be used. Cervical opening, descent of the foetal head and foetal heart rate among other factors are recorded along a time axis. In the 2017 version of WHO's hospital care for mothers and newborn babies, it is recommended to start plotting the partograph when the labour has reached active phase, which is when the cervix is 4 cm dilated. After this point the dilatation is measured together with the descent of foetal head and plotted accordingly in the partograph after each vaginal examination. A cervical dilation rate at 1 cm per hour is desired in the active phase. Other important parameters plotted in the partograph are the number of contractions per 10 minutes, the foetal heart rate (desired frame of 100-180 beats per minute auscultated in between contractions every 30th minute) the mother's blood pressure every fourth hour and her temperature every second hour. The total duration of labour is also an important factor that is recorded in the partograph (19).

PARTOGRAPH

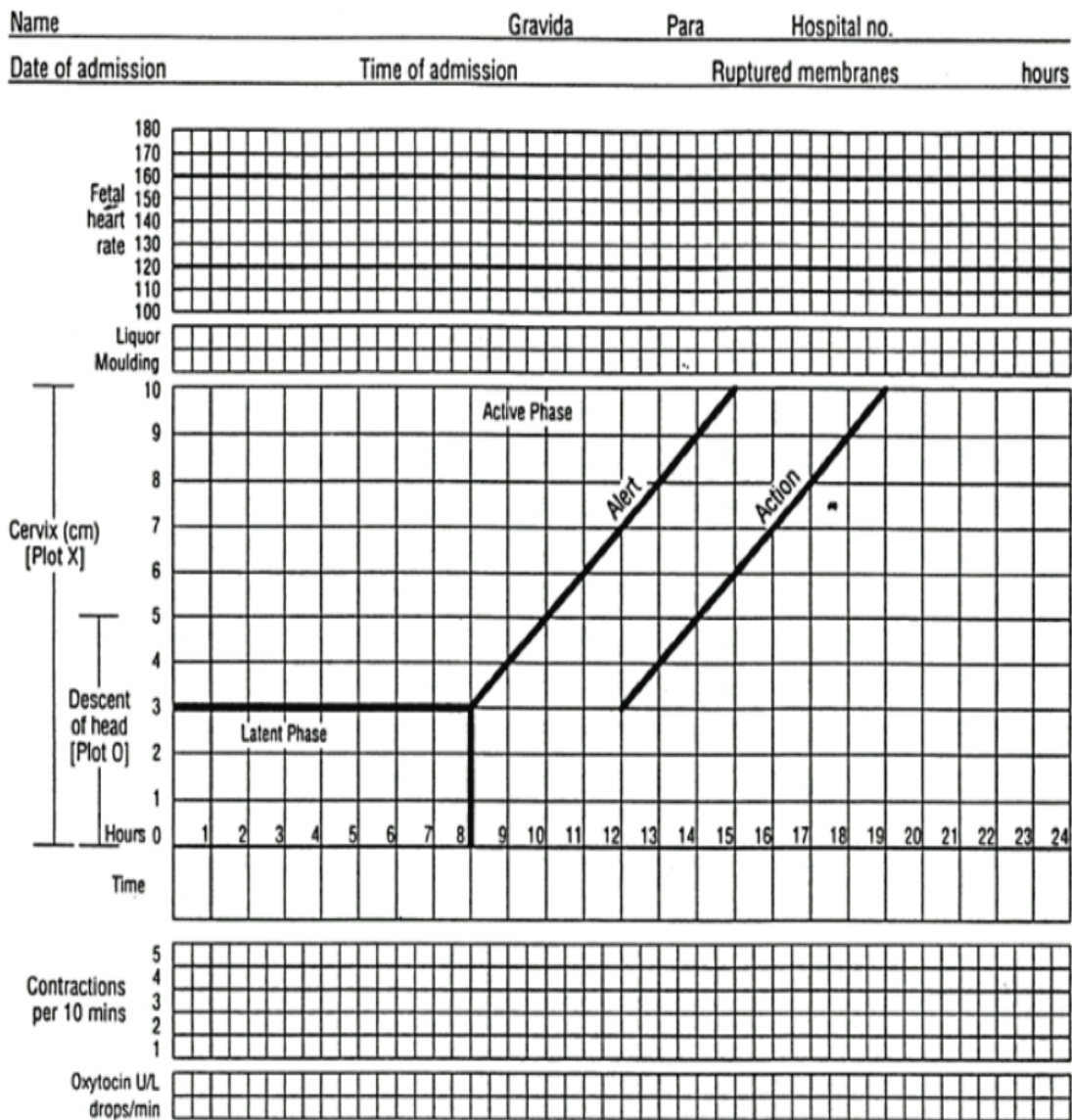


Fig 1. Partograph from WHO (19).

As help an alert line can be added in the partograph. This line starts at 4 cm of cervical dilatation and is drawn to the point of expected full cervical dilatation with a speed of 1 cm an hour and shows the minimal desired opening of the cervix each hour. As the progress to full dilatation not is linear, four hours of slow progress in opening should be accepted before intervention by oxytocin stimulation or operative delivery take place (20). Accordingly an

action line is used parallel to the alert line but 4 hours to the right, indicating time to intervene on slow progress of labour (19). In a study of women with vaginal birth after caesarean section (VBACS) it was observed that a mean cervical dilation rate (CDR) more than 1 cm an hour led to a higher rate of VBACS (21). On the other hand, an absence of foetal head descent despite good contractions and opening of the cervix indicate a disproportion, which should lead to CS if lasting (20). Thus the partograph is an important instrument in labour monitoring.

Studies of the Partograph

Lavender et al. compared the use of different types of partographs in randomized studies of nulliparous women. The study, published in 1998, had three groups with different varies of 2, 3 or 4 hours time to action line in the partograph after the line of observation, 1 cm dilatation per hour. In the group with 4 hours to action line the rate of CS was lowest but the difference was not significant. The group with 2 hours to action line had a better experience from the labour and were more satisfied despite more interventions (22).

A later study by Lavender et al. published 2006 compared CS-rate and satisfaction in nulliparous women with spontaneous active contractions divided into two groups with 2 or 4 hours time to action line. The result showed there were no differences in the caesarean section rate between these two groups (2 hours and 4 hours). Neither was there any difference in number of dissatisfied women in the two groups. In the 2-hour group the action line were more crossed than the 4-hour group and that lead to more intervention in the 2-hour group. This results advocate the 4-hours partograph from WHO (23).

It has also been discussed if different profession could affect the quality and frequency of plotting the partograph. In central Ethiopia a study published by Wakgari et al. pointed out that different professions among the obstetric care providers utilized the

partograph with different frequency. Midwives had a higher utilisation than general practitioners (24).

The Ten Group Classification System

In order to correctly compare changes in caesarean section rate from one year to another and compare different CS-ratios worldwide it is important to have a proper classification system as an instrument to lower CS-rate. At present there is no use of a standard system and therefore there are some difficulties to exchanges information in a meaningful way. WHO recommend the Ten Group Classification System (TGCS) (appendix 1) since it is clinically relevant, easy to handle, duplicable and includes all women giving birth (5).

TGCS categorizes all women about to give birth into 10 different groups. All women belong to one of the ten groups. The classification is used to show in what patient group the risk of a cesarean is high and it makes it possible to follow the trends in a hospital and evaluate the effect of different changes that possibly has an impact in these rates (25). In a study from 2011 Torloni MR1 et al. compared different methods of classification for pregnant women ready to give birth. They found that the Robson classification system, TGCS, gave the overall best results and was considered as the most useful categorizing system (26).

Betran et al. divided 97 095 women delivered in 8 different countries according TGCS classification to investigate how the CS rate were distributed in the different groups. Group 1, nulliparous women with a single foetus in cephalic lie at term pregnancy with spontaneous start, is the second biggest group in TGCS. Women here do not often have medical indications for CS and the caesarean section rate can be expected comparatively low. The choice of delivery method here has a big impact for delivery method in further pregnancies where one previous scar place them in group 5 with the highest CS-rate (27).

Group 3, multiparous women with no previous CS and a single foetus in cephalic lie at term pregnancy with spontaneous start, is usually the biggest group in TGCS. The CS rate in this group is expected very low due to that these women more seldom have obstetric indications for CS (27).

Group 5, multiparous women with previous CS and a single foetus in cephalic lie at term, was the group with highest CS rate in the study from Betran et al. This is an important group due to the situation that with increasing CS-rates in other groups this group will automatically get bigger. With one previous C-section there is a greater risk of another CS in the next pregnancy. Prevention of the first CS is therefore very important to lower the CS-rate (27).

Medical relevance

Inadequate use of partograph can lead to delayed diagnosis of prolonged dysfunctional labour or late detection of disproportion as well as defaulted fetal heart rate auscultation (28-30). The question is if it is possible that this has an impact on the caesarean rate at KCMC?

Aim

The aim of this study was to compare the documentation of supervision of mother and child during childbirth leading to vaginal delivery with that of patients ending up with a cesarean section. Three groups with expected vaginal delivery was analysed separately; nulliparous women, multiparous with no previous CS and multiparous with one previous CS all at term with a single fetus in cephalic lie and spontaneous start of the delivery.

The aim was also to compare the condition of the mothers and foetuses at delivery in these three groups: acceptable level of documentation and not acceptable.

Methods

Study design

Data collection was done during six weeks in the obstetric unit at KCMC. This study is a descriptive cross sectional study why there is no need to follow up the patients.

Study population

From deliveries in the labour unit at KCMC during the collection time three different groups, one slightly modified, from the Ten Group Classification System were included. All three groups studied had term pregnancy (≥ 37 weeks), single cephalic lie and spontaneous start of delivery.

The first group (group 1) included was identical to group number one in TGCS.

This group represents nulliparous women.

The second group (group 3) was identical to TGCS group three. It included all multiparous women without earlier CS.

The last group (group 5a) was similar to group 5 in TGCS but included only mothers with one previous scar and spontaneous start of delivery, trial of scar. Due to these differences from TGCS group 5 this group is named 5a.

Data collection procedures

Pregnant women with cervical dilation more than seven centimeters are moved from the obstetric ward to the labour unit. In the labour unit every delivery is registered in the Delivery book. That book gives information concerning the patient, date of delivery, time of delivery, delivery method, probable complications to the delivery etc. This book was used for collection of id-numbers of deliveries over the past twenty-four hours. These numbers were

paired with the right file in the obstetric unit. The medical file consists of the partograph, admission registration and other clinical notes. This gave information needed to fill in the protocol (appendix 2.), used for recording parameters from the partographs and status of mother and child. After every delivery the Medical Birth Registry (MBR) form was filled in. These forms were stored in the Obstetric unit and were based on interviews with every mother after a delivery. Following factors from the Medical Birth Registry form were used; complications of labour (bleeding, abruption of placenta, Placenta praevia etc.), intervention, mode of delivery, mothers health after birth (Good, Fair, Bad or Maternal death), birth weight, status of the newborn child (Live born, Live born- transferred to paediatrics department, Stillborn, Neonatal death), Apgar score (a system for the newborn child based on heart beats, respiration, colour of skin, muscle tone and reflex irritability), gestational age at birth.

Through matching correct id-number of the protocol and the form from Medical Birth Registry additional information was filled in to make the protocol complete.

After storing, Medical records are not permitted for research without an ethical approval. The files from a SVD are often stored the same day and for CS in a few days, and thereby not reachable for a long time before they get stored. Concerning this I collected data each day from the last twenty-four hours. My aim was to do the collection for eight weeks but since there was some start up problems and absence due to sickness I collected every Monday-Friday for six weeks.

Materials

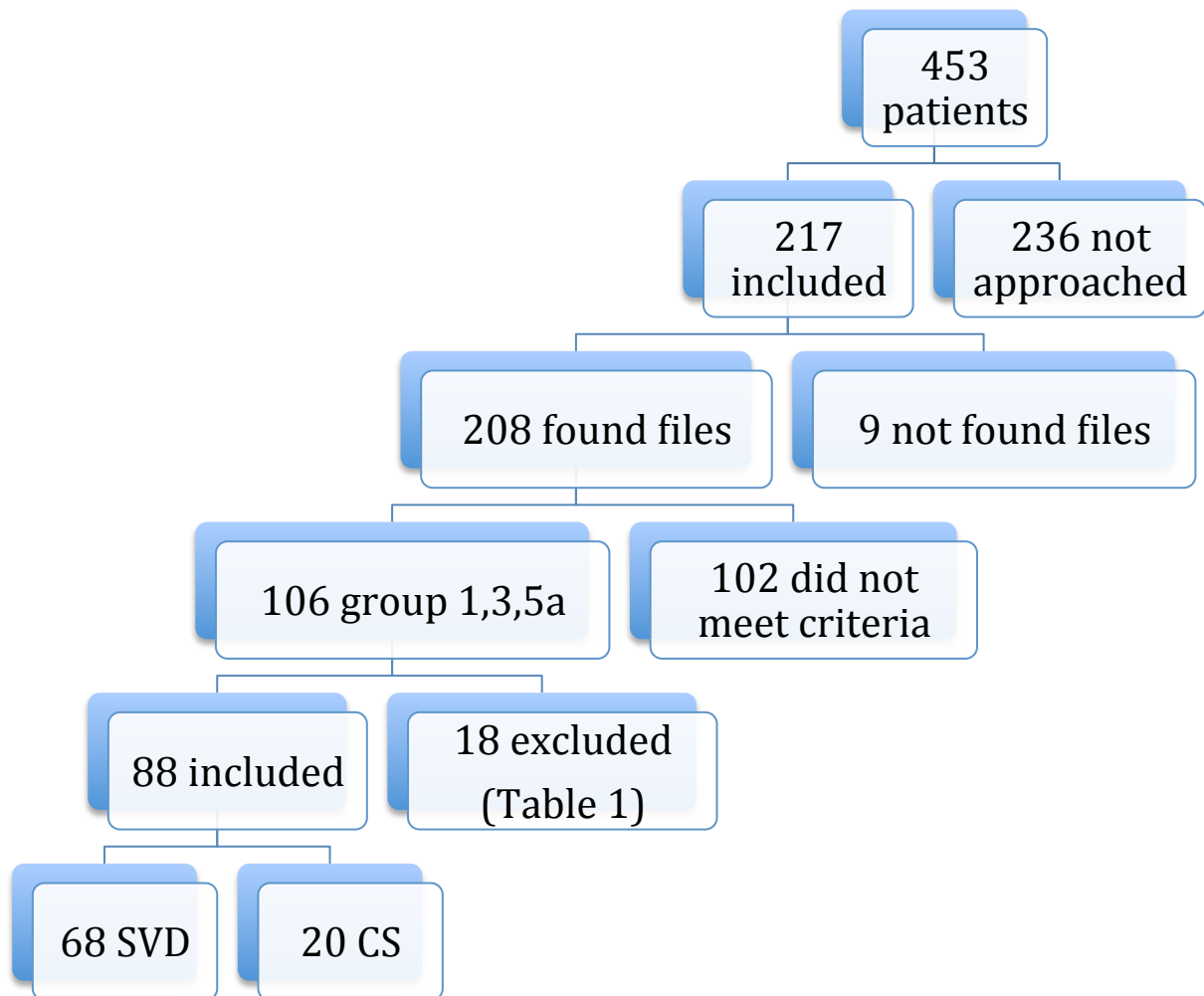


Fig. 2. Flow diagram of participants.

During the data collection time 453 patients delivered. During data collection days at the hospital 217 of these deliveries took place. From an earlier study it is known that the CS-rate Sunday- Thursday do not differ from Friday-Saturday (9). Of these 217 deliveries medical records were found in 208 cases. Due to strict inclusion criteria 106 was included as only full term patients with head presentation and spontaneous start of labour were accepted. After a check up in the medical records further, 18 of these 106 were excluded (Table 1).

Table 1. Excluded patients from group 1, 3 and 5a divided into two different groups.

Group A (9 patients)	Fully dilated at arrival	5
“Dilatation”	In 2nd stage at arrival	2
Group 1: 1 patient	Less than 15 min labour	1
Group 3: 8 patients	7-8 cm dilated at arrival+ anaemia	1
Group B (7 patients)	Decision of CS before 4 cm dilated	4
“Diseases and symptoms”	Vaginal bleeding at arrival	2
Group 1: 4 patients	Macerated child, no FHR or moulding recorded	1
Group 3: 2 patients		
Group 5a: 1 patient		
Total 18 patients		18

Analysing the partograph

According to the recommendations from WHO (19) the partographs were judged as correctly plotted or not. Together with information if it was a vaginal delivery or CS four main groups was formed: (a = vaginal delivery- well plotted, b = vaginal delivery- unwell plotted, c = CS- well plotted, d = CS- unwell plotted).

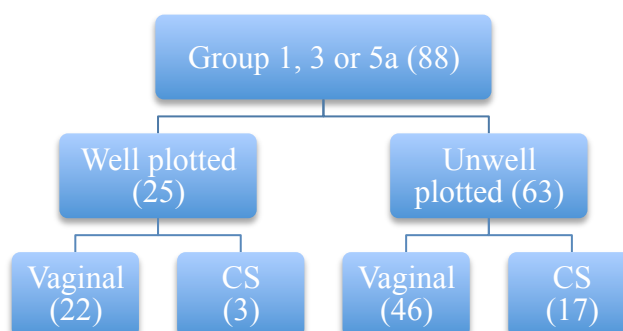


Fig. 3. Categorizing in respectively group (1, 3 or 5a).

To define a well-plotted partograph parameters that included a correct plotted partograph according to guidelines from WHO were considered (19). The parameters included are shown in the table below. There was an acceptance of one fall off within every parameter and fall off from one parameter in total to be included as a well plotted partograph.

Table 2. The frequency of measurement in every parameter in the partograph according to WHO (19).

Parameters	Frequency during latent first stage	Frequency during active first stage
Blood pressure	Every 4 hours	Every 4 hours
Temperature	Every 4 hours	Every 2 hours
Pulse rate	Every 30-60 minutes	Every 30-60 minutes
Fetal heart rate	Every 30 minutes	Every 15 minutes
Contractions	Every 1 hour	Every 30 minutes
Cervical dilation	Every 4 hours*	Every 4 hours*
Head descent	Every 4 hours*	Every 4 hours*
Colour of amniotic fluid	Every 4 hours*	Every 4 hours*
Moulding	Every 4 hours*	Every 4 hours*

*Assessed in every vaginal examination

Parity and number of earlier CS was monitored. Fetal heart rate, level of descent of the fetal head and cervical dilation of the mother was noticed at the time of decision for CS. Fetal heart rate was measured every 30 minutes at KCMC and not every 15 minutes as seen in tab. 2. Due to that circumstance the protocol was changed to measure FHR every 30 minutes instead. Otherwise it would have been severe difficulties to have a proper amount of well plotted partographs. Time from arrival and time from a cervical diameter of four cm to vaginal or operative delivery was in many cases not possible to measure due to insufficient information. Instead time in minutes from start plotting the partograph to delivery or decision of CS was recorded.

Analysing data

To collect the information I have used a self-constructed protocol, appendix 2. Data were stored in SPSS. As the well-monitored patients seemed to differ in factors above from the insufficiently monitored, the program was used for statistical analysis of significance.

Comparing different categories were done using Pearson chi-square test. When less than 5 patients in one group Fischer's exact test (2-sided) was used and p-value less than 0.05 were considered statistically significant.

Ethics

In this study data was collected from partographs in the medical record and from the Medical Birth Register. This was done anonymously through a de-identified coded system in my protocol. Codes of the identifications were kept separately and safe. There was no need for follow-ups as the study was cross-sectional. The study did not expose any harm for patients or personal working in the hospital or in any way affect the treatment of neither the mother nor the newborn child. Dr Pendo Mlay, supervisor and head of the department of Obstetrics and Gynaecology at KCMC has given an ethical permission for data collection.

Results

Distribution of included patients

The distribution of the three different groups in this study (nulliparous, multiparous and multiparous with one previous scar), all with cephalic lie, term pregnancy and spontaneous start of delivery is shown in fig 4. Half of the included patients were multiparous with no previous scar. Only 7 of the included patient had one previous scar. Nulliparous covered 42 per cent (37/88) of the included patients.

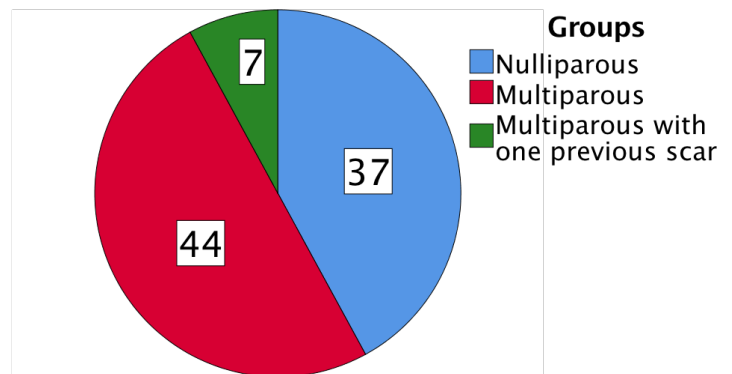


Fig. 4. Distribution of included patient in the three different groups. The different groups are described in Methods.

Method of delivery in each group

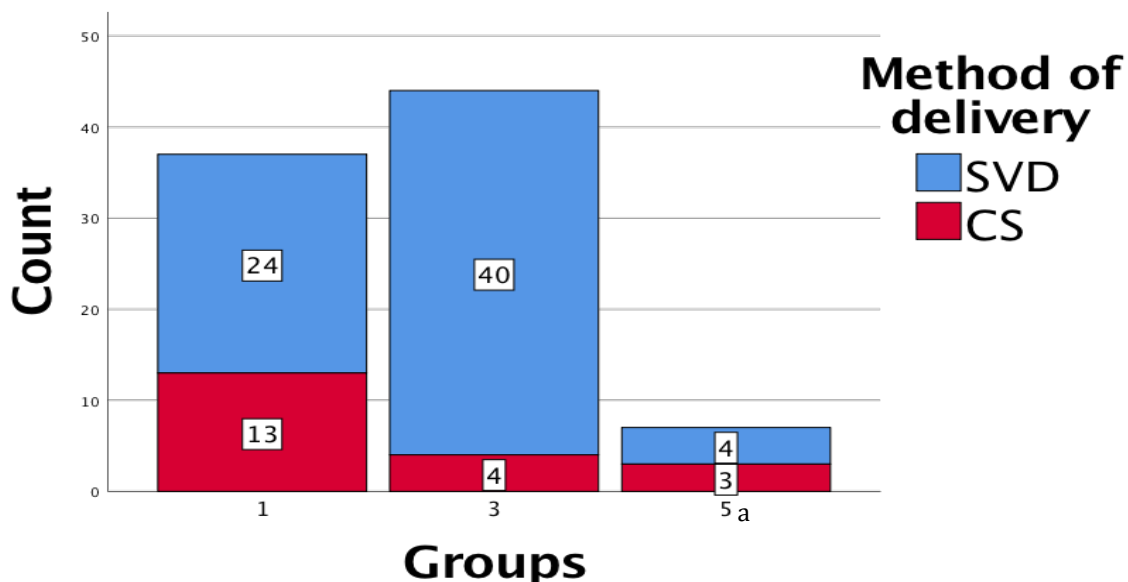


Fig 5. This figure shows the caesarean section frequency in each group. Group 1 (nulliparous), group 3 (multiparous) and group 5a (multiparous with one previous scar). P-value is 0.004 when comparing the three different group an caesarean section rate. Number of patients is 88.

When considering CS-rate in each of these three groups it shows that 35 per cent (13/37) of the patients in group 1 (nulliparous) ends up with a caesarean section. In group 3 (multiparous) the rate of CS is 9 per cent (4/44) which is the lowest rate among these three groups. On the contrary in group 5a (multiparous with one previous scar) we find the highest CS-rate with 43 per cent (4/7). There is significance between the three different groups and CS-ratio, p-value 0.004.

When comparing group 1 and group 3 separately the first group covers 77 per cent of the C-sections. The difference is significance, p-value 0.006.

When instead comparing group 3 and group 5a the result given is that group 5a covers 43 per cent of the CS in these two groups. The difference is significant (p-value=0.045).

Distribution of groups in vaginal and operative delivery

Women with earlier vaginal birth were most common among those who gave birth vaginally in the actual pregnancy (59 per cent). Primiparous was the most common group among CS-patients (65 %).

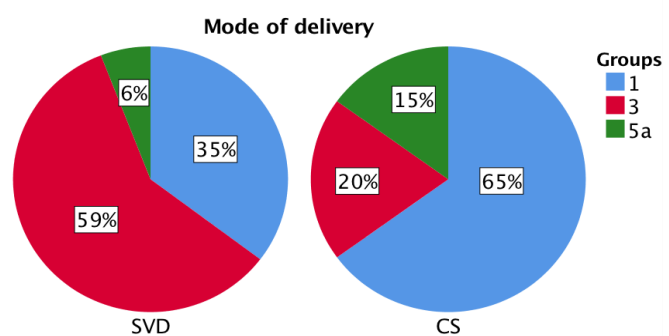


Fig. 6 Distribution of the three groups in each delivery method (Spontaneous vaginal delivery or caesarean section). Group 1 (nulliparous), group 3 (multiparous) and group 5a (one previous scar).

Well plotted or not

Table 3. Well plotted ratios

PARAMETERS	WELL PLOTTED	> 1MISS
Fetal heart rate	69 %	31 %
Moulding	67 %	33 %
Head descent	83 %	17 %
Cervical dilatation	86 %	14 %
Amnionic fluid	85 %	15 %
Contractions	72 %	28 %
Blood pressure	82 %	18 %
Pulse	13 %	87 %
Temperature	47 %	53 %

Well plotted rates for each parameter investigated in the partograph. Well plotted if none or one missing value, number of patients is 88.

Tab. 3 shows for each parameters studied in the partograph the frequencies of well plotted respectively the frequency of more than 1 missing value recorded. Pulse and temperature with only 13 per cent respectively 47 per cent well plotted were the parameters most seldom plotted correctly. Cervical dilatation, amnionic fluid and head descent were the best plotted parameters. Foetal heart rate, a very important parameter to follow the status of the foetus, is only plotted correctly in 69 per cent.

Table 4. Mode of delivery

			Well plotted		Total
			Yes	No	
Method of delivery	SVD	Count	22	46	68
		% within SVD	32 %	68 %	100 %
	CS	Count	3	17	20
		% within CS	15 %	85 %	100 %
Total	Count		25	63	88
	% within Total		28 %	72 %	100 %

Well plotted partograph compared with method of delivery. Between these two groups there is no statistical significance in mode of delivery (P-value = 0.165). Number of patients is 88.

Tab. 4 shows that the total frequency of well plotted partographs in all of the three groups were 28 per cent. Among vaginal deliveries 32 per cent were evaluated as well plotted partographs and in acute CS only 15 per cent were well plotted. Out of all 20 CS only 3 were well plotted when decision of an acute CS. The CS-rate was 23 per cent (20/88) in these three groups where group 1 and 3 are low risk groups.

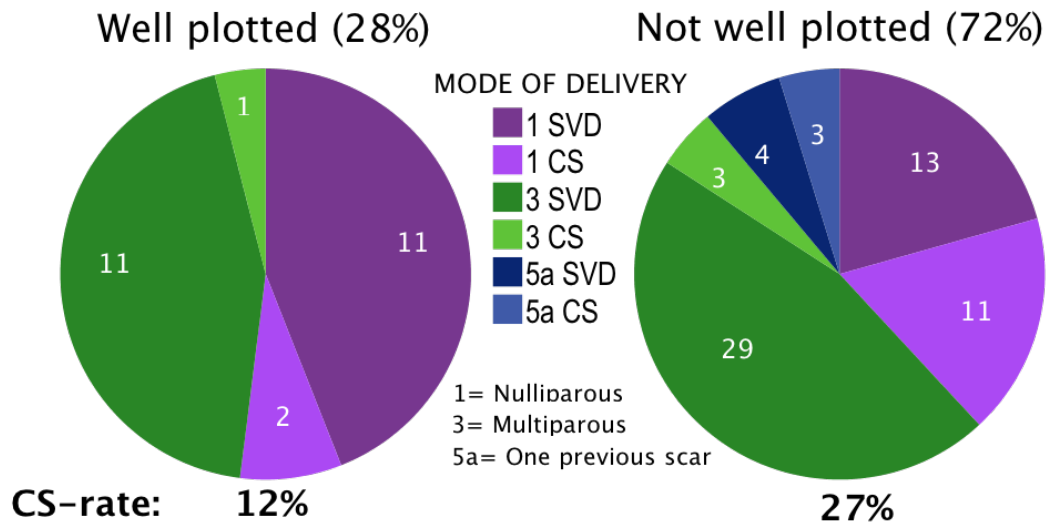


Fig. 7. Distribution of the three different groups in well plotted partographs (left circle) and not well plotted partograph (right circle). There were no statistical significance between plotting of the partograph and CS-rate in these different groups, *p*-value is 0.165. Number of patients is 88.

In Figure 7 the distribution of each group in well plotted respectively not well plotted partographs are shown divided into delivery methods (SVD or CS). The left circle describes the total amount of well plotted partographs and the right circle shows not well plotted partographs. The CS-rate in the well plotted partograph is 12 per cent compared to the higher CS-rate in not well plotted, 27 per cent.

Among the nulliparous, group 1, the majority with well plotted partographs were delivered vaginally, and in the not well plotted partographs almost half of the group was delivered by CS. In group 3, the well plotted ratio was 27 per cent (12/44) and within the well plotted partographs in this group 8 per cent (1/12) were delivered by C-section. Group 3 covered almost half (48%) of the well plotted partographs altogether. There was no significance between CS-ratio and well plotted or not well plotted patients. No delivery in group 5a (one previous scar) was well plotted.

Table 5. Method of delivery

			Well plotted (-pulse, -temperature)		Total
			Yes	No	
Method of delivery	SVD	Count	51	17	68
		% within SVD	75 %	25 %	100 %
	CS	Count	7	13	20
		% within CS	35 %	65 %	100 %
Total	Count		58	30	88
	% within Total		66 %	34 %	100 %

Investigation if there is significance between well plotted partographs where two parameters (pulse and temperature) are excluded when evaluating the partograph and delivery method. P-value turned out to be 0.002. Number of patients is 88.

In table 5 the two lowest plotted parameters temperature and pulse were excluded when evaluating if the partographs are well plotted or not. The result showed that 66 per cent of the partograph were well plotted. Compared to previous table (tab 4.) including all parameters with only 28 per cent well plotted partographs this shows a increased rate of well plotted partographs of almost 40 per cent and significant difference in CS ratio was seen between well plotted and not well plotted patients. The CS-rate in well plotted partographs is 12 per cent and in not well plotted partographs 43 per cent.

Table 6. Mother’s health after birth

			Well plotted		
			Yes	No	Total
Mother’s health after birth	Good	Count	22	47	69
		% within Good	32 %	68 %	100 %
	Fair	Count	2	12	14
		% within Fair	14 %	86 %	100 %
Total	Count		24	59	83
	% within Total		29 %	71 %	100 %

Mother’s health after birth (good, fair, bad, maternal death) compared to well plotted partographs. No statistical significance was found between mother’s health and the plotting of the partograph (P-value= 0.331). Valid number of patients 83, missing 5.

In tab. 6, “Mother’s health after birth” is divided into 4 groups: Good, Fair, Bad, Maternal death. Among the included there were only outcomes of “Good” and “Fair”. Among the group ”Fair” 86 per cent had a not well plotted partograph. Mothers with good health had almost 20 per cent less (68 per cent) not well plotted but the difference was not significant.

Table 7. Status of the newborn

			Well plotted		Total
			Yes	No	
Status of newborn	Live born	Count	22	52	74
		% within Live born	30 %	70 %	100 %
	Transferred to paediatrics department	Count	2	11	13
		% within Transferred to paediatrics dept.	15 %	85 %	100 %
Total	Count		24	63	87
	% within Status of newborn		28 %	72 %	100 %

Comparison between well plotted partographs and status of the newborn. No statistical difference was shown between well plotted partographs and the status of the newborn (P-value= 0.501). Valid number of patients 87, missing 1.

Status of the newborn could be divided in four different groups: Live born, Live born transferred to paediatrics department, Stillborn and Neonatal deaths. Among included patients there were only “Live born” and “Live born transferred to paediatrics” filled in. 13 newborns were transferred to paediatrics and 11 of them (85 per cent) with partographs unwell plotted. Studying the same category but with newborns grouped as “Liveborn” without need of care at the neonatal unit, the rate of unwell plotted partographs was lower, 70 per cent. The difference was not significant.

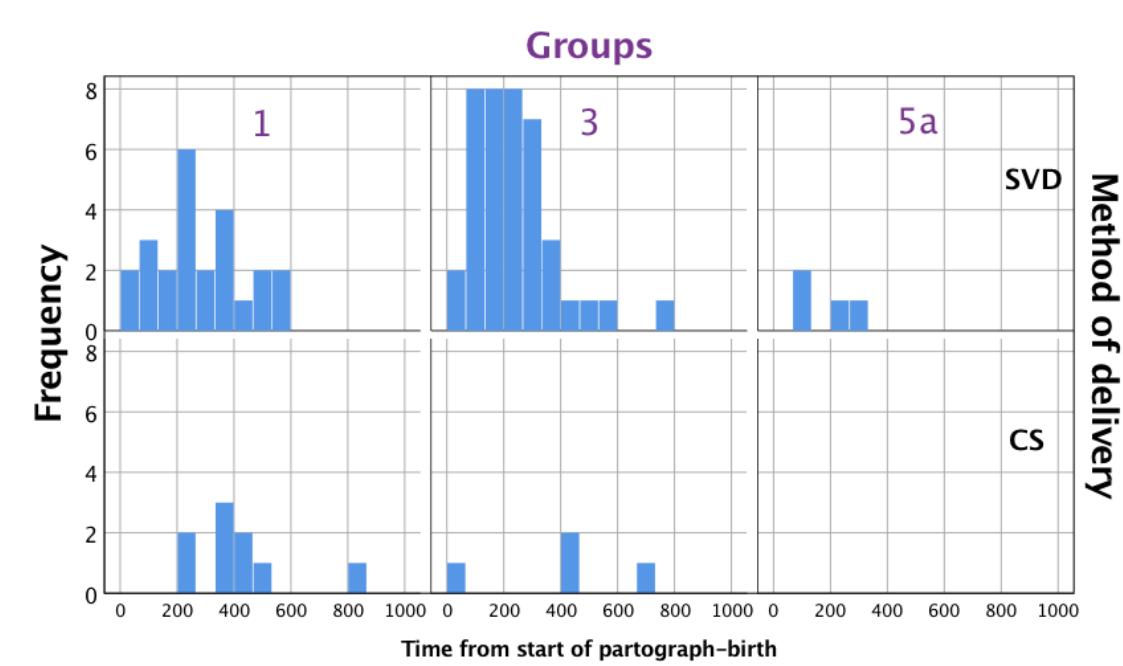


Fig. 8. Time measured in minutes from start of plotting the partograph until delivery or decision of caesarean section. Valid number of patients is 81 and missing 7 patients. 3 of the missing belonged to caesarean section in group 5a.

Fig. 8 describes time in minutes from start of plotting the partograph until time of birth or decision of CS. In the spontaneous vaginal deliveries the majority time from start of plotting until birth is around 250 minutes. When studying caesarean sections and time from start of plotting the partograph until decision of CS the average time is a bit longer, around 400 minutes. A statistical difference in time to vaginal birth and time to decision of CS was found ($p\text{-value} < 0.05$). To notice, out of 7 deliveries in group 5a, 4 was delivered vaginally as seen in fig. 8. The remaining 3 patients in this group, delivered by CS, were missing. This means when making a decision of CS in group 5, with one previous scar, no plotting of the partograph was done or information of time starting the plotting were missing.

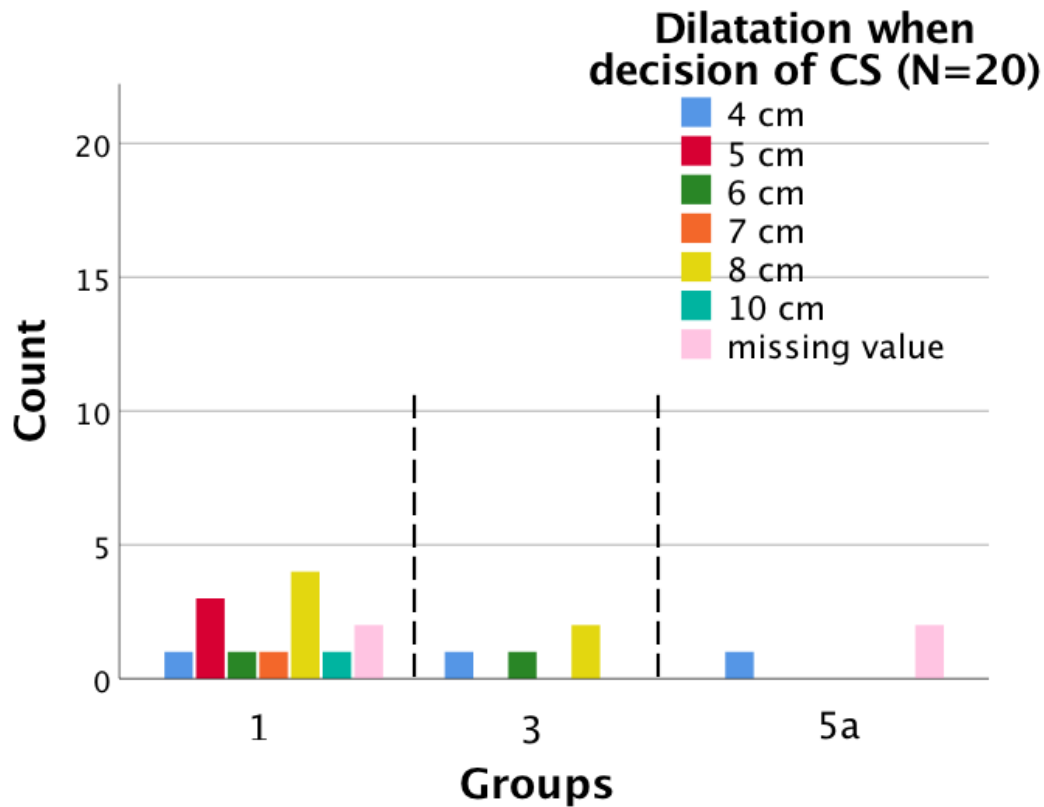


Fig. 9. In this table cervical dilatation is shown at the time for decision of caesarean section. The three different groups are shown separable. There is no significant difference between cervical dilatation at the time of decision for caesarean section in each group (1, 3 and 5a). *P*-value is 0.662. Number of patients is 88, no missing values.

Fig. 9 shows the three different groups in the x-axis and count of patients in the y-axis. Bars are plotted in different colours corresponding to degree of cervical dilatation. The result in cervical dilatation is widely spread though 8 cm dilated when decision of CS in 6 patients is the most common. In group 5a (one previous scar), 2 patients have missing value of cervical dilatation at decision of CS and 1 patient were dilated only 4 cm when time for CS.

Discussion

Over the past years an alarming high CS-rate has been seen at KCMC. A report from Malmborg 2016 pointed out a CS-rate in KCMC of 40.8 per cent (9). The following year a preliminary report from Gottlander showed an increased CS-rate 47 per cent (10). It is difficult to devise an ideal CS-rate though recommendations from WHO is no higher than 10 per cent. Higher rates of caesarean section at a population level are not associated with decreasing rates of maternal or neonatal mortality (5).

This high CS-rate in KCMC is a concern and it has been discussed whether one possible reason could be lack of working with the partographs according to recommendations from WHO. Malmborg mention in her study the importance of partographs and a suggestion for further studies (9).

In this study the total CS-rate was 23 per cent. This is remarkably lower compared to previous studies. The explanation for the low CS-rate in this study is due to strict inclusion criteria based on only three groups in TGCS, group 1 and group 3 both large groups with low CS-rate. A study from Brennan et al. showed the lowest CS-rate in group 1 and group 3 in the TGCS. Induced patients, elective CS, pregnancies with foetuses in breech or transversal lie, twins and premature deliveries are excluded in this study. In these groups the CS-rate is high and increases the total CS-rate (31).

Study population

In this study all included patients started labour spontaneously. Due to a spontaneous start the CS-rate is lower than after induced labour. When the delivery is planned to be spontaneously vaginal something have to fail to convert into a caesarean section.

The three groups were chosen due to the possibility in these groups to arrest an increasing CS-rate. Group 6-10 (breech presentation, multiple pregnancies, oblique or transverse lie) in TGCS (appendix 1) are small groups with expected high CS-rate and therefore it is difficult in these groups to influence on the CS-rate. In the opposite way group 1 and group 3 are big groups with good possibilities to lower CS-rate (27). In group 5 in TGCS elective scars are proposed if the woman already has more than one previous scar so an increase of this group of course increases the CS-rate. Group 5a in this study only include women with one previous scar whom therefore are allowed to deliver vaginally. That gives an opportunity to lower the CS-rate.

In group 1 (nulliparous) a decision to convert an ongoing vaginal delivery to an acute caesarean section will have consequences also for the future, as another caesarean often will follow – and during pregnancies after repeated caesareans there is a much higher risk to develop placenta praevia and placenta accrete (13).

Group 3 (multiparous, no previous scar) was a big group and because of the fact that these mothers had a spontaneous vaginal delivery (SVD) as the previous delivery the CS-frequency usually is low, it is interesting to study the indication for CS when it was performed.

Group 5 a (one previous scar), excluded mothers with more than one previous scar as that is itself an indication for CS. Elective CS as well as induced vaginal deliveries were also excluded as the start of delivery is not spontaneous.

Data collection

In the aim of this study, the wish was to include a higher number of patients. Many of the results in this study were not significant and with a greater study population that might have been possible to point on significance differences. When arrival at KCMC some time was

needed to be familiar with the system of finding correct number of patients who delivered the past 24 hours but also to find and match the correct medical record for these patients. While studying the files, it was sometimes a struggle to understand different handwriting and also difficult to get the knowledge where to find the right information in the file. The inclusion criteria's were strict, described in methods, and there were not a lot of time to get important information before mid-wives and doctors at the hospital needed the medical files for the round, vaccination procedures etc. There was no possibility to get the information when the patient had been discharged and therefore attendance every day was needed to get information about the deliveries. There were no possibility to get materials of deliveries retrospectively from previous days and therefore limited chances to receive more participants.

Well plotted and not well plotted partographs and CS-rate

Within every delivery a partograph was found in the medical record. Whether it was filled in correctly, not correctly or not at all varied a lot. Tab. 4 showed that pulse was plotted well within WHO criteria (19) only in 13 per cent of the labours and temperature in 47 per cent. When presenting this to the staff they were aware of the problem and admitted that those were the parameters they did not take in consideration when there was lack of time (7). Foetal heart rate was not well plotted in almost one third of the partographs. This is a very important factor in labour and the result is alarming and definitely something to improve.

An article from 2015 that studied utilization of partographs in Central Ethiopia discussed the fact that some professions among the obstetric care providers did not utilize the partograph as often as others. Midwives had a higher utilisation than general practitioner (24). In this study it would have been interesting to keep in record what profession filled each partograph. There was definitely a pattern with some workers that filled in more correctly than others. The midwives were normally attending more consequent during the labour than

the doctors. That might effect the plotting. Also when a doctor had more than one labour at the same time it sometimes was impossible to plot with correct frequency.

All included participants

According to my evaluation of the 88 deliveries 28 per cent (Tab.4) were well plotted according to my criteria of a well plotted partograph (described in data collection procedures). Even though no significant difference between well plotted or not well plotted partographs and CS-rate was found the results indicates that in the majority of the deliveries the partographs are not well plotted. The CS-rate among all included patients were 23 per cent (Tab. 4). The CS-rate in well plotted partographs is lower (12 %) than the rate of CS in not well plotted partographs (27%), seen in Fig. 7.

It is interesting that 85 per cent of all CS had not well plotted partographs (Tab. 4). Although the number of not well plotted partographs also was high, 72 per cent, as well as in SVD (68 %), it is remarkable that when converting a planned SVD into a CS the big majority of partographs are not well plotted.

When pulse and temperature were excluded, as generally done at KCMC, the difference was significant, p-value 0.002 (Tab. 5). In this table 66 per cent of the partographs were well plotted. Now the CS-rate in well plotted partograph were 12 per cent and in not well plotted partographs 43 per cent. Compared when all parameters were included (Tab.4) this shows an even greater rise in CS-rate in not well plotted partographs.

It is very important with well plotted partographs to avoid unnecessary CS. WHO has shown that adequate use of partograph can reduce both prolonged labour and reducing caesarean section rate. In the safe motherhood programme the partograph was tested in Southeast Asia involving 35 484 patients. The introduction of a partograph reduced prolonged labour from 6.4 to 3.4 per cent and emergency caesarean sections from 9.9 to 8.3 per cent (30).

Another study in Nepal published 2016 carried out by Ashish et al. showed an increased risk related to intrapartum stillbirth when inadequately monitoring of the foetal heart rate and lack of monitoring progress of labour using the partograph (29). In this study only 69 per cent of the partographs had well plotted foetal heart rate and as earlier mentioned 28 per cent well plotted partographs overall. Could these numbers contribute to an increased risk of intrapartum stillbirth?

In a study that was conducted in three different hospitals in southern Tanzania with 196 patients, 80 of these had poor monitoring. Deliveries with unwell partograph-based monitoring had a relation to bad maternal and foetal outcome. In poorly monitored labours 5 out of 7 perinatal deaths took place. The relation between bad monitored labours and a small increase of CS-rate was not significant but seen (32). That study (32) goes in line with this study in observing a trend of high rates of not well plotted partograph and higher CS-rate in these labours but the difference is not significant.

Group 1(nulliparous)

In group 1, 35 per cent (Fig.2) was delivered by a caesarean section. This is an important group due to patients delivered by C-section in this group will belong to group 5 in the forthcoming pregnancy and thereby being at higher risk of having another CS (27). When studying the well plotted ratio in only this group 35 per cent of the partographs were well plotted (Fig.7). In the total amount of well plotted partographs for all three groups, group 1 counts for around half of the well plotted partographs.

Of the not well plotted partographs in this group 46 per cent was delivered by CS compared to only 19 per cent caesarean section rate within the well plotted partographs in this group. Although the difference is not significant this shows a pattern between not well plotted partographs and a higher CS-rate that was described in the beginning of this paragraph - very important to avoid.

Group 3 (multiparous)

Half of the included patients belonged to group 3. This group also dominated the vaginal deliveries (59%). When looking at ratio of well plotted partographs (Fig. 7) group 3 covers almost half of the well plotted partographs. When comparing the three groups (1, 3 and 5a) the CS-rate in this group were the lowest (9 %). This numbers correspond well with Malmborg study at KCMC in 2016 where 10 out of 94 patients (11 %) in group 3 delivered by CS (9). Compared to a study from Brennan et al. with 47, 402 patients from 9 different countries the mean of CS-rate was lower, 2.7 per cent, in group 3 of TGCS. The countries in this study were high income countries (Ireland, UK, Australia, Canada, New Zealand, Belgium, Norway, Sweden and Iceland) (31) compared to Malmborgs study at the same hospital in Tanzania (9).

Group 5a (one previous scar)

Out of 88 patients 7 had one previous scar. The reason to this low number was because of many elective caesarean sections among mothers with one previous scar. Even if the policy at the department was to allow another vaginal delivery if the patient only had one previous scar reason for elective CS could be mothers wish, complications, one previous scar combined with big baby 3500 kg etc. These did not meet my inclusion criteria with spontaneous start of delivery. A previous study by Malmborg (9) showed that out of 333 deliveries at KCMC during eight weeks 45 belonged to group 5 in Ten Group Classification System (the system is described in the background and appendix 1). Of these 45 patients 39 were delivered by CS. In this study the CS-rate was 43 per cent in group 5a. The difference in CS-rate between group 5 in Malmborgs study in 2016 and 5a in this study is explained with the exclusion criteria's in 5a of elective CS respectively more than one previous CS, these are accepted in group 5 in Malmborgs study. These excluded patients have a big impact in the

higher CS-rate in group 5 showed in Malmborgs study (9). Two previous scars is itself an indication for another CS in following pregnancy and thereby increase the CS-rate.

Interestingly in this study was the fact that all labours in group 5a had not well plotted partographs (Fig. 7). Would it not been very important, particularly in this group, to follow labour strictly to increase the chances to deliver vaginal?

Mothers health and status of the newborn

When comparing mothers health to plotting of the partograph there was no significance between these three groups (Tab.6). Although it is interesting that out of 14 patients with the condition of “fair” after birth 12 of them had not well plotted partographs. Could this correlate to that fact that pulse and temperature, factors that gives information about mother’s health, were the parameters most seldom plotted (Tab.3)?

In table 7 it is shown that 13 of 87 newborns were transferred to paediatrics department. The exact reason for each deliveries was not recorded for this study but big baby, low weight baby, mother with diabetes or bad condition of the newborn were some reasons. Of the 13 newborns transferred to paediatrics 11 of them had not well plotted partographs during labour. There were no significance between status of the newborn and plotting of the partograph but it is a very high rate (85%) of not well plotted partographs within the newborn transferred to paediatrics.

Time and cervical dilatation from start plotting to vaginal birth or CS

The average time from start of plotting the partograph until time of vaginal birth were around 250 minutes (fig 8). Compared when a decision of CS was made, the time from start of plotting the partograph until decision was in average longer, around 400 minutes. This shows an attempt of vaginal delivery before the decision of C-section.

In group 1, the most common (4 patients) dilatation before CS was 8 cm (Fig.9). In accordance to the last paragraph, that shows an effort of trying to deliver vaginally. The dilatation of 5 cm at time for CS was found in 3 patients. In these patients it might have been another circumstance as abnormal foetal heart rate, bad contractions, colour of amniotic fluid etc. that lead to the decision of surgery.

In group 5a (one previous scar), 2 patients had missing value of cervical dilatation at decision of CS and 1 patient were dilated only 4 cm when time for CS. In this group, 3 patients out of 7 in total were delivered by CS. Interestingly all of these 3 CS had missing values in time from start of partographs until decision of scar.

Further studies

It is important to follow if plotting of the parameters in the partographs is correctly filled in. One opportunity to control the plotting of partographs could be random sampling of partographs that will be evaluated according to recommendations from WHO to see if they are well plotted or not. Although this study shows no significant difference between partograph well plotted or not compared to mode of delivery, likely due to an insufficient number of patients, could the trend in the results show that well plotted partographs are important to avoid the increasing CS-rate at KCMC?

Further studies might include more participants and thereby might raise the chance for significant results. In the next study together with updated results of the plotting of each parameter and partographs it would also be interesting to investigate the ratio of well plotted partograph within different professions.

Methodological considerations

As described in the method foetal heart rate was plotted every 30 minutes instead of every 15 minutes in active phase as recommendations from WHO (19). This was the standard of KCMC and therefore it was an acceptance of this frequency. Otherwise it would have been difficulties to find well plotted partographs. It is important to mention this exception due to the fact that recommendations from WHO is separate to the routine at KCMC.

Another problem that was found when including patients was to collect information about induction. In the medical record there was in some cases written down if induction was made or not. In other patients no information about induction was found but when completing the protocol with information from Medical Birth Registry induction was marked. After searching information about the routines of filling in the MBR a midwife working at the ward explained that induction in Medical Birth Registry could both be induction before labour but also augmentation with oxytocin during labour. This made some difficulties in including patients due to the inclusion criteria, not induced. This means that some patients that should be included in group 1 now were excluded as they were thought to be induced patients.

When plotting the parameters into the partograph the environment can be stressful and unexpected things can occur disturbing the procedure of correct plotting. Among the international midwives students but also among some workers in the staff there was a distrust concerning the plotting of the partograph at the actual time of labour. A suspicion concerning completing the plotting after delivery existed. There was also distrust concerning measurements that not was made correctly instead an estimated value was written down. There was also a discussion about the possibility that the staff in labour unit at KCMC were more strict when plotting during the study period, knowing students will come to investigate

the partographs and MBR. None of these suspicions has been proved in this study but it would of course interfere with my results if there were evidence of these rumours.

Due to the fact that CS was more expensive (280 000 TSH) in KCMC than a vaginal delivery (50 000 TSH), and all patients paid by the patients themselves, a discussion about income as a steering factor when choosing method of delivery raised (7). In an article by Fobelets et al. from 2018 pointed out the cost- effective of VBACS compared to ERCD in four different countries in Europe (8). In KCMC, where the patient stands for the income, could the interest be in the opposite way of cost- effective?

Strengths of this study were strict and well-considered inclusion and exclusion criteria's. This made the participants well suited for the aim of this study. Also the evaluation of the partograph was made by one single person, thus there was no inter-observer variation and all partograph were thereby evaluated the same. The written language was English and therefore no need for translation that sometimes can lead to misunderstandings.

Conclusions

The rate of well plotted partographs was low (28 %) at KCMC among nulliparous women, multiparous with no previous CS and multiparous with previous CS all at term with a single fetus in cephalic lie and spontaneous start of delivery. The CS-rate in not well plotted partographs was twice as high as the rate in well plotted partographs.

The best plotted parameters in the partograph were head descent, cervical dilatation and amniotic fluid. The most seldom plotted parameters were pulse and temperature. Foetal heart rate was not well plotted in almost one third of every labour.

When pulse and temperature were excluded from the evaluation of partograph the difference between method of delivery (SVD or CS) and the quality of plotting of the partograph was significant. In the not well plotted partographs the ratio of CS was almost three times higher than in well plotted partographs.

In the group of patients with one previous scar all labours were not well plotted. In this group it is extremely important to follow the partograph parameters as accurate supervision might lead to courage of vaginal delivery. One unnecessary CS here lead to caesarean section as the only option in future deliveries.

In summary, the labours with not well plotted partographs had more than twice as high CS-rate compared to well plotted labours. Still the difference was not significant, perhaps due to a small study group. The partograph is an important tool in supervision of labour and the routines of plotting the partograph should be considered at KCMC.

Populärvetenskaplig sammanfattning

Kvaliteten av övervakningen under en förlossning vid Universitetssjukhuset KCMC i Tanzania- finns det en påverkan på kejsarsnittsfrekvensen?

Kejsarsnitt är ett kirurgiskt ingrepp som debatteras kraftigt. Detta ingrepp kan i vissa fall vara en livräddande procedur men i andra fall leda till komplikationer i form av infektion och ökad risk för blödning vid kommande graviditet. Har man fött med kejsarsnitt två gånger rekommenderas fortsatt födsel med kejsarsnitt eftersom det bildats ärr efter de två ingreppen och komplikationerna att föda vaginalt anses vara för stora.

Med tanke på dessa komplikationer vid kejsarsnitt är det väldigt viktigt att i de fall där vaginal födsel är möjligt välja den metoden. Ibland kan det vara svårt att säkert veta när ett kejsarsnitt är indicerat eller inte. Under en förlossning övervakas fostret och mamman med hjälp av ett partogram vilket är ett formulär som samlar in information om olika parametrar som hjälper till att tolka tillståndet hos fostret och mamman. Exempel på olika parametrar är puls, blodtryck, hur uttänjd livmoderhalsen är osv. Tidigare studier har visat att bra övervakning kan minska långsam utveckling av förlossning och minska kejsarsnittsfrekvensen.

Tidigare studier vid universitetssjukhuset KCMC i Moshi, Tanzania, har visat en ökande snittfrekvens. Förra året, 2017, låg snittfrekvensen på hela 47 procent. Denna studie ville därför undersöka om dåligt ifyllda formulär kan leda till ökat antal snitt. För att vara med i studien var kvinnor tvungna att ha en fullgången graviditet, foster i huvudbjudning (normal placering av fostret med huvudet först), avsaknad av igångsättning och inte ha gjort mer än ett tidigare kejsarsnitt. Alla födslar var med spontan start och planerade att föda vaginalt.

Resultatet från denna studie visade att formulären bara var bra ifyllda i 28 procent av födslarna. Kejsarsnittsfrekvensen hos de väl ifyllda formulären var 12 procent jämfört med 27 procent hos de födslar där formulären var dåligt ifyllda. På

universitetssjukhuset KCMC Tanzania var man mycket dåliga på att fylla i puls och temperatur hos mamman under förlossningen. Även hjärtljud hos fostret som är en mycket viktig komponent i att bedöma fostrets hälsa missades vid nästan var tredje förlossning. Hos kvinnor med ett tidigare snitt fanns ingen förlossning med bra ifyllt formulär.

Slutsatsen från denna studie var att frekvensen av bra ifyllda formulär på universitetssjukhuset KCMC var mycket låg. Det var också högre snittfrekvens i de förlossningar där formulären var dåligt ifyllda. Det är viktigt för kliniken att se över sina rutiner av ifyllning av dessa formulär under förlossningen. En förbättrad ifyllning av formulären kan möjligen bidra till en sänkning av den höga snittfrekvensen.

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Appendices

Appendix I:I

The Ten Group Classification System (TGCS)

Group	Women included
1	Nulliparous with single cephalic pregnancy, ≥ 37 wks gestation in spontaneous labour
2*	Nulliparous with single cephalic pregnancy, ≥ 37 wks gestation who either had labour induced or were delivered by CS before labour
3	Multiparous without a previous uterine scar, with single cephalic pregnancy, ≥ 37 wks gestation in spontaneous labour
4*	Multiparous without a previous uterine scar, with single cephalic pregnancy, ≥ 37 wks gestation who either had labour induced or were delivered by CS before labour
5	All multiparous with at least one previous uterine scar, with single cephalic pregnancy, ≥ 37 wks gestation
6	All nulliparous women with a single breech pregnancy
7	All multiparous women with a single breech pregnancy including women with previous uterine scars
8	All women with multiple pregnancies including women with previous uterine scars
9	All women with a single pregnancy with a transverse or oblique lie, including women with previous uterine scars
10	All women with a single cephalic pregnancy ≤ 36 wks gestation, including women with previous scars
* Often divided into 2a and 4a (inductions) and 2b and 4b (pre-labour CS)	

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PROTOCOL

LABOUR(PARTOGRAFH)	
Number	
Age of mother	
TGCS group	I <input type="checkbox"/> III <input type="checkbox"/> V <input type="checkbox"/>
	Parity_____
Cesarean section	Yes <input type="checkbox"/> No <input type="checkbox"/>
IF CS:	
Fetal heart rate	ok <input type="checkbox"/> taky <input type="checkbox"/> brady <input type="checkbox"/> dec <input type="checkbox"/>
Level of descent	0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/>
Cervical dilation	1 2 3 4 5 6 7 8 9 10
Indication 1	_____
Indication 2	_____
MEDICAL BIRTH REGISTRY	
Complications during delivery	Yes <input type="checkbox"/> No <input type="checkbox"/>
1=PROM 2=Bleeding 3= 3-4 degree tear	1 2 3 4 5 6
4=Abruption placenta 5=Placenta previa 6=Other	
Blood Loss(ml)	_____ml.
Failed intervention	No <input type="checkbox"/>
	Failed vacuum extraction <input type="checkbox"/>
	Failed forceps <input type="checkbox"/>
Gestational age at birth	_____weeks.
Birth weight	_____g.
Status of the newborn child	1. <input type="checkbox"/> 2. <input type="checkbox"/> 3. a(fresh) <input type="checkbox"/> b(macerated) <input type="checkbox"/> 4. <input type="checkbox"/>
Mother's health after birth	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>
Blood pressure(last recorded from partograph)	_____/_____ _____mmHg.
Apgar score	1 min ____ 5 min ____ 10 min____

PROTOCOL

PARTOGRAPH

Fetal heart rate

- auscultated every 15 minutes

ok other _____

Liquor moulding*

- examination every 4th hour

ok other _____

Descent*

- examination every 4th hour

ok other _____

Cervical dilation*

- examination every 4th hour

ok other _____

Colour of amniotic fluid*

- examination every 4th hour

ok other _____

Contractions

- recorded every 30 minutes

ok other _____

Blood pressure

- recorded every 4th hour

ok other _____

Pulse, mother

- recorded every hour

ok other _____

Temperature

- recorded every second hour

ok other _____

*Within every vaginal examination.

Duration of labour

Time from dilation 4 cm to delivery

Appendix I:II

PROTOCOL

Self to note:

Complications during delivery:

- 1=PROM(premature ruptur3e of membrane)
- 2=Bleeding > 500ml
- 3= 3-4 degree tear
- 4=Abruption of placenta
- 5=Placenta previa
- 6=Other complications

Apgar score, 7-10 normal score.

Possible to skip measure after 10 minutes if the result from 1min measure and 5min measure are good. Possible to measure even longer if the are bad results.

Mothers health after birth:

- 1= Good
- 2= Fair
- 3= Bad
- 4= Maternal death

Apgar Score

Gestational age _____ weeks

Sign	0	1	2	Time				
				1 minute	5 minute	10 minute	15 minute	20 minute
Color	Blue or Pale	Acrocyanotic	Completely Pink					
Heart rate	Absent	<100 minute	>100 minute					
Reflex irritability	No Response	Grimace	Cry or Active Withdrawal					
Muscle tone	Limp	Some Flexion	Active Motion					
Respiration	Absent	Weak Cry; Hypoventilation	Good, Crying					
Total								

Comments:	Resuscitation					
	Minutes	1	5	10	15	20
	Oxygen					
	PPV/NCPAP					
	ETT					
	Chest Compressions					
	Epinephrine					