



College of Medicine

**Assessment of Health Worker's Knowledge and Utilization of Partograph to Diagnose
Fetal Distress during Labor at Bwaila Hospital, in Lilongwe Malawi**

By

**Luke Chiwala
(BSC Nursing and Midwifery)**

**A Dissertation Submitted in Partial Fulfilment of the Requirements for
the Award of Master of Global Health Implementation**

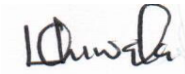
23rd March, 2022

DECLARATION

I Luke Chiwala hereby declare that this dissertation is my original work and has not been presented for any other awards at the University of Malawi or any other University.

Name of Candidate

Luke Chiwala



Signature

Date

23rd March, 2022

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ABSTRACT

World Health Organization recommended the partograph in management of women during labor to improve maternal and neonatal outcomes. Despite gains made in reducing maternal health, neonatal deaths from complications of labor and delivery persists. Quality of care and the use of the partograph in labor can help to avert deaths from labor complications. The way health workers use that partograph to diagnose fetal distress during labor needs to be investigated.

This facility based cross-sectional study was conducted at Bwaila hospital using both qualitative and quantitative methods. A total of 911 partographs of births at Bwaila for the month of April and May 2020 were reviewed. Fifteen (15) midwives in the maternity ward were interviewed. Descriptive statistics and logistic regression were used to analyze quantitative data. Thematic analysis was applied to analyze data from in-depth interviews.

Midwives had good knowledge about the partograph. Utilization of partographs and diagnosis of fetal distress was poor. Meconium-stained liquor (AOR=2.33; 95% CI =1.51-3.59, $p<0.001$), vacuum extraction (AOR=4.64; 95% CI= 1.61-13.58, $p=0.004$), Crossing alert line (AOR=1.70; 95% CI =1.09-2.66, $p=0.020$), Male sex (AOR=1.75; 95% CI=1.17-2.62, $p=0.006$) and Birth Weight (AOR= 0.9992234; 95% CI= 0.9988441 - 0.9995922, $p <0.001$) were factors associated with birth asphyxia.

Improving staffing levels, consistent supportive supervision, availability of equipment and supplies, in-service trainings on labor management and partograph, introduction of incentives, improving inter-professional collaboration, are necessary to improve quality. Partograph needs to be reviewed and modified to meet context needs. Electronic fetal monitoring should be used in busy setting.

ACRONYMS

ACOG	American College of Obstetricians and Gynecologists
APGAR	Appearance, Pulse rate, Grimace, Activity, Respirations
COM	College of Medicine
COMREC	College of Medicine Research and Ethics Committee
CS	Caesarian Section
FHR	Fetal Heart Rate
FSB	Fresh still Birth
IRB	Institutional Review Board
LFT	Life full Term
MNH	Maternal and Neonatal Health
MSB	Macerated Still Birth
NND	Neonatal death
QoC	Quality of Care
RHD	Reproductive Health Directorate
SDG	Sustainable Development Goal
SVD	Spontaneous Vertex Delivery
UNICEF	United Nations Children's Fund
V/E	Vacuum extraction
WHO	World Health Organization

DEFINITION OF TERMS

PGAR score : A quick test given to a baby straight after birth at 1 and 5 minutes to assess their health. It assesses Appearance, Pulse Rate, Grimace (response to stimuli), Activity and respirations.

Birth Asphyxia: A condition where the baby fails to establish breathing at birth

Fetal distress: A condition where the fetus is deprived of oxygen during labor or pregnancy.

Fresh Still Birth: A baby born dead without signs of skin disintegration or maceration and the death is assumed to have occurred less than 12 hours prior to delivery

Partograph: A graphic recording of progress of labor and salient conditions of the mother and fetus plotted against time in hours.

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CHAPTER 1: INTRODUCTION

1.0 Introduction and background

Pregnancy and childbirth are one of the important but risky period for the pregnant woman and her baby. This period involves many biological, psychological and social changes that require a great deal of adjustment and adaptation on the part of the mother. Most women are conscious about the outcome of the pregnancy. The outcome of pregnancy is contingent on the care the woman receives during pregnancy and during delivery. If uncomplicated, labor can be managed by midwives with good birth outcomes. However, good labor outcomes in such uncomplicated pregnancies is attributed to early recognition of complications and prompt intervention (1). One such technology to ensure early detection of complications during labor is the use of the partograph. The partograph has been established as the “gold standard” labor monitoring tool universally (2). The quality of labor management is determined by the assessment of the partographs used. It is expected that every woman should be cared for using the partograph during labor.

The purpose of the partograph is to monitor the progress of labor and identify any complications that may occur during labor. Utilization of the partograph is related to improved maternal and neonatal outcomes of labor (2). It is expected that health workers should be able to identify complications using the partograph and provide necessary interventions in time. Therefore, acquisition of adequate knowledge and proper utilization

of the partograph would accelerate efforts in reduction of maternal and neonatal deaths (3).

The partograph has an impact on

improving the quality of intrapartum care, maternal health and birth outcomes (3).

However, despite wide use of the partograph, birth asphyxia continues to present a major clinical problem and one of the common causes of perinatal and neonatal mortality and morbidity (3). The use of the partograph and its associated strategies brings questions if the tool is really suitable in detecting conditions that precede birth asphyxia during labor. It is not clear if all babies born with birth asphyxia are diagnosed with complications before delivery using this recommended tool. This study therefore aims to assess health worker's knowledge and utilization of the partograph to diagnose fetal distress during labor.

1.2 Problem statement

Despite a drop in the under-five mortality in Malawi, neonatal deaths have remained high accounting 44% of all under five deaths (4). Achieving global targets in infant and child survival requires efforts to reduce deaths in the first month of life especially those due to complications of labor (4). Neonatal survival depends largely on quality and timely care during labor and delivery (5). The partograph is one of the valuable appropriate technologies in use for improved quality of monitoring of labor progress, maternal and fetal wellbeing during labor (6). Despite the routine use of the partograph to monitor labor progress, newborn babies continue to die from complications of labor including fetal distress. The extent to which midwives understand the tool and detect fetal complications during labor using this tool need to be well established. Available literature indicated poor documentation of the partograph in monitoring labor (7). Poor documentation presents gap as to how health workers

will diagnose complications in labor since problems are recognized based on what is documented. It is against this background that this study seeks to establish midwife's knowledge and utilization of the partograph and the extent to which they are able to diagnose fetal distress during labor using the tool.

1.3 Justification of study

Understanding how health workers understand and implement interventions that have been proven to be effective is essential as it will help to address implementation challenges. Studies conducted to assess knowledge about partograph have focused much on general knowledge and not pinned to a condition or outcome. Many of the studies have indicated that knowledge about the partograph is poor (8–10). However, it is important to understand if the users of the partograph understand how to use the tool to detect specific neonatal conditions. It is expected that the results will also facilitate identification of training needs that will improve the quality of intrapartum care through promotion of correct use of the partograph to prevent, detect and manage fetal distress.

1.4 Theoretical framework

The framework that guided this study was Donabedian's conceptual model on quality care which focuses on evaluating performance of a system. In this study, we evaluated how midwives use the partograph to diagnose fetal distress. The partograph is considered effective in promoting quality of care during labor. This framework utilizes three essential evaluating systems: Structure, process, and outcome. The system referred in this study is the utilization of the partograph among nurses, a tool used for quality care to women in labor. The structure denotes the attributes of the setting in which the care may occur which midwives may refer to as drivers or pulling factors to utilization of the partograph. The attributes of the process may

be of any performance done in order to achieve the outcome such as training, attitude and knowledge of the user.

1.5 Study objectives

1.5.1 Broad objective

The aim of the study was to assess health worker's knowledge and utilization of partograph in diagnosing fetal distress during labor at Bwaila Hospital

1.5.2 Specific objectives

The specific objectives for this study are:

1. To assess health workers' knowledge on the use of partograph to monitor fetal condition during labor.
2. Assess health workers knowledge in correctly interpreting partographs with attributes consistent with fetal distress.
3. To estimate the proportion of deliveries where partographs were utilized
4. To explore factors associated with birth asphyxia.
5. To identify challenges faced by health workers when using partograph to monitor fetal condition during labor.

CHAPTER 2: LITERATURE REVIEW

2.1 Burden of neonatal deaths

Neonatal mortality remains a great obstacle in the battle to reduce under-five mortality worldwide. It is documented that globally, 2.5 million children died in the first month of their life in 2018 alone, which is approximately 7,000 neonatal deaths every day (12). Most of the deaths occurred in the first week, with about 1 million dying on the first day and close to 1 million dying within the next six days (13). Reduction of neonatal mortality has been slower than that for maternal and child (1–59 months) mortality, slowest in the highest burden countries, especially in Africa, and reduction is even slower for stillbirth rate (14).

Globally, neonatal mortality rate fell by 51 per cent from 37 deaths per 1000 live births in 1990 to 18 in 2017. This is a small reduction if compared to a 63 per cent in reduction among children aged 1-59 months (14). Neonatal mortality was highest in sub-Saharan Africa and south Asia with each estimated at 27 deaths per 1000 live births in 2017 (14). However, it is noted that even in regions where under five mortality is low, more than half of the deaths occur during the neonatal period. The Sustainable Development Goal number 3.2 aims at reducing neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births by 2030 (15). However, with the current trend, 56 million under five children will die between 2018 and 2030, half of them being neonates (14). Without intensifying action to reduce child mortality, the current trend will see many

countries failing to achieve the SDG 3 target by 2030, and would only achieve the target after 2050 (14).

Like many other countries, despite a huge decline in the under-five mortality, neonatal mortality remains unacceptably high (13). Between 1992 and 2016, under-five and neonatal mortality declined from 234 to 63 and 41 to 27 deaths respectively (13). Two-thirds of all deaths in the first 5 years of life occur during infancy and about 43% of all deaths occur during the first month of life (14). In Malawi, about 9 out of every 100 children born alive die before the age of 5 years (14). This indicates that the huge burden of under-five mortality is contributed to by neonatal deaths. The Malawi trend in reducing neonatal deaths follows a narrow path of success as the achievement in 2016 reflect what was achieved in 2004. The pattern indicates a repeated trend which shows no progress as the 27 deaths per 1000 live births was once achieved in 2004 (figure 1). Unlike under-five mortality, neonatal mortality is much linked to quality of maternity care.

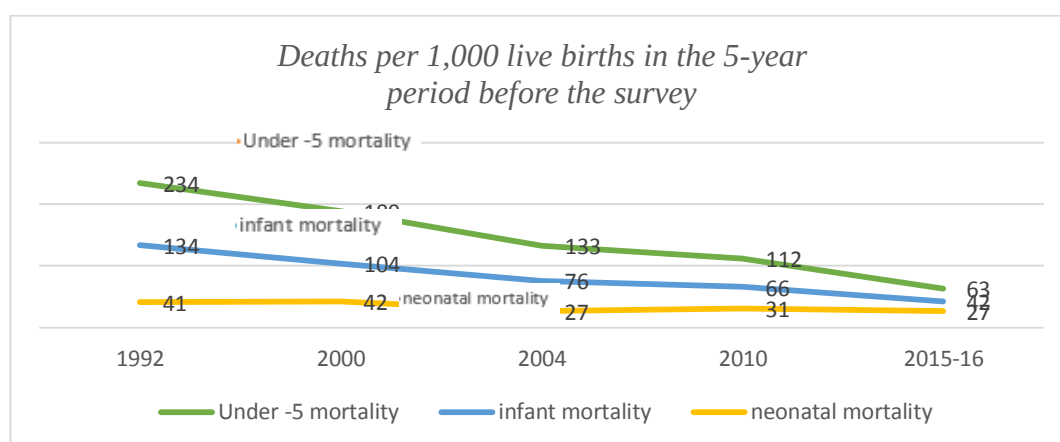


Figure 1: Trends in Early Childhood mortality rates in Malawi

Source: Malawi health and Demographic Survey 2015-16

2.2 Causes of neonatal deaths

The three leading causes of neonatal mortality worldwide are prematurity (36%), birth asphyxia (23%) and infections (23%) (15). Most deaths occurring at health facility within the first week of life among term babies are due to birth asphyxia, a condition where newborns fail to initiate breathing at birth. According to UNICEF data of 2015, the causes of neonatal deaths in Malawi represent the same as reflected worldwide as prematurity causes (33%) of the deaths, birth asphyxia and trauma (25.8%) and sepsis (18.6%) (16).

Birth asphyxia is a serious clinical problem worldwide (16). According to the World Health Organization, birth asphyxia is defined as the failure to initiate and sustain breathing after birth (17). Each year approximately 4 million babies are born asphyxiated, which results in 1 million deaths and an equal number of serious neurological problems such as cerebral palsy, mental retardation, and epilepsy (16). According to trends, the prevalence of birth asphyxia is increasing. In 1990s the incidence of asphyxia was reported as 5.4/1000 live births (18) while in the 2006 the American College of Obstetricians and Gynecologists (ACOG) reported 25-73/1000 live births in developed countries an incidence of 1-6/1,000 live births, and birth asphyxia (23%) represents the third most common cause of neonatal deaths (19). Birth asphyxia is one of the birth complications can be prevented through early recognition of fetal distress during labor. The World Health Organization recommends that women are assessed routinely on admission and during labor, child birth and are given timely and appropriate care (20). In 1994, the WHO declared universal use of the partograph in all settings in monitoring labor to help identify abnormal progress and provide timely intervention when required (4). The recommendation aimed to improve care during labor and also to detect complications

early hence timely interventions in order to reduce maternal and neonatal morbidity and deaths (21). The partograph with its associated management guidelines is designed to improve the timing of critical management decisions in labor (7).

2.3 The partograph

The partograph is a graphic recording of progress of labor and salient conditions of the mother and fetus plotted against time in hours (22). It was designed by Friedman in 1954 and further improved by Philpot and Castle who introduced the alert and actions lines to facilitate interventions during labor (23). The tool has clear demarcations which, if arrived at or exceeded clearly indicate the need to address existing or imminent complications like poor progress of labor, prolonged labor, fetal distress, and in the worst cases, obstructed labor and ruptured uterus (5). In 1994, WHO extensively tested partograph's efficacy and established its scientific basis and rationale for its use in prevention of prolonged labor and within same period declared its universal use in all settings in monitoring labor (6).

The partograph provides a framework for assessing maternal and fetal condition and labor progress during labor. Maternal condition is observed through checking of blood pressure, pulse rate, temperature, and urine output. Fetal condition is monitored by assessing fetal heart rate, molding of the head and caput. Fetal Heart Rate (FHR) monitoring is commonly used and assumed to identify babies being at risk of running short of oxygen (hypoxic). The state of color of liquor can tell whether the fetal life is compromised or not. If used appropriately, the partograph can assist in identifying fetal complications like fetal distress hence timely intervention. Labor progress is assessed through descent of the fetal head, cervical dilatation and uterine contractions.

Following recommendations from the WHO, the Maternal and Neonatal Health program promotes the routine use of the partograph to monitor the progress of labor in all settings (9). National guidelines for management of women during labor have supported and incorporated the WHO recommended partograph in care. In 1988, Safe Motherhood Initiative launched the use of partograph as an international standard practical tool to monitor labor and prevent prolonged labor (24). In Malawi, the Ministry of Health adopted this tool for labor management in 1970s (25)

2.3.1 Benefits of using partograph

The partograph provides health professionals with a pictorial overview of the labor to allow early identification and diagnosis of the complicated labor (6). If used effectively it helps to ensure careful monitoring of the woman in labor, avoids unnecessary interventions, recognizes and responds to complications in a timely manner all of which can help to prevent maternal and neonatal morbidity and mortality (26). Some evidence suggests that midwives find the partograph to have practical benefits in terms of ease of use, time resourcefulness, continuity of care and educational assistance (21).

It is reported that the introduction of partograph and labor management protocol in South East Asia, reduced still births from 0.5% to 0.3% (27). Some evidence suggests that the use of labor chart has been associated with less maternal blood loss, reduced perinatal mortality, birth asphyxia and a better APGAR score at one and five minutes (28, 29). According to some studies the use of the partograph reduces the risk of prolonged labor, cesarean sections, and perinatal mortality (30). A quantitative study in Tanzania, revealed that poor partograph based monitoring of labor was related to unsatisfactory maternal and fetal outcomes (31). Similar

findings were reported in Uganda where poor monitoring of labor using partograph was associated with APGAR score of less than 7 (32). In another study, only 2% of the used partographs fulfilled standard monitoring of fetal heart rate and that a good APGAR score was associated with standard fetal monitoring ($P < 0.001$) (33).

Despite presence of evidence of its effectiveness, many neonates continue to die due to birth asphyxia. It is estimated that 40% of all still births and neonatal deaths occur during the time of birth and the day of birth (15). Four million babies are born with asphyxia each year, of whom 30% die (19). To some effect, the effectiveness of the partograph in reducing neonatal deaths is questionable especially in low- and middle-income countries (23). The use of the partograph in real life setting seem to be below the expectation and recommendation. This illustrates that the availability of evidence on the effectiveness of an intervention is necessary, but not sufficient to produce better health outcomes (34).

2.3.2 Health workers knowledge about partograph

Evidence abounds that the acquisition of knowledge about the partograph and ensuring proper application of that knowledge would culminate in a remarkable reduction in the incidence and outcomes of prolonged and obstructed labor, which are reported to be associated with 8%–10% of maternal deaths (35, 36). It is documented that caregivers may resist using the tool if they have insufficient knowledge and do not fully understand why they have been asked to use the tool (6).

A cross sectional study conducted in public health institutions of Addis Ababa; Ethiopia revealed that knowledge was fair as 96.6% of the respondents could mention one component of the partograph (6). In Amhara, a region of Ethiopia, it was found that 99% of the health workers enrolled knew what that partograph was, however only 20% could mention 75% of the components of the partograph (37). This is in agreement with another study conducted in public health institutions in the northwest and southwest Cameroon where less than one-third (29.6%) of the respondents had good knowledge on the partograph (9). Some studies reported that level of knowledge on partograph was different among cadres as midwives with degree had more knowledge as compared to those with diploma (38).

A cluster randomized control trial conducted in Indonesia assessed the effectiveness of promoting the use of WHO partograph. The results indicated that midwives and obstetricians in the intervention group correctly completed 92.4% of the partographs. The number of babies with APGAR score of less than 7 at 1 minute was also reduced (39). Health worker's educational needs on how to use the partograph showed a significance difference in the outcomes in the women cared for by midwives who received training and those who did not (25). To the contrary, a cross sectional descriptive study conducted in South Sudan to assess midwives' knowledge and use of partograph revealed that despite good knowledge of partograph, its use was very low at 33% (36).

2.3.3 Level of partograph utilization during labor

Studies have revealed poor utilization and adherence to partograph use among health workers (29, 49). A cross- sectional study conducted at Jimma University Specialized Hospital

reported that out of 340 delivery records, partograph was present in 274 records representing 6.9% (40). Another study in Kenya showed that while 88.2% of the 1057 evaluated patient records contained a partograph, only 23.8% of the forms had been used correctly (37). This indicates that many health workers know that they should use the partograph but they do not adhere to standards of its use. This indicates that the availability of the partograph in the clinical area does not promote its use. Another study conducted in Sidama Zone, Ethiopia reported that 275 respondents interviewed reported availability of partographs in their facility. However, only 142 (50.7%) of those reported using the tool routinely, 38.8% used sometimes while the remainder used the tool occasionally (41). Upon review of records used, only 61.3% partographs were filled and all of them were incomplete (41). This is consistent with a study conducted in Amhara region in Ethiopia, Bangladesh and Malawi where despite the partograph being used, documentation was grossly inadequate (23, 25, 37). According to these results, it shows that the use of the partograph to address fetal complications is limited. There is great need to evaluate if the partograph can really assist to improve neonatal health outcomes.

2.3.4 Monitoring fetal condition during labor

Labor can affect the fetus in many ways and some stressors may affect the flow of oxygen to the fetus. The reduction of normal supply of oxygen to the fetus results in fetal distress which eventually leads to decrease in fetal heart rate (42). Fetal distress is defined as depletion of oxygen and accumulation of carbon dioxide, leading to a state of “hypoxia (low oxygen) and acidosis” during intra-uterine life (43). Maternal medical conditions like hypertension, problem with the placenta all may prevents enough oxygen from circulating to the fetus

leading to fetal distress and the baby may be unable to breath after delivery (16). Uterine contractions are the most common cause of decreased oxygen supply to the baby (42). As such, it is very essential to monitor the fetus during labor to assess how it responds to stresses of labor (42).

During labor, fetal condition is determined by the fetal heart rate, color of liquor, molding and caput on the partograph. The fetal heart rate (FHR) is mostly used to monitor the condition of the fetus during labor (44). Fetal heart rate is recorded initially then every 30 minutes. However, in a study conducted in Addis Ababa in Ethiopia, it was found that among the used partographs, only 15.9% had fetal heart rate monitored to standard (30). This is lower than what was reported in Bangladesh where 61% of the partographs had fetal heart rate monitored half hourly (23). It was also noted that the partographs also seemed not to provide adequate information about fetal condition as fetal heart rate was the main determinant for fetal complication, but it was poorly monitored with health workers documenting more on labor progress than on fetal condition (25).

2.4 Challenges with the use of partograph

The reasons why the partograph is difficult to implement should be well understood from health worker's perspective. The partograph can only act as a warning sign only if what is plotted or written on it is correct and adequate. Many challenges affect proper use of the partograph.

2.4.1 Lack of staff supervision

Lack of supervision is one factor affecting implementation of affective interventions. In Uganda, service providers were trained in partograph use in 12 facilities. However, it was discovered that after the training, caregivers were still not using the tool. One of the main

factors was lack of ongoing supervision and clinical audits (47). Similar findings were also discovered by Save the Children during piloting of an electronic partograph in Kenya (48), where health workers pointed lack of supervision as a reason for lack of implementation.

2.4.2 Poor staffing

In poor resource settings with few health workers, health workers fill the partograph just to complete the task. In settings where electronic partograph was implemented, health workers expressed satisfaction with the electronic partograph than the paper based partograph. With poor staffing paper based partograph presents with an overwhelming paperwork to the staff and also presents a bulk of paper which might be costly (48).

Having adequate staffing to attend to women in labor is another factor that may affect utilization of partograph. In a study conducted in Benin, it was found that more staff on duty was associated with high utilization of the partograph. More partographs were completed where there was more than one midwife unlike in situations where few midwives were present.

CHAPTER 3: METHODOLOGY

3.1 Study Design

This was a hospital-based cross-sectional study as data was collected at one specific time. The design was preferred to meet the timeline and to reduce the cost of implementation. The study used mixed methods approach. Mixed methods research is when the investigator collects and analyses data, integrates the findings, and draws inferences using both qualitative and quantitative methods in a single study (16). Mixed method was preferred since it will allow understanding of the research question from different perspectives. When applied, it allows the strengths of one approach to complement the restrictions of another. In this study, qualitative method was applied to better understand findings obtained from the review of the partographs.

3.2 Study setting

The study was conducted at Bwaila hospital in Lilongwe District. Bwaila Hospital is located in area 2, also known as old town. The hospital is one of the facilities with high volume of deliveries in Malawi. According to facility data, in fiscal year 2018-2019, 9909 babies were admitted to Bwaila nursery ward. Of these, 3290 were admitted due to birth asphyxia representing 33.2% of all admissions (50). There were 818 neonatal deaths within the same period of which 360 babies died due to birth asphyxia representing 44% of all deaths. It was observed that the number of deaths due to birth asphyxia was more than those due to prematurity and low birth weight combined 243 (29.7%) and neonatal sepsis 164 (20.0%)

(50).

3.3 Study population

The qualitative component involved in-depth interviews with midwives providing maternity care in the maternity unit at Bwaila Hospital. This population was expected to have experience with the partograph and would be able to provide the required information.

The quantitative component involved review of available delivery records of women who gave birth two months (March and April) prior to data collection to assess if partographs were used. The extent of partograph completeness was also assessed.

3.4 Study Duration

The study was conducted from June 2019 to December 2020. Report was written in December 2020.

3.5 Sample size

3.5.1 Sample size of midwives

Initially the study was designed to interview 20 midwives at Bwaila labor ward. However, during study implementation, it was discovered, there was no new information being generated by the 10th participant as midwives kept repeating same information. The researcher continued the interviews up to 15th participant just to make certain that no new information will emerge. Data analysis was combined with data collection to assess if new codes were emerging. The concept of saturation is very important in qualitative studies (51).

3.5.1 Sample size of Partographs

To avoid bias, all partographs of women who delivered at Bwaila Hospital in two months prior to data collection and met inclusion criteria were enrolled for review. 1500 records were

retrieved for review. Only 915 files met inclusion criteria and those were selected for further review.

2.5.1 Sample selection

2.5.2 Sample of midwives

Midwives who worked in the labor ward were interviewed. Purposeful sampling was used to sample midwives for interviews. Purposeful sampling is widely used in qualitative research for the identification of information-rich cases related to the phenomenon of interest (52). It involves identifying and selecting individuals or groups of individuals that are especially knowledgeable about or experienced with a phenomenon of interest. In addition to knowledge and experience, purposeful sampling also considers availability and willingness to participate, and the ability to communicate experiences and opinions in an articulate, expressive, and reflective manner (52).

Inclusion criteria

The qualitative component included midwives who worked in labor ward at Bwaila Hospital and consented to participate in the study and were certified by the Nurses and Midwives council of Malawi.

Exclusion

Midwives working in other departments at the time of data collection were not included. Students and midwives not certified by the nurses and Midwives council of Malawi were not included in the study.

2.5.3 Sample for partographs

All delivery records of women who delivered at Bwaila Hospital in two months prior to data collection were reviewed.

Inclusion criteria

Only partographs of multiparous and prim parous women who delivered at 28 weeks or more at the facility were included. Partographs were of single or multiple gestation regardless of mode of delivery.

Exclusion criteria

All delivery records without partograph and whose partograph had no monitoring were not included. Macerated births and abortions (gestation less than 28 weeks), where monitoring is unlikely were excluded. Women who delivered at home or on their way to the hospital.

2.6 Data collection

2.6.1 Review of partographs

Patient records for the months of May and June were retrieved for review to determine if partograph was used. Where used, screening was done to determine if the met inclusion criteria. Where the partograph was used and met inclusion criteria highlighted in section 3.6.2, an Electronic Data Extraction tool designed for this was used to extract information from patient files (appendix 2). Where the electronic tool had problems, a paper-based was used and later transferred into electronic form.

Participant details, admission details, labor progress and all examinations during labor were reviewed. Details of first, second and third stage of labor were assessed if documented. The parts of the partograph like fetal monitoring, progress of labor, maternal condition were examined for completeness. Any omissions in documentation were recorded including

frequency of the omissions.

The independent variables of main interest on fetal condition included fetal heart rate, state of membranes, color of liquor, molding and caput. Maternal condition was based on the assessment of temperature, blood pressure and pulse rate. The progress of labor was assessed on cervical dilatation, descent of the head, uterine contractions. Whether the action or alert line was crossed was also documented.

Information on second stage of labor was assessed. Type of delivery, sex, weight, length and head circumference were documented. The dependent variable of baby was assessed on APGAR score at birth at one and five minutes. The data collected was checked manually for accuracy. Every 10th file was checked by an independent individual with same expertise to ensure that the data entered is accurate as compared to the source document (partograph).

2.6.2 In-depth interviews

Interviews were conducted by the researcher after record review and data analysis of quantitative data. This was to ensure that some findings from the quantitative data analysis should guide the discussion. An interview guide was used during the interviews (appendix 3). Participants for in-depth interviews were approached at their own convenient time to ensure that the study does not interfere with routine ward activities. Informed consent was obtained from the participants before study procedures.

2.7 Data management

Data collected electronically was transferred into a computer for storage on daily basis. To ensure patient confidentiality, both the paper and electronic data collection tools were handled by the investigator. The computer was password protected.

Data extraction tools and informed consent forms were kept in a lockable cabinet accessible to the researcher. All electronic and paper -based data were de-identified before storage for privacy. Files and recordings were assigned unique identifiers bearing no personal information.

2.7.1 Data Analysis

2.7.2 Quantitative data

Criteria for assessing health worker's knowledge on partograph

The overall score for knowledge ranged from 0 to 30. The scoring was adapted from a study by Haymanot Mezmur (38). It was modified by changing the scoring mark where higher marks were allocated to fetal parameters. Assessment of description of the partograph and molding was added while the intravenous fluids and drugs was removed. Poor knowledge was classified for scores from 0 to 15, fair knowledge 16 to 23, good knowledge 24 to 30.

Table 1: Criteria for assessing health workers knowledge on partograph

No	Parameter	No	Yes
1	Describes partograph correctly	0	1
2	Fetal heart rate	0	3
3	Molding	0	2
4	Liquor	0	2
5	Descent of head	0	1
6	Cervical dilatation	0	1
7	Uterine contractions	0	1
8	Blood pressure	0	1
9	Pulse	0	1
10	Temperature	0	1

Partograph utilization assessment

Utilization of the partograph will be assessed based on whether the partograph was used or not. Secondly, it will be assessed based on the parameters documented on the partograph.

1.Grading of labor chart

Complete: All sections including all the three components are filled with information (fetal monitoring, labour progress and maternal monitoring) of the partograph

Incomplete: No information in other components or sections of the labour chart.

Blank: No information on the partograph or labour chart

Exploratory Data analysis

This was descriptive in nature where frequencies and percentages of basic indicators were computed and used. Bivariate analysis was employed to determine the association between dependent and independent variables.

Logistic regression

Logistic regression modelling was employed to identify the risk factors for birth asphyxia which was the dependent variable. Given that the outcome was binary, presence of birth asphyxia was labelled 1 and absence of birth asphyxia was labelled 0. For building the model, a purpose approach was used. Purposive variable selection of the likely risk factors for birth asphyxia using literature and results from the univariate analysis was then employed. In the univariate analysis, a cut-off p-value of 0.2 was used to determine the relationship of each variable with the outcome independently. Variables that met the criteria at p-value of 0.2 were included in the multivariate model with a cut-off of p-value=0.05 where those that met a cut-off of 0.05 were included in the final model. The final model was then built which also included optimisation of the model. Once the final model was identified, the model output was translated into a meaningful output as crude odds ratios and adjusted odds ratios for birth asphyxia for each identified risk factor or variable.

2.7.3 Qualitative data

Mainly the analysis focused on understanding health workers knowledge on partograph and challenges that health workers face when using the partograph to monitor fetal condition during labor. Data analysis was done during and after data collection. This gave an opportunity to the researcher to understand if new information was coming. All the data

collected from in-depth interviews were analyzed using thematic analysis approach. Thematic analysis is a method for identifying, analyzing, and reporting patterns (themes) within data (53). It involves identifying patterns or themes within qualitative data that are interesting or important and use these to address the research or say something about an issue (53). Braun and Clark (2006) described thematic content analysis as the first qualitative method of analysis that researchers should learn, as it provides core skills that will be useful for conducting many other forms of qualitative analysis (53).

Recordings from interviews were transcribed verbatim and analysed thematically by the researcher. The researcher familiarized with the data by reading and re-reading the transcripts to have a thorough understanding of the data while identifying meaning units. While reading the transcripts, the researcher labelled meaningful words, phrases, and actions. The meaning units were then condensed, coded, and put into categories, from which themes emerged.

2.7.4 Presentation of results

Results for this study will be presented as quantitative and qualitative data separately.

Quantitative data

Results will be presented as counts and proportions in tables, bar graphs and pie charts while results from inferential analysis will be presented in tables.

Qualitative data

Counts and narration will also be used to present qualitative data from in- depth interviews. Results will also be presented as direct quotes to express what respondents presented.

2.9 Ethical consideration

The protocol was reviewed and approved by the College of Medicine Research Ethics Committee (COMREC). Approval was also sought from the management of the participating hospital. During data collection, informed consent was obtained from all participants. Each participant was asked to consent to take part in a short interview by signing the consent form before any study procedures. All used paper forms were kept confidential by the researcher.

No identifying information were maintained in the final electronic study database. All electronic data was kept in a password protected computer to ensure confidentiality. All used paper forms were stored in locked cabinets and will be destroyed by researcher.

CHAPTER 3: PRESENTATION OF RESULTS

3.1 Introduction

This chapter presents the findings of the study in sections of quantitative and qualitative studies. Firstly, results for quantitative study will be presented and this involves completeness of partographs, completeness of documentation of partograph, status of fetal monitoring, diagnosing fetal distress using the partograph and factors affecting birth asphyxia. Secondly results for qualitative study will also be presented. Results will be presented in sections according to themes that emerged.

3.2 Quantitative findings

A total of 1500 partographs were retrieved for review. Out of the 1500 files, 911 met inclusion criteria for the study. 150 records were deliveries from home and other facilities. 350 partographs had no monitoring of labour and plotting was done only once on delivery so they were not included. 89 records had no plotting at all.

3.2.1 Completeness of documentation

The partographs were assessed if each parameter was documented. For some parameters, the number of omissions in documentation was documented. The findings revealed that most of the partographs had gaps in documentation.

3.2.2 Demographic information

As shown in table below, demographic information was complete in more than 70% of the records. Every partograph had name of participant documented. Time of admission, date and time of membrane rupture were missing in most of the partographs.

Table 2: Completeness of demographic information

Parameter	Complete n(%)	Missing n(%)
Name of woman	911 (100%)	0(0%)
Address	900 (98.8%)	11(1.2)
Age	907 (99.6%)	5(0.5%)
Gravida	907(99.6%)	5(0.5%)
Parity	907(99.6%)	5(0.5%)
Gestation	776(85.2%)	135(14.8)
Date of admission	854(93.7.8%)	57(6.2%0
Time of admission	467(51.3%	444(48.7)
Date membranes ruptured	111(12.2%)	800 (87.8%)
Time membranes ruptured	50 (5.4%)	861(94.5%)

3.2.3 Fatal and maternal monitoring

Fetal heart rate was recorded on all the partographs. 129 partographs had poor monitoring of fetal heart rate with 78 having gross omissions in monitoring. Only 66 (7.2%) partographs had moulding recorded on them while caput was recorded on 134 (14.7%).

More than 70% of the partographs had one recording of blood pressure and Pulse rate. On average temperature was recorded twice on 288 (31.6%) of the partographs. Majority of the partographs 68.4% (n=623) had no recording of temperature.

Table 3: Maternal, fetal and labor monitoring

Parameter	Adequate n(%)	Inadequate n(%)
Fetal heart rate	799 (87.7%)	132 (14.5%)
Caput	133 (14.6%)	778 (85.4%)
Moulding	66 (7.2%)	838 (92%)
Liquor	908(99.7%)	3 (0.3%)
Contractions	837(91.9%)	74 (8.1%)
Descent	856 (94%)	55(6.0%)
Dilatation of cervix	870 (95.5%)	41(4.5%)

3.2.4 Diagnosing foetal distress using partograph

Of the 911 partographs reviewed, fetal distress was suspected in 226 babies. Of these 226, 211(93.4%) had meconium-stained liquor, 3 (1.3%) had low fetal heart rate only while 13 (5.7%) had combination of low fetal heart rate and meconium stained liquor.

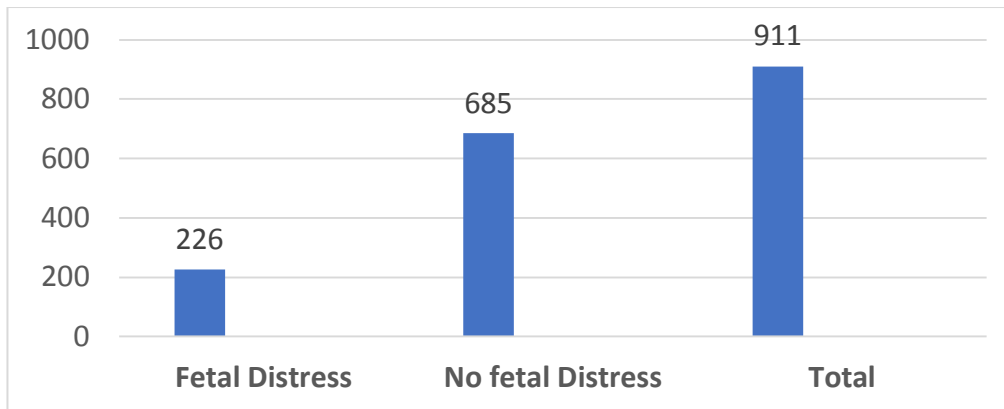


Figure 2: Diagnosis of fetal distress during labor

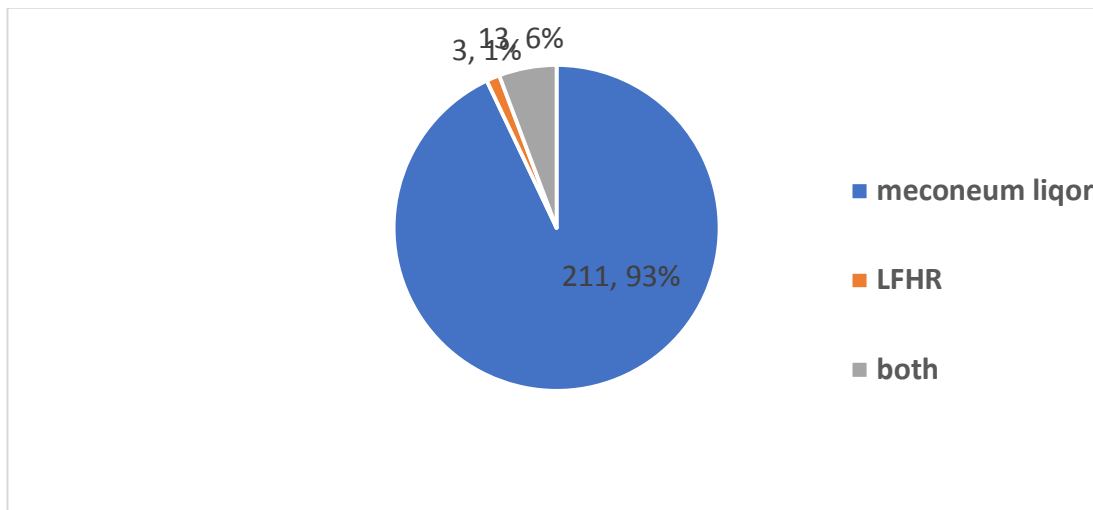


Figure 3 Indicators for fetal distress during labor

3.2.5 Birth asphyxia and fetal monitoring during labor

A total of 230 babies were born with birth asphyxia. Of these, 88 had meconium-stained liquor detected during labor during labor. Only 21 of those born with birth asphyxia had low fetal heart rate during labor. 60 babies with birth asphyxia had normal fetal heart rate and no meconium-stained liquor. Only 89 (38.3%) of babies born with birth asphyxia had fetal

distress detected through meconium -stained liquor (84) during labor.

3.2.6 Proportion of births by deliveries type

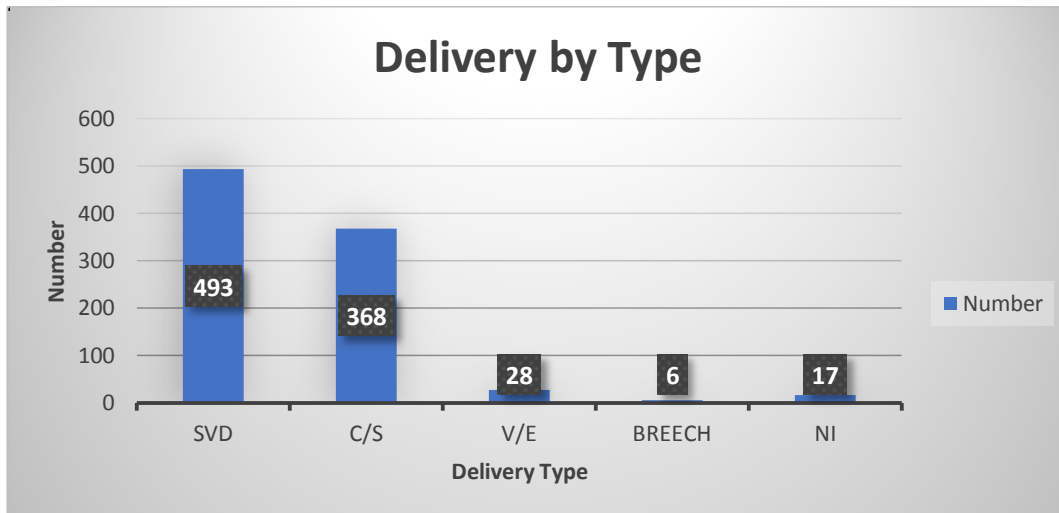


Figure 4: Proportion of deliveries by type

54% of the deliveries were SVD seconded by Caesarian section which accounted 40.4% (n=368) of the deliveries. 28 babies were born through vacuum while 6 were via breech. 17 records had no mode of delivery indicated on the partograph.

3.2.7 Factors associated with Birth asphyxia.

A total of 5 variables were identified to be the main risk factor for birth asphyxia. These were presence of meconium-stained liquor, male sex of the baby, labour that crossed alert line on the partograph and mode of delivery.

The adjusted odds of birth asphyxia in births with meconium liquor was 2.33 as compared to births without the presence of meconium liquor (AOR=2.33; 95% CI =1.51-3.59, $p<0.001$). Additionally, being of male gender was a significant risk factor with the adjusted odds of

asphyxia in males was 1.75 in relation to females male sex of baby (AOR=1.75; 95% CI=1.17-2.62, p=0.006) Therefore, being male was associated with greater odds of asphyxia as compared to being female.

Furthermore, crossing the alert line was associated with increased odds of birth asphyxia as compared to not crossing the alert line (AOR=1.70; 95% CI =1.09-2.66, p=0.020). The mode of delivery was also a significant risk factor when comparing those with vacuum extraction and those who had a normal vaginal delivery. The adjusted odds ratio of birth asphyxia in those who underwent vacuum extraction was high in relation to those who had a normal vaginal delivery (AOR=4.64; 95% CI= 1.61-13.58, p=0.004).

Finally, the adjusted odds of birth asphyxia slightly reduced with increasing weight (AOR= 0.9992234; 95% CI= 0.9988441 - 0.9995922, p <0.001) with every unit increase in weight. The higher the baby's weight the lower the odds of birth asphyxia

Table 4: Factors associated with Birth asphyxia.

Variable	Levels	No Asphyxia n (%)	Asphyxia n (%)	Crude OR (95% CI)	Adjusted OR
Meconium liquor	No	342 (78.3)	95 (21.7)	-	-
	Yes	84 (59.6)	57 (40.4)	2.44 (1.63-3.66, p<0.001)	2.33 (1.51- 3.59, p<0.001)
Sex	Female	221 (78.1)	62 (21.9)	-	-

	Male	205 (69.5)	90 (30.5)	1.56 (1.08-2.28, p=0.019)	1.75 (1.17-2.62, p=0.006)
Crossed alert line	No	238 (79.9)	60 (20.1)	-	-
	Yes	188 (67.1)	92 (32.9)	1.94 (1.33-2.84, p=0.001)	1.70 (1.09-2.66, p=0.020)
Mode of delivery	SVD	251 (78.7)	68 (21.3)	-	-
	CS	167 (69.0)	75 (31.0)	1.66 (1.13-2.43, p=0.010)	1.29 (0.81-2.04, p=0.281)
	V/E	8 (47.1)	9 (52.9)	4.15 (1.53-11.45, p=0.005)	4.64 (1.61-13.58, p=0.004)
Weight (grams)	Mean (SD)	3060.9 (561.5)	2928.9 (532.3)	1.000250 (0.9999774 - 1.000525, p = 0.0732)	0.9992234 (0.9988441 - 0.9995922, p <0.001)

3.3 Qualitative findings

3.3.1 Social-demographic characteristics of the midwives

All the midwives who were approached to participate in the study consented to participate.

Out of the 15 midwives, ten (10) were female and only five (5) were males. The average age

of the midwives was 30. Majority of the midwives had worked in the labor ward for less than 2 years. Many of the interviewed midwives had diploma as highest qualification with only 3 having degrees.

3.3.2 Knowledge of the partograph

Midwives demonstrated understanding of what the partograph was. They described it as a tool used to monitor progress of labor and guides action. Some of the midwives were quoted as follow:

“It is a tool used to monitor how labor is progressing. The tool is important because it guides what action to take depending on findings” (Midwife 1)

“It is the tool that we use to monitor how cervical dilatation is progressing in every 4 hours and also to monitor the condition of the baby through assessment of fetal heart rate every 30 minutes” (Midwife 2)

Majority of midwives said that they use the partograph on all women when cervix is 4 cm or when the woman is in active phase of labor. Few participants said the partograph is used from admission until the woman is discharged. She said.

“...the partograph has many sections. We start using it when the woman has reported to the labor ward or antenatal ward until the woman is discharged because some information is filled at the postnatal using the same form” (Midwife 10)

All the participants were able to mention components of the partograph for monitoring fetal condition and labor progress. Few midwives were able to mention parameters used to monitor maternal condition on the partograph. Temperature was hardly mentioned, and the result is consistent with findings observed in partograph review where temperature was not mostly recorded.

Midwives mentioned liquor, caput, molding, and fetal heart rate as important parameters to

monitor fetal condition.

Table 5: Assessment of knowledge about partograph

Parameter	N=15
Describes partograph correctly	14
Fetal heart rate	15
Molding	15
Liquor	15
Descent of head	13
Cervical dilatation	15
Uterine contractions	15
Blood pressure	8
Pulse	8
Temperature	5

3.3.3 Diagnosing fetal distress using the partograph

All midwives indicated that the partograph is important in diagnosing fetal distress during labor. Fetal heart rate and meconium-stained liquor were mentioned as very important indicators to monitor if baby has fetal distress.

“We monitor fetal heart rate every 30 minutes to check if the baby is fine. Normal fetal heart rate ranges from 120-160 beats per minute. With the partograph it is easy to know if the baby is in danger. We also observe color of liquor, if it is meconium stained it means there is fetal distress” (Midwife 8)

3.4 Challenges faced when using the partograph

3.4.1 Lack of more details

Despite midwives expressing satisfaction with the tool, they mentioned that the partograph was designed to plot for one baby and it is difficult to use when it is twin gestation. Some of the midwives reported the following:

“You know when it is twin gestation, we are to monitor both babies. However, it is difficult to plot for both babies on a single partograph. And in case one baby has fetal distress, it is difficult to isolate in terms of plotting since only one baby is to be plotted on the partograph”

(Midwife 6)

One midwife also said the partograph lacks some information to assist in monitoring baby's condition. She also expressed that the calibrations of the fetal heart rate are not clear.;

“We use fetal heart rate to monitor baby's condition. However, some babies may have

normal heart rate as 120 to 160 beats per minutes. But there is nowhere we can indicate whether the fetal heart is regular, irregular, strong or faint. In this case we only base on fetal heart rate. And the way it is calibrated, the numbers are too much space and people are forced to put dots on the numbers appearing on the partograph....” (Midwife 1)

3.4.2 Lack of knowledge

Midwives expressed that using the partograph is challenging due to lack of knowledge among them. Despite that they know how to plot on the partograph, most midwives do not know how to interpret the partograph. There are also some who do not know how to examine the mother and baby, hence plotting wrong findings.

“One partograph for a single mother can be used by several midwives. But you find that someone has plotted cervical dilatation which is more than what you are finding. This brings confusion because you then need to plot less or start a new partograph. Sometimes we don’t even know how to interpret the findings on the partograph, So the partograph requires skills as well for someone to use it.” (Midwife 2)

3.4.3 Lack of resources to monitor fetal condition.

Midwives expressed that despite having the tool to monitor fetal condition, using fetal scope is not ideal. They suggested having automatic monitors considering the number of women they see in a day. The requirements of the partograph are difficult to meet when monitoring is done manually. Some of the midwives said:

“According to the partograph we are supposed to monitor fetal heart rate every 30 minutes. Now in our case we use the fetal scope which you cannot go and manually assess the woman every 30 minutes. At least when you are using digital monitors”

(Midwife15)

“It is depressing to identify fetal distress on the partograph when there are no resources to manage it. When we diagnose fetal distress, we are supposed to give dextrose which is sometimes not available. We then look as if we failed to interpret the partograph which makes some people omit documenting abnormal findings. (Midwife 3)

3.4.4 Shortage of staff

Midwives observed that shortage of staff contributed to poor use of the partographs. It becomes difficult to document for every woman when there are few midwives available. As a result, some women deliver without partographs or the partograph is documented retrospectively for the sake of record.

“We try to ensure that every woman has a partograph to monitor her labor. But with poor staffing and how busy our maternity is, it is difficult to write for every woman. That is why some women have incomplete partographs” (Midwife 13)

3.4.5 Negligence

Midwives expressed that some midwives do not like documenting on partographs. Some midwives document the partograph after the woman had delivered already just to make sure the partograph is there. Most of the information documented in this manner is not true and may lead to poor decision and missing of diagnosis. One midwife said;

“When you conduct a delivery without partograph people feel you haven’t done a good job. So sometimes we just document it as a requirement that is why some partographs

have no much information”. (Midwife 14

“Some midwives do not just want to use the partograph for won reasons...they just conduct deliveries and ask you to document for them especially for normal deliveries.

Some people document on the partograph after delivery. (Midwife 12)

3.4.6 Poor decision making based on results on partograph.

Midwives expressed that they feel discouraged to use the partograph due to poor response by the clinical department. Delays in responding to complications by clinical staff makes midwives feel not competent with the partograph. This was expressed by 6 midwives who were interviewed.

“...imagine we identify fetal distress and call the clinician to see the patient. They sometimes delay coming. When they come, they tell you that the baby is fine, and more hours should be added. In this case there is nothing we can do but to wait even if we know the baby is fine. But this affect continuity of care.” (Midwife 7)

CHAPTER 4: DISCUSSION

4.1 Introduction

This section will provide detailed discussion of the findings of this study in relation to the objectives of the study and relevant literature. This study involved mixed methods where quantitative and qualitative methods were used. The qualitative component was used to supplement the findings of quantitative study. This discussion will therefore combined discussion for both quantitative and qualitative findings and how the findings from both components collate. The discussion is categorized in line with the specific objectives of the study.

4.2 Knowledge of the partograph

According to findings of this study, midwives had good knowledge of the partograph. Similarly in Ethiopia, 96.9% and 99% of the health workers demonstrated understanding of the partograph [6, 37]. However, midwives in this study felt the tool is difficult to plot and interpret due to its design especially when dealing with twin pregnancy. In Bangladesh midwives admitted lack of knowledge on some components of the partograph, but they still complete it despite not knowing exact value to document [17]. This would result in wrong interpretation of the partograph due to incorrect plotting. It is therefore important to ensure midwives are well trained about the partograph and how to use it. It was however observed that those who worked in labor ward for more than one year had in-depth knowledge regarding the partograph and its interpretation as they managed to mention more components and how they apply in use. It was observed that midwives mentioned what they document

most with temperature being least mentioned and documented as per observed during partograph review.

4.3 Utilization of the partograph

In this study, all the delivery records retrieved for review had partograph attached. Despite partographs being attached, most parameters were not completed. Many records had no recording of molding, caput, blood pressure, pulse rate and temperature. Similar findings were reported in Mulanje where only 10% of the partographs had correct and complete information (55). Some maternal conditions like fever and infection have been directly related abnormal fetal outcomes including seizures (56). Lack of documentation of temperature, pulse rate would negatively affect timely diagnosis of fetal complication resonating from maternal infection. Poor documentation was also reported in other studies (29,36,39). It is observed that in low resource settings utilization is poor and this is more prevalent in low and middle-income countries (57). In some settings, partograph utilization was reported to be poor despite positive attitude, and good knowledge [46]. However, in Niger Delta of Nigeria and Benin partograph utilization was found to be as high as 98.8% and 98% respectively (40, 58). High partograph use was also reported in Wolaita Zone in Ethiopia. (59).

4.4 Diagnosing fetal distress using the partograph.

Roosmalin (1989) believed that using the partograph in labor monitoring prevented prolonged labor and caused timely diagnosis of fetal distress and reduction of stillbirth and fetal mortality (60). This study however reports poor utilization of the partograph. Subsequently, diagnosis of fetal distress was poor in this study with many babies born with birth asphyxia but no prior diagnosis of fetal distress. Mostly, fetal distress is diagnosed based

on fetal heart rate monitoring where fetal scopes are commonly used (61). Poor monitoring and documentation could be factors that contributed to poor diagnosis of fetal distress. The use of fetoscope measurements is also prone to human errors especially in facilities with high volume of deliveries and poor staffing even in normal situations (62).

In this study, the use of fetal heart rate to monitor the condition of the baby and to diagnose fetal distress showed to be unreliable due to documentation challenges. Similar results were reported in Ethiopia, where only 15.9% of records had fetal heart rate monitored (3). However, a study in Uganda where only 2% of the used partographs, indicated that standard monitoring of fetal heart rate was associated with a good APGAR score (33). This difference could be due to data collection tools or differences in labor management protocols. This study also found that monitoring of fetal condition during second stage of labor is rarely done. However, it is in active second phase of labor where the baby is at high risk of fetal acidosis, and this require a close follow-up of the fetal heart rate (63). Meconium-stained liquor was best indicator for fetal distress in this study. Most babies born with meconium-stained liquor had low APGAR scores at birth. Despite that standard monitoring of the fetal heart rate is associated with good APGAR score, this study finds that documentation of fetal heart rate was inconsistent with baby outcomes. Most babies born with birth asphyxia had normal fetal heart rate during labor which indicates that the values documented were incorrect.

4.5 Factors associated with birth asphyxia.

Meconium-stained liquor, delivery through vacuum extraction, sex of baby, crossing of alert line and weigh of baby were factors that showed significant association with birth asphyxia.

Meconium-stained liquor appeared to have a significant risk to birth asphyxia. Similar findings were reported in two separate studies at two facilities in Ethiopia where the risk was much higher AOR=7.5 and AOR =7.15, respectively (64,65). However, in northern Amhara, blood-stained amniotic fluid was greatly associated with birth asphyxia, AOR=5.2 (66). The difference in the findings could be due to different practices as to what is termed blood-stained, and meconium- stained liquor respectively.

Vacuum extraction was also associated with birth asphyxia in this study despite having a low proportion on mothers who delivered through vacuum, 3.1%. The prevalence of vacuum extraction was also low in other studies 0.54% and 0.9% from Nigerian studies (67, 68). Unlike in Latin America, assisted vaginal deliveries are mostly performed in Sub-Saharan Africa (69). Vacuum was mostly performed due to prolonged labor and fetal distress, a similar finding in Ethiopia (66). Better outcomes of vacuum extraction are dependent on timely assessment of labor, skilled operator, and availability of neonatal team (70). The association of birth asphyxia with vacuum extraction would therefore be linked to poor monitoring of women in labor and shortage of skilled staff as reported in the same study.

There was also significant association between birth asphyxia and crossing of alert line. Other studies also reported the relationship between neonatal resuscitation and graph of cervical dilatation on the partograph where the alert line had sensitivity of 97.5% predicting the need for resuscitation (71). In other studied, prolonged second stage was associated with birth asphyxia (65). However, in this study time for full cervical dilatation was rarely documented which made it difficult to calculate length of second stage.

4.6 Challenges faced when using the partograph.

In this study, poor utilization of the partograph was mainly due to monitoring tools and management issues rather than the partograph itself. Similar observation was reported in North Shoa Zone, Ethiopia (46).

4.6.1 Shortage of staff

In current study, shortage of staff was one of the factors affecting use of the partograph. In Malawi, the shortage of human resource for health is severe (72). In many settings, understaffing and high workload are also reported as most organizational barriers affecting quality care (33, 40,73, 74,75). Concerns about staff shortages and workload were also key factors affecting provision of maternal care with over 40% of interviewed staff stating their intention to leave their current post (71). A

study in Addis Ababa City indicated that an increased number of midwives on shift was associated with higher odds of partograph use (76). Midwives find it challenging to monitor women as per partograph considering the frequency of monitoring, volume of deliveries, and inadequate staffing.

4.6.2 Lack of knowledge

Lack of knowledge to interpret the partograph also affected its use in this study. Caregivers may resist use of partograph if they do not know why they must use it (6). Effective partograph use requires health workers to internalize its function, namely continuous monitoring, documentation, and interpretation of collected information that will lead to early detection and prevention of neonatal and maternal complications (77). Health workers in another study where partograph use was good, lack of knowledge prevented health workers from interpreting and identify referral indications from the partographs (78).

In this study despite having good knowledge about partograph, utilization was poor. Poor utilization of the partographs was also reported in many settings despite good knowledge (35,36,41). This indicates that supportive organizational policy that provide incentives and reduce barriers in provision of care is vital (77). Caregivers with good knowledge about the partograph who have received on the job training in obstetric care are more likely to use the partograph during labor and delivery and act in the findings (3).

Therefore, combination of partograph training with labor management protocol is key to utilization of partograph which will eventually promote detection of maternal and fetal complications.

4.6.3 Shortage of equipment and supplies

Shortage of necessary equipment and supplies affect the use of partograph in this study. Similar findings were reported in Kampala, Uganda (57). According to midwives in this study, lack of thermometers, blood pressure machines and timers contributed to gaps in partograph documentation since they could not manage those parameters. Midwives preferred electronic fetal monitoring using dopplers to ease work and improve accuracy.

4.6.4 Lack of inter-professional collaboration

The inter-professional collaborative work between midwives and other maternity care professionals is crucial to improve access and women's choices for maternity care (79). In this study, some midwives expressed concerns that some clinical staff disregards information documented on partographs. When complications are identified, the clinical team who perform advanced procedures take time to respond, sometimes they disagree with what

midwives have assessed and documented on partographs. Conflicts between physicians and midwives is well documented in other studies (80). In practice midwives take care of women with low-risk pregnancies while physicians take charge when complications arise during pregnancy or childbirth (81).

4.6.5 Negligence by some midwives

Midwives expressed that some health workers do not use that partograph by choice hence affecting delivery of care. Similar findings were reported in Ethiopia where those working during the night were more likely to use the partograph inappropriately (82). Supportive supervision to obstetric care providers and regular partograph audit could also improve documentation among all health workers (7).

4.7 Limitations of the study

Conducting in-depth interviews was met with challenges due to staffing issues and COVID pandemic. However, the researcher used midwives free time and ensured COVID preventive measures are followed, and that routine care is not affected.

Not all records of delivery could be retrieved. Data collection coincided with other activities where clerks were using same files to compile reports which resulted in mixing up of records hence estimating proportion of deliveries where partograph was used could be affected.

The study did not include observations to understand how the midwives complete the partograph and when the partographs are completed

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study finds that diagnosis of fetal distress was poor despite midwives having good knowledge about the partograph. Using meconium -stained liquor was reliable indicator to diagnose fetal distress in this study as compared to fetal heart rate. This indicates that meconium-stained liquor is a late sign of fetal compromise and should not be preferred in practice.

Most partographs had missing information especially on maternal and fetal sections. Subsequently, diagnosis of fetal distress is poor when paper based partographs are used. However, midwives were able to diagnose fetal distress using color of liquor as compared to fetal heart rate. This could be because liquor is requiring just observation compared to fetal heart rate where midwives have to assess the woman.

It is therefore important to identify better methods of assessing fetal condition during labor which may be feasible, timely and reliable.

5.2 Recommendations

Public hospitals should ensure that maternity units are well staffed with skilled birth attendants to ensure women are receiving quality care. This is the only long-term solution to fetal monitoring and improving the care of mothers (83). There is need to establish midwifery gaps in all maternity units and ensure staff is well distributed.

In-service training has also proved to improve care of women and use of partograph. Midwives who receive in-service training are more likely to monitor women and use the partograph hence diagnosing fetal complications (84). Performance-based incentives with the aim to counteract weak providers, has the potential for motivating service providers in improving the quality of maternal health services. Equally, frequent supportive supervision helps managers to identify and address maternal and newborn service-delivery gaps including documentation. Supervision registers should be introduced to monitor commitment of hospital managers in staff supervision.

This study finds that lack of equipment for monitoring and managing complications as challenge recommends that maternity unit should be well equipped and provided with necessary resources. With the volume of deliveries, it is recommended that digital fetal monitoring equipment be supplied so that women are easily monitored. If electronic monitors are available, women can monitor fetal condition and report abnormal findings to the midwives. This would also ease pressure on midwives. With liquor, it is mostly women who report rupturing of membranes.

The researcher also recommends that the partograph be modified so that only relevant information can be recorded on it. Other studies in Malawi also suggested review of the partograph to suit context.

An electronic partograph which can be table based and connected to computers should also be introduced in busy units to reduce the burden of paper documentation, improve diagnosis and timeliness of interventions. Use of the e-partograph was also associated with reduced rates

of prolonged labor which is one factor associated with birth asphyxia. Save the children reported that ePartographs improved decision making among health workers in Kenya.

Finally, the researcher recommends review of protocols for performing vacuum extraction as it showed that most babies delivered through vacuum had unfavorable outcomes. Informed consent form should be included in guidelines for vacuum extraction as also recommended in other studies. Furthermore, the use of vacuum extraction in higher facilities where caesarian section is readily available should be discouraged.

Further research should involve observation methods to assess the use of the partograph. An ePartograph should be tested in Malawian setting.

5.3 Dissemination of results

The study was conducted in partial fulfillment of the requirements for the Master's degree in Global Health Implementation, therefore, bound copies of the dissertation will be submitted for examination to College of Medicine, School of Public Health and Family Medicine. The results will also be shared in meetings with, Lilongwe District Health Office, Bwaila Hospital. Furthermore, the findings will be shared with the Reproductive Health Directorate in the Ministry of Health. The results will also be published in peer reviewed journals. The final dissertation document will be submitted to: College of Medicine's Office of the Dean of Postgraduate Studies and Research, College of Medicine Library and the College of Medicine Research and Ethics Committee (COMREC).

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APPENDICES

Appendix 1: Research participant information and consent form for partograph study

Principal Investigator: Mr Luke Chiwala, Master of Science in Global Health Implementation, College of Medicine **Research Supervisor:** Dr Isabel Kazanga Chiumia, Lecturer, Department of Health Systems and Policy College of Medicine

1.0 What you should know about this study

This study is being conducted to explore health worker's knowledge and utilization of the partograph to diagnose fetal distress in labor. Fetal distress is one condition that precedes birth asphyxia during labor. Fetal asphyxia contributes to many neonatal deaths worldwide including Malawi. Reducing neonatal deaths can assist in reducing the number of babies who die before their fifth birthday. The partograph is a tool that is recommended to monitor women in labor to identify problems related to labor. Early detection of fetal distress using the partograph can help to institute appropriate management that will reduce occurrence of birth asphyxia.

2.0 Purpose of this study

The main purpose of the study is to understand health worker's knowledge and utilization of partograph to diagnose fetal distress during labor. The study would like to establish if health workers have knowledge of the partograph and if they use it according to standards. This study will also examine if health workers are able to detect fetal distress during labor using the partograph. Challenges facing health workers when using the partograph will also be explored during the course of the study.

3.0 What will happen

About 15 health care workers particularly midwives will participate in the in-depth interviews. The interviews will be conducted once by the investigator. This will take approximately 30 minutes but also depending on nature of responses. The interviews will be done face to face and will be audio recorded for data storage. The interviewer will also take notes during the interviews. You will be asked questions regarding personal and professional information, knowledge of the partograph and how you use it to diagnose fetal distress during labor. You will also be asked on the experiences that you have regarding the use of the partograph to diagnose fetal distress during labor.

4.0 Risks and/or discomforts

There are no potential risks for participating in this study. It may happen that other members of staff have noticed that you have participated in this study. However, the information that you give will be kept private and will not be shared to anyone apart from those managing the study. The information that you will give will never be used for your performance appraisal and shall not be given to anyone.

5.0 Potential Benefits

There may be no direct benefits for taking part in this study. However, there is a possibility that information gained from the study will help to inform health workers, hospital managers and the governments to identify possible solutions to improve management of women during labor to diagnose fetal distress. This will help to reduce deaths of babies due to birth asphyxia.

6.0 Do you have to pay anything for being in this research?

No. You do not have to pay for being in this study. You will not receive any payment for

participating

7.0 Withdraw from the study

You are free to withdraw from the study at any time. You are also allowed not to take questions that you are not comfortable to answer. Withdraw from the study will not affect you in any way

8.0 Confidentiality

Your information as a participant will be kept confidential. The interviews will be conducted at a private place where no one else can hear our conversation. The interview records will be assigned a code and not your name. The recorded interviews will only be used for purposes of this research and they will be erased when the requirements are met. The consent forms will be kept according COMREC's guidelines and will be destroyed once the requirements of the study are met. The study records will be kept in a lockable cabinet accessed by the researcher only. Your name will not appear in any of the reports of this research.

9.0 Whom should you call if you have questions about this research?

If you have any questions about this study or any problem related to this study, please contact:

- The researcher, Luke Chiwala, on cell phone number: 0888 736 524 or 0993 69 72 78
- The research supervisor, Dr Isabel Kazanga Chiumia, situated at the College of Medicine, Lilongwe Campus. Department of Health Systems and Policy. Cell phone number: 0999 626889

The Chairpeson, COMREC, College of Medicine, Private Bag 360, Chichiri, Blantyre 3.
Phone: (888) 811-8993 Email: comrec@medcol.mw

WE WILL OFFER YOU A COPY OF THIS CONSENT FORM.

For participant and witness (if appropriate)

I have read and/or have been told what the study is about. I have been given a chance to ask questions and I feel that my questions have been answered. I know that being in this study is my choice and that I can leave it at any time. I freely give my consent to participate in this study.

_____Yes _____No (tick) I allow to be interviewed on knowledge and utilization of partograph

Participant Full Name (print) Participant Signature/thumb print Date

Witness Name (print) Witness Signature Date

(As appropriate)

For staff obtaining consent

I have explained the purpose of this study to the participant and have answered all the questions to the best of my knowledge; she or he understands the purpose, procedures, risks and benefits of this study.

Name of person obtaining consent Signature Date

Appendix 2 : Kalata ya umboni wovomereza kutenga mbali mu kafukufuku

Mutu wa kafukufuku: Kafukufuku wa mmene ogwira ntchito zachipatal amagwiritsira partograph kudziwa ngati mwana akubanika pa chipatala cha Bwaila, ku Lilongwe-Malawi.

Wofufuza : Luke Chiwala. Wophunzira ku sukulu ya College of Medicine

Woyang'anira kafukufuku: Dr Isabel Kazanga Chiumia. Wophunzitsa ku sukulu ya College of Medicine.

1.0 Zomwe mukuyenera kudziwa zokhudzana ndi kafukufukuyi

Kafukufukuyi akuchitika ndi cholinga chofuna kudziwa momwe ogwira ntchito zachipatala makamaka omwe amathandiza amayi pochila pa zomwe akudziwa komanso mmene amagwiritsira ntchito partograph pofuna kudziwa ngati mwana akubanika pa nthawi yomwe mayi akuchila. Kubanika kwa mwana nthawi yomwe mayi akuchila ndi vuto lomwe limabwera koyambilira mwana asanabadwe ndi vuto lokanika kulira. Kukanika kulira mwana atangobadwa ndi vuto lomwe likupangitsa imfa za makanda pa dziko lonse lapansi kuphatikizapo Malawi. Kuchepetsa imfa za makanda zitha kuthandizila kuchepetsa chiwelengero cha ana omwe amamwalira asanakwanitse zaka zisanu. Partograph ndi chida chovomelezeka chomwe chingagwiritsidwe ntchito pofuna kupeza mavuto pa nthawi yomwe mzimayi akuchila. Kuzindikila mwansanga ngati mwana akubanika pogwiritsa ntchito partograph zitha kuthandiza kuthandiza kuti chithandizo chipelekedwe mwansanga zomwe zingapangitse kuti chiwelendero cha ana obanika pobadwa chichepe.

2.0 Cholinga cha kafukufuku

Cholinga cha kafukufukuyi ndi kufuna kepeza zomwe ogwirantchito akudziwa komanso mmene amagwiritsila partograph pofuna kudziwa ngati mwana akubanika pa nthawi yomwe mayi akuchila. Cholinga ndikufuna kudziwa ngati obwira ntchito akudziwa za partograph komanso ngati amayigwiritsa ntchito monga monwe zimayenera kukhalira. Kafukufukuyi ayesa kupezanso ngati ogwira ntchito amatha kudziwa ngati mwana akubanika pogwiritsa ntchito partograph. Komanso mavuto omwe ogwira ntchito kuchipatala amakumana nao pogwiritsa ntchito partograph azaunikidwa panthawi yakafukufukuyi.

3.0 Chitachitike ndi chani

Pafupifupi ogwira ntchito 15 makamaka azamba azatenga nao mbali pakafukufukuyi pofunsidwa mafunso. Mafunsowa azafunsidwa pa nthawi imodzi basi. Kefunsa mafunso kuzatenga mphindi makumi atatu komanso zizatengera mayankho omwe aperekedwa. Mafunsowa azafunsidwa maso ndi maso, ndipo zokambirana zizatepedwa pofuna kusunga zokambilanazi. Ofunsa mafunso azizalembanso mayankho a zokambilanazi. Muzafunsdwa mafunso okhudzana ndi inu komanso okhudzana ndi ntchito yanu, zomwe mukudziwa pa partograph, komanso mmene mumagwiritsira ntchito partograph pofuna kudziwa ngati mwana akubanika pa nthawi yomwe mayi akuchila.

4.0 Zoopsa mkafukufukuyi

Palibe choopsa chodziwika mukatenga mbali mkafukufukuyi. Zikhoza kutheka kuti anzanu ogwora nao ntchito akudziwa kuti mwalowa nao mkafukufukuyi. Komano, zomwe titakambilane zizasungidwa bwino ndipo sizizaperekedwa kwa munthu kupatula okhawo omwe akupanga kafukufukuyi ndipo sizizagwiritsidwa ntchito ndi achipatala kudziwa za mmene mumagwirira ntchito.

5.0 Phindu lolowa mkafukufuku

Palibe malipilo ena aliwonse mukavomera kutenga nao mbali mu kafukufuku ameneyu. Koma pali chiyembekezo chaku zotsatila za kafukufuku ameneyu zidzathandiza ogwira ntchoto za chipatala, oyang'anira zipatala komanso boma kupeza njira zina zabwino zothandizila amayi pa nthawi yomwe akuchila. Izi zidzathandiza kuchepetsa imfa za makanda zomwe zimadza Kamba ka kubanika.

6.0 Kodi pali chopereka kutinutenge mbali mu kafukufukuyu?

Palibe. Simudzalipira kapena kulipiridwa mykatenga nao mbali mu kafukufukuyu

7.0 Kodi utha kusiya kutenga mbali kafukufuku asanathe?

Eya. Ndiufulu wanu kutenga mbali mu kafukufukuyu komanso mutha kesiya ntahwi ina iliyonse yomwe

mwafuna. Mulinso ndiufulu kusayankha mafunso ena a mu kafukufukuyu.

8.0 Chinsinsi

Zonse zomwe titakambirane zidasungidwa mwachinsinsi. Zokambilana zathu tizapangira malo achinsinsi omwe aliyense sangamve zomwe tikukambilana. Zomwe titatepe pokambilana zidzagwiritsidwa ntchito mu kafukufukuyi ndipo zonse zokhudzana ndi kafukufuku zikatha tidzafufuta zotepedwazi. Zikalata zaumboni zidasungidwa motsatila ndondomeko bungwe lovomeleza ma kafukufuku ku sukulu ya ukachenjede ya College of Medicine (COMREC), ndipo zidzaonongedwa zones za kafukufukuyi zikakwanilitsidwa. Zonse zokhudzana ndi kafukufukuyi zidasungidwa malo mwachinsinsi. Dzina lanu silidzalembedwa pa chilichonse chokhudzana ndi kafukufukuyi.

9.0 Mudzafunsa ndani ngati muli ndi mafunso okhudzana ndi kafukufuku?

Ngati mufuna kudziwa zambiri kapena muli ndi vuto lokhudzana ndi kafukufukuyi mutha kufunsa _____ anthu _____ awa:

Wofufuza, Luke Chiwala pa nambala izi; 0993697278 komanso 0888736527. Komanso mutha kufunsa oyang'anira kafukufukuyi Dr Isabel Kazanga Chiumia pa nambala iyi 0999626889

Wamkulu wa komiti younika za kafukufuku, COMREC, College of Medicine, Private Bag 360, Chichiri, Blantyre 3. Phone: (088) 881-8993 , Email: comrec@medcol.mw

CHIKALATACHI MUDZAPATSIDWA KUTI MUSUNGE

Kwa wotenga mbali

Ndawerenga komanso ndauzidwa zones zokhudzana ndi kafukufukuyi. Ndapatsidwa mpata wofunsa mafunso ndipo ndili okhutila kuti mafunso anga ayankhidwa. Ndikudziwa kuti ndiufulu wanga kulowa mu kafukufukuyi ndipo ndikhonza kusiya nthawi ina iliyonse. Ndikuvomera kutenga nao mbali mu kafukufukuyi mopanda kukakamizidwa.

-----Inde-----Ayi Ndikuvomereza kufunsiidwa mafunso pa zomwe ndikudziwapo za partograph ndi kagwiritsidwe ntchito kake.

----- Dzina la otenga Mbali -----	----- Sainani/dindani chala -----	----- Tsiku -----
Dzina la mboni	Sainani	Tsiku

Kwa ofunsa chivomerezo

Ndafotokoza kwa wotenga mbali cholinga cha kafukufukuyi ndikuyankha mafunso onse monga momwe ndikudziwira ndipo amvetsetsa za cholinga, zomwe zitachitike, zovuta komanso ubwino wa kafukufukuyi.

----- Dzina la ofunsa Chivomerezo -----	----- Sainani -----	Tsiku
--	----------------------------------	--------------



Appendix 4: Partograph review- Data extraction tool

Have the following been recorded on the partograph_ (tick __yes or No or record NA based on what is provided_____. Indicate response where appropriate

PERSONAL DETAILS

RECORD ID NUMBER:

Are the following provided on the partograph?

Name of Facility	Yes ☐	No ☐
Admission number	Yes ☐	No ☐
Name of client	Yes ☐	No ☐
Address	Yes ☐	No ☐
Age	Yes ☐	No ☐ specify[figure]
Gravida	Yes ☐	No ☐ specify[figure].....
Parity	Yes ☐	No ☐ specify[figure].....
LNMP (Last Normal Menstrual Period)	Yes ☐	No ☐
Gestation	Yes ☐	No ☐ specify.....
HIV STATUS	Yes ☐	No ☐ specify.....

Any general Comment: -----

ADMISSION DETAILS

Has the following admission details documented?

Date of admission	Yes ☐	No ☐ Specify -----
Time of admission	Yes ☐	No ☐

Date and time of onset of labor	Yes ☐	No ☐ specify.....
Date membranes ruptured	Yes ☐	No ☐ specify.....
Time membranes ruptured	Yes ☐	No ☐ specify.....
Abnormal symptoms	Yes ☐	No ☐
If present what symptoms	High blood pressure Bleeding Fever Premature rupture of membranes Other specify.....	
Use of local medication	Yes ☐	No ☐
Comment: -----		

FETAL MONITORING

Were the following recorded (**circle** yes or no, if yes write how many times plotted)

Fetal heart rate (FHR) recorded? Yes ☐ No ☐

Are there any omissions in FHR recording? Yes ☐ No ☐

(Note: FHR is recorded every 30 minutes)

If yes how many omissions?

Is there reading below 120 beats per minute? Yes ☐ No ☐

If FHR of below 120, any documentation of fetal distress? Yes ☐ No ☐

Is there any documentation of management of fetal distress? Yes ☐ No ☐

If yes specify management

.....
State of membranes recorded **Yes** ☐ **No** ☐

If ruptured how many hours before delivery?.....

Color of liquor recorded **Yes** ☐ **No** ☐

If recorded: meconium stained? **Yes** ☐ **No** ☐

If yes specify grade Grade 1

Grade 2

Grade 3

Moulding **Yes** ☐ **No** ☐

If yes specify grade Grade 1 ☐

Grade 2 ☐

Grade 3 ☐

Caput **Yes** ☐ **No** ☐

If yes specify grade +1 ☐

+2 ☐

+3 ☐

Baby has fetal distress? **Yes** ☐ **No** ☐

Diagnosis made by Fetal heart rate ☐

Color of liquor ☐

Molding ☐

Caput ☐

Were the following labor progress indicators recorded (**circle** yes, or no, if yes write how many times plotted

Cervical dilatation Yes ☐ No ☐

Are there any omissions in plotting? Yes ☐ No ☐ if yes, specify how many.....

Descent Yes ☐ No ☐ specify -----

Are there any omissions in plotting? Yes ☐ No ☐ if yes, specify how many.....

Contractions Yes ☐ No ☐ specify -----

Are there any omissions in plotting? Yes ☐ No ☐ if yes, specify how many.....

Provide how many hours the woman was in active phase of labor hours

General comment: -----

MATERNAL MONITORING

Were the following labor progress indicators recorded (**circle** yes or no, and if yes write how many times recorded)

Blood Pressure Yes ☐ No ☐ -----

Mother has hypertension? Yes ☐ No ☐-----

Pulse rate Yes ☐ No ☐ -----

Temperature Yes ☐ No ☐ -----

Mother has fever? Yes ☐ No ☐

General comment: -----

SECOND STAGE OF LABOR

Were the second stage of labor indicators recorded (**circle** yes or no and provide information where applicable

Date and time of full dilatation **Yes** ☐ **No** ☐ specify -----

Delivery date **Yes** ☐ **No** ☐ specify-----

Delivery time **Yes** ☐ **No** ☐ specify-----

Method of delivery **Yes** ☐ **No** ☐ specify -----

Apgar score at 1 min **Yes** ☐ **No** ☐ specify -----

Apgar score at 5 min **Yes** ☐ **No** ☐ Specify -----

Birth asphyxia? (APGAR < 7) at 1 min **Yes** ☐ **No** ☐

If yes specify -----

Birth asphyxia? (APGAR < 7) at 5 min **Yes** ☐ **No** ☐

If yes specify -----

Sex **Yes** ☐ **No** ☐ Specify -----

Abnormalities **Yes** ☐ **No** ☐

Specify abnormality if present

Weight **Yes** ☐ **No** ☐ Specify -----

Baby to nursery **Yes** ☐ **No** ☐

Reason for admission in nursery **Yes** ☐ **No** ☐ specify.....

THIRD STAGE OF LABOR (tick if information provided)

Are details for third stage of labor documented? **Yes** ☐ **No** ☐

Are there any omissions? Yes ☐ No ☐ If yes specify.....	
General comment	
SUMMARY OF LABOR	
Duration of labor Yes ☐ No ☐	
Specify hours-----	
First stage-----hours	
Second stage-----hours (	
TOTAL -----	
Prolonged first stage of labor Yes ☐ No ☐	
Prolonged second stage Yes ☐ No ☐	

Appendix 4: Interview guide

Greetings. My name is Luke Chiwala, a student at College of Medicine. I am investigating on health worker's knowledge and utilization of the partograph to diagnose fetal distress during labor. Much of our discussion will be centered on the use of partograph but in relation to diagnosis of fetal distress. But I will also collect some of information about your profession. As we discussed, none of your information will be given to anyone and will never be used for any purpose apart from research. Some of our discussion will be recorded and I will be taking notes. Some questions I will just be ticking but will also take additional notes. You may feel free to ask for clarification where the question is not clear. Could we proceed?

Demographic characteristics	Responses
Sex	Male ☐ Female ☐
Age	<30 years ☐ 31-35 years ☐ >35years ☐
What is your qualification	NMT ☐ RNM ☐
When did you qualify as midwife	<2 years ☐ 3-4 years ☐ >4years ☐
Are you licensed with the nurses and midwives council?	Yes ☐ No ☐
For how long have you worked in the labor ward?	<1 year 1-2 years >2years
UTILIZATION OF PARTOGRAPH	
Can you tell me what you use to monitor women during labor	
For what women do you use the partograph?	
In practice, how often do you use the partograph?	
KNOWLEDGE ABOUT THE PARTOGRAPH	
In your own words, how can you describe the partograph?	
When do you start filling the partograph?	

What are the components of the partograph that you know?
In using that partograph which component(s) of the partograph do you consider most important in determining fetal condition
Just by looking at the information on the partograph, when do you suspect fetal distress?
Can you tell me about your experience (positive or negative) about the components on the partograph that are used to diagnose fetal distress
Do you think some elements could have been included on the partograph to help in diagnosing fetal distress? What elements if any
What benefits do you get with the use of the partograph
It is expected that babies with birth asphyxia should have been identified during labor. What is your experience? How do you feel about the use of the partograph in detecting fetal distress? How does the partograph assist you to identify fetal complications during labor Some evidence suggests that many partographs are not completely filled and they have gaps b. Why do you think this happens? Personally, what motivates you to use the partograph? What challenges do you encounter with the use of partograph? What should be done to improve detection of fetal distress using the partograph and its associated labor management protocol

--

**Appendix 5: Namulondola wa mafunso kwa ogwira ntchito ku chipinda chochilira
azimayi okhudzana ndi partograph**

Malonje

Ndakulandilani ku zokambilana zathu. Dzina langa ndi Luke Chiwala ophunzira ku Sukulu ya ukachenjede ya College of Medicine. Ndikupanga kafukufuku ndicholinga chofuna kupeza zomwe mukudziwa komanso mmene mumagwiritsira ntchito partograph pofuna kupeza ngati mwana akubanika pa nthawi yomwe mai akuchila. Zokambilanazi zitepedwa komanso zina ndizilemba ndicholinga choti nditenge zones zomwe titakambilane. Titha kupitiliza?

Muli ndi zaka zingati	<30 31-35 >35	
Maphunziro anu ndiotani	NMT RNM	
Sukulu yauzamba munamaliza liti	Osakwana zaka ziwiri 3-4 Kupitilira zaka 4	
Ndinu ovomerezeka ndi bungwe loyangana za anamwino ndi azamba?	Eya Ayi	
Mwagwira ntchito Mchipinda chochilira amayi kwa nthawi yotalika bwanji?		
KUGWIRITSA NTCHITO PARTOGRAPH		
Mumagwiritsa ntchito chani posamalira azimayi makamaka pofuna kudziwa mmene labor		

ikuyendera?
Mumagwritsa ntchito partograph kwa amayi ake ati?
Ndi zinthu ziti zomwe zimakhudza kagwiritsidwe ntchito ka partograph pa ntchito yanu?
ZOMWE MUKUDZIWA PA PARTOGRAPH
Mungafotokoze kuti partograph ndi chani?
Ndi nthawi iti yomwe mumayamba kugwiritsa ntchito partograph?
Kodi partograph ili ndi zigawo ziti?
Ndi zigawo ziti zomwe zili pa partograph zomwe ndizofunikila kwambiri pofuna kudziwa mmene mwana alili
Mumadziwa bwanji kuti mwana akubanika potengera zomwe zili pa partograph
Maganizo anu ndiotani pa zigawo zomwe zili pa partograph makamaka pofuna kudziwa mmene mwana alili?
Kodi ndi zinthu ziti zomwe mukuona kuti zingathandize kudziwa ngati mwana akubanika koma pa partograph palibepo?
Ubwino ogwiritsa ntchito partograph ndi chani?
Ndichifukwa chani ana ambiri amabadwa ali obanika pamene ma partograph amagwiritsidwa ntchito?
Timayembekezera kuti ana omwe abadwa ali obanika, akuyenera kuzindikilidwa pa ntahwi yomwe mayi akuyembekezera kuchila pogwiritsa ntchito partograph. Kunoko zimakhala bwanji?
Maganizo anu ndiotani makamaka pa nkhani yogwiritsa ntchito partograph pofuna kudziwa ngati mwana akubanika

Partograph imakuthandizani bwanji kudziwa ngati mwana akubanika Chimene chimakulimbikitsani ndi chani kuti muzigwiritsa ntchito partograph?
Pali nkawa yoti ma partograph ambiri samalembedwa mwa ndondomeko komanso samamalizidwa kulembedwa. Izi mungafotokoze kuti zimachitika chifukwa chani? Mukuganiza kuti chingachitike ndi chani pofuna kuonetsetsa kuti ma partograph akulembedwa mwa ndondomeko?
Ndimavuto anji amene mumakumana nao makamaka okhudzana ndi kugwiritsa ntchito partograph?

**Appendix 6: Letter to lilongwe district health office requesting for permission
for study at bwaila hospital**

Luke Chiwala

University of Malawi College of Medicine

P/Bag 360 Chichiri Blantyre 3.

Mobile:0888736524.E-mail:lukechiwala87@gmail.com

5th November 2019

The District Social Welfare

Lilongwe District Health Office , P.O. Box 1274, Lilongwe.

Dear Sir

Re: PERMISSION TO CONDUCT A STUDY AT BWAILA MATERNITY UNIT

I am writing to request for permission to conduct a study at your institution.

I am a student at College of Medicine pursuing Masters' degree in Global Health Implementation. My research project is entitled: Assessment of health workers knowledge and utilization of partograph to diagnose fetal distress during labor at Bwaila Hospital.

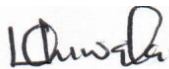
The purpose of this study is to understand if health workers providing maternity care to laboring women have knowledge and can detect fetal distress using the partograph. The study will also explore challenges health workers face when using the partograph to monitor fetal condition during labor.

This study will involve review of partographs retrospectively to assess completeness. Partographs with babies with APGAR score of less than seven will be further reviewed to establish if abnormal fetal condition was identified during labor. In-depth interviews will be conducted with midwives working in the labor ward to understand their knowledge and challenges faced when using the partograph. The study is

expected to be completed by August 2020.

Looking forward to hear from you

Yours faithfully



Luke Chiwala

Appendix 7: Letter from Lilongwe DHO granting permission to conduct this study

Ref. No.:
Telephone No.: 265 726 466/464
Telefax No.: 265 727817
Telex No.:
E-Mail: lilongwedho@malawi.



In reply please quote NO DZH/MALAWI,
Lilongwe District Health Office
P.O. Box 1274
Lilongwe
Malawi

COMMUNICATIONS TO BE ADDRESSED TO:

11th November, 2019

College of Medicine Research Ethics Committee
Private Bag 360
Chichiri
Blantyre 3

Dear Sir/Madam

PERMISSION TO CONDUCT RESEARCH STUDY IN LILONGWE DISTRICT

Approval has been granted to the bearer of this letter: Luke Chiwala, Master's degree in Global Health Implementation student, from College of Medicine to conduct a research study in Lilongwe.

Research Title:

"Assessment of health worker's knowledge and utilization of partograph to diagnose fetal distress during labour at Bwaila Hospital in Lilongwe, Malawi"

Any assistance rendered would be appreciated.

MINISTRY OF HEALTH & POPULATION
LILONGWE DISTRICT HEALTH OFFICE
DHO
NOV 2019
DISTRICT HEALTH OFFICER
Dr. Mary Chimsew Nkunika

For: ACTING DIRECTOR OF HEALTH AND SOCIAL SERVICES- LL

Appendix 8: COMREC approval certificate



Appendix 9 : Journal manuscript

Luke Chiwala^{1, 2*} Alinane Linda Nyondo-Mipando² Isabel Kazanga Chiumia²

Assessment of health worker's knowledge and utilization of partograph to diagnose fetal distress during labor at Bwaila Hospital, in Lilongwe Malawi

¹International Training and Education Centre for Health Malawi, Department of Global Health, University of Washington

²Department of Health Systems and Policy, Kamuzu College of Health Sciences (KUHeS), Malawi

¹Correspondence: Luke Chiwala, chiwalaluke87@gmail.com

Abstract

Background: Quality of maternity care and the use of partograph during labor improves maternal and neonatal birth outcomes. Despite gains realized in maternal health with the use of partograph, neonatal deaths due to complications of labor and delivery remain a challenge. Knowledge and utilization of the partograph by health workers to diagnose fetal distress during labor needs to be established if at all it is adequate to help detect and treat fetal complications, hence preventing neonatal deaths. This study assessed health worker's knowledge and utilization of partograph to diagnose fetal distress during labor.

Method: This facility-based convergence parallel study was conducted at Bwaila hospital in Lilongwe, Malawi using qualitative and quantitative methods. A total of 911 completed partographs of births at Bwaila for April and May 2020 were reviewed. Fifteen midwives in the maternity ward were interviewed. Descriptive statistics and logistic regression were

used to analyse quantitative data using R. Qualitative data was recorded using recorder and analysed manually using thematic analysis approach.

Findings: Utilization of partographs and diagnosis of fetal distress was poor. Factors associated with birth asphyxia were meconium-stained liquor (AOR=2.33; 95% CI =1.51-3.59, $p<0.001$), vacuum extraction (AOR=4.64; 95% CI= 1.61-13.58, $p=0.004$), and crossing alert line (AOR=1.70; 95% CI =1.09-2.66, $p=0.020$). The study identified lack of knowledge on interpretation of the partograph despite a good knowledge on use, shortage of staff, inadequate details on partograph, inadequate equipment and drugs /supplies, negligence as some of the reasons contributing to poor utilization of partographs and diagnosis of fetal distress.

Conclusion: The use of partograph did not improve diagnosis of fetal distress during labor despite midwives having good knowledge of how to use it. Poor knowledge on how to interpret the partograph affected diagnosis of fetal distress. Improving staffing levels, ensuring availability of equipment and supplies, modifying the partograph to meet context needs could improve the use of partograph and detection of complications.

Keywords: Partograph, Fetal distress, Birth asphyxia, Maternity care, Utilization, Malawi

Introduction

Neonatal mortality remains a great obstacle in the efforts to reduce under-five mortality worldwide. Globally, 2.4 million children died in the first month of their life in 2020 alone, which is approximately 7,000 neonatal deaths every day [1]. Most of the deaths occurred in the first week, with about 1 million dying on the first day and close to 1 million dying within the next six days [2]. Reduction of neonatal mortality and stillbirths rate has been slower than that for maternal and child (1–59 months) mortality and has been

slowest in the highest-burden countries, especially in Africa [3]. The Malawi trend in reducing neonatal deaths has been slow since the neonatal mortality in 2016 was the same as what was achieved twelve years earlier in 2004. Unlike general under-five mortality, the pattern of reducing neonatal deaths shows no progress as it is stuck at 27 deaths per 1000 live births [4]

Neonatal mortality is linked to the quality of maternity care. Good labor and neonatal health outcomes are attributed to early recognition of complications and prompt interventions [5]. The use of partograph ensures early detection of complications during labor and improved maternal and neonatal outcomes of labor [6]. It is further believed that the acquisition of adequate knowledge and proper utilization of the partograph by midwives would accelerate efforts in the reduction of maternal and neonatal deaths [7].

The partograph provides health professionals with a pictorial overview of the labor to allow early identification and diagnosis of the pathological labor [8]. If used effectively it helps to ensure careful monitoring of the woman in labor, avoids unnecessary interventions, recognizes and responds to complications promptly all of which can help to prevent maternal and neonatal morbidity and mortality [9].

Evidence revealed that the introduction of partograph and labor-management protocols in South East Asia reduced stillbirths from 0.5% to 0.3% [10]. Furthermore, the use of partograph has been associated with reduced perinatal mortality, birth asphyxia, prolonged labor, perinatal mortality, and a better APGAR score at one and five minutes [11–13]. Labor can affect the fetus in many ways and some stressors may affect the flow of oxygen to the fetus. The reduction of normal supply of oxygen to the fetus results in fetal distress. [14] . Fetal distress is defined as depletion of oxygen and accumulation of carbon dioxide, leading to a state of “hypoxia (low oxygen) and acidosis” during intra-uterine life [15]. Uterine contractions are the most common cause of decreased oxygen supply to the baby,

hence the need to monitor how the fetus is responding to stresses of labor [14]. The fetal heart rate (FHR) is mostly used to monitor the condition of the fetus during labor and is determined using the fetal stethoscope [16]. Fetal heart rate plotted on the partograph, and color of amniotic fluid can inform midwives and other health professionals if the fetus is in distress or not. However, failure to use the partograph properly would make it difficult to have clear picture of the status of the neonate. Improvement in the accuracy of FHR assessment and pattern interpretation is envisaged to be beneficial in reducing the incidence of abnormal birth outcomes like birth asphyxia [17].

Despite the introduction of the partograph neonatal poor health outcome rates remain high [18]. Given the relevance of the partograph, the persisting poor neonatal outcomes, and limited information on how midwives understand the tool and use it to detect fetal distress during labor, this study sought to establish midwives' knowledge and utilization of the partograph and their ability to diagnose fetal distress during labor using the partograph.

Methods

Study design

This was a hospital-based convergence parallel study that used mixed-methods and was carried out between April 2019 and July 2020. The study used both quantitative and qualitative methods to address the research objectives. The quantitative component employed a retrospective partograph review of women who delivered in April and May 2020. The qualitative component involved interviews with midwives working in the labor ward.

Study setting

The study was conducted at Bwaila Hospital in Lilongwe, the capital city of Malawi. The hospital was purposefully selected due to the high volume of deliveries. The facility has an average of 1400 births in a month translating into an average 17,000 births in a year. In

the year 2018-2019, 9909 babies were admitted to Bwaila nursery ward. Of these, 3290 were admitted due to birth asphyxia representing 33.2% of all admissions [19]. There were 818 neonatal deaths within the same period of which 360 babies died due to birth asphyxia representing 44% of all deaths. It was observed that the number of deaths due to birth asphyxia was more than those due to prematurity and low birth weight combined 243 (29.7%) and neonatal sepsis 164 (20.0%) [19].

Bwaila hospital provides outpatient services, antenatal, postnatal services and has inpatient facilities for obstetric and medical conditions. The facility serves as a referral hospital for eight (8) health centres and private hospitals. However, people from the urban areas within Lilongwe access care at the facility without being referred. The maternity unit has ten (10) separate rooms with 2 beds each. This means 20 women can be accommodated at a time. However, floor beds are also created to accommodate additional women. Bwaila labor ward had 52 midwives and two in-charges. The midwives are divided into 5 teams of 10 midwives each who work in shifts day and night.

Sampling and Sample Size

In the quantitative component, a retrospective review of delivery records for the months of April and May was conducted to assess the extent of partograph use and documentation. A total of 1500 partographs of women who were admitted, monitored using partograph, and delivered a live baby or a fresh stillbirth at Bwaila at 28 weeks and above, in the months April and May 2020 regardless of mode delivery were reviewed. Pregnancies of less than 28 weeks of gestation are less likely to be admitted in the maternity and be monitored using the partograph. Out of the 1500 medical records reviewed, only 911 met inclusion criteria and were purposefully selected for further review.

For the qualitative component, we drew a purposive sample of midwives working in the labor ward at the time of data collection, having spent more than 6 months in the maternity section of the hospital and were registered with the Nurses and Midwives Council of Malawi. Purposeful sampling is widely used in qualitative research for the identification of information-rich cases related to the phenomenon of interest [20]. In addition to knowledge and experience, purposeful sampling also considers availability and willingness to participate, and the ability to communicate experiences and opinions in an articulate, expressive, and reflective manner [20]. It was expected that those who stayed six months in the labor ward could provide valuable information about partograph.

Data collection

Quantitative data

Files for the months of April and May 2020 were retrieved with the help of the ward clerks for review. These months were selected in consideration to scope, timing of the study as well as accessibility to records and that some of the midwives who completed the partographs could have been available in the maternity unit. The information on the level of partograph use and the extent of completion was abstracted onto the study questionnaire. The study questionnaire was developed through literature review where some items were adapted [21]. The partograph was also reviewed to make the questionnaire more comprehensive and applicable to the study.

Qualitative data

Fifteen (15) midwives from the labor ward were interviewed. One midwife refused participation due to other engagements. Participants for in-depth interviews were approached at their own convenient time to ensure that the study does not interfere with routine ward activities. An interview guide was used to conduct in-depth interviews. Each midwife was approached individually and informed about the study so that they indicate

whether they will participate or not before the consenting process. Participant's understanding of the partograph and how they use it to diagnose fetal distress during labor were explored. Participants were asked to describe components of the partograph, and state which components are used to diagnose fetal distress. Whether components of the partograph are sufficient to detect fetal complications was also explored. Challenges faced when using the partograph were also explored. Data were collected until saturation where no new information was coming out from the participants despite probing [22].

Data analysis

Quantitative data was analysed using R. The partograph was assessed on completeness of the three parameters of fetal monitoring, labor progress, and maternal condition. The fetal condition was assessed based on fetal heart rate monitoring (FHR), color of liquor, and rate of moulding of the fetal skull. The maternal assessments included temperature, blood pressure, and pulse rate, and labor progress: cervical dilatation, uterine contractions, and descent of fetal head.

Logistic regression modelling was employed to identify the risk factors for birth asphyxia using single predictor variable to determine the relationship of each variable with the outcome independently. Given that the outcome was binary, presence of asphyxia was labelled 1 and absence of birth asphyxia was labelled 0. For building the model, a purpose approach was used. In the univariate analysis, a cut-off p-value of 0.2 was used to determine the relationship of each variable with the outcome independently. Variables that met the criteria at p-value of 0.2 were included in the multivariate model with a cut-off of p-value=0.05 where those that met a cut-off of 0.05 were included in the final model. A final model was then built which also included optimisation of the model. The model output was translated into a meaningful output as crude odds ratios and adjusted odds

ratios for birth asphyxia for each identified risk factor or variable.

Qualitative data were analysed using thematic analysis approach. Thematic analysis involves identifying, analyzing, and reporting patterns (themes) within qualitative data [23]. The researcher familiarized with the data by reading and re-reading the transcripts to have a thorough understanding of the data while identifying and labeling meaningful words, phrases, and actions which formed units. The units were then condensed, coded, and put into categories, from which themes emerged.

Ethics approval and consent to participate

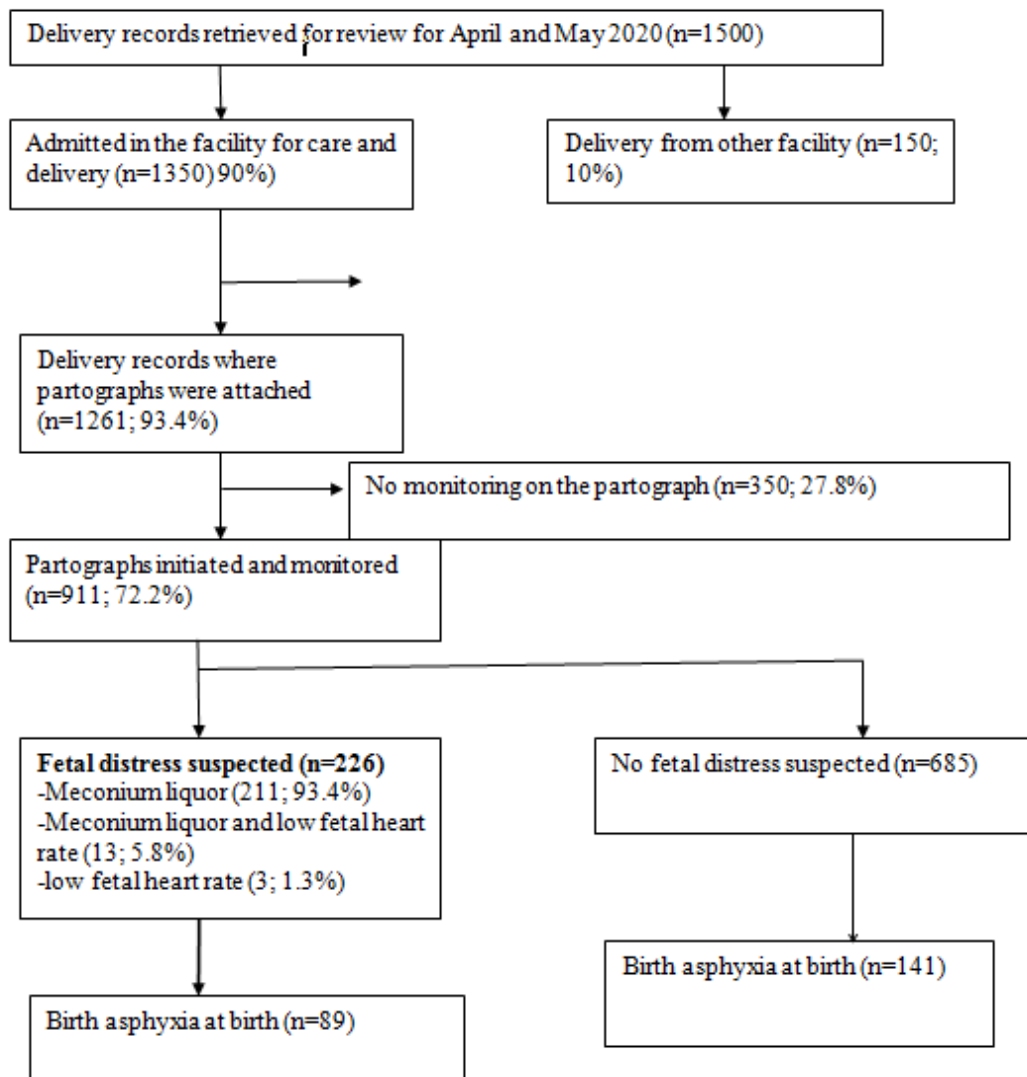
For this study, the Ethics committee of Kamuzu University of Health Sciences formerly College of Medicine approved the protocol (protocol number: P.03/20/3032). Permission was also sought from the management at Bwaila Hospital. For Participants who showed willingness to participate in the study, verbal consent was obtained and documented by the data collectors in the space provided within the participant information sheet. A copy of the documented verbal consent was given to each respondent.

Results

Quantitative findings

Population and sampled partographs

A total of 1500 delivery records were reviewed, and 911(60.7%) records met the inclusion criteria as there was evidence of labor monitoring. 150 (10%) records were deliveries from home and other facilities. 350 partographs had no monitoring of labor and plotting was done only once on delivery, so they were not included while 89 records had no plotting at all (Figure 1)



Excluded: No plotting done (n=89; 6.6%)

Figure 5: Schematic presentation of sampling procedure

Review of the partograph

All records had documentation of names. Subsequently, information on address, age, gravida, parity and gestation were highly documented. However, time of membrane

rupture was least documented with only 50 (5.4%) documented. Date of admission and time of admission was missing on 6.2% (n= 57) and 48.7% (n=444) respectively (Table 1).

Table 6 Completeness of demographic information

Parameter	Complete N (%)	Missing N (%)
Name of woman	911 (100%)	0(0%)
Address	900 (98.8%)	11(1.2)
Age	907 (99.6%)	5(0.5%)
Gravida	907 (99.6%)	5(0.5%)
Parity	907 (99.6%)	5(0.5%)
Gestation	776 (85.2%)	135(14.8)
Date of admission	854 (93.7%)	57(6.2%)
Time of admission	467 (51.3%)	444(48.7)
Date membranes ruptured	111 (12.2%)	800 (87.8%)
Time membranes ruptured	50 (5.4%)	861(94.5%)

Fetal heart rate was recorded on all the partographs. 129 partographs had poor monitoring of fetal heart rate with 78 having gross omissions (more than four gaps) in recording. Plotting was done hourly with observed gaps in documentation. No partograph had fetal heart rate dots connected by a line where trend of the fetal heart rate could be clearly observed. Only 66 (7.2%) partographs had moulding recorded on them while caput was recorded on 134 (14.7%).

More than 70% of the partographs had one recording of blood pressure and pulse rate for

the mother which was only recorded at admission. On average temperature was recorded twice on 288 (31.6%) of the partographs. The majority of the partographs 68.4% (n=623) had no recording of temperature.

Table 7 Maternal, fetal, and labor monitoring

Parameter	Complete N (%)	Incomplete N (%)
Fetal heart rate	799 (87.7%)	132 (14.5%)
Caput	134 (14.6%)	778 (85.4%)
Moulding	66 (7.2%)	838 (92%)
Liquor	908(99.7%)	3 (0.3%)
Contractions	837(91.9%)	74 (8.1%)
Descent	856 (94%)	55(6.0%)
Dilatation of cervix	870 (95.5%)	41(4.5%)

Diagnosis of fetal distress

Fetal distress was suspected in 226 (24.8%) babies using the partograph while 685 (75.2%) babies had no sign of fetal distress during labor.

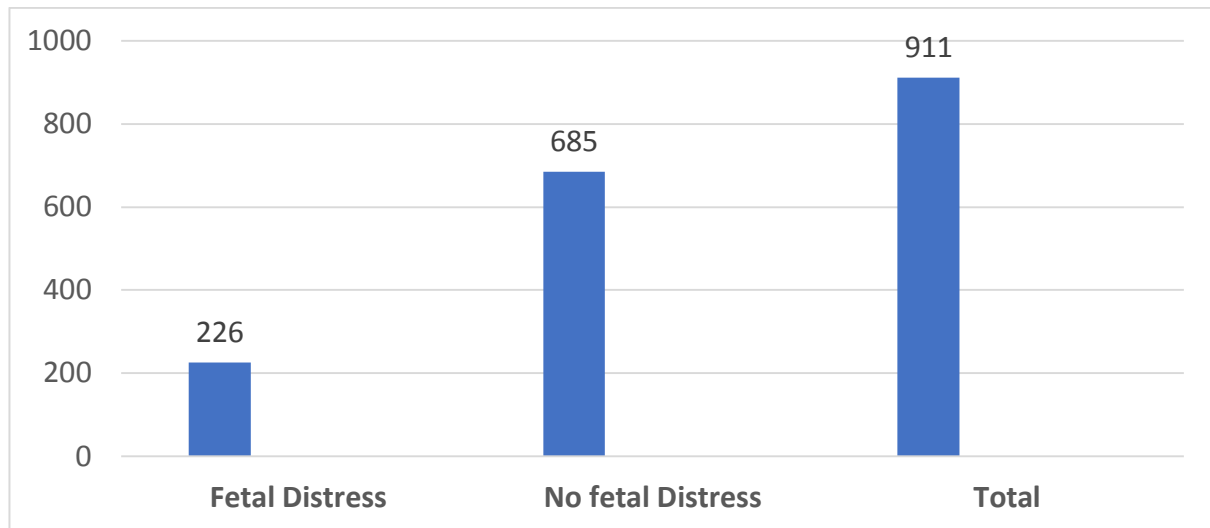


Figure 6: Proportion of babies suspected with fetal distress

Of the 226 babies who were suspected of fetal distress, 211(93.4%) had meconium-stained liquor, 3 (1.3%) had low fetal heart rate (LFHR) only, while 13 (5.7%) had a combination of low fetal heart rate and meconium-stained liquor (Fig.4).

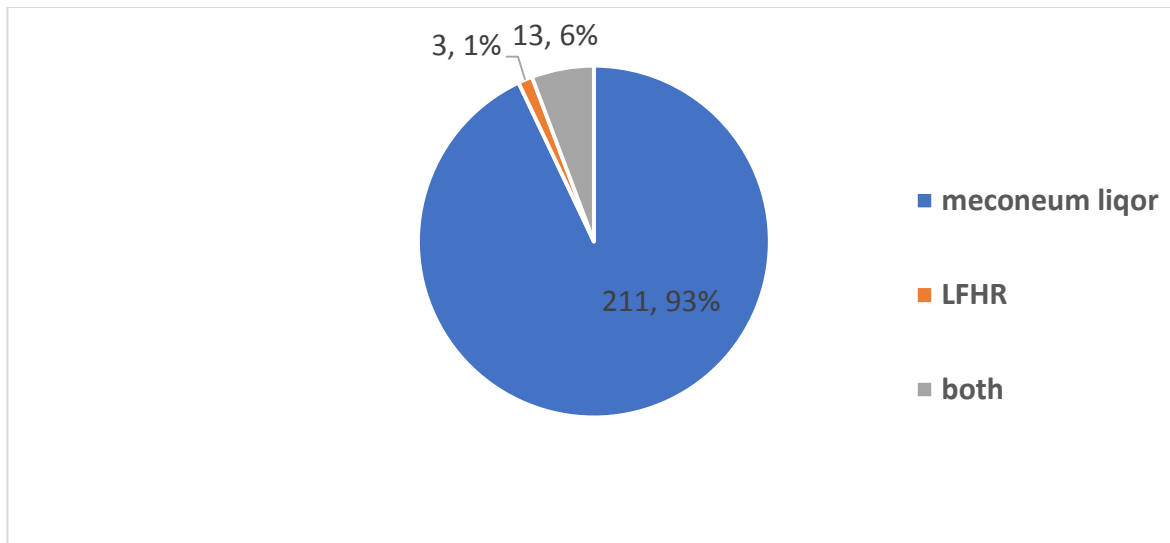


Figure 7: Indicators of fetal distress

A total of 230 (25.3%) babies were born with birth asphyxia (APGAR score less than 7). Of these, 89 (38.7%) had suspected diagnosis of fetal distress during labor. Majority of those born with birth asphyxia 141 (61.3%) had no sign of fetal distress documented on the partograph.

Factors associated with birth asphyxia

Results show that birth asphyxia was associated with presence of meconium-stained liquor (AOR=2.33; 95% CI =1.51-3.59, $p<0.001$), male sex of baby (AOR=1.75; 95% CI=1.17-2.62, $p=0.006$), crossing of the alert line (AOR=1.70; 95% CI =1.09-2.66, $p=0.020$). The mode of delivery was also a significant risk factor. Vacuum extraction was associated with high odds of birth asphyxia (AOR=4.64; 95% CI= 1.61-13.58, $p=0.004$). There was also association between weight of baby and birth asphyxia (AOR= 0.9992234; 95% CI= 0.9988441 - 0.9995922, $p <0.001$). The results indicated that the higher the baby's weight the

lower the odds of birth asphyxia.

Qualitative findings

Knowledge about partograph

Majority of midwives demonstrated an understanding of what the partograph was by mentioning its components. However, few could not mention maternal components of the partograph. All midwives knew the partograph is used to monitor the labor, maternal and fetal conditions.

“It is a tool used to monitor how labor is progressing. The tool is important because it guides what action to take depending on findings” (IDI Midwife 1)

“It is the tool that we use to monitor how cervical dilatation is progressing in every 4 hours and also to monitor the condition of the baby through assessment of fetal heart rate every 30 minutes” (IDI Midwife 2)

Knowledge about partograph use in diagnosing fetal distress

There was a consensus among midwives that the partograph is important in diagnosing fetal distress during labor. Fetal heart rate and meconium-stained liquor were mentioned as very important indicators to monitor if a baby has fetal distress.

“We monitor fetal heart rate every 30 minutes to check if the baby is fine. Normal fetal heart rate ranges from 120-160 beats per minute. With the partograph, it is easy to know if the baby is in danger. We also observe color of liquor, if it is meconium stained it means there is fetal distress” (IDI Midwife 8)

Challenges faced when using the partograph

Inadequate details on the partograph

Midwives reported that the partograph was designed to plot for one baby and it is difficult to use when it is a twin gestation. They expressed a concern that in case of twins, it is difficult to plot for the two babies. The partograph also lacks some details to plot characteristics of fetal heart rate like strength, regularity, and rhythm which gives room to miss complications like fetal distress.

“...when it is twin gestation, we are to monitor both babies. However, it is difficult to plot for both babies on a single partograph. And in case one baby has fetal distress, it is difficult to isolate in terms of plotting since only one baby is to be plotted on the partograph” (IDI Midwife 6)

“We use fetal heart rate to monitor baby’s condition. However, some babies may have normal heart rate as 120 to 160 beats per minutes. But there is nowhere we can indicate whether the fetal heart is regular, irregular, strong or faint. In this case we only based on fetal heart rate. And the way it is calibrated, the numbers are too much space and people are forced to put dots on the numbers appearing on the partograph....” (IDM Midwife 1)

Lack of knowledge on interpretation of the partograph

Despite having knowledge on how to plot on the partograph, most midwives do not know how to interpret the partograph. Some do not know how to examine the mother and baby, hence plotting wrong findings.

“One partograph for a single mother can be used by several midwives. But you find that someone has plotted cervical dilatation which is more than what you are finding. This brings confusion because you then need to plot a lower reading or start a new

partograph. Sometimes we don't even know how to interpret the findings on the partograph, so the partograph requires skills as well for someone to use it.” (IDM Midwife 2)

Lack of equipment, drugs and supplies to monitor and manage fetal condition.

Midwives expressed concern that the use of a fetal scope is not ideal rather suggested the use of electronic monitors considering the number of women they see in a day. The requirements of the partograph are difficult to meet when monitoring is done manually. Also, the lack of resources to manage complications identified is another challenge.

“According to the partograph we are supposed to monitor fetal heart rate every 30 minutes. Now in our case, we use the fetal scope which you cannot go and manually assess the woman every 30 minutes. At least when you are using digital monitors” (IDM Midwife15)

“It is depressing to identify fetal distress on the partograph when there are no resources to manage it. When we diagnose fetal distress, we are supposed to give dextrose which is sometimes not available. We then look as if we failed to interpret the partograph which makes some people omit documenting abnormal findings. (IDM Midwife 3)

Shortage of staff

Midwives observed difficulties in the documentation of partograph for every woman when there are few midwives available. As a result, some women deliver without a documented partograph, or a partograph that is documented retrospectively for the sake of record-keeping. The facility has 52 midwives divided in 5 teams consisting of 10 midwives each. This is not

enough as there is supposed to be more that 12 midwives per shift.

“We try to ensure that every woman has a partograph to monitor her labor. But with poor staffing and how busy our maternity is, it is difficult to document for every woman. That is why some women have incomplete partographs. That is why most partographs are completed after the woman has delivered because we may not manage to complete the partographs in the course of labor” (IDM Midwife 13)

Attitude towards use of partograph

Midwives expressed that some midwives do not like documenting on partographs. Some midwives document the partograph after the woman had delivered already just to make sure the partograph is there.

“When you conduct a delivery without a partograph people feel you haven’t done a good job. So sometimes we just document it as a requirement that is why some partographs have no information”. (IDM Midwife 14)

“Some midwives do not just want to use the partograph for own reasons...they just conduct deliveries and ask you to document for them especially for normal deliveries. Some people document on the partograph after delivery. (IDM Midwife 12)

Discussion

This study has revealed that midwives have good knowledge about the partograph. There was poor utilization and documentation of the partograph, poor monitoring of fetal condition during second stage of labor. Diagnosis of fetal distress was poor with many babies born with birth asphyxia without fetal distress diagnosed during labor.

The present study indicated that knowledge about the partograph was good as midwives mentioned more than 90% of the components of the partograph. Similarly in Ethiopia, 96.9% and 99% of the health workers demonstrated understanding of the partograph (24, 25). However, midwives in this study felt the tool is difficult to plot and interpret due to its design especially when dealing with twin pregnancy. In Bangladesh midwives admitted lack of knowledge on some components of the partograph, but they still complete it despite not knowing exact value to document (26). This would result in wrong interpretation of the partograph due to incorrect plotting. It is therefore important to ensure midwives are well trained about the partograph and how to use it. Studies in Southern, Central and Eastern Ethiopia indicated that on-the-job training on partograph had a significant association with improved partograph utilization (27–29). To ensure easy plotting and interpretation, the partograph could also be modified to suit context needs. In other settings, the use of a color-coded partograph improved partograph interpretation and make it user friendly (6).

Our findings that most partographs were incomplete in different sections is consistent with results from a study that was done in Mulanje, where only 10% of the pantographs had correct

and complete information (30). A study at Mulago hospital in Uganda also found that 61% of partographs parameters for fetal, maternal and labour progress monitoring were incomplete (31). Poor documentation of the partograph is also widely documented in Ethiopia, Sudan and Indonesia (12, 32, 33), and is more prevalent in low resource settings especially in low and middle-income countries (31). The presence of incomplete partographs risks missing aspects like maternal conditions like fever and infections which are directly related to abnormal fetal outcomes including seizures (34).

Standard monitoring of fetal heart rate is associated with a good APGAR score (35) and this finding cements the evidence that monitoring of fetal heart rate improves fetal outcomes. The use of the partograph prevents prolonged labor, promotes timely diagnosis of fetal distress and reduces of stillbirth and fetal mortality (36). Basically, an absent or abnormal FHR is associated with fresh stillbirth or birth asphyxia, with increased need for neonatal resuscitation (37). This study finds that documentation of fetal heart rate was inconsistent with baby outcomes. Most babies born with birth asphyxia had normal fetal heart rate during labor which indicates that the values documented were incorrect. Subsequently, monitoring of fetal condition during second stage of labor was poor, yet it is in the second phase of labor where the baby is at high risk of fetal distress, which necessitates a close follow-up of the fetal heart rate (38, 39). A study conducted in Northern Uganda reported similar findings where observations suggested no monitoring of fetal heart rate in the second stage of labor while records indicated monitoring in 3.2 % of the cases reviewed (40). This indicates that some health workers could complete the partograph without really monitoring or even after the woman had delivered. Similar findings were reported in Korle-Bu hospital in Ghana where health workers were documenting the partograph retrospectively (41). This explains why baby

outcomes were inconsistent with documentation as most of the readings were not correct.

Fetal distress is diagnosed based on fetal heart rate monitoring where fetal scopes are commonly used to capture the rate (42). Midwives described methods used to monitor fetal condition during labor as not sufficient and unreliable considering workload and poor staffing. The use of fetoscope is prone to human errors especially in facilities with a high volume of deliveries and poor staffing (37). Some studies recommended the use of electronic fetal monitoring as it gave users confidence and it improved birth outcomes [43, 44]. To the contrary, some professionals believed that electronic fetal monitoring did not necessarily improve neonatal outcomes (45). However, in this study midwives preferred electronic monitoring as it is accurate and quick and could improve documentation of partographs. Midwives also expressed that with twin pregnancy, it is difficult to monitor and document on the partograph using handheld fetoscope. However, where bedside ultrasound is used, it is possible to identify exact fetal heart rate for each baby by location of the fetal hearts and their positions (46).

Meconium-stained liquor was the common accurate indicator for fetal distress and was associated with cases of birth asphyxia. Most babies with meconium-stained liquor during labor had low APGAR scores at birth. Similar findings were reported in Ethiopia where poor neonatal outcome was associated with presence of meconium in amniotic fluid (47). However, this study demonstrates that meconium liquor is a late sign of fetal distress and should never be considered reliable in monitoring fetal conditions for improvement of the neonatal

outcomes. Consistent monitoring of fetal heart rate and plotting on the partograph could indicate when the baby is having early signs of fetal distress hence early treatment and preventing stillbirths (48).

Lack of necessary equipment and supplies affected the use of partograph. Unavailability and shortage of thermometers, blood pressure machines, and timers contributed to documentation gaps since some parameters could not be assessed. Similar findings were reported in Uganda, where midwives expressed that shortage of equipment affected monitoring and subsequent documentation (31, 40). Also, availability of reliable equipment could help improve management of women in busy settings. The use electronic fetal monitoring using dopplers was preferred as it was perceived to ease work and improve accuracy than the current wooden or plastic fetal scopes. This is in line with other studies, where health workers also expressed advantages of electronic fetal monitoring as it improved maternal and fetal outcome (49).

Understaffing contributed to poor use of partograph as health workers could not manage to examine and document appropriately for every woman. In Malawi, the shortage of human resources for health especially midwives is severe (50). According to a report by the White Ribbon Alliance Malawi, Malawi has a population-to-midwife ratio of 4,915 to 1, which is far less compared to WHO recommended population-to-midwife ratio of 175 to 1 (46). Understaffing has been reported in many settings as one factor affecting the quality of care (35, 51–54). In Ethiopia, concerns about staff shortages and workload were also key factors affecting the provision of maternal care with over 40% of interviewed staff stating their intention to leave their current post (55). A study in Addis Ababa indicated that an increased number of midwives on shift was associated with higher odds of

partograph use (5).

Strengths and Limitations

Our results have to be interpreted with the understanding that we only reviewed Partographs for two months which may affect generalizability of the results, however they provide important insights that can be used to guide practice and further research. The strength in our study lies in the use of both quantitative and qualitative approaches to understand the problem. Although our study was conducted in one facility located in an urban area, the facility is a tertiary level hospital that is also a referral facility for multiple secondary level health facilities which broadens the type of clients that it admits which include both rural and urban residents.

Conclusion

The use of partograph is associated with improved maternity care maternal and fetal birth outcomes. Despite good knowledge about the partograph, several system factors affect proper use of the tool. Poor diagnosis of fetal distress was mainly due to poor interpretation and incomplete and inconsistent documentation of partographs. Improving staffing would ease workload on staff eventually improving care and documentation of partographs. An investment in health workforce is the drive to quality maternity care. Periodic on-site trainings to maternity team on partograph would also improve proper use and interpretation of the partograph. Ensuring availability of drugs and reliable equipment would improve diagnosis and management of maternal and fetal complications including fetal distress. Re-designing the partograph to suit context needs and making it color coded would ease interpretation hence early diagnosis of maternal and fetal complications including fetal distress. There is need to de-implement and abandon the use of vacuum extraction as it is highly associated with

negative birth outcomes.

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