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Decision-to-Incision Time of an Emergency Cesarean Delivery on Prolong Labour: Application of Partograph use at Kwadaso Municipal Hospital in the Ashanti Region of Ghana

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ABSTRACT

Decision-to-incision time is the interval between the moment a decision is made to perform a cesarean section and the time of the incision on the abdominal wall. Ineffective monitoring and documentation of contractions using the partograph by healthcare providers can delay the decision and execution of the incision. The study is a cross-sectional study using a quantitative approach, involving a sample of 54 healthcare providers as primary data and 384 selected partograph entries as secondary data. A systematic sampling approach was used for the secondary data, while a convenience sampling approach was used for the primary data. The study aims to estimate the decision-to-incision time for emergency cesarean sections during prolonged labor, assess the effective use of the partograph on birth outcomes, identify challenges in decision-making for cesarean sections during prolonged labor, and educate healthcare professionals on proper documentation of the partograph. Findings from the study indicated that an estimated incision time of 407.835 minutes (approximately 7 hours) from the start of admission is needed to decide on a cesarean delivery. A time frame between 6 hours 50 minutes and 7 hours 8 seconds could be considered by surgeons when using the partograph during prolonged labor. An estimated time of 112.811 minutes (approximately 1 hour and 8 minutes) is needed for spontaneous vaginal delivery when regular contractions occur, with or without oxytocin augmentation. A stable fetal heart rate of approximately 142 beats per minute is required for delivery. Documentation findings revealed poor practices among some healthcare providers, with 43.6% of respondents indicating gaps in documentation. A model for documentation was presented as follows: logit (Outcome of delivery) = -0.251 + 0.033(gravidae) – 1.207(parity) – 37.64(date of admission) + 39.486(time of admission) + 19.898(ruptured membrane) – 20.55(amniotic fluid) + 1.640(descent of head) – 0.003(contractions per 10 minutes) – 0.115(oxytocin) + 0.360(drugs and fluids) + 0.307(pulse and blood pressure) – 0.388(temperature) – 0.188(urine) – 0.023(fetal heart rate). When properly documented, this model will predict either cesarean delivery or spontaneous vaginal delivery. A higher proportion of the selected healthcare providers were female (92.6%), with only 7.4% being male, making the study predominantly female. The majority were married (68.3%), while 31.5% were unmarried. The age distribution indicated that 42.6% of respondents were between 30 and 39 years old, followed by those between 20 and 29 years. In terms of occupation, 50.0% were staff midwives, 27.8% were senior midwives, 18.5% were medical officers, and 3.7% were principal midwives. While not all respondents understood every indicator on the partograph, a substantial proportion (74.1%) did. Factors contributing to delays in decision-making for incision, which subsequently delay cesarean delivery, included lack of renewal of NHIS cards, financial constraints related to top-up payments by pregnant mothers, inadequate anesthesia materials, and insufficient recovery rooms, operating theaters, and admission beds among healthcare providers. Additionally, the religious beliefs of pregnant mothers and their relatives favoring spontaneous vaginal delivery significantly contributed to delays in incision time for cesarean delivery. In summary, the study concluded that the partograph is an important tool for monitoring a pregnant mother during delivery, and timely intervention is critical.

INTRODUCTION

This chapter includes the background of the study, forgetfulness of prolonged work and other factors related to it, the use of units for emergency work intervention, problem statement, the purpose of the study, objectives and research questions, including significance. of learning and organizational structure.

Background Information

Ungenial leisurely progress in labour as called prolong in labour or failure to progress is a stage that takes longer than expected to deliver by a pregnant mother and this may cause low oxygen levels for the baby, abnormal heart rhythm in the baby, abnormal substances in the amniotic fluid and uterine infection (Olsen. 2023). This is due to variations in labour for different people but rather increases the chances of caesarean section (C- section). Slow progress in labour can happen at any Stages of labour. The first stage consists of three phases: latent, active, and transition, which lasts 12 hours in primipara and 10 hours in multipara. The World Health Organization (WHO) defines a normal birth as "spontaneous in onset, low-risk at the start of labor, and remaining so throughout labor and delivery." Between 37 and 42 weeks of pregnancy, the newborn is born in the vertex position (WHO, 2023).

According to Ayenew & Zewdu (2020), the use of partograph as a tool is for monitoring maternal and foetal wellbeing during the active phase of labour, and a decision-making aid when abnormalities are detected. In many instances when the tool is not used correctly, bad decisions are taken at the labour ward delaying C-section which leads to many complications unhealthy for pregnant mother and the baby. The effective time to decision making for emergency C-section mostly depends on the progress of monitoring tool partograph to effect. Bad decisions are taken when inaccurate measurement on the tool is violated. The section of this study is to estimate appropriate expected time to effect emergency C-section (not guesses) when the cause of prolong labour or delay in progress of labour occurs. Others will be proper and accurate documentation skill of healthcare professionals on the use of partograph monitoring manual or electronic.

In spite of the standard period set by WHO, which is between 30 – 75 minutes in lower income countries to perform an emergency caesarean section due to weak health system, most physicians delay to partake such process which mostly results in maternal morbidity and mortality. Emergency caesareans are divided into three categories based on speed. This is done so that the babies are born at a time that meets their mother's needs. According to Leslie et al. (2022) there is no deadline for caesarean section III. As long as there is no sudden death to the mother or the baby, arrangements can be made for the mother's labor. This type of C-section is done when the mother's water breaks during the C-section and labor begins.

A 2nd caesarean section takes up to 90 minutes from the decision to deliver the baby, and the reasons why it is necessary are threats to the health of the mother or the baby, such as the death of before the baby is born, etc. conditions or if the process does not progress. It is a sign that the mother's baby is in trouble. A Section 1 (or "Clash") C-section requires the baby to be delivered as soon as possible, no later than 30 minutes after delivery. This may be necessary if the mother's baby is in severe pain, the placenta is bleeding profusely, or it is prolapsed (the baby's umbilical cord may slip before the mother's water breaks).

These are the places where an emergency C-section is necessary in order to provide simultaneous assistance to the mother and child. There are other circumstances or explanations creating delays in the labor ward, even with regard to the established rationale for carrying out such responsibilities. The study will shed additional information on the variables or difficulties that physicians have when deciding whether to perform an emergency C-section on mothers who are in severe pain.

Statement of the Problem

Concerns about the length of labor have become a controversial issue in medicine, as delays in early intervention can lead to various complications, including fetal malformations, uterine contraction problems, cervical stenosis, and cephalopelvic instability. Uterine malformation and cervical dystocia can also cause miscarriage (Wikipedia, 2020).

According to Pierrette (2021), a study of over 120,000 women found that prolonged labor during the second stage, after the cervix dilates to ten centimeters, poses serious risks for both the mother and baby. In the study, mothers experiencing prolonged labor were more likely to suffer from postpartum hemorrhage, obstetric trauma, infections, or a combination of health complications.

The partograph is designed to prevent postpartum hemorrhage, fistula formation, protracted and obstructed labor, maternal and fetal death, and morbidity. However, due to pressure in the labor ward, many labor monitoring procedures involving the partograph are occasionally performed incorrectly.

Lavender & Bernitz (2020) noted in their study that while the partograph is often described as a "simple" tool for monitoring labor, it is, in fact, a complex intervention that requires an enabling environment and effective implementation. Unfortunately, in many cases, neither the environment nor the implementation process has allowed the partograph to reach its full potential. While the partograph should be used routinely for all women, its effectiveness remains a topic of debate, as clinical outcome data are not entirely conclusive. This highlights existing gaps in the proper application of the tool, which is crucial for prompt intervention. In most cases, a skilled doctor or midwife is required to utilize it effectively in the labor ward. Although other medical factors influence appropriate and timely decision-making in labor wards, effective partograph monitoring is fundamental in guiding immediate interventions for prolonged labor.

Markos, Arba, & Paulos (2020) found that the prevalence of partograph use in African countries remains low, despite its affordability and effectiveness in intrapartum labor monitoring. Similarly, studies conducted in North Shoa, Ethiopia, revealed that low partograph utilization was due to the unavailability of preprinted partographs in health facilities, the profession type of healthcare providers, lack of on-the-job training, and poor knowledge and attitudes toward its use (Fantu *et al., 2013*).

Anokye *et al. (2019)* discovered that the use and proper completion of the partograph were significantly associated with a reduced incidence of birth asphyxia in hospitals. This suggests that birth asphyxia could be minimized if midwives consistently used and completed partographs during labor. Similarly, Konlan *et al. (2016)* revealed that while midwives in Ghana are aware of the partograph as a monitoring tool for labor, inadequate knowledge of its proper use and staffing shortages hinder its effective application.

To reduce morbidity and mortality in labor wards, the partograph should be recognized as an essential tool for making timely decisions regarding cesarean sections in prolonged labor. This study aims to emphasize the correct use of the partograph by healthcare professionals, determine when a cesarean section decision is appropriate in cases of prolonged labor, and address overlooked challenges. Furthermore, it highlights the importance of updating traditional labor monitoring methods with active and timely interventions for better maternal and neonatal outcomes.

Rationale of Study

Imagining a reduction in the incidence of morbidities and mortalities in labor wards, in harmony with timely intervention and decision-making for emergency C-sections, would help ensure the well-being of both mother and child while contributing to population growth. More needs to be done in terms of timely decision-making and intervention in labor wards to reduce cases of prolonged labor in maternal and gynecological units. This study aims to educate midwives on the proper use of the partograph as a monitoring tool, enhance clinicians' confidence in making timely decisions to perform emergency C-sections without unnecessary delays, and address fundamental issues related to decision-making in labor wards. Additionally, by contributing to the global effort to reduce maternal mortality to less than 70 per 100,000 live births by 2030 and eliminating 3.2 million deaths among infants and children under five, this research will support the achievement of Sustainable Development Goal (SDG) 3; reducing neonatal mortality to less than 12 per 1,000 live births and under-five mortality to less than 25 per 1,000 live births.

Hypothesis

The hypothesis statement tested by scientific research helps the researcher to know the relation between two or more variables in the experiment or data collection. Subjectively, the study hypothesis employed as follows:

H_0: Biodata factors (parity, gravidity, age, occupation, and environmental factors) are not significantly associated with birth outcomes.

H_0: Education on the proper use of the partograph is not significantly associated with birth outcomes.

H_0: The effectiveness of decision-making time for conducting a cesarean section is not significantly associated with prolonged labor outcomes.

Research Questions

I. What is the appropriate estimated time to effect emergency caesarean section on prolong labour in Kwadaso municipal hospital?

II. What best model fit the factors that influence decision to incision time on delivery?

III. Is there an association with the effective use of partograph on birth outcome in the Kwadaso municipal hospital?

IV. What are the challenges regarding to decision making to conduct caesarean section on prolong labour in the Kwadaso municipal hospital?

General Objective

To determine a specific time period to effect emergency caesarean on prolong labour with the use of monitoring tool partograph among pregnant women at SDA Hospital, Kwadaso.

Specific Objectives

I. To estimate decision to incision time for emergency caesarean section on prolong contraction leading to delay in delivery.

II. To model the factors that influence decision to incision time.

III. To assess the effective use of partograph on birth outcome.

IV. To investigate the challenges regarding to decision making to conduct caesarean section on prolong labour.

Scope of the Study

The scope of a study sets the parameters that will be employed and the extent to which the research field will be studied. This summary summarizes the investigation's topics and focal elements. The study's overall goal is to estimate a compelling time limit for emergency cesarean delivery under prolonged labour monitoring and to identify the problems that contribute to the decision to incision in the labour ward. The population and sample to the study is limited to healthcare providers who conduct delivery only and secondary source information from the partograph tool for delivery. The study was also limited to selection bias as purposively, subjects with planned C-sections were omitted in the selection and for lack of resources to expand to regional level and academic time of submission of the thesis. Based on academic time limitation, the study lasted for a period five-month.

Organization of the Report

The research is divided into several areas including background information, reasons, justifications, hypotheses, research questions and objectives, as well as the scope and organization of the research. The second chapter is a summary of the opinions of various authors who have reviewed their research related to the topic being studied. The research methods utilized to compile the information and resources required for this study, as well as the facilities available for the research, are covered in the third chapter. Data analysis and results discussion are covered in chapter four, and discussion, recommendations, and a conclusion are included in chapter five. Nonetheless, the study report concludes with appendices and references.

LITERATURE REVIEW

Introduction

The previous chapter described the background material and the problem under inquiry, whereas the current chapter provides a literature review for the study. The research terrain is crucial in the theoretical and conceptual framework of the effective period for emergency caesarean section intervention to prolong labor. In this sense, the researcher conducts literature evaluations within a certain conceptual framework in order to situate the study in meaningful and progressive contexts.

Theoretical Review

Prolonged labor, also known as failure to progress, occurs when labor takes longer than expected for a pregnant mother to deliver. This condition can lead to complications such as low oxygen levels for the baby, abnormal heart rhythm, the presence of abnormal substances in the amniotic fluid, and uterine infections (Cleveland, 2023). While variations in labor duration are common among individuals, prolonged labor increases the likelihood of a Cesarean section (C-section). Slow progression can occur at any stage of labor.

The first stage of labor, which lasts approximately 12 hours in primiparous women and 10 hours in multiparous women, consists of three phases: latent, active, and transition. The World Health Organization (WHO) defines normal labor as "the sudden, low-risk onset of labor that continues throughout labor and delivery." Normal labor typically occurs between 37 and 42 weeks of pregnancy, although some babies may present in a breech position during this period (WHO, 2023).

According to an epidemiological report by the WHO, the global rate of C-sections has risen to more than one in five births (21%) and is projected to increase to nearly one-third (29%) of all births by 2030 (WHO, 2021). The WHO recommends a decision-to-delivery time of 30 to 75 minutes, depending on the circumstances (Soltanifar & Russell, 2012).

During labor and delivery, emergency C-sections are commonly performed due to complications such as fetal distress, umbilical cord problems, rupture of membranes (including uterine rupture and placental abruption), and placental insufficiency. Delaying a C-section can result in oxygen deprivation for the baby, leading to severe birth complications such as cerebral palsy, autism, hypoxic-ischemic encephalopathy, brain damage, stillbirth, and even maternal death. Delays in decision-making in labor wards pose significant risks to both mothers and babies, putting their survival at high risk. Implementing an effective, evidence-based predictive model to determine the optimal timing for an emergency C-section could help mitigate these risks.

During the active phase of labor, partographs serve as essential tools for monitoring the health of both the mother and fetus and aiding in decision-making when abnormalities are detected. However, when partographs are not used correctly, poor decisions regarding C-sections and other critical interventions are made in labor wards, endangering both mother and baby. The timing of emergency C-section decisions largely depends on accurate partograph monitoring. Errors in measurement or misinterpretation of the tool can lead to poor clinical decisions, increasing risks for both mother and child.

Definition of the Term 'Labour'

Labor, also known as parturition, marks the end of pregnancy when one or more babies are delivered from a woman's womb (Milton, 2021). Labor is divided into three stages: the contraction and dilation of the uterus, the descent and delivery of the baby, and the expulsion of the placenta. The most noticeable sign of labor is strong contractions that help push the baby through the birth canal. The level of pain experienced during labor varies among women and is influenced by factors such as fear, anxiety, previous birth experiences, cultural beliefs about childbirth, pain tolerance, and the level of support received. Pain during contractions has been described as similar to severe menstrual cramps (Raines & Cooper, 2019). Moaning and controlled breathing techniques may help relieve discomfort, but excessive yelling is generally discouraged. During crowning,

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when the baby's head emerges, women often experience an intense stretching and burning sensation. Even those who initially tolerate labor contractions well tend to have a much stronger reaction during this phase.

The Functioning of the Female Pelvis and the Reproductive Organs

Fidoe (2019) states that the primary function of the female pelvic girdle is to support movement, particularly walking and running, while also allowing for sitting and bending. Compared to men, women have a larger, more rounded pelvis, which is specifically designed to accommodate childbirth. The pelvis acts as a bridge, distributing the weight of the upper body between the legs. As a result, the sacroiliac joint must be strong to support this function. Additionally, when sitting, the pelvis bears weight on the ischial tuberosities. Beyond providing structural support, the pelvis also protects pelvic organs, including the uterus to some extent. The sacrum houses the cauda equina, a bundle of nerves that supply various parts of the pelvis. Due to the natural adaptability of the female pelvis, it facilitates childbirth without significant disruption, as the fetus is proportionate to its dimensions. The pelvis has four bones:

- ❖ two nominate (or hip bones) and
- ❖ one sacrum
- ❖ One coccyx.

Female type pelvis

Source: www.physio-pedia.com/Sacroiliac_Joint

The term: Innominate bones

Each innominate bone consists of three main parts: the ilium, ischium, and pubis. The ilium is the largest and most elongated part. When a person places their hand on their hip, it rests on the iliac crest, which forms the uppermost part of the ilium (Fido, 2013). The anterior superior iliac spine is a prominent point at the front of the iliac crest, while the iliac fossa is the smooth, concave surface on the anterior side of the ilium. The ischium, located on the lower portion of the innominate bone, is thick and sturdy. It features a large ridge known as the ischial tuberosity, which bears the body's weight when sitting. Just above this, the ischial spine is a small bony projection with a slight indentation behind it. During childbirth, the position of the fetal head is assessed in relation to the ischial spine, making it an important anatomical landmark. The pubis, or pubic bone, forms the anterior section of the pelvis. It consists of a body and two bony extensions known as the superior and inferior rami. The symphysis pubis connects the two pubic bones at the front, while the inferior rami join with the ischium to form the pubic arch. Between the body of the pubis, the rami, and the ischium, there is an opening called the obturator foramen, which allows the passage of nerves and blood vessels. The acetabulum, a deep socket in the innominate bone, serves as the articulation point for the head of the femur, forming the hip joint. The lower border of the innominate bone features two distinct curves. The greater sciatic notch, which extends from the posterior iliac spine to the ischial spine, is wide and rounded. Just below it, the lesser sciatic notch lies between the ischial spine and the ischial tuberosity. These notches provide passage for important nerves and muscles in the pelvis.

The term: Sacrum

The sacral promontory is the upper edge of the first sacral vertebra, located immediately ahead. The anterior portion of the sacrum is concave and known as the hollow surface of the sacrum. Laterally, the sacrum expands into a wing or ala. Four pairs of holes, known as foramina, penetrate the sacrum, allowing nerves from the cauda equina to nourish the organs. The posterior is roughened to allow for muscle attachments.

The term: Coccyx and Pelvic joints

- The coccyx is a tail made up of four fused points that are placed inside the triangular bone. Four bones (joints):
- one symphysis pubis
- two sacroiliacs
- one sacrococcygeal joints

The symphysis pubis is the joint where the two pubic bones meet, connected by a cartilage plate (Biga *et al., 2019*). This structure provides stability while allowing slight movement. The sacroiliac joints, among the strongest in the body, connect the sacrum to the ilium, forming a crucial link between the spine and pelvis. Additionally, the sacrococcygeal joint is located where the base of the coccyx meets the tip of the sacrum. Under normal conditions, these joints allow minimal movement. However, during pregnancy, hormonal changes loosen the ligaments, increasing flexibility in the pelvis. This adjustment creates more space for the baby's head to pass through the birth canal. In subsequent pregnancies, the symphysis pubis may partially separate. If the separation becomes excessive, it can limit movement, making walking difficult. The sacrum also exhibits a slight nodding motion, moving forward and backward due to the flexibility of the sacroiliac joints. During childbirth, the sacrococcygeal joint allows the coccyx to bend backward, further aiding the passage of the baby's head.

The term: True pelvis

The true pelvis is the bony canal through which the fetus passes during birth. It is a niche, a hole, and an outlet (Egleton and Kuna, 2021). The rim of the pelvis is round but the sacrum protrudes inwards. The posterior region of the sacrum is formed by the nose and wings, the iliac bones form the lateral regions, and the pubic bones the anterior region, all of which are landmarks at birth.

The term: The Vagina

According to Hirsch (2016), the vagina is the channel through which menstrual flow occurs, receives the penis and ejaculated sperm during intercourse, and serves as the birth canal during childbirth. It extends from the pelvis to the abdomen, passing upward and backward into the pelvis in a course almost parallel to the pelvic floor. Understanding the relationship between the vagina and other organs is essential for accurately assessing pregnant women and ensuring a safe delivery (Moncrieff *et al., 2022*). The urethra and bladder are located in front of the vagina and are closely connected to the anterior vaginal wall. The pouch of Douglas, the perineum, and the body of the perineum are positioned posterior to the vagina, forming about one-third of its posterior wall. The pelvic fascia and ureters, which pass near the cervix, lie on either side of the upper two-thirds of the vagina, while the pelvic muscles are on either side of the lower third. The external genitalia are located below the vagina, and the uterus is positioned above it. The uterus extends at right angles to the upper half of the posterior vaginal wall, measuring approximately 10 cm in length, while the anterior wall is about 7.5 cm. The cervix projects into the upper end of the vagina, forming a circular recess known as the vaginal vault, which consists of four fornices. Because the vagina is attached to the uterus at a higher level posteriorly than anteriorly, the posterior fornix is the largest (McEvoy & Tetrokalashvili, 2020). The lateral fornices are located on either side of the cervix, while the anterior fornix is situated in front of it. The vaginal walls are pink and contain tiny wrinkles called rugae, which allow for expansion during sexual activity and childbirth.

The term: Uterus

The uterus functions as a shelter for the fetus during pregnancy (Myers *et al., 2015*). Each month, it prepares for potential pregnancy, and if conception does not occur, it sheds its lining. The uterus is located in front of the rectum, behind the bladder, and within the pelvic cavity. Anteversion refers to the forward-leaning position of the uterus, while anteflexion describes its forward bending on itself. When a woman is standing, the fundus of the uterus rests on the bladder in an almost horizontal position. The bladder and the uterovesical pouch are located in front of the uterus, while the rectum and the pouch of Douglas are positioned behind it. The ovaries, uterine tubes, and broad ligaments are found on either side of the uterus. The intestines are situated above the uterus, and the vagina lies below it. The pelvic floor supports the uterus, and several ligaments play a crucial role in maintaining its position. During early embryonic development, the female genital tract forms when two ducts arise. The Müllerian (or paramesonephric) ducts merge in the midline to create a Y-shaped structure. The unused portions develop into the fallopian tubes, with their upper ends opening into the abdominal cavity. The lower halves fuse to form the utero-vaginal region, which later develops into the uterus and vagina.

The Term: The Ovarian Cycle

The ovum is positioned at one end of the follicle, surrounded by a small perivitelline space. Encasing this is a group of cells known as the discus proligerus, from which the corona radiata is formed by outwardly radiating cells. The zona pellucida refers to the clear innermost layer of the corona. The follicle is lined with granulosa cells and contains follicular fluid. The external limiting membrane, or outer layer of the follicle, is enclosed by the theca, a region of compact ovarian stroma. Under the influence of luteinizing hormone (LH) and follicle-stimulating hormone (FSH), the Graafian follicle matures and moves toward the surface of the ovary. Ovulation occurs when the follicle enlarges, becomes tense, and eventually ruptures, releasing the ovum into the fimbriated end of the uterine tube, which is positioned beneath the ovary to receive it. Some women experience a mild pain known as "mittelschmerz" during ovulation, possibly due to a small amount of blood leaking into the peritoneal cavity. After ovulation, the follicle collapses, and granulosa cells enlarge and multiply over the next 14 days, giving the structure a yellow appearance and an irregular shape. If pregnancy does not occur, the corpus luteum gradually degenerates into the corpus albicans (white body). Multiple corpus albicans structures in various stages of degeneration can be found within the ovary.

The term: The uterine cycle or menstrual cycle

The average 28-day menstrual cycle lasts from puberty until menopause, excluding pregnancy (Cleveland Clinic, 2022). The start of menstruation occurs on the first day of the cycle. There are three primary stages, which are regulated by ovarian hormones and have an impact on the endometrial tissue shape. The period of menstruation: This stage, which lasts for three to five days, is marked by vaginal bleeding. In terms of physiology, this is the last stage of the menstrual cycle, during which the unfertilized ovum and blood from capillaries are shed along with the endometrium, descending to the basal layer.

The term: Fertilization

Following ovulation, the ovum, which measures approximately 0.15 mm in diameter, travels toward the uterus after entering the uterine tube (Schnatz, 2021). Since the ovum cannot move on its own, it is transported by the cilia and the peristaltic contractions of the tube. During this time, the cervix secretes alkaline mucus, which attracts sperm due to the influence of estrogen. Approximately 300 million sperm are deposited in the vagina during ejaculation. However, the acidic environment of the vagina destroys most of them. Those that survive and reach the cervical mucus continue their journey, but many are lost along the way. Only a few hundred sperm make it to the uterine tube, where they encounter the ovum, usually located in the ampulla. As the sperm travel, they undergo capacitation, a process that enables them to release the enzyme hyaluronidase. This enzyme helps them penetrate the zona pellucida and the ovum's outer membrane. Although a large number of sperm are required for this process, only one ultimately fertilizes the ovum. Once the nuclei of the sperm and ovum fuse, the membrane becomes impermeable to prevent additional sperm from entering. The male and female gametes are sperm and eggs, respectively, and their fusion results in a fertilized egg, known as a zygote. The zygote contains 46 chromosomes half from each parent. Fertilization takes approximately two to three days, and conception usually occurs within 48 hours before or 24 hours after ovulation. Therefore, pregnancy begins about 14 days before the expected start of the next menstrual period.

Development of the fertilized ovum

Once fertilized, the egg travels through the fallopian tube and enters the uterus three to four days later (Rochelle & Adwal, 2021). During this time, it undergoes cell division, first splitting into two cells, then four, eight, sixteen, and so on, eventually forming a cluster of cells called a morula (meaning "berry"). These divisions occur approximately every twelve hours and progress slowly. Following this stage, a blastocyst, a fluid-filled structure, develops. The trophoblast, a single layer of cells surrounding the blastocyst, forms the placenta and chorion, while the inner cell mass at one end of the blastocyst develops into the embryo, amnion, and umbilical cord (Herrick & Bordoni, 2020). As the blastocyst travels, it absorbs nutrients from glycogen secreted by the fallopian tube cells and later from the uterine glands. Upon entering the uterus, the blastocyst remains unattached for two to three days. The trophoblast, particularly the part covering the inner cell mass, becomes highly adhesive and begins to digest the endometrial lining. It releases enzymes that break down endometrial cells, facilitating implantation. This process, known as nidation, is completed by the 11th day after ovulation. Once fully embedded, the endometrium forms a small ridge at the surface, marking the blastocyst’s position (Dix, 2019). During pregnancy, the endometrium is referred to as the decidua. Due to rising hormone levels, it thickens to four times its non-pregnant state. The corpus luteum produces high levels of progesterone, which enhances the secretory activity of the endometrial glands and increases blood vessel dilation. During fertilization, the ovum undergoes unequal divisions. The first division produces a larger cell and a smaller cell called the first polar body. Upon fertilization, a second division occurs, generating a mature ovum and a second polar body. Simultaneously, the first polar body may divide again, creating a third polar body. The zygote forms when the sperm and egg fuse, restoring the complete set of chromosomes. Subsequent cell division occurs through mitosis, ensuring each new cell retains a full chromosome set. Sex determination depends on the sperm’s genetic contribution. The ovum always carries an X chromosome, while sperm can carry either an X or a Y chromosome. If an X-bearing sperm fertilizes the egg, a female fetus (XX) develops; if a Y-bearing sperm fertilizes it, a male fetus (XY) form.

Stages of pregnancy

Pregnancy stages are classified into three stages. A normal and full-term pregnancy can last 37-42 weeks, divided into three months. Every three months 12 to 14 weeks (Nwadike and Galan. 2018).

First Trimester or first stage:

The latent phase occurs before the active first stage of labor and may last 6–8 hours in first-time mothers. During this phase, the cervix dilates from 0 cm to 3–4 cm, and the cervical canal shortens from 3 cm to less than 0.5 cm (Dalal & Purandare, 2018). The active first stage is when cervical dilation progresses more rapidly. This phase begins when the cervix reaches 3–4 cm dilation and, in the presence of rhythmic contractions, continues until full dilation at 10 cm. The transitional phase occurs when the cervix dilates from approximately 8 cm to full dilation. This stage often includes a brief lull in the intensity of uterine contractions before the onset of expulsive contractions during the second stage of labor (Hutchison, Mahdy & Hutchison, 2019).

During the first trimester, the uterus expands to accommodate the growing fetus, even though the pregnancy may not yet be physically apparent. Hormone levels shift significantly in the first few weeks after fertilization. The mother’s heart rate increases, the uterus begins supporting fetal and placental development, and blood flow increases to supply oxygen and nutrients to the fetus. These physiological changes contribute to common pregnancy symptoms such as headaches, constipation, fatigue, and morning sickness. The first trimester is crucial for fetal development (Freeborn, Terrell, & Wojcik, 2019). By the end of the third month, all major organs have formed, making this a critical period. To help prevent neural tube defects, it is essential to maintain a balanced diet rich in folic acid.

Second Trimester:

The second part is the expulsion of the stomach. It starts when the cervix is fully dilated and the woman is able to deliver the baby. It ends when the baby is born. Most pregnant women consider the second stage (weeks 13-27) to be the easiest pregnancy (Tamis, 2015). Most early pregnancy symptoms should subside, you should be more energetic during the day and sleep well at night. When the uterus begins to multiply, the woman's belly looks pregnant. By the end of the second trimester, the fetus will grow almost twice as much as it did at the beginning. A few new symptoms appear, but the complications of early pregnancy should decrease (WHO, 2013). Pregnant women frequently complain of heartburn and leg cramps. A diagnostic test would be conducted during the second trimester, when screening tests are also carried out.

Third Trimester:

The third stage involves the separation and ejection of the placenta and membranes, as well as hemorrhage control (Smith, 2022). It begins with the baby's birth and ends when the placenta and membranes are discharged. The third trimester begins in the 28th week and ends with the fetal's delivery. During the third trimester, the mother (or pregnant woman) begins to attend the institution on a regular basis to contact with the healthcare provider(s). The medical officer will consistently perform or test:

- pregnant woman urine for protein
- check blood pressure
- listen to the fetal heart rate
- measure fundal height (the approximate length of the mother's uterus)
- check hands and legs for any swelling

To track how the mother's body is getting ready for fetal delivery, the in-charge medical officer will also assess the baby's position and examine the cervix.

Spurious labour

Many pregnant women experience contraction before the onset of labour; these may be painful and may even be regular for a time, causing a woman to think that labour has started (Raines & Cooper. 2024). Effacement and cervical dilation are the two characteristics of real labor that are lacking in this instance. It is crucial to understand that the woman is feeling real contractions, which are causing discomfort or even pain, but they are not yet settling into the rhythmic pattern of "true" labor and are not affecting the cervix. The obstetrician and midwife exchange the maternity documents. The obstetrician records the results, the dates of the visits, and any prescriptions written down. At this point, which is the baby's due date, the midwife typically enters the labor summary and preliminary information.

A partogram or partograph chart has gained widespread acceptance in recent years as a useful tool for tracking the progression of labor. It's a chart that allows for the early detection of deviations from the norm since it displays the key characteristics of labor in a graphic format.

Caesarean Section

 Check pregnant woman's urine for protein.

Check blood pressure

listen to the fetal heart rate.

Measure the fundal height (approximate length of the mother's uterus).

 Check hands and legs for swelling.

Cesarean section, C-section, or Cesarean birth is the surgical delivery of a baby through an incision made in the mother's abdomen and uterus (John, 2023). Cesarean section is also a fetal delivery that involves an open abdominal incision (laparotomy) and a uterine incision (hysterotomy). The first known cesarean section happened in 1020 AD, and the procedure has developed significantly since then (Sung, S., & Mahdy, H., 2023). With over a million women undergoing cesarean sections each year, this operation is currently the most common in the United States and Europe.

- Check pregnant woman's urine for protein.
- Check blood pressure
- Listen to the fetal heart rate
- Measure the fundal height (approximate length of the mother's uterus).
- Check hands and legs for swelling.

Cesarean deliveries were 5% in 1970, but had increased to 31.9% in 2016. However, despite continued attempts to reduce the number of cesarean sections, doctors do not expect a significant decrease for another decade or two. A cesarean section may be the safest or only option for some women to give birth to a healthy baby, despite the risks of both short- and long-term repercussions.

Importance of caesarean section

Caesarean section allows the fetus to be delivered surgically when pregnant mother cannot deliver vaginally (Hedwige. 2023). Cesarean delivery is more likely under certain circumstances. Among them are:

Abnormal fetal heart rate

Fetal heart rate during labor is a good indicator of fetal function. Health professionals monitor fetal heart rate during pregnancy and delivery (Ordal et al. 2021). The heart rate ranges from 120 to 160 beats per minute. When the fetal heart rate shows a problem, procedures are performed during delivery. This can help to relieve the mother's pain, increase the amount of water and change the position of the mother during labor, but if it does not improve the speed of the heart, preparation for a caesarean section is scheduled.

Abnormal position of the fetus during birth

- While sometimes a fetus is not in the proper position at birth, the normal posture for the fetus is head-down, facing the mother's back (Jacobson et al. 2022). This increases the difficulty of delivery via the birth canal.
- **Problems with labor**
- labor that is either ineffective or does not advance as it ought to.
- **Size of the fetus**

At times when the baby is too large for to deliver vaginally immediate caesarean section must be provided.

- **Placenta problems**
- Placenta previa is one example of this, where the placenta obstructs the cervix. (Anteruption is the term for premature separation from the fetus.)

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- **Pre-eclampsia/eclampsia condition**

Certain maternal diseases, include diabetes, hypertension, or HIV infection

straightly compelled the healthcare providers to book clients or patients for caesarean section.

- **Active herpes sores in the mother's vagina or cervix**

Twins or other multiples during labour sometimes hesitate the provision of caesarean section.

- **Previous caesarean section**

Other reasons of previous caesarean section provided by healthcare provider may consider a cesarean delivery.

Risks of a caesarean section

Adverse drug reactions, excessive bleeding, abnormal placental separation (particularly in women with a history of cesarean deliveries), bladder or bowel injuries, uterine infection, wound infection, difficulty urinating, and urinary tract infections are potential complications of a cesarean section. Additionally, blood clots and delayed bowel function recovery may occur following the procedure (Hopkins, 2023). A cesarean birth may also impact future deliveries. Whether a woman can have a vaginal birth after a cesarean (VBAC) depends primarily on the type of uterine incision made. A repeat cesarean section is usually necessary if a vertical incision was used, as it is not strong enough to withstand the contractions of labor. The C-section procedure is performed in an operating room or a specialized delivery room. The exact surgical approach may vary depending on the medical condition and the healthcare provider's protocols. Most cesarean sections are performed under spinal or epidural anesthesia, which numbs the body from the waist down while allowing the mother to remain awake to see and hear her newborn.

Definition of the Term 'Partograph'

A partograph is a visual representation of a woman's labor process. It is an essential tool for healthcare professionals, allowing them to quickly detect complications during labor and refer women to the appropriate medical facility for care (Dalal & Purandare, 2018). In developing countries, prolonged labor is a leading cause of maternal and neonatal deaths (WHO, 2023). This is particularly true for women whose pelvis is too small to accommodate the baby's head or when the baby does not progress through the birth canal. Prolonged labor can lead to serious complications such as uterine rupture, dehydration, exhaustion, and miscarriage. According to Laughon et al. (2014), prolonged labor also increases the risk of infection and excessive bleeding in both the mother and the infant. A partograph is a simple chart used to record key information about a laboring woman and her baby, including the progress of labor. This information is crucial for obstetricians in preventing and managing prolonged labor and its complications. In line with World Health Organization (WHO) guidelines, the Maternal and Newborn Health (MNH) program advocates for measures to improve decision-making and labor management. When used correctly, a partograph helps healthcare professionals identify prolonged labor and determine the best course of action. In 2020, an estimated 287,000 maternal deaths occurred worldwide (WHO, 2023). Nearly 95% of these deaths occurred in low- and lower-middle-income countries, primarily in sub-Saharan Africa and South Asia. Many of these deaths could have been prevented with accessible healthcare interventions, including the use of partographs. One of the most effective practices for monitoring labor progression and preventing obstructed and prolonged labor is the partograph. However, cases of obstructed labor still occur in medical facilities due to inadequate intrapartum care. A partograph is a pre-printed chart that provides a graphical representation of a laboring mother's and fetus's condition (Lavender & Bernitz, 2020). It records vital observations, including the mother's vital signs, fetal heart rate, and labor progression. These observations allow for a quick and efficient assessment of labor and help guide clinical decision-making. The partograph serves as a risk assessment tool, aiding in the early detection of labor abnormalities. When properly utilized, it facilitates timely intervention, reducing both maternal and neonatal morbidity and mortality. Documentation on the partograph begins when a woman is in active labor.

The History of the Partograph

The partograph was introduced in the 1950s. Obstetrician Friedman developed the cervicograph to track cervical dilation (Dalal & Purandare, 2018). In 1972, Philpott enhanced the cervicograph by incorporating additional features, creating the partograph a comprehensive tool for documenting all intrapartum data (Usman *et al., 2023*). Philpott introduced alert and action lines to assist in identifying prolonged labor. The Safe Motherhood Initiative adopted the partograph in 1988 as a standardized tool for monitoring labor and preventing complications. After extensive testing to assess its effectiveness, the World Health Organization (WHO) approved its scientific basis in 1994 for preventing prolonged labor (Rahman *et al., 2019*). According to Plotkin et al. (2019), using the partograph reduces the risk of prolonged or obstructed labor and helps detect fetal cardiac anomalies that may lead to intrapartum fetal hypoxia. In 1994, WHO recommended universal use of the partograph. This tool provides a structured approach to tracking labor progression while monitoring both maternal and fetal health. If the mother's health is at risk, labor may need to be halted to protect both her and the baby. Maternal monitoring includes blood pressure measurement to detect pre-eclampsia and eclampsia, pulse rate checks to identify sepsis or dehydration, and temperature assessment to detect infections (Karrar & Hong, 2024). Urine output is also monitored to check for proteinuria and dehydration. Keeping the bladder empty is crucial, as a full bladder can obstruct fetal descent. Fetal monitoring is equally vital. Even if the mother is stable, medical intervention may be necessary if fetal distress is detected. Fetal heart rate (FHR) monitoring helps identify potential oxygen deprivation (hypoxia). If the membranes rupture for an extended period, both the mother and baby are at risk of infection. The color of the amniotic fluid (liquor) can indicate fetal distress. If there are no excessive molding or caput formations, vaginal birth is typically expected. Cervical dilation monitoring assesses labor progression and helps determine whether labor is normal, prolonged, or induced. Prolonged labor increases the risk of postpartum hemorrhage (PPH). The partograph’s alert and action lines aid in evaluating cervical dilation. The alert line, drawn from 4 to 10 cm of dilation, helps distinguish between normal and abnormal labor. Crossing the alert line increases the likelihood of fetal distress and the need for neonatal resuscitation. The action line, plotted four hours to the right of the alert line, indicates slow labor progression, which can lead to complications such as uterine rupture, dehydration, exhaustion, and infections in both mother and baby. Effective contractions are crucial for normal labor progression. Regular monitoring of contractions helps determine whether labor is progressing as expected. If not, interventions such as labor augmentation may be necessary. The presenting part’s ability to descend during contractions is an indicator of cephalopelvic disproportion (CPD), a common cause of labor obstruction. Proper monitoring of fetal descent allows healthcare providers to determine the most appropriate course of action. Once a woman enters active labor, skilled providers regularly chart cervical dilation and fetal descent to assess labor progression and identify necessary interventions. They also document essential details such as fetal heart rate, amniotic fluid color, molding, contraction patterns, and any medications administered. Every printed partograph includes pre-drawn alert and action lines. The alert line is plotted when cervical dilation reaches 4 cm, marking the beginning of the active phase. The expected dilation rate is approximately 1 cm per hour. If labor does not progress as expected, the plot approaches the action line after four hours, signaling the need for medical intervention. When the action line is crossed, appropriate interventions may include vacuum-assisted delivery (if full cervical dilation is achieved), a cesarean section, or the administration of oxytocin to stimulate labor.

Partograph: Its importance

The partograph provides healthcare providers with objective data to guide clinical decisions and improves communication among the team members caring for the mother, enabling timely decision-making (Kanyottu, Karonjo & Karani, 2023). However, without management standards that provide explicit instructions on necessary actions, the partograph may not be very effective. Guidelines are essential in every hospital and healthcare facility to help decision-makers understand the actions to take when a partograph indicates that a woman requires additional care. For example, in peripheral areas, providers may need to refer a woman to a center capable of performing a cesarean section or administering oxytocin augmentation. Protocols should outline when and how to take action, when to make referrals, and how to execute them. Despite the WHO's recommendation to use the partograph to monitor all labors, it remains underutilized in many African countries, including Ghana, and other developing regions (Ayehubizu et al., 2022). In some areas, where it has been implemented without proper training, the partograph is often used merely as a record of labor after delivery rather than as a decision-making tool during labor. Additionally, many qualified healthcare professionals view completing the partograph as a time-consuming task and may not fully understand its potential life-saving benefits. However, when used correctly, the partograph ensures continuous monitoring of labor and helps identify and address potentially fatal complications, such as obstructed labor. To be considered competent, a provider must be able to attend a typical labor, perform vaginal and abdominal examinations to assess cervical dilation and fetal descent, and chart this data. The partograph is widely acknowledged as a critical tool for reducing maternal and neonatal mortality caused by obstructed labor. It also serves as a warning system for potential complications during labor, assisting in decision-making and the ongoing evaluation of interventions (Mathibe-Neke, Lebeko & Motupa, 2013). In developing countries like Ghana, the primary purpose of using the partograph is to prevent maternal and fetal morbidity and mortality due to prolonged labor. In developed countries, the goal is to diagnose and treat dystocia early, ensuring appropriate intervention. The government is promoting the growth of the midwifery workforce through direct training, free maternal healthcare, family planning initiatives, and the repositioning of reproductive and child health workers. A task force focused on safe motherhood is also operational. Proper use of the partograph can increase provider confidence and help reduce the incidence of prolonged labor, cesarean sections, and intrapartum stillbirths.

Indicators on Partograph

The partograph has many features which includes; the name of pregnant mother, gravida, parity, date of admission, time of admission, raptured membrane, foetal hear rate, amniotic fluid, moulding, cervix plot x (cm) which involved alert and action lines with decent of the head (plot 0), contraction per minutes, oxytocin u/l drops/minutes, drugs given and iv fluids, pulse and bp, temperature and urine (protein, acetone, volume).

Observations charted on the Partograph

The advancement of labor involves:

- Cervical enlargement
- Fall of the foetal head
- Frequency and duration of uterine contractions
- State of the fetus
- Heart rate in fetuses
- Alcohol and membranes
- Shape of the developing skull
- State of motherhood
- Heart rate/blood pressure
- The temperature
- Volume, acetone, and protein in urine
- Medications and IV fluids
- Regimen of oxytocin

Starting a Partograph

A partograph should only be initiated during the active phase of labor. Contractions must occur at least once every ten minutes and last a minimum of twenty seconds. Cervical dilation must be at least 4 cm (Dalal & Purandare, 2018). Along the left side of the partograph, there is a graph with numbers ranging from 0 to 10, corresponding to squares, each representing 1 cm of cervical dilation. The bottom of the graph is labeled with numbers from 0 to 24, where each square represents one hour. Cervical dilation is plotted with an "X," and vaginal exams are conducted at the time of admission and every four hours thereafter. The term "descent" is marked on the left side of the graph, with lines ranging from 5 to 0, and is represented by an "O" on the partograph to track the descent of the baby's head. Uterine contractions are recorded every 30 minutes during the active phase. The frequency of contractions refers to how many occur within a ten-minute interval. The duration of each contraction, measured in seconds, is the time from the start to the end of the contraction. After the peak of each contraction, the patient should be positioned in the left lateral position for one minute, or every 15 minutes if contractions are unusual.

Act if there are more than three abnormal observations.

State of liquor record membranes as;

Intact = I

Clear = C

Meconium = M

Absent = A

Blood Stained = B

State of Moulding must be recorded as;

Bones are separated and sutures felt = O

Bones are just touching each other = 1+

Bones are overlapping = 2+

Bones are overlapping severely = 3+

Recorded at the foot of the partograph for oxytocin given, drugs issued, pulse every half hour, bp every 4 hours or more, frequently temperature every 4 hours or more frequently and urine look out for protein, acetone and volume (Thierry, 2023). Identify the cause of delayed progress and take the necessary action if the action line is four hours past the alert line. It is best to take action in an area with easy access to obstetric emergency resources. If both the latent and active phases are normal with the latent phase lasting less than eight hours and the active phase remaining at or to the left of the alert line— avoid adding more oxytocin or taking action unless issues arise. Anorectal malformation (ARM) can be performed at any time during the active phase. If the cervix is not nearly fully dilated, transfer to a hospital capable of performing a cesarean section if the cervix lies between the alert and action lines. ARM can be performed if the membranes are intact. Before transferring the patient to the hospital, observe labor briefly. If the membranes remain intact, proceed with ARM and continue regular observations. A thorough medical evaluation must be conducted at or beyond the active phase action line, considering IV infusion, bladder catheterization, and analgesia. Delivery should be considered in cases of fetal distress or obstruction, and oxytocin may be used to induce labor if there are no contraindications. Supportive therapy should only be administered if adequate progress has been made and cervical dilation is expected to occur at a rate of 1 cm per hour or faster.

Decision-To-Incision Time on Caesarean Delivery

The "30-minute rule," derived from hospital feasibility data collected in the 1980s, asserts that, to preserve favorable neonatal outcomes, the decision-to-incision time for an emergency cesarean delivery should not exceed thirty minutes (Bank, Macones & Sciscione, 2023). However, after a thorough analysis of the historical context, current data on delivery timing and related outcomes, and an evaluation of the rule's viability across various hospital systems, its application and continued use are now being questioned. Additionally, there has been growing support for process-based approaches, standardized terminology for delivery urgency, and a balanced trade-off between maternal safety and delivery speed. A proposed 4-tier uniform delivery urgency classification system has also been developed. Class IV pertains to a planned delivery, which requires further study with a uniform structure for comparison, while Class I addresses a perceived threat to the mother's or fetus's life. The current question is: "Does the so-called 'choice-to-incision' time - the interval between the decision to perform an accelerated cesarean delivery and the initial incision - affect neonatal outcomes?" If so, how long is too long? Many healthcare professionals, hospital systems, patients, and juries are grappling with these questions. In both emergency and non-emergency situations, the optimal time to deliver a baby must strike a balance between maternal safety, resource availability, and evidence-based neonatal outcomes. The "30-minute rule" refers to the widely accepted belief that the best outcomes for newborns occur when an "emergency" cesarean delivery takes less than 30 minutes from the decision to incision. Despite calls to reassess its applicability, this has been established as a "standard of care," with legal and care quality consequences for noncompliance.

History of decision-to-incision time

According to Myers *et al. (1972)*, the first signs of brain injury, indicated by necrosis on autopsy, appeared after 10 minutes in term monkey fetuses that experienced complete hypoxia during surgical delivery due to head envelopment and cord occlusion. Widespread brain damage occurred 16–18 minutes later, and death occurred 25 minutes after the onset of hypoxia. A 1982 article in *Standards for Obstetrics and Gynecology* recommended that any obstetrical service caring for high-risk patients should initiate emergency cesarean deliveries within 15 minutes. This recommendation was partly based on the aforementioned research. Brann et al. (1986) studied two monkey models to detail the pathophysiology of hypoxic-ischemic encephalopathy and its consequences. The first model involved protracted partial asphyxia (similar to incomplete placental abruption), where 50% of newborn monkeys experienced convulsions after just one to two hours of partial hypoxia. Various cerebral lesions were observed in this cohort, including those seen in human infants who die shortly after birth or develop cerebral palsy. In the second model, which involved acute complete hypoxia (similar to cord prolapse), long-term neurologic impairment consistent with spastic quadriplegia was linked to a duration of 8 to 10 minutes. These data again suggested that better newborn outcomes would result from delivery within this time frame.

The advent of the 30-minute rule

In 1987, a historic hospital survey found that most U.S. hospitals could initiate a cesarean delivery in under 30 minutes (Bank, Macones & Sciscione, 2023). This survey was distributed to a random sample of hospitals that performed at least five deliveries per year. Rather than focusing on the duration of "emergency" cesarean deliveries, the study aimed to investigate patterns in cesarean delivery rates and trials of labor after previous cesarean deliveries. The survey assessed the ability to prepare for a cesarean birth in under 30 minutes and evaluated the availability of technology to monitor fetal heart rate and contractions. It also explored whether this timeframe might limit a hospital's ability to offer a trial of labor after a previous cesarean delivery. However, the characteristics of the hospitals in the 88% sample and the specific time ranges that hospitals considered feasible were not disclosed. After the study was published, the earlier recommendation of 15 minutes was extended to 30 minutes. This was proposed as a national norm with the 1988 publication of the *Guidelines for Perinatal Care, Second Edition* and *Standards for Obstetric Services*. Despite a lack of compelling scientific evidence linking the 30-minute rule to improved outcomes, it has been widely adopted as a "standard of care" across hospitals in the United State.

National guidelines

Prior to the early 2010s, the American College of Obstetricians and Gynecologists (ACOG) and the American Association of Pediatrics (AAP) said that hospitals should be able to complete an emergency cesarean delivery in less than 30 minutes. Still, these guidelines have changed. The eighth iteration of the AAP and ACOG-created Guidelines for Perinatal Care, which was published in 2017, makes the following statements:

"Historically, the consensus has been that hospitals need to have the capability of beginning a cesarean delivery within 30 minutes of the decision to operate. However, the scientific evidence to support this threshold is lacking. The decision-to-incision interval should be based on the timing that best incorporates maternal and fetal risks and benefits. It is reasonable to tailor the time to delivery to local circumstances and logistics."

In the UK, the National Health Service (NHS) recommended, as of 2021, categorizing cesarean deliveries into four groups according to the clinical concern: category one(1) deals with an immediate threat to the mother's or fetus's life (e.g., suspected umbilical cord prolapse, persistent fetal bradycardia, major placental abruption, or concern for uterine rupture); category two(2) deals with a non-life-threatening compromise to the mother or fetus; category three(3) calls for delivery even in the absence of maternal or fetal compromise; and category four(4) is for a birth that can be scheduled at the mother's and provider's discretion.

The NHS suggests a decision-to-delivery period of less than 30 minutes for a category 1 cesarean delivery and 75 minutes for a category 2 (2) delivery, albeit cautioning that prompt delivery can be dangerous in certain situations.

Effective Use of Partograph on Birth Outcome

When compared to the composite partograph, the modified partograph significantly improved several intrapartum outcomes, including a lower rate of cesarean sections, longer labor duration, and fewer admissions to the neonatal unit, particularly in resource-limited settings (Dalal & Purandare, 2018). A partograph is often a pre-printed document used to provide a visual summary of labor progress and alert medical staff to any complications with the mother or baby. However, the ideal partograph design for mothers and newborns has not been clearly defined, and it remains uncertain whether partographs should be used at all. Due to the relatively low quality of research, it is unclear whether using a partograph affects the rate of cesarean sections or the incidence of low Apgar scores (a score indicating poor condition) in newborns. Furthermore, partographs may not significantly influence the number of women receiving oxytocin to accelerate labor (moderate-quality evidence) or the length of labor itself (low-quality evidence). There is insufficient evidence to conclude that partographs improve performance or that any specific type is demonstrably superior to another. Nevertheless, the use of partographs has been shown to improve the quality of care for many users or units in both high- and low-income settings. Benefits include ease of recording, a graphical representation of labor progress, and the ability to audit care (Monjok et al., 2014). The partograph also provides objective data that helps healthcare professionals make timely clinical decisions. However, without management protocols offering clear instructions on what actions to take and when, the partograph may not be very effective (Maternal & Neonatal Health, 2002).

Challenges Regarding To Decision Making To Conduct Caesarean Section On Prolong Labour

According to Bam et al. (2021), women's decision-making processes are influenced by multiple factors, including knowledge of the cesarean section process, finances, and family support. Additionally, a lack of support from their spouse, partner, or family members can put the baby's life in danger. These factors are significantly correlated with age, parity, history of previous cesarean sections, and knowledge. Sociocultural and gender norms often restrict women's decision-making ability, leading to delays in seeking medical care and contributing to higher maternal mortality rates.

In the study by Bam et al. (2021), certain African societies involve husbands and mothers-in-law in the decision-making process regarding a woman's pregnancy and delivery. Litorp et al. (2022) found in Tanzania that when decision-making is influenced by family, neighbors, and community beliefs, healthcare providers

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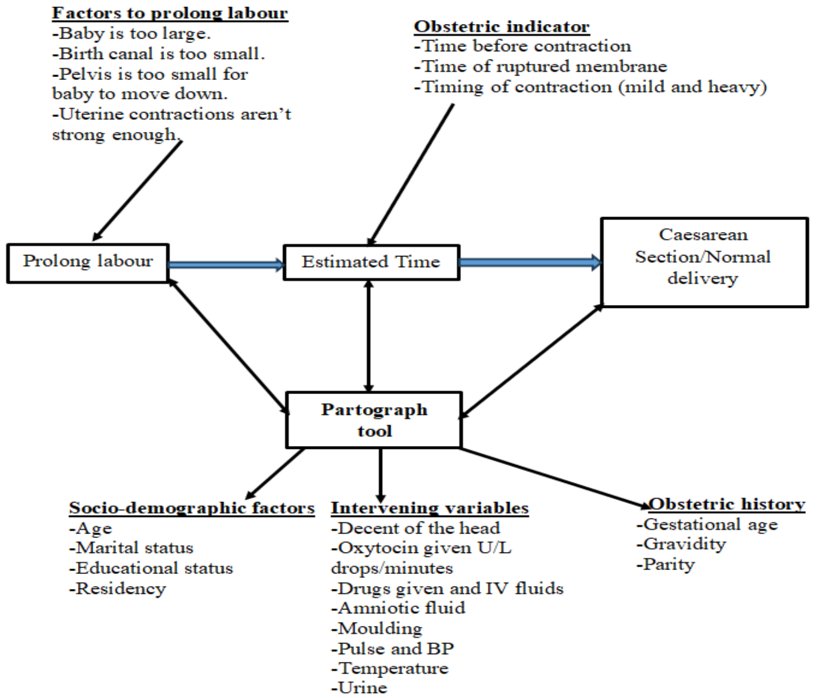
may become frustrated by the potential for women to refuse a cesarean section. Delays in women's decision-making regarding elective cesarean sections for medical reasons must be addressed, as timely cesarean delivery can prevent maternal mortality from obstructed labor and hemorrhage.

Education on Documentation of the Partograph

There is evidence suggesting that appropriately using a partograph to track labor progress can reduce complications related to delivery. However, there is a lack of understanding regarding partograph parameter documentation (Mandiwa & Zamawe, 2017). Inadequate knowledge, attitude, and proficiency in using the partograph are potential causes of subpar midwifery practices, which can lead to unfavorable obstetric outcomes. The partograph serves as a warning system for potential labor complications and assists in decision-making regarding interventions and their ongoing assessment. As mentioned earlier, the partograph is considered one of the interventions that helps reduce maternal and neonatal mortality due to prolonged labor. Proper use of the partograph is crucial for reducing the risk of prolonged labor, improving intrapartum care, and achieving better health outcomes for mothers and newborns in African countries.

Education and accurate documentation of the partograph are essential in reducing neonatal and maternal morbidity. Documentation challenges are a significant issue in service delivery. Often, gaps are left in the partograph, or some healthcare providers complete it after delivery. Education and in-house training are crucial in addressing these issues. According to Mandiwa & Zamawe (2017), poor documentation of vital parameters in partographs, which may indicate inadequate monitoring of labor by healthcare providers, was a significant concern in the study. Contributing factors to poor documentation include the lack of healthcare professionals, the complexity of the partograph, insufficient experience with its use, and a lack of understanding of its significance. Incomplete partographs are also associated with healthcare workers' noncompliance with documentation requirements.

Figure: 2.0: Conceptual framework of Prolong labour, use of partograph and C-section



Source: Authors construct, 2024

Summary of Partograph Documentation

Inadequate completion and recording of partographs by qualified healthcare workers in Ghana remain persistent issues. Proper partograph completion aids in the early detection and management of delivery complications, reducing the incidence of maternal deaths from avoidable causes and, consequently, lowering the maternal mortality ratio. In Ghana, concerns have been raised regarding the substandard documentation of certain partograph parameters by qualified healthcare professionals in public health facilities. The prevalence of improper partograph use, including inaccurate, incomplete, and incorrect documentation, has been linked to several factors, such as the high volume of expectant mothers, congestion in maternity wards, the additional duties of midwives, and the availability of other monitoring tools that also require documentation. Other contributing factors include the mother's condition upon admission, inadequate equipment and supplies, and the limited skill set of midwives. The accuracy and completeness of parameter documentation on the partograph affect its interpretation, the speed of decision-making, and the prioritization of urgent interventions in the labor ward. Therefore, it is crucial that partographs are accurate, correct, and thorough in terms of documentation.

METHODOLOGY

The research techniques utilized to gather data for the study are covered in this chapter. It focuses on the population and sampling, the research design, the facilities available for the study, the methods and processes for gathering data, and the preliminary and additional analysis.

Study Design

A cross-sectional study design was used for the study which helped to obtain the most accurate study outcome. A cross-sectional study is a type of research design where data is collected at a single point in time from multiple distinct individuals. In this design, variables are observed without any manipulation by the researcher (Lauren, 2020). The study will focus on interventions for extended labor, using partographs as monitoring tools, to help Kwadaso Municipal Hospital staff make informed decisions regarding cesarean sections. Quantitative data were primarily used to achieve the study's objectives. Survey data were gathered using partographs completed after delivery as secondary data, alongside respondents' input from questionnaire administration.

Profile of Study Area

Ghana's Ashanti Region is home to the Kwadaso Municipal Assembly. It was a component of the 2018 Assemblies that were formed from the former Kumasi Metropolitan Assembly. The Municipality's administrative capital is Kwadaso, and it was founded by the LI 2292 of 2017 and was inaugurated on March 15, 2018. In 2018, the Municipality is expected to have roughly 251,215 residents, growing at a pace of 2.3 percent. There are 111,911 females and 139,304 males in the overall population. Kwadaso Municipality had 154, 526 residents as of the 2021 housing and population census, giving it a population density of 3,656/km^2. The region's 3% population growth rate is putting strain on the region's meager socioeconomic resources and degrading the Municipality's natural environment. Fertility and the positive net influx of migrants account for the majority of the population's significant increase (GSS, 2021). The Seventh-day Adventist hospital in Kwadaso Municipality is currently the primary referral facility for the municipality whose fundamental principles are responsibility, client-centered care, diligence, discipline, equity, professionalism, honesty, devotion, loyalty, and punctuality. The Christian Health Association of Ghana (CHAG) counts Seventh - day Adventist Health Institution as one of its members. In June 1991, the hospital was founded as a clinic and subsequently became a hospital. The hospital is situated in Ghana's Ashanti Region in the Kwadaso Municipal Assembly. It serves as the referral hospital in the catchment area and receives patients from neighboring districts. Patients also come from other regions to seek healthcare especially in the areas of surgeries concerning specialties. The predominant tribe is Akan especially Asante's with majority groups, followed by Northern tribes. Most of the people are Christians and Muslims with negligible number of Traditionalist. The hospital's mission is to promote, restore, and maintain the physical, mental, social, and spiritual health of individuals, families, and households residing in Ghana through partnerships in training, service delivery, health education, and promotion by a willing, disciplined, highly trained, and motivated workforce. The vision is access to holistic healing, homes and hearts with hope for heaven. The hospital operates with bed capacity of 86 and the services rendered are pharmacy services, physiotherapy, education and Counseling, ophthalmic services, diagnostic services, obstetric and gynecological Services, emergency, ENT, Urology, out-patient and in-patients services, ART Center, pediatric services and surgical services, ambulance services, public health

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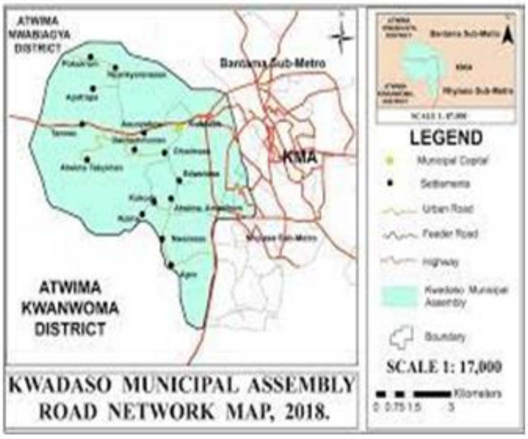
services like family planning, antenatal and postnatal care, child welfare clinic (CWC), immunization, health education, home visit and community outreach. Primary data was collected from these groups in the out-patients department of thehospital.



Source: Ghana statistical service census, 2021

Study Population

The study population involves all labour cases at active first stage who are to deliver in Kwadaso municipal hospital.

Inclusion criteria

All labour cases at active first stage who are being monitored with partograph or an unplanned C-section to determine the outcome of labour.

Exclusion criteria

All planned or booked C-section without the monitoring of partograph.

Study Variables

In research, a variable refers to a person, place, object, or phenomenon that you are attempting to quantify in any way (Al Bistami, 2021). Understanding the distinction between independent and dependent variables helps clarify their significance in terms of what they represent and how they are used. The study variables include the sociodemographic characteristics of the individual being measured, along with other relevant factors. Examples of these variables include the mother's gravidity, parity, admission time and date, fetal heart rate measurements, amniotic fluid and molding, cervical dilation (baby's head position), contractions every 10 minutes, oxytocin dosage (U/L drops/minute), medications administered intravenously, the mother's pulse and blood pressure, temperature, and urine analysis.

Sampling Methods/ Techniques and Sample Size

Researchers may assume they can achieve a representative sample by using their discretion, which could lead to cost and time savings, but it may also introduce bias. The study aims to achieve an optimal sample size by employing a probabilistic sampling process. Fleetwood (2018) defines probability sampling as a method where the researcher uses probability theory to select samples from a larger population. A participant must be chosen at random to be considered part of a probability sample. This statistical technique ensures that every member of the population has a known, non-zero chance of being selected. The key requirement for probability sampling is that each member of the population must have an equal and known chance of being chosen. By applying statistical theory, probability sampling selects a random sample (a small subset) from the population, with the expectation that the sample's responses will align with the population as a whole. Additionally, a systematic sampling method was employed, using identification numbers on the partographs as the reference point or starting point for selecting the partographs used in data collection. Since the number of midwives and doctors was small, no further sampling was needed. The systematic sampling method involves selecting every n^{th} member of the population after a random starting point is chosen (Fleetwood, 2018). This approach was convenient given the pattern of attendance at the hospital. The sample size for this study was estimated using the infinite sample size formula.

$$Sample\ Size = \frac{Z^2 \hat{p}(1-\hat{p})}{\varepsilon^2}$$

Where *n* is the sample size, z is the z-score, p̂ is the estimated population proportion, ε is the error margin (confidence interval)

Sample size, n = $\frac{Z^2\hat{p}(1-\hat{p})}{\varepsilon^2} = \frac{1.96^2(0.5)(1-0.5)}{0.05^2}$

$= \frac{0.9604}{0.0025} = 384.16$

Hence 384 mothers at active phase who used partograph was estimated as sample size for the secondary data. Secondary data is information that has been collected by someone else, often for a purpose other than the current research study (Serra, Martins, & Cunha, 2018). This type of data can be sourced from published reports, academic journals, government records, online databases, and other archival materials. Researchers use secondary data to build on existing knowledge, perform comparative analyses, or support their findings without having to collect new data themselves. Furthermore, all midwives and clinicians were considered for the primary data collection. Primary data is original information collected firsthand by a researcher for a specific study or purpose (Wagh, 2024). This type of data is gathered directly from the source through methods such as surveys, interviews, experiments, or observations. Unlike secondary data, which is obtained from existing sources, primary data is specifically tailored to answer the research question at hand and is considered highly reliable for the intended analysis.

Gamma distribution

The term "gamma distribution" refers to a distribution with two defined parameters that is commonly utilized. Having continuous probability distributions for both the shape parameter and the inverse scale parameter (JU'S Tuition, 2024). The gamma distribution is related to the normal distribution, exponential distribution, chi-square distribution, and Erland distribution. The symbol Γ stands for the gamma function. The gamma distribution contains three parameters: threshold, scale, and shape. Continuous variables with skewed distributions that are always positive have been modeled using gamma distributions. The duration between separate events with regular average time intervals between them, including wait times, insurance claims, rainfalls, etc., is mostly described by the gamma distribution. In oncology, the number of driver events and the interval between them are predicted by the shape and rate parameters, respectively, while the age distribution of cancer incidence frequently follows the gamma distribution. The gamma distribution is commonly employed in the transportation and service sectors to approximate wait and service times. A continuous random variable X follows a gamma distribution with parameters $\theta > 0$ and $\alpha > 0$ if its probability density function is $f(x) = \frac{1}{\Gamma(\alpha)\theta^\alpha} x^{\alpha-1} e^{\frac{-x}{\theta}}$ for $x > 0$

The gamma distribution can be parametrized in terms of a shape parameter $\alpha = k$ and an inverse scale parameter $\beta = \frac{1}{\theta}$ called a rate parameter. A random variable X that is gamma-distribution with shape α and rate β is denoted $X \sim \Gamma(\alpha, \beta) =$ Gamma (α, β). The corresponding probability function in the shape-rate parameterization is; $f(x; \alpha, \beta) = x^{\alpha-1} e^{-\beta x} \beta^\alpha$ for $x > 0$ and $\alpha, \beta > 0$ where $\Gamma(\alpha)$ is the gamma function. ∀ positive integers, $\Gamma(\alpha) = (\alpha - 1)!$

The cumulative distribution function is generalized gamma function;

$F(x;\alpha,\beta)=\int_{o}^{x}(\mu;\alpha,\beta)=\frac{\gamma(\alpha,\beta x)}{\Gamma(\alpha)}$ where $\gamma(\alpha,\beta x)$ is the lower incomplete gamma function. If α is a positive integer.

The mean of gamma distribution is given by the product of its shape and scale parameters $\mu=k\theta$ and $^{\alpha}/_{\beta}$= Mean and Variance $\sigma^2=k\theta^2=\frac{\alpha}{\beta^2}$.

Using $\alpha = average\ time\ (t_1,t_2,t_3\dots t_n) = mild\ contraction$

$\beta = average\ time\ (t_1,t_2,t_3\dots t_n) = strong\ contraction$

Gamma regression models

Assume that Y_i~G(μ_i,α),i=1,...,n, is an n-dimensional random sample. g(μ_i)=η_i= 〖x_i〗 ^' β defines the mean regression structure in gamma regression models with constant shape parameter. Here, β= (β_o,...,β_p)^' represents the vector of mean regression parameters, xi denotes the i-th vector value of the explanatory variables, and η_i is a linear predictor. In this case, the real value function g(.): (0, ∞) 7→R \ is twice differentiable and rigorously monotonic (McCullagh and Nelder, 1989). Common mean link functions in gamma regression include the logarithm function, g(μ) = log(μ); the identity function, g(μ) = μ; and the inverse function, g(μ) = 1/μ. In generalized linear models, the inverse function is the canonical link for the mean. In Cepeda-Cuervo (2001), gamma regression is expanded upon. This proposal uses a regression structure to characterize the form parameter, which is not constant over the observations. Put another way, the mean and shape parameters follow the regression structures given by equations (3) and (4): (3) h(αi) = η2i = z 0 iγ g(μi) = η1i = x 0 iβ (4) where g and h are the appropriate real link functions; γ = (γ0,..., βp) 0 and γ = (γ0,..., γk) 0 are the regression parameter vectors representing the mean and shape, respectively; xi and zi denote the mean and shape explanatory variables for the i-th observation, and 〖η1〗 _i and 〖η2〗 _i are the linear predictors. Within the shape regression framework, a typical link function is the logarithm function.

The method to fit gamma regression model

Using the Fisher scoring algorithm, Cepeda-Cuervo (2001) presents a traditional method for fitting gamma regression models in which the mean and shape parameters follow regression structures. In that paper, he demonstrates how the likelihood function can be expressed in the following manner using the gamma reparameterization provided by (2):

$L(\beta,\gamma)=\prod_{i=1}^{n}\frac{1}{\Gamma(\alpha_i)}\left(\frac{\alpha_i}{\mu_i}\right)^{\alpha_i}{y_i}^{\alpha_i-1}e^{\left(\frac{\alpha_i}{\mu_i}y_i\right)}$ and the log-likelihood function by

$L(\beta,\gamma)=\sum_{i=1}^{n}\{-\log[\Gamma(\alpha_i)]+\alpha_i log\left(\frac{\alpha_i y_i}{\mu_i}\right)-log(y_i)-\left(\frac{\alpha_i}{\mu_i}\right)y_i\}$

Survival analysis-Time to event data (Nelson-Aalen Estimator)

The Nelson-Aalen estimator, which is based on estimating the cumulative hazard function, H(t), using a counting process approach, is an alternative to the Kaplan-Meier method. S(t) can then be estimated using the estimate of H(t). In large samples, the difference between the two approaches' estimates of S(t) will be negligible, but they will always be bigger than the K-M estimate. The survival periods of two or more groups are compared using the log-rank test. To test for a difference in survival groups, a log-rank test is used in this example. The area under the survival function is used to measure the mean time to an occurrence. This estimate is finite if the greatest time is an event time, in which case the survival function goes to zero.

Kaplan–Meier estimator

The Kaplan-Meier estimator, also known as the product limit estimator, is a non-parametric static technique for estimating the survival function using lifetime data. It's often utilized in medical research to evaluate an individual's performance following a certain course of treatment. Kaplan-Meier estimators can be used in a number of sectors, such as determining the length of time that unemployed individuals remain unemployed after being laid off, the amount of time that machines take to break, or the amount of time that juicy fruits remain on plants before being harvested. The survival function estimator

The formula for $\hat{S}(t) = \prod_{i:\, t_1 \le t}\left(1 - \frac{d_i}{n_i}\right)$, where t_i is the time before contraction at which at least one event occurred, d_i is the delivery outcome, such as a caesarean section or spontaneous vaginal delivery at time t_i, and $n_i$is the known individual who underwent a caesarean section or spontaneous vaginal delivery up to time (t). Let τ≥0 be a random variable. We define τ as the amount of time that passes between the beginning of the potential exposure period (t_o) The survival function estimator The formula for S(t) is $\hat{S}(t) = \prod_{i:\, t_1 \le t}\left(1 - \frac{d_i}{n_i}\right)$, where t_i is the time before contraction at which at least one event occurred, $d_i$is the delivery outcome, such as a caesarean section or spontaneous vaginal delivery at time t_i, and $n_i$is the known individual who underwent a caesarean section or spontaneous vaginal delivery up to time t_i. Let $\tau \ge 0$ be a random variable, which we think of as the time that elapses between the start of the possible exposure period, t_o, and the time that an event of interest takes place, t_1:$S(t) = Prob(\tau > t), where\ t = 0,1,\ldots is\ the\ time$. Let $(\tau_1, \ldots, \tau_n \ge 0)$ be independent, identically distributed random variables, whose common distribution is that of τ: τ_j is the random time when some event j happened. The data available for estimating S is not $\left(\tau_j\right)j = 1, n\ but\ the\ list\ of\ pairs\ \left(\left(\widetilde{\tau_j},\ c_j\right)\right) j = 1,\ \ldots, n$ where for $j \in [n] := \{1, 2, \ldots, n\}, c_j \ge 0\ is\ a\ fixed\ determinstic\ interger,$ Censoring time of event j is whether the event happened before the fixed time c_j and if so.

Median survival time

This is the estimated life expectancy for half of the population having a disease or condition. For instance, according to the American Cancer Society (2024), the median survival duration for pancreatic cancer in the US is 11.1 months. This indicates that half of US patients with pancreatic cancer die within 11.1 months after receiving a diagnosis, while the other half die within that time. When describing diseases with a high death rate or bad prognosis, the median survival time is frequently utilized. The survival time mean, X = min (T, t), limited to a specific horizon The restricted mean survival time, or μ, of a random variable T is denoted as t > 0. The restricted mean survival time, μ say, of a random variable T is the mean of the survival time X = min (T, t) limited to some horizon t ∗ > 0. It equals the area under the survival curve S (t) from t = 0 to t = t: $\mu = E(x) = E[min(T, t^*)] = \int_0^{t^*} S(t)dt$. When T is strong or mild contraction per 10 minutes time, we may think of μ as the‘t ∗ delivery expectancy’ either a caesarean or spontaneous vaginal delivery.

Logistics regression

Logistic regression is a popular technique for modeling the outcomes of a categorical dependent variable. It is improper to use linear regression for categorical variables since the answer values are not measured on a ratio scale and the error terms are not normally distributed. Additionally, the linear regression model may predict any real number from negative to positive infinity, whereas a categorical variable can only take on a limited number of discrete values within a specific range. The function used in logistic regression is the logit transform, which takes the natural logarithm of the probability of an event occurring. By reducing the sum of squared variances between the expected and actual values, the least squares approach is utilized in linear regression to estimate parameters. In doing so, a system of N linear equations with 'N' unknown variables in each is being solved. Usually, this is an easy algebraic problem. For the true parameters in a logistic regression, least squares estimation is unable to produce unbiased estimators with a low variance. In its place, maximum likelihood estimation is used to determine the parameters that best fit the data. The logit transforms, or the log-odds of the chance of success, is equivalent to the linear component in the logistic regression model:$log\left(\frac{\pi_i}{1-\pi_i}\right) = \sum_{k=0}^{k} x_{ik}\beta_k \boldsymbol{i}$ = 1, 2, . . . N

Parameter estimation

The goal of logistic regression is to estimate the K+1 unknown parameters. Maximum likelihood estimate is the process of identifying the set of parameters for which the observed data has the biggest probability. The dependent variable's probability distribution is the source of the maximum likelihood equation. Since each yi in the ith population reflects a binomial count, Y's joint probability density function is as follows:

$$f(y|\beta) = \prod_{i=1}^{N} \frac{n!}{y_i!\,(n_i - y_i)!} {\pi_i}^{y_i} (1 - \pi_i)$$

For each population, there are $\binom{n_i}{y_i}$ different ways to arrange y_i successes from among n_i trials. Since the probability of a success for any one of the n_i trials is π_i, the probability of y_i successes is${\pi_i}^{y_i}$. Likewise, the probability of n_i - y_i failures is$(1 - \pi_i)^{n_i - y_i}$. Multinomial logistic regression, like other types of linear regression, predicts the likelihood that observation i will have outcome k in the following manner using a linear predictor function f(k,i):

$$f(k,i) = \beta_{0,k} + \beta_{1,k} x_{1,i} + \beta_{2,k} x_{2,i} + \ldots + \beta_{M,k} x_{M,i+\ \varepsilon_{M,K}}$$

where the regression coefficients c_o,...,β_m represent the relative influence of each explanatory variable on the result. Typically, the model is expressed in the following, more concise form: There is just one vector β, of size m + 1, that contains all of the regression coefficients β0, β1,..., βm. For each data point i, an additional explanatory pseudo-variable called x_0, i is introduced. Its fixed value of 1 corresponds to the intercept coefficient β0. Subsequently, the explanatory variables $x_{0,i,}$ $x_{1,i}$,..., $x_{m,i}$ are integrated into a solitary vector X_i having a magnitude of m + The linear predictor function can therefore be written as follows:where β is the dot product of two vectors, and $f(i) = \beta X_i$

This model characterizes the type of relationship positive or negative, linear or nonlinear—between variables. Currently, the process employed in this section looks into whether things mentioned on the partograph have an impact on the delivery's outcome. To this we try to such the relation between outcome of delivery the items listed on the partograph (arrival time, vital signs, foetal head, contraction, vaginal examination, decent of the head, colour of the liquor, alert time, delivery time). The computations are as follows:

$$Y = \frac{e^{(b_0 + b_1x_1 + b_2x_2 + b_3x_3 + \ldots + b_kx_k)}}{1 + e^{(b_0 + b_1x_1 + b_2x_2 + b_3x_3 + \ldots + b_kx_k)}}$$

$$logit(y) = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + \ldots + b_kx_k$$

Where *Y* = Outcome of delivery (Caesarean Section/Spontaneous vaginal delivery)

b_0 **=** is the constant coefficient which occurs on the *Y* intercept.

b_1= is the independent coefficient variable (arrival time)

b_2 = is the independent coefficient variable (urine)

b_3 = is the independent coefficient variable (vital signs)

b_4= is the independent coefficient variable (fetal head)

b_5= is the independent coefficient variable (contraction time)

b_6= is the independent coefficient variable (vaginal examination)

b_7 = is the independendent coefficient variable (descent of the head)

b_8 = is the independent coefficient variable (colour of the liquor)

b_9 = is the independent coefficient variable (moulding)

b_{10} = is the independent coefficient variable (alert/action time)

b_{11} = is the independent coefficient variable (delivery time)

The independence variables explained

x_1 = arrival time, x_2 = vital signs, x_3 = urine, x_4= foetal head, x_5= contraction per 10minutes, x_6 = vaginal examination, x_7= decent of the head, x_8= colour of the liquor, x_9 = moulding, x_{10} = alert/action time and x_{11} = delivery time.

Definition of the odds

The probability that an event will occur in one group relative to another is known as the odds ratio. Estimates of this ratio derived from samples are also referred to by this word. These groups could be any other dichotomous grouping, such as males and women, experimental and control groups. The odds ratio is as follows if the event's probabilities in each group are p1 (the first group) and p2 (the second group). $\frac{p_1(1-p_1)}{p_2(1-p_2)} = \frac{p_1/q_1}{p_2/q_2} = \frac{p_1 q_2}{p_2 q_1}$; where 1 − px = qx. An odds ratio of one indicates that both groups have an equal risk of encountering the disease or event under study. If the odds ratio is higher than 1, a circumstance or event has a higher probability of happening in the first group. Furthermore, if the odds ratio is less than 1, a condition or event has a lower chance of happening in the first group. The odds ratio must be nonnegative if it is defined. It is undefined if p2 equals zero, that is, if either p2 or q1 equals zero.

Validity/ Credibility and Reliability/ Dependability of Data Collection Tools

When choosing a survey instrument, reliability and validity are crucial considerations (Lani et al, 2013). The degree to which an instrument produces consistent results after several trials is referred to as reliability. The degree to which an instrument measures what it was intended to measure is referred to as its validity. To help lessen the difficulties experienced prior to the major survey, a pilot survey process would be used to test the instrument. After piloting, the instrument's standard was not to be affected by any outside factors.

Data Collection Techniques and Tools

The study used primary and secondary data for analysis. Primary data was gathered from midwives and clinicians who uses partograph for daily monitoring and interventions of labour. A written structured questionnaire was developed through google form application and was used for the primary data collection. A systematic sampling procedure was employed for the secondary data collection and all-inclusive for the primary data since the subject characteristics were not many according to the staff strength involved. The petrographic serial numbers were used as random start which every 9th paper was extracted until final estimated number or sample size was reached. A designed collected tool with needed indicators and variables was used to extract the data. Reference to appendix I.

Data Handling/ Management

Thus, through the administration of questionnaire to caregivers to achieve the total sampling size illustrated, caregivers were briefed about the study, after which permission was sought, and ensured that the staff(s) met the inclusion criteria. Self-administration was not applied much only in cases where staff(s) understanding of the instrument was limited. The duration of the question was a minimum of ten minutes and a maximum of fifteen minutes. Later questionnaires were transformed and sent for further analysis and interpretation. Completeness of responses was checked before transforming the questionnaire from the form to excel sheet. Afterwards data was moved from Excel and coded to IBN SPSS 20.0 version for analysis as well as Stata version 16.0.

Data Analysis

The data analysis was done using SPSS (IBN, version 20.0), Stata version 16.0 and Excel for the preceding preliminary analysis. Excel was used to store the data from google form and later transferred to SPSS and Stata for the analysis. The study was a descriptive analysis with cross-tabulation, application of Poisson distribution and logistics regression to enact the possible best outcome for the study.

Ethical Considerations

First, consideration was given to an introduction letter from the university's department. After being requested to participate, participants were given the opportunity to give their informed consent and accepted it voluntarily. Participants were given a consent form, which they were requested to complete and sign in order to confirm that they understood and were willing to take part in the study. Participants in the research were not subjected to any form of coercion because their participation is voluntary. If answering any of the questions made them uncomfortable, participants were told they may opt out of the study or quit altogether. The study's confidentiality was established prior to data collection. Participants received guarantees that no one would receive their information, and that the research would not use their names or identities. Information disposal was taken into consideration as soon as the institution accepted the job.

Assumptions

Since the sample size is inclusive of all members or subjects, it will fairly represent the entire population, allowing the conclusions of this study to be applied to the general community. Additionally, effective time estimation may be employed for efficient emergency cesarean procedures in cases of prolonged labor.

RESULT

Introduction

The researcher examines the data in this chapter in order to determine the fundamental characteristics of the study's variables. This calls for the use of exploratory analysis together with other standard exploratory methods. Microsoft Excel and SPSS-STEP BY STEP are the statistical programs utilized. This chapter would present the study's findings.

Decision to Incision Time for Delivery

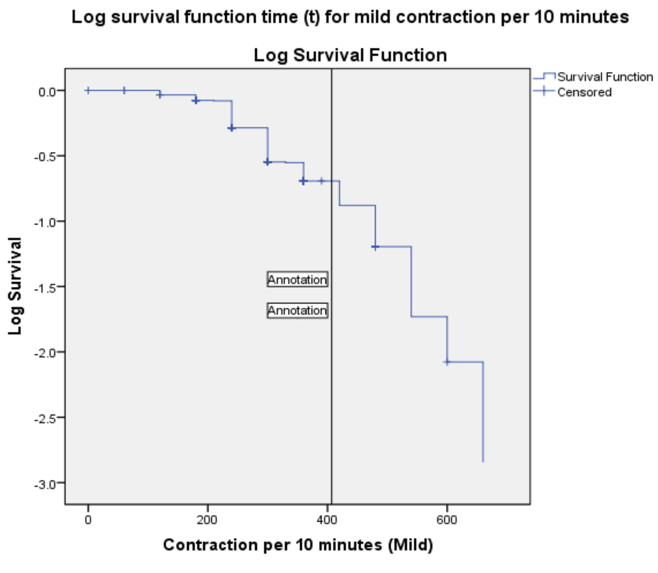


Figure 4.1.0: Log survival function for mild contraction time

Source: Survey data, 2024

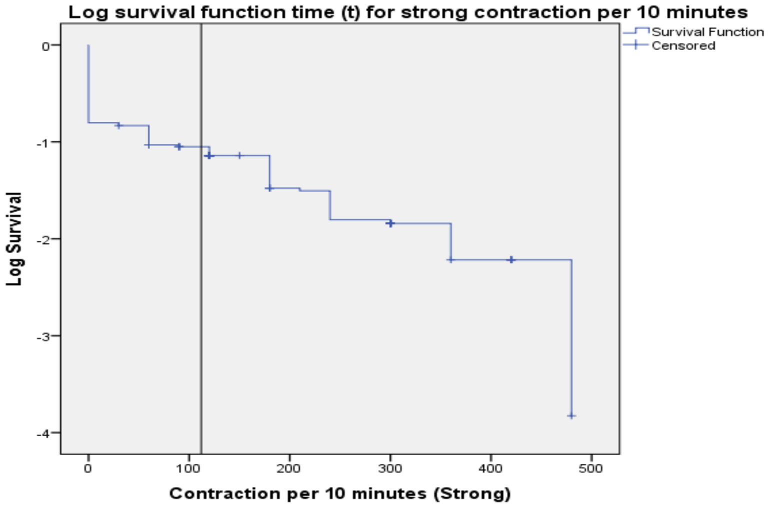


Figure 4.1.1: Log survival function for strong contraction time

The log-rank test indicates a significant difference between the survival curves. The log survival function for mild and strong contractions timed every 10 minutes illustrates the log rate at which mild or strong contractions should occur in order to avoid exceeding the estimated time frame for cesarean delivery (C/S) or spontaneous vaginal delivery (SVD). As shown in Figure 4.1.0, considering the censored time (log-scale = -0.75), this corresponds to an estimated mild contraction time of 407 minutes. This indicates the estimated time to decide whether to proceed with a prolonged case to incision. Exceeding this estimated time may lead to pain, fetal distress, and other complications due to the condition's progression. Figure 4.1.1 illustrates the estimated time frame for strong contractions, with a censored time limit around 112 minutes. This is considered the constant time for strong contractions. A strong contraction lasting around 112 minutes is expected to lead to spontaneous vaginal delivery (SVD). Any time beyond this limit would result in fluctuations between strong and mild contractions, leading to pain, fetal distress, and other related complications depending on the current state of pregnancy. According to Figure 4.1.2, the active phase (time before contraction) demonstrates the time of admission using 6:00 AM as the baseline. The estimated time is 782.566 minutes, which corresponds to 13 hours and 1 minute from the onset of 6:00 AM. This suggests that mild or strong contractions may set in around 8:00 PM, marking the second stage of labor. If a pregnant woman arrives for delivery at 6:00 AM, the expected time for contractions to begin would be 8:00 PM, indicating 13 hours and 5 minutes from the onset.

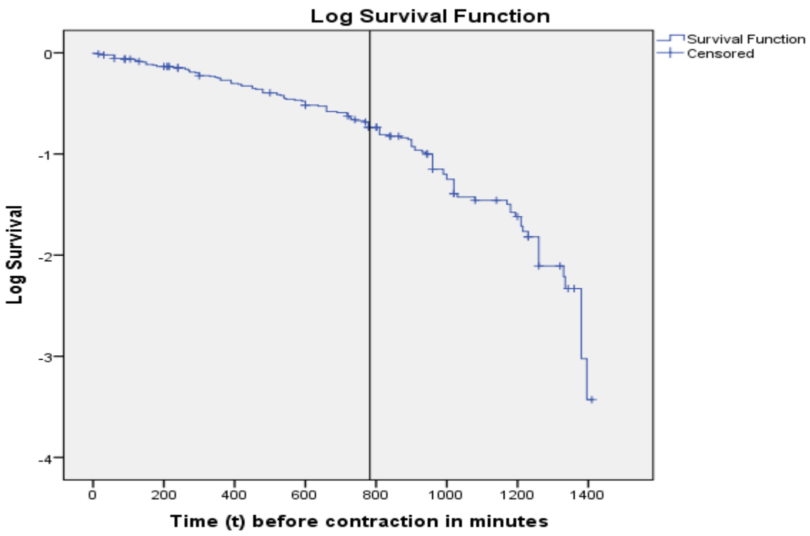


Figure 4.1.2: Log survival function for time before contraction

Source: Survey data, 2024

Means and Medians for Survival Time on Mild Contraction

Table 4.2.0 presents the explanatory table for the survival median estimated time for mild contractions every 10 minutes. The findings in Table 4.7.1 indicate that an estimated time of 450.780 minutes, or approximately 7 hours and 5 minutes, is required to decide on cesarean delivery. The lower boundary time frame is 6 hours and 5 minutes, while the upper boundary limit for making the decision is 7 hours and 5 minutes.

Table 4.2.0: Means and Medians for Survival Time on Mild Contraction

Mean[a]				Median			
Estimate	Std. Error	95% Confidence Interval		Estimate	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound			Lower Bound	Upper Bound
407.835	9.033	390.130	425.539	420.000	15.704	389.220	450.780
a. Estimation is limited to the largest survival time if it is censored.							

Source: Survey data, 2024

Means and Medians for Survival Time on Strong Contraction

Table 4.2.1 presents the estimated time frame for strong contractions per minute. The findings show that an estimated time of 112.811 minutes, approximately 1 hour and 53 minutes, is needed for a spontaneous vaginal delivery based on regular strong contractions. The lower boundary starts at around 94.487 minutes, and the upper boundary is 131.406 minutes, which is approximately 1 hour 34 minutes to 2 hours, for a spontaneous vaginal delivery.

Table 4.2.1: Means and Medians for Survival Time on Strong Contraction

Mean[a]				Median			
Estimate	Std. Error	95% Confidence Interval		Estimate	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound			Lower Bound	Upper Bound
126.229	13.615	108.544	134.915	112.811	9.487	106.487	131.214
a. Estimation is limited to the largest survival time if it is censored.							

Source: Survey data, 2024

Means and Medians for Survival Time on Time Before Contraction

The estimated median time before contractions is 810 minutes, or 13 hours and 5 minutes, from the onset of 6:00 am, according to Table 4.2.2. This indicates that when a pregnant mother reports for admission at 6:00 am, the estimated time before mild or strong contractions begin is 8:00pm, making it a total of 13 hours of predicted time in preparation for delivery.

Table 4.2.2: Means and Medians for Survival Time on Time Before Contraction

Mean[a]			Median		
Estimat	Std.	95% Confidence Interval	Estimate	Std.	95% Confidence Interval

e	Error	Lower Bound	Upper Bound		Error	Lower Bound	Upper Bound
782.566	21.694	740.047	825.086	810.000	34.819	741.754	878.246
a. Estimation is limited to the largest survival time if it is censored.							

Source: Survey data, 2024

Gamma Distribution of Estimated Incision Time

According to Table 4.3.1, which presents a comparative approach based on dependent and independent variables, the dependent variable (time before contraction) and the independent variables (time in minutes, outcome of delivery, fetal heart rate, contractions per 10 minutes [mild/strong], descent of the head, ruptured membranes, and oxytocin dosage in U/L drops) were analyzed for their effects on the outcome. From Table 4.3.1, it was observed that 92 cases (76.0%) showed no descent of the head, indicating the likelihood of a cesarean delivery. Additionally, 343 cases (89.6%) had intact membranes, suggesting prolonged labor that could lead to a cesarean section, regardless of whether the contractions were strong or mild. In cases where no oxytocin was given, 211 (55.1%) indicated prolonged labor, which also pointed to the need for a cesarean section. On the other hand, 172 cases (44.9%) where oxytocin was administered demonstrated augmented labor, indicating that a spontaneous vaginal delivery was more likely. As a result, the outcome of a cesarean section occurred in 293 cases (76.5%) out of 383 selective cases.

Table 4.3.1: Descriptive of Categorical Variable Information

Variable		**N**	**Percent**
Head descending	Descending	92	24.0%
	Not descending	291	76.0%
	Total	383	100.0%
Raptured membranes/hours	Raptured	40	10.4%
	Intact	343	89.6%
	Total	383	100.0%
Oxytocin U/L	No Oxytocin given	211	55.1%
	Oxytocin given	172	44.9%
	Total	383	100.0%
Outcome of delivery	Normal (SVD)	90	23.5%
	Caesarean Section	293	76.5%
	Total	383	100.0%

Source: Survey data, 2024

Descriptives on Continuous Variable Information

From Table 4.3.2, the minimum time before contraction was 10 minutes, while the maximum time was 1420 minutes. The average time before contraction was estimated to be 694.5 minutes, which is 11 hours and 5 minutes from the 6:00 am onset. This indicates that if a patient reports at 6:00 am, the average expected time for contractions to begin would be 5:00 pm in the evening. For mild contractions occurring every 10 minutes, the maximum time was 720 minutes, and the average time was 357 minutes, or 6 hours. For strong contractions occurring every 10 minutes, the maximum time was 480 minutes, while the average contraction time was 65 minutes, or 1 hour.

Table 4.3.2: Descriptives on Continuous Variable Information

Variable		N	Minimum	Maximum	Mean	Std. Deviation
Dependent Variable	Time (t) before contraction in minutes	383	10	1420	694.56	396.145
Covariate	Foetal heart rate	383	110	182	140.50	7.743
	Contraction per 10 minutes (Mild)	383	0	720	357.10	152.812
	Contraction per 10 minutes (Strong)	383	0	480	65.72	103.958

Source: Survey data, 2024

Table 4.3.3: Omnibus Test[a]

Likelihood Ratio Chi-Square	df	Sig.
21.451	7	.003

Source: Survey data, 2024

Tests of Model Effects

Table 4.3.4 presents the test results for the model effects. The findings show that head descent is statistically significant (sig. value = 0.008 < α = 0.05). Ruptured membranes also show statistical significance (sig. value = 0.003 < α = 0.05), and oxytocin administration is statistically significant as well (sig. value = 0.032 < α = 0.05). The outcome of delivery is statistically significant (sig. value = 0.009 < α = 0.05), while the contraction times for mild and strong contractions show statistical insignificance (sig. value = 0.335 < α = 0.05 and sig. value = 0.099 < α = 0.05, respectively).

Table 4.3.4: Tests of Model Effects

Source	Type III		
	Wald Chi-Square	df	Sig.
(Intercept)	88.103	1	.000
Head Descending	7.028	1	.008
Raptured membrane	8.679	1	.003
Oxytocin	4.596	1	.032
Outcome	6.772	1	.009

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Foetal_heart_rate	.034	1	.854
Contraction (Mild)	.930	1	.335
Contraction (Strong)	2.721	1	.099

Source: Survey data, 2024

From the table 4.3.5, the model right:

$$Time\ before\ contraction = 6.421 - 1.297 descent\ of\ the\ head + 0.383 raptured\ membrane$$

$$-0.166 oxytocin + 1.275 outcome\ of\ delivery + 0.001 foetal\ heart\ rate + 0.000 mild\ contraction - 0.001 strong\ contraction$$

This is a gamma regression model estimated based on the variables in session.

Gamma regression model

Now the new model writes: $Time\ before\ contraction = 6.421 - 1.297 descent\ of\ the\ head + 0.383 raptured\ membrane - 0.166 oxytocin + 1.275 outcome\ of\ delivery$.

Hence, the gamma model clearly indicates that for contraction time leading to the delivery outcome, head descent, rupture of membranes, and oxytocin administration are essential in terms of incision time to delivery. Refer to Table 4.3.5.

Table 4.3.5: Gamma regression parameters

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	6.421	.7140	5.022	7.821	80.873	1	.000
Head Descending	-1.297	.4893	-2.256	-.338	7.028	1	.008
Raptured membrane	.383	.1301	.128	.638	8.679	1	.003
Oxytocin	-.166	.0773	-.317	-.014	4.596	1	.032
Outcome	1.275	.4900	.315	2.236	6.772	1	.009
Foetal_heart_rate	.001	.0049	-.009	.011	.034	1	.854
Contraction Mild	.000	.0003	.000	.001	.930	1	.335
Contraction Strong	-.001	.0004	-.001	.000	2.721	1	.099
(Scale)	.504[b]	.0338	.442	.574			

Source: Survey data, 2024

Effective Use Of Partograph On Birth Outcome

Findings on table 4.4.0 indicates logistics regression coefficients based on estimated variables on the partograph. This output signifies the model for effective use of partograph based on proper documentation. The result explains;

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Table 4.4.0: Logistics Regression on Effective Use of Partograph on Birth Outcome

Variable	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Gravidae	.033	.263	.016	1	.899	1.034	.617	1.731
Paraity	-1.207	1.495	.652	1	.419	.299	.016	5.603
Date_Admin	-37.646	27392.420	.000	1	.999	.000	.000	.
Time_Admin	39.486	27392.420	.000	1	.999	14075377194032292 8.000	.000	.
Rept_Memb	19.898	19369.358	.000	1	.999	437985084.492	.000	.
Amniotic_fluid	-20.555	19369.358	.000	1	.999	.000	.000	.
Descent_head	1.640	.330	24.767	1	.000	5.155	2.702	9.834
Contractn	-.003	.344	.000	1	.994	.997	.508	1.956
Oxy	.115	.419	.075	1	.784	1.122	.493	2.552
Drugs_IV	.360	.405	.792	1	.374	1.433	.649	3.168
Pulse_BP	.307	.374	.676	1	.411	1.360	.654	2.829
Temp	-.388	.408	.908	1	.341	.678	.305	1.508
Urine	-.188	.310	.367	1	.545	.829	.452	1.521
Foetal_Heart	-.023	.246	.009	1	.926	.978	.604	1.583
Constant	-.251	.385	.426	1	.514	.778		

Source: Survey data, 2024

Note: Outcome of delivery = Caesarean section (C/S) =1; or Spontaneous vaginal delivery (SVD) = 0 as coded.

The logit model (Logistics regression):

$$logit(\text{Outcome of delivery CS}) = -0.251 + 0.033\text{gravidae} - 1.207\text{parity} - 37.646\text{date of admission} + 39.486\text{time of admission} + 19.898\text{raptured membrane} - 20.555\text{amniotic fluid} + 1.640\text{decent of head} - 0.003\text{contaction per 10minutes} - 0.115\text{oxytocin} + .360\text{drugs and ivfluids} + 0.307\text{pulse and bp} - 0.388\text{temperature} - 0.188\text{urin} - 0.023\text{foetal heart rate}$$

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Log – Likelihood Summary

The model with higher log – likelihood value means that its variables are better fit to the model than the one with a lower log – likelihood value. In one way, we can say that the log – likelihood value tells us how significant the values of co-efficient in our model are. A good model is one that results in a high likelihood of the observed results. A -2log likelihood of (380.973> p=0.05) indicates that certainly the model variables indicated are better and fits well for the model. Therefore, using the variables in the model indicate that we are 95.0% confidence certain that the model generated will fit well. Furthermore, Nagelkerke R Square of 0.139 indicates a weak relationship between the predictors and the outcome.

Table 4.4.1: Model Summary Of Log Likelihood

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	380.973[a]	.092	.139

Source: Survey data, 2024

The model shows statistically significant with chi-square value 37.210 > t_b=22.362 and the (p = 0.05 > sig.value = 0.000). Hence the model stands.

Table 4.4.2: Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	37.210	13	.000
	Block	37.210	13	.000
	Model	37.210	13	.000

Source: Survey data, 2024

Testing the Validity of the Model

To assess the validity of the logit model, we put forth the following hypothesis: b0 = b2 = b3 = b4 = b5 = b6 = b7 = b8 = b9 = b10 = b11 =... bk = 0 is the hypothesis. H1: The sum of all b1s equals 0. where Ho is the null hypothesis and H1 is the alternative hypothesis. If the null hypothesis is true, then the model is incorrect since there is no linear relationship between Y and any of the independent variables, x1 x2... xk. If at least one of the b1 numbers is not zero, then the model dose has some validity.

Interpreting the Coefficients

The coefficients b0, b1, b2 . . . bk described the relationship between each of the independent variables and the dependent variable in the sample.

Intercept

b_0 = - 0.251 is the intercept. When all independent variables are set to 0, this is the expected type of delivery (caesarean section/normal delivery). It also indicates that, with all other variables in the model held constant, we would anticipate a 0.251 decrease in the log-odds of caesarean section or normal delivery for every unit increase.

Parity

The relationship between caesarean delivery/normal delivery and parity of pregnant women on labour is described as b_1 = -1.207. From this number we can say that we expect a 1.2 unit decrease in the log-odds of caesarean/normal delivery with every one-unit increase in parity with all other variables held constant.

Gravidae

The relationship between caesarean section/normal delivery and gravidae checked is described by b_2 = 0.033, which we interpret to mean that for each additional unit increase in gravidae recorded will lead to an increase in log-odds of caesarean/normal delivery by 3.3% when the other variables are hold constant.

Date of Admission

The coefficient b_3 = -37.646 specifies that for each additional unit, there will be a cause of 37.646 decrease in log-odds of caesarean section/normal delivery assuming the constancy of the other independent variables.

Time of Admission

The relationship between caesarean section/normal delivery and time of admission is described by b_4 = 39.486, which we interpret to mean that for each additional unit increase in time of admission checked will lead to an increase in log-odds of caesarean section/normal delivery by 39% when the other variables are hold constant.

Raptured membrane

The next variable is the raptured of membrane and its relationship with the caesarean/normal delivery turns out to be b_5 = 19.898 and its indicates that an extra unit increase in membrane raptured will lead to a log-odds increase in caesarean/normal delivery by 19%.

Amniotic fluid

The coefficient for colour of the liquor is b_6 -20.555 and it means that we would expect a 20.6 unit decrease in the log-odds of caesarean/normal delivery for every one-unit decrease in amniotic fluid recordings, holding all other variables constant in the model.

Descent of the head

The next variable is the descent of the head, and its relationship with cesarean section/normal delivery appears to have b7 = 1.640. This indicates that an extra unit increase in the descent of the head will lead to a log-odds increase in cesarean/normal delivery by 1.640.

Contraction per 10 minutes

The relationship between contraction per 10 minutes and caesarean section/normal delivery is described as b_8 = -0.003. For each additional decrease in contraction will cause an average decrease in log-odds caesarean section/normal delivery by 0.3%, holding all other variables constant.

Oxytocin

The next variable is the oxytocin given in u/l drops/min and its relationship with the caesarean/normal delivery appears to have b_9 = 1.640 and its indicates that an extra unit increase in a decent of head will lead to a log-odds increase in caesarean/normal delivery by 1.640.

Drugs and IV given

The link between caesarean/normal delivery and drugs/IVs given checked is described by b_{10} = 0.36, which we interpret to mean that for each additional unit increase in drugs given checked will lead to an increase in log-odds of caesarean/normal delivery by 36% when the other variables are held constant.

Pulse and BP checked

The relationship between caesarean/normal delivery and pulse/BP checked is described by b_{11} = -0.307, which we interpret to mean that for each additional unit decrease in pulse and bp checked of pregnant mother will lead to a decrease in log-odds of caesarean/normal delivery by 30.7% when the other variables are held constant.

Temperature

The relationship between caesarean section/normal delivery and temperature checked is described by b_{12} = -0.388, which we interpret to mean that for each additional unit decrease in foetal heart rate checked will lead to a decrease in log-odds of caesarean section/normal delivery by 38% when the other variables are held constant.

Urine checked for (protein, acetone and volume)

The relationship between Urine checked and caesarean section/normal delivery is expressed by b_{13} = -0.188. We interpreted this number as a units decrease in urine checked will cause an average decrease in the caesarean section/normal delivery by 0.18% assuming when the other variables are held constant.

Fetal heart rate

The relationship between caesarean section/normal delivery and fetal heart checked is described by b_{14} = -0.023, which we interpret to mean that for each additional unit decrease in fetal heart rate checked will lead to a decrease in log-odds of caesarean section/normal delivery by 2.3% when the other variables are held constant.

Testing the Coefficients

At this point, the goal is to evaluate whether the logit model's linear relationship between x and y can be inferred from the available data. The null and alternative hypotheses were:

H_o: $b_1 = 0$

H_1: $b_1 \neq 0$

(for i = 1, 2, . . ., k); the test statistics is given by:

$$z = \frac{\bar{x}-\mu}{s/\sqrt{n}}\ ,\ z = \frac{\hat{P} - P_o}{\sqrt{P_o(1-P_o)/n}}$$

which is the students z distributed with $n(1 - p_o)$ degrees of freedom.

Test of b_1 (Gravidae/Gravidity)

The probability value, p-value (sig-value) = 0. 899 > critical value $\alpha = 0.05$. Comparing the p-value = 0. 899 to $\alpha = 0.05$, we fail to reject the null hypothesis and conclude that there is enough evidence to infer that, the recording of gravidity on the partograph and the type of delivery are not linearly related.

Test of b_2 (Parity)

The probability value, p-value (sig-value) = 0. 419 > critical value $\alpha = 0.05$, **c**omparing the p-value = 0. 419 to $\alpha = 0.05$, we fail to reject the null hypothesis and conclude that there is enough evidence to infer that, the recording of parity on the partograph and the type of delivery are not linearly related.

Test of b_3 (Date of admission)

The probability value, p-value (sig-value) = 0. 999 > critical value $\alpha = 0.05$. Comparing the p-value = 0. 999 to $\alpha = 0.05$, we fail to reject the null hypothesis and conclude that there is enough evidence to infer that date of admission on the partograph and the type of delivery are not linearly related.

Test of b_4 (Raptured membrane)

The probability value, p-value (sig-value) = 0. 999 > critical value $\alpha = 0.05$. Comparing the p-value = 0.999 to $\alpha = 0.05$; there is enough evidence to conclude that the raptured membrane recorded and the outcome of delivery are not linearly related.

Test of b_5 (Amniotic fluid)

The probability value, p-value (sig-value) = 0. 999 > critical value $\alpha = 0.05$. Comparing the p-value = 0.999 to $\alpha = 0.05$; there is enough evidence to conclude that the amniotic fluid recorded and the outcome of delivery are not linearly related.

Test of b_6 (Descent of head)

P-value (sig-value) = 0.000 < critical value α = 0.05 represents the probability value. By comparing the p-value of 0.000 with α=0.05, it can be concluded that there is a linear relationship between the head's descent and the delivery outcome.

Test of b_7 (contraction per 10 minutes)

The critical value α=0.05 is greater than the probability value, p-value (sig-value) = 0. 994. Based on a comparison between α=0.05 and p-value = 0.994, it may be concluded that there is not a linear relationship between the outcome of delivery and the number of contractions per 10 minutes.

Test of b_8 (Oxytocin U/L drops/minutes)

P-value (sig-value) = 0.784 > critical value α = 0.05 represents the probability value. By comparing the p-value of 0.784 with α=0.05, it can be concluded that there is insufficient data to suggest a linear correlation between the delivery outcome and oxytocin U/L drops/minutes.

Test of b_9 (Drugs given and IV. fluids)

For medications and IV fluid, the probability value, or p-value (sig-value), is 0.374 > critical value, or α = 0.05. Based on a comparison of the p-value of 0.374 with α = 0.05, it is not possible to conclude that there is a linear correlation between the medications administered, the IV fluids recorded, and the delivery outcome.

Test of b_{10} (Pulse and BP)

For medications and IV fluid, the probability value, or p-value (sig-value), is 0.411 > critical value, or α = 0.05. When comparing the p-value of 0.411 to α=0.05, it is not possible to conclude that the recorded blood pressure (BP) and the delivery outcome are linearly correlated.

Test of b_{11} (Temperature)

For medications and IV fluid, the probability value, or p-value (sig-value), is 0.341 > critical value, or α = 0.05. Based on a comparison of the p-value of 0.341 with α=0.05, it is not possible to conclude that the temperature recorded and the delivery outcome are linearly correlated.

Test of b_{12} (Urine-protein, acetone and volume)

The probability value, also known as the p-value (sig-value), for drugs and IV fluid is 0.545 > critical value, or α = 0.05. It is clear that there is not enough information to support a linear link between the recorded urine and the delivery outcome when comparing the p-value of 0.545 to α=0.05.

Test of b_{13} (Fetal heart rate)

For medications and IV fluid, the probability value, or p-value (sig-value), is 0.926 > critical value, or α = 0.05. When comparing the p-value of 0.926 to α=0.05, it is not possible to conclude that the recorded fetal heart rate and the birth outcome are linearly correlated.

Model Summary

Based on the analysis of the independent variables compared to the dependent variable, we observe that the descent of the head is linearly dependent on the outcome of delivery. This indicates that the descent of the head plot is more frequently recorded on the partograph, meaning it is crucial to document the descent of the head in pregnant women. This factor will help decide whether the mother will undergo a cesarean section or spontaneous vaginal delivery, depending on the occurrence of contractions. With a strong significant value of (sig.fig = 0.000) against the alpha-value ($\alpha = 0.05$) and an odds ratio of 0.765 (76%), this indicates that when properly recorded on the partograph, it affects the likelihood of either spontaneous vaginal delivery or cesarean section. Additionally, we can strongly conclude that all variables on the partograph are vital and necessary when completing or documenting the partograph during delivery. Although gaps may be left on the partograph during labor, it is important to always include the descent of the head, as it determines whether the delivery will be spontaneous vaginal delivery or cesarean section. The new logit model is formulated as: logit (Outcome of delivery) = -0.251 + 1.640(descent of head). This underscores the necessity of accurately recording all variables on the partograph, as incomplete documentation can affect the determination of whether the delivery will be spontaneous vaginal delivery or cesarean section.

Challenges Regarding To Decision Making To Conduct Casesarean Section On Prolong Labour

Sociodemographic Information Of Respondents

A person's sociodemographic characteristics, such as their socioeconomic status, which is often determined by education level, occupation, and income, form their sociodemographic profile. In other words, when discussing sociodemographics, we are referring to various social and demographic traits that help identify commonalities among group members. Out of the 54 (100%) respondents selected for the study, a significant majority were female-50 (92.6%)-while 4 (7.4%) were male, as shown in Table 4.5.1. The majority were married, 37 (68.3%), while 17 (31.5%) were unmarried. In terms of age, 23 (42.6%) respondents were in the 30–39 years category, followed by 20–29 years. Regarding profession, 27 (50%) were staff midwives, 15 (27.8%) were senior midwives, 10 (18.5%) were medical officers, and 2 (3.7%) were principal midwives. A high percentage of respondents, 36 (66.7%), held diploma certificates, followed by 17 (31.5%) with degree certificates and 1 (1.9%) with a master's certificate. Regarding work experience, 31 (57.4%) had worked between 1–3 years, followed by 8 (14.8%) who had worked for less than a year. The work areas included 18 (33.3%) respondents in the antenatal ward, 16 (29.6%) in the maternity ward, 15 (27.8%) in the gynecological surgical ward, and 5 (9.3%) in postnatal care.

Table 4.5.1: Demographic Characteristics Of Respondents

Variables in question	Variable	Frequency	Percentages (%)
Sex:	Male	4	7.4
	Female	50	92.6
Age group:			
	20 - 29 years	22	40.7
	30 - 39 years	23	42.6
	40 - 49 years	9	16.7
Marital status			
	Unmarried	17	31.5

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	Married	37	68.5
Rank of staff	Senior Midwife Principal Midwife Staff Midwife Medical Officer	15 2 27 10	27.8 3.7 50.0 18.5
Highest educational qualification	Diploma Bachelor degree Master degree	36 17 1	66.7 31.5 1.9
Number of years of practice	Less than one year 1 - 3 years 4 - 6 years 7 - 9 years 10 years and above	8 31 6 5 4	14.8 57.4 11.1 9.3 7.4
Current Department/Unit	Maternity Gynaecological Surgical Antenatal clinic Postnatal clinic	16 15 18 5	29.6 27.8 33.3 9.3

Source: Survey data, 2024

General Knowledge On Partograph

Table 4.6.0 illustrates the general knowledge of healthcare workers on partograph usage for delivery. Findings show that a majority of respondents, 40 (74.1%), received internal training on partograph usage. A higher proportion, 44 (81.5%), received partograph education in school, which is statistically significant (sig. level = 0.001 < α = 0.05), while 10 (18.5%) were trained in the field. Although not all respondents fully understand every indicator on the partograph, 40 (74.1%) do. About two-thirds of the participants, 47 (87.0%), indicated that the “first stage” is the optimal time for using the partograph during delivery. Basic biodata is recorded first on the partograph, which is statistically significant (sig. level = 0.011 < α = 0.05). Approximately 30 (55.6%) respondents correctly identified the steps for filling out the partograph, while 24 (44.4%) did not. Additionally, 24 (44.4%) respondents leave gaps in the partograph, either intentionally or unintentionally. Significantly (sig. level = 0.027 < α = 0.05), about 32 (59.3%) respondents strongly agree that regular oxytocin U/L drops should

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be given to the mother when contractions are weak. Furthermore, a majority of respondents, 32 (59.3%), indicated that the "third stage" is the appropriate period to augment regular oxytocin U/L drops.

Table 4.6.0: General Knowledge On Partograph

Variables in question	Variable	Frequency	Percentages (%)	Chi-Square (χ)	Asymp.sig
Internal training on partograph	Yes No	40 14	74.1 25.9	1.080	0.782
Learn about partograph	School training Field training	44 10	81.5 18.5	16.912	0.001
Understanding all the indicators of the partograph	Yes No Somehow	40 12 2	74.1 22.2 3.7	8.340	0.214
Time of using partograph	First stage Second stage	47 7	87.0 13.0	16.315	0.001
What to record first on partograph	Basic biodata Cervix plot	50 4	92.6 7.4	11.232	0.011
Steps in filling the partograph	Improper step Proper step	30 24	55.6 44.4	2.700	0.440
Gaps left on filling the partograph	Yes No	24 30	44.4 55.6	2.490	0.477
Regular Oxytocin U/L drops given	Strongly agree Agree Disagree	32 16 6	59.3 29.6 11.1	14.271	0.027
Stage oxytocin U/L drops given	First stage Second stage Third stage	18 4 32	33.3 7.4 59.3	2.113	0.909

Source: Survey data, 2024

Challenges Contributing To Delay In Caesarean Section

Findings from Table 4.7.0 indicate the challenges contributing to delays in cesarean section. The results show that differences in job ranks among healthcare providers were statistically insignificant (sig. level = 2.450 > α

= 0.05), suggesting that inadequate financial support for some pregnant women contributes to delays in cesarean delivery. Approximately 38.9% of respondents indicated that active insurance (NHIS) coverage is also a factor in delaying cesarean delivery.

The difference in job ranks regarding inadequate anesthesia materials as a factor delaying cesarean delivery was statistically insignificant (sig. level = 0.568 > α = 0.05), with 25.9% of health workers strongly agreeing. Additionally, 31.5% of respondents agreed that the absence of anesthesia personnel delays cesarean delivery; however, this was statistically insignificant (sig. level = 0.187 > α = 0.05).

About 51.9% of respondents strongly disagreed that the absence of surgical doctors causes delays in cesarean delivery, and there was a difference between medians of different job ranks regarding this factor. The absence of an operating theater in the maternity ward was not considered a major factor causing delays, as 40.7% of respondents strongly disagreed. Approximately 35.2% of respondents strongly disagreed that a lack of or inadequate number of beds for admission causes delays in cesarean delivery.

Furthermore, 44.4% of respondents strongly disagreed that a lack of financial motivation among surgical doctors contributes to delays in cesarean delivery. Improper regulation of duty rosters among anesthesia and surgical doctors was not considered a factor causing delays, with 46.3% of respondents disagreeing.

Prolonged assessment of labor and monitoring, based on the assumption of a mother's ability to have a normal delivery (SVD), was identified as a factor causing delays in cesarean section by 24.1% of respondents; this finding was statistically insignificant (sig. level = 0.633 > α = 0.05) across job ranks. Theaters were not considered too busy to cause delays in cesarean delivery, as 37.0% of respondents disagreed. Inadequate operating theater rooms were identified as a factor causing some delays, with 33.3% of respondents strongly agreeing and 27.8% disagreeing. Similarly, inadequate recovery rooms were also seen as a factor, with 37.0% strongly agreeing and 20.4% disagreeing; this result was statistically insignificant. Finally, approximately 59.3% of respondents strongly agreed that religious factors—related to mothers preferring normal delivery (SVD)—are a major cause of delays in cesarean delivery.

Table 4.7.0: Challenges Contributing To Delay In Caesarean Section

Variables in question	Variable	Percentages (%)	Mean rank	Chi-Square (χ)	Asymp. sig
Inadequate financial top-ups on the side of pregnant mother	Strongly agree	61.1	30.63	2.450	0.484
	Agree	16.7	17.00		
	Neutral	3.7	27.67		
	Strongly disagree	18.5	24.45		
No Insurance (NHIS) on the side of pregnant mother	Strongly agree	38.9	30.10	2.021	0.568
	Agree	11.1	17.75		
	Neutral	14.8	25.70		
	Disagree	14.8	30.40		
	Strongly disagree	20.4			
Inadequate anaesthesia materials	Strongly agree	25.9	29.07	4.801	0.568
	Agree	7.4	12.00		

	Neutral	14.8	25.28		
	Disagree	16.7	34.25		
	Strongly disagree	35.2			
Absence of Anaesthesia personnel	Strongly agree	20.4	26.50	4.801	0.187
	Agree	31.5	28.50		
	Neutral	1.9	26.46		
	Disagree	27.8	31.60		
	Strongly disagree	18.5			
Absence of Surgical Doctor	Strongly agree	13.0	31.07	0.927	0.819
	Agree	9.3	18.00		
	Neutral	7.4	28.93		
	Disagree	18.5	20.20		
	Strongly disagree	51.9			
Absence of theatre in the maternity ward	Strongly agree	20.4	28.50	4.553	0.208
	Agree		40.75		
	Neutral	13.0	26.61		
	Disagree	5.6	25.75		
	Strongly disagree	40.7			
		20.4			
No motivation (Finance) on the side of Surgical Doctors	Strongly agree	3.7	26.83	2.829	0.419
	Agree	3.7	30.75		
	Neutral	5.6	27.94		
	Disagree	42.6	26.65		
	Strongly disagree	44.4			

Source: Survey data, 2024

Continue: Table 4.7.0: Challenges Contributing To Delay In Caesarean Section

Improper regulation of duty roaster on the side Anaethesis and Surgical Doctors	Strongly agree	1.9	28.33		
	Agree	9.3	43.50	0.195	0.978
	Neutral	1.9	25.15		

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	Disagree	46.3	29.40		
	Strongly disagree	40.7			
Prolong assessment of labour and monitoring with the idea of mother's ability to have normal delivery (SVD)	Strongly agree	24.1	26.93	1.717	0.633
	Agree	16.7	41.25		
	Neutral	16.7	27.33		
	Strongly disagree	14.8	26.05		
Busyness of the theatre ward	Strongly agree	20.4	30.93	5.481	0.140
	Agree	7.4	47.50		
	Neutral	9.3	25.75		
	Disagree	37.0	23.15		
	Strongly disagree	25.9			
Inadequate theatre rooms	Strongly agree	33.3	28.20	0.163	0.983
	Agree	16.7	23.75		
	Neutral	5.6	27.28		
	Disagree	27.8	27.80		
	Strongly disagree	16.7			
Inadequate recovery rooms	Strongly agree	37.0	32.67	4.336	0.227
	Agree	11.1	28.50		
	Neutral	1.9	27.37		
	Disagree	20.4	19.90		
	Strongly disagree	29.6			
Religious factors on the side of mothers having normal delivery (SVD)	Strongly agree	59.3	24.50	1.168	0.761
	Agree	18.5	31.00		
	Disagree	11.1	29.06		
	Strongly disagree	11.1	27.10		

Source: Survey data, 2024

DISCUSSION

Introduction

This chapter discusses the summary results of the previous chapter, demonstrating the achievement of the study objectives and presenting the preceding analysis. Comparisons of findings from different authors and studies are also included.

The study aimed to estimate the expected median time for delivery either cesarean delivery or spontaneous vaginal delivery based on contraction timings measured every 10 minutes. It also revealed demographic characteristics of the healthcare workers primarily involved in deliveries in the labor wards. Out of the 54 selected health workers, a higher proportion were female (92.6%) compared to male (7.4%), making the sample predominantly female. The majority were married (68.3%), while 31.5% were unmarried. In terms of age, 42.6% of respondents were between 30 and 39 years, followed by those between 20 and 29 years. Regarding occupation, 50.0% were staff midwives, 27.8% were senior midwives, 18.5% were medical officers, and 3.7% were principal midwives. Additionally, 66.7% held diploma certificates, 31.5% held degree certificates, and 1.9% held a master's certificate. Over half of the respondents (57.4%) had worked between 1 and 3 years, followed by 14.8% who had worked for less than a year. In terms of work location, 33.3% worked in the antenatal ward, 29.6% in the maternity ward, 27.8% in the gynecological surgical ward, and 9.3% in the postnatal care unit.

A similar study by Hailu *et al. (2018)* on "Assessment of Partograph Utilization and Associated Factors among Obstetric Care Givers at Public Health Institutions in the Central Zone, Tigray, Ethiopia" found that among 220 participants, 65.7% of obstetric care providers were female. The majority (41.9%) were between 20 and 29 years of age, and 56.6% held a diploma. In terms of occupation, midwives constituted 70.2% of the workforce, followed by nurses (16.7%). Additionally, 74.7% worked in the birth ward, while the remaining providers worked in postoperative, family planning, and antenatal wards. Approximately 65.7% of obstetric caregivers had completed Basic Emergency Obstetric and Newborn Care training, and nearly half (48.5%) had worked in clinical settings for five years or more.

The study also found that about three-quarters of healthcare providers had general knowledge of partograph usage for delivery. Findings indicated that 74.1% had received internal training on partograph usage organized by departmental heads. A higher proportion (81.5%) had studied partograph usage in school, while 18.5% were trained in the field. Although not all respondents fully understood every indicator on the partograph, 74.1% did. Approximately 87.0% indicated that the "first stage" is the optimal time for using the partograph during delivery. Recording basic biodata on the partograph was statistically significant (sig. level = $0.011 < \alpha = 0.05$). About 55.6% of respondents correctly identified the steps for completing the partograph, while 44.4% did not. Similarly, 44.4% of respondents left gaps in the partograph, either intentionally or unintentionally. Significantly, 59.3% of respondents strongly agreed that regular oxytocin U/L drops should be administered when contractions are weak, and 59.3% indicated that the "third stage" is the appropriate time to augment with regular oxytocin U/L drops. Overall, knowledge on partograph usage for delivery was highly significant.

In contrast, Sama *et al. (2017)* found that about one-third (33.8%) of respondents were unable to correctly define the partograph as a simple graphical record of labor and key maternal and fetal conditions over time, while 29.6% regarded it as a complex tool. Regarding its preventive role, 60.6%, 78.9%, and 64.8% of obstetric care providers believed that the partograph would reduce maternal morbidity, reduce maternal mortality, and increase the efficiency of care during labor, respectively. Negash and Alelgn (2022) discovered that only 60.8% of study subjects knew how to properly complete a partograph. The most recognized component was the effective standard for observing labor progress (93.2%), while only 15.1% knew that partograph utilization allows time for further discussion of management. Mezmur, Semahegn, and Tegegne (2017) showed that health professionals in health centers were 69% more likely to have a poor level of knowledge about the partograph compared to those in hospitals [AOR = 0.31, 95% CI: 0.20, 0.47]. Those with in-service training were twice as likely to have good knowledge [AOR = 2.0, 95% CI: 1.22, 3.42], and B.Sc. midwives were 2.8 times more likely to have good knowledge than medical doctors.

Challenges leading to delays in decision-making by healthcare providers were also identified. The analysis showed that inadequate financial support for some pregnant women contributed to delays in cesarean delivery, although this finding was statistically insignificant (sig. level = $2.450 > \alpha = 0.05$). About 38.9% of respondents indicated that active insurance (NHIS card) is a factor in delaying cesarean delivery. Inadequate anesthesia materials were also a factor, though statistically insignificant (sig. level = $0.568 > \alpha = 0.05$). Additionally, 31.5% of respondents agreed that the absence of anesthesia personnel delays cesarean delivery, while 51.9% disagreed that the absence of surgical doctors causes delays. The absence of an operating theater in the maternity ward was not considered a major factor, as 40.7% strongly disagreed, and inadequate beds for admission were not viewed as a major issue, with 35.2% strongly disagreeing. Financial motivation for surgical doctors was not considered a contributing factor. Prolonged assessment of labor and monitoring, based on the assumption of the mother's ability to have a normal delivery (SVD), was identified as a factor causing delays in cesarean section, though this was statistically insignificant (sig. level = 0.633 > $\alpha = 0.05$). Inadequate operating theater rooms were cited by 33.3% of respondents as causing delays, and inadequate recovery rooms were considered a factor by 37.0% of respondents. More than half (59.3%) strongly agreed that religious factors—related to mothers preferring normal delivery (SVD)—are a major cause of delays in cesarean delivery.

In contrast, Keimbe *et al. (2018)* found that delays were significantly contributed to by factors such as low socioeconomic status, costly services, lack of essential medicines, and limited knowledge of pregnancy-related complications. Other factors included long distances and transportation difficulties to health facilities. Bivariate analysis showed an association between perceived delays and previous pregnancy-related complications (POR = 1.80; 95% CI: 1.13–2.83) and poor road conditions (POR = 2.34; 95% CI: 1.15–4.77). Bello, Tsele, and Oluwasola (2015) noted that a lack of resources accounted for most delays in cesarean delivery. Although post-service billing is uncommon in the research area due to current economic conditions, delays in acquiring resources can sometimes cause delays in cesarean delivery.

Findings on documentation revealed poor practices among some healthcare providers, with 43.6% of respondents indicating this issue. A model for documentation was presented as follows: logit (Outcome of delivery) = -0.251 + 0.033(gravidae) – 1.207(parity) – 37.64(date of admission) + 39.486(time of admission) + 19.898(ruptured membrane) – 20.55(amniotic fluid) + 1.640(descent of head) – 0.003(contractions per 10 minutes) – 0.115(oxytocin) + 0.360(drugs and fluids) + 0.307(pulse and BP) – 0.388(temperature) – 0.188(urine) – 0.023(fetal heart rate)

Following this model will lead to either cesarean delivery or spontaneous vaginal delivery. Analysis of the independent variables compared to the dependent variable revealed that the descent of the head is linearly dependent on the delivery outcome. This indicates that proper recording of the descent of the head on the partograph is crucial in determining whether the mother will undergo cesarean delivery or spontaneous vaginal delivery based on the occurrence of contractions. This finding was statistically significant (sig. level = 0.000 < $\alpha = 0.05$). Furthermore, if no other factors are present and only the descent of the head is recorded, then the model: logit (Outcome of delivery) = -0.251 + 1.640(descent of head); will determine whether the pregnant mother will have a spontaneous vaginal delivery or a cesarean delivery. The study found that an estimated time of 407.835 minutes (approximately 7 hours) is needed to decide on cesarean delivery, with a lower boundary of 6 hours 50 minutes and an upper boundary of 7 hours and 8 seconds. Additionally, an estimated time of 112.811 minutes (approximately 1.8 to 2 hours) is needed for spontaneous vaginal delivery based on regular strong contractions, with a lower boundary of about 94.487 minutes and an upper boundary of 131.406 minutes (approximately 1 hour 57 minutes to 2 hours 1 minute). Regarding the time before contractions, the estimated median time is 810 minutes (13 hours and 5 minutes) from the onset of 6:00 am, indicating that if a pregnant mother reports at 6:00 am, the expected time for mild or strong contractions to begin is around 8:00 pm; allowing 13 hours for preparation for delivery.

CONCLUSIONS AND RECOMMENDATIONS

Introduction

Findings from the examination of participant replies and additional discussion have improved the study's results in relation to its goals. Overall, the study draws conclusions, suggests addressing unaddressed issues, and highlights a number of strategies for reducing exposure to risks associated with continuing education.

Conclusion

The estimated incision time for prolonged labor is 407.835 minutes (approximately 7 hours) from the start of admission. A time frame ranging from 6 hours 50 minutes to 7 hours and 8 minutes could be considered by surgeons for deciding on cesarean delivery using the partograph when prolonged labor sets in. An estimated time of 112.811 minutes (approximately 1.8 to 2 hours) is needed for spontaneous vaginal delivery when regular contractions occur, with or without oxytocin augmentation. A stable fetal heart rate of around 142 bpm is required for delivery. Documentation must include all listed variables on the partograph without any gaps. Some healthcare providers left gaps due to improper documentation. Among healthcare professionals, partograph usage was well understood. Factors such as lack of NHIS card renewal, pregnant mothers' financial struggles with top-up payments, inadequate anesthetic supplies, and insufficient recovery, theater, and admission beds contributed to poor decision-making regarding incision timing, which delayed cesarean delivery. Additionally, the religious beliefs of pregnant mothers and their relatives favoring spontaneous vaginal delivery greatly impacted the time taken to decide on cesarean delivery. Overall, the study found that partographs are useful tools for monitoring labor, and timely intervention is critical in managing a pregnant mother's delivery.

Recommendations

Based on the study's findings that led to the aforementioned conclusion, the following suggestions are made, and when followed, they will significantly reduce the amount of time that women must wait for a long period due to poor contractions, which can delay and prolong labor and cause fetal distress and delivery complications:

- The estimated time calculated must be considered to reduced pain and prolong labour leading to many complications and foetal distress at the labour ward. (By Healthcare providers)
- Internal training on proper documentation on partograph should be considered. (By Healthcare providers)
- Education on sociocultural and religious believes on the side of spontaneous vaginal delivery should be given out to reduce decision taken on caesarean delivery. (By Healthcare providers)
- Mothers should renew their NHIS cards and plan well for additional top-up payment for caesarean delivery. (By Pregnant mothers and relatives)
- Adequate anaesthesia logistics should be in place for caesarean delivery.
- Adequate beds and recovery rooms should be made available. (By Healthcare providers)
- More theatre rooms in the maternity unit should be provided to reduce the waiting periods for emergency caesarean delivery. (By Healthcare providers)

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