

**ASSOCIATION BETWEEN DURATION OF SECOND STAGE OF LABOUR AND
EARLY MATERNAL AND NEONATAL OUTCOMES OF PARTURIENTS AT
KENYATTA NATIONAL HOSPITAL IN 2018 - A PROSPECTIVE DESCRIPTIVE
COHORT STUDY**

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DECLARATION

This is to declare that this dissertation is my original work, carried out with guidance of my supervisors, and references made to work done by others' have been indicated.

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LIST OF ABBREVIATIONS

APH	Antepartum Haemorrhage
ART	Assisted Reproductive Technology
CS	Caesarean Section
EAS	External anal sphincter
FIGO	International Federation of Gynaecology and Obstetrics
FSB	Fresh still birth
IAS	Internal anal sphincter
KDHS	Kenya Demographic health survey
KNH	Kenyatta National Hospital
MSL	Meconium stained liquor
MOH	Ministry of Health
NICU	Neonatal ICU
PPH	Postpartum haemorrhage
RCOG	Royal College of Obstetricians and Gynaecologists
UoN	University of Nairobi
WHO	World Health Organization

DEFINITION OF TERMS

Second Stage Duration: the duration in minutes from full cervical dilatation to delivery of a singleton baby or the last baby in multiple pregnancies.

Postpartum Haemorrhage: 500 ml or more blood loss from the genital tract within 24 hours of the birth of a baby after vaginal birth. It can be minor (500–1000 ml) or major (1000 ml or more).

Puerperal Sepsis: Infection plus systemic manifestations developing after birth and up to six weeks postnatal. In this study, early puerperal infection up to 7 days post-delivery will be considered.

Prolonged Second Stage: Nulliparous: Duration of 3 hours and 2 hours with and without epidural anaesthesia respectively Multiparous: 2 hours and 1 hour with and without epidural anaesthesia respectively

ABSTRACT

Background: Time frames for second stage of labour to avert maternal and neonatal morbidity and mortality were introduced in the mid-1800s by expert opinion and case series publications. Findings were published where no stillbirths occurred when assisted delivery was employed to shorten second stage of labour. A 2-hour rule was established based on these findings.. Studies on association of duration of second stage of labour and neonatal outcomes have shown mixed results. Some studies have found an increase in poor neonatal outcomes including poor APGAR scores, admission to new born unit and neonatal intensive care unit, trauma and still birth with increase in duration of second stage while some studies have found no difference in outcomes in relation to duration of 2nd stage of labour.

Objectives: The objective was to evaluate the median duration of second stage of labour and evaluate the association between the duration of second stage of labour and early maternal(mode of delivery, perineal tears, postpartum haemorrhage and puerperal sepsis) and neonatal outcomes(APGAR, admission to newborn unit and neonatal sepsis.) among mothers receiving intrapartum care at Kenyatta National hospital.

Methodology: Using a prospective descriptive cohort study design, 232 mothers admitted in active phase of labour with low risk pregnancy that vaginal delivery was anticipated were recruited at Kenyatta National Hospital (KNH) between May 2018 and October 2018. KNH is situated in Nairobi county, the national referral and the teaching hospital for the University of Nairobi, Faculty of Medicine. The maternity wing conducts approximately 10,000 deliveries per year.It provides comprehensive obstetric care and specialized services. This facility is thus suited to carry out this

research. The data was collected between May and October 2018.

Study participants were mothers whose labour was monitored at the facility

Standard (KNH) protocols for management of second stage of labour were used to record time at full dilatation, time of delivery of the baby and the maternal and neonatal outcomes of interest

Results: Mean duration of second stage of labour was 52 mins. 2nd stage more than 60mins was 16 times likely to undergo C/S and 6 times likely to develop puerperal sepsis compared to those 60 minutes and less. Neonates whose mothers spent more than 60 minutes in 2nd stage were 3 times likely to be admitted to the NBU and 6 times likely to develop neonatal sepsis compared to those whose mothers lasted less than 60 minutes.

Conclusion: Median duration of 2nd stage at the KNH is 52 min. Duration of 2nd stage of labour of >60 min is associated with higher CS rates, puerperal sepsis among mothers, admission to NBU and neonatal sepsis .

Recommendation: 2nd stage of labour lasting longer than 60 min calls for re-evaluation of the mother. Larger multicentre studies to establish cause effect for the non-significant parameters.

CHAPTER ONE: INTRODUCTION

1.1 Background

Length of second stage

of labour is defined as the duration from full cervical dilatation to delivery of a singleton baby or the last baby in multiple pregnancies. It is divided into two phases: Passive phase from full cervical dilatation in the absence of involuntary expulsive contractions and the active phase where the presenting foetal part becomes visible and the presence of expulsive contractions as well as active maternal efforts (1).

The Society of Obstetricians and Gynaecologists of Canada (SOGC) guidelines recommend that an arbitrary time limit for the duration of second stage of labour is not necessary, and that maternal, foetal status and rate of descent of presenting part is the best guide to management of second stage of labour. However, concern should be raised with prolonged periods i.e. more than 1 hour in multigravida and more than two hours in primigravida(2)

The American College of Gynaecologists (ACOG) guidelines define second stage labour dystocia as labour lasting more than three hours in nulliparous women with regional anaesthesia and one hour without regional anaesthesia. In multiparous women one hour without regional anaesthesia and two hours with regional anaesthesia are considered acceptable (3) Emphasis has been placed on the management of 1st stage of labour with the use of a partogram as well as on active management of second stage of labour.

However, provision of skilled care during the second stage of labour has not been emphasized. Second stage of labour is the most critical stage where skilled service provision is required for optimal neonatal outcomes.(4)

Recommendations to allow women in second stage of labour to rest and await foetal descent have been made by the Australian perinatal practice guidelines. This reduces maternal fatigue, reduce foetal heart decelerations and also reduce pushing time for the mothers in second stage of labour. They recommend no time limit for second stage of labour unless there is no descent of presenting part.(5)

Duration of 30 min to 3 hours has been accepted in nulliparous women with a median of 50 min.(5) A time frame of 3 hours with regional anaesthesia and 2 hours without regional anaesthesia has been suggested. For multiparous women, duration of 5 - 30min is generally acceptable with median of 20 min. Prolonged second stage is considered if active second stage exceeds 2 hours with regional analgesia and 1 hour without regional analgesia(5) Despite the differing definitions of prolonged second stage of labour, we will use the Kenyan Ministry of Health guidelines that defines second-stage labour as duration from full cervical dilatation confirmed by digital examination to expulsion of the anterior shoulder of the foetus. However the guideline does not provide the acceptable time frame for duration of second stage of labour.(6)

Prolonged durations of second stage of labour have been found in some studies to be associated with deleterious maternal and neonatal outcomes including low APGAR score, perineal lacerations and postpartum fever.(7)

1.2 Conceptual Framework

Maternal characteristics considered to be associated with duration of second stage of labour were considered. These include; body mass index (BMI) at time of recruitment, age of the mother at time of delivery, parity, foetal weight and mothers socioeconomic status evaluated using proxy variables such as residence and level of education.)

Maternal outcomes such as mode of delivery (spontaneous vaginal delivery, operative vaginal delivery and cesarean delivery), occurrence of third- or fourth-degree perineal laceration, postpartum hemorrhage-blood loss of more than 500mls following vaginal delivery and puerperal infections were assessed.

Neonatal outcomes that were evaluated included Apgar score at 5 minutes admission to the Newborn unit (NBU) and early neonatal sepsis within 7 days.

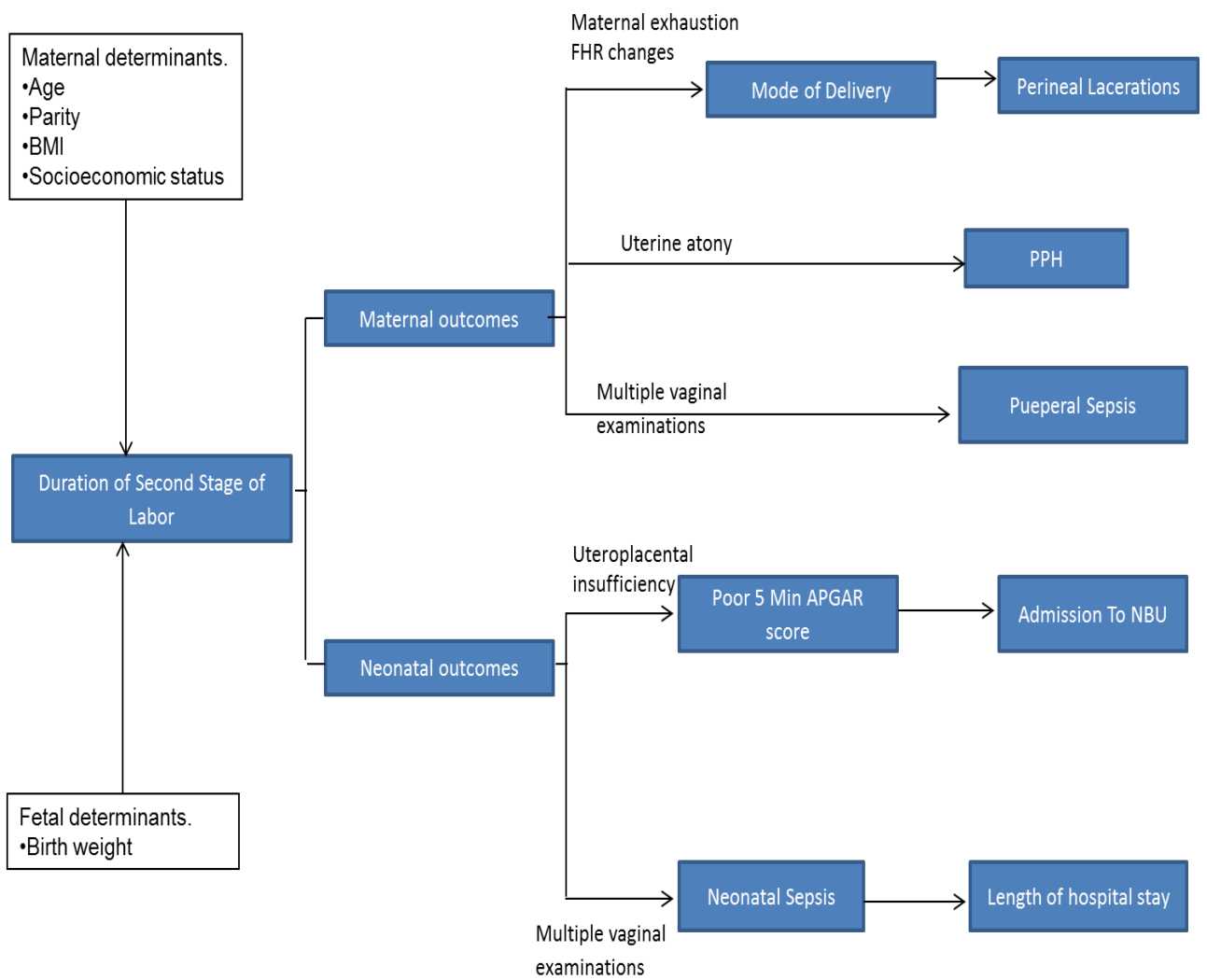


Figure 1: Conceptual Framework of duration of second stage of labour and maternal and neonatal outcomes

1.3 Justification

Second stage of labour is a critical period that influences optimal foetal outcomes. The Society of Maternal-fetal medicine and ACOG state that the absolute maximum duration of time in the second stage of labour beyond which all women should be offered operative delivery has not been identified.(3) Kenya has limited data on duration of second stage of labour. No studies are available locally to offer guidance on the acceptable length of second stage.

Perinatal morbidity and mortality at Kenyatta National Hospital is quite significant. 30% of infants delivered in the maternity unit end up in the newborn unit.79.3% are appropriate for Gestational age (AGA).(8) The major causes of morbidity and mortality in these infants are perinatal asphyxia, respiratory distress, and early neonatal infections. Most of the deaths (86.8%) occur within the first week of life. The neonatal mortality has been recorded at 24.6%. (9) The association between this neonatal mortality rate and duration of second stage of labour is not known.

Second stage of labour is a critical period that influences optimal foetal outcomes (4) yet there are no recent local studies available that outline the optimal duration of second stage in our resource limited population, hence the need to assess the outcomes with varying lengths of second stage.

This study provides information which can be used to develop Standard Operating Procedures (SOPs) in order to improve maternal and neonatal outcomes in women who present at our facility in active phase of labour. This may help in progress towards achieving sustainable development goal number 3 aimed at improving maternal and neonatal health.

1.4 Research question

Is there a relationship between the length of second stage and maternal and neonatal outcomes among mothers who deliver at Kenyatta National Hospital?

1.5 Broad Objective

To evaluate the association between duration of second of labour and early maternal and neonatal outcomes among mothers receiving intrapartum care at Kenyatta National Hospital.

1.6 Specific Objectives

Among women who receive intrapartum care at Kenyatta National Hospital,

- 1) To determine the median duration of second stage.
- 2) To evaluate the association between the duration of second stage of labour and early maternal outcomes (mode of delivery, perineal tears, PPH, puerperal sepsis).
- 3) To evaluate the association between the duration of second stage of labour and early neonatal outcomes (5min APGAR, admission to NBU and neonatal sepsis.)

1.7 Null hypothesis

There is no association between the length of second stage and maternal and neonatal outcomes.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Different findings have been established in studies on association between duration of second stage of labour and maternal and neonatal outcomes. Literature covers a wide variety of such findings. This review focuses on the global and regional perspective on the median duration of second stage, maternal and foetal characteristics associated with length of second Stage and maternal and neonatal outcomes in relation to duration of second stage of labor.

2.1 Median Duration of Second Stage

2.1.1 Global Perspective

There is often no clear demarcation between the end of the first stage and the beginning of the 2nd stage of labour. (10) Signs indicative of onset of second stage include expulsive uterine contractions that increase in frequency and intensity with the mother having the urge to bear down as well as dilatation and gaping of the anal canal. (11)

The division of labour into three stages and subdividing the stages into phases was contrary to the actual events of labour and that basing labour management on these concepts could lead to distress and jeopardy for mother and fetus. While the division of the first stage of labour into the latent and active phase was discussed, it was stated that the distinction between the end of the first stage and the beginning of second stages leads to the greatest errors in clinical practice.

There is difficulty because of lack of clear definition as to when the 2nd stage begins. If it begins with expulsive efforts by the woman, then some women wish to bear down before the cervix is fully dilated and sometimes a woman will not bear down until the presenting part is distending the perineum.(12)

The society for maternal-fetal medicine and American college of Gynaecology guidelines on Duration of second stage state that specific absolute maximum length of time spent in the second stage of labour beyond which all women should undergo operative delivery has not been identified.

Thus, when maternal and foetal conditions remain normal then at least 2 hours in multiparous mothers and 3 hours in nulliparous mothers should be allowed. Longer periods should be allowed on individualized basis such as incase of epidural anaesthesia (3)

The prevalence of prolonged second stage of labour considering the ACOG guidelines are slightly different in nulliparous and multiparous women. In a Canadian study in 2009, 15% of nulliparous mothers had second stage lasting more than 3 hours while 3% of multiparous mothers took more than 2 hours. The study found epidural anaesthesia to be the main factor associated with prolonged second stage.(13)

Subsequent studies globally have shown similar results with nulliparous mothers having a higher prevalence of prolonged second stage compared to multiparous mothers. In the United States, a study in 2014 found a 10% prevalence of prolonged second stage in nulliparous mothers and 4% in multiparous mothers. (14) Altman *et al* in 2015 looked at 32,796 women, 12% pushed for 3 to 4 hours while 9% pushed for more than 4 hours. However, the study did not distinguish the mothers based on the parity. 81% of those who took longer than 4 hours had epidural anaesthesia. (15) Later on in 2017, they conducted a similar study on 42,539 nulliparous mothers that showed 10% prevalence of prolonged duration of second stage taking 3-4 hours while 7% took more than 4 hours. (16)

2.1.2 Regional Perspective

Studies conducted in Africa have showed much difference in the prevalence of prolonged second stage. In a Rwanda study conducted on the prevalence of prolonged labour/labour dystocia leading to caesarian section was 5.4% of all pregnant mothers, however the study did not differentiate 1st stage of labour from second stage. (17) A Ugandan study in 2016 showed 70% of mothers took less than 30min in second stage of labour while 4.3% took longer than 2 hours. Only 2.9% took longer than 180 minutes (2 1/2 hours.) (18)

However, the sample size was much smaller than the global studies (140), there was lack of stratification according to parity and there was no use of epidural anaesthesia (18) In all the studies mothers with singleton pregnancies at term (more than 37) weeks were included in the studies except for the Uganda study where the gestation age cut off was 34 weeks.

2.2 Maternal and Foetal Characteristics Associated with Length of Second Stage

Risk factors associated with prolonged second stage of labour include nulliparity, foetal macrosomia and chorioamnionitis. A Chicago study was conducted to evaluate the risk factors associated with a prolonged second stage and maternal and neonatal outcomes of such pregnancies between 1996 and 1999. The 1st group had patients with second stage of less than 120 minutes. Group 2 had patients with more than 120 mins with group 2 A-120-240 mins and group 2B more than 240 mins. Vaginal delivery rates were highest in the 1st group at 98% while group 2 had higher incidences of poor maternal outcomes (PPH, perineal trauma) with the group that was in second stage for more than 240 mins having the worst maternal outcomes. Neonatal outcomes were similar in all the 3 groups. Pre-eclampsia, diabetes, nulliparity, macrosomia, chorioamnionitis, oxytocin use and labour induction were each independently associated with prolonged length of second stage. (14)

In a 2005 Germany study at the Ludwig-Maximilians University to investigate the impact of parameters influencing the duration of the second stage of labour in vaginal deliveries, 1200 vaginal deliveries were reviewed. The mean duration of the second stage of labour was 70 min. Parity, oxytocin use, epidural analgesia, and occipito-posterior presentation were significant parameters associated with a prolonged second stage of labour. No association was found for birth weight and maternal age. The strongest risk factors for a prolonged second stage were Nulliparity and epidural analgesia (19)

Obesity is becoming a public health concern worldwide with about 1 in every five women who become pregnant in America falling in the obese category.

The prevalence of maternal obesity in Africa is 6.5-50.7% with higher incidence in older multiparous mothers.(20) Obesity is associated with multiple pregnancy complications including risk for gestational diabetes (21). However, studies on obesity in pregnancy are limited thus whether obesity influences the length of second stage is uncertain. 2 studies have been conducted to establish the relation between the lengths of second stage and obesity.

In one of the studies conducted in Sweden, duration of active labour was compared between overweight and obese women versus normal weight women. The median duration of labour was significantly longer in obese women compared to normal-weight women. The length of second stage of labour was significantly shorter in obese women. Nulliparous women with a spontaneous onset of labour had a significant increase in the duration of the active phase of labour with increasing maternal BMI. Once obese women reach second stage they deliver more quickly than normal weight women, which implies that the risk of prolonged labour is restricted to the first stage of labour. (22)

A second study done to evaluate the length of second stage in relation to increasing pre-pregnancy maternal BMI in 2011 in the United states showed no association between increasing maternal BMI and length of second stage or risk of caesarian delivery (23)

Increase in birth rate for advanced maternal age between ages 35 to 44 has been demonstrated by the United States national vital statistics 2011.(24) The caesarian delivery rates are also increasing globally. Studies conducted worldwide have shown a positive correlation between advanced maternal age and caesarian rates. (25)

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However, whether this is due to other confounding factors such as increase in use of epidural anaesthesia is uncertain. Current population characteristics undergoing labour may be different from what Friedman curves predicted.(26) This necessitates further studies that will enhance understanding relationship between maternal characteristics and labour patterns. A retrospective study conducted in the United States of America between 1980-2001 to establish the relationship between the length of first and second stage of labour across maternal age groups included 31,976 births in both nulliparous and multiparous mothers. Younger mothers less than 20 years had a shorter median length of second stage compared to older ones more than 39 years both nulliparous and multiparous mothers. Conclusion was the length of both 1st and second stage of labour increases with increasing maternal age. (27)

A similar study carried out in the US between 2000-2005 to establish the association between parity, maternal age at delivery, gestational age and length of second stage showed a significantly shorter length of second stage in nulliparous under 20 years compared to women more than 40 years of age.(28)

A multicenter retrospective study of 120,442 of singleton term cephalic without previous scar mothers in the US between 2002 and 2008 showed that the length of second stage with and without epidural anaesthesia increased with advancing age (29)

The risk of recurrence of prolonged second stage of labour subsequently is unknown. A Swedish population based cohort study to investigate risk of recurrence of prolonged second stage labour and subsequent mode of delivery after a previous history of prolonged labour between 1992 to 2006, 239,953 women who gave birth to their first and second singleton infants at term. Incidence of 12% of prolonged labour in mothers with previous history of prolonged labour. Rates of prolonged second stage of were higher in women with a previous history of labour dystocia. It was recommended that taking previous history of labour into account as well as other maternal characteristics is important in risk assessment for possible prolonged labour and need for assisted delivery (30)

A study at California in the USA evaluated multiple factors associated with prolonged second stage. Gestational age, maternal age, maternal BMI, socioeconomic status, birth weight among other parameters were evaluated. Women with gestational age above 41 weeks experienced a prolonged second stage lasting longer than 3 hours compared to those less than 41 weeks.

Maternal age longer than 35 years was also associated with a prolonged second stage longer than 3 hours. The study showed no relation between BMI and length of second stage. Higher socioeconomic status was associated with longer duration of second stage lasting longer than 3 hours. Higher birth- weight categories, particularly birth- weight 4500 g or greater, were also associated with a longer duration of second stage.(31)

2.3 Maternal and Neonatal Outcomes

Various studies have shown conflicting findings regarding the association between the length of second stage and maternal and neonatal outcomes. Systematic reviews on association between the length of second stage and obstetric outcomes established that variable definitions of prolonged second stage of labour, different study population characteristics and inadequate control of confounding variables increase the difficulty in addressing the impact of the duration of the second stage on obstetric outcomes. (32)

A systematic review conducted in the United States between 1980 and 2005 found a strong association between prolonged second stage and operative delivery (both assisted vaginal delivery and caesarian). There was also strong association between prolonged second stage and maternal outcomes such as postpartum haemorrhage, severe obstetric lacerations and puerperal infections. Limitations in methodology were noted in most studies. The study found no association between prolonged second stage and adverse neonatal outcomes. (33)

Postpartum haemorrhage is the commonest form of major obstetric haemorrhage. According to WHO it is the leading cause of maternal mortality worldwide. Primary PPH is the loss of 500 ml or more of blood from the genital tract within 24 hours of the birth of a baby. It can be minor (500–1000 ml) or major (more than 1000 ml). Major could be divided to moderate (1000–2000 ml) or severe (more than 2000 ml). (34)

Severe postpartum haemorrhage significantly contributes to maternal mortality in high income countries contributing to >50% of severe maternal morbidity. (35) Global studies have shown increasing incidences of postpartum haemorrhage (36) Several authors have reported that prolonged second stage of labour is associated with increased incidence of postpartum haemorrhage.(33,37). A previous study evaluating the first and second stage of labour in nulliparous mothers showed increased risk of PPH only with second stage of labour.(38)

A retrospective cohort study performed in Canada to estimate maternal and perinatal outcomes among women with increasing duration of the second stage of labour between 1988 and 2006. Individual maternal outcomes such as PPH, infections and trauma as well as neonatal outcomes were assessed with increasing duration of the second stage. Higher risks for, maternal obstetric trauma, postpartum hemorrhage, chorioamnionitis, wound complications, puerperal febrile morbidity and composite maternal morbidity for all durations of the second stage longer than 2 hours were demonstrated.

There were additional risks of obstetric trauma and postpartum hemorrhage (45–73%) for second stage of labour duration longer than 3 hours. (13)

Severe perineal lacerations are a significant complication of normal labour with a serious impact on the quality of life (39). Anal incontinence which is often underreported, bowel symptoms, urinary incontinence sexual dysfunction and postpartum perineal pain have been reported.(40)

RCOG has classified perineal tears based on the anatomical involvement of the perineum as follows:

- First-degree tear: Injury to perineal skin and/or vaginal mucosa.
- Second-degree tear: Injury to perineum involving perineal muscles but not involving the anal sphincter.
- Third-degree tear: Injury to perineum involving the anal sphincter complex: Grade 3a tear: Less than 50% of external anal sphincter (EAS) thickness torn. Grade 3b tear: More than 50% of EAS thickness torn. Grade 3c tear: Both EAS and internal anal sphincter (IAS) torn.
- Fourth-degree tear: Injury to perineum involving the anal sphincter complex (EAS and IAS) and anorectal mucosa. (41)
- Of the perineal lacerations, grade 3 and 4 are considered severe lacerations. 85% of mothers sustain some form of perineal trauma during childbirth with 3% of women sustaining OASIS which comprises of third or fourth degree tears after delivery of their 1st baby and 0.8% in multiparous mothers.(42)

Factors associated with severe perineal tears include instrumental delivery with forceps showing a higher incidence than vacuum delivery with ventouse.(43) Several studies have shown an association between prolonged second stage and increased incidence of perineal tears involving anal sphincters(43,44)

RCOG defines puerperal sepsis as infection plus systemic manifestations developing after birth and up to six weeks postnatal.(45) Puerperal infections refer to wide range entities that occur after delivery. Trauma sustained during both vaginal and caesarian deliveries as well as physiological changes of pregnancy contribute to increase risk of puerperal infections Postpartum perineal pain makes it difficult to diagnose postpartum infections.

Postpartum patients are discharged within a couple of days after delivery making it difficult to observe and diagnose puerperal infections while the mother is still within the hospital. One study showed that 94% of puerperal infections occur after the patient is discharged from hospital (46)

The presence of fever is one of the universally accepted sign of postpartum infection. Postpartum fever refers to temperature above 38 degrees Celsius on any 2 of the 1st 10 days following delivery excluding the 1st 24 hours (47) The major pathogens causing sepsis in the puerperium include Eschereria coli, streptocossus pyogenes and staphylococcus aureus(45)

Endometritis is the commonest puerperal infection. Local spread of colonized bacteria is the commonest cause of puerperal infection following vaginal delivery.

Other puerperal infections include perineal cellulitis, postsurgical wound infections, and retained products of conception, urinary tract infections, mastitis and septic pelvic phlebitis. Caesarian delivery is associated with higher risk of puerperal infections.

Some studies have indicated that cleansing the vagina with povidone iodine solution prior to caesarian delivery decreased risk of post caesarian Endometritis. (48)

However, a study done in our setup showed no difference in the incidence of puerperal sepsis in patients who had povidone iodine cleansing. Several studies done have shown an increase in maternal infections in relation to prolonged second stage of labour.(37)

Neonatal sepsis is invasive bacterial infection occurring in the 1st 28 days of life. It is either early onset occurring within the first 72 hours or late onset occurring after 72 hours. Signs are multiple and nonspecific including diminished spontaneous activity, less vigorous sucking, apnea, bradycardia, temperature instability, respiratory distress, vomiting, diarrhea, abdominal distention, jitteriness, seizures, and jaundice. The diagnosis is mainly clinical though culture would be essential in supporting the diagnosis. Neonatal sepsis occurs in 0.5 to 8.0/1000 births. (80). Early-onset neonatal sepsis usually results from organisms acquired intrapartum. Most infants have symptoms within 6 h of birth.

Group B streptococcus (GBS) and gram-negative enteric organisms (predominantly *Escherichia coli*) account for most cases of early-onset sepsis. Other gram negative enteric bacteria like *Klebsiella* have been isolated.

Late-onset neonatal sepsis is usually acquired from the environment. 30 to 60% of late-onset cases are caused by staphylococci and are most frequently due to intravascular devices especially central vascular catheters. *E. coli* is equally a significant cause of late-onset sepsis, especially in extremely low birth weight infants. Multiple maternal perinatal and obstetric factors increase risk of early-onset neonatal sepsis including preterm birth, premature rupture of membranes (PROM) occurring ≥ 18 hours before birth, maternal chorioamnionitis that manifests as maternal fever shortly before or during delivery, maternal leukocytosis, tachycardia, uterine tenderness, and foul-smelling amniotic fluid .. The most important risk factor in late-onset sepsis is preterm delivery. Others include: Prolonged of intravascular catheter use, prolonged hospitalization, contaminated equipment or IV or enteral solutions.

Neonatal outcomes in relation to the length of second stage have equally given conflicting results. Several studies found no association between prolonged second stage and neonatal adverse outcomes.

Other studies demonstrated that prolonged second stage increased risks of admission to neonatal intensive care unit (NICU), birth asphyxia, birth trauma, low 5 min Apgar score, sepsis or perinatal mortality. Most studies have investigated the entire second-stage duration and neonatal morbidities.

Only a few studies have, with mixed results, investigated neonatal outcomes by duration of pushing.

A population-based cohort study including 42 539, was done in Sweden between 2008 and 2013. Rate of birth asphyxia-related complications gradually increased with duration of second stage it was therefore concluded that prolonged durations of second stage of labour and pushing are associated with increased relative risks of adverse neonatal outcomes. (15)

A Canadian study however reported conflicting results in a study to determine whether perinatal outcomes worsened as the duration of second stage increased. The study found no significant relationship between Second stage duration and low 5 min Apgar score, neonatal seizures or admission to NICU. However, the study found an increase in incidence of foetal trauma increased as with increasing length of second stage of labour. Continuous FHR monitoring and scalp PH determination for at risk foetus during second stage of labour to avoid adverse neonatal outcomes. (49)

Several studies have suggested a relation between the length of second stage and mode of delivery while some studies found no relation between the two. In a retrospective cohort study of 15,759 nulliparous, women in California, San Francisco, between 1976 and 2001. Increasing rates of cesarean delivery, operative vaginal delivery, and perineal trauma were associated with the second stage beyond the first hour. In multivariate analysis, the O-4-hour interval group had higher rates of cesarean delivery, operative vaginal deliveries 3rd- or 4th-degree perineal. (32)

2.3 Conclusion

Mean duration of second stage was 70 minutes in a Germany study by schiessl (37) while in the regional perspective a Ugandan study by Mayanja established a mean duration of 30 minutes (18)

Maternal and foetal characteristics that prolong the duration of second stage of labour included Parity, oxytocin use and epidural analgesia while maternal age and birth weight did not affect the duration of second stage. However labour was significantly shorter in obese mothers. (37)

Adverse maternal outcomes and operative delivery with longer duration of second stage was established in a study by Altman(33) while several studies showed no effect of duration of second stage on neonatal outcomes (15,37)

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter covers the research design and methods, including sampling method, study population, data collection, data analysis and ethical considerations.

3.2 Study Design

The study is a prospective descriptive cohort study in a hospital set-up. Prospective descriptive cohort studies begin with identification of a group with the exposure of interest in a given population who are then followed up within a specified time limit and outcomes of interest are analysed at the end of the study period. The exposure of interest was the duration of second stage of labour in minutes of mothers whose active phase of labour is managed at Kenyatta National Hospital. The duration of second stage was categorized into 2 groups: 0-60 minutes (reference group), and more than 60 minutes. We examined the duration of more than 60 minutes and its associated adverse maternal and neonatal outcomes.

The outcome of interest was maternal outcomes (mode of delivery, perineal lacerations, postpartum haemorrhage, and puerperal infections.) while the neonatal outcomes were (5 min APGAR score, admission to NBU, and neonatal sepsis.) These outcomes were observed over a period of seven days from recruitment.

3.3 Study Setting

This study was conducted at Kenyatta National Hospital, which is situated in Nairobi County in Kenya. Kenyatta National Hospital is the oldest hospital in Kenya, founded in 1901. It serves as a national referral and teaching hospital. It has an average bed capacity of 1800. The study was carried out in the hospital's labour ward and the hospital's newborn unit between May 2018 and October 2018.

KNH is a teaching hospital for the University of Nairobi, Faculty of Medicine, KMTC and visiting students from other institutions. The hospital has obstetrics and gynecology department, with a maternity wing that conducts approximately 10,000 deliveries per year. One midwife is stationed in the triage area; she is responsible for admitting mothers in labor. Each parturient is assigned a primary nurse who monitors labor and makes diagnosis of second stage after which she transfers the mother to the delivery room and proceeds to monitor 2nd stage of labor. There is always at least one postgraduate student present in labor ward who oversees the smooth running of the labour room. The primary midwife on noticing any unusual pattern such as abnormal foetal heart calls on the registrar to review the patient and make a decision regarding further management of the mother. Assisting the registrar are higher diploma students in reproductive health and medical and clinical officer interns. The department is linked to two operating theatres, a blood transfusion laboratory and is capable of providing comprehensive obstetric care. The facility has 50 specialists who offer specialized services. This facility is thus suited to carry out this research. The data was collected between May and October 2018.

3.3 Study Population

The study population was drawn from the hospital labour ward. It comprised of pregnant women who were admitted in labour ward in whom vaginal delivery was anticipated.

Potential study participants were screened at the triage area and 1st stage rooms in labour ward if they met the eligibility criteria and questionnaire administered.

3.4 Eligibility criteria

Inclusion Criteria

- Mothers recruited were both nulliparous and multiparous women admitted in labour ward at Kenyatta National hospital in whom we anticipated vaginal delivery.
- The mothers were at term (at 37 weeks +0 or more) with a live single intrauterine pregnancy in cephalic presentation and with spontaneous onset of labour either latent phase or active labour at less than 6 cm dilated.
- Women who gave informed consent to participate in the study.

Exclusion Criteria

- Mothers who were not in established labour.
- Mothers with twin gestation, malpresentation, preterm labour (Labour less than 37 weeks' gestation), pre labour rupture of membranes, previous caesarian delivery, intrauterine foetal demise or known congenital malformations, caesarian delivery before second stage of labour.
- Mothers who were not willing to participate in the study.

3.5 Sample Size Determination

Assumptions (1):

- Alpha $\alpha = 0.05$ (95% confidence interval)
- Z: 1.645
- Average/mean duration of second stage in our setting (m_1) assumed to be = 1 hour
- B. Schiessl et al, in their paper, -Obstetrical parameters influencing the duration of the second stage of labour demonstrated an increase in maternal and neonatal complications with longer periods of second stage, with a mean duration of (m_2) = 70 minutes
- Estimated standard deviation = 60 minutes

$$n = \frac{Z_{\alpha/2}^2 \sigma^2}{m^2}$$

Formula, Allan Donner et al

Estimation

Sample size = 199

With 90% response rate/complete data rate or 10% missing

data Adjusted sample size:

$$199/0.9 = 222$$

3.6 Sampling Procedure/Sampling Technique

Consecutive sampling was used to recruit eligible participants; Consented women were interviewed using a standard questionnaire in a language of their choice – either English or Kiswahili. The principal investigator collected data assisted by two trained research assistants - a clinical officer intern and a midwife.

3.7 Sources and Methods of Recruitment

The research team comprised of the principal investigator and two research assistants consisting of one clinical officer intern and one midwife both based at Kenyatta National Hospital Labour Ward. The principal investigator trained the research assistants on proper study procedures and supervised data collection during the first two weeks.

Women admitted in labour were approached by the study team for participation. They were provided with all the relevant information regarding the study in English or Kiswahili, and given a chance to make comments or ask questions. A translator was provided in cases where a participant did not understand either English or Kiswahili. Those willing to participate in the study were assessed for eligibility, and only those who met the inclusion criteria, and did not meet any exclusion criteria, were enrolled. The participants signed the consent form. The principal investigator/research assistant then signed the consent form, and a copy made in the participants' file. Enrollment was continuous until the desired sample size was met.

3.8 Data Variables

The primary independent variable (exposure variable) was duration of second stage of labour in minutes. The secondary independent variable was the socio-demographic variables which included: age, BMI, socioeconomic status. Parity and birth weight as the maternal and neonatal determinants of duration of second stage.

Dependent variables (outcome variables) included maternal outcomes including the mode of delivery (spontaneous vaginal, assisted vaginal and caesarean delivery). Postpartum haemorrhage which was assessed by both the primary midwife and the research assistant. Perineal lacerations and puerperal infections in the 1st 7 days of delivery as well as neonatal outcomes including 5 min APGAR score which was done by the primary midwife and confirmed by the research assistant, admission to NBU and the reasons for admission, and neonatal sepsis in the first 7 days of delivery which was determined by the principal investigator by a series of questions 7 days after delivery.

3.9 Data Collection Procedure

The data for this study was collected using a standard structured questionnaire.

(Appendix 2) Structured questionnaires were used as they utilize a series of standardized questions for data collection and incorporated both close and open-ended questions.

The survey questionnaires were administered to patients who were admitted in the labour ward in established labour but less than 6cm dilated. The mothers were monitored using the standard partograph under supervision of the study researchers. Second stage of labour was diagnosed when the mother had the urge to push and confirmed through pelvic digital examination or during routine digital examinations as per the partograph requirements. Second stage onset was at full dilatation up to delivery of the anterior shoulder recorded by the research assistant.

Second stage was monitored using the standard Kenyatta hospital protocol and duration in minutes recorded. Follow up information was obtained after delivery in the 4th stage of labour and 7 days after delivery through a planned phone call by the principle researcher. Information obtained included duration of stay in the hospital, history of any illness in either the mother or neonate that warranted to be seen in the outpatient or admitted to hospital. The researcher, with the aid of trained research assistants administered the questionnaires on patients who consented to the study and fit the inclusion and exclusion criteria.

3.10 Data Quality Assurance

Quality assurance was enhanced throughout the study period to maximize on the validity and reliability of the findings. The accuracy of tabulation was checked by the principal researcher. Pre-testing of study instrument was carried out in a non-study hospital to correct it for bias, misinterpretation of the questions and ambiguity. The validity of the study was ascertained by ensuring that data collection instruments reflect the objectives of the study. The research instrument was validated by the university supervisors.

During data collection process 2 trained research assistant were deployed by the researcher to ensure questionnaires completeness and relevant information was collected. The trained research assistants were supervised by the principal researcher during the 1st two weeks of the study. EpiData software was used during data entry so as to get rid of inconsistencies and ease data cleaning.

3.11 Data Management and Analysis

Descriptive Analysis-

Univariate analysis was carried out on the variables of interest. Means with standard deviations for continuous data such as age, BMI and birth weight were calculated. Proportions were provided for categorical data such a level of education and socioeconomic status. For skewed data, medians with inter-quartile ranges were calculated such as parity.

Inferential analysis

All independent variables were analysed against the outcome variable by means of linear regression. Inferential statistics using relative risks and 95% confidence intervals were presented.

Data was analysed using R statistical software, presentation was in form of charts and graphs for descriptive statistics while tables were used for the presentation of inferential statistics.

3.12 Control of Biases and Errors

The research assistants were trained by the principal researcher and supervised for the first week before being allowed to work on their own.

3.13 Study Limitations

Some of study limitation included loss to follow up of some participants before the end of the study period, missing data where the research assistant did not provide all the information required in the questionnaire, difficulty in establishing the exact time of full dilatation and difficulty controlling for some confounders that would affect outcomes in 2nd stage such as number of vaginal examinations.

3.14 Ethical Considerations

Ethical approval was sought from the Kenyatta National Hospital/University of Nairobi (KNH/UoN) Ethics Review Committee (ERC). The participants' consent was sought and obtained for participation into the study using a consent form which was available in both English and Swahili and translation into the indigenous language was provided. Enrolment was voluntary and participants were allowed to withdraw at any time without any consequences to the patient. The study ensured confidentiality and no names were used at any stage of the data collection process. The information collected was kept under lock and key.

3.15 Dissemination Plan/Study Utility

The study results were analysed and presented to the Department of Obstetrics and Gynecology after which the findings and recommendations were presented to the division (Kenyatta National Hospital department of reproductive health and University of Nairobi) through a continuous medical education session. The study findings will be disseminated to the rest of reproductive health personnel in the country through the annual Kenya Obstetrics and Gynaecology society's' conference to be held in February 2019.

The work will also be published in a manuscript of journals both locally and internationally.

The findings will also be written up as dissertation and will be availed online.

CHAPTER FOUR: STUDY RESULTS

4.1 Data Description

The study involved 224 expectant mothers from whom 24 variables were recorded.

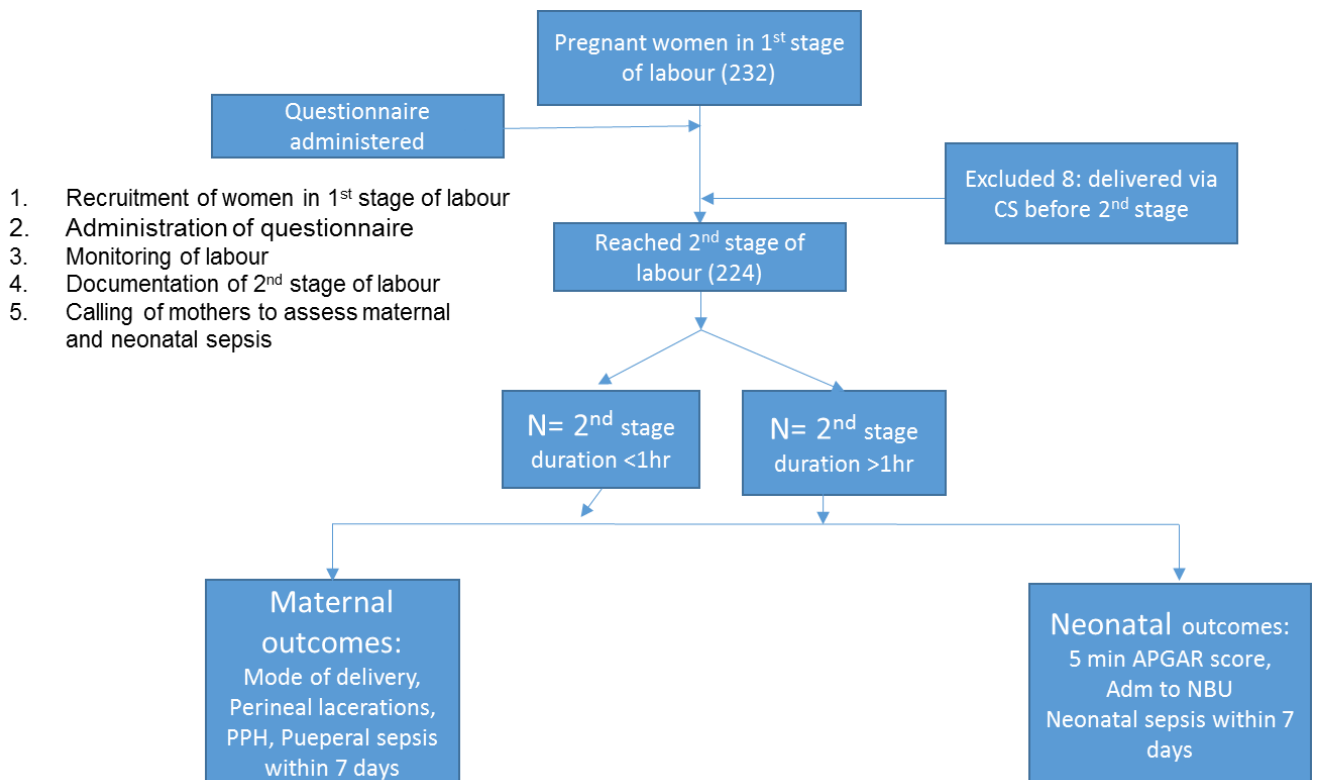
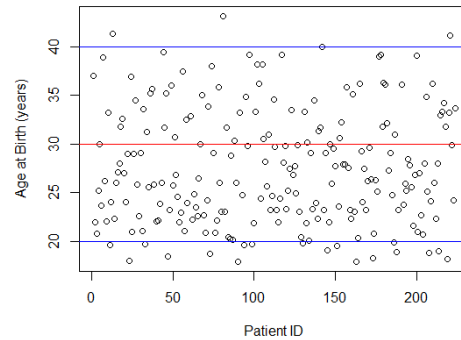
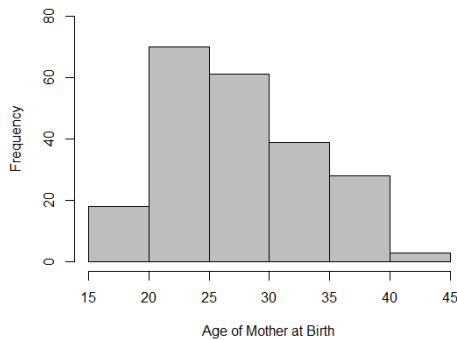


Figure 1: Study flowchart of mothers recruited for assessment of association of duration second stage with maternal and neonatal outcomes at KNH in 2018.

4.2 Univariate Exploratory Analysis

The age of the expectant mothers at birth was computed by getting the difference between their dates of delivery and birth. The age of the mothers at delivery ranged between 17 and 44 years with a mean age of 27.55 years. A histogram of the mothers' age at delivery (Figure 2 (a)) showed that a majority of the mothers were between 20-30 years age bracket. Only 3 mothers were above 40 years of age as depicted by the scatter plot in Figure 2 (b).



(a) Histogram of Mothers' Age at Birth

(b) Scatterplot of Mothers' Age at Birth

Figure 2: Histogram and Scatter Plot of Mothers' Age at the Time of delivery at KNH between May and October 2018.

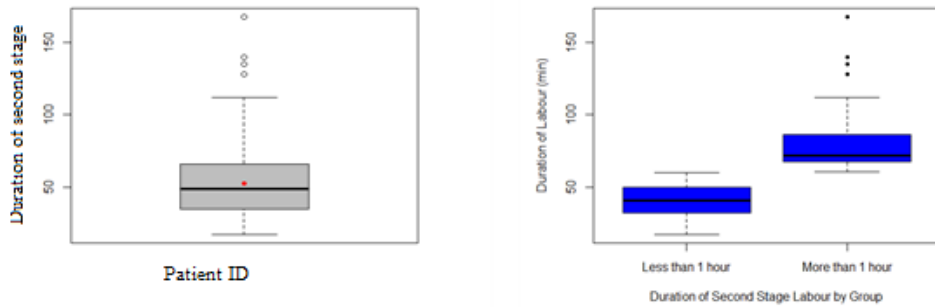
The participants BMI ranged between 19.9 kg/m² and 44.3 kg/m² with a mean BMI of 25.2 kg/m². The BMI was further classified into underweight (below 17 kg/m²), normal (18.0 kg/m² - 25.0 kg/m²) overweight (26.0 kg/m²) and obese (above 30.0 kg/m²).

Out of 218 mothers whose BMI was recorded, 108 (49.5 %) were within the normal range, 99 (45.4%) overweight while 11 (5.0 %) were obese. There was no underweight mother in the study.

The duration of second stage labour was computed by getting the difference between the time at full dilation and the time at delivery. The average duration for second stage labour was 52.5 minutes. The shortest and longest duration for second stage labour was 17 minutes and 168 minutes respectively.

Figure 3(a) shows a boxplot of the duration of second stage labour. The records of four mothers were located above the whisker of the boxplot. This suggests that the five mothers had an excessively long period of second stage labour compared to the rest.

Duration of labour was further dichotomized with a cut off of 60 minutes to yield two categories. Out of 224 mothers, 157 (70.1 %) lasted 60 minutes and less in second stage labour while 67 (29.9 %) lasted more than 60 minutes in second stage labour. The average duration spent by mothers who lasted less than one hour was 40.3 minutes. Mothers who lasted more than an hour spent a mean of 80.1 minutes in second stage labour. Figure 3(b) is suggestive of a clear difference in the two groups.



(a) Aggregated length of Second Stage Labour (b) Length of Second Stage Labour by group

Figure 3: Box Plot of Aggregated and Grouped Duration of Second stage among mothers receiving intrapartum care in KNH between May and October 2018.

The birth weight of the new born was dichotomized into underweight (< 2500 mg) and normal (More or equal to 2500 mg) birth weights. Out of 222 patients whose birth weights were recorded, 209 (94.1 %) newborns had normal weight while 13 (5.9 %) were underweight.

The mothers spent an average of 2.7 days in hospital after delivery. The shortest and longest period spent in hospital by a mother after delivery was 1 and 9 days respectively. A total of 169 mothers (77.2 %) were discharged within 2 days after delivery.

Level of education was categorized into Primary, Secondary and Tertiary levels. 114 (51.2 %) had schooled up to secondary level. This formed the majority.

The remaining 49 (21.3 %) and 61 (27.5 %) were educated up to primary and tertiary levels respectively. Figure 4 shows a pie chart of the distribution of the subjects to the three levels of education.

Level of education (n=224)

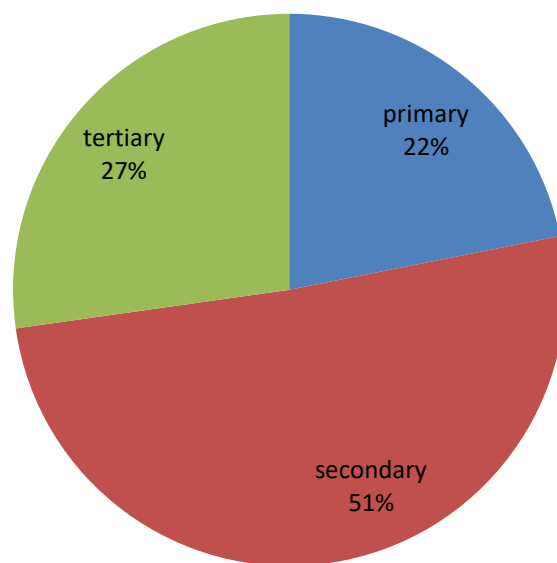


Figure 4: Level of Education of Mothers Receiving Intrapartum care at the KNH between May and October 2018.

Among the expectant mothers in the study, 180 (80.2 %) were married while 44 (19.8 %) were single. The participants area of residence was grouped into four namely urban, peri-urban, slum and rural areas with 18, 177, 18 and 11 expectant mothers being distributed into the four groups in that order.

A total of 17 mothers (7.8 %) delivered via caesarian section. Perineal laceration was recorded in 123 (56.4 %) mothers. In addition to that, 104 (47.7 %) of them experienced perineal laceration of first degree. 18 mothers had second degree laceration while only one patient had laceration of third degree.

Moreover, 9 (4.1 %) of the mothers had post-partum haemorrhage. Among the mothers in the study, Seven (3.2 %) out of 219 developed puerperal sepsis within seven days of delivery. Parity of the expectant mothers was grouped into two, that is, Nulliparous for mothers who had not successfully carried a pregnancy to term and multilparous for mothers who had successfully carried at least one pregnancy to term. Nulliparous mothers constituted 86 (38.4 %) of the 224 expectant mothers who participated in the study.

Most newborns scored highly for the 5 minute APGAR assessment. The mean APGAR score at minute 5 for the newborns was 9.3. The lowest and highest score was 5 and 10 respectively. Most newborns had a five minute APGAR score of 9 and 10. 25 (11.4 %) developed neonatal sepsis within seven days of delivery.

Finally, out of the 224 mothers who participated in the study, 22 (10.0 %) of them gave birth to babies who were then admitted to the Newborn Unit for various reasons such as development of respiratory distress, meconium aspiration syndrome and birth asphyxia.

Table 3: Social Demographic characteristics of mothers receiving intrapartum care at the KNH between May and October 2018.

Variable	Category	Total (n = 224)	≤60 Minutes	> 60 Minutes
Age (years)			28(6)	25(5)
Marital Status	Single	44	29 (66)	15(34)
	Married	180	128 (71)	52 (29)
Residence	Peri – Urban	177	119 (67)	58 (33)
	Urban	18	15 (83)	3 (17)
	Rural	11	9 (82)	2 (18)
	Slum	18	14 (78)	4 (22)
Education Level	Primary	49	41 (84)	8 (16)
	Secondary	114	72 (63)	42 (37)
	Tertiary	61	44 (72)	17 (28)
Parity	Nulliparous	86	43 (50)	43 (50)
	Multiparous	138	114 (83)	24 (17)
BMI	Obese	11	7 (64)	4 (36)
	Overweight	99	64 (65)	35 (35)
	Normal	108	82 (76)	26 (24)

4.3 Bivariate Analysis

In the bivariate exploratory analysis the data was visualized using bivariate plots and frequency tables. Bivariate analysis was also done through fitting simple logistic regression models of each of the four maternal and three neonatal outcome variables against the duration of second stage labour as the main exposure. These yielded the unadjusted relative risks and confidence intervals as shown in Table 4.

Table 4: Unadjusted Relative Risk of Maternal and Neonatal Outcomes in relation to duration of 2nd stage of labour among women receiving intrapartum care at KNH between May and October 2018.

Maternal Outcomes		Total	≤60 Min	> 60 Min	RR	(95 % CI)	P-Value
Mode of Delivery (n = 218)	Vaginal	201	151 (75)	50(25)	17.	6 (5.2,110)	< 0.001
	Cesarean	17	2 (12)	15(88)			
PostPartum Haemorrhage (n = 222)	Yes	9	5 (56)	4 (44)	1.9	(0.5, 6.9)	0.330
	No	213	151 (71)	62 (29)			
Peuperal Sepsis (n = 219)	Yes	7	2 (29)	5 (71)	6.9	(1.4, 42.5)	0.026
	No	212	154 (73)	58 (27)			
Perineal Laceration (n = 218)	Yes	123	89 (73)	33 (27)	0.9	(0.7, 1.2)	0.413
	No	95	65 (68)	31(32)			
Neonatal Outcomes							
Admission to NBU (n = 221)	Yes	22	7 (32)	15 (68)	4.9	(2.2, 12.4)	< 0.001
	No	199	147 (74)	52 (26)			
Neonatal Sepsis (n = 219)	Yes	25	6 (24)	19 (76)	7.7	(3.4, 20.3)	< 0.001
	No	194	149 (77)	45 (23)			
APGAR Score (n = 223)	> 7	218	154 (71)	64 (29)	3.5	(0.6, 26.0)	0.165
	< 7	5	2 (40)	3 (60)			

The length of time that a mother spent in second stage labour had a significant association with the mode of delivery ($p < 0.001$). The probability of a mother who lasted more than an hour in second stage labour giving birth through a Cesarean section was approximately 17 times that of a mother who lasted less than an hour. Mothers who lasted more than an hour in second stage labour were therefore more likely to undergo Cesarean section compared to their counterparts who lasted less than an hour in the same stage.

Likewise, the length of time that a mother spent in second stage labour had a significant association with the occurrence of puerperal sepsis ($p = 0.03$). Mothers who labored for more than one hour in second stage were 6 times more likely to develop puerperal sepsis compared to those who labored for less than an hour.

There was no significant association between the duration of second stage labour on one hand and either postpartum haemorrhage ($p = 0.330$) or perineal lacerations ($p = 0.413$) on the other hand.

In the assessment of the association between the duration of second stage labour and neonatal outcomes, a significant association was established with both admissions to NBU ($p < 0.001$) and neonatal sepsis ($p < 0.001$). Babies born of mothers whose second stage labour lasted more than an hour were 5 times more probable to be admitted in the newborn unit compared to the babies born of mothers whose second stage labour lasted less than an hour.

Moreover, babies born of mothers whose second stage labour lasted more than an hour were also approximately 8 times more likely to develop neonatal sepsis within 7 days of delivery compared to the babies born of mothers whose second stage labour lasted less than an hour. There was no significant association between the duration of second stage labour and APGAR score as a neonatal outcome ($p = 0.165$).

4.4 Multiple Logistic Regression

In the multivariate analysis, maternal and neonatal outcomes that showed significant association with duration of second stage labour were subjected to multiple logistic regression model to control for the effects of age at birth, parity, BMI of the mother and weight of the newborn babies. This yielded the adjusted relative risk as shown in Table 5.

Table 5: Adjusted Relative Risk of Maternal and Neonatal Outcomes in relation to duration of 2nd stage of labor among women receiving intrapartum care at KNH

Maternal Outcome		Total	≤60 Minutes	>60 Minutes	Adj. RR	(95 % CI)	P-Value
Mode of Delivery	Vaginal	201	151 (75)	50 (25)	16.0	(4, 72)	< 0.001
(n = 218)	Caeserian	17	2 (12)	15 (88)			
Puerperal sepsis	Yes	7	2 (29)	5 (71)	5.2	(1, 41)	0.025
(n = 219)	No	212	154 (73)	58 (27)			
<hr/>							
Neonatal Outcome							
<hr/>							
Admission to NBU	Yes	22	7 (32)	15 (68)	3.3	(1, 10)	0.016
(n = 221)	No	199	147 (74)	52 (26)			
Neonatal Sepsis	Yes	25	6 (24)	19 (76)	6.6	(2, 16)	< 0.001
(n = 219)	No	194	149 (76)	45 (23)			
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Having adjusted for the effects of the age of mother at birth, parity, BMI of the mother and weight of the newborn babies, the probability of babies born of mothers who labored for more than an hour being admitted to the newborn unit reduced to 3 (from 5 in Table 4) times that of babies who were born of mothers who labored for less than hour.

The probability of babies born of mothers who labored for more than an hour experiencing neonatal sepsis within 7 days of delivery also reduced to 7 (from 8 in Table 4) times that of babies born of mothers who labored for less than an hour.

There was a slight change before and after controlling for the age of mother at birth, parity, BMI of the mother and weight of the newborn babies. The relative risk of mothers who lasted more versus those who lasted less than an hour in second stage labour in relation to their mode of delivery reduced to 16 (from 17.6) with a significant p value of < 0.001 .

After the adjustment, mothers who lasted more than 60 minutes in second stage of labor were 5 times more likely to develop puerperal sepsis within 7 days of delivery compared to those who spent 60 minutes and less in second stage.

CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

Among the 224 mothers who participated in this study, the median duration of 2nd stage of labour was 52 minutes. This figure was lower than the findings of B. Schiel et al(19)... who reported a mean duration of 70 minutes. This difference between the studies would be attributed to the use of epidural analgesia in the latter study hence prolonging duration of the second stage. 70% of the participants lasted less than 60 minutes and less in second stage of labour. These findings closely match those found by Mayanja et al(18) in Uganda where 82% of mothers lasted 60 minutes and less in second stage. In both studies there was no use of epidural analgesia.

A mother in 2nd stage of labour for more than 60 minutes was 16 times more likely to undergo caesarian compared to one who lasted 60 minutes and less. This finding was similar to Altman R (33) systematic review that found strong association between duration of second stage of labour and operative delivery both assisted vaginal delivery and caesarian section. Cheng et al(32) also showed increasing CS risk estimates of 2.0 for each completed hour in 2nd stage of labour.

Women whose second stage of labor was longer than 60 minutes in second stage were 5 times more likely to develop pueperal sepsis compared to those who lasted 60 minutes and less. This finding was similar to Altman et al (33) and Janni et al (37) who demonstrated significantly higher rates of pueperal infections with increasing duration of second stage of labour. Factors associated with higher rates of puerperal and neonatal sepsis such as number of vaginal examinations performed during labor could contribute to this findings. However in the study the standard partograph was used and digital vaginal examinations were limited to every 4 hours unless absolutely necessary such as report of urge to push. Duration of rupture of

membranes is also known to contribute to increased rate of both puerperal neonatal sepsis, the KNH SOPs advocate for prophylaxis antibiotics for prolonged rupture of membranes in labor.

There was therefore adverse influence of duration of 2nd stage more than 60 minutes on the two maternal outcomes.

Of the neonatal outcomes analysed, babies of mothers who lasted in second stage for more than 60 minutes were 3 times more likely to be admitted to the newborn unit due to respiratory distress; birth asphyxia and meconium aspiration syndrome. This finding is unlike previous studies by Janni et al (37) and Menticoglou et al (49) that showed no relationship between duration of 2nd stage of labour and need for admission to the newborn intensive care unit. The difference in the studies could be attributed to the fact that the two later studies had continuous foetal heart rate monitoring and therefore all babies who developed non reassuring foetal status were identified intrapartum and delivered through assisted vaginal delivery or caesarian section.

Neonatal Sepsis was found to be 7 times more in babies whose mothers lasted more than 60 minutes in second stage of labour. This finding was similar to Laughan SK et al (14) who found rates of neonatal sepsis to be double in mothers with prolonged second stage of labour.

The study examined early maternal and neonatal outcomes providing relevant information regarding management of 2nd stage of labour. However, it had several limitations including difficulty in determining exact onset of 2nd stage labour and being a cohort study, we were unable to blind the primary health care workers managing labour in the participants – we attempted to control this by having the principal investigator and researcher confirm some parameters such as time at onset of second stage and estimation of blood loss.

The time at onset of second stage of labor was established either from routine vaginal examinations as per the standard partograph or when the mother reported the urge to push prompting a vaginal examination.

The study evaluated participants delivered at one academic institution, a teaching and referral Hospital with adequate staffing and therefore the results might not be generalizable to facilities with fewer staff without adequate monitoring. Despite these limitations, to the best of our knowledge, this serves as the first study of evaluating 2nd stage and early maternal and neonatal outcomes in our set up and it offered comprehensive analysis of description of duration of 2nd stage of labour and early maternal and neonatal outcomes.

Conclusion

The study findings showed median duration of 2nd stage at the Kenyatta National Hospital is 52 minutes. Mothers lasting more than 60 minutes in second stage of labour had higher rate of caesarian delivery and puerperal Sepsis within seven days of delivery and their babies were likely to be admitted to the newborn unit and develop early neonatal Sepsis.

Recommendations

Second stage of labor lasting longer than 60 minutes calls for re-evaluation of the mother and decision made to either continue with labor monitoring or intervention. Large multicenter studies need to be conducted to establish cause-effect for the duration of 2nd stage labour and postpartum haemorrhage, perineal lacerations and APGAR score

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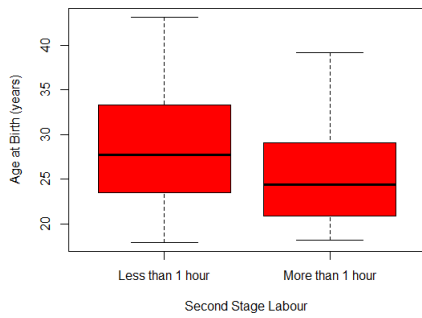
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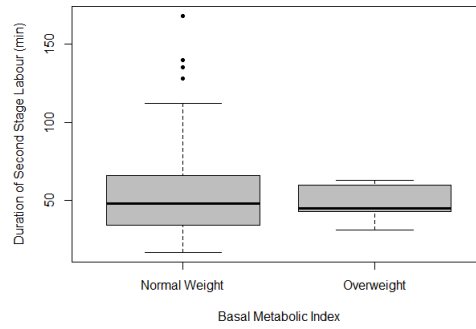
APPENDIX

Appendix 1-Dummy tables of association between duration of second stage of labor and maternal and neonatal outcomes of mothers receiving intrapartum care at KNH between May and October 2018

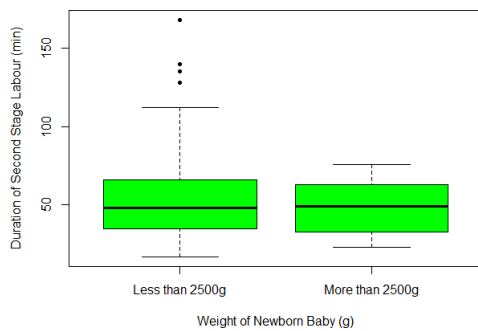
Graphs



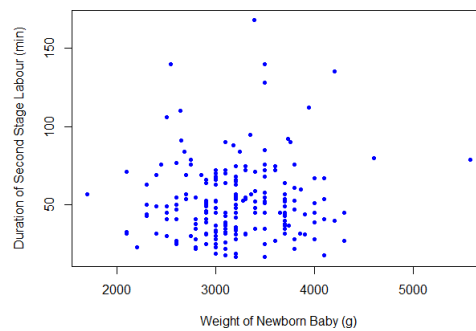
(a) Mothers' Age by Duration of Labour



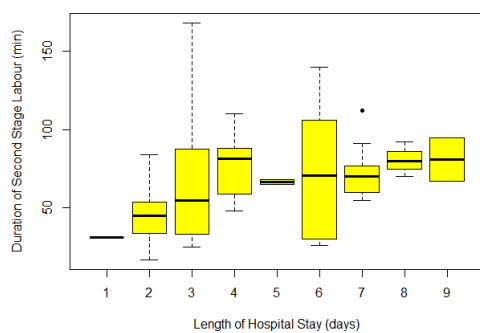
(b) Duration of Labour by BMI



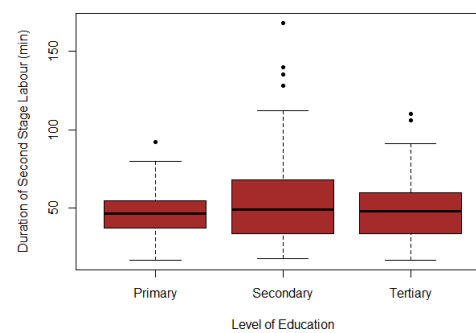
(c) Duration of Labour vs Birth Weight



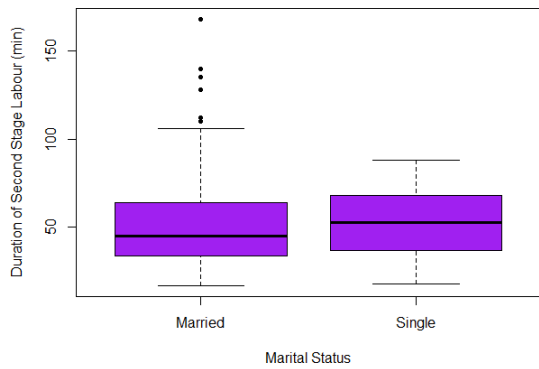
(d) Duration of Labour vs Birth Weight



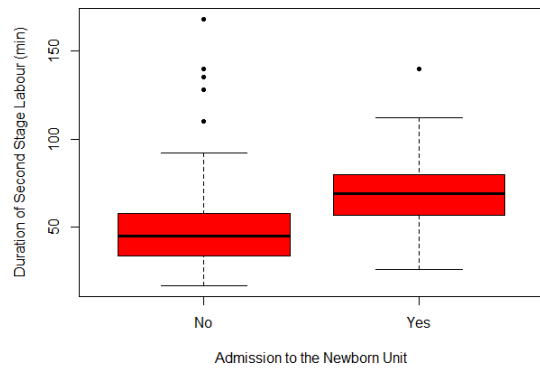
(e) Duration of Labour vs Hospital Stay



(f) Duration of Labour by Education



(a) Duration of Labour by Marital Status



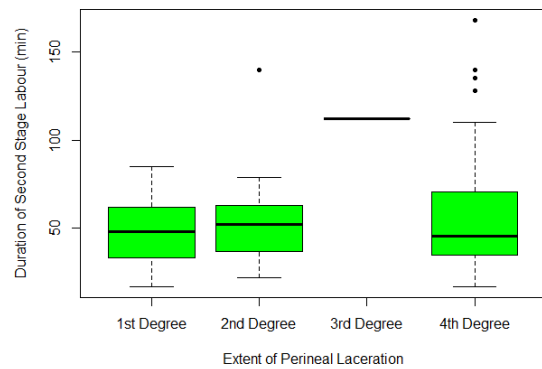
(b) Duration of Labour by Hospital Admission

Admission

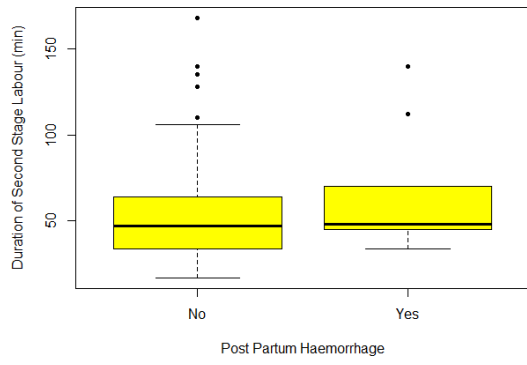


(c) Duration of Labour by Delivery Mode

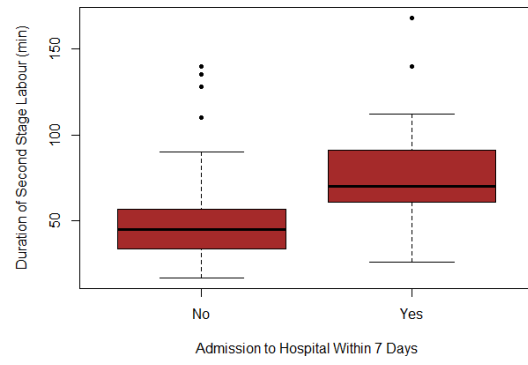
Laceration



(d) Duration of Labour by Perineal Laceration



(e) Duration of Labour vs PPH



(f) Duration of Labour by 7-Day Admission

Admission

QUESTIONNAIRE

DATE: __/__/____

Patient ID_____

Title: Association between duration of second stage of labour and maternal & neonatal outcomes at the Kenyatta National Hospital.

Thank you for agreeing to take part in this study. The study seeks to establish whether there is any association between the duration of second stage of labour and maternal and neonatal outcomes. The researcher/her assistant will ask you some questions whose responses she will enter in the spaces provided.

Part 1: Immediate

PART A: DEMOGRAPHICS	
Date of birth	__/__/____ (dd/mm/yyyy)
Weight (kg)	__ kg
Height (cm)	__ cm
BMI (kg/m ²)	__ kg/m ² (To be calculated)
Level of education	<input type="checkbox"/> Primary <input type="checkbox"/> Secondary <input type="checkbox"/> Tertiary
Marital status	<input type="checkbox"/> Married <input type="checkbox"/> Single <input type="checkbox"/> Divorced

	Residence	<input type="checkbox"/> Urban <input type="checkbox"/> Peri-urban <input type="checkbox"/> Rural <input type="checkbox"/> Slum
	Parity	No of children _____ No of pregnancies _____
PART B: DURATION OF SECOND STAGE		
	Time at full dilatation	__ . __ <input type="checkbox"/> AM <input type="checkbox"/> PM
	Time at delivery	__ . __ <input type="checkbox"/> AM <input type="checkbox"/> PM
	Duration of second stage(min)	__ __ min (Calculate from time at full dilatation to time at delivery)
PART C: NEONATAL OUTCOMES		
	Date of delivery	__ / __ / ____ (dd/mm/yyyy)
	5min APGAR	—
	Birth weight	_____ gm

	Did you have any illness in the past 7 days that required treatment (mother)?	<input type="checkbox"/> No <input type="checkbox"/> Yes If yes what was the reason for treatment _____ _____
END OF FORM		

Consent Form - English

PART 1: INFORMATION SHEET

Introduction

Dr. Agunda Commulita is a post-graduate student in the department of Obstetrics and Gynecology, University of Nairobi, currently carrying out a study: Association between duration of second stage of labour and early maternal and neonatal outcomes at Kenyatta National Hospital. You are invited to participate in this study and can take all the time you need to decide if you want to participate or not. Kindly take time to read through the information provided. If there are any questions, comments or clarifications, please feel free to ask the principle investigator or the research assistants.

Purpose of the Study

The aim of this study is to collect information on the association between the duration of second stage of labour and the outcomes of the mother and the baby at Kenyatta National Hospital. This is in order as to better manage our patients and reduce the adverse outcomes for both the mother and the baby.

Procedure

If you agree to participate in this study you will have to sign and also date the consent form. A copy of the completed form will be made and given to you to keep. You will then complete a questionnaire that will be provided to you. A member of the research team will be present for any questions or clarifications you may have. Once you have filled, your details will be recorded then you will be managed in labour like the rest of the mothers, the time you are ready to give birth will be recorded as well as the time you actually deliver. Details of your baby such as the weight as well as any complications related to the delivery will be recorded. You will be called after 7 days to answer a few questions regarding your wellbeing and that of your baby.

Potential Risks

There are no anticipated risks associated with this study.

Potential Benefits

The information given to the research team by you is aimed to better manage patients who deliver at our facility and the country in general.

Confidentiality

The information that you give will be very confidential. No names will be used and instead each participant will be assigned a unique identification number. Only the research team will have access to the information provided, which will be kept under lock and key. Upon completion of the study, results will be shared only to the relevant parties.

Right to Refuse/Withdraw

Participation in the study is solely voluntary, therefore, you do not have to take part if you do not desire to. You may decide to withdraw from the study at any time you wish. Declining from participating or withdrawing will not in any way influence your current or future treatments/interventions and all your rights will be respected.

PART 11: CONSENT

I have read and understood the information provided above. I have been fully explained to about the study and have had the opportunity to ask questions which have been answered to my satisfaction. I have agreed to participate in this study voluntarily and have not been coerced/manipulated or bribed in any way.

Participant’s Name: ----- OR Thumb Print of Participant

Participant’s Signature: -----Date: ----- AND

Witness’s Signature: ----- Date: -----

Statement by Researcher

I have explained to the participant about the study. I have given the participant an opportunity to ask questions relevant to the study, and I have answered correctly to the best of my abilities.

I have confirmed the participant has given consent voluntarily.

Name of Researcher: -----

Signature: -----

Date: -----

Who to Contact

For any questions or clarifications about the study, feel free to contact:

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