



**EFFECT OF MODE OF DELIVERY ON OUTCOMES OF FULL TERM NOENATES
ADMITTED IN A TERTIARY HOSPITAL OF KIGALI**

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Masters of Nursing/ Neonatal track

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By

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A dissertation submitted in partial fulfilment of the requirements for the degree of

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In the College of Medicine and Health Sciences

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Kigali, June, 2017

DECLARATION

I, Jeannette UMBWIYENEZA, hereby declare that the work on which this study is based is my original work, and that it has not been, is being or is to be submitted elsewhere for another degree acquisition.

Student: Jeannette UMBWIYENEZA

Supervisor: Alice MUHAYIMANA

DEDICATION

I lovingly dedicate this work to Almighty God, for he granted me life and strength to go on, and to my beloved family for their emotional and economic support, especially to my little princess INKINDI Naella Chelsea for she is my reason to live.

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ABSTRACT

BACKGROUND: Annually, there have been 147,183,065 deliveries or (20 births per 1000 populations) worldwide and 37 births per 1000 population in sub-Saharan region. Nowadays, there is a great deal of controversy regarding the optimal mode of delivery in some situations. However, the neonatal outcomes depend either on maternal factors, health system, the neonates or the mode of delivery itself. Cesarean section has been shown to be beneficial to the newborn when medically indicated, for instance timed delivery, less risk of birth trauma and asphyxia worldwide, but can also cause some complications. This study aimed at assessing the effect of mode of delivery on outcomes of full term neonates in University Teaching Hospital of Kigali (CHUK).

METHODS: This retrospective cohort study includes all full term neonates born on single pregnancy at CHUK and admitted in NICU from January 1st to December 31st, 2016. We described neonates' demographics, clinical characteristics and health history; and outcomes. The incidence rates and estimation risk of outcomes were calculated; the association between neonatal outcomes and mode of delivery was assessed using univariate analysis and chi-square test.

RESULTS: In 2016, 185 full term neonates were enrolled. The most common mode of delivery was cesarean section (68.6%) followed by spontaneous vaginal delivery (31.4%). The neonatal mortality was associated significantly with time from birth to NICU admission and reasons of admissions ($p < 0.001$). However, no association proven between neonatal mortality and mode of delivery ($P = 0.545$). The overall in hospital complications was 44.3%; majority being sepsis (23.2%) and jaundice (15.1%). The in hospital mortality rate was 7%. 2.6% of death is attributable to birth trauma ($AR = 0.026$), whereas 3% of post-delivery morbidity is attributable to

C/S delivery (AR=0.03, RR=1.04). 19% of birth trauma is attributable to the mode of delivery (AR=0.19, RR=1.2). Respiratory complications are more common in C/S than SVD (AR=0.7, RR=3.7) *CONCLUSION*: The mode of delivery or process of delivery itself can be a confounding factor on neonatal outcomes. We need to early identify the neonates who need assistance and support them.

LIST OF ABBREVIATIONS AND ACRONYMS

CHUK	Centre Hospitalier Universitaire de Kigali
CMHS	College of Medicine and Health Sciences
C/S	Cesarean Section
SVD:	spontaneous vaginal delivery
IRB	Institutional Review Board
IQR	Inter Quartile Range
MOH	Ministry Of Health
NHRC	Neonatal Health Research Center
NICE	National Institute for health and Clinical Excellence
NICU	Neonatal Intensive Care Unit
NIH	National Institute for Health
NISR	National Institute of Statistics of Rwanda
PPHN	Persistent Pulmonary Hypertension of Newborn
RDHS	Rwanda Demographic Health Survey
RDS	Respiratory Distress Syndrome
SDGs	Sustainable Development Goals

SVD	Spontaneous vaginal delivery
TTN	Transient tachypnea of Newborn
VBAC	Vaginal Birth after Cesarean
WHO	World Health Organization
LOHS	Length of hospital stay
RR	Relative risk
AR:	Attributable risk
IR:	Incidence rate

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CHAPTER 1: INTRODUCTION

1.1 Introduction

Vaginal birth is becoming less common as caesarean section rates rise steadily in many countries. Birth by Caesarean section (C/S) has implications beyond the prevention of maternal and perinatal morbidity and mortality, both for the present and future health of mothers and babies. It appears that the rate of increases in some countries is related more to other factors, than to the existence of new evidence for the need to change practice. Some of these factors are surgical development, expansion of C/S medical indications, malpractice litigation and maternal request for C/S.(Mancuso *et al.*, 2006), (Rahman & Pradhan, 2014), (Zwecker, Azoulay & Abenhaim, 2011).

Caesarean section can be a lifesaving intervention for mother and baby when vaginal birth is contraindicated. However, it is associated with increased morbidity and mortality.(Belizán, Althabe and Cafferata, 2007), (Souza *et al.*, 2016). Therefore the objective of this study is to assess the effect of mode of delivery (C/S vs. normal vaginal delivery) on outcomes of full term neonates.

1.2 Background to the study

Assessing and analyzing the effect of mode of delivery on neonatal outcomes is of a great importance in the context of the continuous rise in cesarean section worldwide. The ICM (International Confederation of Midwives) states that there is no new evidence to change practice, and adopt C/S instead of keeping birth a normal process, rather the change is being influenced by diverse factors other than the evidence based practice. This study will outline the true effect of mode of delivery on neonatal outcomes.

Since the end of the Second World War, there has been a significant increase in C/S rate worldwide in low and high income countries, regardless of the recommended rate by the World Health Organization (WHO). In 1985, WHO recommended that in any region, C/S rate should vary between 10-15% (WHO, 1985).

In a recent worldwide study done in 150 countries from 1990-2014, data from it shows that 18% of all births occur by C/S. They argued that the distribution of the worldwide C/S rate differs and is not stable, showing Latin America and the Caribbean to be the one with the highest rate worldwide (42%) and Africa with the lowest rate (7%). Eastern Asia experienced a steeper increase of 30%, while Western Africa experienced the lowest increase (0.5%). Lower income regions have been reported under using C/S (6%) while middle and higher income regions abuse C/S (20%, 27%) respectively (Betrán *et al.*, 2016).

Specific reasons for the increase in C/S trends have been identified, for instance; progress in the development of surgical and anesthetic techniques (Mancuso *et al.*, 2006); the expansion of medical indications (Rahman & Pradhan, 2014); the sharp decline in vaginal birth after previous cesarean (VBAC). (Marian F. MacDorman, Fay Menacker, 2008)(Arias *et al.*, 2003); increased malpractice litigation with premiums against medical practitioners.(Weaver, Statham & Richards, 2007)(Zwecker, Azoulay & Abenhaim, 2011); maternal request for C/S in the absence of medical indication.(Shahoei *et al.*, 2014)

C/S does offer benefits, when medically indicated. The WHO (2005) global survey on maternal and perinatal health, in eight randomly selected Latin American countries, resulted in findings that cesarean section independently reduces overall risks in breech presentation and risk of intrapartum fetal death in cephalic presentation (Villar *et al.*, 2007). Although cesarean section

delivery is beneficial, it can also have negative outcomes, for instance the ones reported by the NICE (National Institute for health and Clinical Excellence) guidelines where a significantly increased risk of NICU admission for planned C/S (13.9%) as compared to planned vaginal delivery (6.3%) have been reported, as well as neonatal respiratory morbidity for instance transient tachypnea of newborn (TTN) and respiratory distress syndrome (RDS), persistent pulmonary hypertension of newborn (PPHN). (NICE, 2011)

Mode of delivery does not only emphasize on C/S. Vaginal delivery is also another mode and it is also beneficial as well as risky. Some of the benefits of vaginal delivery include but are not limited to normal physiological adaptation to external environment in terms of respiration, immunity. Associated risks include birth trauma, specifically shoulder dystocia and the associated sequels. It can also result in birth asphyxia from delayed labor or cord compression. (Robert K. Creasy, Robert Resnik, Jay D. Iams, Charles J. Lockwood, 2009)

1.3 Problem statement

Cesarean section has been increasing worldwide. Actually 18% of all births are by C/S worldwide. In Rwanda, it has been shown that some urban districts have a C/S rate higher than 20%, even though the C/S rate at the national level is 14.8%, which is also close to the limit. Nyarugenge district where this research has been carried in is one of the urban districts having a high rate more than 20%. Centre hospitalier universitaire de Kigali (CHUK) where this study was conducted is also experiencing an increase in use of C/S; where they had total deliveries of 2,056 in 2016 and more than half (1,276) were delivered by C/S. This is in discordance with WHO as it recommends that in any region, C/S rate should not exceed 15%. Some studies have shown that C/S rate above 10% were not associated with reduction in maternal and neonatal morbidity rates. The WHO Global Survey on Maternal and Perinatal Health in Latin America

(2005), demonstrated an increased rate of preterm deliveries and fetal death when C/S delivery rate rose above 10% (Villar *et al.*, 2006)

There is no published research done in Rwanda in those areas with higher C/S rate and especially in CHUK, to evaluate whether there are deaths that are related to C/S, or simply to know if there is an influence that mode of delivery has on neonatal outcomes. Having an idea on whether mode of delivery neonatal outcomes associated with vaginal delivery vs. cesarean delivery will help in decision making of keeping birth normal and do cesarean section only once it is indicated. The rationale behind this study, therefore, is to assess the effect of delivery mode on outcomes of full term neonates.

1.4 Objective

1.4.1 Main objective

To assess the effect of mode of delivery on outcomes of full term neonates in CHUK.

1.4.2 Specific objectives

- To establish the mode of delivery for full term neonates in CHUK.
- To determine outcomes of full term neonates in CHUK.
- To assess the effect of mode of delivery on outcomes of full term neonates in CHUK.

1.5 Research question

What are the modes of delivery for full term neonates in CHUK?

What are the outcomes of full term neonates in CHUK?

What is the effect of mode of delivery on outcomes of full term neonates in CHUK?

1.6 Justification of the study

This study is aiming at assessing the effect of mode of delivery on outcomes of full term neonates. Identifying the effect that mode of delivery may cause on neonatal outcomes, it will

assist healthcare professionals since early conception in planning for preventive measures and suitable management. The findings from this study will allow the healthcare professionals to be aware of which mode of delivery is more or less likely to impact the neonatal outcomes, and therefore help them in decision making especially in case of elective C/S. This will also be helpful in policy planning and in elaboration of health education agenda; thus improving population awareness. It will also enhance best practices in newborn resulting in better outcomes.

1.7 Definition of concepts

Mode of delivery: Is the way pregnant women will deliver by. (<http://medical-dictionary.thefreedictionary.com>)

Neonatal outcomes: Are all birth related conditions that may worsen neonate status early post birth. (<https://neonatal.rti.org/>)

Full term neonate: Is a baby born between 38 and 42 weeks of gestation.(Orzalesi &Aite, 2011).

Cesarean section: Is a surgical procedure in which an incision is made through a woman's abdomen to deliver the baby. (<http://www.medindia.net/surgicalprocedures/caesarean-section>)

Spontaneous vaginal delivery: Is when the delivery occurs in a normal way without induction of labor and use of forceps, vacuum extraction, or a cesarean section. (Dresang &Yonke, 2015)

Neonatal intensive care unit (NICU): Is a unit designed with special equipment to provide continuous monitoring and potentially lifesaving care for premature or seriously ill newborn infants (Orzalesi &Aite, 2011).

1.8 Structure of the study

This study is made of five chapters. The first one is introduction, subdivided into introduction, background, problem statement, the aim of the study, research objectives, research questions, significance of the study, definition of concepts, Structure/organization of the study. The second chapter is about literature review and is subdivided into introduction, theoretical Literature, empirical Literature, critical Review and Research Gap identification, conceptual framework.

Third chapter describes the methodology and is composed of introduction, research design, research approach, research setting, population, sampling, sampling strategy, sample size, data collection, data collection instruments, data collection procedure, data analysis, ethical considerations, data management, data dissemination, limitations and challenges. Chapter four consists of the findings from the collected data analysis. The fifth chapter consists of discussion of findings, and the last chapter briefly talks about recommendations, conclusions and summary of the study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This section of research concern of reading and critically analyzes what is already known about this study, identifying gaps and strengths in the previous studies. It has been achieved using search engines such as GOOGLE SCHOLAR, HINARI, and PUBMED CENTRAL.

2.2 Theoretical literature

The philosophy around childbirth is mostly supporting that pregnancy and childbirth are normal physiological processes, nature designed for the baby to be brought into the world. Childbirth is understood as an innate experience. It has its own steps and rhythm that work better when minimal interference is exerted, meaning that it should be respected as it is. The philosophy also suggests that women should be active participants in childbirth process, informed about childbirth process, supported and guided, they may be active in giving birth rather than abiding and receive passively birth technologies. Women that gave birth normally will experience a potential transformation therefore; have a sense of feeling powerful and more responsible, personal growth which will impact both the newborn and the mother. Midwife and nursing sciences overlaps, due to the fact that both sciences see the client as unique but also as whole. Midwife and nurses attending birth must act like protectors of natural childbirth and ensure safe pregnancy, labor and delivery with lesser interventions. (ICM, 2011)

At birth the fetus has a number of rather remarkable challenges to overcome, including making the transition from having oxygen and nutrients provided through the maternal blood supply to relying on its own lungs and digestive tract for these needs. Infants that are born by cesarean, especially elective cesarean section, have a very different birth experience than infants that are delivered by a spontaneous vaginal birth. These differences may affect the infant's respiratory

and metabolic systems in negative ways that result in increased short term and long term morbidity.(Jain Lucky & Eaton Douglas, 2006); (Ramachandrappa Ashwin, 2008)

Labor exposes the fetus to a cascade of hormone changes thought to be important for a successful transition from the womb to the external environment. In particular, increased levels of catecholamine and glucocorticoids are thought to help activate sodium ion channels in the pulmonary epithelium responsible for clearance of the majority of the fetal lung fluid. Infants born by elective cesarean section do not experience this surge of endogenous hormones. This is thought to lead to less fluid cleared from the lungs at birth, which could result in higher rates of respiratory morbidity in the neonatal period that could potentially extend into childhood. (Finley *et al.*, 1997), (Baines *et al.*, 2000)

Also, prior to birth, the fetuses' digestive tract is sterile, and is first colonized by bacteria during delivery. The digestive tracts of infants born vaginally are first colonized by flora similar to the flora of the mother's digestive tract. The digestive tracts of infants born by CS are first colonized by surface bacteria in the delivery room and on the mother's skin. Infant gut flora has a significant impact on the maturation and development of the immune system. Initial colonization with flora from the delivery room environment rather than the mother's digestive tract could lead to increased susceptibility to atopic disease, such as asthma.(Kristensen & Henriksen, 2012), (David *et al.*, 2005)

2.3 Empirical literature

2.3.1 Cesarean section historical background

One of the first citations to C/S where the fetus and the mother apparently survived was in 1500.

Jacob Nufer, a pig farmer in Switzerland allegedly operated on his wife after a prolonged labor (Feindel & Skinner, 2003). The “Do Corporis Human Fabrica” was published in 1543 by Andreas Vesalius documenting the female and abdominal anatomy. This provided the basis for operative obstetrics in the 18th and 19th century.(Todman, 2007)

The first successful C/S was reported to be done by Dr James Miranda Stuart Barry around 1815. She was serving in the British army as a physician. (Sewell, 1993)

In 1879, traditional healers did a successful C/S as witnessed by one British traveler in Uganda. It was amazing to notice that the healer used banana wines to semi intoxicate the woman, as well as to clean his hands and abdomen prior to surgery. Similar reports come from Rwanda where botanical preparations were used to anesthetize the patient and promote wound healing.

With further development in anesthesia, pharmacy and surgery, C/S has evolved from an operation attempting to save the soul of fetus whose mother was dead, to a frequently performed procedure in which the mother not only expects to survive, but also expects her baby (Sewell, 1993)

2.3.2 Types and indications of cesarean section.

Different types of cesarean section are according to the technique and incision used in the procedure. For the interest of the study, we focus on types of C/S basing on when it is performed.

Emergency C Section: It’s when there is suspected danger to the mother's or baby’s condition.

Emergency C/S has many indications for instance, fetal distress, maternal distress, mechanical impedance to the progress of labor, abnormal fetal presentations.

Elective Cesarean Section (Planned C-Section): The Cesarean is planned and done on a specific date chosen by the patient and the doctor after assessing the maturity of the baby. Most of the time, it is chosen by the mothers in order to avoid labor pain.

It also has indications, like Previous Cesarean, placenta praevia, abnormal position of the baby such as breech or transverse lie, Genital herpes in the mother–Medical problems in the mother like high blood pressure or diabetes, triplets or more number of babies, heavy and Big Baby >4 kg in weight, uterine deformity.(

<http://www.medindia.net/surgicalprocedures/caesarean-section-types-and-indications.htm>)

2.3.3 Cesarean section rates

Since the end of the second world war, there has been a significant increase in C/S rate worldwide in low and high income countries, despite the recommended rate by the World Health Organization which is between 10-15% (WHO, 1985). In a recent study done in 1990- 2014, from 150 countries around the world, they found that actually 18, 6% of all births occur by C/S, arguing that the distribution of the worldwide C/S rate differs and is not stable. Latin America and the Caribbean region were shown to be the one with the highest C/S rate worldwide (40.5%). Statistics of the increasing trends since 1990-2014, are summarized in the following table.(Betrán *et al.*, 2016)

**Table 1: CHANGE IN CAESAREAN SECTION RATES IN 121 COUNTRIES
CATEGORIZED ACCORDING TO THE UNITED NATIONS
GEOGRAPHICAL GROUPING FROM 1990 TO 2014**

REGION/SUB REGION	CHANGE IN RATE (earliest and latest rates %)	ABSOLUTE INCREASE (%)
AFRICA	2.9 - 7.4	4.5
East Africa	2.3 – 3.9	1.6
Middle Africa	–	–
Southern Africa	–	–
Northern Africa	4.5 – 27.8	23.3
West Africa	2.6 – 3.1	0.5
ASIA	4.4 – 19.5	15.1
Eastern Asia	4.9 – 35.2	30.3
South Central Asia	4 – 11.4	7.4
South Eastern Asia	4.1 – 15	10.9
Western Asia	6.3 – 28.1	21.8
EUROPE	11.2 – 25	13.8
Eastern Europe	7.8 – 23.7	15.9
Northern Europe	11.1 – 22.4	11.3
Southern Europe	16.3 – 31.1	14.8
Western Europe	14.8 – 24.5	9.7
LATIN AMERICA AND THE CARIBBEAN	22.8 – 42.2	19.4
Caribbean	9.9 – 28.5	18.6

Central America	14.8 – 38.4	23.6
Southern America	28.4 – 45.8	17.4
NORTHERN AMERICA	22.3 – 32.3	10
OCEANIA	18.5 – 32.6	14.1
Australia/ New Zealand	18.5 – 32.6	14.1
WORLD TOTAL	6.7 – 19.1	12.4
Lower income regions	1.9 – 6.1	4.2
Middle income regions	6.3 – 20.9	14.6
Higher income regions	14.5 – 27.2	12.7

Lower income countries have been generally shown to have the lowest C/S rates, and most of them are African countries. Factors contributing to this are delay in seeking, accessing and receiving good quality care, thus increasing maternal and perinatal morbidity.

Definitely, the recommended rate by the world health organization is between 5% and 15%; it has become the reference of the ideal C/S rate. “The recent WHO statement on C/S provided a summary of performed systematic reviews and ecological analysis and the conclusion from these is that in a population, the C/S rate above 10% are not associated with a reduction in maternal and neonatal mortality”(Betran *et al.*, 2016)(WHO, 1985)

However, a few studies have criticized the use of a specific value to define the optimal cesarean section rate. The state of the science conference on cesarean section on maternal request in 2006 discouraged the ideal rate stating that optimum cesarean delivery rate will vary over time and across different populations (Natcher, 2006). A similar statement was made by Robson,

suggesting that cesarean section rate should be determined by maternal and fetal outcomes. He further proposed that this rate should be determined locally and that rates should vary between units (Robson, 2001). This proposal would make sense in a Rwandan tiered referral system where for instance the CS rate in a tertiary institution would be expected to be higher than that of a district hospital that refers complicated cases.

Five specific reasons for the C/S increasing trends have been identified

Progress in the development of surgical and anesthetic techniques:

As it is made, patients and health care providers have come to perceive C/S as a much safer procedure (Mancuso *et al.*, 2006).

The expansion of medical indications:

In 2001, the main indications for C/S were previous C/S (24.1%) and cephalopelvic disproportion (16.5), abnormal fetal lie and previous bad mishap each was 7%, later in 2011 other indications were added such as hypertensive disorders, maternal request. The top 3 main indications still are fetal distress (24.6%), failed induction (14.8%) and previous C/S in labor (11.3%) (Rahman & Pradhan, 2014)

Sharp decline in vaginal birth after previous cesarean (VBAC):

In the United States, from 2001 to 2002, the VBAC rate fallen from 23 to 12.7% per 100 women who had previously a cesarean section. It had risen 50% from 1989 to 1996 but has fallen 55% since 1996, high of 28.3%.(Marian F. MacDorman, Fay Menacker, 2008) (Arias *et al.*, 2003).

Increased malpractice litigation premiums against medical practitioners:

Issues of malpractice litigation have turned medical practitioners into "defensive obstetricians". This has been proposed as another factor behind the rise in C/S trends (Weaver, Statham & Richards, 2007). A study done in UK has shown that consultants believe that litigation and defensive practices are the reason for the increasing trend in C/S rate at 67.1%. Another study done in US showed that average state malpractice premium of over \$100,000 was associated with higher incidences of total cesarean deliveries. Odds ratio (OR) of 1.17, 95% (Zwecker, Azoulay and Abenhaim, 2011)

Elective cesarean section:

Cesarean section is called elective once performed on maternal request, without any medical indication. Statistics of elective C/S are not readily identifiable in any existing studies. However, it has been estimated in the United States and internationally that nearly 4 to 18% of all cesarean deliveries are on maternal request (National Institutes of Health (NIH), 2006). Reasons behind why mothers are nowadays requesting cesarean section are diverse. Fear of labor pain, minimizing the risk of fetal distress during labor, safety and birth process control, prevention of pelvic organ prolapse and stress urinary incontinence, avoidance of female body change were found to be among the reason of requesting cesarean section. (Dursun *et al.*, 2011) (Fenwick *et al.*, 2010)

Elective C/S has been increasingly perceived as the reason for the increase in C/S rate. However, a significant number of studies do not support this. They show that mostly, women prefer vaginal delivery to cesarean section. A study done in Iran ended up with findings that of the 22 pregnant women who participated in the study, only 4 preferred C/S (Shahoei *et al.*,

2014). Another one done in Turkey showed that the great majority (87%) of participating women would choose vaginal delivery while only 13% opted for cesarean section (Akarsu and Mucuk, 2014)

Statistics from the Rwandan demographic health survey (RDHS 2016) have shown that neonatal mortality is at 20 deaths per 1000 live births. This is still inconsistent with the sustainable development goals(SDGs) precisely goal number 3 which is" ensure healthy lives and promote wellbeing for all at all ages" This SDG3 suggests that by 2030, "all countries should reduce neonatal mortality to at least as low as 12 per 1000 live births. These figures by the RDHS show that Rwanda is well progressing toward the third SDG, but this is to be maintained to not falling back. Measures have to be taken including choosing the best appropriate mode of delivery with less complication thus reducing unnecessary neonatal deaths. (<http://www.un.org/sustainabledevelopment/health/>)

In another perspective especially in lower income countries, and on which this study is built on, is the difference in use of cesarean section among urban and rural populations. This has been confirmed in researches that have been conducted for that purpose, and they found that C/S was under used in rural areas while it was abused in urban areas. This has been justified by the fact that people in cities are more educated, earn a certain amount of money, have easy access to health information and health services.(Ronsmans, Holtz and Stanton, 2006)

In Rwanda, RDHS report showed the same difference. In urban areas, 22% of all births are by cesarean section, despite the national C/S delivery rate of 14%.(NISR(national institute of statistics of Rwanda), ministry of finance and economic planning of Rwanda, ministry of health of Rwanda, DHS program, 2016). Precisely, the ministry of health reported that C/S rate is

higher than 20% in Gasabo, Nyarugenge, and Muhanga districts, and those are urban districts among the others in Rwanda. (Ministry of Health of Rwanda, 2013).

2.3.4. Neonatal outcomes of C/S compared to vaginal delivery

Cesarean section delivery offers benefits when it is medically indicated; which is different for planned or elective cesarean section delivery. In a Global Survey on Maternal and Perinatal Health in Latin America from 2005 showed that elective CS delivery did not have a beneficial impact on fetal outcomes. Also, several studies have assumed that there is no benefits associated with CS higher rates, but rather that they may lead to an increase in maternal as well as neonatal mortality and morbidity (Belizán, Althabe and Cafferata, 2007)

There have been a number of observational studies that have documented poorer outcomes for infants born by cesarean section compared to vaginal delivery. Outcomes that could be related to either lung fluid clearance or respiratory morbidity, and neonatal intensive care unit admission. (Hopkins *et al.*, 2007), (Visco *et al.*, 2006), (Caroline Signole, 2009), (Many et al, 2015), (Geller et al., 2010)

Visco *et al.*, (2006) conducted a systematic review in which they examined the effect of elective cesarean delivery on neonatal mortality. They excluded studies that only examined subpopulations and studies with less than 100 subjects. They found that the evidence was inconclusive at that time due to small sample sizes and lack of control variables in the available studies. Since then, several additional observational studies have been published.

Macdorman *et al.*, (2006) examined the effect of cesarean delivery with no indicated risk on neonatal mortality in a population of term, singleton deliveries. The no indicated risk group was used as a substitute for cesarean delivery on maternal request. They used national vital records

data consisting of linked birth and infant death certificates for years 1998-2001. They excluded women with a previous cesarean delivery, deliveries with any evidence of congenital anomalies; any reported labor complications, any reported medical risk factors, and infants with 5 minute APGAR scores less than 4. They found an increased risk of neonatal mortality for infants delivered by cesarean delivery with no indicated risk, with an adjusted odd ratio (AOR) of 2.0 (95% CI, 1.6-2.6). In this study all remaining cesarean deliveries after exclusions, including cesarean deliveries in which there was evidence that the woman labored prior to delivery, were combined and compared with all vaginal deliveries.

In a later study, MacDorman *et al.*, (2008) repeated the above analysis, using data from 1999-2002, with an intent to treat design. In this case, intent to treat consisted of removing the group of women who labored but went on to deliver by cesarean, from the cesarean delivery group and moving them into the vaginal delivery group. The assumption behind this change is that if a woman labored, then she intended to have a vaginal delivery, but a post labor onset complication resulted in the eventual cesarean delivery. With the intent to treat analysis they found that the risk of neonatal mortality for infants delivered by elective cesarean delivery was still significantly increased (AOR 1.7, 95% CI 1.4-2.1).

In the above described systematic review conducted by Visco, et al.,(2006) the reported effects of elective cesarean delivery on respiratory morbidity in neonates was also examined.

The review indicated that neonates delivered by elective cesarean delivery were at an increased risk of respiratory morbidity. A number of studies have been published since the review of Visco *et al.*, (2006) was conducted, the majority of which agree with their findings.

Kolas *et al.*, (2006) conducted a study examining data from 24 obstetric units in Norway during a six month period in 1999, that reported their data to a national medical birth registry. They included only singleton, term infants without congenital anomalies in the study; however, they did not exclude women with a prior cesarean delivery. The groups compared were planned cesarean delivery (n=825) and planned vaginal delivery (n=17,828). They found an increased risk of overall respiratory morbidity, which included respiratory distress syndrome, transitory tachypnea of the newborn and persistent pulmonary hypertension. As mentioned above, this study included women who had a previous cesarean delivery, and newborns with birth defects, neither of which was controlled for in the analysis. Although the prospectively collected data is likely of high quality, the study is open to potentially omitted variable bias.

Gerten *et al.*, (2005), examined the relationship between respiratory distress syndrome seen in neonatal intensive care units and cesarean delivery in a population based case control study in Arizona. Cases and controls were selected from a statewide clinical database collected by the Arizona Neonatal Intensive Care Unit Program. Admission to a neonatal intensive care unit was not required for a neonate to be entered into the database. Neonates who were readmitted to the hospital within 96 hours of birth or were recommended by a neonatologist were also included. This data was then linked to birth certificate data. Exclusions included multiple births, congenital anomalies, and deliveries complicated by placental previa or breech presentation. Cases included neonates that had a diagnosis of respiratory distress syndrome and were admitted to a neonatal intensive care unit. Each case was matched by year of birth to five controls. Controls came from a population of neonates without a diagnosis of respiratory distress syndrome and who had never been admitted to a neonatal intensive care unit. Multivariable logistic regression analysis was used to control for demographics, maternal complications, and infant complications, as available

on the birth certificate, though no mention was made of controlling for or excluding women who had a previous cesarean delivery. This study found an increased risk of respiratory distress syndrome for infants delivered by cesarean section compared to vaginal delivery (AOR 2.3, 2.1-2.6). After stratifying cesarean delivery by the presence of labor, the risk was slightly higher for cesarean delivery without labor (AOR 2.6, 2.3-2.8) than it was for cesarean delivery with labor (AOR 1.9, 1.2-2.9). The effect of elective cesarean delivery has also been examined in terms of other neonatal outcomes, including seizures, birth asphyxia, sepsis, jaundice, hypoglycemia, and brachial plexus injury.

Kolas *et al.*,(2006) as described above, examined the relationship between neonatal seizures and elective cesarean delivery. They found no statistically significant differences between the elective cesarean delivery group and the planned vaginal delivery group (AOR 0.8, 0.1-5.5). In the systematic review by Visco *et al.*, (2006) mixed evidence was found in regard to the relationship between cesarean delivery and birth asphyxia, with one study showing a protective effect of cesarean delivery, and a second study showing a harmful effect. Kolas *et al.*,(2006) also examined the relationship between elective cesarean delivery and sepsis, finding no significant differences between elective cesarean delivery and planned vaginal delivery (AOR 0.6, 0.2-1.7). Geller *et al.*, (2010), examined the relationship between elective cesarean delivery and jaundice. They found an increased risk for jaundice in the elective cesarean delivery group (AOR, 2.3, 1.6-3.3).

Towner *et al.*,(1999) using data from California for the years 1992 to 1994, examined the relationship between cesarean delivery in nulliparous women and brachial plexus injury. The study excluded multiple births and breech deliveries, and no multivariable methods were used in the analysis. They found a decreased risk of brachial plexus injury in neonates delivered by

cesarean delivery compared to vaginal delivery (OR 0.4, 0.3-0.5). Another population based cohort study done in Canada, which aimed at estimating the impact of C/S on neonatal outcomes, found that CS is protective against neonatal birth trauma, specifically once done without labor. (OR=0.20, 95% CI 0.08 to 0.52 and OR=0.04, 95% CI 0.02 to 0.10, respectively). (Liston *et al.*, 2008)

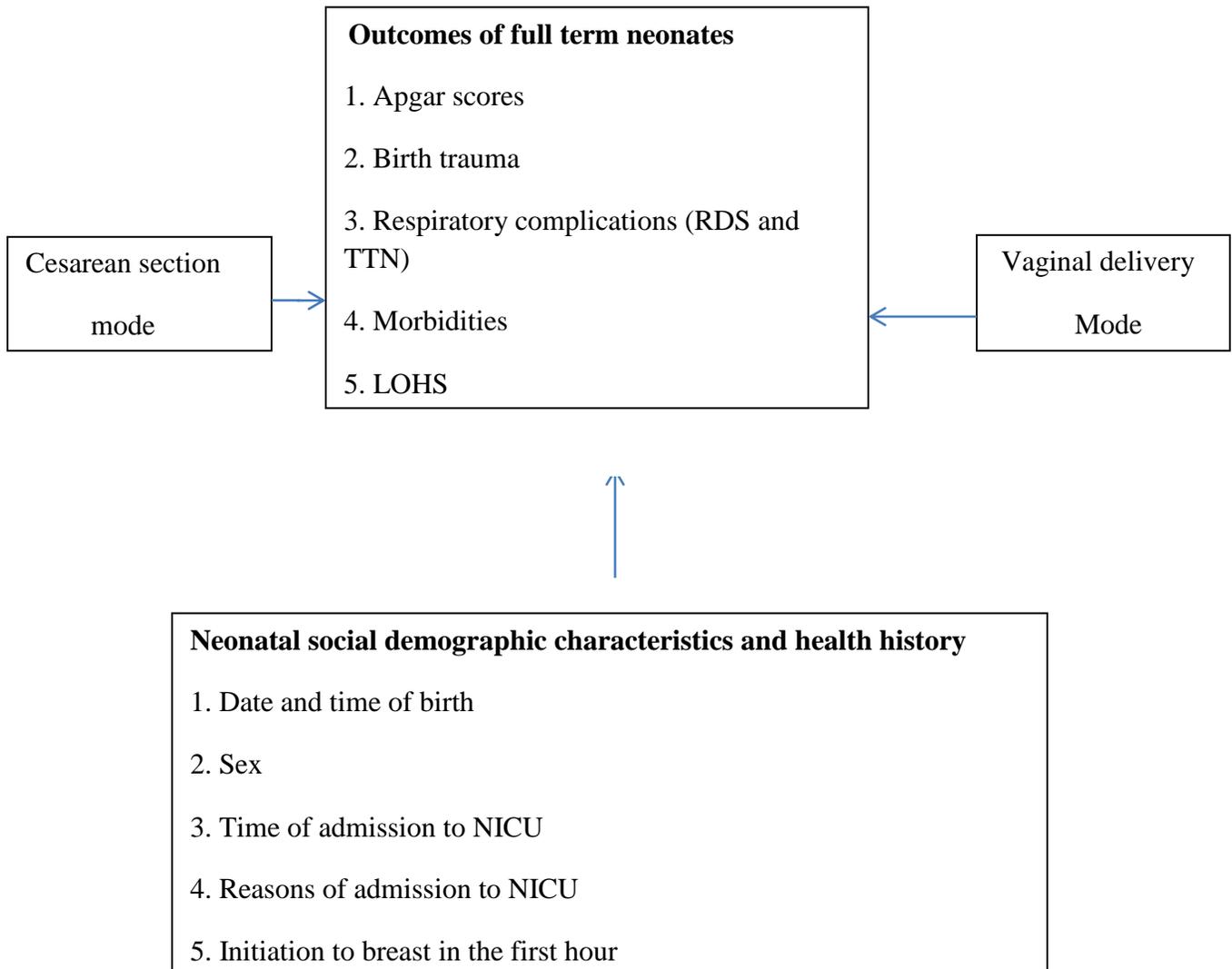
As a summary from the above literature, infants delivered by elective cesarean delivery are at increased risk of morbidity and mortality, as justified by the following summarized points:

1. Birth experience in terms of natural and physiological transition is not experienced by infants born by elective C/S than those born by SVD.
2. Fetal lung fluid is best cleared in infants born by SVD than those born by C/S, reason why respiratory morbidities are more prevalent in infants born by C/S. Many studies found the evidence of association of C/S with respiratory distress syndrome.
3. The gut flora of infants born by C/S is Initial colonized with flora from the delivery room environment, rather than being colonized with the mother's digestive tract which is the case for infants born by SVD, could lead to increased susceptibility to atopic disease, such as asthma and impose a significant impact on the maturation and development of the immune system.
4. Increased risk of neonatal morbidity and mortality in infants born by C/S especially elective compared to those born by SVD
5. Increased risk for jaundice in the elective cesarean delivery than in SVD.
6. C/S has been proven to be protective against birth asphyxia and birth trauma than SVD.

2.4. Critical review and research gap identification

The available literature examining the impact of mode of delivery on neonatal outcomes emphasized almost only on elective cesarean section. Few studies only included C/S with labor. A weakness of selection bias has been observed in many of the reviewed literature. Lack of control of confounding factors has also been identified as another challenge or weakness. The strength of the literature used is that some of them randomized the mode of delivery; others used larger samples and were multisite.

Figure 1: 2.5 Conceptual Framework



CHAPTER 3. METHODOLOGY

3.1 Introduction

This chapter explains details of the research process. It is the heart of a research to be successful. It explains about the methodology, the area of concern where the research was done, the population of interest, data collection instrument and method, data analysis, data management and dissemination, lastly ethical consideration and limitations.

3.2. Research design

This is a retrospective cohort study design. Burns and Grove described retrospective study as “an epidemiological study in which a group of people are identified who have experienced a particular event. Both the proposed cause and effect have already occurred” (Burns and Grove, 2015)

3.3. Research approach

This study is a quantitative study. It has been defined as a “research method in which numerical data are used to obtain information about the world. It describes variables, examine their relationship and determine cause and effect interactions between them” (Burns and Grove, 2005)

3.4. Research settings

This study was conducted at University Teaching Hospital of Kigali (CHUK), in neonatal intensive care unit (NICU). CHUK is a referral hospital located in Nyarugenge district, in Kigali the capital city the most populated area of the country (NISR, 2010). The hospital was built in 1918 by the Belgian authorities and started with 4 hospitalization rooms and dispensary. As the country capacity increased, the dispensary was also widened to respond to Rwandan population needs. In 1963 an agreement between Rwanda and Belgian kingdom for its assistance was signed

finally stopped by 1994 genocide. During the genocide, the hospital faced with the huge loss of human and finance resources and ought to close.

In July 1994 the hospital reopened and grew gradually seeing that today it has a capacity of receiving 509 in patients in 15 clinical and par clinical services.

Now, the hospital is under the responsibility of the ministry of health in collaboration with the National University of Rwanda and financed by the Belgian Technical cooperation. CHUK is the national reference hospital which provides technical support to district hospitals and serves as a training center for medical as well as nurses students and performs medical researchers.

The NICU where this study was conducted is a unit from pediatric department. It is located at the right side from the main entrance of CHUK, in maternity building, just opposite pediatric emergency unit. It has 22 beds but they can add some bassinets once the admissions increase. NICU's personnel are 2 pediatricians, 4 residents, 13 nurses and 1 nurse unit manager.

3.5. Study population

Populations of interest were neonates admitted in NICU during the period of January up to December 2016.

3.5.1. Inclusion criteria

The study included babies that were born at CHUK, by C/S or by SVD, from a singleton pregnancy and were born term.

3.5.2. Exclusion criteria

We excluded babies born from mothers with chronic conditions, or any other disease during pregnancy. Babies born with congenital malformations were excluded.

3.6. Study sample and sampling strategy

All neonates admitted to NICU during the study period, and meeting the inclusion criteria was included in the study.

The sample size has been calculated based on one single proportion (10.1%) based on study done in low and middle income country(Minoo Fallahi, 2014)

$$\text{Sample size } N = z^2 pq / d^2$$

N= sample size, Z= value from standard normal distribution corresponding to desired confidence level (Z=1.96 for 95% confidence interval)

P= expected proportion of mortality for term newborn =10.1%

$$q = 1 - p \Rightarrow q = 1 - 0.1 = 0.9$$

d= confidential coefficient =0.05

$$N = (1.96)^2 0.1 \times 0.9 / (0.05)^2 = 138$$

The sample size is **138**

3.7. Data collection

“Data collection is the process of selecting subjects and gathering data from these subjects” (Burns, Grove 2005).

3.7.1 Data collection instruments

During this study, data were collected from the records, using a data capture sheet developed by the researcher and has been approved by the supervisor.

3.7.2 Validity and reliability of the data collection tool

Validity refers to whether a tool measures what it is intended to measure while reliability refers to the degree at which a tool produces the unchanging results. The data capture sheet was developed by the researcher and approved by the project supervisor. It has been developed based on the literature relevant to the topic of interest, turning around the objectives of the study and the conceptual framework. To determine the internal coherence of the tool, the researcher did a pilot study prior to data collection.

3.8. Data collection procedures and analysis

After obtaining the ethical clearance from the CMHS_IRB, the researcher addressed a letter to CHUK, requesting the permission to collect data. Data were collected in 12 days, counting 3 days in a week meaning from Monday to Wednesday starting from 7 A.M up to 5P.M, from January 23th to February 8.

Data was extracted from hospital admission registers, patient files in the archive. Trained data collector used a predesigned tool to collect patient data on paper forms. Pilot study to test the validity and reliability of the tool was done on records of one month. After validity and reliability ascertained, helped by trained research assistants, all files for neonates admitted from January to December 2016 were reassembled. Each data capture sheet was coded according to the patient's archive code that appears on the file, but also serial numbers from 1 were added just to know the number of files done with data collection.

Each file was then verified for inclusion eligibility before the researcher starts to collect data from it. If it was found not meeting the inclusion criteria, it was arranged separately. The one meeting inclusion criteria was studied and data recorded on the capture sheet, it was done the

same way for all files until they are all done. Sheets completed everyday was taken home to be stored in a closed keyboard while waiting for entering them in a computer.

Data was entered into an electronic EXCEL database and analyzed using Stata v13.0 (College Station, TX: StataCorp LP). We described patient demographics, clinical characteristics, and outcomes using frequencies and percentages for categorical data, and median and interquartile ranges for continuous data. The association between neonatal outcome variables and mode of delivery was assessed using univariate analysis and chi square test. Incidence rates of neonate outcomes were calculated and compared among the caesarean section group and the vaginal delivery group. Subsequently, estimation of risks (Relative Risk and Attributable Risks) was calculated using 2x2 tables.

3.9 Ethical considerations

Ethical principles considered in this study are

Right to anonymity was assured by keeping the data capture sheets without names or any other identifiers. Only codes of archive were used on the data sheet.

Right to privacy was assured by keeping the hard copies in a closed keyboard, once entered in a computer; it was locked with a password that known only by the researcher.

Ethical clearance was obtained from the University of Rwanda institution review board (IRB) for the approval of this proposal; afterwards, permission from CHUK for collecting data using their records was obtained. No informed consent was needed as the researcher was dealing with records not human subjects.

3.10 Data management

After collecting data, they have been entered in a computer that was locked with a password only known by the researcher. Afterwards, at the end of analysis, hard copies of the data capture sheet will be stored in a closed keyboard for a period of seven years and only the researcher will have access to the key. These can be destroyed after that time.

3.11 Data dissemination

After analysis, the results will be transmitted to end users using by presenting oral and written report of the research result to the hospital, giving them a printed copy of the whole study. The research will also be published in a nursing journal for its more fast distribution around the world. Finally, the results will be presented to the ministry of health.

3.12 Limitations and challenges

As it is a retrospective study, information limitation was the main challenged justified by lack of data due to poor documentation or even the available data may not be accurate (information bias).

Another challenge was finding files in archive. Even though files are there, to access to them, we were given a limited number of files, the reason was that they have few personnel to deal with this. Consequently, it took us additional days to those that were planned for data collection. Another reason behind and that is almost general is that people until now don't value research. They consider that we are just giving them extra work.

Short time for the study has been also one of the challenges.

In CHUK, statistics regarding use of C/S were not clear; they don't separate emergency C/S from elective ones. This may lead to confounding while studying C/S as combined.

Another limitation to this study was the limited literature related to this topic. Few similar articles, lack of data for elective cesarean section in Rwanda, and almost no article in sub-Saharan Africa, thus making it recommended in future research.

CHAP 4. RESULTS

This chapter reports on the study findings based on quantitative data, obtained from 185 full term neonates born in 2016, at CHUK by cesarean section or spontaneous vaginal delivery on singleton pregnancy; and admitted in Neonatal intensive care Unit.

4.1.DEMOGRAPHIC CHARACTERISTICS AND HEALTH HISTORY OF NEONATES AT CHUK

Table 2: 4.1.1 Demographic characteristics

Variable	Number of patient	Percentage %
Sex: Male	99	53.5
Female	86	46.5
Birth weight in kg,(median, IQR)	3.5	(3.2, 3.9)

Among the enrolled full term neonates, the majority was male (53.5%) and the median birth weight was 3.5kg with interquartile ranging between 3.2 and 3.9kg (Table 4.1).

Table 3 :4.1.2. Time from birth to NICU admission

Time in hours	N	%
immediately	37	20
1-6 hours	81	43.8
7-12 hours	15	8.1
13- 24 hours	2	1.1
After 24hours	50	27.0

The neonates admission to NICU was even across the time with the most majority admitted within 1 to 6hours 43.8% (Table4.3).

Table 4 : 4.1.3 Reasons for admission in NICU

Variables	Number of patient	Percentage
Infectious risk	49	26.5
Transient tachypnea of newborn(TTN)	43	23.2
Neonatal sepsis	26	14.1
HIE	24	13
Jaundice	11	6
PROM	10	5.4
Meconium aspiration syndrome	6	3.2
Chorioamnionitis	5	2.7
PPHN	3	1.6
RDS	3	1.6
Wound injuries	5	2.7

The first most common indication of NICU admission was infection risk 26.5% followed by TTN 23.2%

Table 5:4.1.4 Initiation to breast in the first hour

Initiation to breast	Number of patients	percentage
yes	77	41.6
no	108	59.4

Among the enrolled neonates, only 41.6% started breastfeeding in the first hour.

Table 6 : 4.2MODE OF DELIVERY OF FULL TERM NEONATES AT CHUK

VARIABLES	NUMBER OF PATIENTS	PERCENTAGE %
Mode of delivery		
C/S with labor	75	40.5
C/S without labor	52	28.1
SVD	58	31.4

68.6% of all the full term neonates were born by C/S, and almost half of them were elective C/S.

Table 7: 4.3OUTCOMES OF FULL TERM NEONATES AT CHUK

VARIABLES	NUMBER OF PATIENTS	PERCENTAGE %
Apgar scores		
APGAR at 1 minute(mean, range)	7; 1-10	
APGAR at 5 minute(mean, range)	8; 2-10	
APGAR at 10 minutes(mean, range)	9; 3-10	

Birth trauma		
Yes	37	20
No	148	80
Types of Birth trauma		
Cephalohematoma	20	10.8
Facial bruising	14	7.6
Wound	3	1.6
No birth trauma	148	80
Respiratory complications		
RDS	3	1.6
TTN	43	23.2
No respiratory complications	139	75.2
Morbidity		
Neonatal sepsis	43	23.2
Pathologic jaundice	28	15.1
Eye problems	2	1.1
Electrolytes imbalance	2	1.1
Others	7	3.8
LOHS in days(median, IQR)	6	(3,10)

Not applicable		
Mortality		
Alive	172	93
dead	13	7

The Apgar score was variably at 1st, 5th and 10th minutes where its average was 7, 8 and 9 respectively. TTN has been found to be the most existing respiratory complication in full term neonates at CHUK compared to RDS with 23.2% and 1.6% respectively. Sepsis and jaundice are the dominating morbidities in NICU with 23.2% and 15.1% respectively. The median length of hospital stay was 6 days (IQR: 3, 10). The overall mortality is 7%

4.4. EFFECT OF MODE OF DELIVERY ON NEONATAL OUTCOMES

Table 8: 4.4.1. Effect of mode of delivery on neonatal morbidity

Mode of delivery	morbidity		Total
	yes	no	
C/S	57	70	127
SVD	25	33	58
Total	82	103	

Incidence of morbidity in neonates born by C/S 57/127

Incidence of morbidity in neonates born by SVD 25/58

RR= $57 \times 58 / 127 \times 25 = 1.04$ (The incidence of morbidity is 1.04 times more noted in those born by C/S compared to SVD)

AR= $57 / 127 - 25 / 58$: $57 / 127 = 45\%$ (45% of post-delivery morbidity is attributable to c/s delivery)

Table 9: 4.4.2 Effect of mode of delivery on birth trauma

Mode of delivery	Birth trauma		Total
	yes	no	
C/S	27	100	127
SVD	10	48	58
Total	37	148	185

Incidence of birth trauma defect during C/S =27/127

Incidence of birth trauma during SVD =10/58

RR= $27 \times 58 / 10 \times 127 = 1.2$ => birth trauma for neonates is 1.2 times more common in those born by C/S than those born by SVD

AR= $0.21 - 0.17 / 0.21 = 0.19$ => 19% of birth trauma is attributable to the mode of delivery.

Table 10: 4.4.3 Effect of mode of delivery on neonatal mortality

Mode of delivery	mortality		Total
	Alive	Dead	
C/S	118	9	127
SVD	54	4	58
Total	172	13	185

Incidence of mortality in neonates born by C/S is 118/127

Incidence of mortality in neonates born by SVD is 54/58

RR= $118 \times 58 / 54 \times 127 = 0.9 \sim 1$

Neonatal mortality is not attributable to mode of delivery as the RR is 1

Table 11: 4.4.4 Effect of mode of delivery on respiratory complications

Mode of delivery	Respiratory complications		Total
	Yes	No	
C/S	41	86	127
SVD	5	53	58
Total	46	139	185

Incidence of respiratory complications in neonates born by C/S is $41/127 = 0.3$

Incidence of respiratory complications in neonates born by SVD is $5/58 = 0.08 \sim 0.1$

Relative risk is $41 \times 58 / 5 \times 127 = 3.7 \Rightarrow$ respiratory complications are 3.7 times more common in those born by C/S than those born by SVD

AR = $0.3 - 0.08 / 0.3 = 0.7 \Rightarrow 0.7\%$ of respiratory complications is attributable to mode of delivery

Table 12: 4.5 Association between variables and neonatal mortality

Variable	Alive	Dead	P value.
Birth weight	172	13	0.698
Sex			
Male	89 (51.7%)	10 (76.9%)	0.091
Female	83 (48.3%)	3 (23.1%)	

Mode of delivery			
C/S	118(68.6%)	9(69%)	0.615
SVD	54 (31.4%)	4 (31%)	
Time from birth to admission in NICU			
immediately	25 (14.5%)	12 (92.3%)	0.000
1-6 hours	81 (47%)	0	
7-12 hours	15(8.7%)	0	
13- 24 hours	2 (1.2%)	0	
After 24hours	49 (28.5%)	1 (7.7%)	
Reasons of admission			
Infectious risk	49 (28.5%)	0	0.000
Transient tachypnea of newborn(TTN)	43 (25%)	0	
Neonatal sepsis	25 (14.5%)	1 (7.7%)	
HIE	13 (7.6%)	11 (84.6%)	
Jaundice	11 (6.4%)	0	
PROM	10 (5.8%)	0	
Meconium	6 (3.5%)	0	

aspiration syndrome			
Chorioamnionitis	5 (2.9%)	0	
PPHN	2 (1.2%)	1 (7.7%)	
RDS	3 (1.7%)	0	
Wound injury	5 (2.9%)	0	
Morbidity			
Sepsis	40 (23.3%)	3 (23.1%)	0.019
Jaundice	25 (14.5%)	3 (23.1%)	
Electrolytes imbalance	0	2 (15.4%)	
Eye problems	2 (1.2%)	0	
Anemia	7 (4.1%)	0	
None	98 (57%)	5 (38.4%)	

Neonatal outcome variables were compared to different mode of delivery and other variables seemed to influence it (Table4.6). The analysis revealed association between some variables: time from birth to NICU admission ($P<0.001$), reasons of NICU admission ($P<0.001$), and morbidity ($p=0.019$).

CHAPTER V: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1. DISCUSSION

5.1.1 Introduction.

This chapter is answering the main purpose of this study, which was to assess the effect of mode of delivery on outcomes of full term neonates. The questions the study was intended to answer were to know the mode of delivery in CHUK, the outcomes of full term neonates in CHUK and of course the effect that mode of delivery has on outcomes of full term neonates in CHUK

5.1.2 Mode of delivery of full term neonates at CHUK

In 2016, 185 full term neonates were born at CHUK and admitted in NICU for follow up treatment. The assessed variables to these neonates are even across the mode of delivery.

Our results showed that the majority of full term neonates were born by caesarian section with labor, which is comparable to other series where Liston et al., in a study conducted in North America found that 61% of all deliveries were by C/S with labor. Another study done in Iran, ended up with almost the same findings showing that the C/S was the most adopted mode of delivery (Liston *et al.*, 2008); (Minoo Fallahi, 2014).

Around half of the neonates were initiated to breastfeeding at the first hour. Surprisingly, this study find out that the babies born by SVD were the most initiated to breast than those born by C/S. This is in contradiction with the literature where many studies highlight that mostly C/S is a barrier to early breast initiation (Rowe-murray and Fisher, 2002). In 2002, Fisher and colleagues conducted a prospective longitudinal study which noted that women who delivered by C/S experienced a delay in initiating breast compared to those who delivered vaginally with or without instruments: this is explained by anesthesia effect and pain that prevents the mother to sit up or change position early post operation to initiate breast feeding. These findings from this

study may be justified by the fact that during data collection, many of the excluded study population were mainly neonates that were born by SVD. It can also be due to lack of that information recorded in most of the SVD delivered neonates. There is a concern by the researcher to discover why files of neonates born by C/S are well documented than those of neonates born by SVD.

For the curiosity of the researcher, association between some variables and neonatal mortality has been established. The analysis revealed association between some variables: time from birth to NICU admission ($P < 0.001$), reasons of NICU admission ($P < 0.001$), and morbidity ($p = 0.019$).

5.1.3. Outcomes of full term neonates at CHUK

The APGAR score was not bad as the average at the different assessment interval was 7,8 and 9 respectively; and it is not dictated by the mode of delivery as suggested by the similar study conducted in Iran (Mino Fallahi, 2014). Such findings made the researcher wondering on its validity, because an important number of babies scored 10 at the first minute, while according to the literature, it is impossible to have an APGAR score of 10 at the first minute. This may raise a question of whether the midwives are well calculating the APGAR scores.

Liston *et al.*, 2008) found that birth trauma differs according to the mode of delivery, and majorities are associated with spontaneous vaginal delivery. Unexpectedly, it is in contrast with our findings, where birth trauma was attributed to C/S and cephalohematoma was the most birth trauma documented. This could be linked to the prolonged labor before C/S is performed for emergency, as it has been observed in the analyzed data.

Visco, et al., (2006) reported effects of elective cesarean delivery on respiratory morbidity in neonates. The review indicated that neonates delivered by elective cesarean delivery were at an

increased risk of respiratory morbidity. Also Gerten *et al.*, (2005), examined the relationship between respiratory distress syndrome seen in neonatal intensive care units and cesarean delivery in a population based case control study in Arizona. They found an increased risk for RDS for neonates delivered by C/S compared to SVD. This is similar to our findings, where TTN was the most prevalent respiratory morbidity. The only difference is that our study didn't separate elective C/S and C/S with indication.

The median length of hospital stay was 6 days with interquartile range of 3 to 10days. These findings are in normal limit as the longer stay is the one above 7days. Some of the neonates spent more than 7 days but, the numbers are low and not significant.

The overall in hospital complications encountered was mainly sepsis and jaundice. This septic condition may be due to either nosocomial infection or the infection risk. These findings are not far from other publications where nosocomial infections are among the common complications in neonatal intensive care unit. (Sekar, 2010).

The overall mortality was 7% which is comparable to other series done in low and middle income countries especially sub-Saharan countries (Althabe *et al.*, 2006)(Minoos Fallahi, 2014)

5.1.4. The effect of mode of delivery on outcomes of full term neonates at CHUK

The examined neonatal outcomes for full term neonates at CHUK were: Apgar scores, birth trauma, respiratory complications, LOHs and mortality.

Results from this study showed that the mode of delivery has no effect on Apgar scores, LOHs, and neonatal mortality. The affect has been determined on respiratory complications, neonatal morbidities and birth trauma. Results showed that mode of delivery have an effect on respiratory

morbidity, with neonates born by C/S being more exposed. The affect as well has been reported on birth trauma, with neonates born by C/S being more exposed. The effect of mode of delivery has been demonstrated on neonatal morbidity as it has been established that the incidence of morbidity is more noted in those born by C/S compared to SVD.

5.2. CONCLUSION

According to the results, mode of delivery has an effect on outcomes of full term neonates; especially respiratory morbidity, birth trauma and the possibility of morbidities; but does not have an effect on neonatal mortality and morbidity. Although vaginal delivery is strongly emphasized in hospitals, the decision regarding the mode of delivery depends on the individual and the interest of both mother and the infant. Considering the high frequency of CS complications in both mothers and babies, this mode of delivery should be selected in emergencies, and NVD is preferred in elective conditions.

5.3. RECOMMENDATIONS

1. We strongly recommend accurate documentation for all neonates.
2. CHUK should revise the policy as they are experiencing an increased number of C/S, and we have seen that it is mostly associated with neonatal complications.
3. Refresher courses on APGAR scores calculations to all birth attendants.
4. Encourage health care providers for detection of emergencies early during labor to avoid performing C/S following a prolonged labor.
5. Future researches on effect of mode of delivery on neonatal outcomes that separates C/S with labor and elective C/S.

6. Future research on the impact of C/S on neonatal mortality.

7. CHUK should supervise the implementation of infection prevention and control measures as sepsis was one of the dominating morbidities.

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APPENDICES

I. DATA COLLECTION FORM

Number:

1. Characteristics and health history of full term neonates

➤ sex: male Female

➤ Birth weight

➤ Time of birth

➤ Time of admission to NICU :

Immediately:

After 6 hours:

After 12 hours:

After 24 hours:

After more than 24 hours:

➤ Reason of admission to NICU:

Respiratory Distress Syndrome (RDS):

Meconium Aspiration Syndrome:

Chorioamnionitis:

Infectious risk:

Persistent Pulmonary Hypertension of Newborn (PPHN):

Transient Tachypnea of Neonates (TTN):

Intra ventricular hemorrhage (IVH):

Premature rupture of membranes (PROM):

➤ Breastfeeding in the first hour:

Yes No

1. Mode of delivery:

NVD if yes what was the duration of labor

C/S if yes was it without labor: with labor:

2. Outcomes of full term neonates

➤ Apgar score:

First minute:

Fifth minute:

Tenth minute:

➤ Birth trauma: Yes No

If yes, tick the appropriate

Cephalohematoma:

Facial bruising:

Fracture:

Dislocation:

Others:

Others:

➤ Respiratory outcomes

Respiratory Distress Syndrome (RDS)

Transient Tachypnea of Newborn (TTN)

➤ Morbidity during NICU stay:

Neonatal sepsis:

Pathological jaundice:

Eye problems:

Others

➤ Length of hospital stay:

Less than 24h:

1-7 days:

8-14 days:

15-21 days:

22-28 days:

More than 28 days:

➤ Neonate's evolution (mortality)

Cured

Dead:

ETHICAL APPROVALS



CENTRE HOSPITALIER UNIVERSITAIRE UNIVERSITY TEACHING HOSPITAL

Ethics Committee / Comité d'éthique

February 3rd, 2017

Ref.: EC/CHUK/245/2017

Review Approval Notice

Dear Jeannette Umbwiyeneza,

Your research project: "Effect of Delivery Mode on Outcomes of Term Neonates Admitted in a Tertiary Hospital of Kigali."

During the meeting of the Ethics Committee of University Teaching Hospital of Kigali (CHUK) that was held on 3/02/2017 to evaluate your protocol of the above mentioned research project, we are pleased to inform you that the Ethics Committee/CHUK has approved your protocol.

You are required to present the results of your study to CHUK Ethics Committee before publication.

PS: Please note that the present approval is valid for 12 months.

Yours sincerely,


ETHICS COMMITTEE
John Nyitigira

The Secretary, Ethics Committee,
University Teaching Hospital of Kigali

<<University teaching hospital of Kigali Ethics committee operates according to standard operating procedures (Sops) which are updated on an annual basis and in compliance with GCP and Ethics guidelines and regulations>>.

B.P. :655 Kigali- RWANDA www.chk.rw Tél. Fax : 00 (250) 576638 E-mail : chuk.hospital@chukigali.rw

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 16/01/2017
Ref: CMHS/IRB/068/2017

Jeannette UMBWIYENEZA
School of Nursing and Midwifery, CMHS, UR

Dear Jeannette UMBWIYENEZA

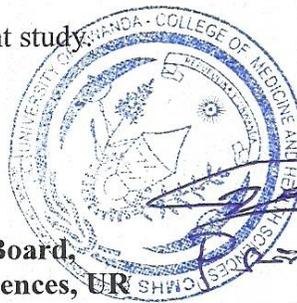
RE: ETHICAL CLEARANCE

Reference is made to your application for ethical clearance for the study entitled *“Effect Of Delivery Mode On Outcomes Of Term Neonates Admitted In A Tertiary Hospital Of Kigali.”*

Having reviewed your protocol and found it satisfying the ethical requirements, your study is hereby granted ethical clearance. The ethical clearance is valid for one year starting from the date it is issued and shall be renewed on request. You will be required to submit the progress report and any major changes made in the proposal during the implementation stage. In addition, at the end, the IRB shall need to be given the final report of your study.

We wish you success in this important study.

Fas Professor Kato J. NJUNWA
Chairperson Institutional Review Board,
College of Medicine and Health Sciences, UR



Prof. JB Gakwira
IRB Vice-Chair

Cc:

- Principal College of Medicine and Health Sciences, UR
- University Director of Research and Postgraduate studies, UR

SCHOOL OF NURSING AND MIDWIFERY

Kigali, on 30 / 01 /2017

Ref. No: S.O./ UR-CMHS/SonNM/17

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

Re: Request to collect data.

Referring to the above subject, I am requesting for permission for Jeannette UMBWIYENEZA, a final year student in the Masters of Science in Nursing at the University of Rwanda/College of Medicine and Health Science to Collect data for his/her research dissertation entitled "Effect of delivery mode on term neonates' outcomes admitted in a tertiary hospital in Kigali"

This exercise that is going to take a period of 2 months starting from 13th February 2017 to 12th April 2017 will be done at Kigali university teaching hospital in its neonatal intensive care unit .

We are looking forward for your usual cooperation.

Sincerely,

 **Dr. Donatilla MUKAMANA, RN, PhD**
Dean, School of Nursing and Midwifery
College of Medicine and Health Sciences

