PREVALENCE AND RISK FACTORS ASSOCIATED WITH NEONATAL JAUNDICE AMONG NEWBORNS ADMITTED AT A SELECTED DISTRICT HOSPITAL OF RWANDA

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In the college of Medicine and Nursing Sciences

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DECLARATION

I, Claudine MUREKATETE do hereby declare that this research project report entitled Prevalence and risk factors associated with neonatal jaundice among newborns admitted at a selected district hospital of Rwanda in 2016-2018 submitted in partial fulfilment of the requirement for the Master's degree in Neonatology track, at University of Rwanda, is my original work and has not previously been submitted elsewhere. Also, I do declare that a complete list of references is provided indicating all the sources of information quoted or cited.

MUREKATETE Claudine

DEDICATION

The present work is dedicated to The Almighty God, my lovely husband MINANI Emmanuel, my 4 children TETA Noëlla Merveille, MUKUNZI Gloria Nicaise, SUGIRA Dieumerci Chris and SANO Elie Bertrand. It is also dedicated to my father SEDOROGO Fabien, my mother KARWERA Illuminée, my brothers and sisters for their incomparable support.

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I, finally thank everybody who contributed morally or materially, directly or indirectly to the fulfilment of this research thesis.

May God bless you all!

ABSTRACT

Background

Neonatal jaundice is one of the most common reasons for admission of neonates in the Neonatal intensive care unit (NICU). Despite global efforts, low- and middle-income countries continue to experience serious problems regarding neonatal outcomes due to neonatal jaundice.

Available evidence has shown continuously the burden of neonatal jaundice in several countries including Rwanda where the prevalence and risk factors associated with neonatal jaundice need to be assessed in dept.

Purpose of study: The purpose of the study is to assess the prevalence of and risk factors associated with neonatal jaundice among newborns admitted at a selected district hospital of Rwanda.

Methodology: A quantitative approach has been used with a retrospective cross-sectional design for 210 files. A stratified proportional sampling was used to select files.

Descriptive statistics and inferential statistics were used for the data analysis.

Results: A total of 210 newborns were included in this study. Of this number, 93 (44.3%) newborns were diagnosed with neonatal jaundice .Associated risk factors were ABO and other blood group incompatibility(p= 0.001*) ,infections (p =0.017*),Caesarean section as method of delivering (p 0.000*), the birth weight of 2501-3000g (52.4%) ,the age of more than 7 days (P= 0.002*),the maternal age of 35 and more(51.5%) , the female gender and prematurity (P= 0.017*). **Conclusion**: The prevalence of neonatal jaundice was high. 44.3% of newborns developed neonatal jaundice. ABO and other blood group incompatibilities, infections, prematurity gestation age of the baby and the C/Section as a method of delivering were predominant associated risk factors with neonatal jaundice. There is a need of conducting further researches on prevalence and risk factors associated with neonatal jaundice in other districts of Rwanda.

Keys words: neonatal jaundice, prevalence, risk factors, newborns, district hospital.

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LIST OF SYMBOLS AND ABREVIATIONS/ACRONYMS

AAP: American Academy of Paediatrics

ABE: Acute bilirubin encephalopathy

BE: Bilirubin encephalopathy

BMI: Body mass index

BMJ: Breast milk jaundice

BWT: Birth weight

CMHS: College of Medicine and Health Sciences

ER: Endoplasmic reticulum

NNJ: Neonatal jaundice

ET: Exchange transfusion

G6PD: Glucose-6-phosphate dehydrogenase

HIC: High income country

hUGT1: Humanised UGT1

KDH: Kabgayi District Hospital

Km: Michaelis-Menten constant

LIC: Low income country

LMICs: Low and Middle income countries

MIC: Middle income country

NHPI: Native Hawaiians and Pacific Islanders

OAT: Organic anion transporter

OATP: Organic anion transporting polypeptide

PT: Phototherapy

SGA: Small-for-gestational age

SNH: Significant neonatal jaundice

SPSS: Statistical Package of Social Science

TcB: Transcutaneous bilirubin

Tg: Transgenic

TSB: Total serum bilirubin

UDP: Glucuronosyltransferase 1A1 Humanised

UGT: UDPglucuronosyltransferase

UGT: Uridine 5’ diphosphateGlucurosyltransferase.

UR: University of Rwanda

WHO: World health organization

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CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

Neonatal jaundice is one of the serious conditions that affects 60%-80% of newborns worldwide(Olusanya and Slusher, 2015 p 293) . In sub- Saharan Africa and in South Asia, an estimated 1.1 million babies were reported to have severe hyperbilirubinemia every year (Bonnette, Alexis, & Francois, 2017).It has shown that in one study conducted in Malaysian , 75% of new-borns contracted jaundice in the first week of life, and 25–30% of them developed severe neonatal jaundice, defined as a serum bilirubin (SB) concentration of 340mmol/l (Wong, Boo and Othman, 2017 p 281). Rwanda as one of low-income country (LIC) needs to know to prevalence and risk factors associated with neonatal jaundice so that to reinforce the existing policies in maternal neonatal child health.

1.2 BACKGROUND OF THE STUDY

The burden of neonatal jaundice continues to pose significant public health concern worldwide(Greco *et al.*, 2016 p173). It has been shown that neonatal jaundice is one of the most common causes of morbidity in new-borns worldwide, and the most frequent cause of hospitalization or readmission for special care in the first week of life(Olusanya *et al.*, 2016 p 2).It has been seen that severe neonatal jaundice (NNJ) remains a life-threatening condition in many areas of the world, though the true dimension of the problem is largely unknown. Severe neonatal jaundice has different aetiologies, dependent on variable genetic backgrounds and geographical location, even within regions of the same country(Greco et al., 2016). Risk factors like maternal, prenatal and neonatal have been found to be significantly or not significantly associated with severe hyperbilirubinemia in low and middle income countries(Olusanya, Osibanjo and Slusher, 2015p 293). The Global Burden of Disease (GBD) Study in 2016 shows that neonatal jaundice accounted for 1,008 deaths per 100,000 live births (95% Uncertainty interval or UI: 641.4 – 1,578.2) and ranked 7th globally among all causes of neonatal

deaths in the early-neonatal period (0 – 6 days).12,29 The burden is highest in sub-Saharan Africa

and South Asia where jaundice was the 8th and 7th leading cause of neonatal mortality respectively.

It has also been shown that severe hyperbilirubinemia, with or without bilirubin encephalopathy, is associated with substantial mortality and long-term morbidities in low- and middle-income countries (Olusanya *et al.*, 2016 p1) where Rwanda belongs too. The Neonatal jaundice can lead to kernicterus (brain damage from very high bilirubin levels)at any time during infancy. Kernicterus can be manifested by different severe neurological symptoms like lethargy, poor feeding and loss of Moro reflexes (Boskabadi, Ashrafzadeh, Azarkish, & Khakshour, 2015).At 3 years of age, full neurological symptoms of kernicterus including bilateral athetosis with involuntary muscular spasms, extra pyramidal symptoms, seizure, mental retardation, dysarthria, high frequency hearing loss, and strabismus and eye movement abnormalities appear(Boskabadi *et al.*, 2015 p 8).

The management of neonatal jaundice relies on the phototherapy; Feeding hydration and exchange transfusion(Ng and How, 2015 p 599).Rwanda Health Sector has registered significant achievements in the previous years. However, there are challenges that need to be addressed in order to improve the quality of services delivery for prevention and control of some conditions. The identification of needs and a concerted effort to improve management at different levels of the health system can significantly reduce acute bilirubin encephalopathy (ABE) and improve opportunities for thousands of newborns around the world(Greco *et al.*, 2016 p173). The assessment of the prevalence and risk factors associated with neonatal jaundice at a selected district hospital of Rwanda will be an important basis in strengthening neonatal care and will contribute to a decreased mortality and morbidity associated with neonatal jaundice as it will involve health care providers in implementation of new protocols of caring newborns with jaundice.

1.3 PROBLEM STATEMENT

Poor data about neonatal jaundice are observable in Rwanda while different studies in other countries of the world have shown continuously an increasing in neonatal jaundice prevalence.

In South Africa, the prevalence of neonatal jaundice was 55.2%(Brits et al 2018 p 1) whereas in Pakistan, the prevalence of neonatal jaundice was 27.6%.In Rwanda, the only study conducted at

Ruhengeri district hospital identified high prevalence of neonatal jaundice which was 41.3% and the risk factors of pathologic hyperbilirubinemia in the same hospital were maternal age, birth weight and number of parity.(Bonnette, Alexis and Francois, 2017 p 95) These risk factors are only contextualized to that district hospital which is in North province. The associated risk factors are not well documented in other district hospitals in Rwanda.

While several studies have identified factors associated with neonatal jaundice, data about prevalence and related risk factors have remained limited in Rwanda(Bonnette, Alexis and Francois, 2017). The author of the only research conducted on neonatal jaundice in Rwanda, recommended that other research studies should be conducted across Rwanda to confirm the prevalence of pathologic hyperbilirubinemia in newborns. The present study assessed the prevalence and risk factors associated with neonatal jaundice at a selected district hospital of Rwanda. The selected district hospital of Rwanda has cases of neonatal jaundice (the researcher had observed 12 cases of jaundiced newborns for a total of 30 newborns admitted in neonatal unit during two weeks), the reason why the assessment of prevalence and risk factors associated with neonatal jaundice was necessary at that selected district hospital.

1.4. AIM OF THE STUDY

To assess the prevalence and risk factors associated with neonatal jaundice among new-borns admitted at a selected district hospital of Rwanda in 2016-2018

1.5. RESEARCH OBJECTIVES

1. To determine the prevalence of neonatal jaundice at a selected district hospital of Rwanda
2. To describe the risk factors associated with neonatal jaundice at a selected district hospital of Rwanda.

1.6 RESEARCH QUESTIONS

1. What is the prevalence of neonatal jaundice at a selected district hospital of Rwanda?
2. What are the risk factors of neonatal jaundice at a selected district hospital of Rwanda?

1.7 SIGNIFICANCE OF THE STUDY

1.7.1 to nursing administration

The Ministry of Health will focus on the results from this study for enhancing the training of general nurses working in neonatal unit. And with the time, the specialised nurses in neonatology nursing should be the only ones to work in neonatal unit for improvement nursing neonatal.

Results from this study will help healthcare policy makers to recognize main neonatal risk factors and how to deal with them.

1.7.2 to nursing practice

The results will help the selected district hospital to recognize the most common risk factors of neonatal jaundice at their hospital and how to deal with them. The results will also help in management of neonatal jaundice and in the improvement of nursing and midwife practice related to neonatal jaundice. With the identified gaps and barriers to the practice regarding neonatal jaundice, the selected district hospital of Rwanda will establish policies and strategies to support the areas of weakness in management of neonatal jaundice in neonatal unit of the hospital.

1.7.3 to nursing research

Researchers will use this study for accurate information on the risk factors of neonatal jaundice in Rwanda, and they will use it as a source of further researches.

1.7.4 to nursing education

Student will use this study as source of further researches and nursing education will use this study in elaboration of curriculum necessary in teaching risk factors associated with neonatal jaundice. The study findings will be used by UR/School of nursing and midwifery authority to increase the training of specialist nurses in neonatology for improvement of new-borns quality of care.

1.8 DEFINITION OF CONCEPTS

Risk factor: a risk factor is any attribute, characteristic or exposure of an individual that increases the likelihood of developing a disease or injury (WHO, 2004)**.** In this study, a risk factor**:** is anything that increases the likelihood of a new born to develop the jaundice.

Prevalence is the percentage of a population that is affected with a particular disease at a given time (Merriam Webster 1828).In this study, prevalence is the percentage of new-borns who have experienced neonatal jaundice among all the new-borns admitted in neonatal unit in the years 2016-2018 at the selected hospital.

Neonatal period: period from birth to 28 days, sometimes subdivided into early neonatal (birth to 7 completed days) and late neonatal (day 8 to day 28) (WHO, 2013). In this study, neonatal period is the period from birth to 28 days.

Neonate: or new-born infant is a child under 28 days of age (WHO, 2013). In this study, a neonate is a child under 28 days.

Jaundice: yellowish pigmentation of the skin, tissues, and body fluids caused by the deposition of bile pigments. (Merriam Webster, 1828).In this study, jaundice is a yellow discoloration of the skin, mucous membranes, and the withes of the eyes in the new-borns.

1.9 STRUCTURE/ORGANIZATION OF THE STUDY

The dissertation has two main parts .The first is the presentation of the project. The second is the structure of the project.

The first part with small roman numbers contains: The title page, declaration, dedication, acknowledgements, abstract, table of contents, list of symbols and abbreviations/acronyms, list of tables, list of figures and list of annexes

The second part with arabic numbers contains 6 chapters: Introduction; Literature review; Methodology; Results; Discussion; conclusion and recommendations. It also includes references and appendices.

1.10 CONCLUSION TO CHAPTER ONE

Different studies have been conducted on neonatal jaundice, and several interventions have been suggested for its management. Despite all those efforts made neonatal jaundice is still a big problem. This chapter shows the overview of neonatal jaundice, its background, the problem statement, specific objectives, research questions and the significance of the study and it aims to assess the prevalence and risk factors associated with neonatal jaundice.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

A literature review is an evaluative report of information found in the literature related to your selected area of study (Burns and Grove 2005:93). The literature review haves been illustrated in first time, the global overview of neonatal jaundice, including the prevalence and risk factors of neonatal jaundice. The WHO global action plan for neonatal jaundice, and the countries implementation of WHO program regarding neonatal jaundice. Secondary, it has been illustrated the prevalence of neonatal jaundice and the risk factors associated with neonatal jaundice. Thirdly, the conceptual framework and empirical and theoretical literature have also been illustrated. The terms used for searching are jaundice, neonate, prevalence and risk factors. The citation used reference style of Harvard. The sources of information were Google search, Google scholar, PubMed, Hinari and grey literature search.

2.2 THEORETICAL LITERATURE

Neonatal jaundice is a physiologic condition characterized by yellowish discoloration of the skin and conjunctiva as a consequence of increased levels of serum bilirubin during the first week of life(Greco *et al.*, 2016 p 172).

Pathophysiology of bilirubin metabolism:

Unconjugated hyperbilirubinaemia in the newborn infant occurs through two principal mechanisms:

1.Bilirubin production in the newborn is twice as high per kg body weight as it is later in life (8.5 mg/kg/day vs 4.0 mg/kg/day).

2.Induction of UGT1A1 which conjugates bilirubin in the liver is delayed, thus limiting excretion .Increased production combined with limitations in excretion account for the accumulation of bilirubin in the immediate postnatal period. Neonatal hyperbilirubinaemia therefore reflects a transient imbalance in the interplay between developmentally modulated changes in bilirubin production and its excretion.

In the newborn, the lifespan of red blood cells is shorter than that of adults and varies from around 60 to 100 days.Bilirubin is produced from the degradation of haem (from senescent red blood cells, myoglobin from muscle, enzymes such as cytochromes and catalases) by haem

oxygenase and biliverdin reductase within the reticuloendothelial system . This constitutes the first step in the metabolism of bilirubin. Biliverdin is an intermediate product with equimolar quantities of carbon monoxide and free iron released as by-products. Bilirubin is then transported to the liver in serum bound to albumin, but a small fraction is always unbound. The equilibrium concentration depends on several factors including the bilirubin/albumin molar ratio, the pH, and the presence of competitors for the bilirubin binding site on albumin. Unbound bilirubin is lipid-soluble, and it is the bilirubin component capable of crossing the blood-brain barrier to occasionally cause life-long brain damage. Following uptake into the hepatocytes, bilirubin is conjugated to water soluble forms, so called conjugated bilirubin, through glucuronidation by UDP-glucuronosyltransferase (UGT)1A1 . The immaturity and delay in the expression of UGT1A1 are major factors limiting bilirubin excretion. In the newborn period bilirubin in bile mainly appears as mono-conjugates, whereas later in life the di-conjugates constitute more than 80% of the total.In combination with the overproduction of bilirubin during this developmental stage, conjugated bilirubin once excreted may be deconjugated in the intestine and re-absorbed into the circulation by a process known as enterohepatic circulation, predisposing the infant to high TSB(Total Serum Bilirubin) levels. This may contribute to increased and prolonged jaundice in the newborn infant and in extreme cases can add to the bilirubin pool leading to ABE Acute Brain Encephalopathy) or bilirubin-induced neurological dysfunction (BIND).
Sequestration of blood from birth injuries (e.g. cephalohematoma) and congenital haemolytic conditions, the most common being G6PD deficiency, may also exacerbate hyperbilirubinaemia by increasing bilirubin production, further aggravating the imbalance in bilirubin metabolism. Furthermore, congenital disturbances in bilirubin metabolism with mutations in the *UGT1A1* gene leading to life-long complete or partial loss of activity of the UGT1A1 enzyme, have been associated with pathological jaundice(Woodgate,2015).
Several types of hyperbilirubinemia have been reported in neonates including physiological jaundice, pathological jaundice, jaundice due to breastfeeding or breast milk and hemolytic jaundice including three subtypes due to rhesus(Rh)factor incompatibility, ABO blood group incompatibility and Jaundice associated with Glucose-6-phosphate dehydrogenate (G6PD) deficiency (Ullah, Rahman, & Hedayati, 2016).

Neonatal jaundice is usually not harmful and a self-limiting condition; however, very high levels of bilirubin may cause permanent brain damage, a condition called kernicterus(Brits et al, 2018 p 2)**.**Hyperbilirubinemia can be complicated into kernicterus (brain damage from very high bilirubin levels) at any time during infancy and that one is very serious complication of hyperbilirubinemia. Kernicterus can be manifested by different severe neurological symptoms like lethargy, poor feeding and loss of Moro reflexes(Boskabadi *et al.*, 2015 p 8). At 3 years of age, full neurological symptoms of kernicterus including bilateral athetosis with involuntary muscular spasms, extra pyramidal symptoms, seizure, mental retardation, dysarthria, high frequency hearing loss, and strabismus and eye movement abnormalities appear. Mild and moderate neuromuscular imbalance, deafness and mild cerebral dysfunction are observed in children with mild kernicterus, which may not be recognizable before school years.(Boskabadi*et al.*, 2015 p 8).

The management of neonatal jaundice relies on the phototherapy; Feeding, hydration and exchange transfusion (Ullah et al., 2016 pg 558). For term and pre-term babies with significant hyperbilirubinemia in the first 28 days of life with bilirubin rising greater than 10 micromoles/liter per hour or babies with co-morbid illnesses such as infections have been shown to have fewer exchange transfusions if treated with a combination of intravenous immunoglobulin (IVIG) (500mg/kg over 4 hours) alongside phototherapy than those treated with phototherapy alone.(Rao et al., 2017 p 5-6).

Delays in providing timely and effective treatment for infants with or at risk of significant hyperbilirubinemia are widely reported in resource poor countries, and often expose the affected infants to an elevated risk of acute bilirubin encephalopathy or its chronic form, kernicterus, far beyond rates reported in high-income countries.(Olusanya, Osibanjo and Slusher, 2015p 295).

The Rwanda National Neonatal Care protocol(2014 pg 45-46), recommends the following in terms of neonatal jaundice management: if there is evidence of moderate to severe jaundice by physical exam (jaundice appears below the chest),Start phototherapy regardless serum bilirubin laboratory measurement. Jaundice of palms and soles is consistent with bilirubin level of at least 340 μmol/L =20mg/dL. Exchange transfusion is a treatment of extreme hyperbilirubinemia. If bilirubin level exceeds the following values 220μmol/L (10mg/dL) for the baby <35 weeks of gestation, <2 kg, sepsis hemolysis and poor feeding and 260μmol/L (15mg/dL) for baby ≥35

weeks of gestation, ≥2 kg, Healthy(no risk factors) on DOL(day of life) 0;For the baby with 260µmol/L (15mg/dL) <35 weeks of gestation, <2 kg, sepsis hemolysis and poor feeding ; 425µmol/L=25mg/dL) ≥35 weeks of gestation, ≥2 kg, Healthy(no risk factors) on DOL 1 and 340µmol/L=20mg/dL for the baby with <35 weeks of gestation, <2 kg, sepsis hemolysis and poor feeding; 425µmol/L=25mg/dL) for the baby with ≥35 weeks of gestation, ≥2 kg, Healthy(no risk factors) on DOL ≥2,Consider referral if exchange transfusion possible. Never discontinue phototherapy when planning or conducting an exchange transfusion.

2.3 EMPIRICAL LITERATURE

2.3.1 Prevalence of neonatal jaundice

Hyperbilirubinemia is one of the most common causes of morbidity in new-borns worldwide, and the most frequent cause of hospitalization or readmission for special care in the 1st week of life.(Olusanya *et al.*, 2016 p 1).Neonatal jaundice has been searched on by many researchers and the prevalence statistics vary from study to study but the similar information was that neonatal jaundice is seriously public problem.A study conducted in India showed that the incidence of G6PDD (Glucose-6 phosphate Dehydrogenase deficiency) was found to be 4.16% and only in males. Total serum bilirubin level in G6PD (Glucose-6 phosphate Dehydrogenase) deficient cases was (mean =22.72±5.1), which is significantly higher when compared with other causes of jaundice like physiological jaundice, Cephalohematoma, and idiopathic jaundice, except ABO and Rhesus incompatibility. Physiological jaundice was the most common cause of neonatal jaundice (45.83%).(Singh *et al.*, 2017 p 63) whereas a study conducted in Nigeria showed that neonatal jaundice was present in only 132 of the 2,509 neonates delivered with prevalence of 52.6. Total prevalence of neonatal jaundice in females was 43.6 and total prevalence in males was 67.4. The study showed also that 70.5% of the neonates developed jaundice within the first week of life.(Kolawole, Obueh, & Okandeji-Barry, 2016)

Furthermore, another study conducted in Nigeria also showed that the incidence of Severe Neonatal Hyperbilirubinemia (SNH) was hospital-based. In the only community-based study in inner-city Lagos, 351 (6.7%) of 5262 infants enrolled were reported to be jaundiced based on parental history. Basic incidence of severe hyperbilirubinemia was at least 5.5% (95%

confidence interval: 4.9–6.2%) according to that study. The incidence of SNH was likely to be foully under-reported in hospital which was not conducting adequate post discharge surveillance till the 8th day after birth. (B. Olusanya et al., 2016)

In Rwanda a study conducted at Ruhengeri hospital showed that in 150 newborns who have been taken as sample, where 52.6 females and 47.3% were males. The overall prevalence of pathologic and physiologic hyperbilirubinemia (neonatal jaundice) was 41.3%. Of them, the pathologic hyperbilirubinemia was 7.3% and 34.0% was for physiological hyperbilirubinemia.(Bonnette, Alexis and Francois, 2017 p 95). The author of the only research conducted on neonatal jaundice in Rwanda, recommended that other research studies should be conducted across Rwanda to confirm the prevalence of pathologic hyperbilirubinemia in new-borns.

2.3.2 Risk factors of Neonatal jaundice

Neonatal jaundice is one of the significant public health problems among neonates in the world. Understanding risk factors of neonatal jaundice provides more understanding on the reason of its preventive measures. A study conducted in Native Hawaiians and Pacific Island Women has shown that obesity during pregnancy is one of the risk factors of neonatal jaundice, when the liver is already under metabolic stress, is associated with elevated maternal and neonatal unconjugated bilirubin. (Rougee, Miyagi, & Collier, 2016).In this study obesity during pregnancy has been pointed out as a maternal risk factor.

In addition to that ,a study conducted in Japan and USA has shown that breast-feeding is a contributing factor for the development of neonatal hyperbilirubinemia when there is deficiency in UGT1A1 enzyme responsible for bilirubin metabolism to became a water soluble glucuronide., in that case the Breast Milk Jaundice develop.(Rev, 2015p 873). In this study breastfeeding has been shown as a maternal risk factor contributing to neonatal jaundice.

A study conducted in Malaysian showed the impact of ethnicity on the neonatal jaundice where it showed that the prevalence of G6PD mutation was common in the Malaysian neonates, especially among those of Malay ethnicity, and was significantly associated with hyperbilirubinemia.(Wong, Boo and Othman, 2017 p 282). In this study, the ethnicity has been shown as a demographic risk factor to the neonatal jaundice.

13 studies conducted in India, Nigeria, Pakistan, Nepal and Egypt showed that primiparity; delivery outside public hospitals, ABO incompatibility, Rhesus haemolytic disease ;G6PD deficiency); UGT1A1 polymorphisms; low gestational age ;underweight/weight loss and high transcutaneous /total serum bilirubin levels are risk factors associated with neonatal jaundice. (Olusanya,Osibanjo and Slusher,2015p294). In those studies, maternal risk factors like primiparity; delivery outside public hospitals; ABO incompatibility and Rhesus haemolytic disease has been shown as contributing factors to neonatal jaundice. Through the same studies also ,neonatal risk factors likeG6PD deficiency ; UGT1A1 polymorphisms; low gestational age ;underweight/weight loss and high transcutaneous /total serum bilirubin levels has been mentioned as contributing risk factors to neonatal jaundice.

In Rwanda a study conducted at Ruhengeri hospital pointed out few risk factors for pathologic hyperbilirubinemia which were maternal age, number of parities, the gender of the newborns and the birth weight, where there is a need to assess the existing of more risk factors in southern province in Rwanda. In this study the mentioned maternal risk factors were maternal age and the number of parities whereas the gender of the newborns and the birth weight were neonatal risk factors.

It exists a relationship between risk factors and neonatal jaundice:

A study conducted in Native Hawaiians and Pacific (NHPI) showed that there is an association of obesity in pregnancy with incidence of maternal as well as neonatal hyperbilirubinemia in three ethnic populations: Caucasian, Asian, and NHPI women. (Rougee, Miyagi and Collier, 2016 p 373). other studies conducted in India, Nigeria, Pakistan, Nepal and Egypt showed that risk factors such as race, rhesus disease, ABO incompatibility, maternal age, social class, primiparity, male gender, sepsis, sibling jaundice, gestational age, low birth weight and weight loss were associated with severe hyper- bilirubinemia(Olusanya, Osibanjo and Slusher, 2015 p 295).A study done at the University College Hospital, Ibadan in Nigeria between 2005 – 2011showed that it exist a significant relationship between neonates ‘gestational age, place of delivery, G6PD, Rhesus factor and Neonatal Jaundice among the neonates cases studied in University College Hospital (UCH). (Serifat, U and &tongo, 2015 p 861).

2.4. CRITICAL REVIEW AND RESEARCH GAP IDENTIFICATION

A study conducted in Nigeria at Eku Hospital, showed that the prevalence of neonatal jaundice was low compared to the prevalence from other studies on neonatal jaundice like for example one study with 126 (Kavehmanesh et al., 2008) and another with 149.9 (Najib et al., 2013). The author suggested that health care providers working with neonates should play a key role in identifying the associated risk factors and assessing neonates for pathological jaundice. Parental counselling, education for early detection, regular antenatal care, and longer hospital stay are required in order to prevent this condition.

A study conducted in Southern Nepal showed that there is gap in knowing the role of an infant's difficulty in feeding as a potential modifier in the association between exclusive breastfeeding and jaundice where further researches need to be conducted.(Darmstadt and Tielsch, 2013)

According to Bonnette et al., 2017, their study showed that there is a need of conducting further researches using a large sample size across Rwanda to confirm the prevalence of pathologic Hyperbilirubinemia in newborns. They suggested also that clinicians should carry out continuing regular assessments during the neonatal period for the risk of an infant developing severe hyperbilirubinemia.

2.5 CONCEPTUAL FRAMEWORK

The **Environmental Theory** by Florence Nightingale defined Nursing as "the act of utilizing the environment of the patient to assist him in his recovery." It involves the nurse's initiative to configure environmental settings appropriate for the gradual restoration of the patient's health, and that external factors associated with the patient's surroundings affect life or biologic and physiologic processes, and his development.

The Nightingale's four major concepts of nursing theory.

1.Environment: Physical components of the environment include internal and external environment where we find ventilation and warming, health of houses, light, noise, bed and bedding, cleanliness of rooms and walls, personal cleanliness, taking food and what food. Social and psychological environment addressed as chattering hopes and advices, petty management, observations of the sick and variety.

Maternal risk factors are maternal conditions that can lead to the occurrence of any medical condition. For this study were ABO incompatibilities, method of delivering, oral contraceptive use during pregnancy, Sibling jaundice, Alcohol use during pregnancy and premature rupture of membranes. In this study they make part of environment.

2. Person is the individual who receives the nursing care. Although Nightingale did not define the person specifically, she did conceptualize person as holistic. For this study, the person is represented by newborns with their sociodemographic characteristics and those of their mothers. **Demographic risk factors** are socioeconomic characteristics of a population expresses statistically, such as age, sex, educational level, income level, marital status, occupation, religion, birth rate, death rate, average size of a family, average age at marriage.(Business dictionary ,2018).For this study, demographic risk factors were maternal age, Birth weight of the newborn, Newborn age on admission, gender.

3. Health does not mean to be well only but to be able to use every power the individual has. Nightingale believed "nature alone cures". In this study, neonatal jaundice is in relation with health. **Neonatal risk factors** are newborns conditions that can lead to the development of any abnormal condition. For the present study, neonatal risk factors were low birth weight,

prematurity, cephalohematoma, early hospital discharge, no breastfeeding with the first hour after birth and infections and they can make part of determinants of health.

4. Nursing is viewed in two arenas. The first is defined as general nursing; she carry out the activities mentioned in canons of environment and another one is proper nursing who are educated in the art and the science of nursing. They are able to apply nursing process. (Ann NursPract 3(1): 1040 (2016)).

Nurse related practices are those practices that can have an impact on the outcome of a patient. For the present study, the following were the nursing practices which were in relation with neonatal jaundice: examination of the skin colour, determination of the time of occurrence of the yellow colour, bilirubin screening and medical diagnosis of the newborn.

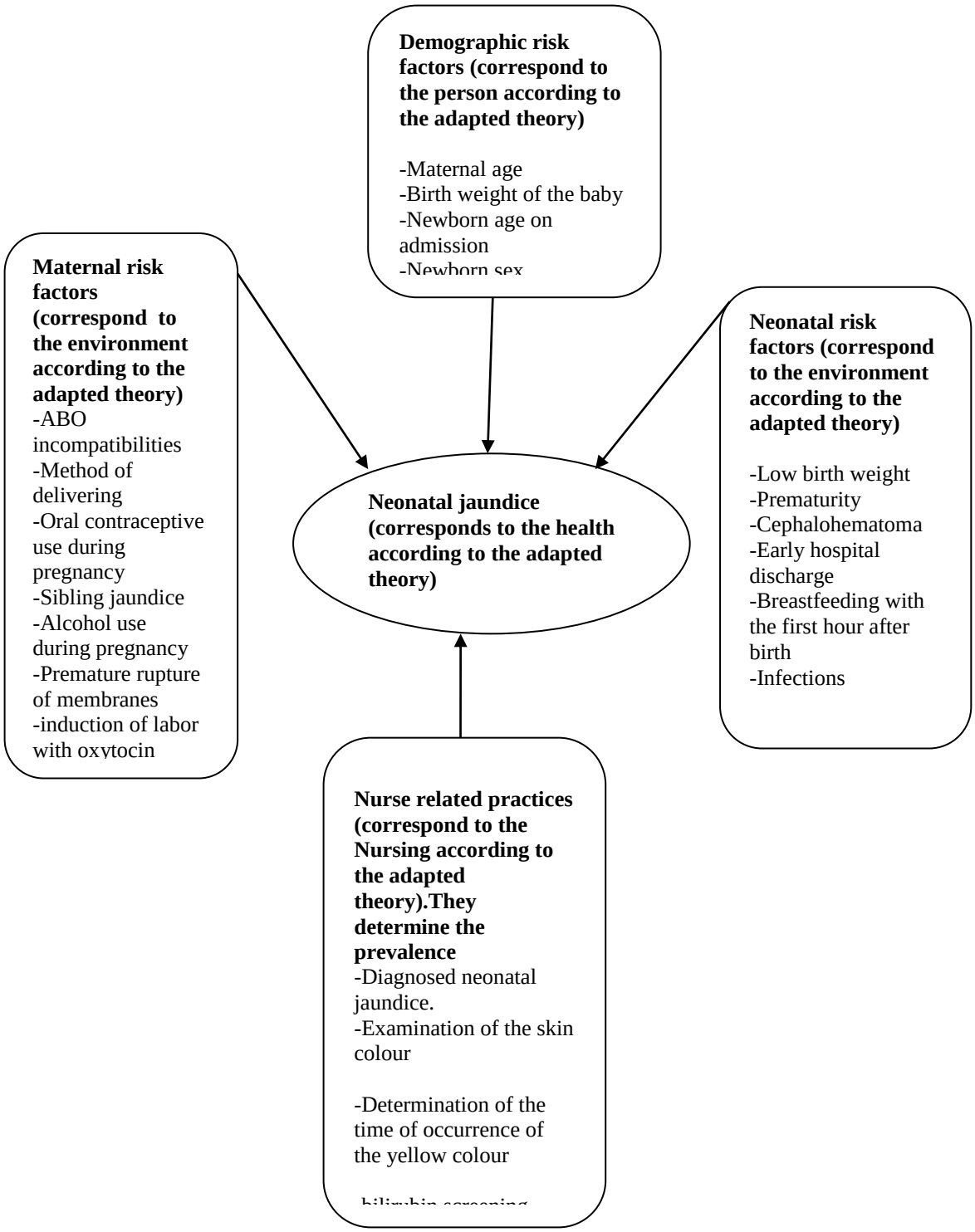

Figure1. Neonatal jaundice conceptual framework

This conceptual framework is adapted by the researcher from The Environmental Theory by Florence Nightingale which has been published as the first nursing theory in 1860.

2.6 CONCLUSION

Several studies have shown the burden of neonatal jaundice globally.

It has also been shown that neonatal jaundice is a leading cause of hospitalization in the first week of life if not well managed and that it can lead to significant bilirubin-induced mortality and disability. The management of neonatal jaundice is known by health care staff but neonatal jaundice is still observable where there is a need to explore the risk factors associated with neonatal jaundice and its prevalence at a selected district hospital of Rwanda, as it has been shown that in Rwanda very few studies have been conducted on neonatal jaundice.

CHAPTER 3: METHODOLOGY

3.1 INTRODUCTION

This is the plan that aims at conducting research using specific steps to draw a conclusion (Grove, Burns and Jennifer, 2013).This chapter explains the process and methods used to conduct the study. This includes the introduction, study area, study population, study design, sample size and sampling methods, data collection methods and procedures, data analysis, study limitation and problems, ethical consideration and the conclusion

3.2 RESEARCH DESIGN

Research designs are types of inquiry within quantitative, qualitative and mixed methods approaches that provide specific direction of procedures in a research design (Creswell et al., 2014). A retrospective design was used to collect data. A descriptive design was relevant to this study because it facilitated the researcher to obtain more information about characteristics within a particular field of a study from which little is known.

3.3 RESEARCH APPROACH

Research approaches are plans and procedures of research that span the steps from broad assumptions to detailed methods of data collection, analysis and interpretation (Creswell et al., 2014). A quantitative approach was used in this study as a method of inquiry and data management to generate desired results.

3.4 RESEARCH SETTING

Research setting is generally defined as the site where the research will be conducted. Research settings can be in various forms: health care facilities, individuals' homes, classrooms, etc. It's selected basing on the research question and needed information to answer it (Polit& Beck, 2013, p28).

This study has been conducted at Kabgayi district hospital of Rwanda (in neonatology ward) located in southern province, Muhanga district, Nyamabuye sector, Gahogo cell, Kamazuru Village. The hospital was built in 1930 as the property of the Catholic Church represented by Monsignor Classes and officially inaugurated on 9th September 1937. Initially, the selected hospital had 4 principal services which included internal medicine, the paediatric, the surgical

and maternity with a capacity of 40 beds. It has gradually expanded its activities, and currently several additional services are offered. The bed capacity increased and now the hospital has 480 beds. It has a total of 196 staff including nurses, midwives, doctors, technicians and administrative staff. Kabgayi district hospital has been chosen because it is easy to access it considering time management and resources limited.

3.5 POPULATION

The study population is the set of individuals with the same characteristics that interest the researcher (Polit and Cheryl, 2012) For his study The population was the total number of newborns ‘files kept in the registry of Kabgayi district hospital from 2016-2018.

3.6 SELECTION CRITERIA

3.6.1. Inclusion criteria

Inclusion criteria are defined as the conditions that specify the under-study population characteristics (Polit& Beck, 2013, p290).

For this study, it was all new-borns admitted in neonatal unit of a selected district hospital of Rwanda in 2016-2018 and born at a selected district hospital.

3.6.2. Exclusion criteria:

Exclusion criteria are those characteristics that the study population has not to possess (Polit& Beck, 2013, p290).

For this study, it was all new-borns admitted at a selected district hospital before 2016 and after 2018 and born at other health facilities than the selected district hospital.

3.7 SAMPLING

3.7.1 Sample size

Sample is a subset of the total population that the researcher wants to study purposely to generalize data to the whole population (Rebar *et al.*, 2011).

A sample size is a small group of cases used to represent some larger group. In this study the sample size was obtained using the stratified proportional sampling for new-born admitted and born at Kabgayi district hospital in 2016- 2018.

This study has used the formula of Taro Yamane (1967) to calculate the sample size of new-borns for representing all newborns admitted in the selected district hospital of Rwanda.

$n= N/1+N*(e)^2$ where:

n= Sample size; N= the population size; e= the acceptable sampling error (e=0.05).

The population of this study was 160 new-borns in 2016, 157 new-borns in 2017, and 125 new-borns in 2018.

The total population was =160+157+125=442

The sample size was $442/1+442*(0.05)^2$=210 newborns

3.7.2 Sampling Strategy

A sampling strategy is the process of taking a defined and quantified proportion of a larger population of target items as being representative of the population as a whole(Berinsky,2008).

In this study, stratified proportional sampling method has been used to obtain the sample.

Table 1: Proportional sampling strategy

Years concerned by the study	**Population for each year**	**Stratified proportional sample for each year**
2016	160	160*210/442=76
2017	157	157*210/442=74
2018	125	125*210/442=60
All 3 years:2016,2017 and 2018	Total population for 3 years=442	The sample size was 76+74+60=**210**

3.8 DATA COLLECTION INSTRUMENT

Data collection instrument are tools used to collect information for an evaluation, including serves, test, questionnaire, interview instrument, case logs and attendance record (Corlien, 2003). The researcher has used the tool developed by Hanneke Brits 2018 who conducted the research also on risk factors associated with neonatal jaundice. This tool had three main sections focusing on the categories of data such as section of demographic data, section on the prevalence of neonatal jaundice, section of maternal risk factors and lastly the section of neonatal risk factors. The researcher has used the retrospective auditing as instrument as she met the documents (files of newborns born in 2016-2018).

3.8.1 Validity of the instrument

Validity of a research tool is referred as the degree to which a tool really measures what it is supposed to measure (Polit & Beck 2014, p. 205).

Face validity

Face validity refers to whether the instrument looks or appears as if it is measuring the appropriate construct. Face validity deals with the superficial appearance of a measurement technique (Polit &Beck 2014, p. 205).

In this study, after the development of the instrument, it has been given to the expert to judge its accuracy. For the present study, the content and construct validity have been ensured by categorizing items of the tool according the research objectives, literature review and theoretical framework.

Internal validity

Internal validity is the degree to which the results can be attributed to the independent or predictor variables. (Polit& Beck, 2004). In this study, it helped the researcher to see if she studied what she intended or not. The assessment of internal validity was controlled by avoiding the use of confusing and complicated words in data collection tool.

The content validity index (CVI)

The content validity index is the degree to which an instrument has an appropriate sample of items for the construct being measured'' (Polit& Beck, 2004, p. 423). For the content validity, the researcher gave the developed tool to the expert and non-expert person in the field of

neonatology for testing if the content of the tool was valid and if it would produce the consistent relevant results.

Construct validity

Construct validity testing is the method that the researcher can use to determine the ability of an instrument actually to measure the research concepts or constructs. (Polit& Beck, 2004).In this study, the research checked the agreement between the theoretical concept of the study and the designed measuring device (instrument).

Table 2: Construct validity table

OBJECTIVES	SPECIFIC OBJECTIVES	COMPONENTS OF THE CONCEPTUAL FRAMEWORK	SECTION IN THE TOOL
1.	To identify the prevalence of neonatal jaundice	**Nursing practices:** -Neonatal jaundice observed as medical diagnosis. -Examination of the skin colour, -Determination of the time of occurrence of the yellow colour, and bilirubin screening as elements which determine the neonatal jaundice	Section B
2.	To describe the risk factors associated with neonatal jaundice	**Neonatal and maternal risk m factors associated with neonatal jaundice:** Low birth weight -Prematurity -Cephalohematoma -G6PD deficiency -Early hospital discharge No breastfeeding with the first hour after birth -Infections ABO incompatibilities -Method of delivering -Oral contraceptive use during pregnancy -Sibling jaundice -Alcohol use during pregnancy -Premature rupture of membranes	Section A and C

3.8.2 Reliability of the instrument

The instrument and or procedure should measure what they are supposed to measure and be consistent to what they are measuring (Rebar *et al.*, 2011, pp. 161–162).

For the reliability testing, the researcher conducted a pilot study at a selected district hospital among 10 new-borns admitted in neonatal unit to pre-test the instrument. After that, the researcher gave the same tool to one of the nurse working in neonatal unit for testing if that tool would provide the same results as these found from first pilot study. The consistency of the tool has been used to test the reliability. Consistency of a measure is when same scale used by 2 data collectors or in 2 settings would yield the same results. Internal consistency refers to the degree of homogeneity of the items on a closed-ended questionnaires designed to measure a single research concept.

The Cronbach's alpha which is the most common approach to estimating internal consistency, is based on the inter-correlation or co-variance of all the items in a scale examined simultaneously, where , alpha varies from 1 to 0, with 1 denoting perfect internal consistency and 0 no internal consistency. For this study the Cronbach's alpha has been used to determine the internal consistence. The questionnaire had 22 items and the Cronbach ' s alpha test was 0.856 ,which shows that items were connected and related to each other.

3.9 DATA COLLECTION PLAN

Polit and Beck (2004:716) define data collection as the gathering of information needed to address a research problem. After authorization from University of Rwanda, researcher contacted the administration of the selected district hospital to request permission to conduct the study in their institution. After receiving the approval from authorities, the researcher introduced herself to the in charge of hospital registry in order to allow and orient her where files were kept. A modified data collection tool from Hanneke Brits, a researcher from South Africa who conducted the similar study on the prevalence of neonatal jaundice and risk factors in healthy term neonates, has been used with permission (APPENDIX 5) to collect data needed to answer the research questions. The tool was modified and adapted to the Rwandan context and to the conceptual framework of the present study. The performed modifications were concerning the removal of mother's race and the primiparity. Other items on the tool have been maintained as they were applicable in Rwandan context.

The data collection tool had 22 items:4 items to determine demographic data of the baby and the mother,1 item to determine the prevalence of neonatal jaundice,10 items to the determine neonatal risk factors of neonatal jaundice and 7 items to determine maternal risk factors of neonatal jaundice. The tool was submitted to an expert nurse with Doctorate in Nursing Practitioner (DNP) in neonatology science for a face validation to confirm if the tool would be measuring what it was supposed to measure (the prevalence and risk factors of neonatal jaundice).The tool was piloted on 10 cases admitted in neonatal unit in 2018 and the reliability of the tool was tested using that pilot study. For this study the Cronbach's alpha has been used to determine the internal consistence. The tool had 22 items and the Cronbach ' s alpha test was 0.856 ,which shows that items were connected and related to each other.

3.10 DATA ANALYSIS

Data analysis is a process which includes ways of working with information(data) to support the work, goals and plans of your program or agency.(AED/TAC-12 Spring 2006).In this study, analysis of data involved descriptive statistics (frequency distribution and cross tabulations) and inferential statistics. The data analysis used descriptive statistics for the first objective of the study which was to determine the prevalence of neonatal jaundice and inferential statistics has been used for the second objective which was to describe the risk factors associated with neonatal jaundice. The data were analysed using an SPSS software version 21 through the descriptive and statistical tests. The variables were computered, chi-square to test the association between demographics, neonatal and maternal risk factors and the prevalence of neonatal jaundice. The strength of association between dependent and independent variables was determined by the P Valueless than 0.05 as statistical significance.

3.11 ETHICAL CONSIDERATIONS

Research ethics is referred to as a system of moral values that is concerned with the degree to which research procedures adhere to professional, legal and sociological obligations to the study Participants (Polit & Beck 2004:717).

Before conducting the study, the researcher obtained an ethical clearance from University of Rwanda /College of Medicine and Health Sciences /Institutional Review Board (IRB)

(APPENDIX).The recommendation from the Ministry of Health (MOH) had also been obtained (APPENDIX). The approval from the study site had also been obtained (APPENDIX). Information from files was kept confidentially. No name from the file will be known by anyone else. The anonymity of the study tool was also considered for keeping and managing the data from participants. For this study, the consent form had not been used as the researcher was looking for the files kept in the registry. After obtaining files, the use of codes has been considered on the research tools and for entering data into SPSS.A personal computer locked with a secret password was used for data entry.

3.12 DATA MANAGEMENT

The filled tool was stored safely, the data was coded, entered and saved into the computer in SPSS program and then secured by a password known only by the researcher. The data has been categorized based on the variables by use of codes. Both hard and soft copies will continue to be stored in a locked cupboard for 5 years as they can be needed for future research and helpful to the respective hospital.

3.13 DISSEMINATION

Findings from this study will be communicated to the University of Rwanda, to the health policies makers, to the administration of the selected district hospital and to the education board. The researcher will make presentation in seminars, workshop and conferences and the effort will be made for publishing.

3.14 LIMITATIONS AND CHALLENGES

Some of data was missed in the files as the study was retrospective and they have been a selection bias as the stratified sampling was used. Literature from Rwanda was very few and the research had not enough financial support for the transport and for printing the research tools. The time was not also sufficient for the study.

3.15 CONCLUSION TO CHAPTER THREE

A quantitative descriptive retrospective research have been conducted to assess the prevalence and risk factors associated with neonatal jaundice among newborns .The sample size was 210 newborns admitted in neonatal unit in 2016-2018. The information was obtained through a retrospective auditing tool which has been developed to collect data. The validity and reliability of the tool was tested to the Rwandan context. The data from the filled tool was coded and entered into computer and was analysed through the use of SPSS version 21 program.

CHAPTER 4: RESULTS

4.1. INTRODUCTION

This chapter presents the findings of the study. The purpose of the study was to assess the prevalence and risk factors associated with neonatal jaundice among newborns admitted at a selected district hospital of Rwanda.

A sample of admitted newborns in neonatal unit was selected using stratified proportional sampling method. Data was collected through neonatal files using retrospective auditing as instrument. The SPSS/pc computer software was used to compute all statistical analyses. Results on demographic data, descriptive statistics of the prevalence of neonatal jaundice, martenal and neonatal risk factors as well as inferential statistics on factors associated with neonatal jaundice are presented.

4.2 DEMOGRAPHIC CHARACTERISTICS

Table 4.1 displays results on age, gender, birth weight, medical diagnosis of the new-born and maternal age. According to the results on Table 4.1, the age range for the 210 participants was 176 for those with less or equal to 7 days (83.8%) which was higher and 34 for those with more than 7 days (16.2%). In terms of gender, the sample comprised more males than females. There were 127 (60.5%) males and 83 (39.5%) females. For the birth weight ,the majority range of weight for 210 participants was 2501g-3000g 147 (70%),1 (0.5%) was in the range of 1501g-2000g of birth weight and 62 (29.5%) were in the range of 2001g-2500g of birth weight. An analysis of the participants' medical diagnosis indicated that the majority of the participants, 93 (44.3%)were presenting neonatal jaundice, 23(11.0%) were presenting neonatal infection, 30(14.3%) were presenting birth asphyxia, 28(13.3%) were presenting prematurity, 11(5.2%) were presenting respiratory distress syndrome, 7(3.3%)were presenting Congenital malformation, 4(1.9%) were presenting low birth weight, 1(0.5%)was presenting hypoglycaemia, 1(0.5%)was presenting bleeding disorders, 1(0.5%)was presenting neurologic disorders, 1(0.5%)was presenting dehydration, 1(0.5%) was presenting renal problem. For maternal age, the majority range of age 25-34 were 131(62.4 %), for the age range of 15-24 they were46(21.9 %), for the age range of 35 and more they were 33(15.7 %).

Table 3.Demographic data of the baby and the mother (N=210)

Demographic variables of the baby		**frequency**	**Percentage**
Newborn age of admission in neonatal unit(days)	≤7days	176	83.8%
	>7days	34	16.2 %
	Total	**210**	**100%**
Gender	female	83	39.5%
	male	127	60.5%
	Total	**210**	**100%**
Birth weight	1501g-2000g	1	0.5%
	2001g-2500g	62	29.5%
	2501g-3000g	147	70%
	Total	**210**	**100%**
Demographic variables of the mother (N=210)		frequency	Percentage
Maternal age	15-24	46	21.9 %
	25-34	131	62.4 %
	35 and more	33	15.7 %
	Total	**210**	**100 %**

4.2 PREVALENCE OF NEONATAL JAUNDICE IN 2016-2018 (N =210)

The section 4.2 displays results which answer to the first research question about the prevalence of neonatal jaundice .For a total sample of 210 newborns, a clinical retrospective diagnosis of neonatal jaundice was confirmed in 93 newborns based on the observed newborn medical diagnosis. This gave the prevalence of 44.3% as demonstrated by the figure 4.1 below.

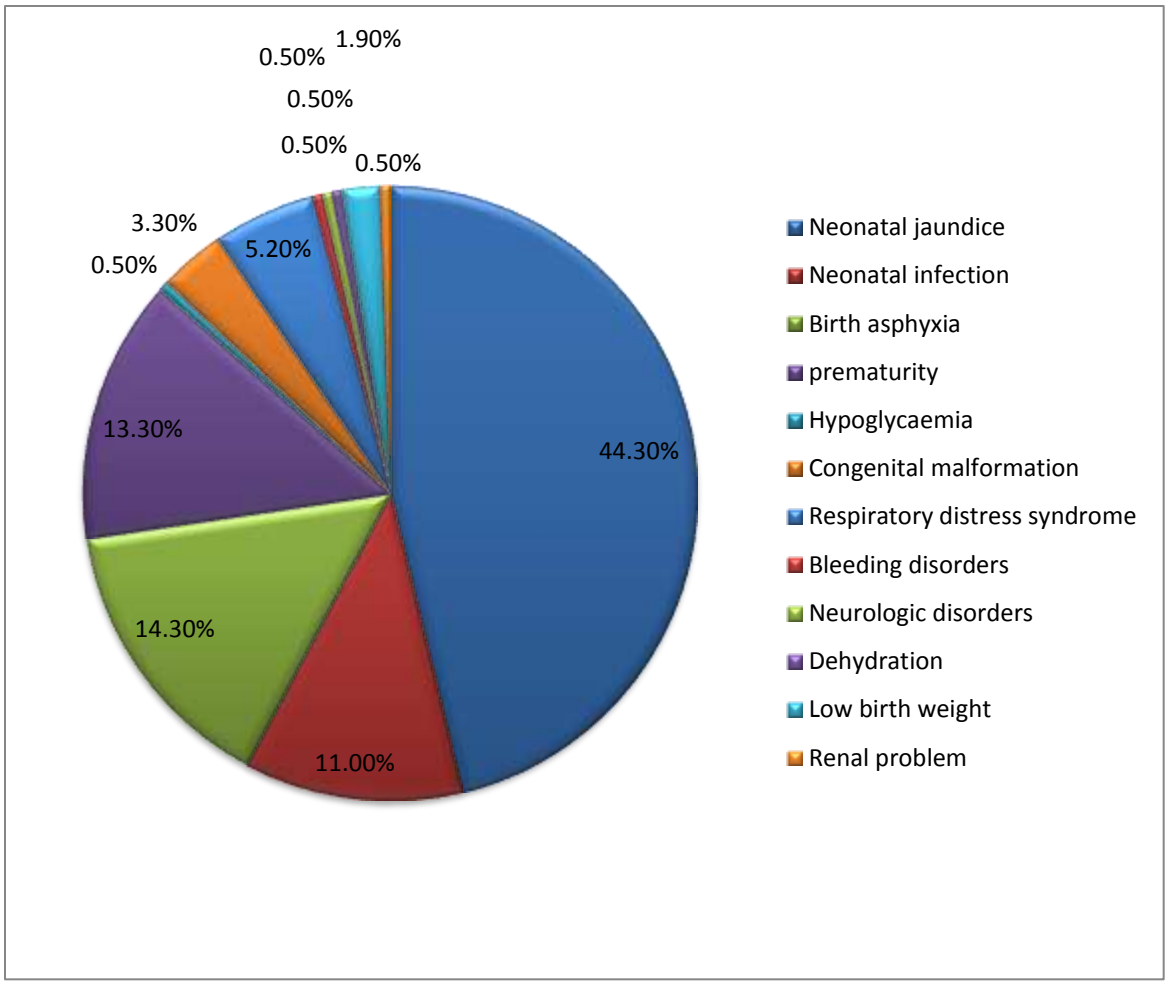

Figure 2.Prevalence of neonatal jaundice in 2016-2018

Table 4.2 below shows the elements based on to determine neonatal jaundice. For the bilirubin level (more than 5 mg /dl), 53(25.2 %) newborns were having it before 7 days, 18(25.2 %) were having it after 7 days and 139(66.2 %) were not screened for neonatal jaundice. For the skin colour, 93(44.3%) newborns were having a yellow colour, 89(42.4 %) were having a pink colour and 28(13.3 %) were having a bluish colour. For the time of yellow colour occurrence, 9(4.3%)

were having it before 24 hours after birth, 84(40%) were having it after 24 hours after birth and 117(55.7%) were not assessed for the yellow colour.

Table 4.Basic elements used to determine neonatal jaundice

Variables		**frequency**	**Percentage**
Bilirubin level(>5mg/dl)	Before 7 days	53	25.2 %
	After 7 days	18	8.6 %
	Not screened	139	66.2 %
	Total	**210**	**100 %**
Skin colour	Yellow	93	44.3%
	Pink	89	42.4 %
	Bluish	28	13.3 %
	Total	**210**	**100%**
Time of yellow colour occurrence	Before 24 hours after birth	9	4.3%
	After24 hours after birth	84	40%
	Not assessed for the yellow colour	117	55.7%
	Total	**210**	**100**%

4.3 MATERNAL RISK FACTORS OF NEONATAL JAUNDICE

Table 4.3 shows results on induction of labour with oxytocin, method of delivering, oral contraceptive in pregnancy, alcohol use during pregnancy, sibling jaundice, ABO incompatibility and premature rupture of membranes. For the induction of labour with oxytocin, 210(100%) mothers has not been induced. For the method of delivering, the majority of mothers106 (50.5%) delivered by C-Section, 104(49.5%) delivered by natural method, for oral contraceptive during pregnancy, the totality of mothers 210(100%) have not used them during pregnancy. For alcohol use during pregnancy 210(100%) mothers have not consume alcohol. For Sibling jaundice, 210(100%) mothers have not shown any sibling with jaundice. For ABO incompatibility, 3(1.4%) of mothers were presenting ABO incompatibility, 207(98.6%) of mothers were not presenting ABO incompatibility. For premature rupture of membranes, only one mother 1(0.5%) was experiencing it, 209(99.5%) have not experienced the premature rupture of membranes.

Table 5.Maternal risk factors of neonatal jaundice (N=210)

Variables		**frequency**	**Percentage**
Induction of labour with oxytocin	Yes	0	0%
	No	210	100%
	Total	**210**	**100**%
Method of delivering	Natural	104	49.5%
	C-Section	106	50.5%
	Total	**210**	**100**%
Oral contraceptive in pregnancy	Yes	0	0%
	No	210	100%
	Total	**210**	**100**%
Alcohol use during pregnancy	Yes	0	0%
	No	210	100%
	Total	**210**	**100**%
Sibling jaundice	Yes	0	0%
	No	210	100%
	Total	**210**	**100**%
ABO incompatibility	Yes	3	1.4%
	No	207	98.6%
	Total	**210**	**100**%
premature rupture of membranes	Yes	1	0.5%
	No	209	99.5%
	Total	**210**	**100**%

4.4 NEONATAL RISK FACTORS

Table 4.4 displays the results on ABO and other blood group incompatibilities, Infections, Prematurity, gestation age of the baby (weeks), non breastfeeding within one hour after birth, Early hospital discharge and Cephalohematoma as neonatal risk factors . For ABO and other blood group incompatibilities, 10(4.8%) newborns were presenting it and 200 (95.2%) were not presenting it. For infection 50(23.8%) newborns were presenting it and 160(76.2%) were not. For Prematurity 46(21.9%) were presenting it and 164(78.1%) were not. For gestation age of the baby (weeks), 3(1.4%) were having 28 weeks, 3(1.4%) were having 30 weeks, 2(1.0%) were having 31 weeks, 9(4.3%) were having 32 weeks, 1(0.5%) was having 33 weeks, 4(1.9%) were having 34 weeks, 6(2.9%) were having 35 weeks, 15(7.1%) were having 36 weeks, 9(4.3%) were having 37 weeks,

26(12.4) were having 38 weeks, 62(29.5%) were having 39 weeks, 62(29.5%) were having 40 weeks, 8(3.8%) were having 41 weeks. For non breastfeeding within one hour after birth, 11(5.2%) were able to breastfeed within one hour after birth and 199(94.8%) were not. For early hospital discharge 11(5.2%) have been early discharged and 199(94.8%) were not .For cephalohematoma 1(0.5%) newborn was presenting it and 209(99.5%) were not.

Table 6. Neonatal risk factors of jaundice

Variables		Frequency	Percent
ABO and other blood group incompatibilities	No	200	95.2%
	Yes	10	4.8%
	Total	**210**	**100.0**%
Infections	No	160	76.2%
	Yes	50	23.8%
	Total	**210**	**100.0**%
Prematurity	No	164	78.1%
	Yes	46	21.9%
	Total	**210**	**100.0**%
gestation age of the baby(weeks)	28	3	1.4%
	30	3	1.4%
	31	2	1.0%
	32	9	4.3%
	33	1	0.5%
	34	4	1.9%
	35	6	2.9%
	36	15	7.1%
	37	9	4.3%
	38	26	12.4%
	39	62	29.5%
	40	62	29.5%
	41	8	3.8%
	Total	**210**	**100.0**%
non breastfeeding within one hour after birth	No	199	94.8%
	yes	11	5.2%
	Total	**210**	**100.0**%

Early hospital discharge	No	199	94.8%
	Yes	11	5.2%
	Total	**210**	**100.0**%
Cephalohematoma	No	209	99.5%
	Yes	1	0.5%
	Total	**210**	**100.0**%

Table 4 .5 below, displays the association of demographic characteristics with neonatal jaundice. For demographic factors, there is no significant association of medical diagnosis of the newborn with neonatal jaundice.

Table 7. Risk factors associated with neonatal jaundice.

***p value< 0.05**

Demographic factors	**P.Values**
Newborn age of admission in neonatal unit(days)	0.150
Birth weight	0.255
Gender	0.542
Maternal age	0.255

Table 4 .6 below, displays the association of maternal and neonatal risk factors with neonatal jaundice. For maternal risk factors, there is a significant association between the method of

delivery (p 0.000) and neonatal jaundice. For neonatal risk factors, there is a significant association between ABO and other blood group incompatibilities (P **0.001***) and neonatal jaundice. There is also a significant association between infections (P 0.017*) and neonatal jaundice. There is also a significant association between prematurity (P 0.017*) and neonatal jaundice. There is also a significant association between gestation age of the newborn (weeks) (P 0.002*) and neonatal jaundice.

Table 8.Maternal and neonatal risk factors associated with neonatal jaundice (N=207)

***p value <0.05**

Maternal risk factors associated with neonatal jaundice	
Maternal risk factors	**p.Values**
Method of delivering	0.000*
ABO incompatibility	0.147
Premature rupture of membranes	0.532
Neonatal risk factors associated with neonatal jaundice	
Neonatal risk factors	**p.Values**
ABO and other blood group incompatibilities	0.001*
Infections	0.017*
Prematurity	0.017*
gestation age of the newborn (weeks)	0.002*
non breastfeeding within one hour after birth	0.858
Early hospital discharge	0.107
Cephalohematoma	0.505

CHAPTER 5: DISCUSSION

This chapter presents a summary of the results and discusses the findings, focusing on the specific study questions addressed in the study on Prevalence and risk factors associated with neonatal jaundice among new-borns admitted at a selected district hospital of Rwanda in 2016-2018. The implications of the study were discussed in relation to the nursing administration, nursing practice, nursing education and nursing research. Recommendations and limitations of the study were also outlined and lastly the conclusion of the study was presented.

Demographic sample of the newborn and the mother

The sample size in this study was 210.In this study, for the age , the age group of more than 7 days 17 (50.0%)was greater than the age group of less or equal to 7 days. This is in contrast with the study conducted on Evaluation of bilirubin and risk of pathologic hyperbilirubinemia levels in newborns at Ruhengeri Hospital where he found that the age group of below or equal to one week was greater than that of the age group of above seven days..(Bonnette, Alexis and Francois, 2017 p 95).The present study was also in contrast to what has been found in the study conducted in Nigeria on the Prevalence of neonatal jaundice in Eku Baptist community Hospital in Delta State which showed that 70.5% of newborns developed the neonatal jaundice within the first week of life.(Kolawole, S.E.,et al., 2016)

For the gender, among jaundiced neonates, according to the cross tabulation females constituted a high number 41(49.4%).Females were higher in number than males. This shows that female infants are more susceptible to neonatal jaundice than male infants in the present study. This is in accordance to the study conducted on Prevalence and Factors Associated With Neonatal Jaundice: A Case Study Of University College Hospital, Ibadan which found that jaundiced females infants 53.9% were presenting a big number than male infants(Serifat, U and &tongo, 2015 p 861).This is also in contrast to the study conducted in Nigeria on the Prevalence of neonatal jaundice in Eku Baptist community Hospital in Delta State which showed that male newborns were presenting a high number 67.4% of jaundice than females.(Kolawole, S.E.,et al., 2016)

This is also in contrast to the results from the study on Incidence, etiological risk factors and outcome of glucose-6 phosphate dehydrogenase deficiency (G6PDD) among neonates presenting with hyperbilirubinemia in tertiary care hospital, Punjab which found that the number of jaundiced male infants 68.45% was higher than the one of female infants(Karnail Singh et al .,2017,pg. 64).

For the Birth weight, the majority of jaundiced neonates were having2501g-3000g 77 (52.4%).This is slightly in accordance to what have been found in the study on Evaluation of bilirubin and risk of pathologic hyperbilirubinemia levels in newborns at Ruhengeri Hospital in Rwanda ,which showed that the majority 72% of jaundiced newborns were having >2500 g of birth weight(Bonnette, Alexis and Francois, 2017 p 95) .

For the maternal age, the age range of 25-34 was presenting a big number of jaundiced newborns 62(47.3%) in this study.

Prevalence of neonatal jaundice

A total of 210 newborns were included in this study. Of this number, 93 (44.3%) newborns were diagnosed with neonatal jaundice. The prevalence of neonatal jaundice was 44.3% which was high. This is slightly in accordance to the study conducted in Rwanda on Evaluation of bilirubin and risk of pathologic hyperbilirubinemia levels in newborns at Ruhengeri Hospital in Rwanda where the prevalence of neonatal jaundice was 41,3%(Bonnette, Alexis and Francois, 2017 p 95) . A study conducted in South Africa on the prevalence of neonatal jaundice and risk factors in healthy neonates at National district in Bloemfontein showed that the prevalence was 55.2% which was high compared to the prevalence in the present study(Brits, H., et al., 2018).According to the medical diagnosis of the newborn, the prevalence of neonatal jaundice was 44.3% compared to other medical diagnosis in the present study. In contrast to the present study, a study conducted in Pakistan on Incidence of neonatal hyperbilirubinemia: a population-based prospective study in Pakistan showed that there was a low prevalence of neonatal jaundice 27.6 %(S. S. Tikmani et al., 2010)

Risk factors associated with neonatal jaundice

According to the cross tabulation the following risk factors has been found to be associated with neonatal jaundice.

Caesarean section as method of delivering which was accounting 57.5%, the birth weight of 2501-3000g was accounting 52.4%,the age of more than 7 days which was accounting 50.0%the maternal age of 35 and more which was accounting 51.5%, the female gender which was accounting 49.4%, ,infectionswhich was accounting 74 % , prematurity which was accounting 26.1 % and ABO and other blood group incompatibility which was accounting 100%.

Almost the same risk factors have been found in the study conducted in Nigeria on the Prevalence of neonatal jaundice in Eku Baptist community Hospital in Delta State which showed the following risk factors which were associated with neonatal jaundice sepsis, anemia, prematurity, ABO incompatibility and lack of breast feeding (Kolawole, S.E., et al., 2016).

In contrast to the study conducted in Iran on complications of neonatal jaundice and predisposing factors in newborns mentioned idiopathic jaundice, ABO incompatibility, Rh incompatibility and GG6PD deficiency as risk factors associated with neonatal jaundice (Boskabadi, H.et al., 2015)

In contrast again to the present study ,a study conducted on Incidence and Risk Factors for Neonatal Jaundice among Newborns in Southern Nepal showed that male sex, high birth weight, breastfeeding patterns, warm air temperature, primiparity, skilled birth attendance , place of delivery, prolonged labor, oil massage, paternal education and ethnicity were the important risk factors associated with neonatal jaundice (Scrafford, C.G.et al., 2013).

CHAPTER 6: CONCLUSION AND RECOMMANDATIONS

6.1 INTRODUCTION

The chapter displays the conclusion and recommendations made after study the researcher conducted on the prevalence and risk factors associated with neonatal jaundice among newborns. Four levels of recommendations has been mentioned the nursing practice, Nursing administration, Nursing research and Nursing education respectively.

6.2 CONCLUSIONS

The prevalence of neonatal jaundice at the selected district hospital was high. Among the admitted newborns, 44.3% developed neonatal jaundice. The aim of the study was to assess the prevalence and risk factors associated with neonatal jaundice among newborns admitted at a selected district hospital of Rwanda in 2016-2018.

The most common risk factors associated with neonatal jaundice in the present study were ABO and other blood group incompatibility(p 0.001*) ,infections (p 0.017*),Caesarean section as method of delivering(P 0.000*), the birth weight of 2501-3000g ,the age of more than 7 days (P 0.002*),the maternal age of 35 and more , the female gender and prematurity (P 0.017*). The findings showed that there is no statistical significant for non breastfeeding within one hour after birth, Early hospital discharge and Cephalohematoma.

The findings showed that there is no statistical significant for non breastfeeding within one hour after birth, Early hospital discharge and Cephalohematoma.

6.3 RECOMMENDATIONS

Based on the research findings, the following recommendations are made:

To the nursing practice

The selected district hospital must recognize the most common risk factors of neonatal jaundice at their hospital and how to deal with them. The management of neonatal jaundice must be strengthened and they must be an improvement of nursing and midwife practices related to neonatal jaundice. With the identified gaps and barriers to the practice regarding neonatal

jaundice, the selected district hospital of Rwanda must establish policies and strategies to support the areas of weakness in management of neonatal jaundice in neonatal unit of the hospital.

To the Nursing administration

There is a wide number of neonatal risk factors associated with neonatal jaundice at the selected district hospital, where there is a need for the health care providers who work with neonates to play an important role in identifying risk factors associated with neonatal jaundice on time and prevent their occurrence where possible. A heath education is a key for the parents for the early detection of neonatal jaundice. Regular antenatal care must be done for all pregnant women and the long stay in hospital after newborn birth can play an important role in preventing neonatal jaundice. There must be more training of health care providers especially nurses and midwives in early diagnosis of the risk factors of neonatal jaundice. Guidelines and protocols about neonatal jaundice must be available in order to provide appropriate care to jaundiced newborn.

The Ministry of Health must focus on the results from this study for enhancing the training of general nurses working in neonatal unit. And with the time, the specialised nurses in neonatology nursing should be the only ones to work in neonatal unit for improvement nursing neonatal.

The administration of the selected district hospital, should check how to add some important elements like information on history of a sibling jaundice in the family, the use of alcohol and other drugs during pregnancy, use of oral contraceptive during pregnancy. The bilirubin level must be checked for all newborns admitted in neonatal unit as a routine check up. The blood group of each admitted pregnant woman must be known before delivery.

All information must be filled in the file of the neonate during the admission.

To nursing research.

There is a need of conducting further researches on prevalence and risk factors associated with neonatal jaundice in other districts of Rwanda as it remains a challenging health problem and researches conducted in Rwanda are very few and yet the problem is there.

To the nursing education

There is a need to strengthen the existing curriculum on the newborn care. To provide a much time to the student to integrate the theory to the practice. Workshops and continuous training of the lectures on new practices on neonatal care is highly needed in order to provide enough and current knowledge to the students. The university should organize the campaign where students can reach the community and teach the community about neonatal jaundice prevention and other conditions.

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APPENDICES

APPENDIX 1. APPROVAL FOR THE RESEARCH TOOL USE

Inbox x

Claudine Murekatete<tetaclaudin@gmail.com> Oct 12, 2018, 5:03 PM

to britsh

I am Claudine MUREKATETE, neonatal nurse student in master's program at the University of Rwanda in the college of medicine and health sciences.
In fact, I am conducting a research on the prevalence and risk factors associated with neonatal jaundice among newborns admitted at a selected hospital of Rwanda in 2016-2018
It seems difficulty to me to find an appropriate and adequate tool, the reason why I need your help.

I am looking forward your positive response!

Hanneke Brits <BritsH@ufs.ac.za> Oct 22, 2018, 3:34 PM

to **Hanneke**, me

Please find attached the data collection form that we used.

Have a lovely week

H

Hanneke Brits

Associate Professor/Principal Specialist: Family Medicine
Medeprofessor/EersteSpesialis: Huisartskunde
Faculty / Fakulteit: Health Sciences / Gesondheidswetenskappe
PO Box / Posbus 339, Bloemfontein 9300, Republic of South Africa / Republiek van Suid-Afrika
051 4013310
27834580848
051 4013312
BritsH@ufs.ac.za

From: Hanneke Brits
Sent: Friday, 12 October 2018 4:23 PM

APPENDIX 2. UR ETHICAL CLEARANCE LETTER

UNIVERSITY OF RWANDA — COLLEGE OF MEDICINE AND HEALTH SCIENCES

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 14/01/2019
Ref: CMHS/IRB/027/2019

MUREKATETE Claudine
School of Nursing and Midwifery, CMHS, UR

Dear MUREKATETE Claudine

RE: ETHICAL CLEARANCE

Reference is made to your application for ethical clearance for the study entitled ***"Prevalence and Risk Factors Associated with Neonatal Jaundice among Newborns Admitted at a Selected District of Rwanda In 2016-2018".***

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.

Professor Jean Bosco GAHUTU
Chairperson Institutional Review Board
College of Medicine and Health Sciences, UR

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

EMAIL: researchcenter@ur.ac.rw P.O. Box: 3286, Kigali, Rwanda WEBSITE: http://cmhs.ur.ac.rw/ www.ur.ac.rw

APPENDIX 3. AUTHORIZATION LETTER FOR RESEARCH FROM MINISTRY OF HEALTH

REPUBLIC OF RWANDA

Kigali, 26 MARS 2019
N° 20/1770 /DGPHFIS/2019

MINISTRY OF HEALTH
P.O .BOX: 84 KIGALI
www.moh.gov.rw

MUKASHYAKA Joëlla/ Tel: 0788489231
MUJAWAMARIYA Francoise/ Tel: 0783302009
✓MUREKATETE Claudine/ Tel: 0788545982
School of Nursing
University of Rwanda/CMHS
KIGALI

Re: Authorization of research

Reference is made to the letters requesting authorization of research for completion of your master's program in Nursing;

I hereby authorise your research as well as those of your colleagues in same situation to facilitate the entire cohort to speed up their academic activities. The students will have to present the CMHS/IRB research approval letter with this one to any health facility to have access of data.

Sincerely,

MINISTERE DE LA SANTE

Dr. Diane GASHUMBA
Minister of Health

Cc:
- Principal of College of Medicine Health Sciences
- Dean of School of Nursing and Midwifery/CMHS/UR

APPENDIX 4. RESEARCH APPROVAL LETTER FROM THE STUDY SETTING

REPUBLIC OF RWANDA

26 MARS 2019

Kigali,
N° 20/1770 /DGPHFIS/2019

For reception
March 28th 2019

MINISTRY OF HEALTH
P.O .BOX: 84 KIGALI
www.moh.gov.rw

MUKASHYAKA Joëlla/ Tel: 0788489231
MUJAWAMARIYA Francoise/ Tel: 0783302009
MUREKATETE Claudine/ Tel: 0788545982
School of Nursing
University of Rwanda/CMHS
KIGALI

Re: Authorization of research

Reference is made to the letters requesting authorization of research for completion of your master's program in Nursing;

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Sincerely,

MINISTERE DE LA SANTE

Dr. Diane GASHUMBA
Minister of Health

Cc:
- Principal of College of Medicine Health Sciences
- Dean of School of Nursing and Midwifery/CMHS/UR

APPENDIX 5.RESEARCH TOOL FOR NEONATAL JAUNDICE

Introduction:

This was a 22 items data collection tool used to determine the prevalence and risk factors associated with neonatal jaundice. The provided empty space on the tool has been filled for all 22 items looked for neonatal jaundice, and this for all 210 files looked for as sample size.

Components of data collection instrument	
File number……	
Data form is completed (dd /mm/ yy) ……/……/……	
1)Demographic data of the baby and the mother	
Newborn age of admission in neonatal unit (days): ①≤7 ②>7	
Gender: ①Male ②Female	
Birth weight(g): ①≤2500 ②>2500	

Maternal age : ① 15-24 ②25-34 ③35 and more	
2)Prevalence of neonatal jaundice	
Medical diagnosis of the newborn	
Basic elements used to determine neonatal jaundice	
Bilirubin levels(>5mg/dl) ①Before 7 days ②After 7 days ③ Not screened **Skin colour:** ①yellow ②pink ③ Bluish	
Time for yellow colour occurrence: ①Before 24 hours after birth ②After 24 hours after birth ③Not assessed for yellow colour occurrence	
3)Neonatal risk factors	
-ABO and other blood group incompatibilities	
-Infections	
-Prematurity	
-Gestation age of baby (weeks)…….	
-Breastfeeding within 1 hour after birth	

-Early hospital discharge	
-Cephalohematoma	
4)Maternal risk factors	
- Premature rupture of membranes :①Yes ②No	
-ABO incompatibility	
-sibling jaundice : ①Yes ②No	
- Alcohol use during pregnancy: ①Yes ②No	
- Oral contraceptive in pregnancy: ①Yes ②No	
-Method of delivering: ①Natural ②C-Section ③Instrumental	
- Induction of labour with oxytocin: ①Yes ②No	