UNIVERSITY of RWANDA

SOCIAL DEMOGRAPHIC, MEDICAL AND MATERNAL LIFE STYLE FACTORS ASSOCIATED WITH LOW BIRTH WEIGHT AT SELECTED REFFERAL HOSPITAL IN RWANDA

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Declaration

I declare that this dissertation contains my own work except where specifically acknowledged

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Signed……..

Date……..

Dedication

This dissertation is dedicated to my family, who never stopped praying for me, who supported me financially and emotionally and never stopped believing in me even when I stopped believing in myself. I pray the Lord will empower me to show you in this world how much you mean to me. I love you very much

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Abstract

Introduction: Low birth weight is found as a major public health problem both in developed and developing countries; it is highly linked to childhood morbidity and mortality. Though, very low birth weight has a high risk of death and disease during the first year of life. Hence, maternal socio-economy status, medical factors and life style are linked to a low birth weight.

Purpose: This study will assess the social demographic, medical factors and maternal life style factors associated with low birth weight among new born in selected Rwandan Referral Hospital.

Objectives: To describe the social demographic, medical factors and maternal life style factors of low birth weight at selected Rwandan referral hospital and to determine the risk factors associated with low birth weight

Methodology: Quantitative approach with descriptive cross-sectional design was used. A census sample of 108 was selected using purposive sampling strategy. Self-administered questionnaire and medical birth registry was used to collect data in two months (March and April 2019). Data was coded and entered into the Statistical Package for the Social Science version 21. Descriptive and inferential statistics of chi square test was performed to analyse the data. .

Results: The mean age of participants is 30.69 with 79.6% married mothers. The education level is dominated by primary graduates (23.1%) with 50.95 unemployed whereas 61.9% live in rural areas. 89.7% are multigravida with 88.8% pregnancy unsuccessful. The previous premature birth was 81.3% with 97.9% of low birth weight. Vaginal (45.4%) and urinary tract (50.9%) infection are also reported. Hypertension was reported at 59.8% whereas 50.5%, 50.5%, 45.9%, 47.5% had experienced lower backache. Education level (p= 0.009), employment (p= 0.017), previous premature outcome (p=0.025), miscarriage (p=0.028), hypertension (0.020), pain when urinating (p=0.056), meals frequency (p=0.009) and consultation in ANC visits (p=0.045) are significantly associated with low birth weight.

Conclusion: Four Antenatal care visits and consultation by gynaecologist obstetrician during ANC visits should be strengthened the maternal- child health in Rwanda. The awareness towards heavier physical activities during pregnancy should be taken as major concern. Negative past gyneco-obst antecedents should be taken into consideration during a subsequent pregnancy.

Key words: Low birth weight, risk factors, new born

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HIV: Human Immunodeficiency Virus

LBW: Low Birth Weight

VLBW: Very Low Birth Weight

ELBW: Extremely Very Low Birth Weight

MLCC: Midwife-Led Continuity of Care

NICU: Neonatology Intensive care Unit

NISR: National Institute of Statistics Rwanda

RHM: Rwanda Military Hospital

WHO: World health organization

CHAPTER ONE: INTRODUCTION

1.1 Introduction

The weight inferior to 2500 grams at birth is amongst of the grievous health problems of the infants in the worldwide nowadays. Each year, an approximate of 20 million low birth weight infant are born worldwide, by which over 18 million of these are accounted in underdeveloped country, hence, low birth weight infants are in their future life at advanced risk of morbidity, poor growth, impaired psychomotor, cognitive development and mortality compared to normal weight infant (Momenabadi *et al.*, 2017, p2). In developing country where Rwanda is classified, low birth weight is mostly related with multifactorial factors like mother's biological, socio-demographic factors, antenatal care visits (Momenabadi *et al.*, 2017, p2). Rwanda as one of developing countries needs to work on low birth weight with evidence based practice. Hence, the first step is to know the factors associated with LBW in order to strengthen the existing policies in maternal child health.

1.2 Background to the study

Rwanda has tremendously improved the newborn health and survival situation trough different initiatives such as community health insurance scheme which highly impacted the reduction of challenges to afford healthcare services, performance-based financing (PBF) schemes which contributing to boost provision of quality health services, strengthening and streamline the scope of practice of Community Health workers (Ministry of Health_GoR, 2012, p20). However, despite those initiatives, the reduction of newborn mortality rate is slowly decline (Khurmi *et al.*, 2017, p15). Though, Rwandan four years Summary Report of Maternal and Newborn Deaths, mentioned that "61% Neonatal mortalities were reported including low birth weight newborns" (Khurmi *et al.*, 2017, p8) which means that, LBW is a concern to Rwandan health sector which need contribution of clinicians, researchers , educators and entire Rwandan community because the first age of individual may determine the fruitful future development.

The progress that a human being achieves in the first 12 months of life is indispensable and vital for surviving and hold up the competitive long-life. Though, healthcare starts on that point to ensure the prosperity, longevity of a strong future nation. However, neonatal morbidity and mortality are still being a severe health challenges globally (Safari et al. 2016, P3) and among other causes LBW is considered as among prior main drive of mortality and morbidity in infants (Pawar & Kumar, 2017, p1) as well as the probability of developing

disabilities and chronic diseases in future life (Gebregzabiherher et al., 2017, p3). A new born with weight inferior at 2500grams irrespective of their gestational age at the birth may have physical characteristics such as "emaciated look, loose folds of skin, lack of subcutaneous tissue and LBW new born are likely to have the same problems such as low oxygen levels at birth, inability to maintain body temperature, difficulty feeding and gaining weight, infection, breathing problems, like respiratory distress syndrome, neurologic problems, such intraventricular haemorrhage, gastrointestinal problems such as necrotizing enterocolitis, sudden infant death syndrome" (Boston Childrens Hospital, 2018, p2)

Despite the effort made by health agencies to advance the quality of maternal and child health, 15.5 % of all births are born with less than 2500 grams which count twenty million of babies born every year worldwide, though, 92% of less than 2500grams new born are native in developing countries, 70% in Asian countries and 22% in African countries (Muchemi et al., 2015, P3; Kandel & Kafle, 2017, p2). In East Africa Countries, the study done in Kenya shown that the prevalence of LBW was 12.3% (Muchemi et al., 2015, p2), and the study done in northern Tanzania shown that the incidence of new born with less than 2500grams was 10.6% (Mitao, Philemon, Obure, Blandina T. Mmbaga, et al., 2016, p3) whereas Rwanda Demographic Survey 2014-2015 stated that the incidence of LBW was 6% (NISR, 2016, p129).

Despite the efforts may be done by health sector to manage the health of LBW, they are exposed to have the same problems like: "Low oxygen levels at birth, inability to maintain body temperature, risk of infection, difficult in feeding and gaining weight, breathing problems such as respiratory distress" (Mitao, Philemon, Obure, Blandina T Mmbaga, et al., 2016, p5) which complicate their health status management and consequently, their mortality rate is 20 times higher than among infants of normal weight (Pawar & Kumar, 2017, p3; Gebregzabiherher et al., 2017, p6). Their management requires but not limited to care in the neonatal intensive care unit, temperature skilful rooms and extraordinary feedings, sometimes with nasal gastric tube if a baby cannot drink (Boston Childrens Hospital, 2018, p1), in addition to these, the WHO recommends 3 areas to manage LBW such as midwife-led continuity of care (MLCC) models, Kangaroo Mother Care and Specific clinical interventions such as thermal care, feeding sustenance, oxygen therapy , and other treatments to help babies breathe more easily (World Health Organization (WHO), 2018a, p50).

Rwanda health sector take the management of new born as first pillar to save the humanity life. In this regards, the Ministry of Health of Government of Rwanda had provided the

guidelines to manage the neonatal babies in general, the guidelines state that new born with less than 2500 grams are low birth weight (LBW), less than 1500 grams are very low birth weight (VLBW) and 500 gram to <1000 grams are extremely low birth weight (ELBW) and they should be well managed because they are extremely more likely to develop the life complications ending most of time by death (Ministry of Health_GoR, 2012, p15). This guidelines provides the core elements and behaviour to focus on during LBW, VLBW and ELBW complication management by healthcare providers at Rwandan territory such as fluid and nutrition management, fluid guideline for infants, Recipes for Intravenous fluid, Enteral fluid guidelines, Kangaroo mother care and incubator guidelines for LBW(Ministry of Health_GoR, 2012, p20). Though, Rwanda guidelines to manage LBW fall into 3 areas of WHO recommendations to manage LBW except midwife-led continuity of care (MLCC) models.

As management of Low Birth weight is naturally complicated, it becomes worse when it arrive in developing countries including Rwanda by which multifactorial elements play considerable part in advanced health complications to the LBW such as chronic family poverty leading to food insecurity, scarcer of qualified and skilled health professionals, few and insufficient equipment at health facilities, lack of pregnant women prosperity which lead to future hopeless (Wolcott et al., 2015, P3; Muchemi et al., 2015, p4; Gebregzabiherher et al., 2017, p8). Fortunately, Rwanda has political will to strengthen the maternal and child health through different initiatives and strategies. Among them, 2015 year marked the end of the Millennium Development Goal (MDG) era where Rwanda highly registered a great achievement and the beginning of the implementation of the Sustainable Development Goals (SDGs) by which all health and healthcare system strata will remain to be an essential part of implementing strategies directing to accomplish the vision 2020 and Sustainable Development Goals (SDGs) (MINECOFIN RWANDA 2016, p1; MINECOFIN RWANDA, 2015, p10) . Though, the assessment of risks factors associated with Low birth weight will be valuable tool to practice evidence based to implement effectively the 3rd goal especially Strengthen maternal &child health care.

1.3 PROBLEM STATEMENT

Low birth weight is not natural pregnancy outcome for developing countries but also developed countries face that problem by which the incidences in developed countries are 10% against a range of 15-40% for developing countries (Johnson et al., 2015, p1). In East African countries, the study done in Tanzania had shown that the incidence of new born less

than 2500grams was 10.6% (Mitao, Philemon, Obure, Blandina T. Mmbaga, et al., 2016, p1), Kenya 12.3% (Muchemi et al. 2015, p4) and Rwanda 6% (NISR, 2016, p129).

Low birth weight is registered as the main source of neonatal morbidity and mortality in infant worldwide (Gebregzabiherher et al., 2017, p2), hence, 1500grams or less at birth present a high risk of death (Sicuri *et al.*, 2011, p1). Though, different social-economic behaviour factors have been linked to low birth weight such as poor maternal nutrition before and during pregnancy, low maternal education, maternal occupation, alcohol, smoking, drug use during pregnancy as well as chronic diseases like chronic hypertension, renal diseases, heart diseases, Diabetes and HIV and psychological problems (Surendranadha Reddy, 2017, p5; Muchemi et al., 2015, p4). Though, worldwide there are few studies focusing on the factors associated to very low birth weight or extremely low birth done. In Rwanda there is a little known documented risk factor associated to LBW

Despite the fact that LBW has been documented as major factor striking the infant survival, health and development, Having a LBW baby can cause emotional, social and financial stress for the family because LBW babies can have life-long health problems and it is also the main reason babies die in the first year of life (UNICEF and WHO, 2004). It is a publicon health problem and interventions need to be put in place to reduce its incidence.
Since LBW is preventable, it is important to establish the factors associated with this outcome.

1.4 THE AIM OF THE STUDY

To assess the social demographic, medical and maternal life style factors associated with Low birth weight among new born babies at selected Rwandan referral hospital

1.5. SPECIFIC OBJECTIVES

1. To describe the social demographic, medical and maternal life style factors of low birth weight in selected Rwandan referral hospital

2. To establish the risk factors associated with low birth weight in selected Rwandan referral hospital

1.6. RESEARCH QUESTION

1. What are social demographic, medical factors and maternal life style factors of low birth weight in selected Rwandan referral Hospital?

2. What are the associated risks factors of low birth weight in selected Rwandan referral hospital?

1.7. SIGNIFICANCE OF STUDY

The assessment of the factors associated with Low birth weight at Rwanda Military Hospital will be valuable tool to practice evidence based to implement effectively the third goal of sustainability development goals, especially strengthen neonatal healthcare as there is no study that have been done in relation to this issue in my country. Meanwhile, this study will be benefit for:

For midwifery and neonatal nursing professional

The outcomes of this study will support midwives and neonatal nurses likewise to understand deeply the risks factors associated with low birth weight and take them into thoughtfulness when caring mothers from antenatal services to delivery

Neonatal nursing research

This study will serve as baseline reference for other nurses/Midwives researchers in order to fruitful the future professional nursing practice, hence this study will contribute for nursing continuing advancements which promote optimal nursing care for low birth weight on the basis of evidence obtained through research.

Education

The result of this study will serve as baseline for further planning of in service training and budgeting for required equipment based on key determinants. Though, the curriculum will be strengthened by including low birth weight in detail at all levels of training, in-service training on proper management of low birth weight.

Administration of the hospital

This study is very important as it will provide information related to the risk factors associated to low birth weight in selected Rwandan tertiary health facilities, though, its outcome will contribute to neonatal health improvement as it will serve as baseline. In addition to that, the results of this study will provide the data which could be used in prediction for the whole country in planning pre-service and in service training and infrastructure allocation.

1.8. OPERATIONAL DEFINITION OF KEY TERMS

1**. Low birth weight**

is defined by World Health Organization as "birth weight less than 2,500grams at birth"(Edmond and Bahl, 2006, p10). In this study it will be considered as any new born with fewer than 2,500 grams at birth regardless other factors.

2**. New born**

New born is defined as a human infant from the time of birth up to the first 4 weeks of lifetime (Edmond and Bahl, 2006, p11). In this study a new born will be considered as any baby born at Rwanda Military Hospital within data collection with not more than 28days of age.

3**. Risk factors**

Risk factors are "circumstances or variables associated with a lower possibility of positive outcomes and an advanced likelihood of negative or socially unwanted results in other words they are somewhat that rises a person's chances of developing an illness or harm" (World Health Organization (WHO), 2018c, p15; World Health Organization (WHO), 2004, p50). In this context, risk factors will be considered as any attribute or characteristic that increases the chance of delivering with Low Birth Weight, very low birth weight and extremely very low birth weight at Rwanda Military Hospital during data collection period.

1.9. ORGANISATION OF STUDY

This study is composed by: Chapter 1: Introduction, chapter 2: Literature review, chapter 3: methodology, chapter 4: Results, chapter 5: results discussions, References then after Appendices

1.10. CONCLUSION OF THE CHAPTER ONE

The chapter one elucidated on risk factors of Low Birth Weight are a public health concern worldwide even if LBW distribution is different in different corners of globe. The developing countries account higher prevalence and incidence than developed countries. The factors associated to LBW are variables globally; some are commonly in developing countries the others are commonly in developed countries. However, some of them are commune denominator of LBW both in developing countries and developed countries such as lifestyle and biological factors. Lastly, this part demonstrated how it important and beneficial to conduct this study in Rwanda because based on my knowledge there is no other similar study conducted in Rwandan territory.

CHAPTER TWO: LITERATURE REVIEW

2.1. INTRODUCTION

A study literature review is a survey of books, scholarly articles, and any other material relevant to the research problem under investigation (Tiwari, 2017, p3), hence, it makes an exposition of the existing knowledge and logical thinking which led researcher to feel that what planned to be done is worth to demonstrate to the readers how the study fits within a larger field of researches (University of Southern California, 2018, p1). Though, this chapter will focus on the studies that were conducted previously in different corners of the world in order to understand the magnitude of low birth weight at international, regional and national level. This part of proposal will place the researcher in bath of required searchable knowledge and skills to undertake the required tools to achieve the objectives of the study.

The first part is theoretical literature that describes low birth weight through showing its burden, defining it symptoms and its complications to the babies and its management in Rwandan context. The second part is constituted by the empirical literature that describes the demographic data and factors associated with low birth weight. The last part will describe the theoretical framework of the study.

The literature search was performed to identify similar studies with a purposeful and systematic research of the key words like low birth weight, risk factors in online research databases such as Google Scholar, HINARI, web of science and Science direct by limiting on the year of publication from 2013 to 2018.

2.2. THEORETICAL LITERATURE

This section of theoretical literature will describe the symptoms, complications, management and burden of low birth weight.

2.2.1: Definition of low birth weight

Low birth weight has been defined as “a birth weight of less than 2500 grams irrespective of gestational stage”, subsequently; low birth weight is reflected to be linked to high risk of early childhood morbidity and death than normal birth weight (Cutland *et al.*, 2017, p3,4). Hence, Low birth weight (LBW) constitutes a key maternal child health alarm worldwide and it becomes more complicated when it arrives in developing countries and is one of the

toughest distinct risk influences for early neonatal death and morbidity (Mahumud, Sultana and Sarker, 2017, p18).

2.2.2: Symptoms, complication and burden of low birth weight

Birth weight is among measurable indicators of monitoring or assessing the outcome of pregnancy at health facility by healthcare providers or at home by community health workers. Birth weight may be categorized into 3 classes refereed on the weight of new born, though normal birth weight is considered to a new born with weight superior or equal to 2500 grams but inferior to 4000grams, low birth weight for a baby born with a weight inferior to 2500 grams whereas heavy birth weight baby or macrosomia is considered as baby born with weight superior or equal to 4000grams (Abubakari, Kynast-Wolf and Jahn, 2015. p1).

Low birth weight may have physical characteristics "such as emaciated look, loose folds of skin, lack of subcutaneous tissue and head bigger than chest by >3cm and LBW new born are likely to have the same problems such as low oxygen levels at birth, inability to maintain body temperature, difficulty feeding and gaining weight, infection, breathing problems, like respiratory distress syndrome, neurologic problems, such as intraventricular hemorrhage, gastrointestinal problems such as necrotizing enterocolitis, sudden infant death syndrome" (Ministry of Health_GoR, 2012, p60; Boston Childrens Hospital, 2018, p2).

Hence, different studies illustrated that low birth weight new-borns are at an augmented risk of negative endings, including long-term neurological disabilities, increasing of Non communicable disease like cardio-vascular disease and diabetes, motor and sensory impairment, learning difficulties leading to poor academic achievement and behavioural problems (Cavallo *et al.*, 2015, p1; Jornayvaz *et al.*, 2016, p1; Cutland *et al.*, 2017, p2).

Globally, Low Birth weight has unwanted further consequences to the infant life which may be short-range such as high infant mortality, child- hood growth failure, respiratory distress syndrome (RDS), retinopathy, necrotizing enterocolitis, severe intraventricular haemorrhage, bronchopulmonary dysplasia (Chang *et al.*, 2015, p.3) or long term risk such as high frequency of adult cardiovascular diseases, diabetes, debilitating on childhood development and birth weight of offspring (Abubakari, Kynast-Wolf and Jahn, 2015 p1-2; Jornayvaz *et al.*, 2016, p5). Even if low birth weight and heavy birth weight are not desired pregnancy outcome, the LBW constitute a main factor of disability, morbidity and mortality in neonates, infancy and child hood than Heavy birth weight (World Health Organization (WHO), 2018, p1). Consequently, Low birth weight effects in considerable costs to the

health sector and enforces an important problem on the society as an entire and on family specifically as proven by the study conducted in Italy stating that "the family with low birth weight suffered from higher productivity losses because they had fewer working hours as they are required to provide much attention to a baby and the mothers were also more likely to lose their jobs" (Cavallo et al., 2015, p10).

In underdeveloped countries, the economic burden of low birth weight to the society and health system is not much documented but the study done in Mozambique revealed that LBW brings an important economic burden both for the health system as well as for the families, this economic burden comes from Health system costs during infancy care associated with LBW babies and household costs for routine health care cost follow LBW (Sicuri et al., 2011, p6-7).

The root of Low birth weight may be accredited to two major clinical scenarios: "intrauterine growth retardation and preterm delivery" (Johnson et al., 2015, p790) and those clinical phenomena may be associated with 3 main combined factors such as maternal lifestyle during pregnancy, socio-demographic of family and medical or biological factors (Pawar and Kumar, 2017b, p1,2; Surendranadha Reddy, 2017, p5).

2.2.3: Management of low birth weight

The management of LBW constitutes a great effort to improve the LBW babies' lives, experience from both developed and underdeveloped countries has evidently revealed that "appropriate care of LBW infants, including feeding, temperature maintenance, hygienic cord and skin care, and early detection and treatment of infections can substantially reduce mortality in this highly vulnerable group" (Edmond and Bahl, 2016, p10). As far as maternal child health is a public health concern worldwide different measures have been made to enhance the healthcare of low birth weight, among them there are indication for low birth weight hospitalization (Amano *et al.*, 2014, p2), "advanced delivery room resuscitation" (ADRR), which defined as chest compressions, intubation or the prescription of adrenaline, is meaningfully more likely in infants of low birth weight and gestational age (Ballot *et al.*, 2017, p2), Furthermore, the recommended advises were drown to the parents of LBW and clinicians during and after hospitalization such as breastfeeding or mother's own expressed milk, pre-term infant formula, exclusive breastfeeding for 6 months, human milk supplementation (Edmond and Bahl, 2016, p12, 13).

Though, Rwanda as one of developing countries recognizes the positive outcomes of efficient management of LBW and to promote the maternal child health, the Rwandan Ministry of Health designed the neonatology clinical guidelines in which the measures to be taken for low birth weight have been illustrated, thus, the guidelines indicate the probable causes of LBW, signs, symptoms and Ballard score (Neuromuscular Maturity and Physical Maturity assessment), advanced investigation to be done and common complications and their possible management which could guide the clinicians in diagnosis and decision making (Ministry of Health_GoR, 2012, p59-84). However, the data and measures on LBW classification is still a gap to address.

2.3: EMPIRICAL LITERATURE

The study aiming to assess the risks factors associated with LBW requires deep gathering of empirical data from other scholars' activities in order to have full understanding of empirical phenomena and knowledge patterning our study. Though, this section of literature review describes extend of LBW globally, regional and describing its risk factors.

2.3.1 Prevalence of low birth weight

More than twenty million new born globally representing 15.5% of all births are born with LBW, among them 95.6% are in low and middle income countries. An estimated 6% of infants are born with LBW in East Asia and the Pacific countries whereas Sub-Saharan countries account 13%, and up to 28% in South Asia; hence high-income states report lower LBW rates, including 6.9% from United Kingdom (Cutland *et al.*, 2017, p2) and the prevalence of Very Low Birth Weight was recorded as 1% in Italy (Cavallo *et al.*, 2015, p1).

A study done in Bhagalpur Hospital, Nepal country, south Asia shown that the prevalence of LBW was 9.4% , which is less than what was perceived in a hospital-based study (29.8%) in the Western Region Hospital and in Kathmandu (Kandel and Kafle, 2017, p2, 4). A study on done in Adwa General Hospital, Northern Ethiopia was found that the prevalence was 10% which is similar to the prevalence revealed in study done in Pakistan (10.6%) (A. Khan, F. D. Nasrullah, 2016, p137). Though, the LBW has been reported at high level in study done in Ghana where prevalence was 29.6% (Abubakari, Kynast-Wolf and Jahn, 2015, p4)

The eastern African countries present the prevalence of LBW which is nearest of the developing country average (16.5%), 13% for Tanzania and 15.8% for Uganda (Mahumud, Sultana and Sarker, 2017, p4) whereas the prevalence of LBW is 12.3% in study done in Kenya (Muchemi, Echoka and Makokha, 2015, p4), in Rwanda there is incidence of 6%

(NISR, 2016, p153). Even if the incidence in Rwanda has been revealed by Rwanda Demographic Health Survey 2014-2015, the prevalence of LBW in Rwanda is not known, on my knowledge no any study done in Rwanda determining the prevalence reason why there is a gap of literature regarding LBW in Rwandan territory.

2.3.2: Risk factors of low birth weight

Low Birth Weight as among possible pregnancy outcome is not hazard, rather is stimulated by different factors the mother contracted before and during pregnancy period. Different scholars reported how any factor contributes to LBW even if the levels of influencing pregnancy outcome vary from scholar to another.

2.3.2.1: Socio-demographic factors

They play a big role in pregnancy outcome, the study done in the Southeast of Iran shown that neonate sex, parity number, maternal age at delivery, mode of delivery, maternal education level, place of living, consanguinity were significantly related to LBW (Momeni *et al.*, 2017, p3). In addition to that, different study done in Northern Ethiopia, Nepal, India and Tanzania found a significant relationship between the LBW and teenage pregnancy which may be justified by adolescent mothers are both bodily and psychologically less capable for bearing the affliction of pregnancy (Borah and R, 2016, p3; Mitao, Philemon, Obure, Blandina T. Mmbaga, *et al.*, 2016, p4; Gebregzabiherher, Haftu, Gebrehiwet, *et al.*, 2017, p5; Kandel and Kafle, 2017b, p172).

The scholars revealed that demographic status may influence the birth weight outcome, thus the education level of mothers influences the prevalence of LBW, for example in India, the study revealed that illiterate mothers presented high prevalence of LBW (24.9%) against higher education (1.2 %)(Surendranadha Reddy, 2017, p2), this is emphasized by the other study done in Iran, where 60% of mother with LBW are illiterate (Momenabadi *et al.*, 2017, p3).

However, this is contrary with what found by Mogire in Kenya where prevalence of LBW was not significantly associated to education level, the mother with none/primary education represented 32.3% and those with secondary/tertiary education 33.3% of LBW(Mogire, 2013, p67) whereas Muchemi reported that mothers without classic education were 4 times more likely exposed to have LBW paralleled to with advanced education (Muchemi, Echoka and Makokha, 2015, p2).

In Tanzania, the study revealed that the area of residing either rural or city contribute significantly to LBW ($P < 0.001$), though, there is a significance difference between women from rural area who presented higher rate of LBW (12.3%) to those who were residing in the city region with prevalence of 9.5%, whereas 80.1% of LWB came from unemployed mothers (Mitao, Philemon, Obure, Blandina T. Mmbaga, *et al.*, 2016a, p4).

This is similar to the data from India, where housewife presented high prevalence (16%) compared to those who have the job (1.4%) (Surendranadha Reddy, 2017, p3). However, this data is somehow contrary to the data from Nepal in which 7.2% of LBW babies belonged to housewife occupation (Kandel and Kafle, 2017, p2). In Rwanda, even if not much known towards factors influencing LBW, the DHS revealed that the percentage of children with a LBW grows up from 4% in City of Kigali to 8% in South (NISR, 2016, p155), this explain that the residency of mother may contribute to the outcome of pregnancy.

2.3.2.2: Medical and gyneco-obstetrical Factors

This regards the health status like bacterial vaginal infections, chronic and non-communicable diseases like diabetes, maternal cardiovascular disease and uterine anomalies (Mitao, Philemon, Obure, Blandina T. Mmbaga, *et al.*, 2016, p4). Among others factors primiparity, multiple gestation, previous LBW baby, abortion, birth defects, preeclampsia, and oligohydramnios are other medical factors which associated to LBW (Momeni *et al.*, 2017, p4). In addition to that fetal Growth Restriction contribute to LBW in three different ways such as fetal ("chromosomal abnormalities, multiple pregnancies, fetal structural anomalies and fetal infections"), Maternal ("nutritional deficiencies, especially of vitamin C and E and infections"), Placental Insufficiency (Krishna and Bhalerao, 2011, p2)

2.3.2.3: Maternal lifestyle

Factors under maternal lifestyle which could influence low birth weight may include smoking in which the nicotine and carbon monoxide the main constituent of cigarette have adverse foetal effects which may contribute not only on various congenital malformation but also on low birth weight (Muchemi, Echoka and Makokha, 2015, p2, 5, 10), thus it has found that parental smoking affects male and female foetuses differently (ISHMAEL, 2011, p29).

The study done in France has found that maternal consumption of high alcohol was associated to decreases in birth weight, thus, alcohol and illicit drugs are able to limit foetal growth and may contribute to birth defects, moreover, drug abuse during pregnancy is crucial

maternal lifestyle which may contribute enormously to LBW because some drugs, like cocaine, may increase the chance to have the premature delivery. (ISHMAEL, 2011, p29; Mogire, 2013, P69). Furthermore, WHO revealed that the mother's lifestyle like taking alcohol, smoking or various drug could affect the growth of foetus, as well as the pregnancy duration which lead at the end on LBW(Edmond and Bahl, 2006, p16) because the in utero biological developments that distress the foetus are correlated to the mother's physiology (Surendranadha Reddy, 2017, p5).

Nutrition problems (such as nausea and vomiting, heartburn, poor appetite and constipation) and poor maternal nutrition are known as causes of LBW, due that during the foetal development phase, growth depends on the maternal nutritional situation (Mitao, Philemon, Obure, Blandina T. Mmbaga, *et al.*, 2016, p3). Though, it has been noticed that poor nutrition, and low body mass index responsible for LBW were predominantly presented in younger mothers that old mothers (Momeni *et al.*, 2017, p4).

Furthermore, wherever delivery process is carried out in hospital, non-attendance or attending antenatal service less times lead to a substantially high risk of severe undesired pregnancy outcome as it has revealed by a study done in Iran in which it has found a significant association between mothers' antenatal care and LBW ($P < 0.001$) (Momenabadi et al., 2017, p3). Though, Antenatal care (ANC) services is an achievement story in African region, since more than two-thirds of pregnant women at least consume one ANC service, Rwanda accounts antenatal care (ANC) visits at 98 percent for at least one visit from skilled personnel, however, the frequency was below the standard set by WHO and the Government of Rwanda, only 44 percent of women met the standard of at least four ANC services and in addition to that, consultation during antenatal is still at low rate, the ratio of women who consulted a physician during these visits is higher in town areas (11 percent) as compared to in countryside areas (3 percent) (NISR, 2016, p113-114).

Consequently, the low rate of 4 ANC visits and low number of consultation in ANC visits contribute to slow down the defensive measures required to escape the risk of miscarriage, insufficient weight gain (less than 4.3 kg) for women in early pregnancy earlier than twenty four weeks and other unwanted pregnancy outcomes such as LBW (Krishna and Bhalerao, 2011, p2).

Despite the effort can be made to manage health status of pregnancy mother for many women in the low and middle income countries, yet, economic, social and cultural factors make it demanding for them to attain the necessary nutriment and healthcare, which are

closely interconnected (Mogire, 2013, p30), thus, Jwa et al. revealed that the lower educational level presented higher systolic values both in early and mid-pregnancy compared to advanced educational groups and the mean diastolic Blood Pressure in early pregnancy was greater in the group of less educated families than of high level (Jwa *et al.*, 2013, p4).

This findings showed that social economic factors such as home income, Mother's education, partners involvement in pregnancy health (Lewis, Lee and Simkhada, 2015, p6) influenced directly and indirectly the birth weight outcome. Though, poor social economy status of the mothers contribute to lack of adequate health services such as early consultation as well as means of self-care management for Non-communicable diseases such as Diabetes, Hypertensions, kidney diseases, preeclampsia, etc. and communicable diseases such as Sexual Transmitted Infection, malaria, gastrointestinal disease, etc (Jwa et al. 2013, p3).

Therefore, Jwa et al. discovered that maternal lifestyle played a crucial role in medical factors of pregnancy women which lead to LBW, for instance, smoking pregnant mother presented lower Blood Pressure, hence, smoking predicts the association between maternal life style and cardiovascular events (Jwa *et al.*, 2013, p7) and consequently finishing to LBW. In conclusion, social economy status, maternal life style, and medical factors of pregnant women hinder the minimum antenatal care and consultation required in order to ensure the maximum management of pregnancy women till labour, hence, all those risk factors of low birth weight are inter correlated to contribute to LBW, thus, one induce another one which contribute directly to LBW.

2. 4: CRITICAL REVIEW AND RESEARCH GAP

Different study done in different region including in Northern Ethiopia, Nepal, India and Tanzania focused on relationship between the LBW and teenage pregnancy which may be justified by adolescent mothers demonstrated that are both bodily and psychologically less capable for bearing the affliction of pregnancy (Borah and R, 171, p3; Mitao, Philemon, Obure, Blandina T. Mmbaga, *et al.*, 103, p9; , However all above researchers emphasising on different topics , but did not talk on the factors influencing LBW , therefore is important to investigate those factors.

Though, worldwide there are few studies focusing on the factors associated to very low birth weight or extremely low birth done. Gebregzabiherher, Haftu, Gebrehiwet, *et al.*, 211, p5; Kandel and Kafle, 119b, p172), but did not focused on factors associated with low birth weight.

In East Africa Countries, the study done in Kenya focused also the prevalence of LBW and revealed that was 12.3% (Muchemi et al p 47), and other study done in northern Tanzania emphasising on the incidence of new born with less than 2500grams and shown that was 10.6% (Mitao, Philemon, Obure, Blandina T. Mmbaga, et al., 221, p3). None of those studies focused on factors influencing LBW.

Thus, in Rwanda there is a little known documented risk factor associated to LBW type as there are few studies done known towards the risk factor associated to LBW type, for instance at Rwanda military hospital also no study done for identifying the factors associated with LBW, though, such kind of study is needed in order to prevent complications related to LBW at Kanombe and in Rwanda.

2.5: CONCEPTUAL FRAMEWORK

According to Potschin and colleagues "a conceptual frameworks might be used to: 'figure out thinking', 'building work', 'simplify issues', and 'provide common reference point"(Potschin-Young *et al.*, 2018, p428). The present conceptual framework model has been adapted from the model used by Takito, (Takito and Benício, 2010, p94). The operationalization of conceptual model will be restructured on three interconnected variables of risk factors associated with low birth weight:

i) **Socio-demographic variables:** are defined as nothing more than characteristics of a population subjected to be included in the study, mostly they are characterized as ageing, gender, marital status, education status, family income, residence location (Osibanjo *et al.*, 2018, p14).

ii) **Maternal medical variables:** are defined as "maternal health status during the prenatal period and at delivery carries far reaching significance for the health of offspring" (Jackson and Vaughn, 2018, p18) though, in this study, the researcher will identify but not limited to how the chronic and non-communicable diseases, Parity, previous LBW baby, Fetal Growth Restriction could be linked to low birth weight in our study population;

iii) **Maternal lifestyle variables:** are defined as interests, opinions, behaviours, and behavioural orientations of mother during prenatal such as smoking, alcoholic drink consumption, Nutrition problems during pregnancy like missing the appropriate meals and lack of micronutrient complements, Drug abuse, strenuous working conditions, prolonged standing for long time, heavy lifting activities , antenatal care visit with number of

gynaecologist & Obstetricians' or midwife assessment (Takito and Benício, 2010, p94; Tang *et al.*, 2017, p2).

The following model showed how different factors contribute to LBW but also how they are associated to induce the low birth weight.

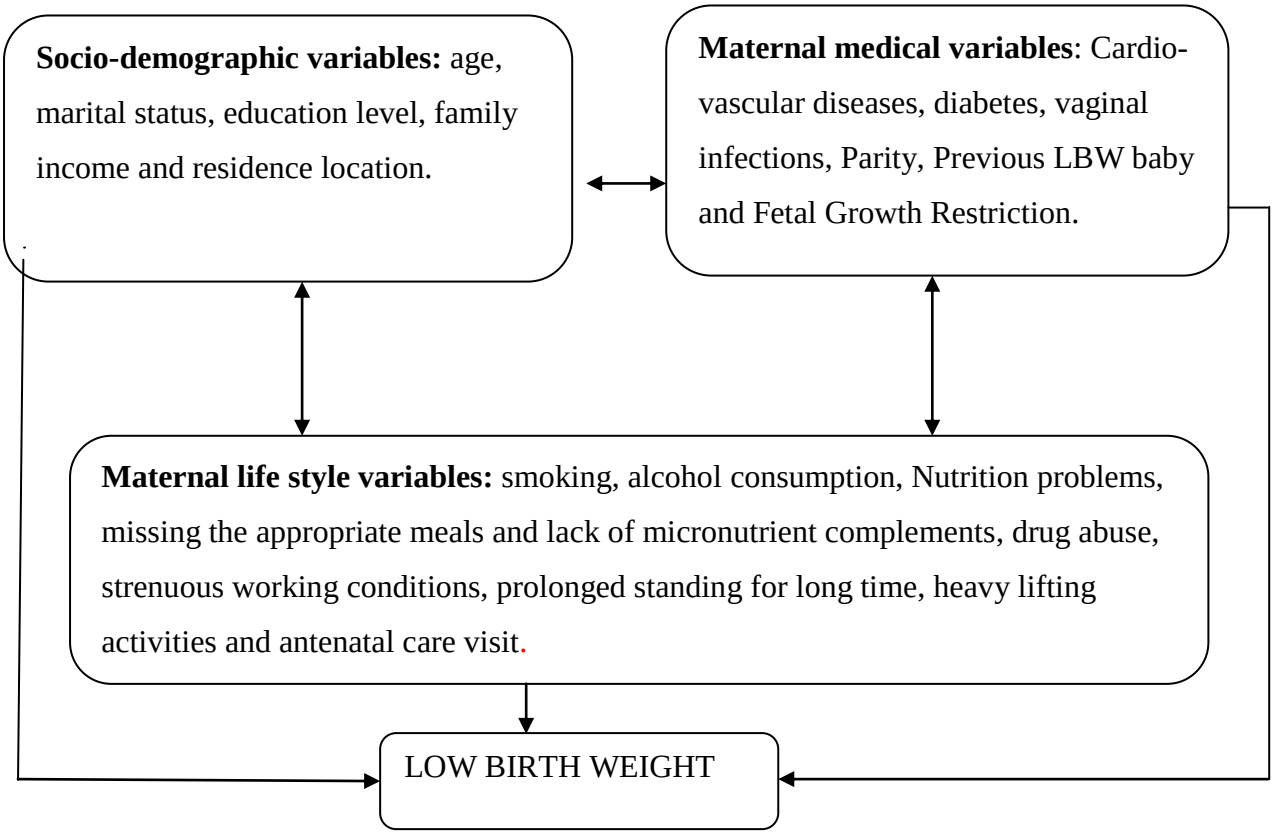

Figure 2. 1: Conceptual framework of low birth weight

Adopted from: (Takito and Benício, 2010, p94)

2.6. CONCLUSION TO THE CHAPTER TWO

This chapter had sorted out the prevalence worldwide in which it has noted that the developing countries account higher prevalence of LBW than developed countries due that the factors associated with LBW are worse than in developed countries. Though, among others the maternal lifestyle, medical factors, socio-economy and antenatal consultations are the risk factors of LBW worldwide. Different scholars have found that those factors contribute independently to the high prevalence of LBW.

CHAPTER 3 RESEARCH METHODOLOGY

3.1. Introduction

According to Kothari research methodology is defined as "the source of all knowledge and the method, which human being employs to obtain the knowledge of whatever the unknown from known" (Kothari, 2004, p14). This part of study provides a systematic way to the research problem. It describes how this study was done scientifically and along the way, the relevant methods and techniques which was elucidated during gathering data and arranging them, techniques for the collection of appropriate data to my study problems, sorting it out and interpreting it in order to reach the objectives of the study.

3.2. Research design

A research design is defined as "the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure"(Kothari, 2004, p44). This study used diagnostic research design because it determined the frequency with which risk factor occurs or its association with other risk factor associated with low birth weight. Thus, a cross-sectional survey technique was used due to the fact that it was conducted within defined period (March and April 2019). Data was corrected from subset of population who fall into study population during data collections.

3.3. Research approach

Research approach is a "plan and procedure that consists of the steps of broad assumptions to detailed method of data collection, analysis and interpretation"(Sudeshna and Shruti Datt, 2016, p1). Though, due that the data was translated into the use of statistical analysis to make the connection between what is known and what can be learned by research, this study used quantitative approach and a sample of population was studied (questioned or observed) to determine its characteristics, and it was then inferred to the population that has the same characteristics.

3.4. Research setting

The study was conducted at Rwanda military Hospital (RMH). RMH is located in Kigali City, Kicukiro District, Nyarugunga Sector. RMH serve and receive clients from all district hospitals of eastern province and also receive clients from district hospitals in Kigali like Masaka, Muhima and Kibagabaga district hospitals, in additional to that, RMH receives the clients transferred from different district hospitals across the country.

RMH has different department and services ranking it at tertiary referral hospital in Rwanda based on its mission to provide tertiary care to the population (MOH Rwanda, 2015, p33). Thus, even if is military hospital, it offers also the medical and health services to civilians. This study was conducted in maternity department and in Neonatal Intensive Care Unit which are highly equipped by standardized infrastructures and medical equipment like more hospital birds, incubators, medical ventilator machines, and Continuous Positive Airway Pressure (CPAP) machines etc. which are used to manage LBW. In NICU they receive above 70% of low birth weight babies.

3.5: Population

Polit and Beck define "the population as the totality of elements or people that have common, defined characteristics, and about whom the study results are relevant"(Polit and Beck, 2010, p1452) whereas "Target population refers to all the members who meet the particular criterion specified for a research investigation"(Alvi, 2016, p11). In this study, participants were recruited from RMH. The study population was all mothers who had birth of low birth weight at RMH during data collection period. The target population was the mother delivered low birth weight whereas accessible population was the mother delivered low birth weight accepted and consented to participate in the study.

3.5.1: Inclusion criteria

According to Patino and Ferreira, Inclusion criteria are defined as "the key features of the target population that the investigators will use to answer their research question"(Patino and Ferreira, 2018, p84). In this study, only the mother who delivered LBW during data collection and care givers of under aged mothers (less than 18 Age) was included.

3. 5.2: Exclusion criteria

In contrast of inclusion criteria, exclusion criteria are defined as "features of the potential study participants who meet the inclusion criteria but present with additional characteristics that could interfere with the success of the study or increase their risk for an unfavourable outcome" (Patino and Ferreira, 2018, p84). In our context, Mother delivered LBW before or after data collection period was excluded. In addition to these, mother delivered at Rwanda Military Hospital with a new born of more than 2,500grams and mother given birth to twins during data collection was excluded.

3.6. Sampling

A sample size is a group of individuals that are taken from a greater population for measurement; it must be characteristic of the population and neither too excessive nor too small to certify that it satisfies the requirements of efficiency, representativeness, reliability and flexibility so that the researcher can generalize the discoveries from the study sample to the population as a whole (Kothari, 2004, P69; Phrasisombath, 2009, P4).

3.6.1. Sample size

This study included 108 mothers given birth to low birth weight. The sample size is determined based on study design approach, as well as the researcher was not aware of the exact number of mother who will deliver low birth weight during data collection at RMH and based on latest 5 months number of LBW delivery, the researcher adopted the census method because no month reached 30 LBW, this choice is referred to recommendation made by Israel for population which is less than 200 (Israel, 2013, p2).

3.6.2. Sampling strategy

The sampling strategy is the planned process through which a sample is extracted from a population allowing researcher to be sure that the sample drawn from population will represent the population from which sample is drawn (Alvi, 2016, P12). Though, the sampling strategy was based on relevant eligibility and characteristics (Polit and Beck, 2010, p1452). As far as this study was looking at all mothers with low birth weight babies during the study period, the sampling strategy was purposive, and target population for the sample was selected deliberately by the researcher.

3.7. VALIDITY AND RELIABILITY OF RESEARCH INSTRUMENTS

Research instrument is the tools that will be used to collect and analyze data related to risk factors associated to low birth weight at RMH. The tool was adapted from the tool validated and used by Gebregzabiherher in the study ‘The Prevalence and Risk factors for low birth weight among term newborns in Adwa General Hospital, Northern Ethiopia’(Gebregzabiherher et al. 2017, p4). Everything used in the mentioned study was not used; the selection was made according to our objectives. Furthermore the deep literature review was provided some tools which was included in our study.

Furthermore, the researcher used the clinical record form that found in maternity registry to collect data regarded on pre-pregnancy weight, height and weight gain during pregnancy;

vaginal and urinary tract infections and sexual transmitted diseases during pregnancy and other birth weight.

Though, the data collection tool was compiled into 3 sections, the first section collected social demographic data, second section collected the data related to medical factors and the third section collected the data regarding on maternal life style factors and Antenatal visits.

Hence, Validity and reliability of research instrument are interrelated within an assessment to minimize the test errors.

3.7.1. Validity of instrument

According to Heale and Twycross validity is defined as "the extent to which a concept is accurately measured in a quantitative study"(Heale and Twycross, 2015, p2). Though, the validity indicates the degree to which an instrument measures what it is supposed to measure (Kothari, 2004, p86)

The validity process was done through piloting data collection, then after:

Face validity: the subjective assessment of validity which will be made by researchers and participants to assess if the instrument measured what is supposed to measure. The researcher adjusted the instrument in a way that anyone who takes the instrument tool understands what is being to measure.

Content validity: the instrument adopted from the tool validated and used in other study by which the selection and addition of other tools from deep literature was considered. Though, this validity test was performed to assess if the instrument sufficiently covers all content of study variables. Though, the experts in neonatology and neonatology researcher reviewed all of the instrument tool items for readability, clearness and completeness.

Constructive validity was measured through testing homogeneity and convergence of the instrument. Though, the researcher associated a set of other propositions with the results received from using our measurement instrument in order to confirm to predicted correlations from sound theories.

Table 1: Validity process

Objective	Component in conceptual framework	Component in research instrument
To identify the social demographic, medical factors and maternal life style factors of low birth weight in selected Rwandan referral hospital	Socio-demographic variables Maternal medical variables Maternal life style variables	The questionnaire provided the responses on the questions intended to reveal the status of socio economy in section 0ne of instrument, maternal medical factors in section two and thirdly, life style factors of mothers delivered a low birth weight at RMH
To establish the risk factors associated with low birth weight at RMH	The low birth weight factors are interconnected each other. Though, the measurement of their association to induce low birth weight is crucial. The conceptual framework diagram show how one may intrigue another which will lead to low birth weight.	All sections were included. The statistical test was performed to provide the relational significance of low birth weight factors.

3. 7.2. Reliability of instrument

A study instrument is seen as being reliable when different researchers can use it under stable conditions, with consistent results and the results not varying, though, reliability returns on consistency and replicability of instrument over time, thus, reliability is seen as the degree to which an instrument is free from measurement errors (Bolarinwa, 2015, p198). Hence, to ensure the reliability of instrument the researcher performed different activities:

Pretesting the instrument: via piloting study stability of tool (consistency of results using an instrument with repeated testing), and equivalence of the tool (Consistency among responses of multiple users of an instrument, or among alternate forms of an instrument) was

performed. A sample of 10 participants was selected in order to pre-test the tool. Those 10 participants were received questionnaire and respond on it.

Structuring of the instrument: helped a researcher to carefully design directions for measurement with no variation from group to group of participants. The wordings and meaningful of questions was taken into considerations, by which simple words, which are familiar to all respondents was employed.

3.8. DATA COLLECTION PROCEDURE

Data collection method was structured survey by which data was collected through administered questionnaire; the questionnaire was in Kinyarwanda and English. The questionnaire consisted by a number of questions printed in a definite order on a form or set of forms. The respondents had to answer the questions on their own or facilitated by researcher. Before any interaction with participant the researcher made more explanations of the study aims to the participants. The participants who agreed voluntarily to participate in the study read and signed a consent form then after begin to answer questions with facilitation of researcher.

After getting filled questionnaires, the researcher started to digitize the questionnaires into computer for crosschecking and analysis.

3.9. DATA ANALYSIS

Editing

Collected and digitalized data was processed through examining the collected raw data to detect errors and omissions and to correct these when possible. As a matter of fact, the researcher performed a careful scrutiny of the completed questionnaires in order to ensure that the data are accurate, consistent with other facts gathered, uniformly entered. Then after, completed, well arranged data was coded and tabulated.

Classification

The collected, edited and coded data was arranged in groups or classes on the basis of research objectives applied on the questions to answer. Though, the data having a common characteristic was placed in one class related to the variables assessed. Furthermore, as this study is quantitative survey, the Classification according to class-intervals was performed due that the researcher collected numerical characteristics of accessible population.

Coding

Numerals and other numerical sign were used in order to be regrouped into limited number of categories or classes for better digitalized and cross tabulated.

Digitalized data was crosschecked through Microsoft excel and analyzed through SPSS version 20 software. Hypothesis inferential statistics technics was used to predict the outcomes of study to whole population.

Tabulation

The researcher used descriptive statistics in SPSS to present the results in tables and cross tabulations of the collected data. The data was summarized in raw data and displayed the same in compact form (the form of statistical tables) for further various statistical computations. In order words, the data was arranged in columns and rows. Tabulation helped a researcher to conserve space and reduces explanatory and descriptive statement to a minimum, the process of comparison, the summation of items, the detection of errors and omissions, and provides a basis for various statistical computations (Kothari, 2004, p127).

Chi square and fishers' exact test was performed to determine the association between variables.

3.10. ETHICAL CONSIDERATIONS

Before any interaction with study participants, the researcher was required to obtain an ethical clearance from the University of Rwanda, College of Medicine and Health Sciences through Institutional Review Board, allowing her to conduct this study. Hosting institutions was notified for their protocol review and authorization.

Participation was voluntary; the participants had time to be explained about the objectives of this study. Furthermore, the targeted population was explained that the study is part of the academic requirement to be fulfilled and the data collected is for research purposes only and the confidentially will be kept firmly.

The targeted participants accepted to participate in a study signed the consent form and give the authorization to the researcher to include her in the study. Hence, the participant had a right to withdraw at any time from the study without any consequences.

The right to self-determination of participants is valuable in this study process, the research purpose and its significance, the data collection instrument structure and procedure to be used in data collection was fully explained to participants.

The researcher guaranteed the participants the right to fair treatment, privacy and protection from discomfort and harm. In addition, the participants informed the participants that there is no financial compensation related to participation in this study. The contact information of the researcher, the Chairperson of UR-CMHS/Institutional Review Board was provided to study participants.

Information supplied by the participant are stored in a way that are not available to the others bodies (individuals or institution) without permission of participants. Thus, the confidentiality and anonymity was ensured through assigning each participant a unique identifier code which was used in data analysis. Consequently, the name of participants was remaining on consent form only. Furthermore, the collected data on hard copies are stored in cupboards lockable whereas digital data are stored with strong pass ward.

3.11. DATA MANAGEMENT

The gathered data was kept by the researcher in a locked up cupboard/ Soft copies was kept on a password protected computer and no one has access and the right to change them or to alter them**.**

3.12. DATA DISSEMINATION

The results of this study will be disseminated to policy makers, Ministry of Health, professional bodies through various means such as abstract presentation in conferences and research publication journals.

3.13. LIMITATIONS AND CHALLENGES

The main problems contracted by researcher are documentation by which the researcher did not have the information from other Rwandan hospitals. Thus, this study was limited in referral hospital and therefore, the results could not be inferred to health facilities from rural areas due that this study was done in Kigali city only but it can be reference for the same study in rural country entities.

Furthermore, Time and financial constraint was contracted to reach more participants.

3.14. CONCLUSION TO CHAPTER THREE

This section of research methodology discussed the study design that was applied, the sampling and data collection procedure used to get accurate data. It also showed the validity and reliability of instrument tool that was used. Finally, it describes how the ethical issues implication was considered, and how data collected was analysed and managed.

CHAPTER 4. RESULTS PRESENTATION

4.1. Introduction

This chapter is talking about the findings of the study. The results are presented in forms of descriptive tables and cross tabulated tables.

The findings are presented in tables and cross tables accordance with objectives. Thus, the results are organized according to the social demographic characteristics of participants, medical history, maternal life style and antenatal behaviour

4.2. Social demographic Characteristics of respondents

The social demographic of participant are characterized by mean of age of 30.69 where majority are between 18 and 35 age old. The majority of participants are married (79.6%), whereas the highest education attained is dominated by primary education level (34.3%) seconded by secondary alumni (23.1%). The employments are dominated by unemployment status at 50.9%. The residence is dominated by rural resident with 61.9%.

Table 2: Social demographic characteristics (N =108)

Variable	Category	Frequency	Percentage
Age grouped Mean 30.69 SD 5.41	Under 18	2	1.9
	18 to 35	85	78.7
	Above 35	21	19.4
Marital status	Divorced	1	.9
	Unmarried- not living with a par	3	2.8
	Unmarried- living with a partner	18	16.7
	Married	86	79.6
Level of education attained	Post-secondary	14	13.0
	Secondary	25	23.1
	Technical and vocational school	8	7.4
	Primary	37	34.3
	No formal education	24	22.2
Spouse's level of education attained	Post-secondary	17	16.3
	Secondary	26	25.0
	Technical and vocational school training	11	10.6
	Primary	34	32.7
	No formal education	16	15.4
Employment status	Employed	13	12.0
	Self-employed	40	37.0
	Unemployed	55	50.9
Spouse's employment	Student	1	1.0
	Employed	39	37.5
	Self-employed	47	45.2
	Unemployed	17	16.3
Area of residence	Rural	65	61.9
	Urban	40	38.1

4.3 Medical and maternal life style factors of low birth weight

This section was presented the descriptive data regards to the previous pregnancy status, the illness accounted during pregnancy and the lifestyle of mother during pregnancy.

4. 3. 1 Previous pregnancy history

The table 4.3 summarizes the findings related to previous pregnancy of participants, thus, 89.7% reported that they had other pregnancy before, by which, 88.8% were not successful due mostly to premature birth and abortion (21.3% and 16.7%) respectively. The premature birth was 81.3% with 97.9% of low birth weight. However, the still born baby was 16.3%. The participants who had had miscarriage were 31.3% by whom their majority had once

miscarriage (64.3%), with the first trimester as critical (64.3%), the reported causes are leaded by unknown causes(55.6%) seconded by various sickness (22.2%).

Table 3: Pregnancy history (N=108)

Variable	Category	Frequency	Percentage
Multiparty	No	11	10.3
	Yes	96	89.7
Successful pregnancies	No	71	88.8
	Yes	9	11.3
If No the probable causes	Pre-eclampsia	10	14.5
	High BP	7	10.1
	Premature birth	23	33.3
	Caesarean	9	13.0
	Stillbirth	2	2.9
	Abortion	18	26.1
previously premature baby	No	18	16.7
	Yes	78	72.2
Previous low birth weight baby	No	2	2.1
	Yes	93	97.9
Previous still born baby	No	77	83.7
	Yes	15	16.3
Miscarriage	No	66	68.8
	Yes	30	31.2
Times of miscarriage	More than thrice	4	14.3
	Twice	6	21.4
	Once	18	64.3
Period of miscarriage	Third trimester (7th – 9th month)	3	10.7
	Second trimester (4th – 6th month)	8	25.0
	First trimester (1st – 3rd month)	18	64.3
Vaginal infections during pregnancy	No	59	54.6
	Yes	49	45.4
Type of vaginal infection	Candidiasis	16	31.4
	Bacterial vaginitis	35	68.6
Urinary tract infections during pregnancy	No	53	49.1
	YES	55	50.9

4. 3. 2: Pregnancy illness

This section presents the findings related to the medical history for mothers given birth to Low birth weight during data collection period. Among others there are Non Communicable diseases, vaginal and urinary infection.

The table 4.4 summarizes the different illnesses contracted by mother during pregnancy or the chronic diseases. The participants reported that 45.4% of them had contracted vaginal infection and the critical trimester is second trimester (49%), bacterial vaginitis occupies the important place at 68.6%. The urinary tract infections are not forgotten where half of participants (50.9%) reported that they had suffered the urinary tract infection and majority suffer it in the third trimester of pregnancy (49.1%). Non Communicable diseases are also illness which could not be ignored in LBW outcome (59.8% suffer High blood pressure, diabetes with 2%, heart problems with 1.9% and kidney problems at 1%). Thus 13.2% experienced vaginal bleeding during pregnancy, whereas 50.5% had experienced lower backache, 50.5% had experienced pelvic pressure, 47.5% had experienced pain when urinating and 45.9% had experienced abdominal pain.

Table 4: Pregnancy illness (N=108)

High blood pressure	No	43	40.2
	Yes	64	59.8
Heart problems	No	105	98.1
	Yes	2	1.9
Kidney problems	No	101	99.0
	Yes	1	1.0
Lung problems	No	100	97.1
	Yes	3	2.9
Diabetes	No	100	98.0
	Yes	2	2.0
Vaginal bleeding	No	92	86.8
	Yes	14	13.2
Lower backache	No	50	48.5
	Yes	53	51.5
Pelvic pressure	No	53	49.5
	Yes	54	50.5
Pain when urinating	No	53	52.5
	Yes	48	47.5
Abdominal pain	No	53	54.1
	Yes	45	45.9

4. 3. 3: Maternal life style

The maternal life style section describes the behaviour of mothers given low birth weight during pregnancy or before.

The table 4.5 indicates that 45.5% work in environment with strenuous and 42.6% reported to be involved in prolonged standing or standing for long periods of time, 50.9% reported that they do heavy lifting, with extensive bending (72.2%), and 75.9% reported that they do not have a domestic house help or anyone who helps with house work. The participants reported that 78.7% consume less than three meals on average per day and mostly because of lacking means to buy the food (59.5%), hence, Body Mass Index measurement indicates that the majority are in healthy weight(75.6%) seconded by overweight (20.5%), hence, the weight gained during pregnancy is predominant by underweight with 73.8%. Thus, 61.9% reported that they used micronutrient supplements during pregnancy and lack of health professional prescription and lack of knowledge about them are mainly causes of non-adherence (57.5% and 40% respectively) whereas the majority of micronutrients users had used the iron (92.5%). The alcohol consumption is reported in minority by which only 29.2% of participants consume alcohol and 77.1% reported that they had consumed alcohol during pregnancy period. Smoking was absolutely avoided as 100% did not smoke, however, 22% of their husbands smoke. Furthermore, firewood and charcoal are principal source of fuel used when they are cooking (56.5% and 38% respectively).

Table 5: The maternity life style (N=108)

Variable	Category	Frequency	Percentage
Strenuous working environment	No	30	54.5
	Yes	25	45.5
Prolonged standing or standing for long periods of time	No	62	57.4
	Yes	46	42.6
Having domestic house help or anyone who helps with house work	No	82	75.9
	Yes	26	24.1
Doing heavy lifting	No	53	49.1
	Yes	55	50.9
Doing extensive bending	No	30	27.8
	Yes	78	72.2
On average in a day meals consumed during the pregnancy	Three	23	21.3
	Two	71	65.7
	One	14	13.0
Body Mass Index group	Obesity	1	1.3

	Overweight	16	20.5
	Healthy weight	59	75.6
	Underweight	2	2.6
Weight gain status	Under gain	62	73.8
	Normal gain	19	22.6
	Over gain	3	3.6
Causes of consuming less than three meals	Out of choice	10	11.9
	Lack of time	18	21.4
	Lack of Money	50	59.5
	Lack of appetite	6	7.1
Use of micronutrient supplements during the pregnancy	No	40	38.1
	Yes	65	61.9
If use of micronutrient, type used (Sample of drug will be used as a prompt)	Folic and calcium	1	1.5
	Folic and Iron	1	1.5
	Multivitamins	1	1.5
	Calcium	1	1.5
	Folic acid	1	1.5
	Iron	62	92.5
Drinking alcohol	No	75	70.8
	Yes	31	29.2
Consuming alcohol during the entire period of the pregnancy	No	4	12.9
	Yes	27	87.1
Smoking	No	100	100.0
Smoking during the pregnancy	No	95	100.0
Husband smoking	No	78	78.0
	Yes	22	22.0
The main type of fuel used when cooking	Gas/Electricity	6	5.6
	Charcoal	41	38.0
	Firewood	61	56.5

4. 3. 4 Antenatal care services

The table 4.6 illustrates the perinatal services status of respondents, thus all of them attended the ANC services by whom 45.7% attended at least 3times and 46.7% attended 2 times. 49.1% reported that they had consulted the Gynaecologist Obstetrician (26.4% at least 3 times and 32.1% at least 2 times). Furthermore, 51.9% of participants reported that they had had ultrasound (33.9% at least 3times and 30.4%)

Table 6: Antenatal services (N=108)

Variable	Category	Frequency	Percentage
Prenatal service	Yes	108	100.0
Times of prenatal services	Five and above	7	6.7
	Four	10	9.5
	Three	31	29.5
	Two	49	46.7
	One	8	7.6
Gynecologist & Obstrecian consultation	Five and above	4	7.5
	Four	1	1.9
	Three	9	17.0
	Two	17	32.1
	One	22	41.5
Ultrasound done	No	52	48.1
	Yes	56	51.9
Times of ultrasound	Five and above	4	7.1
	Four	3	5.4
	Three	12	21.4
	Two	18	30.4
	One	19	35.7

4.4: Low birth weight status

Table 4.7 reveals information on low birth weight status. This part of findings gathered the information regarding the low birth weight according to their classification. Low birth weight is considered as born with 2500grs ≥ x≥1500grs, Very low birth weight as 1500grs ≥x≥1000grs and extremely very low birth weight less than 1000grs.

The low birth weight type is dominated by 63% of moderate LBW

Table 7: Low birth weight classification

		Frequency	Percentages
Type of Low Birth Weight	Low birth weight	68	63
	Very low birth weight	28	25.9
	Extremely very low birth weight	12	11.1

4.5 Risk factors associated with type of low birth weight

This part of findings describes the association between social demographics, medical history, life style and type of low birth weight at RMH from March 2019 to May 2019. The Low birth weight was considered as the dependent variable.

4.5.1 Association between social demographic characteristics and type of low birth weight

The table 4.8 represents the relationship between social demographic characteristics and low birth weight type outcomes. The findings revealed that the education level of mother and his spouse is significantly associated to low birth weight type (p-value=0.009, and p-value=0.001 respectively). The employment status of both mother and spouse is also statistically significant with p-value =0.051 and p-value=0.017 respectively. However, the social demographic variables like age, marital status and area of resident do not show statistical significance relationship with low birth weight type (p-values are greater than 0.05).

Table 8: Association between social demography characteristics and type of low birth weight (108)

		Type of Low Birth Weight			
		EVLBW	VLBW	LBW	p-value
Age grouped in years	Under 18	0(0%)	1(0.9%)	1(.09%)	0.695
	18 to 35	11(10.2%)	21(19.4%)	53(49.1%)	
	Above 35	1(9%)	6(5.6%)	14(13.0%)	
Marital status	Married	10(9.3%)	25(23%)	51(47.2%)	0.704
	Unmarried- living with a partner	2(1.9%)	(1.9%)	14(13.0%)	
	Unmarried- not living with a par	0(0.0%)	1(9%)	2(1.9%)	
	Divorced	0(0.050	0(0.0)	1(9%)	
Level of education attained	No formal education	4(3.7%)	0	11(10.2)	0.009
	Primary	6(5.6%)	8(7.4%)	23(21.3%)	
	Technical and vocational school	0(0.0%)	1(9%)	7(6.5%)	
	Secondary	2(1.9%)	5(4.5%)	18(16.7%)	
	Post-secondary	0(0.0%)	5(4.6%)	9(8.3%)	
Spouse's level of education attained	No formal education	2(1.9%)	7(6.7%)	7(6.7%)	0.001
	Primary	7(6.7%)	9(8.7%)	18(17.3%)	
	Technical and vocational school training	1(1.0%)	2(1.9%)	8(7.7%)	
	Secondary	1(1.0%)	5(4.8%)	20(19.2%)	
	Post-secondary	1(1.0%)	4(3.8%)	12(11.5%)	
Employment status	Unemployed	5(4.6%)	15(13.9%0	35(32.4%)	0.051
	Self-employed	6(5.6%)	11(10.2%)	23(21.3%0	
	Employed	1(9%0	2(1.9%)	10(9.3%)	
Spouse's employment	Unemployed	1(1.0%)	7(6.7%)	9(8.7%)	0.017
	Self-employed	7(6.7%)	12(11.5%)	28(26.9%)	
	Employed	4(3.8%)	8(7.7%)	27(26.0%)	
	Student	0(0.0%)	0(0.0%)	1(1.0%)	
Area of residence	Urban	4(3.8%)	9(8.9%)	27(25.7%)	0.824
	Rural	8(7.6%)	17(16.7%)	40(38.1%)	

4.5.2 **Association between medical and maternal life style with type of low birth weight in selected Rwandan referral hospital**

Table 4.9 highlights information on medical and maternal factors associated with low birth weight. The findings revealed that having previous premature baby, low birth weight, experiencing miscarriage and the trimester of miscarriage are significantly associated to type of low birth weight (p-value=0.025, p-value=0.051, p-value=0.028 and 0.046 respectively). The other factors like previous pregnancies, successfulness of pregnancies and previously given birth to a still born baby are not associated to the type of low birth weight

Table 9: Relationship between previous pregnancy outcomes and type of low birth weight

		Type of Low Birth Weight			
		EVLBW	VLBW	LBW	p-value
Multiparty	Yes	12(11.2%)	25(23.4%)	59(55.1%)	0.556
	No	0(0.0%)	2(1.9%)	9(8.4%)	
Pregnancies successfulness	Yes	1(1.3%)	2(2.3%)	6(7.5%0	1.000
	No	10(12.5%)	19(23.8%)	42(52.5%)	
Previous premature baby	Yes	12(12.5%0	23(24.0)	43(44.8%)	0.025
	No	0(0.0%)	2(2.1%)	16(16.7%)	
Previous low birth weight baby?	Yes	12(12.6%)	24(25.3%)	57(60.0%)	0.051
	No	0(0.0%)	1(1.1%)	1(1.1%)	
Previous still born baby?	Yes	2(2.2%)	5(5.4%)	8(8.7%)	0.574
	No	8(8.7%)	20(21.7%)	49(53.3%)	
Miscarriage?	Yes	6(6.3%	9(9.4%)	15(15.6%)	0.028
	No	5(5.2%)	16(16.7%)	45(46.9%)	

4.5.3 Current pregnancy illnesses and type of low birth weight

The table 4.10 shows that some pregnancy illnesses are associated to low birth weight type. Suffering urinary tract infection, the trimester of suffering urinary tract infections, suffer high blood pressure and experiencing pain when urinating are significantly associated with type of low birth weight (p-value=0.028, p-value=0.029, p-value=0.020, p-value=0.056 respectively). However, kidney, lung, lower backache, and abdominal pain suffering are not significantly associated to low birth weight type.

Table 10: Association between pregnancy illnesses and type of low birth weight

		Type of Low Birth Weight			
		EVLBW	VLBW	LBW	p-value
Urinary tract infections during pregnancy	YES	4(3.7%)	11(10.2%)	40(37.0%)	0.028
	No	8(7.4%)	17(15.7%)	28(25.9%)	
Urinary tract infections at trimester of pregnancy	First trimester	2(3.6%)	8(14.5%)	17(30.9%)	
	Second trimester	2(3.6%)	3(5.5%)	17(30.9%)	0.029
	Third trimester	0(0.0%)	00.0%)	6(10.9%)	
High blood pressure during pregnancy	Yes	5(4.7%)	19(17.8%)	40(37.4%)	0.020
	No	7(6.5%)	9(8.4%)	27(25.2%)	
Kidney problems during pregnancy	Yes	0(0.0%)	1(1.0%)	0(0.0%)	0.417
	No	12(11.8%)	25(25.4%)	64(62.7%)	
Lung problems during pregnancy	Yes	0(0.0%)	2(1.9%)	1(1.0%)	0.250
	No	12(11.7%)	25(24.3%)	63(61.2%)	
Lower backache during pregnancy	Yes	5(4.9%)	13(12.6%)	35(34.0%)	0.729
	No	7(6.8%)	13(12.6%)	30(29.1%)	
Pelvic pressure during pregnancy	Yes	4(3.7%)	14(13.1%)	36(33.6%)	0.428
	No	8(7.5%)	14(13.1%)	31(29.0%)	
Pain when urinating during pregnancy	Yes	4(4.0%)	9(8.9%)	35(34.7%)	
	No	8(7.9%)	16(15.8%)	29(28.7%)	0.056
Abdominal pain during pregnancy	Yes	3(3.1%)	13(13.3%)	29(29.6%)	
	No	7(7.1%)	13(13.3%)	33(33.7%)	0.583

4.5.3 Maternal life style and low birth weight type

The findings of table 4.11 revealed that the meals consumed during the pregnancy per day, the use of nutrient, the cause of not using micronutrients, and weight gain during pregnancy are significantly associated with low birth weight (p-value=0.009, p=value=0.028, p-value=0.056, p=0.012 respectively). However, strenuous environment work, prolonged standing, possession of domestic house helper, extensive bending, drinking alcohol, smoking an d body mass index before pregnancy do not significantly associated to low birth weight type (p-value>0.05).

Table 11: Association between maternal life style with low birth weight type

		Type of Low Birth Weight			
		EVLBW	VLBW	LBW	p-
Strenuous working environment	Yes	1(1.8%)	5(9.1%)	19(34.5%)	0.333
	No	4(7.3%)	8(14.5%)	18(32.7%)	
Prolonged standing or standing for long periods of time	Yes	5(4.6%)	10(9.3%)	31(28.7%)	0.672
	No	7(6.5%)	18(16.7%)	37(34.3%)	
Having domestic house help or anyone who helps with house work	Yes	1(9%)	0	19(17.6%)	0.318
	No	11(10.2%)	22(20.4%)	49(45.4%)	
Doing heavy lifting	Yes	8(7.4%)	16(14.8%)	31(28.7%)	0.302
	No	4(3.7%)	12(11.1%)	37(34.3%)	
Doing extensive bending	Yes	10(9.3%)	22(20.4%)	46(42.6%)	0.366
	No	2(1.9%)	6(5.6%)	22(20.4%)	
On average in a day meals consumed during the pregnancy	One	4(3.7%)	4(3.7%)	6(5.6%)	0.009
	Two	7(6.5%)	18(16.7%)	46(42.6%)	
	Three	1(9%)	6(5.6%)	16(14.8%)	
Use micronutrient supplements during the pregnancy	Yes	5(4.8%)	19(18.1%)	41(39%)	0.028
	No	7(6.7%)	9(8.6%)	24(22.9%)	
Reason of not using micronutrient supplements during pregnancy	Not Prescribed	7(17.5%)	3(7.5%)	13(3.5%)	0.056
	Lack of knowledge	0(0.0%)	5(12.5%)	11(27.5%)	
	Prescribed not take	0(0.0%)	0(0.0%)	1(2.5%)	
Drinking alcohol	Yes	5(4.7%)	5(4.7%)	21(19.8%)	0.239
	No	7(6.6%)	23(21.7%)	45(42.5%)	
Consuming alcohol during the entire period of the pregnancy	Yes	3(9.7%)	4(12.9%)	20(64.5%)	0.120
	No	2(6.5%)	1(3.2%)	1(3.2%)	
Husband smoke	Yes	4(4.0%)	2(2.0%)	16(16.0%)	0.124
	No	8(8.0%)	23(23.0%)	47(47.0%)	
Husband smoke during mother's pregnancy	Yes	3(13.6%)	2(9.1%)	16(72.7%)	0.361
	No	1(4.5%)	0(0.0%)	0(0.0%)	
Type of fuel use when cooking	Firewood	8(7.4%)	17(15.7%)	36(33.3%)	0.852
	Charcoal	4(3.7%)	998.3%)	28(25.9%)	
	Gas/Electricity	0(0.0%)	2(1.(%)	4(3.7%)	
Body Mass Index	Underweight	1(1.3%)	1(1.3%)	0(0.0%)	0.287
	Healthy weight	7(9.0%)	16(20.5%)	36(46.2%)	
	Overweight	1(1.3%0	6(7.7%)	9(11.5%)	
	Obesity	0(0.0%)	1(1.3%)	0(0.0%)	
Weight gain status	Under gain	9(10.7%)	13(15.5%)	40(47.6%)	0.012
	Normal gain	1(1.2%)	9(10.7%)	9(10.7%)	
	Over gain	0(0%)	2(2.4%)	1(1.2%)	

4.5.3 Association between antenatal care and type of low birth weight

The table 4.12 illustrates that the times the pregnant mother attend the antenatal care services and consultation of gynaecologist & Obstetrician during pregnant period are significantly associated with type of low birth weight (p-value=0.019, p-value=0.045 respectively). Thus, the time to start the ANC, doing ultrasound and the frequency of ultrasound are not significantly associated with type of low birth weight (p-value>0.05).

Table 12: Association between antenatal care and type of low birth weight (N=108)

		Type of Low Birth Weight			
Variables		ELBW	VLBW	LBW	p-value
Month of pregnancy starting antennal care visits	1st- 3rd month	8(7.6%)	21(20%)	44(41.9%)	
	4th - 6th month	2(1.9%)	5(4.8%)	22(21%)	0.278
	7th - 9t month	1(1%)	0(0%)	2(1.9%)	
Times of antenatal Care visits	One	3(2.9%)	3(2.9%)	2(1.9%)	
	Two	5(4.8%)	13(12.4%)	31(29.5%)	
	Three	4(3.8%)	6(5.7%)	21(20%)	0.019
	Four	0(0%)	1(1%)	9(8.6%)	
	Five and above	0(0.0%)	3(2.9%)	4(3.8%)	
Times consulted by gynaecologist & Obstetrician during your pregnancy	One	3(5.7%)	5(9.4%)	14(26.4%)	
	Two	0(0%)	6(11.3%)	11(20.8%)	
	Three	0(0%)	1(1.9%)	8(15.1%)	0.045
	Four	0(0%)	0(0%)	1(1.9%)	
	Five and above	0.0%	1(1.9%)	3(5.7%)	
Ultrasound during pregnancy	Yes	5(4.6%)	14(13%)	37(34.3%)	0.699
	No	7(6.5%)	14(13%)	31(28.7%)	
Times of ultrasound	One	2(3.6%)	4(7.1%)	14(25%)	
	Two	1(1.8%)	5(8.9%)	11(19.6%)	
	Three	1(1.8%)	4(7.1%)	7(12.5%)	0.861
	Four	0(0.0%)	0(0.0%)	3(5.4%)	
	Five and above	1(1.8%)	1(1.8%)	2(3.6%)	

4.6 Conclusion to chapter four

The chapter four presented the study findings, where the Social demographic characteristic, previous pregnancy history, medical conditions, heavier physical activities and pregnancy consultation by specialist are significantly associated with low birth weight type.

CHAPTER 5 DISCUSSION

5.1. Introduction

The purpose of this project part is to debate the results from this study towards study objectives. The findings were related with the others studies done elsewhere by other scholars to argument opinions of authors. This part of study is subdivided based on the objectives of the study.

5.2. Social demographic characteristics

This study includes 108, by which majority are aged between 18 and 35 years old with age mean of 30.69 and standard deviation of 5.41. This findings correlate with the finding of other scholars, because it is the recommended reproductive age group (Muchemi, Echoka and Makokha, 2015, p6) and contrary to Jammeh's study where mothers less than 18 years old are 1.8 times more likely to deliver a LBW than older mothers with more than 35 years old(Jammeh, Sundby and Vangen, 2011, p98).

The marital status of participants are dominated by married family 79.6%, this findings explain the outcome of Rwandan government complain for legal cohabiting , thus it is similar to the findings of the study done in Ethiopia where 90% were married mothers (Gebregzabiherher, Haftu, Gebrehiwet, et al., 2017, p3). Though, the family education initiatives like "Umugoroba w'ababyeyi, Malayika Mulinzi (Guardian Angel), Ijisho ry'Umuturanyi (Neighbour watch) Initiatives"(GoR, 2014,p27) may be a solution to alleviate the low birth weight outcome. The different studies revealed that level of education for both partners is key significantly associated with low birth weight, in this study, the researcher find that majority of mother delivered LBW at RMH in study period their level of education is low by which 58.8% did not attend at least secondary school. This result differs from those find from the similar study done in Kenya where the majority attained the secondary school (Muchemi, Echoka and Makokha, 2015, p5).

As well as, some scholar's findings revealed that mothers with lower formal education were four times more likely to deliver low birth weight compared to more educated, thus, the SDG guide for Rwanda" Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all"(Government of Rwanda, 2015, p2) will be one of concomitant initiatives to reduce and manage all type of LBW. Thus, the level of education among mother delivered LBW influences significantly their employability status (p=0.001). Contrary to the study done by Muchemi, the education level was dominated by secondary school leavers whereas employability was dominated by self-employed (Muchemi, Echoka and

Makokha, 2015, p8) Consequently, as long as the level of education is lower the employability is scarcer and then the family income become worse, which lead to further nutritional consequences to the pregnant mother and new born as it has revealed by Li Tang et al. that "Dietary deficiencies are associated with intra- uterine growth retardation, premature birth (<37 weeks Health) and different malformation"(Tang et al., 2017, p2).

The area of resident is one factor of LBW, this study find that the majority come from rural area. The findings are similar to the findings of Mitao et al. "Women residing in rural area had higher rate of low birth weight as compared to those who were residing in the urban area"(Modesta Mitao, Rune Philemon, Obure et al., 2016), but differ from those find by Muchemi et al. in which he find that "mothers living in urban areas were found to be more likely to deliver low birth weights compared to their rural counterparts"(Muchemi, Echoka and Makokha, 2015, p3), the same as to the study done in Tanzania (Mitao, Philemon, Obure, Blandina T. Mmbaga, *et al.*, 2016a, p4). Thus, this difference may be related to the status of the hospital in which the study has been taken place.

5.3 .Antenatal Care services

The findings of this study revealed that 100% of mother delivered low birth weight and accepted to participate in this study recorded at least 1 antenatal care practice, greater to the study done in India (89%) (Kandel and Kafle, 2017b, p170) and bit greater to the study done in Kenya (94%)(Mogire, 2013, p51). This figures show the power of maternal-child health campaign strengthens by the government of Rwanda.

5.4. Low birth weight status

The study find that the majority of low birth weight were in first category of LBW (2500-1500grs, (63%) and 25.9% with Very low birth weight (VLBW). Thus, this percentage are very higher than the findings of study done in Italy, where VLBW is 1% (Cavallo *et al.*, 2015, p1). As well as the VLBW infant are more likely to die than LBW first category(Ballot *et al.*, 2017, p2), the Rwandan community is required to strengthen the mother- child program in order to reduce the burden resulting to VLBW. This difference may be a result of social economic of study areas where Rwanda is poorest country whereas Italy is developed country.

5.5. Medical status of mother delivered low birth weight

The gravidity of mother is key element to illustrate the factors associated with low birth weight type. Thus, in this study the majority of mother delivered low birth weight are

multiparous at 89.7% differently to the findings of the study of Pawar et al. in which the primiparous are more having Low birth weight (Pawar and Kumar, 2017b, p3795) and Jammeh where primiparous mothers are 2.5 times more likely to deliver a LBW baby than multiparous (Jammeh, Sundby and Vangen, 2011,p98). The findings revealed that 88.8% of pregnancies were not successful, where premature birth; abortion, pre-eclampsia, and high blood pressure are most causes of low birth weight. These findings are similar to the different studies done by different scholars (Golestan, Karbasi and Fallah, 2011, p14; Mogire, 2013, p31; Tang *et al.*, 2017, p4) but differently to the study done by Momeni (Momeni *et al.*, 2017, p4) . Furthermore, the miscarriage was also among the medical factors which could not be ignored in factors associated to low birth weight as the participants reported that 31.2% have been experienced the miscarriage and 35.7% of them had it twice and above. This finding is lower that what find in the study done in Kenya where among unsuccessful pregnancies 79.2% were due to miscarriage (Mogire, 2013, p49).

As well as other studies findings (Golestan, Karbasi and Fallah, 2011, p22; Tellapragada *et al.*, 2016, p166) the genitourinary tract infections are also reported figures in low birth weight outcome which could not be ignored because in this study 50.9% reported that they suffered urinary tract infections and 49.1% of them in 3rd trimester, whereas, vaginal infections were at 45.4% and 49% of them suffered vaginal infections in 2nd trimester.

Furthermore, other maternal diseases were reported as important figures in low birth weight outcome such as hypertension (59.8%), lower backache (51.5%), vaginal bleeding (13.2%), pelvic pressure (50.5%) pain when urinating (47.5%) and abdominal pain (45.9%). Thus, the same as other studies these maternal diseases were reported to be linked on low birth weight (Golestan, Karbasi and Fallah, 2011 p22; Mogire, 2013, p53,60; Muchemi, Echoka and Makokha, 2015, p5; Pawar and Kumar, 2017b, p5)

5.6. Maternal life style of mother delivered low birth weight

The maternal life of pregnant mother is key element to influence positively or negatively the pregnancy outcomes. Though, the bivariate correlation analysis revealed that the physical activities are significantly correlated to medical status of pregnant mothers which influence the pregnant outcomes, this is similar to the other studies (Johnson *et al.*, 2015, p791; Tang *et al.*, 2017, p2). Thus, having extensive bending activities are negative moderately correlated (r=-0.3, p=0.005) and positive weak correlation (r=.2, p=0.044) to vaginal bleeding; having strenuous working environment is moderate positively correlated to lower backache and pelvic pressure (r=0.4, p=0.005and r=0.3, p=0.02 respectively); heavy lifting and pain when

urinating is weakly correlated (r=0.2, p=0.035) and having a house helper is negatively correlated to pelvic pressure. Thus, as it was revealed by other researchers this finding prove that the maternal life style is indirectly related to low birth weight by inducing the worse medical status during pregnancy. Hence the worse medical status are the lead of low birth weight (Golestan, Karbasi and Fallah, 2011, p22; Muchemi, Echoka and Makokha, 2015, p5).

Behind of physical activity during pregnancy, the meal taking, weight gain during pregnancy, micronutrient taking, smoking and alcohol usage are behavior to be considered in predicting, prevention and management of low birth weight(Nguyen *et al.*, 2017,p10). In this study, we find that the majority were in health weight before pregnancy (BMI=18.5-24.9) at 75.6%, but with under weight gain status (73.8%), whereas use of micronutrient supplements during the pregnancy is not efficient (61.9%). Thus, this worse nutritional status and behavior are key element to be considered in order to reduce the burden of low birth weight among Rwandan, hence, the strengthening family campaign through various local initiatives like 'umugoroba w'Ababyeyi(family evening), iminsi igihumbi yo kwita k'umubyeyi n'umwana (1000 days of pregnant mother caring' are key solution to alleviate the low birth weight (GoR, 2014, p12). Similar to the other study done in Tanzania (Modesta Mitao, Rune Philemon, Obure *et al.*, 2016, p4). Contrary to other studies in which Smoking and alcohol use during pregnancy were associated with low birth weight(Mourtakos *et al.*, 2015, p2; Modesta Mitao, Rune Philemon, Obure *et al.*, 2016, p4) in this study, smoking and alcohol taking are not common behavior practice among our study population . This is an outcome of government of Rwanda to aware the population about the negative consequence of alcohol during pregnancy and the consequence of the smoking on health in general and legal measures to be taken on public smoking on Rwandan territory.

5.7. Risk factors associated with type of low birth weight

The chi square test was used to test the statistical significance of association among variables in order to predict the factors associated with type of low birth weight among our study population (Low birth weight (first category), Very low birth weight and Extremely very low birth weight) the bivariate correlation analysis was also performed among independent variables to see how they are inter-correlated to induce LBW.

The analysis find that level of education and employment status for both parents are significantly associated with type of low birth weight ($p<0.05$), though, this is similar to the other studies where the social economic factors have been found to be associated with LBW(Jwa et al., 2013; Mogire, 2013, p28; Patra et al., 2017, p8) thus, the education level had

revealed to be crucial in protecting the pregnant mother and then influencing delivery outcome. The education level of family predict the employability status (r=0.6, p=0.001), reason why the increasing of education level, increase the probability of getting a job. Thus, the inter-correlation of social demographic characteristic lead indirectly to low birth weight which could be EVLW, VLBW or LBW first class (Lewis, Lee and Simkhada, 2015, p6). However, marital status, age and area of resident are not significantly associated with LBW type in our study. These findings differ from the findings of other studies where marital status, age and area of residence were significantly associated with LBW (Mitao, Philemon, Obure, Blandina T. Mmbaga, et al., 2016a, p4).

A part from social demographic, the gravida status of participants is key element to consider in low birth weight root analysis, though, having previous premature birth, low birth weight, and experiencing miscarriage are significantly associated to LBW type. Those finding are similar to the other studies(Bazyar et al., 2015, p22; Muchemi, Echoka and Makokha, 2015, p5). Furthermore, the illnesses contracted by mother or chronic diseases could be also factors to induce low birth weight. Thus similar to the other studies the genitourinary infection (Golestan, Karbasi and Fallah, 2011, p21) and trimester of infection (Golestan, Karbasi and Fallah, 2011, p21; Tellapragada et al., 2016, p172) are significantly associated with Low birth weight type ($p<0.5$). This shown that the treatment of genitourinary infection timely could prevent the low birth weight type and its complication especially VLBW and EVLBW.

No communicable Diseases like hypertension and pain when urinating are find to be associated with low birth weight type, as we have find that there is correlation between the physical activities with pain during urinating, thus physical activities are also associated with Low birth weight type ($p<0.05$). These findings are similar to the study conducted in Kenya (Mogire, 2013, p52 and 54) but contrary to the study found that Diabetes, kidney diseases, preeclampsia, and Sexual Transmitted Infection are associated with LBW (Jwa et al. 2013, p3). Though, the management of hypertension, and reducing the dangerous physical activities like lifting heavy stuff during pregnancy period are milestone to reduce the LBW outcomes in our society.

Management of clinical status of pregnant mother could not reduce LBW incidence and its related consequences without make awareness to maternal life style, thus, this study find that average taken meals per day, taking micronutrient supplement, and weight gain during pregnancy are significantly associated to low birth weight type. This findings are similar with the findings of other study conducted in Kenya and Greece (Mogire, 2013, p8; Mourtakos et

al., 2015, p2). This behaviour change will be achieved upon the mother attended regularly and follow the advice given by the health professional advises during antenatal care visits (Krishna and Bhalerao, 2011, p3).

The findings revealed that the times attended ANC and medical consultation of gynaecologist& obstetrician during pregnancy are significantly associated with low birth weight type. This findings are similar to the study done in Brazil where the scholar find that "inadequate number of antenatal visits is associated with LBW"(Regina et al., 2014, p7). Hence, during ANC visit, the mother gain admittance to indispensable obstetric care to avoid or treat serious obstetric complications which may worse the pregnancy outcome(Family Care International, 2007, p11).

CHAPTER 6 CONCLUSION AND RECOMMENDATIONS

6.1. Introduction

Factors leading to LBW are many and may contribute directly to LBW or indirectly by inducing one or more risk factors which at the end contributing to LBW, thus those factors are interconnected. Many studies revealed that education level of pregnant mother may induce indirectly the LBW in the illiterate family by hindering family planning and healthy behaviours during pregnancy (Surendranadha Reddy, 2017, p215)

6.2. Conclusion

The social demographic characteristics are dominated by 18 to 35 ageing, married couples with lowest formal education, unemployed mother, self-employed spouses living in rural areas. Whereas gravida is marked by multiparous with unsuccessfully pregnancies, and previously given birth to low birth weight and suffering genitourinary infections. The recent pregnancy medical status is highlighted by genitourinary infections, hypertension, experiencing Lower backache, pelvic pressure, pain when urinating and abdominal pain. Maternal life style has been alarmed by having heavy physical activities and under weight gain during pregnancy. Furthermore, all participants recorded at least 1 ANC visit and a half of them attended at least 1 ultrasound service. The low birth weight outcome is dominated by 2500-1500 grams.

The factors associated with low birth weight type are education level of both parents and their employability status, miscarriage and the trimester of miscarriage, urinary tract infections and pregnancy trimester, hypertension, experiencing pain when urinating, meals frequency per day and micronutrient taking, as well as number of ANC visits and consultation of gynecologist & Obstetrician during pregnancy period.

6.3. Recommendation

6.2.1 Recommendations for nursing practice

Upon the results of this study, the health facilities are recommended to include ANC into community outreach in order to increase the rate of attending four standard ANC visits.

The health care provider are recommended to sensitize the pregnant mother about weight gain during pregnancy and micronutrient supplement

6.2.2 Recommendations for administration of the hospital

Strengthening the maternal-child health program and sensitize the community about pregnant mother caring, life style and food supplement and physical activities.

Strengthening the ANC visits and includes in the package the consultation of Gynaecologist& obstetrician.

Organize continuous training and regular refresher courses for healthcare providers, especially in primary healthcare facilities.

Incorporate maternal-child health program in extra-curricular activities for all level of education in Rwanda

Facilitate the creation of maternal –child health club from primary to tertiary education

6.2.3 Recommendation for further research

Further studies are needed in this field in order to:

Identify the factors associated with low attending 4 ANC visits, Depression and LBW delivery; Cost analysis of LBW delivery in Rwanda

6.2.4 Recommendations for nursing education

Organize continuous training and regular refresher courses for lecturers towards LBW regardless the specialities

Organize the continuous community outreach in rural areas towards maternal child health

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APPENDICES

APPENDIX I: CONSENT /ASSENT FORM

THE UNIVERSITY OF RWANDA

CONSENT/ASSENT TO PARTICIPATE IN A RESEARCH STUDY

Study Title

RISK FACTORS ASSOCIATED WITH LOW BIRTH WEIGHT AMONG NEW BORN AT SELECTED REFFERAL HOSPITALS IN RWANDA

Researcher

Fatuma MUREKATETE RM, School of Nursing and Midwifery, College of Medicine and Health Sciences, University of Rwanda.

Introduction

This study is about assessing the risks factors associated with low birth weight among new born in selected Rwandan Referral Hospitals. We are concerned with describing the social demographic, medical factors and maternal life style factors of low birth weight at selected Rwandan referral hospitals and establishing the risk factors associated with low birth weight in selected Rwandan referral hospitals.

This study recruits only people who voluntarily choose to take part. Please we cheer you to take your enough time to make your decision about participating and discuss your choice with your family or friends if you want. If you have any misunderstanding, you may also ask the researcher or research assistant for assistance. Hence, you are being requested to participate in this study because you have a low birth weight.

Reason to conduct this study

The reason to conduct this study is to learn more and reveal the risks factors associated with low birth weight among new born in selected Rwandan Referral Hospitals. In addition, this study is conducted in order to fulfill the requirement of Masters of Science in Nursing (Neonatology Truck) at University of Rwanda, College of Medicine and Health sciences, School of Nursing and Midwifery.

Confidentiality and participant' right

The participant will be assigned a code which will be the unique identifier.

You have a right to answer any question, skip a question or withdraw from study at any time and there will not be any applied penalty. No answers or comments will be reported or shared with the third part without your consent; all answers will be reported as a group without any participant's identification.

Side effect resulted on the study

There are no any side effect or any risk from participating in this study

Benefits to participate in the study

There is no any financial benefit for participating in the study and or any other direct benefit to you from participating in this study. However, the information that you provide will help to improve the neonatology services and reduction of low birth weight.

Who can answer my questions about the study?

You can talk to the researchers about any questions, concerns, or complaints you have about this study. Contact the researchers Mrs. Fatuma MUREKATETE on +250788755012 or Director of CMHS research Center Professor GAHUTU Jean Bosco on +250783340040

PERMIT OF CONSENT

I have read and explained the information on the research that I am going to participate in. I have had the chance to ask questions about it and any questions I have been questioned have been responded to my satisfaction. I consent voluntarily to be a participant in this study

Name of Participant_____

Signature of Participant _____

Date _____

Day/month/year

APPENDIX II: QUESTIONNAIRE

QUESTIONAIRE FOR THE STUDY ON RISK FACTORS ASSOCIATED WITH LOW BIRTH WEIGHT AMONG NEW BORN AT SELECTED REFFERAL HOSPITAL IN RWANDA

Code of participant ……. (Assigned by a researcher)

(Please fill in or tick where appropriate)

(A) SOCIO-DEMOGRAPHIC FACTORS

1. **Age:** …… (years)

2. **Marital status (tick where appropriate)**

Married	1
Unmarried- living with a partner	2
Unmarried- not living with a partner	3
Widowed	4
Divorced	5

3. **Level of education attained**

No formal education	1
Primary	2
Technical and vocational school training	3
Secondary	4
Post-secondary	5

4. **If married, what is your spouse's level of education attainment?**

No formal education	1
Primary	2
Technical and vocational school training	3

Secondary	4
Post-secondary	5

5. **Employment status**

Unemployed	1
Self-employed	2
Employed	3
Student	4

6. If married, what is your spouse's employment status?

Unemployed	1
Self-employed	2
Employed	3
Student	4

7. Area of residence

Urban…	1
Rural …	2

B) MEDICAL FACTORS

8. Have you been pregnant before?

Yes	1
No	2

9. **If YES how many times?** ……..

10. Were all the pregnancies successful?

Yes	1
No	2

11. If NO specify……..

	Yes	No
12. Have you previously given birth to a premature baby	1	2
13. Have you previously given birth to a Low birth weight baby?	1	2
14. Have you previously given birth to a still born baby?	1	2

15. Have you experienced a miscarriage?

Yes	1
No	2

16. If YES on 15th question how many times?

Once	1
Twice	2
More than thrice	3

17. If yes on 15th question at what month of the pregnancy?

First trimester (1st – 3rd month)	1
Second trimester (4th – 6th month)	2
Third trimester (7th – 9th month)	3

18. If YES on 15th question what was probable cause of miscarriage

Sickness	1

A lot of work	2
Accident	3
Weak placenta	4
No known cause	5
Physical abuse	6

19. Have you experienced prior pregnancy termination?

Yes	1
No	2

20. Did you suffer from any vaginal infections (any events of increased amount of vaginal discharge, a foul odor vaginal discharge or itching or burning around vagina) during pregnancy?

Yes	1
No	2

21. If YES on 20st question, at which trimester did you suffer?

First trimester (1st – 3rd month)	1
Second trimester (4th – 6th month)	2
Third trimester (7th – 9th month)	3

22. If YES what type of vaginal infection?

Bacterial vaginosis	1
Candidiasis	2

23. Did you suffer from any urinary tract infections during pregnancy (pain or burning during urination, urge to urinate but not much urine comes out, cloudy urine or smelly urine)?

Yes	1

No	2

24. If YES on 23th question, at which trimester did you suffer?

First trimester (1st – 3rd month)	1
Second trimester (4th – 6th month)	2
Third trimester (7th – 9th month)	3

Questions regarding different diseases

Do you suffer from any of the following?	Yes	No
25. Do you suffer from high blood pressure?	1	2
26. Do you suffer from Heart problems	1	2
27. Do you suffer from Kidney problems	1	2
28. Do you suffer from Lung problems	1	2
29. Do you suffer from Diabetes	1	2
30. Did you experienced vaginal bleeding	1	2
31. Did you experienced Lower backache	1	2
32. Did you experienced Pelvic pressure	1	2
33. Did you experienced Pain when urinating	1	2
34. Did you experienced Abdominal pain	1	2

C) MATERNAL LIFESTYLE

Work conditions

35. Is the environment you work in strenuous?

Yes	1
No	2

Don’t know	3

36. Does it involve prolonged standing or standing for long periods of time?

Yes	1
No	2

37. Do you have a domestic house help or anyone who helps with house work?

Yes	1
No	2

38. Did you do any heavy lifting (lifting of loads heavier than the participant could handle and which put strain especially on the lower back like water jerricans either from a height, up a flight of stairs and also level ground.)?

Yes	1
No	2

39. Did you do any extensive bending?

Yes	1
No	2

40. On average in a day how many meals did you consume during the pregnancy?

One	1
Two	2
Three	
More than three	

41. If you consumed less than three meals, why?

Lack of appetite	1
Lack of money	2

Lack of time	3
Out of choice	4

42. Did you use micronutrient supplements during the pregnancy?

Yes	1
No	2

43. If NO, why?

Not prescribed	1
Lack of knowledge about them	2
Lack of access to them	
Prescribed but did not take	

44. If YES, which type did you use? (Sample of drug will be used as a prompt)

Iron	1
Folic acid	2
Calcium	3
Multi vitamins	4
Folic and Iron	5
Folic and calcium	6

QUESTION ON RISKY BEHAVIOR

	Yes	No
45. Do you drink alcohol	1	2
46. If YES on 45, did you ever consume alcohol during the entire period of the pregnancy?	1	2

47. Do you smoke?	1	2
48. If YES on 47, did you ever smoke during the pregnancy?	1	2
49. Does your husband smoke?	1	2
50. If YES, did he ever smoke in your presence during your pregnancy?	1	2

51. What is the main type of fuel you use when cooking?

Firewood	1
Charcoal	2
Gas/ Electricity	4

QUESTIONS REGARDING ANTENATAL CARE

52. Did you attend prenatal service?

Yes	1
No	2

53. If YES on 52th question, at which month of pregnancy did you commence antenatal/prenatal care visits?

First trimester (1st – 3rd month)	1
Second trimester (4th – 6th month)	2
Third trimester (7th – 9th month)	3

54. If YES on 52th question how many times:

1	2	3	4	5 and more

55. If YES on 52th question, how many times did consulted by gynecologist & Obstetricians' or midwife assessment

1	2	3	4	5 and more

56. If NO, why?

.....

57. If YES on 52th question did you do ultrasound?

Yes	1
No	2

58. If YES on 57th question how many times

1	2	3	4	5 and more

APPENDIX III: CLINICAL RECORD FORM

MOTHER

Code Participants …….....

1. Age……. (years)
2. Pre-pregnancy weight……. (kg)
3. Weight …… (kg)
4. Height ….....
5. Weight gain during pregnancy……. (kg)
6. Did the mother suffer from any vaginal infections during pregnancy…….
7. Did mother suffer from urinary tract infections during pregnancy……..
8. Syphilis infection……..
9. Chronic illnesses present in the mother……..
10. HIV status……
11. Any complications that could have affected the pregnancy……
12. Birth status: singleton birth ( ) multiple birth ( )

INFANT

13. Baby's gestational age at birth……
14. Baby's status at birth; low birth weight ( ) normal birth weight ( )

APPENDIX IV. BUDGET FOR THE STUDY ON RISK FACTORS ASSOCIATED WITH LOW BIRTH WEIGHT AMONG NEW BORN AT SELECTED REFFERAL HOSPITAL

I. Preparation for the study					
Item	No. of Persons	No. of Days	No. Person-days	Cost/Unit(RWF)	Total/RWF
1. Research Proposal preparation and submission.	1	8	8	20000	160000
2. Introduction to the RMH	1	5	5	10000	50000
3. Pre-testing and finalizing research instruments e.g. questionnaires.	1	5	5	20000	100000
Subtotal 1					310,000

II. THE SURVEY

Nº	Item	Persons	No. of days	Person-Days	Unit Cost (RWF)	Total (RWF)
1	Data Collection (Fieldwork)	1	10	10	20000	500000
	Subtotal 2					500000

III. STUDY SUPPLIES

Nº	Item	Quantity	Unit Price RWF	Total RWF
1	Note Books A4	1	2000	2000

2	Pencils	10	200	2000
3	Duplicator paper(ream)	1	5000	5000
4	File	1	6000	6000
5	Pen	10	200	2000
6	Rubber eraser	10	200	2000
	Subtotal 3			19,200

	IV. PRODUCTION OF THE DISSERTATION					
Nº	Item	Quantity	No. of days	Pers.-days	Unit Price RWF	Total RWF
1	Data coding, and digitalization	1 person	3	3	10000	300000
2	Data analysis	2 persons	4	8	20000	160000
3	Thesis Writing (First Draft)	1 person	2	2	50000	100000
	Subtotal 4					290000

	V. WORKSHOP FOR THESIS VALIDATION					
Nº	Item	Quantity	NO./Days	Pers/days	Unit Price RWF	Total RWF
1	Dissertation Writing (Final draft)	1	1	1	100000	100000
	Submission of Final Dissertation	1	1	1	100000	100000
	Subtotal 5					200,000

VI. BUDGET SUMMARY

Nº	DESCRIPTION	TOTAL/RWF
1	Preparation for the Study	310,000
2.	The survey	500,000
3	Study supplies	19,200
4.	Production of the dissertation	290,000
5	Workshop for thesis validation	200,000
	TOTAL BUDGET	1,319,200