



UNIVERSITY *of*
RWANDA

RESEARCH PROJECT

**NURSES' PERCEPTIONS AND ACTIONS TOWARD REDUCTION OF CLIMATE
CHANGE RELATED NEONATAL HEALTH RISKS AT SELECTED HOSPITALS IN
KIGALI**

By

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College of Medicine and Health Sciences

School of Nursing and Midwifery

Master of Sciences in Nursing (Neonatology)

2019



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Student registration number: 215042211

A dissertation submitted in partial fulfillment of the requirements for a MASTER OF
SCIENCES IN NURSING (Neonatology)

In the College of Medicine and Health Sciences

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June 2019

DECLARATION

I do hereby declare that this study project entitled “**Nurses ‘perceptions and actions toward reduction of climate change’s related neonatal health risks at selected hospitals in Kigali’**” submitted in partial fulfillment of the requirement for the Master’s Degree of Sciences in Nursing (Neonatology) at University of Rwanda, College of Medicine and Health Sciences, School of Nursing and Midwifery is my original work and was not previously submitted elsewhere. I also declare that the complete list of references is provided to indicate all resources of quoted or cited information.

Names

Signature

NSENGIYUMVA Richard

A handwritten signature in blue ink, consisting of a horizontal line with a vertical stroke crossing it, and a small loop at the end.

DEDICATION

I dedicate this work to the Almighty God who helped me throughout the whole journey of studies.

Then, I dedicate this work to my families for their role of guidance, support, love, and affection.

My teachers, friends and students colleagues for their support and encouragement to me

I wish to extend my great dedication of this work towards UR/CMHS midwifery department staff for their support and encouragement

Finally, I dedicate this paper work to the nurses and midwives from Rwanda Military, King Faysal, Muhima and Kigali University Teaching at hospitals for their help and role in data collection.

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ABSTRACT

Background: Climate change is recognized as a global public health problem. Literature shows that yearly, millions of neonatal deaths are attributable to climate change's consequences worldwide. **Objective:** This study aimed to assess nurses' perceptions and their position towards actions leading on the reduction of climate change associated neonatal health risks at selected hospitals in Kigali. **Methods:** A quantitative cross-sectional design was used. A stratified random sampling technique was used to select 184 out of 340 nurses and midwives working in maternity, pediatrics and neonatology units of the four selected hospitals in Kigali. The self-administered questionnaire was used to collect data from 5th March to 31st May 2019. Using SPSS version 23, descriptive and inferential statistics were used to analyze data. **Results:** 62.1% of participants were females, 60.5% nurses, 55.4% with an advanced diploma and 57.6% working in referral hospitals. 57.1% had low awareness of climate change; the main source of awareness was mass media (44.1%) and over 60% had negative perceptions of potential neonatal health risks associated with climate change. Henceforward, the majority (72.9%) was in a weak position towards actions leading on reduction of climate change associated neonatal health risks. 75.0% of those who had personal cars had no intention to walk, bike or use public transport. High educational level was strongly associated with high-level awareness and positive perceptions of potential neonatal health risks associated with climate change ($p < 0.05$). Then, a positive correlation between strong awareness, positive perceptions and strong position to climate action was found, ($r = 0.204$, $p < 0.05$). **Conclusion:** There is low-level awareness of climate change; negative perceptions of climate change's associated potential neonatal health risks and weak position towards actions leading to reduction of climate change associated neonatal health risks among nurses and midwives from selected hospitals in Kigali. Offering in-service training and integrating climate change and health nursing curriculum can help increase awareness and climate action among Rwandan nurses and midwives.

LIST OF SYMBOLS AND ACRONYMS/ABBREVIATIONS

ANC: Ante-natal consultation

CC: Climate change

CCMA: Climate change mitigation and adaptation

CHUK: Centre Hospitalier Universitaire de Kigali

DALYs: Disability-Adjusted Life Years

GW: Global warming

IPC: Intergovernmental Panel on Climate Change

IRB: Internal Review Board

KDH: Kibagabaga District Hospital

KFH: King Faysal Hospital

PNC: Post-natal consultation

SPSS: Statistical Package for the Social Sciences

TPB: Theory of Planned Behavior

UN: United Nations

UNFPA: United Nations Population Fund

USA: United States of America

WHO: World Health Organization

%: Percent

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CHAPTER ONE: INTRODUCTION

1.1. Introduction

This chapter discussed the background of the problem, the problem statement, the purpose, objectives, the rationale, hypothesis, theoretical and conceptual framework, and the scope of the study

1.2. Background

Climate change nowadays is recognized as both one of the biggest threats and global health challenge in the 21st century. It is causing multiple health challenges ranging from disease outbreaks, increasing drug-resistant pathogens and multiple humanitarian crises due to that. (WHO, 2019). Globally, almost 3 million neonatal deaths and stillbirths yearly are attributable to climate change (Gennaro, O'Connor, & Marx, 2017).

According to Macpherson, (2014), one manifestation of climate change is the increasingly severe extreme weather that causes injury, illness, and death through heat stress, air pollution, infectious disease, and other means. It is estimated that climate change causes 9 million premature deaths no country in the world is unaffected by climate change (Landrigan et al., 2018).WHO, (2016) estimated that 12.6 million deaths globally are attributable to climate change which is about 23% of all deaths and 22% of the disease burdens expressed in terms of Disability-Adjusted Life Years (DALYs), a common measure used to assess the effect of a factor affecting healthy life expectancy (WHO, 2016a).

According to the UNISDR (2016), between 1995 and 2015 extreme temperatures from CC directly or indirectly caused 27% of all neonatal deaths globally (The UN Office for Disaster Risk & Centre for Research on the Epidemiology of Disasters, 2015). The WHO indicated that climate change is expected to cause approximately 250,000 additional neonatal deaths per year in developing countries between 2030 and 2050(Hales, Kovats, & Simon Lloyd, 2014).Despite improvements in reducing neonatal mortality efforts failed to meet the respective 75% reduction goals because of climate change(World Health Organization, 2015).

In Africa, studies done in Kenya and Ghana found a correlation between high ambient temperatures and increased all-cause mortality among under-five children. (Serdeczny et

al., 2017). A study was done in 19 Africa countries, including Kenya, Uganda, and Rwanda by (Grace, Davenport, Hanson, Funk, & Shukla, 2015) found that relationship.

The WHO estimated that adverse neonatal health outcomes related to CC would increase sharply, with twice the health burden by 2030 (WHO, 2016b). By 2100, it is projected that Sub Saharan Africa (SSA) region will five-fold hotter than today and heat-wave hazard is more likely to affect under-five children and the elderly (Caminade et al., 2014).

Rwanda is heavily affected by climate change effects and since 1970; it has experienced an average temperature increase of 1.4°C which is higher than the global average due to CC. Hence, there is an expected increase up to 2.5°C by 2030,(Byers et al., 2018). The recent global climate vulnerability and risk indexes placed Rwanda's climate change among the high-risk nation in terms of climate change risk exposure (Byers et al., 2018).Moreover, in Rwanda, more than 50% of premature deaths due to pneumonia among children under 5 are caused by climate change (Gebauer & Doevenspeck, 2015) and 28% of neonatal death is attributable to climate change (Persson et al., 2017).

According to Patz and Thomson, (2018), to achieve to CCMA, using nurses and midwives in teaching cc and health must be a priority. Hence, (Leffers & Butterfield, 2018) argued that nursing practice must include strategies to reduce cc related health impacts through patient assessment and clinical care, research, advocacy, policy-making, and work with communities to strengthen resilience. However, studies conducted in Ethiopia, Bangladesh, and China showed that the majority of nurses did not know cc action was among nursing concerns and did not know their work could also influence the development of CC's related health effects (Xiao et al., 2016).In Rwanda, little is documented about nurses 'awareness and involvement in climate change mitigation and adaptation CCMA. Thus, this study explored nurses' and midwives' awareness of climate change and their self-reported action toward CCMA to reduce neonatal health risks.

1.3. Problem statement

Neonatal mortality and morbidity are still high worldwide. Because climate change is highly associated with preterm birth, lower birth weight, increased neonatal sepsis, respiratory infections, heatwaves 'consequences, etc., efforts to reduce neonatal morbidity and mortality ratio to set goals failed (World Health Organization, 2015). Likewise, in Rwanda, recent reports show that neonatal mortality and morbidity rate is still high (16.4 deaths per 1,000 live births) despite efforts made. Prematurity is still the leading cause of neonatal mortality (32%), followed by low birth weight (61%) followed by neonatal sepsis/infection (10%), (Khurmi, MBBS, MPH et al., 2017). Moreover, it is estimated that in Rwanda, 28% of neonatal death is attributable to climate change (Persson et al., 2017). Thus, Rwanda nurses and midwives role is needed to reduce that number of babies who die or get sick due to climate change. Hence, in their study, Leffers, Levy, Nicholas, & Sweeney, (2017) recommended nurses' efforts to reduce neonatal mortality linked to climate change.

Despite, the International Council of Nurses (ICN), ICM (International Council of Midwives, WHO, REMA and others are calling all midwives and nurses to be involved in multi-sectoral measures to lessen the burden of climate change on the vulnerable population's health including neonates, to date, in Rwanda little is documented about nurses 'awareness, perceptions of climate change and associated neonatal health risks. Moreover, currently, there is no documented data available about what Rwanda nurses and midwives are doing to mitigate and adapt to climate change's associated negative health consequences in neonatology, especially in Kigali city located hospitals. Therefore, this study aims to explore nurses' and midwives' perceptions and self-reported actions toward reduction of neonatal health risks associated with climate change in four hospitals located in Kigali.

This study is important because, during his clinical experience of more than 10 years as a midwife in maternity and neonatology, the researcher used to see preterm deliveries when hot season got hotter than previous years, increased malaria linked stillbirth cases in cold zone where malaria was unusual, drought-induced preterm deliveries and low birth weight in Eastern province, sunburn skin lesions on neonate. Despite all those observed neonatal disorders have affinity with climate change, the nurses and midwives role in mitigation is uncertain.

1.4. The aim of the study

The main aim of this study is to assess nurses' perceptions and their position towards actions leading to the reduction of climate change associated neonatal health risks at selected hospitals in Kigali

1.5. Research objectives

1. To assess the level of awareness of climate change among nurses and midwives from four selected hospitals in Kigali
2. To identify the level of perceptions of potential neonatal health risks associated with climate change among nurses and midwives from four selected hospitals in Kigali
3. To isolate self-reported actions and position towards actions leading to the reduction of climate change associated neonatal health risks among nurses and midwives from four selected hospitals in Kigali
4. To find out the relationship between position towards actions leading to the reduction of climate change associated neonatal health risks and awareness of climate change among nurses and midwives from four selected hospitals in Kigali

1.6. Research questions

What is the level of awareness of climate change and awareness source among nurses and midwives from Kigali selected hospitals?

What is the level of perceptions of potential neonatal health risks associated with climate change among nurses and midwives from Kigali selected hospitals?

What are the self-reported actions and the position towards actions leading to the reduction of climate change associated neonatal health risks among nurses and midwives from four selected hospitals in Kigali?

What is the relationship between the position towards actions leading to the reduction of climate change associated neonatal health risks and awareness of climate change among nurses and midwives from four selected hospitals in Kigali?

1.7. Significance of the study

To nursing practice: It would be logical for nurses and midwives to be aware of climate change and its consequences on neonatal health to help promote prevention. Therefore, this study will help boost awareness on their role and individual responsibilities as nurses towards mitigation of climate change's associated neonatal health hazards. Hence, this study will help nurses and midwives to lead their efforts to identify potential neonatal risks, vulnerable neonates, prevent and anticipate negative climate change-related neonatal health impacts, and assure that systems are in place to detect and respond to current and emerging climate change-related neonatal health threats.

To nursing education: Educators in nursing and midwifery should teach nursing and midwifery students on climate change impact on neonate's health. Therefore this study will help nursing and midwifery curriculum developers and reviewers to incorporate climate change unit in the nursing and midwifery curriculums. However, there is no limitation, because even other health professional educators may do so in their curriculums.

To research: The researcher in this study realized that very limited researches on knowledge, perceptions, and role of nurses and midwives towards climate action are available. So, this study comes at a time for it will help to boost and to inspire other aspirant nursing and midwifery researchers especially from the East African community and particularly nurses, midwives and other health professionals to generate new ideas and researches on the role of the nurse and midwives in fighting against neonatal health risks associated with climate change. However, there is no limitation, because even other health professional researchers may refer to this study to design other related researches.

1.8. Definition of Concepts

Climate refers to the average weather over a specific period of time (Webster et al., 2017).

Climate change: measurable shifts in traditional climate patterns of a given place outside the normal range of natural climate variability attributed to anthropogenic factors (Maccracken, 2019).

Climate change awareness: In this study, climate change awareness means knowing that climate change has a negative effect on human and neonatal health. It is also having information on current available national and international protocols or guidelines on

climate change mitigation in the health sector. Moreover; it is recognizing the nurse's role in climate change mitigation and adaptation

Climate change's perceptions: interpretation of climate change and related potential neonatal health risks, interpretation of climate change as a threat to neonate health, neonatal care and that climate action is a concern in the nursing profession.

Neonate: A newborn infant, or neonate, is a child under 28 days of age. During these first 28 days of life, the child is at the highest risk of dying. It is thus crucial that appropriate care is provided during this period, both to improve the child's chances of survival and to lay the foundations for a healthy life(Axon, Russell, & Wilkins, 2014).

Climate action: Nurses efforts or activities to reduce greenhouse gas emissions and strengthen resilience and adaptive capacity to climate-related health hazards

Intention to climate action: Having an idea or plan to change behaviors in order to mitigate or adapt to climate change's associated health risks

Self-reported action: activities currently done by nurses and midwives to reduce climate change associated with neonatal health risks.

Climate change associated neonatal health risks: any risk or disease or condition on the neonate that can occur as a poor consequence of climate change.

Potential climate change-related neonatal health risks: Risks only attributable to climate change such as prematurity, lower birth weight, death/morbidity from heat or cold stroke, neonatal infections (e.g. sepsis, malaria, meningitis, etc.), congenital malformations, neonatal respiratory diseases, effects of exposure to ultraviolet rays (skin damage and skin cancer, eye problems, disturbed immune function), neonatal metabolic disorders, poor post-natal growth, neonatal psychological and behavioral disorders.

Nurse: Being a general nurse or midwife

1.9. Structure/Organization of the study

The organization of this study is as the following: Chapter one: is reserved for the introduction. In this part, the researcher discussed on Background of climate change and negative effects on human and neonatal health, the problem statement, the aim of the study, research objectives, research questions, significance of the study and definition of key concepts. Chapter two: reserved for the literature review where the researcher presents and

discusses theoretical literature, empirical literature, and conceptual framework. Chapter three: In this chapter, the researcher presents and discusses the methodology, approach used in this study. It discusses also on the study population, sampling procedure, data collection procedure and analysis, ethical considerations, data management, and planned data dissemination strategies. Chapter four: Manly reserved for study findings. Chapter five: Focuses on findings discussion. Chapter six: shows the study conclusion and recommendations

1.10. The conclusion to Chapter one

Climate change causes various negative neonatal health risks worldwide and in Rwanda. In Rwanda, little is known and documented about what nurses and midwives are aware of and what they are doing to mitigate those risks. Therefore, this study is highly needed

CHAPTER TWO. LITERATURE REVIEW

2.1. Introduction

This chapter of review literature discussed on theoretical study framework, empirical literature and study conceptual framework. It ends by showing a critical review and identifies the research gap on this topic.

The literature search strategy: The investigator used databases such as Cochrane Library, PubMed, CINAHL, and Google Scholar. The MESH words or keywords included "Climate change, Health effects, Newborns, Nursing, Midwifery, and Profession." Furthermore, all theoretical and empirical articles written on this issue were explored.

2.2. Theoretical Literature

In this study, the theoretical framework used was adapted from the Theory of Planned Behavior (TPB) by Icek Ajzen - 1991. TPB is a theory that links one's beliefs and behavior. In TPB, individual's attitude toward behavior, subjective norms, and perceived behavioral control, together shape his/her behavioral intentions and behaviors. This motivated the researcher in this study to use TPB as a guiding theoretical framework. Hence, guided by the TPB, the research built a conceptual framework.(Discussed in 2.4.).

de Leeuw *et al.*, (2015) argued that the importance of individuals' awareness and attitude should be central to improving natural environments. It is, therefore, argued that people with positive attitudes can play a significant role in environmental preservation (Wynveen & Sutton, 2015). Icek Ajzen, (2015) postulates that attitudes translate into intentions and intentions to translate into behavior. Consequently, in his theory of a planned behavior model, Ajzen places significant emphasis on assessing awareness and attitudes. According to Fielding & Hornsey,(2016), upon encountering new information or situations, individuals' initial attitudes might be challenged or changed, hence a change in attitude is based on new information or situations. An individual's intention to portray a particular behavior is the central tenet of the theory of planned behavior. Icek Ajzen, (2015) argued that intention indicates the extent of zeal and effort that a person will make to perform a behavior and is determined by the attitude towards the behavior, subjective norms and supposed behavioral control.

Theory of Planned behavior model has been used for many times to change people's attitude toward the environment and prevents natural environment degradation. For

example, findings from a study done in Malaysia using the TPB model indicated that attitudes, subjective norm and perceived behavioral control have a positive influence on behavioral intention to adapt/mitigate climate change. That study results also found mediating effects of behavioral intention between attitudes, subjective norms and perceived behavioral control and pro-environmental behavior (Masud et al., 2016). Hence, Masud et al. (2015) postulated that awareness and perceptions of climate change consequences on health influence attitudes towards climate action. Moreover, study done by Macovei, (2015) using TPB model found that awareness of the consequences and the need of a pro-environmental behavior, is a strong determinant of intention to behave in a pro-environmental manner and actual pro-environmental behavior consisting in energy conservation, and may serve as a predictor for future research in the field of pro-environmental behavior.

2.3. Empirical literature

2.3.1. Overview on and causes of climate change and global warming

According to Caserini, (2017), since 1900, the global average surface temperature has increased by about 0.8 °C (1.4 °F) accompanied by warming of the ocean, a rise in sea level, a strong decline in Arctic sea ice, and many other associated climate effects. Detailed analyses by various researchers have shown that the warming during this period is mainly a result of the increased concentrations of CO₂ and other greenhouse gases. Nicholas and Breakey, (2017) state that climate change is an emerging challenge linked to negative outcomes for the environment and human health. According to the Royal Society and the US National Academy of Sciences, (2014), Ozone layer is destroyed by human activities especially the burning of fossil fuels. This leads to global warming through excessive accumulation amounts of greenhouse gases to the atmosphere.

The healthcare system has even been involved in contribution to GHG emissions. The World Bank, (2017) and (Dhillon & Kaur, 2015) argued that the health sector is also a contributor to greenhouse gas emission from the energy needed to run health facilities, transport patients, equipment and pharmaceutical products, and hospital waste. This is no different from what is happening in Rwandan's health settings. The World Health Organization's (WHO) calls all health systems to contribute to reducing their own greenhouse gas emissions through Health Care without Harm Program (WHO, 2019). According to Health Care Without Harm (2017) due to their massive buying power, and

their mission-driven interest in preventing disease, nurses and midwives can help shift the entire economy toward sustainable, safer products and practices. Therefore, nurses and midwives must take precautions in their daily practice by checking whether their activities and practices are not increasing climate change and global warming effects.

2.3.2. Global impact and mechanism of climate change on human health

Rossati, (2017) stated that people living in low-income countries are particularly vulnerable. In their study, Nick Watts et al., (2017) concluded that people in developing countries are the most vulnerable to health risks associated with climate change. (Nick Watts et al., 2017) added that neonates, pregnant women, older adults, and people with low incomes, face increased risks more than others. Then, various researchers argued that the health consequences of global warming include: increasing rates of heat stress and exhaustion; heat waves cramps; heatstroke, and sudden death especially in children under 5 years (Thornton, Ericksen, Herrero, & Challinor, 2014).

Recently, WHO, (2019) reported increased morbidity and mortality from extreme weather events and disasters; worsening cardiovascular and respiratory illnesses related to poor air quality and heat waves; increased risk for cancer due to increased exposure to harmful ultraviolet sun rays; and shifting vector-borne, waterborne, and foodborne disease pathways. Again, various studies from WHO reported an association between diabetes increase and climate change (WHO Fact sheet, 2017). Furthermore, Watts, Adge, and Agnolucci, (2015) reported that the exacerbation of forced migration, malnutrition, food and water scarcity increased effects of climate change on human health.

According to (Mirzaei et al., 2016) respiratory infections have continued to increase due to climate change. D'Amato *et al.*, (2014) argued that 3 million people die from chronic obstructive pulmonary diseases (COPD) every year, and it is predicted that COPD will be the third leading cause of death by 2030 with climate change-related heat stress, outdoor and indoor air pollution. In a study conducted in Rwanda, findings showed asthma in infants and school-aged children was associated with climate change and exposure to traffic-related air pollution the time of birth (Habineza et al., 2017). Therefore, researches exploring the association between climate change and potential neonatal health risks such as prematurity, neonatal sepsis, etc in Rwanda are needed.

Climate change has also been attributed to the increase and spread of infectious diseases. Also, Wu, Lu, Zhou, Chen, & Xu,(2016) argued that climate factors including temperature, precipitation, humidity, and sunshine affect pathogens, hosts and disease vectors, thereby influencing the occurrence and spread of infectious diseases. A study done in Ghana, results showed an association between climate change and increased cerebrospinal meningitis (CSM) in children (Codjoe & Nabie, 2014). In Rwanda, such study is needed

2.3.3. Negative effects of climate change on neonatal health

Climate change especially global warming may have severe health consequences for neonates are very fragile with incomplete physiological maturation such as thermoregulation. Hence, climate change may also cause preterm delivery to pregnant women in various ways. In a current multi-city study done in Korea, due to climate, a significant association between increased ambient temperature and infant mortality was found. In that study, results showed Sudden Infant Death Syndrome (SIDS) for a 1 °C increased by 1.52% (Son, Le, and Bell, 2017).

According to (World Health Organization, 2015b), preterm birth and low birth weight (LBW) are principal causes of neonatal morbidity and mortality as well as possible increased morbidity in adulthood. A study that was done in the United States of America(USA) showed a decrease of 7 to 11 grams in the weight of the baby and risk of preterm delivery among pregnant women exposed to extremely high temperatures during the second or third trimester of pregnancy(Caminade et al., 2014).This study also found that about 10.7 % of neonatal mortality rate and 13.6% of low birth weight due to climate change are expected from 2041-2070. In another study done in Brazil, it was found that 10.1% of LBW and 10.5% of neonatal mortality rate were attributable to climate change's related extreme weather due to cold and heat stress (Pereda, de Menezes, and Alves, 2014).

In Africa including Rwanda, climate change has been also associated with preterm birth and low birth weight. A study done in 19 Africa countries including Rwanda and other East African community countries, results showed a strong positive correlation between low birth weight and climate change where even a single day in the second trimester with the mercury topping 100 correlated to a 0.9-gram weight deficit(Grace et al., 2015). Similar findings have been recently published in different other countries such as Bangladesh, Australia, Korea, Belgium and Canada (Mathew et al., (2017)(Poursafa, Keikha, &

Kelishadi, 2015), (Son, Lee, Lane, & Bell, 2019),(Cox et al., 2016)(World Health Organization, 2015a). A particular study in Rwanda needed

Climate change has been alleged many times to be associated with neonatal infection. In a study done in Nigeria, results showed climate change was associated with an increased risk of neonatal septicemias (Akindolire, Tongo, Dada-Adegbola, & Akinyinka, 2016). Moreover, a study done in Ghana, results showed an association between climate change and increased cerebrospinal meningitis (CSM) in neonates (Codjoe & Nabie, 2014).

According to (Newman et al., 2016), various neonatal mental, behavioral and psychological problems are attributed to the climate change heat stress. So, we have to pay attention while warming babies in our working settings. Moreover, a study done in the USA showed an association between climate change and congenital heart defects (Zhang et al., 2019). Climate change may alter the incidence and severity of respiratory infections and respiratory allergy in neonates due to the degradation of air quality caused by 1 or more pollutants (Mirsaeidi et al., 2016).

Climate change has been also associated with stillbirth in pregnant women due to heatstroke/heatwaves accompanied by potentially physiological changes that alter the capacity to regulate body temperature in those vulnerable persons. In a study done in Canada, results showed that elevated outdoor temperatures due to climate change were associated with term stillbirth, including stillbirth due to undetermined causes or maternal complications(Auger, Fraser, Smargiassi, Bilodeau-Bertrand, & Kosatsky, 2017).Thus, with all above CC's related neonatal health consequences, Rwanda has to take today more serious measures to mitigation and adaptation and especially involve nurses and midwives and other health care providers since they are them who are always on the field in health settings.

Studies that were done in Uganda, Kenya, Rwanda, and Ethiopia showed that due to climate change, the rise in temperature over highlands increased neonatal morbidity and mortality due to malaria among pregnant women from high mountain regions(Cyril Caminade et al., 2014). Moreover, through weather changes, CC indirectly impacts health through its effect on the economic livelihood of the population (Gupta, 2014).The study done in Ghana found a strong association between poverty and increased neonatal mortality rate (Kayode et al., 2014). Hence, another study done in Peru, results showed that neonatal mortality rate countrywide decreased after anti-poverty agencies had started (Huicho et al.,

2016). Despite there no available research data did in Rwanda, we also have a problem of poverty caused by droughts due to climate change and pregnant mothers are prone to have anemia, low birth weight babies and associated neonatal consequences, stillbirth, etc.

2.3.4. Nurses ‘awareness and perception toward mitigation and adaptation to climate change associated with human health risks.

Nurses have also been vital in addressing environmental hazards that affect health. According to ANHE (2019) having the knowledge and understanding the connection between climate change and health is important for nurses because they can also drive change within the health sector to reduce emissions. Hence, as trusted professionals, nurses hold an immense ability to make a difference, reach many people, and push for action to address climate change. (ANHE, 2019).

The study done in China among nurses showed that the majority of nurses (76%) knew about the climate change would upset public health but more than half of the nurses did not perceive their work could also influence the development of climate change(Xiao et al., 2016). However, another study done by Polivka and colleagues in 2012, found that 50% of respondents were able to list only 5 of the 12 health-related impacts and unsure of other climate change negative related health impacts (Polivka, Chaudry, & Mac Crawford, 2012a). From this, more researches are needed in this area in order to increased awareness and find evidence linking climate change to health. This factor will probably convince nurses and midwives that climate change affects their patients' health so they need to be prepared to deal with those effects.

Another study that was done by Anåker et al., (2015) found that despite most of the nurses were aware of their responsibility on climate change action, the majority of them perceived that climate change mitigation is not an important concern in the nursing profession. Sometimes, nurses think climate change is a political concern. However, a study done in China, results showed that the majority of nurses perceived nursing as having the responsibility to address health-related impacts of climate change and that climate change is an important nursing concern. (Polivka, Chaudry, & Mac Crawford, 2012b).

Because there is still much unknown regarding nursing awareness and engagement around climate and health, the ANHE has developed a variety of resources specifically for nurses to help them know enough about climate and health or the solutions in place to educate

others or address climate change in nursing practice. To learn more about nurses' awareness, motivation, and behaviors related to climate change and health, the Climate, Health, and Nursing Tool (CHANT) was developed.

2.3.5. Role of the nurse/Midwife in mitigating climate change associated neonatal health hazards

Every day, nurses and midwives must show their role in mitigating climate change as long as they struggle with climate change health-related consequences in their profession and even in their own lives. Since nurses and midwives will be called upon to care for neonates who bear the burden of disease from the impact of climate change and ecologically irresponsible practices that harm ecosystems and contribute to climate change, nurses must play a vital role in reducing climate change associated negative health effects. However, according to Teherani et al., (2017) nurses and midwives must first recognize the connection between the climate, ecosystems, sustainability, and health and their responsibility and capacity in changing the status quo.

Sustainable Healthcare Education (SHE) about education on the impact of climate change and ecosystem alterations on health in a community. Therefore, the vital role of the nurse towards prevention of adverse neonatal health outcomes due to the changing climate and environment is to educate community on hazardous risks of climate change on neonate's health and how to adapt (Teherani et al., 2017). Thus, this is what is needed for Rwandan nurses and midwives. According to George, Bruzzese and Matura, (2017) nurses and midwives are the main contributors to the human resources for health needed for climate-smart health systems, especially during extreme weather events and in disaster risk management.

Angelini, (2017) described the importance of alliance for nurses for a healthy environment as a powerful venue for all nurses to network, lead, and advocate CC mitigation. Then, Patz and Thomson, (2018) argued that to achieve climate change mitigation and adaptation, using nurses and midwives in teaching CC and health is a priority. (Veenema et al., 2017) argued that nurses are particularly well situated to initiate and activate change for the protection and promotion of the health of individuals, populations, and future generations.

A study done in China showed the majority (76%) of nurses had the intention to walk, bike, and use public transport in order to reduce air pollution, (Xiao et al., 2016). Very few

studies are available on role and actions of nurses and midwives towards climate change mitigation and adaptation. Therefore, such kind of study is needed in Rwanda.

2.3.6. Challenges of nurses to address climate change's related neonatal health risks

Leffers *et al.*, (2017) noted that barriers for nurses taking action on climate change include political discord and a narrow practice focus. In the study done in Sweden, results showed the majority of nurses felt they had a responsibility to address climate and environmental issues but they did not do it because they were overloaded by more pressing, day to day job requirements (Anåker *et al.*, 2015). Little is available on what nurses and midwives know and perceive about climate change action. A study done in China, results showed that the majority of nurses perceived lacking the ability to address climate change health-related impacts (Polivka *et al.*, 2012b). A study on challenges of nurses to address climate change's related a neonatal health risk is needed.

2.4. Conceptual framework

In this study, the conceptual framework used was conceived from the Theory of Planned behavior (TPB) by AJZEN. TPB is a theory that links one's beliefs and behavior. In this theory, it is stated that attitude toward behavior, subjective norms, and perceived behavioral control, together shape an individual's behavioral intentions and behaviors. TPB model has been used many times to assess individuals' environmental behavioral intentions in a workplace setting. That motivated the researcher in this study to design conceptual framework based on this theory.

Figure 1. Study conceptual framework

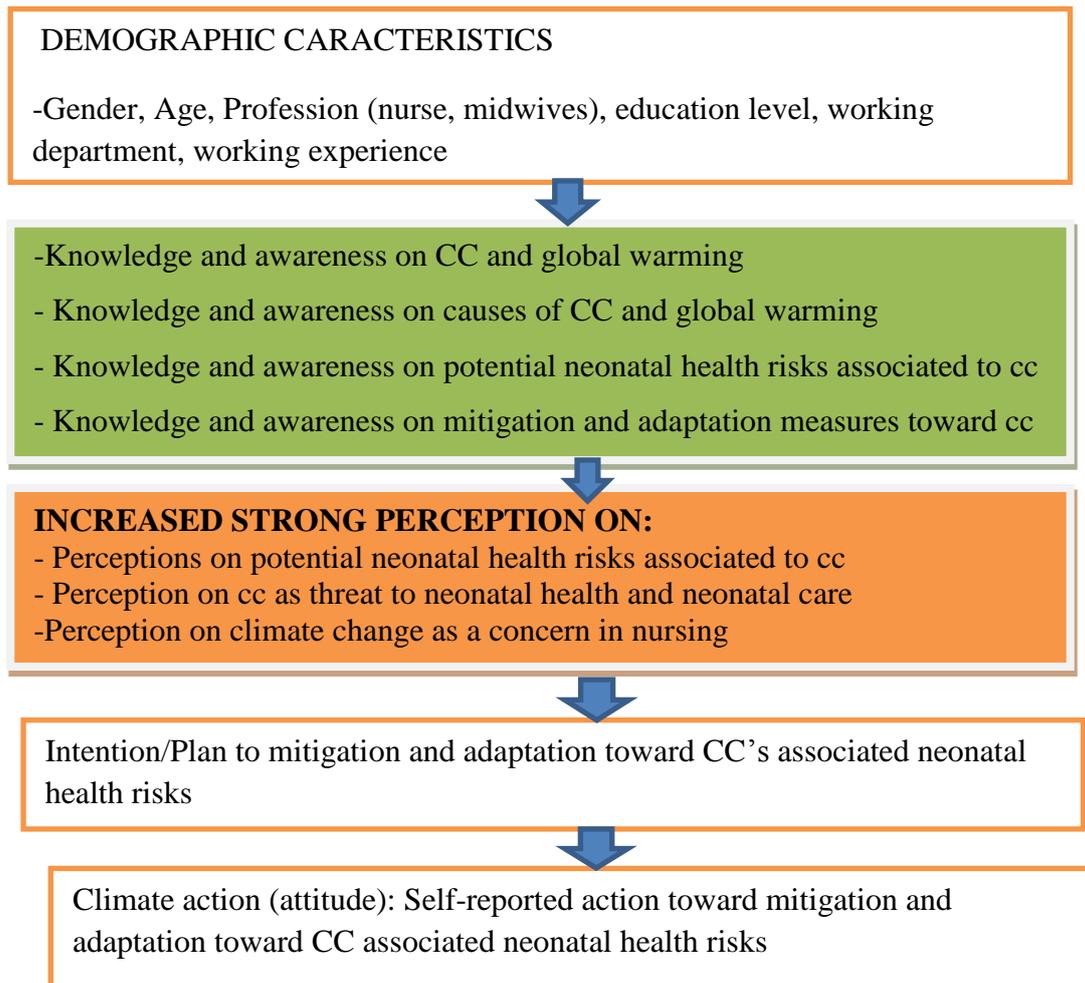


Figure 1 shows that awareness about CC and its associated neonatal health hazard among nurses and midwives increase perception on CC and potential neonatal health risks, perception on cc as a threat to neonatal health and as a concern in nursing. This factor influences nurse and midwife to plan or act toward mitigation and adaptation to CC associated neonatal health effects, and the end of all is improved neonatal quality of life. Also, demographic variables such as age, gender, level of education, profession, working experience, working department, level of working hospital may trigger awareness, perception of climate change and neonatal health risks and as a concern in nursing and also those demographic variables may induce nurses or midwives to climate action to reduce neonatal health risks associated with CC

2.5. Critical review and research gap identification

This literature has discussed in deep climate change and its impact on health especially neonates and the role of the nurse in climate change mitigation. No, any study was discussed regarding climate change and Rwandan nurses and midwives apart from only one study because little is available on climate change and health in Rwanda. Since very limited current researches on climate change impact in neonatology are available, this pushed the researcher to use non-very current research studies in this literature. However, all literature discussed in this section is concomitant with the study's objectives, research question, and problem statement.

2.6. The conclusion to chapter two

Climate change is a significant global problem that will continue to grow worldwide and causing adverse effects on neonatal health but very few researchers on climate change and neonatal health area are available. Rarely nurses and midwives' research on climate change and neonatal health hazards are available despite there are them mostly who struggle daily with climate change-related consequences while caring for their neonates. The researcher in this study calls upon nurses and midwives to do researches on the link between climate change and neonatal health hazards.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Introduction

This chapter discusses the study research, research approach design setting, study population, sample size, sampling techniques, research tools and technique, ethical considerations, limitations of the study, data management and analysis and presentation of findings

3.2. Research design

In this study, a descriptive cross-sectional study design was used because every participant was met once during the period of the stud. According to (Erickson, 2017), descriptive studies describe, explain, and validate findings. Those studies report summary data such as measures of central tendency (the mean, median, mode, standard deviation, variation, percentage, and correlation between variables).

3.3. Research approach

In this study, the quantitative research approach was used. This approach was used for several reasons, but mainly because the researcher wanted to quantify awareness, perceptions and self-reported actions of nurses and midwives. For example, McNabb and McNabb, (2018) argued that quantification could give greater confidence in the accuracy of conclusions derived from qualitative data

3.4. Research setting

The research was conducted at four hospitals located in Kigali city. Those are Rwanda Military Hospital (RMH), Muhima District (MDH) Hospital, King Faysal Hospital (KFH), and University Teaching Hospital of Kigali (CHUK).

University Teaching Hospital of Kigali (CHUK): The University Teaching Hospital of Kigali is located in Nyarugenge District. It is the largest public teaching referral hospital in Rwanda. Its monthly average of neonates" admission in NICU, pediatrics, and neonatology is 80; CHUK has a catchment area of 29 district hospitals. Within this hospital, there are 17 clinical departments including maternity, neonatology, and pediatrics. Muhima hospital is a district hospital located in Nyarugenge District which has been in operation since 2001; the hospital has a catchment area of 302,778 populations from ten health centers. Muhima

hospital is primarily a maternal-child Hospital (MOH, 2015). Its monthly birth rate is 630 babies while the annual birth rate is 7563 babies.

Rwanda Military Hospital: is a tertiary referral hospital which receives neonate from different district hospitals from Eastern Province and some in Kigali city. It also admits an average of 20 neonates per month only in NICU. The neonatology unit in this hospital is located in the middle of the hospital. The total number of neonatology staff is 42, 7 doctors (2 pediatricians and 5 pediatrician residents) and 35 nurses and midwives (means 1 holding masters in neonatology, 14 with A₀ and 20 with A₁ in nursing and midwifery). RMH is located in Kigali City, Kicukiro District, Nyarugunga sector, 3km from Kigali International Airport. This hospital was considered as hospital two in order to keep anonymity.

University Teaching Hospital of Kigali: is a teaching and tertiary referral hospital. It is commonly known as CHUK a French acronym of “Centre Hospitalier Universitaire de Kigali. CHUK receives a big number of neonates from different district hospitals of Northern Province and some in Kigali city. It admits an average of 45 neonates per month. The neonatology unit in this hospital is located near the entry of the hospital and main public road. Staff working in NCU are; 12 Nurses A₁, 1 Midwife A₁, 1 Nurse A₀, and 1 pediatric doctor. UTHK is built-in Kigali city, Nyarugenge District, Nyarugenge sector, situated in few meters from Serena Hotel. This hospital was considered as hospital one in order to keep anonymity.

Muhima hospital: is a district hospital that has been in operation since 2001, the hospital has a catchment area of 302,778 populations from ten health centers. Muhima hospital is primarily a maternal-child Hospital Its monthly birth rate is 630 babies while the annual birth rate is 7563 babies. The average monthly number of admission in NICU is 125 where preterm neonates are 80.

King Faysal hospital (KFH): Started in 1992 with the aim of providing specialized health care. It is among national referral hospitals and located in the capital of Rwanda -Kigali. It provides 34 services including executive services with 160-bed capacity. This institution offers a variety of services through different departments which include; Internal Medicine, Surgical, Pediatrics, and ICU, as well as other specialized departments. The neonates ‘intensive care unit (NICU) of this has 7 beds; receiving the neonate patients in life-threatening conditions.

KFH has a mandate to do specialized health care and to reduce patients that are transferred outside the country. The hospital has top quality medical personnel in the country in order to achieve the designated mandate. This hospital has expanded its services including open

heart surgery, kidney transplant, plastic surgery, and brain surgery. The hospital has acquired accreditation for three times repeatedly that is 2010, 2013 and 2016 by COHSASA (The Council for Health Service Accreditation of Southern Africa). The hospital has 40 doctors and 216 nurses

including midwives: 192 nurses and 23 midwives. Its Vision is to be a center of excellence in health service provision, clinical education, and research.

3.5. Population

The study population included 340 nurses and midwives working in Maternity, neonatal and pediatrics departments at four hospitals in Kigali (CHUK, RMH, KFH, and MDH)

3.5.1. Inclusion criteria

Inclusion criteria were being a registered nurse or midwife working in neonatology, maternity or pediatrics department during the study period.

3.5.2. Exclusion criteria

Being a nurse or midwife working in other services and having a level of study below advanced diploma (A1)

Being not able to answer in English

3.6. Sampling

This section discusses the sample size and sampling strategy used in this study

3.6.1. Sample size

The respective expected nurses and midwives in those 3 services at each hospital are the following: CHUK: 60 in maternity and 50 in neonatology, NICU & pediatrics. At Muhima Hospital: 45 in maternity, 20 neonatology and 25 in pediatrics. At Rwanda Military Hospital: 47 in maternity, 25 neonatology and NICU and 20 in pediatrics. At King Faysal Hospital: 20 in maternity, 13 neonatology and 15 in pediatrics. So the total expected study population is 340 nurses and midwives. From all the total study population of 340 nurses

and midwives working in maternity and neonatal units, only 184 were taken as sample size. This number was obtained by using Taro Yamane's sample size calculation formula to obtain reliable information. From that formula, the researcher assumes that the maximum proportion of nurses and midwives who will respond correctly is (p = 0.05) with a 95% confidence interval and 5% marginal error.

$$n = \frac{N}{1 + N(e)^2}$$

From this formula: n= corrected sample size, N = population size, and e = Margin of error (MoE).

$$n=340: 1+340(0.05)^2 = 183.7 = \pm 184$$

This sample size satisfies the requirement for the formula because it is applied when the population of the study is finite.

3.6.2. Sampling strategy

A stratified random sampling strategy was used in this study. Before randomizing study participants, proportion calculations based on population numbers were done in order to obtain the number of study participants from each hospital. After that, the random choice of participants in each service from all selected hospital was made by using a lottery on staff lists. Using the same technique, the replacement of participants who were absent or missed during the data collection period was done.

3.7.1. Variables and measures

In this study, variables that were measured are scattered into 3 sections: Section I is about social demographic variables with 7 items (age, gender, level of education, Profession, working experience in years, working department and level of the working hospital) they were presented using frequency and tables. Table.1.

Section II.1 measured awareness about climate. It is made of 11 items(awareness about: CC and global warming, current CC's situation in Rwanda, potential causes /risk factors of cc and global warming, cc is a threat and risky to human's health, CC is a threat and risky to neonatal health, potential direct/indirect neonatal health risks associated to CC, potential measures to be done in mitigation and adaptation to potential neonatal health risks

associated to CC, personal role and responsibilities to address potential neonatal health risks associated to CC through nursing practice, Guidelines for mainstreaming cc adaptation and Mitigation in Health Sector established by the government of Rwanda since 2013, the “WWHEN Checklist” for cc mitigation and adaptation at health facility level established by the government of Rwanda since 2013 and about what ICN urges to nurses regarding cc mitigation and adaptation). They were measured by answering Yes or No and presented in frequency table. Table.2.The level of awareness was presented using a bar chart. Figure 2.

Section II measured the source of awareness on cc using yes or no with 7 items (1: for school 2: Hospital /Co-workers/Friends 3: Radio/TV 4.Social media /internet. 5: for journal/ books readings, 6: Workshop/conference.7: >1 source *EXCEPT* for school. Results were presented using a Bar chart. Figure 4.(The section III.1. measured perceptions of potential neonatal health risks associated with CC through the Likert scale from strongly disagree, disagree , unaware , agree and strongly agree with 10 items(Prematurity, Lower birth weight, Death/morbidity from heat or cold stroke, neonatal infections, congenital malformations, Neonatal respiratory diseases, effects of exposure to ultraviolet rays, neonatal metabolic disorders, poor post-natal growth and neonatal psychological and behavioral disorders). They were presented in the frequency table and figure.Table.3 and figure 5.

The section III.1, measured self-reported actions/Intention towards actions leading to the reduction of climate change associated neonatal health risks regarding using I do it, I plan to do it, I neither do nor plan it. Here, 14 items were included (Assessing neonatal health risks related to CC to babies,- Unclothing, clothing and displace the newborn to a comfortable place to prevent heat/cold stroke,-Using /advocating for safe equipment like air conditioners and infrastructures that can protect the neonate against heat or cold stroke,- Raising CC and global warming issue and its neonatal related health risks in staff meetings and safety committee,- Buying local made products/food -Use Clean cooking methods,-Supporting &sensitizing colleagues about behaviors and lifestyle change to mitigate negative impacts of CC and neonatal health-Engaging and participating in cc health-related policy debates,-Organizing & attending clubs, conferences, workshops on CC and associated neonatal health-related issues, Educating parents/families/communities in prenatal and post-natal consultations on mitigation and adaptation to CC related neonatal health risks,-Attending short course on CC and associated neonatal/health consequences,-Engaging in research on negative impact of CC on human and neonatal health, mitigation and adaptation. Results were presented in the frequency table and figure. Table.4, and figure 6.

Section III.2 measured action and intention towards actions leading to the reduction of climate change associated neonatal health risks in respondents with personal cars. 2 items were measured (Walking/biking frequently rather than using a personal car/motorbike,-sing frequently public transport cars frequently instead of personal car/motorbike. Those variables' results were presented in frequency table and figure. Table.5 and figure 7.

Dependent and independent variables

Independent variables (IV): Demographic characteristics (age, gender, and profession, level of education, and working experience), awareness about climate change, and perceptions of potential neonatal risks associated with CC. Dependent variables (DV): self-reported actions and intention toward climate action will be dependent variables.

The following variables were measured using chi-square and presented in tables: Association between awareness of CC and socio-demographic variables. Table 6. Association between perceptions of potential direct/indirect neonatal health risk associated with CC and socio-demographic variables. Table 7. Association between nurses and midwives 'self-reported actions, and intention to CCMA and socio-demographic variables.

Table.8. Association between awareness levels, self-reported actions, and intention to actions leading to the reduction of climate change associated neonatal health risks. Table.9.Finally, the relationship between awareness level on CC, perceptions of potential neonatal health risks associated with CC, and position towards actions leading to the reduction of climate change associated neonatal health risks were measured using Spearman rho correlation test and presented in the table. Table 10.

3.7.2. Validity and reliability of research instruments

Validity designates the accuracy of the study. (Mohamad, Sulaiman, Sern, & Salleh, 2015) describe the validity of the research instrument as the strength of the extent to which that instrument measures what is supposed to measure. In this study, the data collection tools' content and construct validity was warranted based on study objectives and concepts from the conceptual framework. Moreover, the empirical literature review used in this study reinforced by the conceptual model helped to eliminate potential confounders. To minimize the representativeness bias due to sampling strategy and ensure external validity diminishes biases, the study randomized participants who met the inclusion criteria during the period of study. This could allow for generalization of the study findings in similar situations. Several variables have been assessed for their roles as confounders.

Reliability is defined by Mohamad et al., (2015) as a measure of the consistency and steadiness of results obtained by using a particular instrument. Within this study, to ensure reliability, the internal coherence of the research tool was established by a pre-tested on 10 persons with similar characteristics to the sample before the actual data collection on participants. After the pretest, the questionnaire was adjusted based on the feedback from the pre-test before being used for data collection. Cronbach Alpha test was used to verifying internal reliability and consistency between items from the scale. The reliability coefficient was found to be 0.7 and higher.

3.8. Data Collection

This section discusses profoundly on the study data collection instrument and the procedure used in collecting data.

3.8.1. Data Collection Instruments

The self-administered questionnaire written in English was used to collect data. That tool was a modified version of the data collection tool used by Nigatu and colleagues (Nigatu, Asamoah, & Kloos, 2014) with some additional items tailored to neonatal health and nursing and the Rwandan context. Using the ICN, WHO and Rwanda Guidelines for Mainstreaming Climate Change Adaptation and Mitigation in the Health Sector, some items' wording changes were done in order to adapt to the current study context. However, the root and meaning of each item were kept unchanged. The permission to use and modify the tool was sought from owners by email correspondence.

3.8.2. Data collection procedure

Managers of the three selected units at the study site were contacted to discuss a convenient time to meet the staff. Individual midwives or nurses were met in day duty hours at their respective working service and invited to participate voluntarily in the study. After the purpose of the study was explained, participants signed the informed consent form and the self-administered questionnaire (SAQ) was given. While the participant was answering the questionnaire, the investigator stayed near to give any language clarification in case it is needed by the participant. To complete the questionnaire it took about 20-25 minutes.

3.9. Data analysis

Hilfiker, Sun and Hong, (2018) state that data analysis is carried out to reduce arrange, also, to give meaning to the data. In this study, data were analyzed using Statistical Packages for Social Scientists (SPSS) software version 23. Descriptive and inferential statistics were used. A p-value of < 0.05 was statistically significant. Socio-demographic data were summarized using descriptive statistics (frequencies) and inferential statistical test including Chi-square and the Spearman rho correlation tests were used to assess the relationship (association and correlation) between study variables.

3.10. Ethical considerations

Ethical approval was obtained from the UR Institutional Review Board (IRB) and then permission to collect data was got from the research committees or administration of study sites. Voluntary participation and withdrawal from the study at any time were guaranteed to participants. Confidentiality and anonymity were assured through using only initials and not full names on the questionnaire, privacy, beneficence/non-maleficence, and justice principles were also assured. Data from the study were used for the purpose of this study only. A signed informed consent form was obtained from every participant before filling the SAQ.

3.11. Data management

Data were coded and entered into a personal computer with Statistical Packages for Social Scientists (SPSS) software 23rd version. Entered were double checked by the principal investigator to minimize errors. After that, data were cleaned via scrutinizing inconsistencies, errors, and omissions. Then, data were kept in a computer file with a password only known by the investigator and that cannot easily be guessed. Data saved on the flash drive for the backup purpose were destroyed later. Filled questionnaires were kept in the hermetically locked cupboard for confidentiality purpose and those kept on CDs were kept safely.

3.12. Data Dissemination

Findings from the study were presented to the University of Rwanda, study settings (hospitals where the study took place). There is a plan from the investigator to present findings to the ministry of health, the ministry of environment and in different workshops, national /international conferences and seminars. Then the manuscript for publication is under process. Hence, a copy of the study was deposited in the library of the University of Rwanda.

3.12. Limitations and challenges

To get the research approval from UR Institutional Review Boards (IRBs) from 4 hospitals took longer and hampered the work plan of this study. The study was completely not able to assess all actions to climate change mitigation and adaptation because the list of activities is too long and cannot be assessed in only one study. The scope of the study was limited in a manner that it assessed only nurses and midwives while at the hospital there is

a dynamic interrelationship among nurses and other health care providers that can influence awareness and perceptions of climate change-related health impact.

Also, the study was not able to observe nurses' self-reported actions to ensure whether they do that or not. It was limited only to self-reported action. Only nurses and midwives were asked whether they are aware or not. No test questions were included to know what they know and how much knowledge they have regarding climate change and associated neonatal health risks. Findings from this study cannot be generalized because of small sample size used and nurses and midwives from all hospitals Kigali were not assessed.

3.13. The conclusion to chapter three

In conclusion, this study is a quantitative design. Only nurses and midwives from Kigali selected hospitals were assessed with a self-administered questionnaire. Validity and reliability of the tool are insured in the study. Hence, privacy, anonymity, and autonomy were guaranteed in this study. Descriptive statistics and inferential statistics using SPSS version 23 were done and results presented in tables. Despite findings from this study are to be disseminated in different ways, this study cannot be generalized since it was done only on small sample size and also not in all Rwandan hospitals.

CHAPTER FOUR: PRESENTATION OF RESULTS

4.1 Socio-demographic characteristics of participants

Table 1: Socio-demographic characteristics of participants

Socio-demographic characteristics	n (%)	
Age	20- 29	37 (20.9%)
	30-39	70 (39.5%)
	40- 49	64 (36.2%)
	≥50	6 (3.4%)
Gender	Male	67 (37.9%)
	female	110 (62.1%)
Education level	advanced diploma	98 (55.4%)
	Bachelor's	61 (34.5%)
	Master's	18 (10.2%)
Profession	Nurse	107 (60.5%)
	Midwife	68 (38.4%)
	Nurse-Midwife	2 (1.1%)
Working department	maternity	57 (32.2%)
	neonatology	63 (35.6%)
	pediatrics	57 (32.2%)
Working Experience	<3months	13 (7.3%)
	3 months to 1 year	24 (13.6%)
	2 years to 5 years	96 (54.2%)
	>5years	44 (24.9%)
Level of hospital	University teaching	51 (28.8%)
	Referral	50 (28.2%)
	District	35 (19.8%)
	Private	41 (23.2%)

Table.1.shows the majority, n=110 (62.1%) of respondents were female, the majority, n=70(39.5%) were aged 30-39,the majority, n=98 (55.4%) have advanced diploma level, the majority107(60.5%) are nurses, the majority, n=63(35.6%) works in neonatology department , the majority have working experience of between 2 to 5,n= 96(54.2%) and the majority, n=51(28.8%) works in university teaching hospital.

Table 2. Nurses and midwives awareness on climate change about climate change, associated neonatal health impacts and available resources to mitigation and adaptation

Awareness about climate change	Yes	No
	n (%)	n (%)
Climate change and global warming	168 (94.9%)	9 (5.1%)
Current climate change's situation in Rwanda	107 (60.5%)	70 (39.5%)
Causes /risk factors that can lead to cc and global warming	163 (92.1%)	14 (7.9%)
Threat and risky to human's health	166 (93.8%)	11 (6.2%)
Threat and risky to neonatal health	134 (75.7%)	43 (24.3%)
Potential direct/indirect neonatal health risks associated to cc	134 (75.7%)	43 (24.3%)
Potential measures to be done in mitigation and adaptation to	114 (64.4%)	63 (35.6%)
Personal role and responsibilities as a nurse/midwife to address	79 (44.6%)	98 (55.4%)
Guidelines for Mainstreaming CC Adaptation and Mitigation in the Health Sector established by the government of Rwanda since 2013	2 (1.1%)	175 (98.9%)
WWHEN Checklist" for CCMA at health facility level established by the government of Rwanda since 2013	3 (1.7%)	174 (98.3%)
International Council for Nurses (ICN) urge to nurses regarding CCMA	4 (2.3%)	173 (97.7%)

The table.2 shows most of the respondents=168(94.9%) are aware of climate change and global warming, 163(92.1%) are aware of potential causes /risk factors that can lead to climate change and global warming. The majority, n=166 (93.8%) are aware climate change is a threat and risky to human health, n= 134(75.7%) are aware climate change is a threat and risky to neonatal health. Also, the majority=114(64.4%) are aware of potential measures to be done in mitigation and adaptation to potential neonatal health risks associated with climate. However, only, n=2 (1.1%) are aware of the guidelines for mainstreaming climate change adaptation and Mitigation in the Health Sector established by the government of Rwanda since 2013, only n=3(1.7%) are aware of the “WWHEN checklist” for climate change mitigation and adaptation at health facility level established by the government of Rwanda since 2013. Then, only, n=4(2.3%)are aware of what the

International Council for Nurses (ICN) urges to nurses regarding climate change mitigation and adaptation.

Nurses and midwives awareness level about climate change, associated neonatal health impact, and available resources to mitigation and adaptation

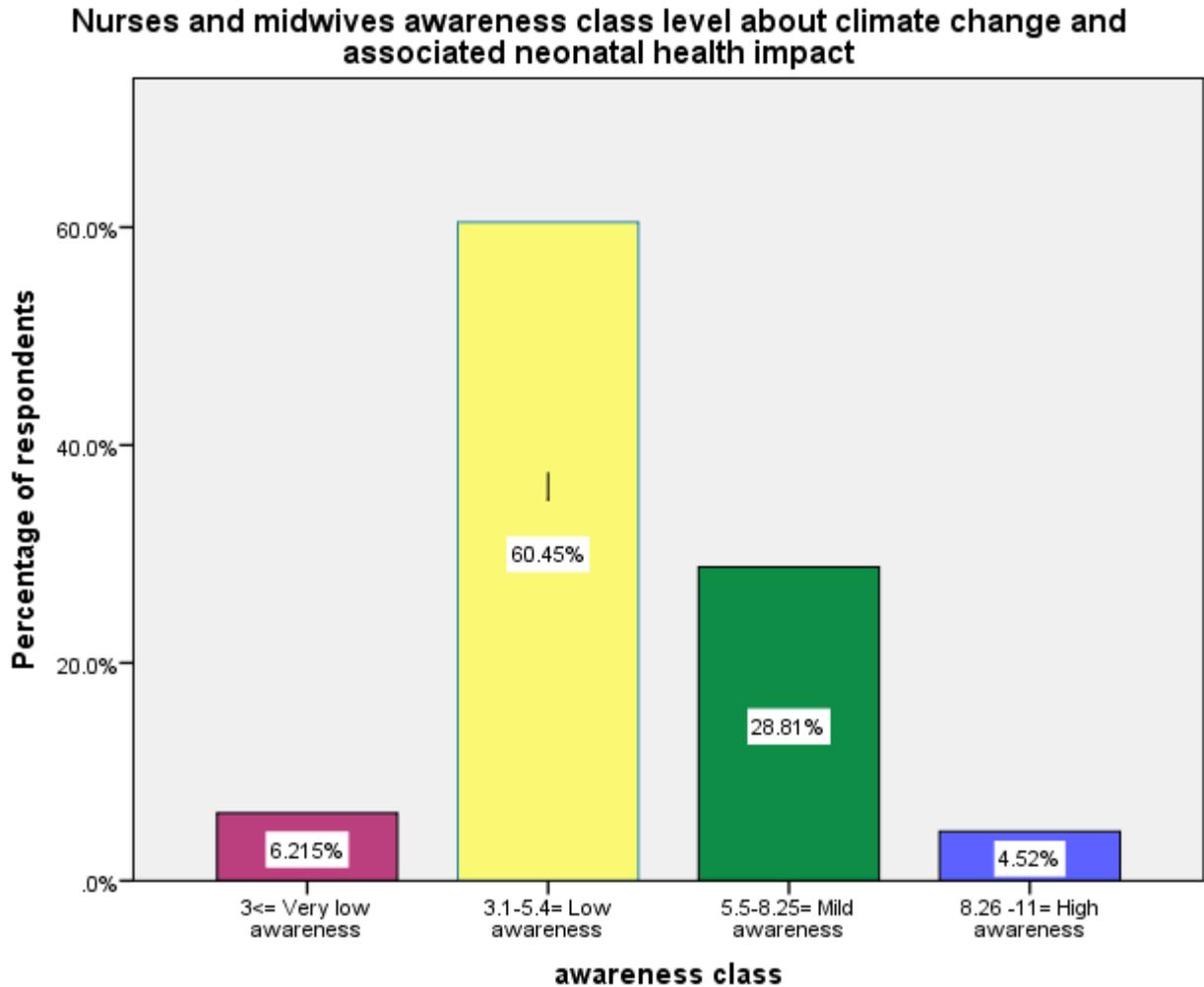


Figure 1, shows nurses and midwives' awareness class level about climate change associated neonatal health impacts, and available resources to mitigation and adaptation.

After giving scores to 11 items of awareness on the total score of 11 and classifying respondents according to their respective individual score, the majority of respondents are in low awareness class 60.4 % (107) with an individual total score ranging between 3.1 to 5.4 and only 8 (4.52%) Respondents who scored 8.26 to 11 were found to be in high-level

awareness. Then 6.2% are in very low-class awareness against 28.8% who are in mild class. This classification method was adapted from Akrofi, Antwi and Gumbo, (2019).

Nurses and midwives climate change awareness source

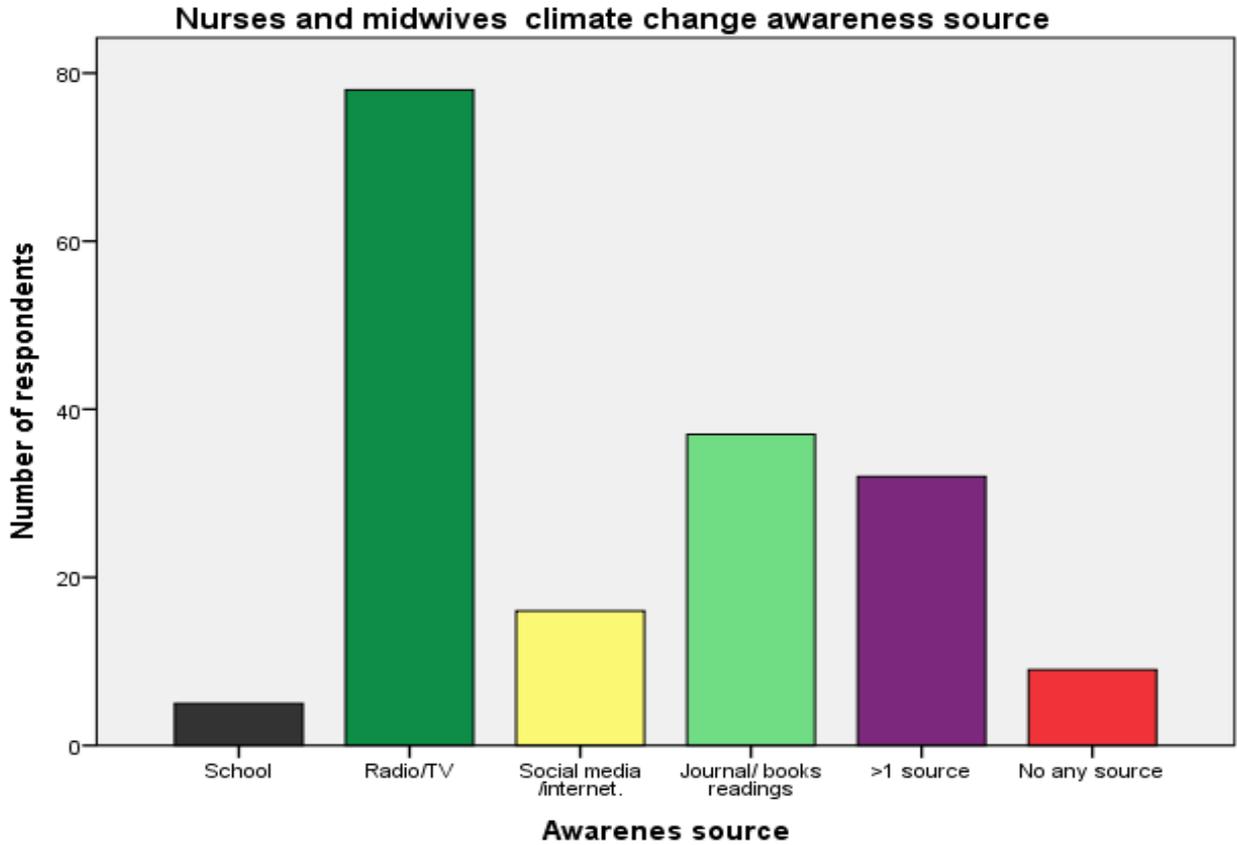


Figure 2. Climate change awareness source

Figure 6 shows that the majority of respondents got the awareness of climate change from radios and TV=78(44.1%). However, only 5(2.8%) reported they got awareness from nursing school.

Nurses and midwives' awareness level on climate change compared to awareness source

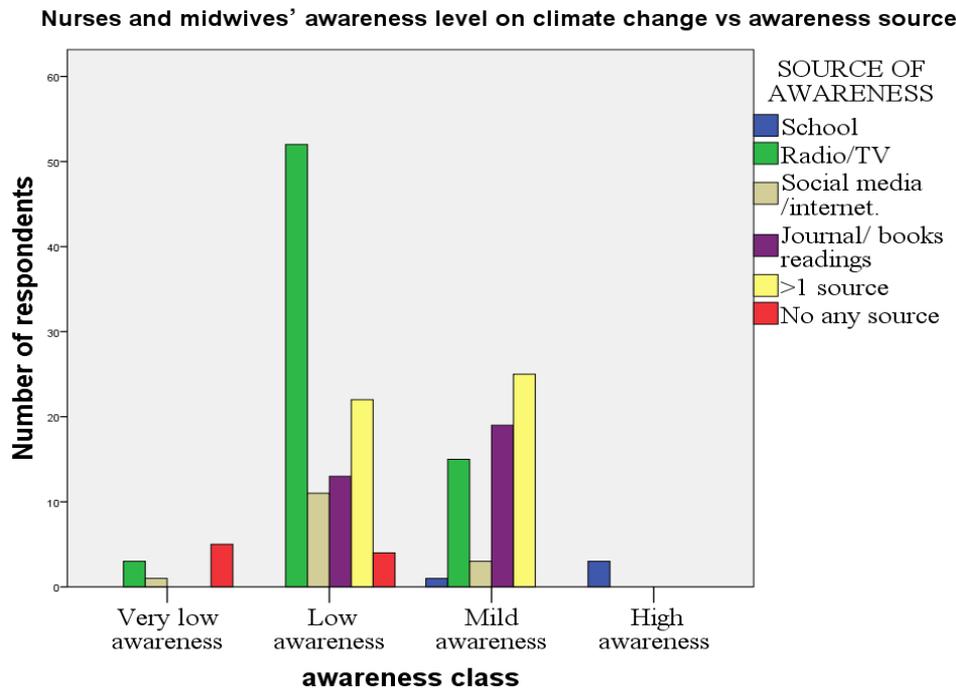


Figure 3. Nurses and midwives' awareness level on climate change vs awareness source

Figure.7 shows that all respondents with high awareness level respondents were from those who got awareness from school.

Table 3. Perceptions about potential neonatal health risks associated with climate change

Potential neonatal health risk	Strongly disagree	Disagree	Unaware	Agree	Strongly agree
	n (%)	n (%)	n (%)	n (%)	n (%)
Prematurity.	7 (4.0%)	5 (2.8%)	81 (45.8%)	69 (39.0%)	15 (8.5%)
Lower birth weight.	5 (2.8%)	15 (8.50%)	89 (50.3%)	54 (30.5%)	14 (7.9%)
Sudden Death	3 (1.7%)	5 (2.8%)	87 (49.2%)	70 (39.5%)	12 (6.8%)
Neonatal infections.	8 (4.5%)	8 (4.5%)	88 (49.7%)	68 (38.4%)	5 (2.8%)
Congenital malformations.	8 (4.5%)	6 (3.4%)	101 (57.1%)	58 (32.8%)	4 (2.3%)
Neonatal respiratory diseases.	4 (2.3%)	7 (4.0%)	85 (48.0%)	72 (40.7%)	9 (5.1%)
Effects of exposure to ultraviolet	5 (2.8%)	3 (1.7%)	71 (40.1%)	88 (49.7%)	10 (5.6%)
Poor post-natal growth.	8 (4.5%)	9 (5.1%)	83 (46.9%)	67 (37.9)	10 (5.6)
Neonatal psychological and behaviors disorders.	8 (4.5%)	10 (5.6%)	94 (53.1%)	60 (33.9%)	5 (2.8%)

The table.3 shows that the majority of respondents are unaware of all the above listed potential neonatal health risks. Only n=15 (8.5%) strongly agreed on prematurity and n=5(2.8%) strongly agreed on neonatal infections. 9(5.1%) respondents strongly agreed on neonatal respiratory diseases and 10(5.6%) strongly agreed on the effects of exposure to ultraviolet rays.

Nurses and midwives perception level on potential neonatal health risks associated with climate change

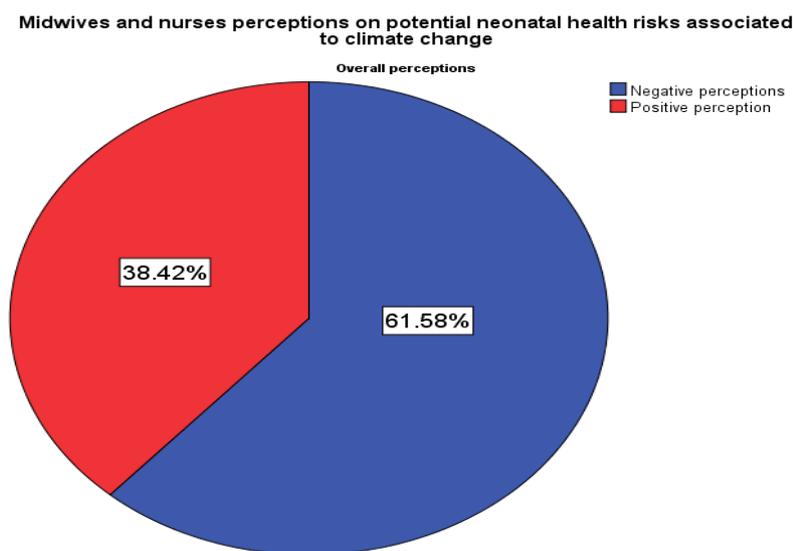


Figure 4. Nurses and midwives perception level about potential neonatal health risks associated with climate change

From the total score of the above scale with the optimum cut-off point of 3.5 obtained from Receiver Operator Characteristic (ROC) Curve, Figure.8 shows that the majority of participants 108(61%) had negative perception regarding potential neonatal health risks associated with climate change. This classification method was adapted from Akrofi, Antwi and Gumbo, (2019).

Table 4. Nurses and midwives self-reported actions and intention towards reduction of climate change associated neonatal health risks

Self-reported actions and intention to CCMA	I do it	I plan to do it	I neither do nor plan it
	n (%)	n (%)	n (%)
Assessing neonatal health risks related to cc to all babies	9 (5.1%)	33 (18.6%)	135 (76.3%)
Unclothing ,clothing and displace the new-born	99 (55.9%)	37 (20.9%)	41 (23.2%)
Using /advocating for safe and protecting equipment	17 (9.6%)	43 (24.3%)	117 (66.1%)
Raising the issue in staff meetings or safety committee.	6 (3.4%)	28 (15.8%)	143 (80.8%)
Buying local made products/food at home	17 (9.6%)	30 (16.9%)	81 (73.4%)
Use Clean cooking methods at home.	69 (39.0%)	61 (34.5%)	47 (26.6%)
Supporting & sensitizing colleagues on behaviors and lifestyle change	25 (14.1%)	96 (54.2%)	56 (31.6%)
Participate in cc's health related policy and debates	2 (1.1%)	42 (23.7%)	133 (75.1%)
Attending clubs, conferences, workshops on cc and neonatal health issues.	4 (2.3%)	78 (44.1%)	95 (53.7%)
Educating parents/families/communities in ANC and PNC about cc issue on health and on CCMA	5 (2.8%)	75 (42.4%)	97 (54.8%)
Attending a short course on cc and neonatal/health consequences.	2 (1.1%)	8 (4.5%)	167 (94.4%)
Doing research on cc and related neonatal health risks on	0 (0%)	3 (1.7%)	174 (98.3%)

Table 4 shows that from all items, fewer respondents self-reported specific actions towards the reduction of climate change associated neonatal health risks compared to those who neither do nor plan to do that. More respondents to self-reported action are only for unclothing, clothing and displace the new-born to a comfortable place to prevent heat/cold stroke=99(55.9%). Only 9(5.1%) assess neonatal health risks related to CC and the majority n=135(76.3%) do not have any intention to do that. Only 6(3.4%) claim the issue of cc and its neonatal related health risks issue in staff meetings and safety committee. The majority do not have intention to: advocate for safe equipment like air conditioners and infrastructures that can protect the neonate against heat or cold stroke 117(66.1%), engage

and participate in climate change health-related policy 133(75.1%) ,engage in research174(98.3%), buy locally made products/food not only due to prices or quality difference s or other reason but in order to reduce gases. emission and air pollution that destroys ozone layer through transportations=81(73.4%), to rise cc and global warming and neonatal related health risks issue in staff meetings or safety committee n=143(80.8%) and include cc and health consequences family teaching in prenatal and post-natal consultations n=97(54.8%). Despite only 2(1.1%) respondents they attended CC and associated neonatal/health consequences meeting, the majority n=167(94.4%) does not have the intention to attend it. No respondent does research on cc and related neonatal health risks but only 3(1.7%) have the intention to do that. The majority of the intention to CCMA only seen on supporting &sensitizing colleagues about behaviors and lifestyle change, n=96(54.2%). The majority of respondents 75.1% had no intention to participate in climate change health-related policy.

Nurses and midwives’ position towards actions leading to the reduction of climate change associated neonatal health risks

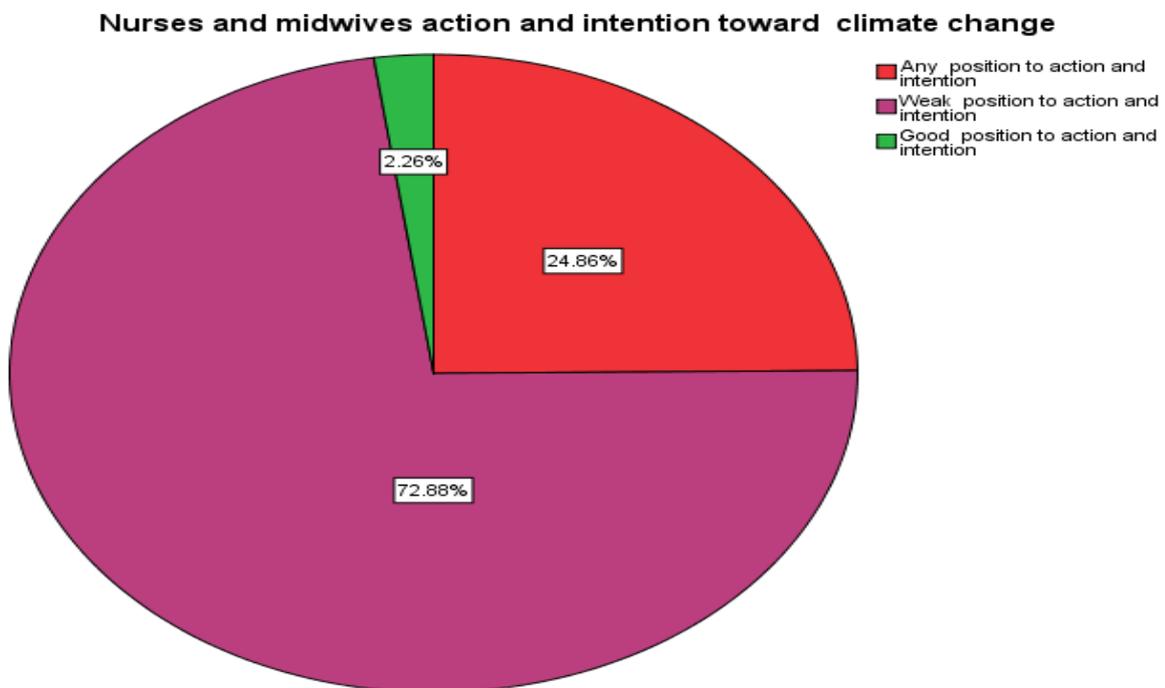


Figure 5. Nurses and midwives’ position towards actions leading to the reduction of climate change associated neonatal health risks

Figure 5 shows that after the total position to action and intention ‘score was done from 14 items; the majority of respondents 129 (72.9%) were in the class of weak action and intention to CCMA while only 4(2.3%) were in a strong class. This classification method was adapted from Akrofi, Antwi and Gumbo, (2019).

Table 5. Nurses and midwives with personal cars and self-reported actions and intention towards the reduction of climate change associated neonatal health risks

Self-reported action/intention	Having a car/motorbike	I do it n (%)	I plan to do it n (%)	I neither do nor plan it n (%)
Walking/biking frequently rather than using a personal car/motorbike	Yes	3 (5.3%)	7 (12.5%)	46 (82.1%)
Using frequently public transport cars frequently instead of personal car/motorbike	Yes	5 (8.9%)	9 (16.0%)	42 (75.0%)

Table 5 shows that the majority of respondents who had a personal car or motorbike were neither doing or planning to walk or bike 46 (82.1%) and had no plan to use public transport cars frequently 42(75.0%) in order to reduce carbonic gas emission and air pollution that destroy the ozone layer.

Nurses and midwives’ position to walking, biking and using public transport

Nurses and midwives with personal car and their position toward walking, biking and using public transport to reduce ozone layer destruction

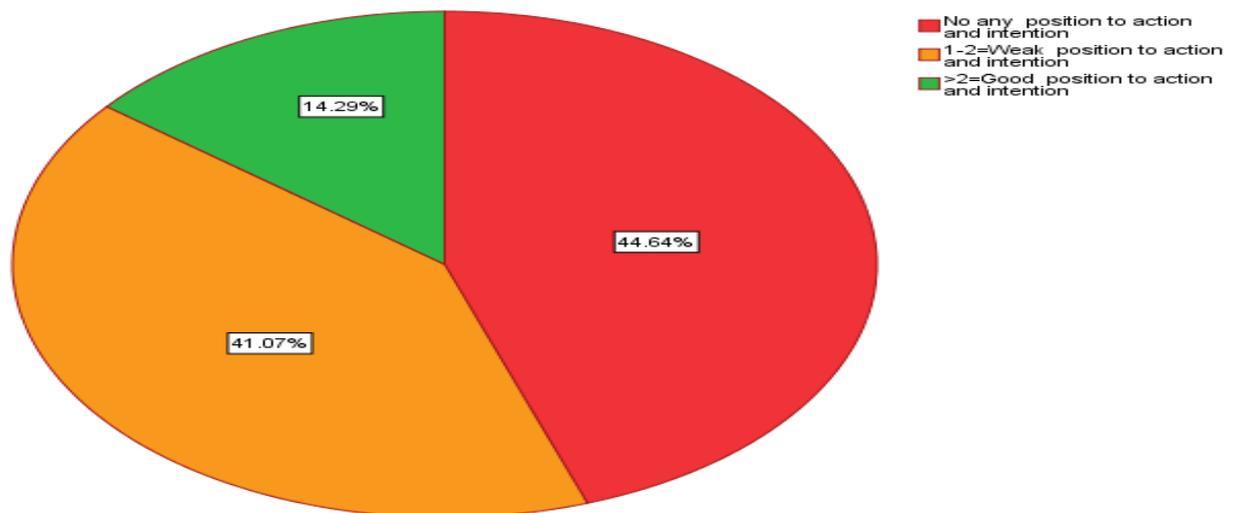


Figure 6. Position towards actions leading to the reduction of climate change associated neonatal health risks among nurses and midwives with personal car

The Figure 7 shows that the majority of respondents who had personal cars =25 (44.6%) were in class of no any action and intention and only 8 (14.2%) in class of good position to action and intention toward climate change mitigation and adaptation through walking, biking and using public transport frequently instead of personal car to reduce carbonic gas emission and air pollution that destroy ozone layer. This classification was obtained after attributing marks to each item on action and plan (0=no action and no plan, 1= plan and 2 for do). From the total score of 4, those who scored 0 = No any position to action and intention, 1-2= Weak position to action and intention and >2= Good position to action and intention. This classification method was adapted from Akrofi, Antwi and Gumbo, (2019).

Table 6. Association between socio-demographic variables and nurses and midwives' awareness level on climate change and associated neonatal health risks

Sociodemographic characteristics	Nurses and midwives 'awareness level				X ²	Value	df	p-value
	No awareness n (%)	Low awareness n (%)	Mild awareness n (%)	High awareness n (%)				
Age					11.1	9	0.269	
20- 29	3 (1.7%)	24 (13.6%)	10 (5.6%)	0 (0.0%)				
30-39	4 (2.3%)	35 (19.8%)	31 (17.5%)	0 (0.0%)				
40- 49	1 (0.6%)	40 (22.6%)	21 (11.9%)	2 (1.1%)				
≥50	1 (0.6%)	3 (1.7%)	2 (1.1%)	0 (0.0%)				
Gender					4.24	3	0.236	
Male	1 (0.6)	40 (22.6%)	26 (14.7%)	0 (0.0%)				
Female	8 (4.5)	62 (35.0%)	38 (21.5%)	2 (1.1%)				
Education level					14.64	6	0.023	
Advanced diploma	8 (4.5)	62 (35.0%)	28 (15.8%)	0 (0.0%)				
Bachelor's	2 (1.2)	29 (16.4%)	30 (16.9%)	1 (0.6%)				
Master's	0 (0.0)	11 (6.2%)	6 (3.4%)	3 (1.9%)				
Profession					44.4	6	0.235	
Nurse	6 (3.4)	63 (35.6%)	37 (20.9%)	3 (1.8%)				
Midwife	3 (1.7%)	38 (21.5 %)	27 (15.3%)	0 (0.0%)				
Nurse-Midwife	0 (0.0%)	1 (0.6%)	0 (0.0%)	1 (0.6%)				
Work department					44.4	6	0.010	
Maternity	1 (0.6%)	36 (20.3%)	20 (11.3%)	0 (0.0%)				
Neonatology	6 (3.4%)	34 (19.2%)	21 (11.9%)	2 (1.1%)				
Pediatrics	2 (1.1%)	32 (18.1%)	23 (13.0%)	0 (0.0%)				
Work Experience					11.8	9	0.225	
<3months	0 (0.0%)	9 (5.1%)	4 (2.3%)	0 (0.0%)				
3 months to 1 year	1 (0.6%)	13 (7.3%)	10 (5.6%)	0 (0.0%)				
2 years to 5 years	8 (4.5%)	55 (31.1%)	33 (18.6%)	0 (0.0%)				
>5years	0 (0.0%)	25(14.1%)	17 (9.6%)	2 (1.1%)				
Level of hospital					12.7	9	0.175	
District	1 (0.6%)	31 (17.5%)	18 (10.2%)	0 (0.0%)				
University teaching	6 (3.4%)	21 (11.9%)	22 (12.4%)	2 (1.2%)				
Private	7 (4.0%)	21 (11.9%)	22 (12.4%)	0 (0.0%)				
Referral	1 (0.6%)	26 (14.7%)	14 (7.9%)	2 (1.2%)				

The table 6 shows there is an association between education level and high awareness level on climate change and associated neonatal health risks(X² value=14.64, df=6, p=<0.05). Association was also found on working department (X²=value=44.4, df=6, p=<0.05).However, no statistical significance was found on age, gender, working experience and level of working hospital.

Table 7. Association between socio-demographic variables and strong perceptions of potential direct/indirect neonatal health risk associated with climate change

Sociodemographic characteristics	Level of perception		X ²	Value	df	p-value
	Weak perception n (%)	Strong perception n (%)				
Age				3.044	3	0.385
20- 29	27 (15.3%)	10 (5.6%)				
30-39	40 (22.6%)	30 (16.9%)				
40- 49	38 (21.5%)	26 (14.7%)				
>=50	3 (1.7%)	3 (1.7%)				
Gender				0.982	1	0.322
Male	43 (24.3%)	23 (13.0%)				
Female	64 (36.2%)	46 (26.0%)				
Education level				1.155	2	0.561
Advanced diploma	63 (35.6%)	34 (19.2%)				
Bachelor's	34 (19.2%)	27 (15.3%)				
Master's	11 (6.2%)	7 (4.0%)				
Profession				1.397	2	0.497
Nurse	69 (39.0%)	38 (21.5%)				
Midwife	38 (21.5%)	30 (16.9%)				
Nurse-Midwife	1 (0.6%)	1 (0.6%)				
Work department				2.486	2	0.289
Maternity	30 (16.9%)	27 (15.3%)				
Neonatology	41 (23.2%)	22 (12.4%)				
Pediatrics	37 (20.9%)	20 (11.3%)				
Work Experience				7.682	3	0.049
<3months	10 (5.6%)	3 (1.7%)				
3 months to 1	12 (6.8%)	12 (6.8%)				
2 to 5	65 (36.7%)	31 (17.5%)				
>5	21 (11.9%)	23 (13.0%)				
Level of hospital				0.370	3	0.946
District	32 (18.1%)	19 (10.7%)				
University teaching	29 (16.4%)	21 (11.9%)				
Private	21 (11.9%)	14 (7.9%)				
Referral	26 (14.7%)	15 (8.5%)				

Table 7 shows there is a weak statistical significance found between working experience and strong perceptions of potential direct/indirect neonatal health risk associated with CC(p=<0.05) among nurses and midwives. But, no statistical significance found on age, gender, profession, level of education, working department and level of working hospital.

Table 8. Association between position towards actions leading to the reduction of climate change associated neonatal health risks and socio-demographic variables

Demographic Variable	Overall self-reported action and intention to CCMA			X ²		
	No, position n(%)	any Weak position n (%)	Strong position n (%)	Value	df	p-value
Age (in years)				7.831	6	0.251
20- 29	8 (4.5%)	28 (15.8%)	1 (0.6%)			
30-39	10 (5.6%)	51 (28.8%)	9 (5.1%)			
40- 49	5 (2.8%)	49 (27.7%)	10 (5.6%)			
>=50	1 (0.6%)	5 (2.8%)	0 (0.0%)			
Gender				0.613	2	0.736
Male	9 (5.1%)	52 (29.4%)	6 (3.4%)			
Female	15 (8.5%)	81 (45.8%)	14 (7.9%)			
Level of education				20.60	4	0.000
Advanced diploma	16 (9.0%)	74 (41.8%)	5 (2.8%)			
Bachelor's	6 (4.5%)	46 (26.0%)	7 (4.0%)			
Master's	0 (0.0%)	13 (7.3%)	8 (4.5%)			
Profession				4.079	4	0.395
Nurse	16 (9.0%)	78 (44.1%)	13 (7.3%)			
Midwife	8 (4.5%)	54 (30.5%)	6 (3.4%)			
Nurse-Midwife	0 (0.0%)	1 (0.6%)	1 (0.6%)			
Working department				1.852	4	0.763
Maternity	8 (4.5%)	43 (24.3%)	6 (3.4%)			
Neonatology	6 (3.4%)	50 (28.2%)	7 (4.0%)			
Pediatrics	10 (5.6%)	40 (22.6%)	7 (4.0%)			
Working Experience				21.94	6	0.001
<3months	4 (2.3%)	8 (4.5%)	1 (0.6%)			
3 months to 1 year	2 (1.1%)	19 (10.7%)	3 (1.7%)			
2 years to 5 years	16 (9.0%)	76 (42.9%)	4 (2.3%)			
>5years	2 (1.1%)	30 (16.9%)	12 (6.8%)			
Level of hospital				17.71	6	0.007
District	9 (5.1%)	25 (14.1%)	1 (0.6%)			
University teaching	2 (1.1%)	37 (20.9%)	11 (6.2%)			
Private	8 (4.5%)	31 (17.5%)	2 (1.1%)			
Referral	5 (2.8%)	40 (22.6%)	6 (3.4%)			

The table 8 shows that there is statistical significance between the high level of education, working in the high-level hospital, working experience of more than 5 years and being in a strong position to climate action among nurses and midwives. $p < 0.05$.

Table 9. Association between position towards actions leading to the reduction of climate change associated neonatal health risks and awareness level on climate change

	Awareness level				X ²	Value	df	p-value
	No awareness n (%)	Low awareness n (%)	Mild awareness n (%)	High awareness n (%)				
Position to action & intention to CCMA						116.34	6	0.000
Any position to action and intention.	9 (5.1%)	24 (13.6%)	12 (6.8%)	0 (0.0%)				
Weak position to action and intention.	0 (0.0%)	78 (44.1%)	52 (29.4%)	0 (0.0%)				
Strong position to action and intention.	0 (0.0%)	0 (0.6%)	0 (0.0%)	2 (1.1%)				

Table 9 shows there is strong statistical significance ($p < 0.05$) between the high-level awareness on CC and strong position towards actions leading to the reduction of climate change associated neonatal health risks. Respondents with high awareness were more likely to be in strong position 2(1.1%) to CCMA compared to those with no awareness 0 (0.0%), low awareness 0(0.0%) and mild awareness 0 (0.0%).

Relationship between climate change, position towards actions leading to the reduction of climate change associated neonatal health risks and awareness level on climate change

Independent variables(IV) vs Dependent Variables(DV)	N=177	Spearman's rho Correlation Coefficient	p-value
High-level awareness on CC vs positive perceptions of potential neonatal health risks		0.224	0.010
High-level awareness on CC vs strong position to action and intention towards CCMA.		0.253**	0.000
Positive perceptions of potential neonatal health risks vs strong action and intention toward CCMA.		0.171*	0.023

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table 10 shows there is a positive correlation and statistical significance between high awareness level on climate change and negative perceptions of potential neonatal health risks associated with CC $r=0.224^{**}$, $p < 0.05$. A positive correlation with strong statistical significance is found between high-level awareness on CC and strong position towards actions leading to the reduction of climate change associated neonatal health risks. $r=0.253$, $p < 0.05$. Finally, the positive correlation is found between positive perceptions of potential neonatal health risks and strong action and intention toward CCMA. $r=0.171$, $p < 0.05$.

CHAPTER 5: DISCUSSION

5.1. Sociodemographic variables

Out of the 184 nurses and midwives sampled for the study, 177 (95.67%) completed the questionnaire. 2 (1.1%) refused to participate while 5 (2.7%) missed in service to complete the questionnaire. This shows that the response rate was good and the level of attrition was very low. As described in Table 1, the majority (60.4%) of participants was still young (below 40 years old. The female's number was higher than in males 62.1% and 37.9 %. This might be due to that originally nursing is a female dominant profession. Nurses made 60.5% of participants while midwives were 38.4% and nurse-midwives were 1.10%. More than half of participants had advanced diploma level (55.4%) while (35.6%) were working in neonatology compared to (32.2%) each in maternity and pediatrics. More than half (54.2%) of participants had working experience of 2 years to 5 years and the working hospital rate was (28.8%) in University teaching, (28.2%) Referral, 19.8 % (District), (23.2%) private. Table 1. These study findings are closely similar to those of the study done by (Akrofi et al., 2019).

5.2. Nurses and midwives awareness of climate change and associated neonatal health risks

In this study, results show that the majority 94.9% of participants were aware of climate change and global warming, 92.1% are aware of potential causes /risk factors that can lead to climate change and global warming and 93.8%) aware about climate change is a threat and risky to human's health. Also, 75.7% were aware climate change is a threat and risky to neonatal health and 64.4% aware of potential measures to be done in mitigation and adaptation to potential neonatal health risks associated with climate. However, very few participants 1.1% were aware of the guidelines for mainstreaming climate change adaptation and Mitigation in the Health Sector established by the government of Rwanda since 2013, 1.7% aware about the "WWHEN checklist" for climate change mitigation and adaptation at health facility level established by the government of Rwanda since 2013 and only 2.3% aware about what the International Council for Nurses (ICN) urges to nurses regarding climate change mitigation and adaptation. Despite the majority of participants are aware that climate change and global warming and are threats and risky to neonatal health, the majority (60.4 %) of respondents were in low awareness class, only 4.5% were in high-

class awareness about climate change's associated neonatal health impacts and available resources to mitigation and adaptation. Table 2 and Figure 5.

Findings of this study are similar to those of a study done in Bangladesh by Kabir et al., (2016) where the majority of the respondent was in low-class awareness. However, findings of this study differ from that reported in the study done by (Nigatu et al., 2014) in Ethiopia where it was found that 77.5% of health care providers had a high level of awareness about climate change. This difference may be due to that in other countries health care providers are taught about climate change-related health risks when they are still at school. Moreover, it may be due to that sensitization regarding climate change mitigation and adaptation specifically to health care providers is still low in Rwandan health facilities. From the lower, mild and high awareness found among some nurses and midwives in this study, it can be the basis to upgrade their knowledge and awareness level on the negative impact of climate change to neonatal health and how to mitigate and or to adapt to those effects.

5.3. Source of awareness of climate change and associated neonatal health risks among nurses and midwives

The predominant source of awareness was mass media: radio and TVs 44.1% and only 2.8% responded they got awareness from school. These results are similar to those of a study done in Bangladesh by (Kabir et al., 2016) where results showed that most respondents had obtained information on climate change issues from electronic mass media. The nursing school curriculum is the best option to prepare nurses and midwives to effectively address the health impacts of climate change because the information received through mass communication is not sufficient to prepare health sciences, students, to effectively design interventions to tackle health effects of climate change.

5.4. Demographic variables and awareness of climate change's associated neonatal health risks

Gender: Although there was no statistical significance shown in gender regarding awareness on climate change, it is found that there is a slightly higher proportion of females (1.7%) with high awareness than males 0.6%. Similarly, a study conducted by (Nigatu et al., 2014) in Ethiopia where it was found that women had a better understanding of the impact of climate change than men, and the review by (Pearse, 2017) concluded that women generally recognize climate change as a more severe threat than

men. These gender differences may be attributed to the relatively higher social responsibility of Rwandan women than men in their communities.

Hence, women are always on top of caring babies from inside the uterus to the neonatal period. This increases women's awareness of causes, negative consequences of climate change to neonate's health and other related information. This pattern of female awareness can be a chance to profit when we want to activate the participation of women in debates on mitigation and adaptation to neonatal health risks associated with climate change. Thus, since women in our country are the majority of the total population and that our country has empowered them, they have the capability to change the environment; we can use them in mitigation and adaptation to health issues related to climate change.

Age: This study also shows that the awareness of climate change varies in accordance with age, working experience. In this study, a high level of awareness on climate change and related neonatal health risks was more likely to be higher in older respondents and with longtime working experience than younger. These findings are similar to the study done in Ethiopia by (Nigatu et al., 2014) and those of a study done in Nigeria by (Sola & Michael, 2016). This may be related to that older respondents have lived experience with bad effects of climate change on human health compared to young ones who only read climate change from books and the internet. May be, older people know what change and what not changed regarding the environment temperature and its consequences. This is an added advantage we can use older nurses and midwives to support and encourage younger ones toward mitigation and adaption to negative effects of cc on neonates.

Level of education and profession: In this study, respondents with bachelor's and master's level were more likely to have a higher level of awareness on CC and associated neonatal health risks than those with an advanced diploma. These findings are similar to the study done in China (Yang et al., 2018). Another similarity was from a study done in Bangladesh where age, educational qualification, and profession were significantly associated with the awareness about climate change(Kabir et al., 2016). Highly educated nurses and midwives can and should be taken as a cornerstone in raising awareness cc neonatal health-related risks and help to shape the attitudes and practices of the new generations toward actions to mitigation and adaptation.

Level of a working hospital: In this study results show that respondents working in University teaching I and referral hospitals were more likely to have higher level awareness

on CC and associated neonatal health risks than those working in private and district ones. These findings are similar to the study done in China (Wei et al., 2014). This may be related to that there are many specialists who are very knowledgeable with different expertise that share knowledge and skills with other remaining staff. Hence, at high-level hospitals, there is various in-service training, workshops done there.

Working department: Nurses and midwives working in the neonatology unit were more likely to have higher -level awareness on CC and associated neonatal health risks. These findings are similar to the study done in China (Yang et al., 2018). It may be due to that they always deal with clients who cannot offer enough information regarding what causes the disease and they are obliged to do deep critical thinking and searches around all possible factors that may induce neonatal mortality and or morbidity. Moreover, in neonatology service nurses and midwives working there take consideration of the environmental factors in treating and preventing relevant disease conditions. We can use them to advocate social and environmental actions for improving neonatal health.

Profession: Nurses were more likely to be in the category of high-level awareness on CC and associated neonatal health risks than midwives. These results are similar to a study done by (Yang et al., 2018) in China where both nurses had a high awareness level on CC as the same as their medical and other health care providers' counterparts. Maybe this is caused by the differences in educational programs or the differentiation in professional functions between nurses and midwives. Climate change should be integrated into and nursing students and midwifery curricula.

5.5. Nurses and midwives perceptions on potential neonatal health risks associated with climate change

The findings of this study show that the most perceived potential neonatal health risk by respondents was ultraviolet rays effects (49.7%) followed by death/morbidity from heat or cold stroke (39.5%). These results are closely similar to those of a study in East Harlem, New York (USA), where around 50.0% of local health officials perceived climate change impacts to constitute a serious risk to human health. (Sheffield, Durante, Rahona, & Zarcadoolas, 2014).

After compiling the total perception's scores on potential neonatal health risks from each individual, the majority of the respondent was found in weak perception group. This is

similar to a study done by (Anåker et al., 2015) and that of (Yang et al., 2018) in China where the majority were unable to unaware of some of potential climate change-related health impact despite they knew the causes of CC and aware that CC has negative impacts on human's health. This may be related to that heat and UV rays' effects on neonates' health can be more easily and directly observed through skin manifestations than others. That's maybe why the majority of respondents perceived unaware and negatively other potential neonatal risks associated with CC. There is a need to teach and train nurses and midwives about various consequences of climate change on neonatal health.

5.6. Nurses and midwives 'self-reported actions and intention towards actions leading to the reduction of climate change associated neonatal health risks

Results of this study show that the only the most self-reported action was unclothing, clothing and displace the new-born to a comfortable place to prevent heat/cold stroke (55.9% of respondents). Very little number (1.1%) of respondents attended a short course on CC and associated health risks while the majority had not any intention to attend it. No respondent was doing research on CC and related neonatal health risks while those who had the intention to do it very few (1.7%). Hence more than half (54.2%) had the intention to support & sensitize colleagues about behaviors and lifestyles change (which is good).

The astonishing is that more than half (54.8%) of participants were neither doing nor planning to educate parents/families/communities in prenatal and post-natal consultations regarding mitigation and adaptation to climate change-related neonatal health risks. Moreover, the majority of respondents 80.8% do not have any intention to raise climate change and global warming and its neonatal related health risks issue in staff meetings or safety committee. Only a few respondents (9.6%) buy local made products/food for any other reason than to reduce gases emission and air pollution that destroy ozone layer through transportations while the majority (73.4%) does not even plan to do that. Also, it was found that a little number of respondents use clean cooking methods at home for only the purpose of reducing deforestation and green gases emission and air pollution that destroys the ozone layer while the big number(34.5%) does not have even any intention to do that.

Henceforward, findings of this study show that the majority(82.1%) of respondents with personal cars were neither doing or planning to walk or bike and had no plan to use public transport cars frequently in order to reduce carbonic gas emission and air pollution that destroys the ozone layer. This last number is alarming compared to how nurses should key people to reduce air pollution's related health effects. In the end, when the total action and intention to CCMA 'score was calculated based on individual responses to climate action items, it was found that majority of respondents (72.9%) were in the class of weak position to climate action while only 2.3% were in a strong class. This last number is too little compared to the harmful effects of CC human and neonate's health. Table 6 and Table 7.

The findings of this study differ from those of the study done by (Xiao et al., 2016) where the majority (76%) of respondents had the intention of action regarding climate change mitigation especially regarding walking, biking, and public transport use. Moreover, findings of this study differ from the WHO calls to action where nurses/midwives must actively be involved in efforts aimed at mitigation, adaptation, and resilience efforts in climate change, including becoming involved in policy, advocacy, research, and practice opportunities. (Lilienfeld, Nicholas, Breakey, & Corless, 2018).This might be related to that in developing countries including Rwanda, a car is taken as luxe and sign of having money and moreover, public transport facility is still a big challenge.

To conclude this part, my opinion is the following: "mindset of using personal has to be changed through climate change and health awareness sensitization campaigns by starting from health care providers". Also, public transport facilities must be strengthened in order to help mitigation of climate change-related to negative health effects. Empowering nurses, midwives, and other health care providers through policymaking, advocacy and research is highly needed to rule out how CC is affecting the health of the vulnerable population and how to mitigate cc related health negative impact.

5.7. Association between socio-demographic variables and awareness on climate change

The results of this study show that having high levels of education and working in the neonatology department was associated with having a high level of awareness on climate change and related neonatal health risks. The statistical significance was <0.05 compared

to other above listed demographic variables. These findings are similar to those of the study done in China by (Yang et al., 2018) and that of Nigatu, Asamoah and Kloos, (2014) in Ethiopia where higher education level and working department were associated with increased awareness. In those two studies, nurses with high education level and working from areas where they were vulnerable populations to climate change were more likely to be aware of climate change's related health impacts than others.

This may be related to that the more education level increases the more the knowledge and experience on environmental issues increase too due to. It is better to introduce climate change-related health consequences at all levels of a nursing school for early and sustainable prevention.

5.8. Association between perceptions of potential direct/indirect neonatal health risk associated with climate change and socio-demographic variables

In this study, having a strong perception of potential direct/indirect neonatal health risk associated with CC was only associated with having working experience of more than 5 years. Similar findings were shown in a study done by Xiao et al., (2016) where junior nurses were less likely to have a strong perception of potential climate change-related health threats. This may be related to that the more experience of work increases, the more critical thinking and perception on environment consequences increase. We have to strive for increasing knowledge and perceptions on potential climate change health effects since they are usually considered as prerequisites for the nurse and midwives to mitigate and adapt to climate change's health effects.

5.9. Association between self-reported actions, intention towards actions leading to the reduction of climate change associated neonatal health risks and socio-demographic variables

In this study, being in a strong position to action and intention to climate action was more likely to be associated with having higher education level (Bachelors and Master's Degree) and also working in university teaching or referral hospital. Findings of this study are similar to those of a study done in the USA by (Polivka et al., 2012a) and those of Guyana by Stacy, (2016). As explained above, this may be related to that there are various training, researches and staff with different expertise at university teaching and referral hospitals and

that the more the education level is higher the more variety of studies contents. Since neonatal health consequences associated with CC are everywhere, all health care providers with all low and high education level, from low to high-level health settings must be trained regarding cc and health impact if we want to mitigate or adapt to CC's related negative health effects on neonates.

5.10. Association between awareness level of climate change and position towards actions leading to the reduction of climate change associated neonatal health risks

The findings of this study show that having high-level awareness of climate change and its risks on neonate's health was more likely associated to be in a strong position towards actions leading to the reduction of climate change associated neonatal health risks among respondents. This is similar to a study done by Xiao et al., (2016), where high-level awareness on climate change and related health consequences was associated with climate action among respondents. Another study done in Guyana by Stacy, (2016) showed that the personal efforts to mitigate climate change were associated highly associated with having advanced awareness on CC and its consequences. Thus, training on health impacts of climate change needs to be offered to nurses and midwives to increase awareness and their motives to CCMA.

5.11. Relationship between nurses and midwives' awareness level on climate change, perceptions of potential neonatal health risks, position towards actions leading to the reduction of climate change associated neonatal health risks

Despite the majority of respondents were in negative perceptions of potential neonatal health risks climate change and weak position to climate action, results of this study show that respondents who have high awareness level on CC are more likely to have positive perceptions of potential neonatal health risks associated to climate change. Moreover, respondents who were in a strong position to climate action were more likely to be from high-level awareness of CC and strong perceptions classes. Table 16. This might be due to that those who were in those classes most of them had education level not less than a bachelor's degree.

The findings of this study are similar to a study done in South Africa by Akrofi, Antwi and Gumbo, (2019) where results showed a positive relationship between awareness, perceptions of CC and active involvement in actions leading to the reduction of climate

change associated neonatal health risks among study participants. However, findings of this study differ from those of a study done in China by (Wei et al., 2014) where findings showed inconsistency between respondents' perceptions of climate change and self-reported actions. The results of this study also differ from those of a study done in Sweden by (Anåker et al., 2015) that found the majority of nurses were aware of CC consequences but they did not act because of the day to day work overwork.

Since, having strong awareness on climate change and positive perceptions of potential CC's related neonatal health risks may be taken as a major determinant of both the action and intent to take voluntary actions with regards to CCMA to reduce CC associated neonatal health risks, enriching nurses and midwives with the requisite knowledge on climate change through trainings, workshops, nursing curriculum, is thus vital.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1. Introduction

This chapter describes the conclusion and recommendations. Study recommendations are addressed to clinical practice, nursing and midwifery and other health sciences schools, ministry of health and to researchers.

6.2. Conclusion

This study revealed low-level awareness of climate change, negative perceptions of potential climate change's associated neonatal health risks and weak position towards actions leading to the reduction of climate change associated neonatal health risks among nurses and midwives working in four selected hospitals in Kigali. High education level, working in neonatology and having long time working experience were found to be associated with having more advantages of increased awareness on climate change; having positive perceptions of potential climate change's associated neonatal health hazards and being in strong position towards actions leading to the reduction of climate change associated neonatal health risks. Offering in-service training on climate change and its effect on neonate's health to nurses and midwives; integrating climate change and health in the nursing curriculum; and creating opportunity to them to upgrade their level of education and/or specialize in environmental health issues can help increase awareness and boost them to be involved in climate action to reduce climate change's related neonate's health risks.

6.3. Recommendations

I would like to recommend Nurses and midwives in clinical practice: to adhere to WHO, ICN, ICM, and Rwanda policy and or guidelines established. I also recommend them to educate families and community climate change-related health risks. Nurses and midwives have also to change their lifestyles and behaviors that lead to climate change. Nursing and midwifery schools have to incorporate climate change and health consequences in the nursing curriculum at all levels. The Rwanda Ministry of health has to offer training to health care providers mostly nurses, midwives to boost them about climate action. Researchers: studies on effects of CC and its outcome on neonate's health are needed in Rwanda. Moreover, a countrywide research on nurses and midwives role in mitigation of climate change associated neonatal health risks is needed

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APPENDICES

APPENDIX 1. QUESTIONNAIRE FOR MIDWIVES AND NURSES

Nurses perceptions and actions toward the reduction of climate change-related to neonatal health risks at selected hospitals in Kigali

Section-I: Socio-demographic data

Please select the option that is applied to you. Put only check✓

1. Age		2. Gender		3. Experience in working department					
20- 29 years		Male		<3months					
30-39 years		Female		3 months to 1 year					
40- 49 years				2 years to 5 years					
>50 years				>5years					
Marital status									
Single		Engaged		Married		Divorced		Separated	

Please select and put the only check✓ on the option that is applied to you in the following table.

4. Education level		5. Profession		6. Position		7. Working department	
A 2		Nurse		Bedside		Maternity	
Diploma		Midwife		Service charge	in	Neonatology	
Bachelor's degree		Nurse-midwife		Nurse-assistant		Pediatrics	
Master's degree							
8. Level of a working hospital							
District Hospital		University Teaching hospital			Referral Hospital		High-level private hospital

Section-II: Awareness about climate change, associated neonatal health impacts, and available resources to mitigation and adaptation

Please check “Yes” if you know about and “No “if you do not know about. **If YES**, indicate the source by putting a check on **1:** for school **2:** Hospital /Co-workers/Friends **3:** Radio/TV **4:** Social media /internet. **5:** for journal/ books readings, **6:** Workshop/conference. **7:** >1 source **EXCEPT for** school. For the time, put a check on the number corresponding to the time **1:** < 1 year, **2:** for between 1 to 5 years and **3:** for over than 5 years

Awareness questions(IV)		Yes	No	Source of awareness
1	Do you know about climate change and global warming?			1-2-3- 4-5-6-7
2	Do you know about the current climate change situation in Rwanda?			1-2-3- 4-5-6-7
3	Do you know about potential causes /risk factors that can lead to climate change and global warming?			1-2-3- 4-5-6-7
4	Do you know climate change is a threat and risky to human health?			1-2-3- 4-5-6-7
5	Do you know about climate change is a threat and risky to neonatal health?			1-2-3- 4-5-6-7
6	Do you know about potential direct/indirect neonatal health risks associated with climate change?			1-2-3- 4-5-6-7
7	Do you know about potential measures to be done in mitigation and adaptation to potential neonatal health risks associated with climate?			1-2-3- 4-5-6-7
8	Do you know about your personal role and responsibilities as a nurse/midwife to address potential neonatal health risks associated with climate through nursing practice?			1-2-3- 4-5-6-7
9	Do you know about the Guidelines for Mainstreaming Climate Change Adaptation and Mitigation in the Health Sector established by the government of Rwanda since 2013?			1-2-3- 4-5-6-7
10	Do you know about the “WWHEN Checklist” for Climate Change Mitigation and Adaptation at the health facility level established by the government of Rwanda since 2013?			1-2-3- 4-5-6-7
11	Do you know about what the International Council for Nurses (ICN) urges nurses regarding climate change mitigation and adaptation?			1-2-3- 4-5-6-7

Section-III: 1. Midwives/ nurses' perceptions about potential neonatal health risks associated with climate change

III .1.To which extent you do you agree with each one of the following either direct or indirect potential neonatal health risks to be linked to effect(s) of climate change? Indicate to what extent you agree or disagree. **This section applies only if you have answered “YES” to the QUESTION N0.6 in Section-II**

1= Strongly Disagree	2= Disagree	3 =Unaware	3= Agree	4= Strongly agree
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Potential direct/indirect neonatal health risk associated with CC		Strongly disagree	Disagree	Unaware	Agree	Strongly agree
1	Prematurity					
2	Lower birth weight					
3	Death/morbidity from heat or cold stroke					
4	Neonatal infections (e.g. sepsis, Malaria, Meningitis,etc.)					
5	Congenital malformations					
6	Neonatal respiratory diseases					
7	Effects of exposure to ultraviolet rays (Skin damage and skin cancer, eye problems, disturbed immune function)					
8	Neonatal metabolic disorders					
9	Poor post-natal growth					
10	Neonatal psychological and behavioral disorders					

SECTION III. Nurses and Midwives' personal self-reported actions/Intention to actions leading to the reduction of climate change associated neonatal health risks

Do you have a personal car or motorbike?

yes	no
-----	----

If “Yes”, answer all questions from the below section.

If “No “do not

answer the question **N0 5 and N0 6**

IV.1.Among the following actions, you self-report by ticking what you do to reduce current or future neonatal health risks associated with climate change and global warming

Personal Self-report action		I do it	I plan to do it	I neither do or plan it
1	Assessing neonatal health risks related to climate change to babies admitted in service			
2	Unclothing, clothing and displace the newborn to a comfortable place to prevent heat/cold stroke			
3	Using /advocating for safe equipment like air conditioners and infrastructures that can protect the neonate against heat or cold stroke			
4	Raising climate change and global warming and its neonatal related health risks issue in staff meetings and safety committee			
5	Walking/biking frequently rather than using a personal car/motorbike to reduce carbonic gas emission and air pollution that destroy the ozone layer			
6	Using frequently public transport cars frequently instead of personal car/motorbike to reduce carbonic gas emission and air pollution that destroys the ozone layer			
7	Buying local made products/food not only due to prices or quality difference s or other reason but in order to reduce gases emission and air pollution that destroys the ozone layer through transportations			
8	Use Clean cooking methods (gas, economic stoves, etc.) stoves instead of charcoal and wood at home for only the purpose to reduce deforestation and green gases emission and air pollution that destroy the ozone layer			
9	Supporting & sensitizing colleagues about behaviors and lifestyle change to mitigate the negative impacts of climate change and neonatal health			
10	Engaging and participating in climate change health-related policy debates and climate change health-related mitigation and adaptation policy formulation			
11	Organizing & attending clubs, conferences, workshops on climate change and associated neonatal health-related issues			
12	Educating parents/families/communities in prenatal and post-natal consultations on mitigation and adaptation to climate change-related neonatal health risks			
13	Attending a short course on climate change and associated neonatal/health consequences			
14	Engaging in research on the negative impact of climate change on human and neonatal health, mitigation and adaptation			

APPENDIX 2. INFORMED CONSENT EXPLANATION FORM

STUDY TITLE: Nurses ‘perceptions and actions toward the reduction of climate change’s related neonatal health risks at selected hospitals in Kigali

To be read and understood and questions to be answered in a language the participants understand.

Dear Participant, My name is NSENGIYUMVA Richard, a Masters student in the Master of Sciences in Nursing (Neonatology track) at the University of Rwanda, College of Medicine and Health Sciences. I am carrying out a scientific study on the “Nurses ‘perceptions and actions toward reduction of climate change’s related neonatal health risks at selected hospitals in Kigali” The study forms a part of the requirements for the award of a Master’s Degree under the supervision of Mrs. MUKARUBAYIZA M. Rose and Dr. Pamela MEHARRY who are my lecturers in the University of Rwanda. A total of 114 persons will participate in the study. I invite you to participate by answering questions on the designated questionnaire. At the end of the study; recommendations for intervention measures will be made.

Please note the following:

1. There will be NO compensation for taking part in this research.
2. Your participation is voluntary
3. Participation involves answering questionnaires and interview questions.
4. You can withdraw from the study at any time without any penalties or loss of benefits.
5. Your name will not be used anywhere in the study and the information gathered will be treated with confidence and solely for this study and for an intervention project based on findings herein.
6. No harmful or invasive procedures shall be conducted on you.
7. Feel free to ask any questions at any time of conducting the study. All information obtained will be professional and confidentiality will be upheld.

I kindly request you to sign the statement below after reading through it.

Signature of participant

Date

APPENDIX 3. RESEARCH PARTICIPANT INFORMED CONSENT

I agree to participate in this research project on “Nurses ‘perceptions and actions toward the reduction of climate change’s related neonatal health risks at selected hospitals in Kigali ”which is being conducted by NSENGIYUMVA Richard.

I understand that this study involves answering prepared questions. I understand that my participation in this study is entirely voluntary, and that if I wish to withdraw from the study, I may do so at any time, and that I do not need to give a reason for doing so. If I withdraw from the study, I understand this will have no effect on my relationship with researchers.

I understand that I may receive any direct benefit from participating in this study, but my participation may help others in the future. I understand the information I give will be kept confidentially to the extent permitted by law. I have read and I understand this information and agree to take part in the study.

Signature of participant

Date

APPENDIX 4.GANTT CHART SHOWING TIMELINES OF THE RESEARCH STUDY

TASK / ACTIVITY	PERIOD													
	Jun 18	Jul 18	Aug 18	Sep 18	Oct 18	Nov 18	Dec 18	Jan 19	Feb 19	Mar 19	Ap 19	May 19	June 19	
Shaping the research topic and identifying a research area														
Searching for literature related to study questions														
Developing a research proposal														
Presentation of the proposal														
Requesting for permission from IRB of the University of Rwanda														
Requesting data collection to study area														
A pilot study to pre-testing the data collection tool														
Data collection														
Data analysis and interpretation of the findings and report writing														
Research project presentation														
Final report to UR & Research settings														

APPENDIX 5. A THE BUDGET PLAN FOR A RESEARCH STUDY FROM: FROM 1ST MARCH 2018 UP TO 15TH, JUNE, 2019

TITLE OF THE STUDY: Nurses ‘perceptions and actions toward the reduction of climate change’s related neonatal health risks at selected hospitals in Kigali’

I. Preparation for the study

No	Tasks to be performed	No. of persons	No. of days	No. of person-days	Cost/unit (Rwf)	Total (Rwf)
1	Research proposal preparation	3	25	75	5,000	200,000
2	Ethical clearance and permission to do the work	3	5	15	3,000	30,000
3	Contact University of Rwanda administration to orient members on the project	3	10	30	3,000	20,000
4	Pre-testing and finalizing research instruments	3	10	30	4,000	100,000
	Sub-total 1					350,000

II. The survey

No.	The task to be performed	No of person/material	No of days	No of person-days	Unit cost (Rwf)	Total (Rwf)
1	Data collection	3	10	30	5,000	150,000
2	Transport	3	10	30	3,000	90,000
3	Communication	4	3	12	2,500	30,000
4	Restaurant	3	10	30	2,000	60,000
	Sub-total 2					330,000

III. Study supplies

No	Tasks to be performed	Quantity	Unit price (Rwf)	Total (Rwf)
1	Papers	2	3,000	6,000
2	Pens	12	100	1,200
3	Pencils	5	50	250
4	Rubber eraser	5	100	500
5	Computer	3	50,000	150,000
6	Flash disk	1	6,000	6,000
7	Printing	300	50	15,000
8	Photocopying	120	20	2,400
9	Communication (phone & internet)	4	2,500	15,000
10	Clipboards	4	5,000	20,000
11	Others (bindings)	5	1,000	5,000
	Sub-total 3			221,350

IV. Production of report

No.	The task to be performed	No of persons	No of days	No of person-days	Unit cost (Rwf)	Total (Rwf)
1	Data coding & data entry	2	10	20	2,500	50,000
2	Data analysis	3	10	30	5,000	150,000
3	Report writing	2	10	20	5,000	100,000
4	Presentation of report	2	10	20	5,000	100,000
	Sub-total 4					400,000

IV. Work for report validation

No.	The task to be performed	Quantity	No of days	No of person-days	Unit cost (Rwf)	Total (Rwf)
1	Submission of final report	3	7	21	5,000	50,000
2	Report to University of Rwanda administration as feed-back	3	15	45	2,000	90,000
	Sub-total 5					540,000

BUDGET SUMMARY

No	DESCRIPTION	TOTAL
1	Preparation for the study	350,000
2	The survey	330,000
3	Study supplies	221,350
4	Production of report	200,000
5	Work for report validation	300,000
	TOTAL BUDGET	1,401,350

BUDGET JUSTIFICATION

Preparation of the study includes the main activities of the project preparation, finalizing and submission of the report that will take 350,000

The survey which includes activities done to the field and data analysis will take 330,000

The study supplies which are the materials and the office rent that will be needed during the study will take 221,350.

The production of the report which includes report writing and printing will take 200,000

Workshop presentation for validation another like salary for supervisor will require to 300,000

The general total for the whole project will be 1,401,350

The source of funds will be my monthly salary

APPENDIX 6.UR-Ethical clearance permission letter



UNIVERSITY OF
RWANDA

COLLEGE OF MEDICINE AND HEALTH SCIENCES

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 14/01/2019
Ref: CMHS/IRB/030/2019

NSENGIYUMVA Richard
School of Nursing and Midwifery, CMHS, UR

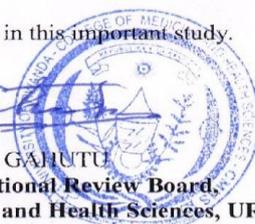
Dear NSENGIYUMVA Richard

RE: ETHICAL CLEARANCE

Reference is made to your application for ethical clearance for the study entitled *“Perception and Self-Reported Nurse Actions toward Reduction of Climate Change Related Neonatal Health Risks at Selected Hospital in Kigali”*.

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

We wish you success in this important study.



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

Cc:

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

APPENDIX 7. Rwanda military hospital-ethical clearance permission letter



March 29, 2019

Ref.: RMH/IRB/005/2019

REVIEW APPROVAL NOTICE

Dear NSENGIYUMVA Richard
School of Nursing and Midwifery, CMHS
University of Rwanda

Your Research Project: "Perception and Self-Reported Nurse Actions toward Reduction of Climate Change Related Neonatal Health Risks at a Selected in Kigali".

With respect to your application for ethical approval to conduct the above stated study at Rwanda Military Hospital, I am pleased to confirm that the RMH/Institutional Review Board (IRB) has approved your study. This approval lasts for a period of **12 months** from the date of this notice, and after which, you will be required to seek another approval if the study is not yet completed.

You are welcome to seek other support or report any other study related matter to the Research office at Rwanda Military Hospital during the period of approval.

You will be required to **submit the progress report** and any major changes made in the proposal during the implementation stage. In addition, you are required to **present the results** of your study to the RMH/IRB before publication.

Sincerely,



Prof. Alex M. Buteera
Colonel
Chairperson Institutional Review Board, RMH

APPENDIX 8. King Faysal Hospital-Ethical clearance permission letter



KING FAISAL HOSPITAL, KIGALI

Patient Centered Care

27th March, 2019

NSENGIYUMVA, Richard
Post graduate student: Master of Science in Nursing
College of Medicine and Health Sciences (CMHS)
University of Rwanda (UR)
Phones: 0784200008
Email: richnse@gmail.com

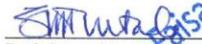
We acknowledge receipt of your study protocol: **"Perception and self-reported nurses' action toward reduction of climate change related neonatal health risks at selected hospitals in Kigali"**.

After a thorough review; the reviewers of KFHH, K Ethics Research Committee conclude that the proposal was not adequately thought through such that the Results, Conclusions and Recommendation may not be scientifically valid. The self-administration of the entire questionnaire at a go has many challenges as outlined above. The reviewers find it difficult to allow the student carry out the work at KFHH with the proposal in the entire current form.

Therefore; it is recommended that the postgraduate rewrites the relevant sections of the proposal with the supervisors, resubmit the revised version to Office of Continuous Quality Improvement of the hospital for a revisit before he is allowed to do the work at KFHH.

N.B. It is a requirement that you deposit a final copy of your research in the office of Continuous Quality Improvement in King Faisal Hospital, Kigali for our records.

Best Regards


Prof. Samuel Lutalo
Clinical Professor of Medicine;
Chief Consultant Physician and
Chairperson KFHH, K Ethics Research Committee

CC:
- Chief Executive Officer, Oshen- KFHH
- All KFHH, K Ethics-Research Committee Members.

King Faisal Hospital, Kigali will become a Centre of Excellence in health services provision and clinical education in Africa

• EMAIL: info@kfh.rw • Website: www.kfh.rw
GASABO DISTRICT, P.O. Box 2534 KIGALI, RWANDA

APPENDIX 9. CHUK military hospital-ethical clearance permission letter



CENTRE HOSPITALIER UNIVERSITAIRE
UNIVERSITY TEACHING HOSPITAL

Ethics Committee / Comité d'éthique

February 19th, 2019

Ref.: EC/CHUK/028/2019

Review Approval Notice

Dear Nsengiyumva Richard,

Your research project: *“Perceptions and self-reported nurses' actions toward reduction of climate change related neonatal health risks at selected hospitals in Kigali”*.

During the meeting of the Ethics Committee of University Teaching Hospital of Kigali (CHUK) that was held on 08th February, 2019 to evaluate your request for ethical approval of the above mentioned research project, we are pleased to inform you that the Ethics Committee/CHUK has approved your research project.

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

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

Yours sincerely,

Emmanuel Munyaneza
The Secretary, Ethics Committee,
University Teaching Hospital of Kigali



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

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

APPENDIX 10. Muhima hospital-ethical clearance permission letter

REPUBLIC OF RWANDA

Kigali, February 11nd 2019



KIGALI CITY
NYARUGENGE DISTRICT
MUHIMA HOSPITAL
P.O. BOX 2456 KIGALI
Tél. /Fax : +252 50 37 7
E-mail : muhima.hospital@moh.gov.rw

NSENGIYUMVA Richard

Re: Your request for conducting a study at Muhima District Hospital

Dear Richard,

Reference made to your letter received on February 5th 2019 requesting to conduct a study at Muhima District Hospital for your research project entitled: *Perception and self-reported nurse's action toward reduction of climate change related neonatal health risks at selected hospital in Kigali.*

I would like to inform you that your request is approved and at the end the administration of Muhima hospital shall need to be given the final report of your study.

Yours sincerely,

MANIRAGUHA YEZE Aimée Victoire

Chief Ethic Committee



Cc:

- Clinical Director
- Director of Nursing