



**COMPLIANCE AND FACTORS INFLUENCING USE OF  
TELEMEDICINE AMONG COVID-19 PATIENTS ADMITTED IN  
HOME BASED CARE IN KIGALI**

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## DECLARATION

This is my original work and has never been submitted to any Institution. No part of this research should be reproduced without the author's consent or that of Mount Kenya University.

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## **DEDICATION**

I dedicate this work to Almighty God for guiding me throughout my studies. I also dedicate this work to my family, my lecturers, supervisors and friends for guidance and support given to me through this journey.

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First of all, I would like to thank the almighty God for the unconditional love upon my life, supported with special encouragement especially during my studies which pushed me to the completion of this study work at MKU.

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May God bless you all!

## ABSTRACT

During the management of the novel coronavirus disease (COVID-19), telemedicine has established itself as the ultimate way of managing a high number of positive cases across the world. There is a concern about its compliance, factors influencing use of telemedicine and feasibility among the patients. The main objective of this study is to assess the compliance, factors influencing use of telemedicine and barriers among covid-19 patients admitted in home-based care of Kigali city. A retrospective study was carried out among 384 participants using both quantitative and qualitative methods. Data were collected using interviewer-administered questionnaires and key informants' interviews were conducted on clinicians and patients admitted in home-based care during covid-19 pandemic, Data analysis was performed using SPSS Version 26. The compliance to telemedicine use is high 87%, being male (AOR=5.53, 95% CI: 1.92-15.9, p=0.020), young age of 16 to 35 years (AOR=2.213, 95% CI: 1.049-4.926, p=0.008), getting married (AOR=6.26, 95% CI: 4.727-14.901, p<0.01) and having regular job (AOR=0.8, 95% CI: 0.013-0.479, p=0.006) significantly increased the likelihood to high compliance of telemedicine use. **Qualitative** approach through key informant interviews for both patient and clinicians have shown the following main barriers on use of telemedicine: Living alone, electric power and Insufficiency medical supply as nearest pharmacy were the main challenges for telemedicine use among covid-19 patients in home-based care in Kigali . The study used a mixed approach to assess the compliance use of telemedicine and factors influencing factors and in Kigali city home-based care. The identified factors and challenges might support the decision making in scaling-up the telemedicine use strategies.

**Keywords:** Telemedicine, compliance, home-based care,

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## LIST OF ACRONYMS AND ABBREVIATIONS

<b>CEO</b>	: Chief Executive Officer
<b>COVID-19</b>	: Severe Acute Respiratory Syndrome –Coronavirus type-2 discovered in 2019
<b>EAC</b>	: East African Community
<b>HBC</b>	: Home Based Care
<b>HPT</b>	: Health Promotion Theory
<b>MKU</b>	: Mount Kenya University
<b>MOH</b>	: Ministry of Health
<b>PPE</b>	: Personal Protective Equipment
<b>SARS–CoV2</b>	: Severe Acute Respiratory Syndrome –Coronavirus type-2.
<b>SCT</b>	: Social Cognitive Theory
<b>SSA</b>	: Sub-Saharan Africa
<b>TPB</b>	: Theory of Planned Behavior
<b>WHO</b>	: World Health Organization

## OPERATIONAL DEFINITION OF KEY TERMS

**Compliance** : in this research the term compliance refers to complying or adheres to the established guides for based care( isolation ) among covid-19 patients.(Shahrabani S, Mizrachi 2016 Jun).

**factors Influencing** : In this research factors influencing refers to all possible factors that influencing compliance on use telemedicine among covid-9 patient in home based case/ isolation like demographic factors such as age, education level, etc

**Covid-19**: in this research proposal the term Covid-19 refers to a respiratory disease caused by Severe Acute Respiratory Syndrome –Coronavirus type-2, discovered in 2019. The virus spreads mainly from person to person through respiratory droplets produced when an infected person coughs, sneezes, or talks

**Home Based Care (HBC)**: in this research the term HBC refers to a health care or supportive care provided by a professional caregiver while the individual is in his home where the patient or client is living, as opposed to care provided in group accommodations like clinics, hospitals or nursing homes.

**Telemedicine**: in this research proposal the term Telemedicine means the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities.

## CHAPTER ONE: INTRODUCTION

### 1.0 Introduction

This introduction chapter entails the study background. In addition, it consists of a problem statement of the problem, objectives, and questions of the study proposal. Moreover, it states how this research is significant, its limitations and its scope. It concludes with the organization of this research..

### 1.1 Background of the Study

Global distribution of Covid-19 since the initial report from China spread quickly and the number of cases expanded exponentially. In December 2019, China detailed a flare-up of pneumonia of obscure causes in Wuhan, the capital city of Hubei territory. Most of the early cases were epidemiologically connected to the

Huanan fish discount showcase where oceanic creatures and live creatures were sold (Li, 2020). Coronaviruses infer their title from the Latin word “corona” meaning crown. The title alludes to the interesting appearance of the infection beneath an electron magnifying lens as circular particles with a edge of projections taking after the sun based crown (Chowdhury, 2020). The World Wellbeing Organization (WHO) named the resultant malady as Coronavirus illness 2019 shortened as COVID-19 and on Walk 11, 2020, WHO, after surveying the circumstance over the globe, pronounced COVID-19 as a widespread (Chowdhury, 2020). On January 11, the primary case was detailed exterior territory China in Thailand and inside months, the infection spread to all the landmasses China in Thailand and within months, the disease spread to all the continents except Antarctica. The new Corona virus quickly crosses the borders of many countries. Countries such as Thailand, Japan,

Singapore, Taiwan, and South Korea are among the first countries affected because of their proximity to China (Koorosh, 2020). In Rwanda, the first case of COVID-19 was reported on March 14, 2020, and the Rwandan government rapidly enforced policies to stop local transmission, including the implementation of national lockdown. Generally, efforts to contain the spread of COVID-19 have included national and regional lockdowns – defined as large scale physical distancing measures and movement restrictions (TheEastAfrican, 2021). However, a number of new cases and Covid-19 patients raised as Delta variant arrived in Rwanda with spreading quickly and this put pressure on the health care system. With the identification of this variant in Rwanda and the upsurge of cases, a new guideline has been developed and underscores the need to tighten preventive measures and patients were admitted in Home Based Care (HBC) (TheEastAfrican, 2021).

Before Telemedicine use in Covid-19 management, the World Health Organization (WHO) recommended that all laboratory confirmed cases be isolated and cared for in a health care facility. In situations where isolation in a health care facility of all cases were not possible, WHO emphasized the prioritization of those with highest probability of poor outcomes: patients with severe and critical illness and those with mild disease and risk for poor outcome (age >60 years, cases with underlying comorbidities, e.g., chronic cardiovascular disease, chronic respiratory disease, diabetes, cancer). Therefore all mild cases could not be isolated in health facilities, then those with mild illness and no risk factors had to be isolated in non-traditional facilities, such as repurposed hotels, schools, stadiums or gymnasiums where they could remain until their symptoms resolve and laboratory tests for COVID-19 virus were negative (MOH, 2020). Alternatively, asymptomatic patients or with mild disease and

no risk factors had to be managed at home via telemedicine in what is commonly known as Home based care (HBC) (MOH, 2020).

Global adoption of telemedicine for the management of patients in HBC as it was done during COVID-19 pandemic was unprecedented and may have a significant and durable impact on health care delivery. Telemedicine has not commonly been tested in disaster settings (Lurie, 2018). It was an essential component of the medical response to COVID-19 by reducing demand on strained health care infrastructure and enabling health care needs to be met at home while reducing exposure for patients and medical staff (Bloem, 2020). However patient demand for telemedicine outstripped the ability of health care providers to supply it (Hong, 2020).

In Sub-Saharan Africa (SSA), telemedicine networks has been in productive use for home management of Covid-19 and has enabled various collaboration channels, distance learning and teleconsultations. For instance telemedicine enabled the communication and sharing of medical information in electronic form, and thus facilitated access to remote expertise. A physician located far from a reference center could consult his colleagues remotely in order to solve a difficult case, follow a continuing education course over the Internet, or access medical information from digital libraries (Africa, Africa Needs Telemedicine to Overcome its Healthcare Challenges, 2020). Although Telemedicine in Africa was being challenged by information and communication technologies infrastructure, the continent is participating in the race for good health. The Flying Doctors Healthcare Investment in Nigeria has helped in that. Flying Doctors partner with Arik Air, to enhance the development of Telemedicine in different SSA countries and currently is active in more than seven countries including Gabon, Central Africa Republic, Congo and Burkina Faso (Africa, Africa Needs In East



African Region the East African Community (EAC) is now seeking to improve its healthcare delivery systems using these newfound e-health and informatics initiatives. In Rwanda telemedicine was adopted when Covid-19 mild cases could not be isolated in health facilities, then those with mild illness and no risk factors had to be isolated in non-traditional facilities, such as repurposed hotels, schools, stadiums or gymnasiums where they could remain until their symptoms resolve and laboratory tests for Covid-19 virus were negative (MOH, 2020). Alternatively, asymptomatic patients with mild disease and no risk factors had to be managed at home via telemedicine in what is commonly known as Home based care (HBC) (MOH, 2020). Since 2016 a form of telemedicine named Babylon had opened a branch in Rwanda under the name of Babyl. This allowed every Rwandan to be able to get healthcare using the telephone in the easiest manner. Therefore Babyl provided online consultations with the best clinical experts and doctors, extensive medical Q&A, cutting-edge monitoring and diagnostics, one-tap appointment booking and prescription delivery, as well as access to clinical records when requested (Babylon, 2022).

## **1.2 Problem Statement**

Telemedicine has emerged as an effective way to manage a large number of COVID-19 cases worldwide, including in Rwanda where the Rwanda Biomedical Centre (RBC) and Babyl Health collaborated to establish a fully functional telemedicine system for home-based care of COVID-19 patients. However, there are concerns about patient compliance and factors influencing the use and feasibility of telemedicine, as highlighted by Hong (2020). In order to improve telemedicine services and provide timely care while minimizing exposure in healthcare facilities during pandemics, it is important to assess the compliance factors, barriers and factors influencing the use of telemedicine among COVID-19 patients in

home-based care in Kigali. This would also save time, improve convenience, reduce costs and allow for real-time consultation with multidisciplinary teams, as noted by Bloem (2020). Although telemedicine has proven to be effective, information on compliance and factors influencing its use is scarce, particularly in low-resource settings. Lurie (2018) found that the level of telemedicine use may range from patient compliance to accessibility. Therefore, identifying the main factors that influence the use of telemedicine is crucial for its future adoption in the management of other medical conditions among vulnerable populations. Babyl Health has been providing digital health services in Rwanda since 2016 and believes that accessible and affordable healthcare can be provided to everyone globally. In December 2020, RBC and Babyl established home-based care/isolation for COVID-19 patients with mild symptoms, who were monitored through telemedicine from day one of their positive test result up to day 14, according to RBC's COVID-19 guidelines. However, there has been no study conducted on patient compliance with the use of telemedicine. Therefore, this study aims to assess compliance, barriers and factors influencing the use of telemedicine among COVID-19 patients in home-based care in Kigali

### **1.3 Objectives of the Study**

#### **1.3.1 General Objective**

The main objective of this research is to assess compliance and factors influencing use of telemedicine and barriers among Covid-19 Patients Admitted in Home Based Care in Kigali

#### **1.3.2 Specific Objectives**

- i. To determine the compliance towards use of Telemedicine among Covid-19 Patients Admitted in Home Based Care in Kigali.

- ii. To establish factors influencing use of Telemedicine among Covid-19 Patients Admitted in Home Based Care in Kigali.
- iii. To explore barriers in use of telemedicine among covid -19 admitted in home based care in kigali

#### **1.4 Research Questions**

- i. What is the compliance towards the use of Telemedicine among Covid-19 Patients Admitted in Home Based Care in Kigali ?
- ii. What are the factors influencing use of Telemedicine among Covid-19 Patients Admitted in Home Based Care in Kigali?
- iii. What the barriers in use of telemedicine among covid-19 patient in Home Based Care in kigali

#### **1.5 Significance of the Study.**

This study is a good occasion for the participants since it determine the compliance, factors influencing use of telemedicine and barriers among Covid-19 Patients Admitted in Home Based Care in Kigali and the challenges that will be addressed by policymakers to ameliorate or adopt the telemedicine care to patients with other diseases. The government of Rwanda and its Stakeholders will gain advantages from this study as they will know the compliance factors influencing use of telemedicine and barriers among patients and address by development of new policies. The findings of this study produce evidence that will form a basis that will be relied on by future researchers. The Researcher is benefiting from the development of this study because it raises the knowledge during focused searching and conducting a literature review of published articles related to this research. This is added to the academic merits that are worth this research.

## **1.6 Limitations of the Study**

The study is subjected to a specific group of people ( covid-19 patients in home based care in kigali) and the findings of the study are not based on a conclusion to the general population, This could be due to the difference in demographics, health status , culture belief or other factors.

## **1.7 Scope of the Study**

### **1.7.1 Concept Scope**

This study assessed the compliance, factors Influencing use of telemedicine and barriers among Covid-19 Patients Admitted in Home Based Care in Kigali

### **1.7.2 Content Scope**

The current study describes the compliance and factors influencing use of telemedicine and barriers among Covid-19 Patients Admitted in Home Based Care in Rwanda .

### **1.7.2 Geographical Scope**

This study is limited to the covid-19 patient admitted in home based care and followed up using telemedicine in Kigali.

### **1.7.3 Time Scope**

The research was done retrospectively among Covid19 patients who were admitted in HBC from December 2020 to June 2021.

## **1.8 Organizational of the Study**

Chapter one entails the study background. In addition, it consists of a problem statement, objectives, and questions of the study. Moreover, it states how this research is significant, its limitations, scope, and organization of this research . Chapter two consists of theoretical and empirical literature, critical review and research gap, theoretical framework as well as a conceptual framework. Chapter three entails the research design, targeted population, sample size as well as sampling procedures, study tool instruments, ways of controlling the quality of the research, procedures of collecting and analyzing the data, and how the researcher considers ethics while conducting this research.

## **CHAPTER TWO: REVIEW OF RELATED LITERATURE**

### **2.0 Introduction**

These are the descriptions of the available literature concerning this study. It comprises the literature related to theories according to the topic, past similar study findings explained empirically, reviewing them critically as well as mentioning the research gap, theoretical framework, and conceptual framework.

### **2.1 Theoretical literature**

#### **2.1.1 Use of Telemedicine worldwide**

The World Health Organization (WHO) issued a global report on telemedicine, which settled the following broad definition of telemedicine after an evaluation of numerous peer-reviewed studies:

“The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities. (Karsten, 2020)”

Telemedicine is all form of virtual health care service using technology to give long distance medical care, education and health administration (Lurie, 2018). Other methods of telemedicine comprise distant monitoring using sensors which can be attached to the patient, activated on their watch or telephone, incorporated into their clothes, or embedded in their home environment. Specific symptoms, such as tremor, gait, and falls, appear very measurable. Monitoring can be done passively when occurring in the background or actively

asking patients to complete scheduled tasks at fixed intervals (Espay, 2019). A successful example of passive monitoring was provided for patients with Parkinson disease, showing that body-worn sensors could reliably monitor falls in the home environment (SilvadeLima, 2019).

### **2.1.2 Patient compliance**

the extent to which a person's behavior - taking medication, following a diet, and/or executing lifestyle changes - corresponds with agreed recommendations from a healthcare provider." Essentially, patient compliance refers to the degree to which a patient adheres to the medical advice and treatment plan prescribed by their healthcare provider. This can include following medication schedules, making lifestyle changes, attending appointments, and other behaviors that support their health and well-being. Patient compliance is an important aspect of healthcare as it can impact the effectiveness of treatment and overall health outcomes.(WHO)

### **2.1.3 Use of Telemedicine in management of covid -19 patient in Rwandan context**

Taking the Rwandan case into consideration, since in March 2020 when the first case was imported, the entire health care system, meaning from public hospitals to medical practitioners to first responders was greatly challenged by the rapid and mass spread of the Covid-19. At that time hospitals, clinics and providers were impacted by the lack of personal protective equipment (PPE), insufficient patient testing, and institutional stresses in the care of infected persons (MOH, 2020). Therefore all mild cases could not be isolated in health facilities, then those with mild illness and no risk factors had to be isolated in non-traditional facilities, such as repurposed hotels, schools, stadiums or gymnasiums where they could

remain until their symptoms resolve and laboratory tests for Covid-19 virus were negative (MOH, 2020). Alternatively, asymptomatic patients or with mild disease and no risk factors had to be managed at home via telemedicine in what is commonly known as Home based care (HBC) (MOH, 2020).. By November 2020 a form of telemedicine named Babylon had opened a branch in Rwanda under the name of Babyl. This allowed every Rwandan to be able to get healthcare services using telephone in the easiest manner. Therefore Babyl provided online consultations with the best clinical experts and doctors, extensive medical Q&A, cutting-edge monitoring and diagnostics, one-tap appointment booking and prescription delivery, as well as access to clinical records when requested (Babylon, 2022).

#### **2.1.4 Telemedicine use in the future**

When observing the functioning of telemedicine and how things are done, it brings together a multidisciplinary approach of a wide range of stakeholders that include health-care providers, researchers, medical-device firms, and mobile-application developers (Restrepo, 2018). Therefore telemedicine services offer the next generation of greater access to information and platforms for communication, as well as present patients with more innovative ways to self-monitor their well-being. The American Medical Association has most recently explored digital technology in health care as an emerging and growing market. Their playbook for digital health implementation offers a repository of best practices and questions for medical providers (Karsten, 2020). It is for this reason effective and affordable telemedicine services will be required in future to tackle different trends of health.



## **2.2 Empirical Literature.**

### **2.2.1 Telemedicine in Rwanda**

Since 2016 through MOH, Babyl health first fully digital health service provider started working from here in Rwanda with support and guidance of MOH and Babyl's mission to provide accessible and affordable healthcare to everyone on earth is a noble one, and it's wonderful to see them making progress towards achieving it through their work in Rwanda.

Technology can be a powerful tool for increasing access to healthcare, particularly in areas where traditional healthcare services may be limited or unavailable. By partnering with local organizations and leveraging technology, Babyl is helping to overcome some of the barriers that can prevent people from receiving the care they need.

The government has demonstrated a commitment to enhancing access to healthcare by leveraging digital technology. Amid the COVID-19 pandemic, digital healthcare has proven to be an effective means of managing the rapid spread of the virus across the country

### **2.2.2 Compliance on use of Telemedicine among Covid-19 Patients Admitted in Home Based Care**

Worldwide demand for telemedicine resulting from the public health emergency caused by Covid-19 raised the general attention and claim for telemedicine and led to a rapid expansion of this mode of patient care (Shajeea, 2020). The major advantage of telemedicine was that it helped when there was a dramatic reduction of in-person consultations, a surge in the use of remote patient monitoring and televisits. At last, telemedicine has emerged worldwide as an indispensable resource to restrain the spread of the disease through improving the surveillance of patients, facilitating early identification, and allowing prompt management of

infected people, as well as enabling continuity of care of vulnerable patients with multiple chronic diseases (Omboni, 2021).Based on previous study conducted on factors influencing telemedicine use during covid-19 outbreak has shown that Telehealth was a great opportunity to improve accessibility health delivery service mostly during a quick expansion of Positive cases of covid-19 in Home based care program that aimed to provide accessible and affordable,influencing factors of patient behavior toward adoption telemedicine health service. It has shown that Literacy level, facilitating conditions such connectivity (Khan and Alghazzawi 2021) In general, good compliance at the start of a study was found to drop off over time, most rapidly in the period immediately after the start. Success factors identified in the study included the extent of patient health, education, telehealth system implementation style, user training and competence in system usage, active human support from the healthcare provider and maintaining strong participant motivation.

The findings of a literature review on patient compliance in home-based self-care telehealth monitoring situations, intended to establish a knowledge base for this aspect which is often neglected alongside more conventional clinical, economic and service evaluations

In Africa, the advantages of telemedicine are indisputable. According to The World Health Organization (WHO) Africa has 24% of the burden (of disease) with only 3% of the health workers commanding less than 1% of world health expenditure” (WHO, 2021). This is aggravated by the fact that the population growth rate exceeds the production rate of health professionals. Thirty-one African countries have less than 20 doctors per 100,000 people (WHO, 2021). Therefore Telemedicine has always been touted as a potential solution to some of Africa’s health problems. The needs for Home based care due to Covid-19 pandemic

has heightened interest in and awareness of telemedicine in Africa as in the rest of the world (Omboni, 2021).

Rwanda has a startling low physician density of 0.064 for every 1,000 people and therefore Rwandans seeking medical care are used to waiting in long lines or traveling long distances for medical attention (MOH, 2020). However, thanks to near-universal broadband access, now Rwandans need only reach for their phones the mode of telemedicine used in Rwanda. In partnership with London based telehealth startup Babylon and the Bill and Melinda Gates Foundation, the Rwandan Ministry of Health launched an app called Babyl Rwanda, which connects users with an artificial intelligence chatbot to triage medical complaints, make recommendations and schedule remote physician appointments (Borgen, 2019). The app is programmed with several languages including Kinyarwanda, English and French. Those without phones need only visit a Babyl Booth to access the necessary technology. This program is the one used in Home Based Care follow up of Covid-19 patients. The notable immediate benefit of telemedicine during Home Based Care Covid-19 patients as for other diseases are obvious, eliminating the risk of spreading the coronavirus during in-person visits. However, there are many other benefits, including notably connecting patients and their providers over long distances, cost savings, quality care improvement, availability of specialists and information not readily available via in-person visits, access to healthcare for patients in rural areas; and comfort and convenience (Schick, 2020).

### **2.2.3. Factors Influencing use of Telemedicine among Covid-19 Patients Admitted in Home Based Care**

Worldwide, the rapid propagation of Covid-19 has created changes in compliance with telemedicine. With the extraordinary rise in the number of daily cases as it is reported every day, there was a need for healthcare providers to use telemedicine to meet the increasing demand for their services. Some patients reported negative compliance to telemedicine due to different reasons like fear of violations against their rights as they couldn't see their providers. patients' privacy seemed to be not protected and good faith use of communications telemedicine platforms such as telephones, Skype and Face Time were required. Patients also feared disclosure of their privacy as some of them weren't familiar with this mode of care (CompuGroupMedico, 2021). There are no studies found in regional or local area that examined the influencing factors towards telemedicine use among Covid-19 patients admitted in Home Based Care.

### **2.2.4 Barriers on use of telemedicine among Covid-19 Patients Admitted in Home Based Care**

Throughout the World adopted the use of telemedicine in covid-19 management since then was no study conducted to explore barriers on use telemedicine among covid -19 patients in home based care/isolation and better way follow up during their time in isolation and even before outbreak of covid-19 was no established barriers of telemedicine utilization for those who wanted to embrace telemedicine .The barriers may differ expressed by both urban and rural parties , licensure, equipment issues, incompatible electronic health records, and gaps in rural broadband (Karsten, 2020). Other barriers include the quality of infrastructures

and technologies, as well as the level of acceptance of patients and doctors across different countries (Breton, 2021).

Sub-Saharan Africa general adoption of telemedicine is challenged by the barriers such as comparatively poor information, technology and communications technology infrastructure in in large scale of its population. It is unsurprising that the telephone, WhatsApp® software application, and e-mail are the only common methods used (MOH, 2020). Majority of African population aren't familiar with Videoconferencing using Skype, Zoom®, and WhatsApp® where it was reported in five percent of the modality used (Breton, 2021). Using e-mails and videoconferencing were unpopular because of technical limitations in Africa in general, and lack of insurance reimbursement for telemedicine and medico-legal and ethical concerns were noted as hindrances to telemedicine in many African countries. However, as elsewhere in the world, the COVID-19 pandemic served as a catalyst for telemedicine in Africa (Bloem, 2020). There are no studies found in regional or in Rwanda that examined the barriers to telemedicine among Covid-19 patients admitted in Home Based Care.

### **2.3 Critical review and research gap identification**

The literature review indicates that telemedicine provides several benefits during Home Based Care for Covid-19 patients, such as reducing the risk of spreading the virus during in-person visits, connecting patients and providers over long distances, cost savings, improved quality of care, access to specialists and information, and increased access to healthcare in rural areas. However, the rapid spread of Covid-19 has affected the compliance of telemedicine usage and prompted researchers to investigate factors that may affect its use, including individual characteristics such as age, education level, cost and reimbursement policies, licensure, technical issues, and gaps in rural broadband. Despite the prevalence of

qualitative studies exploring key informant perspectives, no mixed-methods studies have examined individual-level compliance and barriers to telemedicine usage among specific groups or the general population. Additionally, no studies have been found in Rwanda or the region that specifically examine barriers to telemedicine usage among Covid-19 patients in Home Based Care.

## **2.4 Theoretical framework**

This study is backed up by three theories. Those theories are Health Promotion Theory (HPT), the Theory of Planned Behavior (TPB) and the Social Cognitive Theory (SCT). The HPM was established by an American Nursing theorist Nola J. Pender back in early 1980s. The first goal of the model was to avoid and prevent all factors that may hinder the optimal health. The TPB is a generalized theory of human behavior in the social psychology literature that can be used to study a wide range of individual behaviors. It presumes that individual behavior represents conscious reasoned choice, and is shaped by cognitive thinking and social pressures.

The last Theory that was chosen in this study is the Social Cognitive Theory (SCT). This theory is also known as Social Learning Theory and it was developed by Bandura in 1989. Psychologist Albert Bandura along with his students and colleagues conducted a series of studies, known as the Bobo doll experiment, in 1961 and 1963 to find out why and when Canadian children display aggressive behaviors. According to the theory, people's behavior is learned by observation, imitation, and positive reinforcement. For people adopting such a thing, role models facilitate learning and individuals reenact behaviors they have observed directly or seen in the media. This theory is adapted to this study because Telemedicine will be effective in Rwanda if and only if barriers that are challenging its implementation are

eliminated. Those barriers affect the patient’s compliance which can be modified by the application of this Social Cognitive Theory.

## 2.5 Conceptual framework

### Independent variables

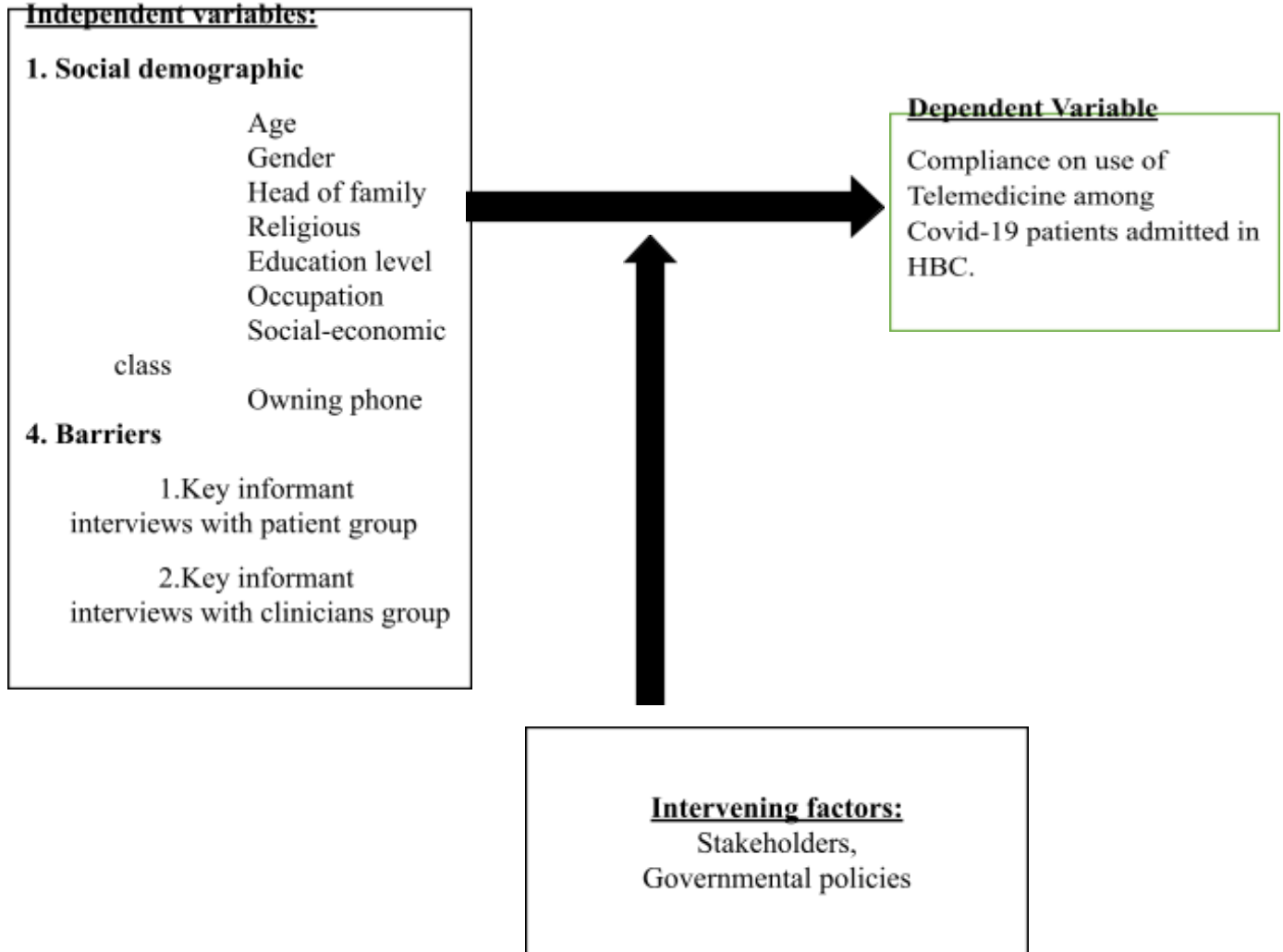


Figure 2. 1: Conceptual framework

This part clearly explains different dimensions of the study contents. As it is shown in the diagram various variables come together. It connects the various variables (dependent, independent, moderating, intervening and controlling) and their inter-relationships. This section first demonstrates the relationship of the variables in a diagrammatic form and then proceeds to show how the dimensions were incorporated followed by a list of how the dimensions are operationalized and thereafter a detailed narrative of the construct of each variable.

As it is mentioned in the figure 1, in this study “Compliance and influencing factors in telemedicine use among covid-19 patients admitted in home based care in Kigali. The population of this study is Covid-19 patients that were admitted in Home Based Care and treated using Telemedicine in Kigali, independent variables are influencing factors, benefits and challenges on utilization of telemedicine while the dependent variable is compliance on telemedicine use. But some confounding variables like stakeholders, organizational structure, policies and procedures can affect the independent variables.

## **2.6 Summary**

In summary, the second chapter of literature review described the highlights of published literature related to this study. The theoretical literature described Telemedicine. The empirical literature mentioned that the notable benefits of telemedicine during Home Based Care Covid-19 patients were eliminating the risk of spreading the coronavirus during in-person visits, connecting patients and their providers over long distances, cost savings, quality care improvement, availability of specialists and information not readily available via in-person visits, access to healthcare for patients in rural areas; and comfort and convenience, worldwide, the rapid propagation of Covid-19 has created negative compliance with



telemedicine and Telemedicine is facing barriers such as cost and reimbursement policies, licensure, equipment issues, incompatible electronic health records, and gaps in rural broadband. The gap identified is that even though Telemedicine was adopted in Rwanda no studies found in regional or in Rwanda that examined the barriers to telemedicine among Covid-19 patients admitted in Home Based Care. In the theoretical framework chosen Social Cognitive Theory (SCT). The conceptual framework indicates the relationship between the variables.

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.0 Introduction**

This section entails different methodological details that will be based on while conducting this research proposal. It designates the study design, target population, calculation of a sample size as well as different ways of obtaining the sample from the population, study instruments, ways of controlling the quality of the research, procedures of collecting and analyzing the data, and how the researcher will consider ethics while conducting this research.

### **3.1 Research Design**

For this research, a mixed approach (combining quantitative and qualitative methods) was utilized, using a cross-sectional study design. This design was chosen because it allows for the collection of data from participants at a single point in time, which helps to eliminate assumptions. Additionally, the cross-sectional design is cost-effective and efficient, making it ideal for this study.

### **3.2 Target Population**

The quantitative portion of the study targets Covid-19 patients who received Home Based Care and admitted in Telemedicine follow-up via the Rwandan branch of Babylon, operating under the name Babyl, between December 1st, 2020, and June 30th, 2021. The Babyl database indicates that 9,466 patients were admitted during this period (Babylon, 2022).

Meanwhile, the qualitative portion of the research involves key informant interviews with three Covid-19 patients and three clinicians who worked in Home Based Care.

### **3.3 Sample Design**

#### **3.3.1 Sample Size for quantitative and qualitative part**

The sample size for the quantitative and qualitative parts of the study are as follows

For the quantitative portion, a sample of 384 participants was obtained using Slovin's formula (Ellen, 2022). This formula is typically used to calculate sample size in prevalence studies of populations less than 10,000. The formula,  $n=N/[1+N(e)^2]$ , was used, where  $n$  is the sample size,  $N$  is the projected population size of the study, and  $e$  is the desired error (5%). By substituting the numbers in the formula, the sample size was calculated to be  $n=9466/[1+9466(0.05)^2] = 383.7$ , which was rounded up to 384. This sample size is considered large enough to represent the target population, and a 5% error was selected as it gave the desired sample size.

For the qualitative data collection, a purposive sample of three healthcare professionals (clinicians) who worked in Home Based Care and three patients who had experienced special care were admitted in key informant interviews to identify barriers to the use of telemedicine in Kigali..

#### **3.3.2 Sampling Technique**

The quantitative participants were selected using a systematic sampling method, with a random starting point and a fixed interval of 24. This interval was calculated by dividing the population size by the desired sample size of 384. Participants were recruited according to their order of recording in the database, based on their admission dates. To be included in the study, participants must be willing to participate and over 18 years old at the time of being diagnosed with Covid-19. Those who are unwilling or deceased are replaced with the next

participant in the database. For the qualitative part of the study, 3 healthcare professionals and 3 patients were purposely selected to participate in key informant interviews, These interviews were aim to identify barriers to the utilization of Telemedicine in Kigali

### **3.4 Data Collection Methods**

#### **3.4.1 Data Collection Instrument**

An English version of the data collection tool that was used during Data collection is found in Appendix 3. It was developed based on the specific objectives of this research proposal. There was no standardized questionnaire to be adapted to this study and therefore data collection questionnaire was developed by the researcher based on the specific objectives of the study and local context. The study questionnaire was selected since it is effective means of measuring the behavior, attitudes, preferences, opinions and, intentions of relatively large numbers of subjects more cheaply and quickly than other methods. The questionnaire of this study will use closed questions to collect data (Appendix 3). The tool was translated into the Kinyarwanda language before data collection and later be administered using Google form for participants so that data collection tracking easy. Interview guide for qualitative Data Collection was indicated on Appendix 4 of the research proposal.

#### **3.4.2 Procedures of Data Collection**

Six experienced Data Collectors were hired and trained on research questionnaires and ethics in order to speed up data collection. Each Data Collector will be required to conduct an interview on 4 participants during a period of 6 days. A Data Collector conducted a telephone interview to meet the participants of this study. Participants are given research explanations and are required to sign a consent form before responding to research questions. Both questionnaire and Consent forms are available in two languages (appendix 2) and were

available to participants using google forms. The questionnaire was interviewer-administered. Only voluntary participants were included. Data quality will be safeguarded by pretesting the validity as well as reliability of the questionnaire. Data stored in a locked draw and specific folders scripted with passwords for its safety.

### **3.4.3 Reliability and validity of instruments.**

#### **Reliability**

Reliability means the honesty of the processes and data collected. It makes sure that the research findings can be repeated and attributed to other situations . In this study the researcher intends to conduct a **test-retest** reliability method in order to measure the stability of the responses of questions on questionnaires among 10 random participants in separate occasions. 10 participants are enough when considered at different occasions. The instrument was considered reliable when in all those five different occasions with multiple time points, it could consistently reproduce the same result over all the visits; provided that all other variables remain the same. If the tools provide such consistency, they will be regarded as having high test re-test reliability and therefore appropriate for use in this research.

#### **Validity**

Validity is an indicator of how sound the research study is. It is also the closeness of what is being measured or intended to be measured. It entails if variables represent the objective being measured. For validity, a pretest pilot study was conducted on random 5 participants to verify the validity of the questionnaire. The pilot study employed criterion-related, content, and construct validity test method.

### **3.5 Data Analysis**

Primary recording and validation was done in SPSS software version 26 for statistical analysis. Descriptive analysis was carried out and examined the individualities of data. In conducting analysis, variables were quantified using frequencies and percentages. Chi-square test was computed to test the relationships among independent and dependent variables. A P-value less than 0.05 will be considered statistically significant. A multivariate analysis was carried out on significant variables to determine compliance, influencing factors and barriers of Telemedicine utilization among patients in HBC Kigali. Final results will be represented in tables and figures.

### **3.6 Ethical Considerations**

Ethical permission was sought from the Mount Kenya University (MKU) Institutional Review Board (IRB). Another permission to conduct this study was obtained from the CEO of Babyl Rwanda in order to have access to Babyl Rwanda Database and patients records. Before obtaining data from the participant a Kinyarwanda version of consent form will be offered to the participants and all the questions from the participants were answered. Data was collected from the volunteering participants after getting all explanations participants will be required to sign on consent form. Collecting data will be done to only volunteering participants after signing a consent form (Appendix 2). No name was used on the questionnaire (Appendix 3). The confidentiality of the data that will be collected will be ensured since only the researcher has access to collected data and no names of the participants that were used. Specific computer folders will be created for data storage. This study proposal carries no risk for the participants. The benefit of participation is that the barriers to Telemedicine in Rwanda will be known and be addressed by policy makers and

stakeholders during making future decisions. Data stored in locked draw and specific folders scripted with computer password for soft copy safety. Questionnaire will be discarded after five years.

## **CHAPTER FOUR: FINDINGS AND DISCUSSION**

### **4.0 Introduction**

This chapter presents the study findings and discussion on the compliance and factors influencing use of telemedicine and barriers among covid-19 patients admitted in Home based care in Kigali city. All sampled patients 384 responded to our administered questionnaire on the response rate of 100%, the analysis was conducted following the specific objectives starting with description of social demographic characteristics of respondents using descriptive frequency tabulation. The chi-square test of independence was conducted to assess individual factors influencing compliance on use of telemedicine . In multivariate analysis, binary logistic regression was computed to control for confounding factors and to identify the likelihood measures of association such as adjusted odd ratio and its 95% confidence interval. Throughout bivariate and multivariate analysis, p-value less than the significant level (0.05) indicated the significant relationship. The results were presented in tables and appropriate graphs. Lastly, the discussion related the findings from this study to other studies conducted.

### **4.1 Socio demographic characteristics of Respondents**

This section provides a description of the respondents' demographic data, which includes their gender, marital status, occupation, level of education, age, and religion. The following table (Table 4.1) provides descriptive statistics for each demographic variable, which are helpful in understanding the respondents' backgrounds. Each variable will then be compared with the outcome variable of interest, which is compliance with using telemedicine, after which it will be discussed in more detail.



**Table 4. 1:Socio-demographic characteristics of respondents (N=384)**

Characteristics	Frequency (N=384)	Percent (%)
<b>Gender of Respondent</b>		
Female	176	45.8
Male	208	54.2
<b>Age</b>		
18-35	181	47.1
36-59	157	40.9
>60	46	12
<b>Marital status of Respondent</b>		
Divorced/separated	8	2.1
Married/cohabiting	231	60.2
Single	118	30.7
Single mother	27	7
<b>Level of Education</b>		
No formal education	2	0.5
Primary	72	18.8
Secondary	129	33.6
More than Secondary	181	47.1
<b>social-conomic Category</b>		
Category 1	0	0
Category 2	105	27.3
Category 3	274	71.4
Category 4	5	1.3
<b>Occupation of respondent</b>		
Agriculture/farming	16	4.2
Irregular Job	24	6.3
Jobless	110	28.6
Other (mention)	4	1
Regular Job	230	59.9
<b>Occupation of Head of Family</b>		
Agriculture/farming	37	9.6
Irregular Job	28	7.3
Jobless	109	28.4

Other (mention)	2	0.5
Regular Job	208	54.2
<b>Religion of respondent</b>		
Catholic	208	54.2
Muslim	32	8.3
No religion	13	3.4
Other (Mention)	17	4.4
Protestant	114	29.7
<b>Having personal cell phone</b>		
Yes	379	98.7
No	5	1.3

**Source: Primary data**

The results from table 4.1 showing the demographic characteristics revealed that more than half of the respondents were males (54.2%) as the females were only 45.8%. Also, age was disaggregated into three categories that is 18-35, 36-59 and >60. Most of the respondents were aged between 18-35 (47.1%) followed by those between 36-59 (40.9%) and very few of the respondents (12%) were above 60 years of age. In terms of marital status, more than a half of the respondents were married/cohabiting (60.2%), 30.7% of them were single and only 2.1 were divorced. In addition, 47.1% of the respondents had achieved tertiary education, 33.6% had secondary education and only 0.5% of the respondents had no education at all. Furthermore, 34.9% of the respondents belonged to social-economic category 1, 27.6% belonged to category 2, 36.2% belonged to category 3 and only 1.3% belonged to social-economic category 4. More than a half of the respondents (59.9%) had regular jobs however, 28.6% were jobless and only 4.2% of the respondents were carrying out agriculture/farming. Also, more than a half of heads of families had a regular job (54.2%), 28.4% were jobless while 9.6% and 7.3% were farmers and had irregular jobs respectively. Regarding their religion, more than a half of the respondents were Catholics

(54.2%) by religion, 29.7% were protestants and only 3.4% had no religion. Regarding the ownership of personal cell phone, 98.7% of respondents had their personal cell phones.

#### **4.1.Presentation of Findings**

The main objective of this research was to assess compliance and influencing factors towards Telemedicine use among Covid-19 Patients Admitted in Home Based Care in Rwanda.

##### **4.2.1. The compliance towards use of Telemedicine among Covid-19 Patients Admitted in Home Based Care in Kigali.**

Compliance towards telemedicine use was our target variable measured by a combination of four statements which ensured the communication between patients and clinicians, the following table indicates the results regarding the compliance towards telemedicine use among Covid-19 patients admitted in home-based care in Kigali city. MORISKY Scaling was used to classify the compliance level of telemedicine use among Covid-19 patients admitted in home-based care, according to this scaling compliance refers to the extent to which a patient correctly complies with medical recommendations. It usually refers to taking medications or drugs as prescribed, but it can also relate to using medical equipment, taking care of oneself, exercising on one's own, or attending therapy sessions (Cuevas.D & Wenceslao, 2015).

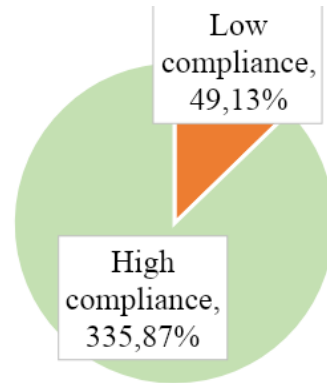
**Table 4. 2: The compliance of covid-19 patients towards telemedicine use among covid-19 patients admitted in home-based care.**

Compliance to the telemedicine Service among Covid-19 patients admitted in HBC	Yes		No	
	Frequency (N)	Percent (%)	Frequency (N)	Percent (%)
HBC Patient Respondent to the health care Team	355	92.4	29	7.6
Response Of Clinicians to Patients	338	88.0	46	12.0
Patients Accessibility to Reach To Medical Team	343	89.3	41	10.7
Patient Prescription Issuing Accessibility	353	91.9	31	8.1

**Source: Primary data**

From the above table 4.2.1, the most patients had access to reach out to the medical team (92.4%) with only 7.6% that were not able to reach out to the medical team. 88% of the clinicians were able to respond back to the patients with only 12% unable to respond.

The pie-chart below reveals that most of the patients (87%) had high compliance to the telemedicine services with only 13% of the patients with low compliance, Patients who responded yes to all four or three of the statements (Table 4.2.1) were considered having high compliance to telemedicine while patients who responded no to all, two or three of the statements was considered to have low compliance to telemedicine use.



**Figure 4. 1: The compliance of covid-19 patients towards use of telemedicine among covid-19 patients admitted in home-based care.**

**Source: Primary data**

#### **4.2.2. The Influencing factors of compliance on use of Telemedicine among Covid-19 Patients Admitted in Home Based Care in Kigali.**

The Influencing factors of compliance towards use of telemedicine among covid-19 patients admitted in home-based care were assessed, the association of socio-demographic variables (independent variables) was tested with compliance level to telemedicine use (High or Low), chi-square test of independence was used and an association with p-value of less than 0.05 was insignificant as explained in the following table 4.2.2.

**Table 4. 3: Influencing factors with compliance of covid-19 patients towards telemedicine use.**

Characteristics	Low Compliance		High Compliance		Chi-Square	P-Value
	Frequency (N)	Percent (%)	Frequency (N)	Percent (%)		
<b>Gender of Respondent</b>						
Female	12	3.13	164	42.7	8.2	<b>0.003</b>
Male	34	8.85	174	45.3		
<b>Age</b>						
18-35	8	2.08	38	9.90	16.76	<b>&lt;0.01</b>
36-59	32	8.33	149	38.80		
>60	6	1.56	151	39.32		
<b>Marital status of Respondent</b>						
Divorced/separated	2	0.52	6	1.56	41.12	<b>&lt;0.01</b>
Married/cohabiting	8	2.08	223	58.07		
Single	36	9.37	109	28.39		
<b>Level of Education</b>						
No formal education	1	0.26	1	0.26	6.08	0.108
Primary	13	3.39	59	15.36		
Secondary	13	3.39	116	30.21		
Tertiary	19	4.95	162	42.19		
<b>social-economic Category</b>						
Category 1	36	9.38	98	25.52	8.034	0.061
Category 2	4	1.04	102	26.56		
Category 3	1	0.26	138	35.94		
Category 4	0	0.00	5	1.30		
<b>Occupation of respondent</b>						

Agriculture/farming	3	0.78	13	3.39		
Irregular Job	9	2.34	15	3.91		
Jobless	7	1.82	103	26.82	19.55	<b>0.001</b>
Other (mention)	1	0.26	3	0.78		
Regular Job	26	6.77	204	53.13		

**Occupation of Head of Family**

Agriculture/farming	11	2.86	26	6.77		
Irregular Job	5	1.30	23	5.99		
Jobless	9	2.34	100	26.04	17.25	0.082
Other (mention)	1	0.26	1	0.26		
Regular Job	20	5.21	188	48.96		

**Religion of respondent**

Catholic	25	6.51	183	47.66		
Muslim	0	0.00	32	8.33		
No religion	4	1.04	9	2.34	9.765	0.055
Other (Mention)	1	0.26	16	4.17		
Protestant	16	4.17	98	25.52		

**Having a personal cell phone**

No	0	0.00	5	1.3	0.689	0.526
Yes	46	11.98	333	86.7		

**Source: Primary data**

Different factors were assessed to find out which of them were associated with compliance to telemedicine among covid-19 patients during home-based care. A chi-square test was run as shown in the table 4.2.2 above.

The results indicated that the age of the patient is associated with the compliance as it is statistically significant ( $\chi^2=16.76$ ;  $p<0.01$ ) as the pvalue is less than the 5% level of

significance. Furthermore, the results revealed that those aged between 36-59 had high compliance of 39.8% followed by those above 60 years old (39.32%). Respondents aged 18-35 years old are the only ones that had figures among low compliance of 9.90%.

Gender of respondent was found to be significantly associated with compliance to telemedicine while 45.3% of males and 42.7% had high compliance ( $\chi^2=8.2$ ;  $p=0.003$ ). Regarding the marital status, those who were married/cohabiting had high compliance 58.07% followed by those who were single 28.39% who later has also more low compliance to telemedicine (8.07%). The marital status was associated with the compliance as the chi-square results have indicated with the p value ( $<0.01$ ) being less than the level of significance.

The results also revealed that those patients with more than a secondary level of education, secondary education and primary education were the most compliant one with high compliance of 46.33%, 33.59% and 18.75% respectively. The education status was not associated to the compliance as from the chi-square test ( $\chi^2=6.08$ ;  $p=0.108$ ) revealed that it is statistically insignificant at 5% level of significant.

Also, according to the social-economic category, those of category 3 were the most compliant patients with 35.94% high compliance. This was followed by category 2 with 26.56% high compliance level, however, more respondents from social-economic Category 1 had low compliance to telemedicine (9.38%). This factor is not associated with the compliance on use of telemedicine among covid-19 patients as the results from the chi-square test indicated that it is insignificant statistically ( $\chi^2=8.034$ ;  $p=0.061$ ).



The occupation of both respondents and health of their families were assessed with compliance to telemedicine; occupation of respondents was found to be significantly associated with compliance ( $\chi^2=19.55$ ;  $p=0.001$ ) with more respondents with regular jobs had high compliance (53.13%). The association of occupation of head of family with the compliance to telemedicine was not significant although around a half of respondents (47.66%) were catholic and had high compliance to telemedicine but also had a lowest compliance to telemedicine (6.51%).

From bivariate analysis in which we were assessing the association of a single variable and compliance to telemedicine, independent variables with significant association were added together in multivariate analysis using binary logistic regression to control confounders. Adjusted odd ratio were reported, their p-value and 95% confidence intervals for every variable as indicated by the table 4.2.3 below.

**Table 4. 4:Multivariate analysis of factors influencing compliance on use of telemedicine**

Characteristics	AOR	CI at 95%	P-Value
<b>Gender of Respondent</b>			
Male	5.53	(1.92-15.9)	<b>0.020</b>
Female	1*		
<b>Age</b>			
18-35	2.213	(1.049-4.926)	<b>0.039</b>
36-59	1.363	(0.898-2.340)	0.128
>60	1*		
<b>Marital status of Respondent</b>			
Married/cohabiting	6.6	(4.727-14.901)	<b>&lt;0.01</b>
Separated/Divorced	2.63	(0.481-14.438)	0.264
Single	1*		
<b>Occupation of respondent</b>			
Agriculture/farming	0.8	(0.013-0.479)	<b>0.006</b>
Irregular Job	0.255	(0.075-0.867)	<b>0.029</b>
Jobless	2.005	(0.602-6.670)	0.257
Other (mention)	0.917	(0.079-10.708)	0.945
Regular Job	1*		

1\* reference category

**Source: Primary data**

The results showed that male respondents were 5.53 times more likely to have high compliance to telemedicine as compared to females (AOR=5.53, 95% CI: 1.92-15.9, p=0.020). The compliance to telemedicine decreased with age, young participants aged between 18 to 35 years old were 2.213 times more likely to have high compliance to telemedicine as compared to old participants aged above 60(AOR=2.213, 95% CI: 1.049-4.926, p=0.008). Also, adults aged between 36 to 59 years old were 1.36 times more

likely to comply with telemedicine use , However, this association was not statistically significant.

Getting married and living with a partner increased the likelihood to high compliance towards telemedicine as compared to single people, these respondents were 6.6 times more likely to comply to telemedicine as compared to single respondents (AOR=6.26, 95% CI: 4.727-14.901,  $p<0.01$ ). comparing to respondents with regular jobs, having irregular job and being a farmer were both less likely to highly comply for telemedicine, 0.8 times (AOR=0.8, 95% CI: 0.013-0.479,  $p=0.006$ ) and 0.25 times (AOR=0.255, 95% CI: 0.075-0.867,  $p=0.029$ ) respectively.

#### **4.2.3 The barriers on use of telemedicine covid -19 admitted in home-based care**

Key informant interviews from three patients admitted in home-based care for covid-19 and three health care providers who routinely followed up the patients in HBC using mobile phone were recorded. Despite the great benefits of improved access to medical care at home and getting connected to healthcare providers at any time, some barriers on both sides were observed and are below presented separately.

##### **4.2.3.1. Barriers from respondents**

During their interview, respondents commonly tackled on some barriers which could negatively influence their telemedicine compliance 6 of them were identified include: Living alone, Lack of stable electric power , Insufficiency medical supply as nearest pharmacy, Rumors about covid-19 , untrusted telemedicine care,Untrusted way of treatment ,and Unknown health status of patient .

#### **4.2.3.2. Patients' barriers**

##### **Living alone**

During the period of covid-19 pandemic, patients who were living alone were more likely to have lower compliance to telemedicine use. Two of three respondents interviewed narrated how being alone at home with Covid-19 infection was not easy particularly when it came to seeking for medications from pharmacy. One of them said “During covid-19 pandemic’s confinement, I was home almost lonely with my grand child who can’t travel to pharmacy, I quietly managed to talk to clinician on phone however, I could not find someone to bring prescribed medicines from Pharmacy, therefore, I could sometimes refuse to answer calls.”

##### **Lack of stable electric power**

Especially in some areas (semi-urban), the electric power could be unstable and leave some phones uncharged as all three interviewed respondents mentioned. One of them said “Not only during covid-19 but sometimes I relied on electric power and once it becomes unstable my phone shut down and hence misses the call from a clinician”.

##### **Insufficiency medical supply as nearest pharmacy**

Two of three interviewed Covid-19 patients declared that they could miss the prescribed medication from the nearest pharmacy. “Our district was under total lock down and could not move to other pharmacies. After I finished talking to the clinician, I immediately used to seek recommended medication from the Pharmacy. However, once I missed them, I stopped even talking to clinicians on the phone.”

#### **4.2.3.3. Healthcare providers' barriers**

As health care providers, some challenges were met during the covid-19 towards telemedicine use.

#### **Rumors about covid-19 and untrusted telemedicine care.**

All three interviewed clinicians reported that during the covid-19, rumors circulated among population that it was not a real pandemic, this has affected the treatment of Covid-19 patients who also believed in rumors, "I once contacted a patient for treatment and she said to me that I should not worry about her that covid-19 is not real due to Rumors circulated on internet, I tried to convince her that covid-19 signs and symptoms are different from flu but she resisted and sometimes she could put phone off intentionally."

#### **Untrusted way of treatment**

As home based care initiative was thought to be due to covid-19 pandemic, patients could not believe in virtual diagnosis, and due to rumors about covid-19 existence, patients in home-based care could refuse to take calls from healthcare provider as they believe in non-existence of covid. All clinicians interviewed said that this was a big challenge in compliance towards telemedicine and one said "When I called a patient, someone else responded and he treated me as conspirator and he refused to talk to me about the patient's health."

#### **Unknown health status of patient**

Health care providers could not find the patient contact and worry about the health status whether he/she got severe illness or is healthy. There were patients who could not afford to purchase the prescribed medicines and therefore lost follow-up and missed the prescribed medication; Two of three clinicians declared. One of the clinician narrated “ I remember when I contacted a Covid-19 patient in the evening, she was really ill and the next morning I missed her phone, with none else to contact, I worried about her life after the last treatment.”

### **4.3 Discussion of findings**

The objectives of this study were to assess the compliance of Covid-19 patients to telemedicine use and explore the influencing factors. The study was conducted in Kigali city among 384 Covid-19 patients admitted in home-based care.

The results from our study showed that among 384 respondents, 335 (87%) had a higher compliance to telemedicine use, this was due to evaluated mutual communication between a medical team and patient regarding the treatment and medication prescription using telephone. To assess the compliance to telemedicine use, patients were asked how likely they responded to the health care team, whether they received the response from clinicians, their accessibility for reaching the medical team and accessibility to prescribed medication. This high compliance to telemedicine use was also observed from the study conducted in Brazil on multiple use of telemedicine during the pandemic which has shown than 76% had high compliance to telemedicine use (Scheffer et al., 2022).

Compliance level observed from our study is comparatively higher than 8% as shown by the study conducted by Lee et al., (2019) because of two reasons; their study was conducted in

rural areas and this proportion is in general population rather than being the special case of covid-19 patients admitted in home-based care.

The study on the compliance to telemedicine use before the covid-19 pandemic indicated that the compliance was very low 26% (Elizabeth D. Ferucci et al., 2022). Telemedicine has shown to be the safest method of communication between patients, both infected and uninfected, and professionals during the COVID-19 pandemic due to the requirement of social seclusion and the lack of viable therapies. This resulted in home-based care, and as a result, telemedicine utilization has seen more compliance than in the past. Also, the study conducted in Norway shown that before covid-19 pandemic, some hospitals irregularly employed telemedicine; it was not widely practiced. Most disciplines, such as rehabilitation, neurosurgery, skin, and venereal diseases, used telemedicine, therefore the compliance was too low 0.1% at national level (Alami et al., 2017).

During our study, gender and age of respondents were observed to be significantly associated with compliance to telemedicine use among covid-19 patients, where female patients were 5.5 times more likely to comply to telemedicine use ( $p=0.020$ ), young patients were more likely to comply to telemedicine, this was also obtained from the study conducted by Lee et al., (2019) which indicated that females, young adults and respondents with higher education had high compliance to telemedicine (Lee et al., 2019).

The same study conducted on compliance to use of telemedicine before and after covid-19 indicated that age, gender, region was significantly associated with telemedicine use (Sinha et al., 2021). Another population based study on exploring social demographic factors that

affected telemedicine access indicated that Gender, insurance status, family income, age and education were found to significantly influence telemedicine access and use(Chagpar, 2022).

The use of telemedicine has improved access to non-life-threatening medical care, decreased the risk of SARS-CoV-2 transmission, conserved scarce medical supplies, allowed for the quick deployment of a large number of medical professionals, and supported continuity of care when local hospitals and healthcare facilities were unable to keep up with demand. But not everyone in the population has had equal access to telehealth (Omboni et al., 2022).

In this study, barriers such as unstable mobile network, insufficiency medications at nearest pharmacy and missing the patient's phone was also observed from a systematic review study conducted on challenges observed from telemedicine use during the covid-19 pandemic include, The technical obstacles were a lack of universal access to technology and poor mobile connections (Ftouni et al., 2022).



## **CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATION**

### **5.0 Introduction**

This chapter includes a summary of findings, conclusions and recommendations.

### **5.1 Summary of findings**

This study was conducted on 384 covid-19 patients admitted in home-based care in Kigali city during Covid-19 pandemic. The study's main objective was to assess the compliance of covid-19 patients towards telemedicine and associated factors in Kigali city's home based care. The first objective was to determine to compliance on use of telemedicine second objective was to explore the socio-demographic factors associated with use of telemedicine and the third objective was to narrate the potential barriers that could hinder the use of telemedicine among covid-19 patients admitted in home-based care in Kigali city. The summary of findings for every specific objective is shown respectively as follows.

#### **5.1.1 The compliance towards Telemedicine use among Covid-19 Patients Admitted in Home Based Care in Kigali.**

The study results showed that 92.4% of covid-19 patients admitted in home-based care responded to health care team while 7.6% did not. 88% of respondents also revealed that they received responses from clinicians while 12% did not. Regarding the patients accessibility to reach to medical team, 89.3% of patients revealed that they had high access to medical team, moreover, 91.9% of respondents declared high access to prescribed medications. All these four compliance measures were combined to classify the compliance

level (High or Low) among Covid-19 patients and 87% of respondents showed a high compliance to telemedicine use while only 13% had low compliance as shown in the graph 4.2.1.

### **5.1.2 Factors influencing use of Telemedicine among Covid-19 Patients Admitted in Home Based Care in Kigali.**

In bivariate analysis, only independent factors such as Gender, Age, Marital status and occupation of respondent were found to be associated with compliance to telemedicine among covid-19 patients in Home based care in Kigali city with p-values,  $p=0.003$ ,  $p<0.01$ ,  $p<0.01$ ,  $p=0.001$  respectively. With p-value less than 0.05 considered significant.

These variables were only inserted in multivariate analysis by using binary logistic regression to control for confounders and obtain the adjusted odds ratio. Results from logistic regression shown that male patients were more likely to comply to telemedicine ( $p=0.020$ ); respondents living with their intimate partners were more likely to comply to telemedicine use ( $p<0.01$ ); being farmer and having irregular job was negatively associated with compliance to telemedicine use,  $p=0.006$  and  $0.029$  respectively.

### **5.1.3 The barriers of telemedicine utilization by covid -19 admitted in home-based care.**

Despite the great advantage of telemedicine during covid-19 pandemic that made the health care services fast from health care provider to patient admitted in home-based care, certain barriers were reported by both patients and clinicians that banned the complete compliance level. Through key informants interviews, patients reported that being alone at home could not allow them to find someone to bring prescribed medication from the nearest pharmacy particularly during the confinement, additionally, some pharmacies did not have prescribed

medications or patients could not afford the cost of medications, lastly, as result of poor mobile network and unstable electric power, patients could miss the calls from a responsible physician. Moreover, physicians also reported some challenges that include finding the patient's phone off and worrying about the health status of the patient in that case.

## **5.2 Conclusion**

Telemedicine was employed in Rwanda during the COVID-19 pandemic to evaluate the intensity of the waves and take home-based patient care into consideration. The strategy has improved the infrastructure of support for community health workers, who may be tasked with providing care for up to 100 COVID-19 patients. The project has given health workers training, equipment, and the assurance of doctors' support. Despite of the pre-pandemic period, during and after pandemic period, Use of telemedicine was given attention by the population for its advantages in improving and making quick health care delivery. Young adults, males, married and patients who had regular jobs were more likely to comply to telemedicine use during the covid-19 home-based care.

## **5.3 Recommendation**

The following are recommendations based on research findings.

### **To government**

The covid-19 pandemic showed how telemedicine is needed for easy health care delivery and efficiency health services to patients, however, more public awareness interventions are needed to educate the population on benefits of telemedicine to speed up health services delivery and lowering the nurse-patients ratio.

The government needs to partner with the telecommunication companies to improve mobile network availability in rural areas to prevent the shortage of mobile network which could lead to miscommunication between a patient and a health provider.

### **To community**

There is a need to improve awareness on benefits of telemedicine in the community, community health workers should encourage the community members to adhere to telemedicine use and provide accurate information on their health status for proper treatment.

### **To the researcher**

This research was conducted to evaluate the compliance, Influencing factors towards telemedicine use and barriers among covid-19 patients admitted in Home-based care during the covid-19 pandemic. Further research is needed to assess the knowledge and attitudes towards telemedicine and increase the study scope.

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## **APPENDICES**

## Appendix1. Research clearance certificate from Mount Kenya University

# Mount Kenya University

INSTITUTE OF POST GRADUATE STUDIES & RESEARCH

### INTRODUCTION LETTER

REF: MKU04/PGS&R/0750/2022

14 NOV ,2022

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

**RE: HENRY MURINZI**

**MPH/2019/56775**

This is to confirm that the above- named person is a bonafide- student of Mount Kenya University Rwanda.

He is currently carrying out research work to enable him complete his Masters of Public Health (Epidemiology Option) Degree Program. The title of his research is: **COMPLIANCE AND INFLUENCING FACTORS OF TELEMEDICINE USE AMONG COVID-19 PATIENTS ADMITTED IN HOME BASED CARE IN KIGALI.**

**A CASE STUDY OF BABYL HEALTH LTD**

The information received will be confidential and for academic purposes only.

Any assistance accorded to him to complete this study will be highly appreciated.

Thank you.

  
Alice Kituyi Kiyake (PhD)  
Ag. DIRECTOR

  
INSTITUTE OF POST GRADUATE STUDIES & RESEARCH

## Appendix 2 : Research approval from Babyl



**Henry Murinzi( MPH/2019/56775)**  
**KIGALI-RWANDA**  
**21st November 2022**


**Dear Henry,**

**RE: ACCEPTANCE OF DATA COLLECTION**

Reference is made to your request **REF:MKU04/PG&R/0750 /2022** for data collection of your academic research at Babyl health Ltd's medical and data management departments . It's a pleasure to confirm that your request has been granted effective 21/11/2022.

The research is intended to reach out covid-19 patients followed up by Babyl clinical team in home based care (**HBC**) From **1st December 2020 to 30th June 2021**.The Sample size is 384 participants and 5 clinicians as key informant interview .

Sincerely,

  
Shivon Byamukama (PhD)  
Managing Director,  
Babyl, Rwanda.



### **Appendix3: Information and consent form(English)**

**Risks or Discomforts:** There are no risks or any discomforts in this research.

**Profits:** The importance of contribution is that barriers to Telemedicine in Rwanda will be prevented.

**Confidentiality:** The information that you will give will always be a secret. The researcher only will have access the information. Your names will not be required. No other person will know that you participated in this research.

I have read the consent form and I am willing to participate in the study

Signature

Date

Henry MURINZI

Tel: +250786089466

Signature

Date

## **Appendix2.2 Information and consent form (Kinyarwanda)**

### **URUPAPURO RWUZUZWA MU KUGIRA URUHARE MU BUSHAKASHATSI**

**Ubushakashatsi:** Tugutumiriye kugira uruhare mubushakashatsi bwo gusuzuma “ Imbogamizi zo kuvurwa hakoreshejwe ikoranabuhanga uri kure yamuganga mubarwayi barwariye Koronavirusi murugo mu Rwanda.”. Turakwinginze kuko ubufasha bwawe bukenewe cyane muri ubu bushakashatsi. Rwose wihangane usome amakuru akurikira witonze mbere yuko wemera cyangwa uhakana kubugiramo uruhare.

**Uko bikorwa:** Urugira uruhare muri ubu bushakashatsi usubiza ibibazo bike kandi bidakomeye turi bukubaze. Birafata igihe gito nk’iminota cumi n’itanu cyangwa itagezeho.

**Imbogamizi cyangwa ibyateza ingorane:** Ntagorane cyangwa imbogamizi tubona ko zabaho muri ubu bushakashatsi.

**Akamaro k’ububushakashatsi:** Ibizava muri ububushakashatsi bizifashishwa mu kureba imbogamizi zihariye mwahuye nazo bityo ubwo buryo buzanonosorwe neza.

**Ibijyanye n’ibangamubushakashatsi:** Ibisubizo uri buduhe ndetse n’amazina yawe byose biragirwa ibanga. Ibyavuye mu bushakashatsi nibiramuka bishyizwe kumugaragararo, bizasohoka mu buryo bukomatanyije kuburyo umuntu kugiti cye adashobora kumenyekana.

**Gufasha mu bushakashatsi kubushake bwawe:** Gufashani ubushake bwawe. Niba wumva utisanzuye udufashe ubimenyeshe umushakashatsi; Ntugire impungenge kuko wemerewe kudasubiza ikibazo cyose kitakunyuze. Nanone uyu mushinga w’ubushakashatsi wagenzuwe na Kaminuza ya Mount Kenya muri komite ishinze ubuziranenge bw’ubushakashatsi kandi bagaragajeko ntakibazo uteye.

Nasomye amakuru yose yanditse kuri iyinyandiko. Ndemera gusubiza muri ububushakashatsi.

Umukono ..... Itariki .....

## Appendix 4. Questionnaire

Instructions:

This questionnaire is interviewer-administered. It must be completed by the Researcher. The participant's responses must be filled as given without modification or alteration.

Fill the answers in the places provided

Part one: Identification and Social demographic characteristics of the participants

Date of Data Collection .....

What is the Admission Date? .....

Social demography

1)what is the age of the participant ?

18-35 years

36-60 years

60 years and above

2)What is the Sex of the Participants?

Male

Female

Other

Who is the head of the family?

Self  b)Father  c) Mother

5. What is the religion of the participants?

No religion

Catholic

Protestant

Muslim

Other (Mention).....

What is the occupation of participants?

Jobless

Agriculture/farming

Regular Job

Irregular Job

Other (mention) .....

What is the occupation of the Head of family?

Jobless

Agriculture/farming

Regular Job

Irregular Job



Other (mention) .....

What is the education level of participants?.....

No education  b) Primary  c) Secondary  d) More than Secondary

What is the marital status of the participants?

Single mother  b) Married/  c) Divorced/separated

What is your ubudehe category ?

a) Category one  b) Category two  c) Category three  d) Category four

Do you have a personal cell phone?

Yes  b) No

Do you have a Smartphone

Yes  b) NO

Part Two: utilization of Telemedicine use among Covid-19 patients admitted in HBC

Did you see the following as an advantage of telemedicine use?

No transportation and less time or costs Yes  NO

It's easy way to access team of clinicians in a distance Yes  NO

provide medical advices and orientation at anytime Yes  NO

Appointment on-demand options Yes  NO

It helped you to Access to doctors and nurses as was expected Yes  NO

There is less Chance of spreading infection to others Yes  NO

There is less Time consuming Yes  NO

did you see it as convenient way of accessing health service in your hands Yes  NO

it was easy for you get your prescribed medication Yes  NO

consultation over the phone wa a good experience for you Yes  NO

Part three: Network Connectivity on accessing to Telemedicine Service among Covid-19 patients admitted in HBC

According to your home location, network connectivity enabled you to use Telemedicine service during your time of isolation in HBC? Yes  NO

According to you, Telemedicine service was a hard and bad experience?

Yes

No

Unable to decide

Part Three Compliance to the Telemedicine Service among Covid-19 patients admitted in HBC

15. During your time in HBC you were able to respond to all incoming follow up messages sent everyday to your phone??

Yes

No

17. When you encountered an issue, were you able to get medical help through the phone??

Yes

No

18. were you able to reach out to the medical team for any query /concern related covid -19 retesting through your phone Yes  NO

19. During your time in HBC were you able to issue your prescription via mobile phone ?

Yes

No

#### Appendix 4. Kinyarwanda

Amabwiriza :

Ibibzo bigenewe bikanasubizwa na abitabiriye ububushashakashatsi ntanakitwe bahinduyemo  
.Igice cya mbere: Kumenyekanisha n'imibereho yairanga abitabiriye ubushakashatsi

Imibereho y'abaturage

1)imyaka yuwitabira ni imyaka ingahe ?

18-35 imyaka

36-60 imyaka

60 imyaka kuzamuka

2)Niki Igitsina Cyabitabiriye?

Umugabo

Umugore

Ibindi

Ninde mukuru wumuryango?

we kugiti cye  b)umubyeyi w'umugabo  c)umubyeyi w' umugore

5..Ni irihe dini ry'abitabiriye?

Nta dini

Catholic

Protestant

Musulim

Abindi.....

Ni uwuhe mwuga w'abitabiriye?

Nta akazi

Ubuhinzi / ubuhinzi

Akazi gasanzwe

Akazi kibiraka

ibindi bitavuzwe haruguru .....

Ni uwuhe mwuga Umukuru wumuryango?

Nta akazi

Ubuhinzi / ubuhinzi

Akazi gasanzwe

Akazi kibiraka

Other (mention) .....

Ni uruhe rwego rw'uburezi rw'abitabira??.....

Nta burezi busanzwe  b) Ibanze  c) Secondary  Kurenza Amashuri Yisumbuye

irangamimerere?

Ingaragu  b) abashaka/ ababana  c) abatandukanye

Nihe cyiciro cyawe cy'ubudehe?

a) 1  b) 2  c) 3  d) 4

Ufite terefone yawe igendanwa?

Yego  b) Oya

Ufite Smartphone

Yego  b) Oya

Igice cya kabiri: gukoresha Telemedisine mu barwayi ba Covid-19 bemewe muri HBC

Wabonye ibi bikurikira nkibyiza bya telemedisine?

Nta ngendo nigihe gito cyangwa ikiguzi Yego  Oya

Nuburyo bworoshye bwo kugera kumurwi wabaganga kure ? Yego  Oya

tanga inama zubuvuzi nicyerekezo igihe icyo aricyo cyose Yego  Oya

Yagufashe Kugera kubaganga nabaforomo nkuko byari byitezwe Yego  Oya

There is less Chance of spreading infection to others Yego  Oya

Bitwara igihe gito Yego  Oya

Nabonye ari inzira yoroshye yo kubona serivisi yubuzima mumaboko yawe ??

Yego  Oya

byari byoroshye kuri wewe kubona imiti yagenwe?

Yego  Oya

consultation over the phone wa a good experience for you Yes  NO

Part three: Network Connectivity on accessing to Telemedicine Service among Covid-19 patients admitted in HBC

Ukurikije aho uherereye, guhuza imiyoboro byagushoboje gukoresha serivise ya Telemedicine mugihe cyawe cyo kwigunga muri HBC? Yego  Oya

Nkuko ubibona, serivisi ya Telemedicine yari ibintu bikomeye kandi bibi?

Yego

oya

Igice cya gatatu kubahiriza serivisi ya Telemedicine mu barwayi ba Covid-19 bemewe muri HBC

15. Mugihe cyawe muri HBC washoboye gusubiza ubutumwa bwoherezwaga buri munsu kuri terefone yawe??

Yego

Oya

16. Mugihe wahuye nikibazo, washoboye kubona ubufasha bwubuvuzi ukoresheje terefone ?

Yego

Oya

17 washoboye kwegera itsinda ryabaganga kubibazo byose / impungenge zijyanye na covid -19

kugerageza ukoresheje terefone yawe yego  oya

18. Mugihe cyawe muri HBC washoboye gufata imiti wandikiwe ukoresheje terefone

igendanwa?

Yego

oya



## **Appendix 5 Interview Guide for Qualitative data collection**

### **Instructions**

- A. Start with warm up of the participants
- B. Introduce yourself
- C. Introduce the study and its purpose
- D. Get the consent from the participants
- E. Assign identification codes to the participants
- F. Prepare and make sure that recorders are working
- G. Start the interview
- H. Let's participants finish; gives them time to think; tolerates pauses

### **Questions**

1. Introduce yourself without telling us your name and mention your code and your category (health professional or patients)
2. How do you understand telemedicine?
3. How did you interact with Telemedicine during Covid-19 pandemic?
4. What are the advantages of telemedicine in Rwanda?
5. What are the barriers of telemedicine in Rwanda?
6. What do you see can be improved in order to make telemedicine effective in Rwanda?