



Center for Innovative Drug Development and Therapeutic Trials for Africa
College of Health Sciences, Addis Ababa University

CDT-Africa MSc in Clinical Trials fellowship

MSc in Clinical Trials program

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GSR/2323/2012

Title

Preparedness and response to the COVID-19 pandemic in a hospital in Nairobi County, Kenya.

A research thesis submitted in partial fulfillment of the requirements for the award of Master of Science in Clinical Trials by the Center for Drug Development and Therapeutic Trials for Africa, College of Health Sciences, Addis Ababa University.

December 2021

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Declaration

This thesis is my original work and has not been presented for a degree in any other university.

Catherine Lydiah Wanjiru

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Signature



Date 18th April 2022

Supervisors' Approval

This thesis has been submitted for review with my approval as Catherine's research advisor.

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Date 16th April 2022

Acknowledgments

This is to thank the Almighty God for the gift of life to undertake this research. I thank my family for their overwhelming love, support and encouragement in the pursuit of this master's degree. I thank CDT-Africa for awarding me this masters fellowship. I thank my lecturers in Addis Ababa University for teaching me and equipping me with knowledge in clinical trial design, conduct, management and clinical research methods. I thank my supervisor's Dr. Charlotte Hanlon and Dr. Girmay Medhin for helping me to refine my idea and bring out an excellent proposal that guided this research. I thank them for their time, wisdom, advise and helping me to narrow down the broad idea I had. I thank my colleagues and friends in Kenya Medical Research Institute and Addis Ababa University for their advice and support on master's research proposal guidelines and research undertakings. I sincerely thank the faculty at Strathmore University and researchers in Kenya Medical Research institute for their research exposure that led me to pursue a master's degree. I thank Elsevier for the Mendeley application that was used to find journals and referencing. I thank the management and staff in Belevue hospital for providing their time, knowledge and resources to participate in this study's research.

Dedication

I dedicate this research to my mother Gladys W. Macharia and my dear family whose support has been immense. I also appreciate Ms. Alice N. Macharia and the late Dr. Esther N. Mwangi whose passion for research led me to pursue a master's degree. Overall, I thank the Lord Almighty for the gift of life to undertake this research.

Acronyms and Abbreviations

A.D.	After Christ
ANC	Antenatal Clinics
ART	Antiretroviral therapy
B.C.	Before Christ
CAD\$	Canadian Dollar
CDC	Centers for Disease Control and Prevention
CDT	Centre for Drug Development and Therapeutic Trials for Africa
CHWs	Community Health Workers
CoV	Coronaviruses
COVID-19	Coronavirus disease 2019
CVD	Cardiovascular Disease
EVD	Ebola Virus Disease
GDP	Gross Domestic Product
H1N1	Influenza A virus subtype
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
ICU	Intensive Care Unit
IPC	Infection Prevention and Control
KEMRI	Kenya Medical Research Institute
KIIs	Key Informant Interviews
KUTRH	Kenyatta University Teaching and Referral Hospital
LMICs	Low and middle - income countries
MERS	Middle East Respiratory Syndrome

MOH	Ministry of Health
NACOSTI	National Commission for Science, Technology & Innovation
NHIF	National Health Insurance Fund
NIV	Non-Invasive Ventilator
NPIs	Non-Pharmaceutical Interventions
PEPFAR	President's Emergency Plan for AIDS Relief
PHC	Primary Healthcare
PID	Participant Identification
PPEs	Personal Protective Equipment's
SARS	Severe Acute Respiratory Syndrome
SISA	Strengthening Influenza Sentinel Surveillance in Africa
SOPs	Standard Operating Procedures
SSA	Sub-Saharan Africa
UK	United Kingdom
UNAIDS	United Nations Program on HIV and AIDS
USA	United States of America
WHO	World Health Organization

Definition of Operational Terms

Pandemic – a global epidemic of a contagious illness that occurs locally and internationally over a large geographic area and demography with widespread socio-economic impacts (Dwyer-Lindgren et al., 2019).

COVID-19 – a disease caused by SARS-CoV-2 a beta-CoV that presents as pneumonia and attacks the lower respiratory system. It was declared a global pandemic on 30th January 2020 and is related to SARS and MERS (previous pandemics) (Dwyer-Lindgren et al., 2019).

Preparedness – Involves increasing epidemiologic capacity to detect and respond to public health events through regular response activities, surveillance and multidisciplinary training and planning (Georgia department of public Health).

Response – a coordinated, effective and collaborative approach to an occurrence (a pandemic in this case) that encompasses identification and recognition of an epidemic (pandemic), community and professional resource mobilization, robust communication and awareness, infection control implementation, contact tracing, surveillance, case definition and research-based medication/vaccination of those affected. The response ladder starts nationally with international input as a function of sound governance (Dwyer-Lindgren et al., 2019).

Abstract

Background: Historically, pandemics and epidemics of infectious disease have caused devastating impacts in Sub Saharan Africa (SSA). In particular HIV/AIDS and Ebola Virus Disease (EVD) were associated with very high death rates. Knowing the extent to which previous experiences have equipped countries of SSA to prepare for and respond to the COVID-19 pandemic helps policy makers to make appropriate preparation for future pandemics.

Objective: This study assessed preparedness for and response to the COVID-19 pandemic in a hospital in Nairobi County in Kenya at the start of the pandemic and the current status of preparedness and response.

Methods: This case study was conducted in a level four private hospital located in an urban setting in Kenya with a catchment area population of 191,207 Kenyans in its catchment area. Data was collected using qualitative methods (that is observation, in-depth interviews, focus group discussions), a cross-sectional survey and a literature review. Data was collected from a total of seventy-two participants. The sample for the cross-sectional quantitative survey was fifty-one hospital employees. In-depth interviews were conducted with 17 participants (hospital managers, clinical services administrators, clinical department head of departments and public health staff). A focus group discussion was held with ten participants including the hospital management, consultant physicians, community health workers and a social worker. Observation was conducted in the hospital for a total of forty-five and a half hours to understand and to investigate implementation of COVID-19 prevention protocols in the hospital which were recommended by ministry of health. Qualitative data was coded and analyzed thematically while quantitative data were analyzed descriptively using SPSS software. Findings were triangulated across the data sources to address the research question. Prior permission and ethical clearance were obtained to conduct this study.

Findings: In depth insight was gathered from the qualitative data on the initial lack of clarity around the COVID-19 case definition, inadequate resources including staff, medication and personal protective equipment at the onset of COVID-19. COVID-19 Protocols endorsed by the Ministry of health were implemented in the hospital, with some challenges. The response to COVID-19 greatly impacted delivery of other primary healthcare services. Quantitative data indicated that visual cautions about COVID-19 were adequate (100%) and a system response plan was implemented at a good level (72.6%). However, resources were quite constrained

(staff (62.7%), medication (60.8%) and Personal Protective Equipment's (PPEs) (66.7%)). Overall, the hospital was not prepared to respond to COVID-19 (66.7%). More than half of the respondents (66.7%) said that infection control was implemented in the hospital premises and wards. Resources for COVID-19 response were constrained in the hospital (64.7% of participants) and the hospital did scarce resource allocation in response to COVID-19. Finding from the observation of service delivery and the hospital compound during the data collection showed that staff were in personal protective equipment, isolation protocols were displayed, personal protective equipment precautions were displayed, sanitizers were available and COVID-19 testing was outsourced. The literature review highlighted the need for strengthening of the healthcare system in relation to pandemic preparedness. A pandemic preparedness response plan was lacking. COVID-19 majorly impacted maternal and child health due to reduced clinic attendance and the cost of COVID-19 management was a burden to the healthcare infrastructure.

Conclusion: At the onset of the pandemic the hospital was not prepared to respond to COVID-19 in terms of space, staff, (resources) and system coordination. However, capacity has been built and structures implemented over the pandemic period. Hence, the hospital is currently more prepared and well equipped to respond to COVID-19 pandemic. Findings from the primary quantitative study we have learned how pandemics overwhelm the healthcare system by creating an increased demand for medical supplies and the unforeseen increased costs to meet healthcare needs.

Policy Implications: This study showed that hospital preparedness and response relied heavily on the country's healthcare infrastructure, human resource capacity, medical supply, surveillance information and pandemic preparedness and response plans that the country should put in place before a pandemic hits. All these pillars form the backbone for adequate pandemic preparedness and response. The results from this study have a potential of informing policies on contagious disease outbreak surveillance by emphasizing the need for adequate health system preparedness for potential outbreaks through adequate resource mobilization and implementing a working pandemic response plan in Kenya's healthcare system. Extrapolation of the lessons in this study's findings to Sub Saharan Africa should take the country into account.

Chapter One

1.0 Introduction

A **pandemic** is described as an infectious or contagious illness with spread in more than one country causing health problems and a great number of fatalities globally. Pandemics destabilize healthcare systems, economies and socialization of affected countries. The burden of a pandemic is quantified in terms of transmission rate, attack rate and duration. Severity of pandemics is seen in disabling conditions, hospitalization and mortality in affected populations. Surveillance systems should be put in place in advance so as to determine the pandemic causing agent, treatment, prevention and control strategies when the pandemic hits (Akin & Gözel, 2020)

Sub Saharan Africa (SSA) has faced health system challenges in Ebola Virus Disease (EVD) control highlighting that health system strengthening is a key area in pandemic response (Rugarabamu et al.,2020). The EVD pandemics in 2014 to 2016 revealed gaps in disease identification, response and this was attributed to the lack of an EVD preparedness plan and a weak healthcare system in SSA (Armstrong-Mensah et al.,2021). The devastating impacts of the Ebola virus disease to the healthcare system in Sub-Saharan Africa are well recorded. The challenges in management the of Ebola Virus disease have some similarities with those of the COVID-19 pandemic (Afolabi et al.,2021).

SSA has also been severely affected by the HIV/AIDS pandemic (Lau &Muula.,2004). Access to anti-retroviral drugs is still a challenge in SSA. HIV/AIDS is still a leading cause of death and the economy continues to be impacted by HIV/AIDS. Mother-to-child-transmission is still an issue (Kolenda.,2020). There is still need for governments in SSA to make anti-retroviral drugs more accessible to its people so as to minimize the impacts of HIV/AIDS (Nketia-Amponsah et al.,2019). HIV/AIDS care needs integration with mental health care services however this remains a challenge with few resources directed to healthcare (Remien et al., 2019). HIV/AIDS weakened the healthcare system, showed how misguided information puts vulnerable communities at risk and continues to expose the global inequalities in HIV pandemic response in SSA(Olufadewa et al., 2021).

1.2 Background to the study

Historically pandemics often referred to as plagues have been recorded and have shaped our medical innovations and treatment regimens (Dwyer-Lindgren et al., 2019). The Athenian Plague of 430 B.C. that is believed to have originated in Ethiopia was expanded to Egypt and Greece taking lives of 25% of the population. The Antonine Plague of 160 to 180 A.D. started

in Selucia and spread to Asia minor, Egypt, Greece and Italy. That pandemic affected the military and economic supremacy of the Roman empire and might have contributed to the downfall of the Roman empire (Dwyer-Lindgren et al., 2019)

The Bubonic plague (black death) started in China in 1334 and claimed 25 million people after it spread to Europe, Russia and the Middle East. This global pandemic claimed approximately 150 million lives reducing the global population from 450 million to 300 million, and reducing the European population by 60% from the year 1334 to 1400. In the 20th Century, the Spanish flu is the deadliest global pandemic caused by the H1N1 strain of the influenza virus. It originated from the USA, China, Spain, France or Austria and spread through every continent and all countries globally. It had a mortality rate of 10 to 20% and killed approximately 50 to 100 million people in a year which supersedes the black death fatalities in a century (Dwyer-Lindgren et al., 2019)

Public healthcare system preparedness and response are very vital in any pandemic. Pandemics can cause catastrophic damage if not tackled in a timely fashion and properly. In most cases, however, the causative agent might not easily be known and that creates a difficulty to find the best ways of preventing the spread of the pandemic or to develop therapeutic interventions. Hence, the health system should always be ready to face future pandemics and make all possible preparation to minimize its negative effects. This study was designed to assess the response and preparedness of a selected hospital in Nairobi County in Kenya to the 2019 Coronavirus pandemic.

1.3 Problem Statement

Pandemics are known to cause great disruption to day to day living of people affecting health, economic and social aspects of the society. They are known to hit hard especially Low- and Middle-Income Countries (LMICs), as a result of their vulnerable healthcare systems with weak capacity to handle the onset of a pandemic. Pandemics occur suddenly and oftentimes control measures are borrowed from past similar experiences. The occurrence of the current COVID-19 pandemic is a living example of the sudden occurrence of pandemics, its associated all rounded negative impacts and the challenges it brought to the healthcare system and the society. The COVID-19 pandemic continues to reveal the status of healthcare systems at global, regional and country level in terms of preparedness and response. Hence, it was timely to investigate the readiness of the health care system of Kenya to respond to COVID-19 pandemic. Although readiness of the health system can be investigated in various ways addressing the issue through a case study might be more economical while generating

informative finding that can be used as inputs for policy makers and program implementing government structures.

1.4 Research Question

- How prepared was the level four hospital in Nairobi County, Kenya to respond to the COVID-19 pandemic and how is the ongoing response to the COVID19 pandemic now?

1.5 Research Objectives

Broad Objective

- To assess the preparedness and response of the hospital in Nairobi County, Kenya to the COVID-19 pandemic.

Specific Objectives

1. To investigate preparedness of the hospital in Nairobi County to COVID-19 in terms of: -
 - a. Adequacy of established infrastructure in preparedness to COVID-19,
 - b. Availability of required human resource capacity to manage COVID-19 pandemic,
 - c. Quantification of medication and PPEs availability and effectiveness to manage COVID-19 pandemic.
2. To assess adequacy of overall response to COVID-19 pandemic in the hospital in Nairobi County by: -
 - a. Estimating/Identifying mobilized resource, communication and awareness activities, infection control implementation work done, contact tracing, surveillance, case definition and treatment to COVID-19,
 - b. Assessing adequacy of implementation of protocols and guidelines in the study hospital in Kenya,
 - c. Assess the impact of response made to COVID-19 pandemic on other primary healthcare services (such as maternal and child health).

1.6 Justification of the study

COVID-19 is an ongoing pandemic that global healthcare systems continue to grapple with. Much needs to be done to improve preparedness and response tactics to ensure that the current

and future pandemics are controlled effectively. Pandemics are known to occur in a sweeping continuum if not controlled, especially with globalization and are often very costly if not well responded to. Lessons continue to be gathered from the ongoing pandemic. In-depth investigation of the study hospital in Nairobi County was done so that the healthcare system can learn from what is done in this hospital and what benefits are gained and what challenges were faced. Hence, this study has contributed to the much-needed information on the health system response to COVID-19 in Kenya.

Chapter Two

2.0 Literature Review

Pandemics affect millions at a go with a global spread and cause dire consequences on health, social, economic and security. Effective emergency response plans and management will alleviate unnecessary deaths, illness and socio-economic impacts in the present and future and should be adopted by various governments (Dwyer-Lindgren et al., 2019). The study and review of past pandemics helps to guide and inform on preparedness and response measures to the current pandemic that is in its second wave with worrying infection rates in developed countries like USA and UK and future pandemics.

2.1 Spanish Flu Influenza Pandemic

The Spanish flu of 1918 to 1920 caused by H1N1 avian influenza virus was known as the mother of all pandemics. The virus caused a death toll of approximately 50 to 100 million and infected 500 million people of the world's population then. This pandemic was considered to be quite deadly (Dwyer-Lindgren et al., 2019). This virus overwhelmed Europe, USA, Africa, Asia and Pacific Islands. It was a deadly virus that destroyed the immune system it swept through in a first wave then the virus mutated causing a catastrophic second wave and third wave. It occurred during World War I and influenced global civilization. Those exposed to the pandemic experienced observable effects for example expectant mothers gave birth to children with lower immunity than those born before or after the pandemic (Radin et al., 2012).

Spanish flu attacked the respiratory system and death was as a result of severe bacterial pneumonia. Mortality was unusually high in those aged 20 to 40 years accounting for 99% of the deaths. This was unlike the pandemics in 1957 and 1968 where those below 65 years of age accounted for 36% and 38% of influenza deaths. The reason for this observation remains unclear to date. It was of avian decent and is now categorized as Influenza A virus that became seasonal as of 1920 in humans (Dwyer-Lindgren et al., 2019).

In Europe, poor health services, overcrowding and unsanitary conditions acted as an enabling environment for faster disease spread. This was further accelerated by a weak public health system that was far beyond prepared for such a pandemic. Diagnosing the causal agent was not a possibility until later years. Influenza vaccines and medication were unavailable with modern medicine being in discovery stages. Pandemic control focused on use of face masks, covering one's nose and mouth when sneezing or coughing, quarantine, closing of schools and curbing mass gatherings. This was meant to flatten the infection curve so that hospitals would not be

overwhelmed. These strategies could not control likelihood of viral infection and the Spanish flu remains the most tragic pandemic in human history to date (Dwyer-Lindgren et al., 2019)

2.2 HIV/AIDS Pandemic

The HIV/AIDS pandemic present since 1981 as identified by CDC started in the USA and its spread caused significant public health concern. Globally, 40 million people are infected with a prevalence rate of 0.79% and a cumulative death toll of up to 40 million since 1981 and 1 million people annually since 2005. In SSA the HIV/AIDS disease burden has the highest prevalence of 25% in Botswana, Lesotho and Swaziland (Radin et al., 2012)

As of 2017, Sub Saharan Africa (SSA) with 12% of the world's population had 71% of the worldwide HIV burden, 75% deaths and 65% of new HIV/AIDs infections (Dwyer-Lindgren et al., 2019). In mapping the prevalence of HIV in SSA it has been noted by PEPFAR and UNAIDS that low coverage of ART medication availability has a correlation to high HIV/AIDS burden (Dwyer-Lindgren et al., 2019). In terms of population infected with HIV ten countries represented in Table 1 account for 80% of infection in South and Eastern Africa (Kharsany & Karim, 2016)

SSA accounted for 65% of the global HIV/AIDs infection with 26 million infected out of 40 million by 2003. The severity of HIV/AIDS in SSA is high and there are a number of factors that play a great role. They include cultural practices, poverty, poor nutrition, lack of knowledge, shortage of ART, socio-economic factors and political instability (Flint, 2011).

Table 1: People living with HIV in selected countries in SSA

Country	Infected population	Population in 2016
South Africa	25%	56.21 million
Nigeria	10%	185.96 million
Mozambique	6%	27.83 million
Uganda	6%	39.69 million
Tanzania	6%	53.03 million
Zimbabwe	6%	14.03 million
Kenya	6%	49.05 million
Malawi	4%	17.21 million
Zambia	4%	16.36 million
Ethiopia	3%	103.6 million

Source: Infected population - Kharsany & Karim, 2016; Population – WBG, 2016

2.3 2009 H1N1 Pandemic

This was a fusion of H1N2 and H1N1 viruses found in North American and Eurasian swine respectively. This was linked to the 1918 virus just like the 1957 and 1968 Influenza pandemics. The virus was first detected in Mexico in 2009 March/April and had recorded 16,813 deaths by March 19th 2010 according to WHO. The emergence of this pandemic was unforeseen, future prediction is not easy however adequate preparation through surveillance can be done. Pandemics have unpredictable morbidity and mortality hence effective interventions must be implemented. The 2009 H1N1 pandemic spread rapidly before it could be recognized in a modern age of antiviral agents and vaccines this is quite intriguing. Pandemic response strategies need to be re-examined and updated as frequently as possible (Taubenberger & Morens, 2010b).

The H1N1 virus or Swine flu was declared to have ended in August 2010 by WHO with 18,500 laboratory confirmed deaths. Mathematical modelling estimated that 151,700 to 575,400 global deaths were caused by the H1N1 pandemic (Saunders-Hastings & Krewski, 2016) The 2009 H1N1 affected those below 50 years more than those older and was higher in children. People younger than 64 years of age accounted for 80% of the deaths with Africa and South East Asia recording the highest death rates compared to other continents (Akin & Gözel, 2020).

2.4 2013 Ebola Virus Pandemic

The Ebola virus caused by five strains including *Zaire*, *Sudan*, *Bundibugyo*, *Tai Forest*, and *Reston* causes hemorrhagic fever characterized by high fever and malaise that further develops to bleeding in its severe form. The initial three virus strains are more common in humans causing a fatality rate of 25 to 90%. The 2013 to 2016 Ebola Virus Disease (EVD) outbreak in West Africa resulted in 11,323 fatalities out of 28,646 cases was caused by the Zaire Ebola virus strain. This particular outbreak superseded the other 29 Ebola virus outbreaks that had occurred as it started in Guinea in 2013 December, spread to Liberia, Sierra Leone and Nigeria and by 8th August 2014 Ebola was declared an international public health Emergency. Cases were declared in Senegal, USA, Spain, Mali, UK and Italy by 29th December 2014. Ebola screening was implemented as of August 2014 globally using the WHO Ebola case definition screening tool. The cases were traced to West Africa mainly Guinea, Sierra Leone and Liberia statistics are as per Table 2 (Coltart et al., 2017)

The dynamics of EVD transmission was further extrapolated by a myriad of factors that point to poor preparedness and response. The factors include population mobility, poor economic, health systems and telecommunication, culture and behavior where community resistances and

misleading theories fueled further spread. There was a severe failure in response that was characterized by late identification of cases, poor governance, poor communication, uncoordinated response, minimal experience in the outbreak magnitude, lack of community sensitization and shortage of healthcare workers. In this outbreak response failure was pegged on leadership nationally and internationally. The local public health system was not in a position to handle the cases: neither were surveillance strategies adequate to identify, report and effectively respond to the 2013 EVD outbreak (Coltart et al., 2017).

Table 2: Ebola statistics in affected countries

Statistic	Guinea	Liberia	Sierra Leone
Population	12.3 million	4.4 million	6.3 million
Rural population (%)	63.3	50.7	60.4
GDP (USD)	539.6	457.9	792.6
Physicians per 1000 people	0.1	0.014	0.022
Reported EVD cases (WHO)	3,811	10,687	14,124
EVD deaths (WHO)	2,543	4,810	3,956

Source: Coltart et al., 2017

Preparedness to Pandemics

Preparedness is the ability to have sufficient epidemiologic capacity to detect and respond to public health events through regular response activities, surveillance and multidisciplinary training and planning (Georgia department of public Health).

Current disease control prevention, preparedness and response strategies focus on responding when a pandemic is a global concern. The unsuccessful development of a vaccine for the global HIV pandemic and emergence of the 2009 H1N1 pandemic pointing to four Influenza A pandemic occurrence's shows the current approach is failing. This displays how vulnerable populations are to emerging and reemerging infections. Understanding disease transmission patterns through surveillance and preparing in advance is imperative (Pike et al., 2010).

Despite advanced understanding of Influenza virus characterization and infection routes, generation of surveillance data to inform public health response posed a great challenge in the H1N1 2009 pandemic (Saunders-Hastings & Krewski, 2016)

The burden of Influenza in SSA is not clearly understood despite respiratory illness being a major cause of deaths. The importance of surveillance for Influenza among other diseases has been signaled by the 2009 H1N1 pandemic. The Strengthening Influenza Sentinel Surveillance

in Africa (SISA) project was implemented by *Agence de Medicine Preventive* in selected countries in SSA following WHO standards. The project was implemented in Angola, Cameroon, Ghana, Nigeria, Rwanda, Sierra Leone and Zambia. This initiative improved influenza surveillance and led to development of national respiratory disease surveillance. The sustainability of this project depends on how the various countries authorities view importance of surveillance data to prevention, intervention and treatment guidelines and processes (“Improving Influenza Surveillance in Sub-Saharan Africa,” 2012)

In addition to SISA surveillance for influenza has been done in 15 countries in North Africa, West Africa, East Africa, South and Central Africa under The African Network for Influenza Surveillance and Epidemiology (ANISE). ANISE is an initiative of international organizations and governments to help African governments in building Influenza surveillance capacity in Africa. Through this initiative it was noted that Influenza causes 48% respiratory disease in children below the age of 5 that is appalling (Radin et al., 2012).

In terms of preparedness to COVID-19, SSA presents numerous health system challenges such as inadequate Intensive Care Units (ICUs), medical staff and infrastructure. The high burden of communicable diseases such as HIV/AIDS, TB and malaria form the focal point in terms of preparedness. It is anticipated that person-to-person transmission will be quite high due to many asymptomatic individuals, lack of PPE and an already overwhelmed healthcare system. African governments should invest highly in preparedness to the COVID-19 failure to which a crisis is foreseen owing to the healthcare framework. There were serious gaps in implementing infection prevention in the 2013 EVD outbreak and SSA has lessons to gather and implement especially on community behavior response to WHO prevention guidelines (Nuwagira & Muzoora, 2020).

2.5 Response to Pandemics

In the 2009 H1N1 pandemic notable improvement in responses was seen in North America and Europe that exhibited a high level of preparedness in comparison with past pandemics. Response was seen in combining Non- Pharmaceutical Interventions (NPIs) and pharmaceutical with H1N1 vaccination, antivirals, hand hygiene and voluntary isolation used effectively. UK and Canada recorded the highest mass vaccination, antiviral treatment for suspected cases and prophylaxis of the masses with antivirals.

Impacts of pandemics cannot be understated with the H1N1 pandemic causing economic, healthcare system and human resources strain on the affected countries. In Canada total direct

costs to patient treatment, hospitalization and medication were at 2 billion CAD\$. Economic losses were at 0.5 to 1.5% in terms of the GDP of the most affected countries (Saunders-Hastings & Krewski, 2016)

In SSA a massive failure in leadership was the main cause for poor response to the outbreak leading to high fatality (Agyeman et al., 2020). The susceptibility of the African population to COVID-19 is seen in the social, cultural, economic, health and political dynamics in SSA. Responding to COVID-19 appropriately requires financial muscle so as to adequately implement prevention measures and SSA has had to receive input from various partners to achieve this. To improve response to future epidemics in SSA training personnel, the public, providing sufficient and effective PPEs, setting up proper communication channels and establishing proper guidelines for health institutions and laboratories would need to be implemented (Agyeman et al., 2020).

Pandemics remain unpredictable and globalization has made distinct spreading/transmission routes less obvious unlike in the past when military movement and trading lines were the major culprits. Now more than ever flexibilities in pandemic response policies are imperative as pandemics occur. It is highly unlikely that future pandemics will mimic past ones, but lessons can be gathered to improve disease surveillance, human, capital and resources planning to better contain future pandemics (Saunders-Hastings & Krewski, 2016).

2.6 Corona Virus Pandemic

COVID-19 caused by SARS-COV2 causes respiratory illness in the affected person apart from systemic symptoms. It is related to previously identified SARS-CoV and MERS-CoV. The first COVID-19 cases were reported in December 2019 in Wuhan China with patients exhibiting severe respiratory distress symptoms by 16th February 2020 there were 51,857 cases globally. Currently there are 233,503 COVID-19 cases with 4,777,503 deaths according to World Health Organization (WHO,2021). COVID-19 symptoms included cough, high temperature and fatigue while clinically chest x-rays indicated pneumonia-like features. Transmission was person-to-person through contact or inhalation of infectious droplets spread through sneezing or coughing with COVID-19 established as a zoonotic specifically bat origin (Rothan & Byrareddy, 2020).

Presently with vaccines beginning to gain market entry through vaccine trials but still no specific medication for the virus treatment constituted broad spectrum antiviral drugs such as Lapinavir, Neuroaminidase inhibitors, peptide and RNA synthesis inhibitors. Prevention measures focused on reducing person-to-person spread of COVID-19 with physical distance,

handwashing, wearing of face-masks and passenger screening were implemented (Rothan & Byrareddy, 2020).

COVID-19 was declared a Public Health Emergency of international concern on 30th January 2020, countries with weak health systems were at the highest risk. In terms of prevention quarantine alone is not sufficient. Response to COVID-19 has lessons ranging from transparency failure with clinicians who first identified the virus being intimidated, delay in quarantine in Wuhan, lack of public awareness, emergency declaration delay and the initial lack of vaccine development funding. With the pandemic still ongoing proper surveillance and continuous monitoring is needed to properly characterize the COVID-19 pandemic that is rapidly changing (Sohrabi et al., 2020).

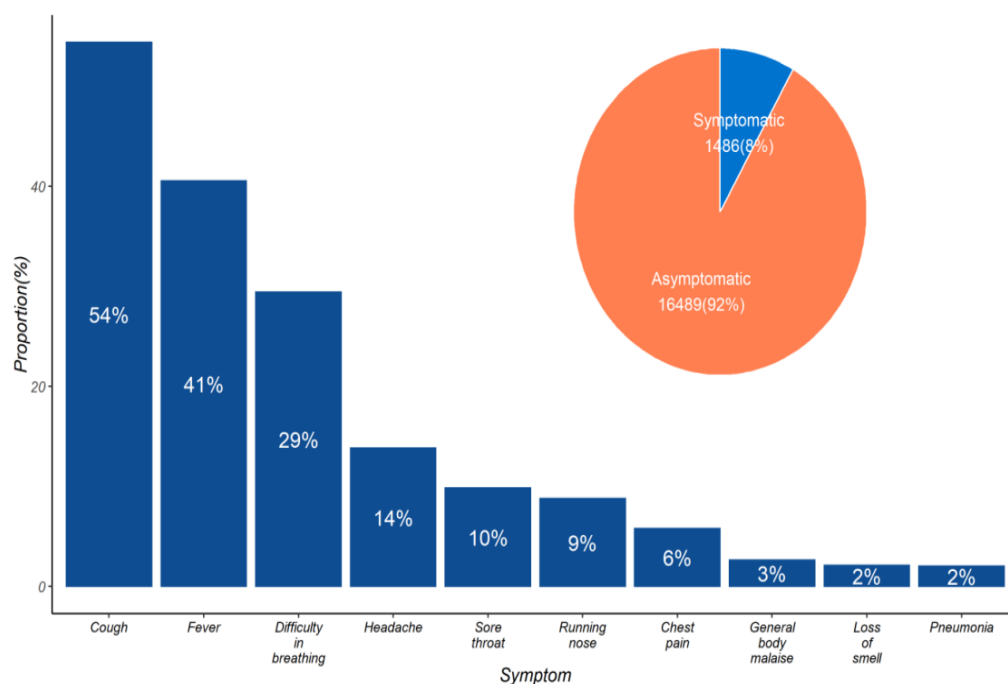
The question remains was SSA prepared to handle COVID-19 with significant gaps in International Health Regulation (IHR) implementation? Africa CDC partnered with WHO to establish a CoV taskforce with African countries to strategize on passenger screening, laboratory diagnosis capacity, control and prevention measures, clinical management and supply logistics. In SSA, the existing health systems in terms of human capacity, clear policies, resources such as medication and PPEs availability are seen to be wanting to handle high COVID-19 morbidity rates (Paintsil, 2020).

The first COVID-19 case in Kenya was confirmed on 13th March 2020. With no known cure preventive public health measures had to be put in place to control the spread of the virus (Ongwae & Ongwae, 2020). In Kenya consistent with the WHO regulatory guidelines prevention measures included closing learning institution's, curfews, employing more healthcare workers, closing entertainment spaces like night clubs, public prevention sensitization through adverts on hand hygiene, sneezing and coughing etiquette, wearing masks and keeping a physical distance (Mbae, 2020).

Kenya's implementation of the prevention measures also included frequent cleaning and disinfection of public premises like hospitals and malls and disinfection of vessels such as aircrafts and ships. Quarantine was implemented for passengers arriving and further to this all flights to Kenya were banned as of 25th March 2020 and lifted on 1st August 2020 with traveler's required to produce a COVID19 negative test valid within 96 hours before travel. Cessation of movement was implemented in Nairobi, Mombasa, Kilifi and Kwale for 21 days as of 6th April 2020 for 21 days subject to extension with rising COVID 19 cases (Ongwae & Ongwae, 2020).

At the early onset of the pandemic contact tracing was done as majority of cases were from out of the country. As the numbers progressed and with asymptomatic cases through community transmission there was a breakdown in surveillance as cases went unidentified contributing to rapid spread of the COVID-19. There is a gap in national case isolation guidelines and a need for a healthcare system with sufficient workers, PPEs and bed capacity to handle the growing COVID-19 numbers by County governments (Ongwae & Ongwae, 2020). Majority of the cases in Kenya are asymptomatic (92%) while 8% were symptomatic as of 27th July 2020 as shown in figure 1 (Highlights, 2020). A study was conducted to assess Kenya's hospital bed capacity to attend to a rise in COVID-19 cases and was concluded to be inadequate especially with the period that the pandemic has lasted. Additional general hospital beds, ICU beds and ventilators would need to be purchased notwithstanding the existing shortage of medicines and trained healthcare workers in the face of a pandemic Barasa, Ouma & Okiro, 2020).

Figure 1: COVID-19 case distribution in Kenya by presentation



Source: Ministry of Health, COVID-19 Situational Report 27th July 2020

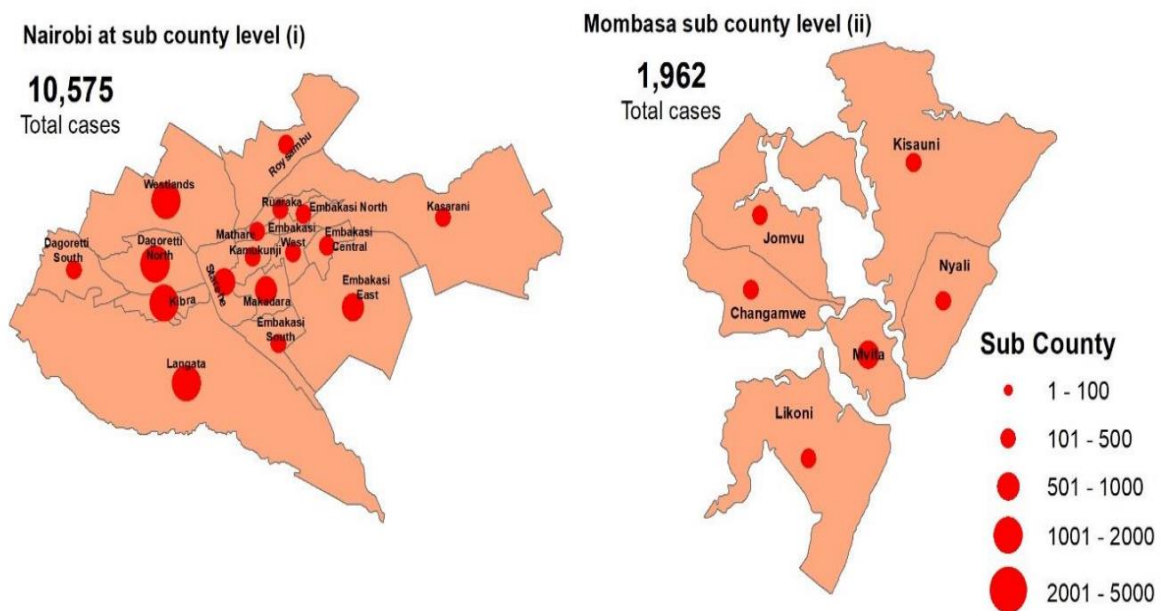
In terms of distribution of COVID-19 cases in Kenya 59% were from Nairobi and 11% from Mombasa County as of 27th July 2020. Nairobi County has the highest attack rate of 240.5 per 100,000 people followed by Mombasa County with 162.4 per 100,000 people as shown in map 1 (Highlights, 2020). COVID-19 related cases are 65% in males and 35% in females and case fatalities being 75% male and 72% female. Case fatalities by age and sex indicate higher deaths

in those above the age of 60 with the age group accounting for deaths with 33% males and 9% females. In figure 2 laboratory testing capacity has continued to improve with 268,171 cumulative tests being conducted as of 27th July 2020. 37% of National Public Health Laboratories have exhibited late reporting and incomplete results but improvement is continuous(Highlights, 2020).

Key challenges noted in response to COVID-19 in Kenya include inadequate resources for surveillance at sub-national and sub-county level, long turnaround time for laboratory results delaying response and decline in community health seeking behaviour for fear of contracting COVID-19. There is complacency at community level to report cases and deaths to health workers, shortage and insecurity of PPES at sub national level and stigmatization of COVID-19 patients and public health workers in isolation and healthcare facilities. There a challenge of COVID-19 positive cases adhering to home-based care and isolation guidelines (Highlights, 2020).

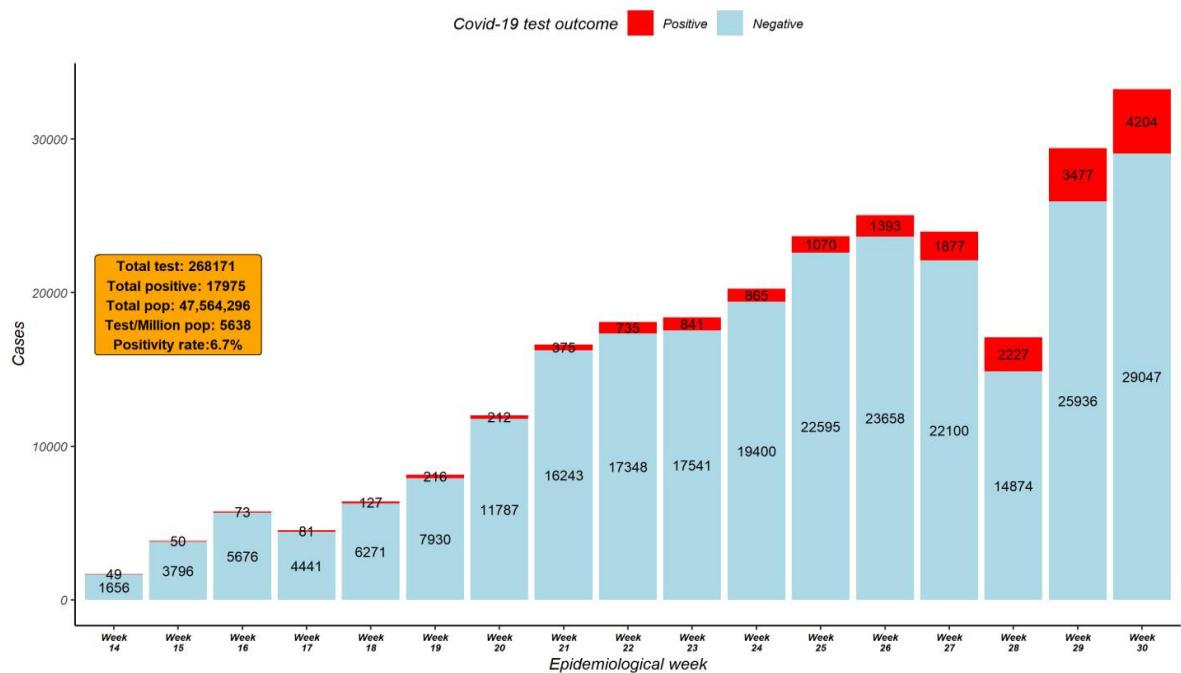
By July 2020, there were 96,802 confirmed cases in Kenya, with 79,073 recovered and 1685 fatalities according to the MOH. As of 1st October 2021, Kenya recorded 249,725 COVID-19 cases with 5,128 fatalities (MOH,2021). There are COVID-19 specific protocols and guidelines (Appendix 4) on the MOH website with emergency response, infection prevention and control guidelines, hospital preparedness guidelines and SOPs for various healthcare workers (MOH, 2020). This study enumerated preparedness and response of the healthcare system in Kenya to COVID-19 from the onset to the present by taking the case of a hospital.

Figure 2: Distribution of COVID-19 cases in Nairobi and Mombasa County



Source: Ministry of Health, COVID-19 Situational Report 27th July 2020

Figure 3: COVID-19 Laboratory Testing



Source: Ministry of Health, COVID-19 Situational Report 27th July 2020

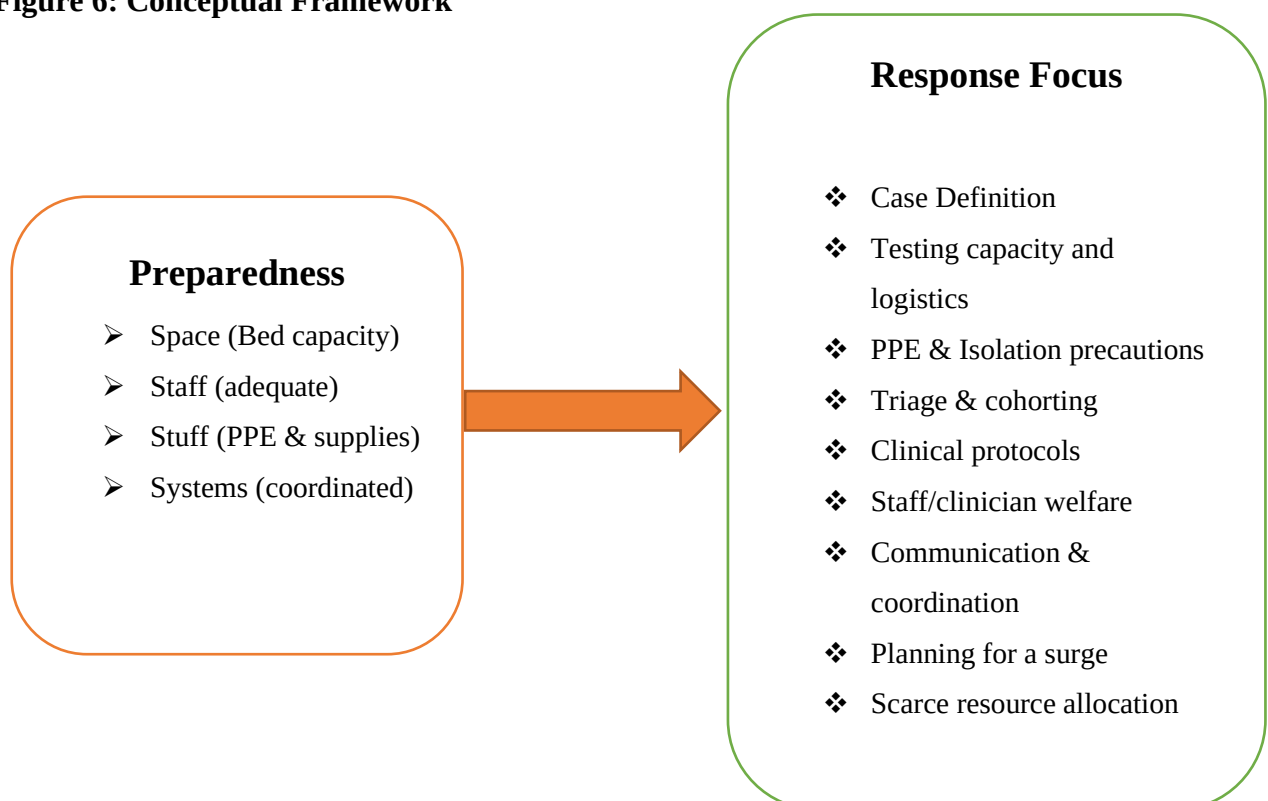
2.7 Conceptual Framework

This study used a conceptual framework of an adaptable approach to hospital preparedness for acute surge events due to emerging infectious diseases. This framework was developed based

on the H1N1 pandemic occurrence in 2009 and it can be adopted for use in the COVID-19 pandemic (Anesi et al., 2020). It focuses on a demand and supply approach. This is where there may be hospital response strain due to a high number of patients, higher acute cases, need for specific attention with PPEs and isolation. This may deplete the supply of resources in a bid to meet the demand. Therefore, this model proposes the use of a preparedness conceptual framework with 4 key S's. This includes *space* by repurposing beds, *staff* by ensuring adequate clinicians and public health staff, *stuff* where hospital equipment and supplies have to be increased and *system* where response must be well coordinated.

In this model response entails implementation of WHO guidelines, ensuring adequate PPE, following primary care guidelines, clear communication and planning for a surge from normal routine care in the hospital. All this should be done without compromising healthcare standards or staff well-being (Anesi et al., 2020). Using this model as shown in figure 6, we were able to check how well prepared the healthcare systems in Kenya were to respond to COVID-19 pandemic.

Figure 6: Conceptual Framework



Preparedness and Response to COVID-19 in Kenya

A literature review was conducted as part of the data collection methods and addressed overall preparedness and response of Kenya's healthcare system to the COVID-19 pandemic. This literature review enabled a wider conclusion of the research findings. The key findings included:-

Lack of pandemic preparedness, response plan and infrastructure

In March 2020 World Vision International planned to provide PPE to communities in Kenya to prevent the spread of COVID-19 (Concerns, 2020). Kenya's goal to attain universal health coverage through the National Health Insurance Fund that covers 11% of the population has been severely impacted by COVID-19. Health insurance has not been able to cover the costs of COVID-19 testing and treatment due to its expensive nature. Healthcare access has been impacted especially with a health budget of 9%, 600 ICU beds and few healthcare staff. In April 2020 healthcare workers reported lack of masks and PPE to attend to COVID-19 patients posing a healthcare crisis. Mental illness has been on the rise attributed to inadequate health insurance. The health system's capacity to deal with COVID-19 has been sorely tested. There is a need to improve the healthcare infrastructure through resource mobilization, employing more healthcare workers and proper welfare of staff (Ouma et al., 2020).

There was lack of a pandemic preparedness response plan and this was seen in the strained healthcare system. Healthcare workers became sick, lacked PPEs, were poorly paid, lacked COVID-19 infection prevention knowledge and threatened to go on strike (Wangamati & Sundby, 2020).

By mid-2020 COVID-19 had infected 4% of the Kenyan population this was estimated using antibody tests conducted on blood samples by Kenya Medical Research Institute (KEMRI) (European & Toll, 2005). Lack of personal protective equipment has been reported among healthcare workers in a healthcare facility Nairobi County. This led public health workers fleeing patients with COVID-19 to avoid attending to them without PPEs and lack of training on managing COVID-19 (Wangamati & Sundby, 2020).

Wearing of masks was a countermeasure implemented on 5th April 2020 in response to COVID-19 and its impact on the COVID-19 curve were seen in a situational report by Ministry of Health (Adamuoch, 2020). In terms of handling bodies of patients with COVID-19 a

guideline by ministry of health was put to ensure disinfection and fumigation prior to handling a COVID-19 case in the community and hospital. (MOH,2020).

COVID-19 management is costly to the healthcare system

A study conducted to estimate the unit costs for COVID-19 case management indicated that the costs per patient is higher than the normal cost of care. This has impacted the healthcare system in LMICs and has implied the need for donor funds to meet cost of care. Therefore, hospitals have had to come up with low-cost options without affecting quality such as home-based care for some asymptomatic patients although not all such cases can be treated from home. Most insurance have reported the unit cost to be higher by two to four times (E. Barasa et al., 2021).

COVID-19 pandemic response took a collaborative approach

In preparation to respond to COVID-19 in Kenya mathematical modelling was done to show the implementation of Nonpharmaceutical Interventions (NPIs) such a school closure, mini lock downs and curfews to allow hospitals prepare appropriate epidemic response. This modelling was done before lifting of the September 2020 lockdown(Gathungu et al., 2020). The Kenyan government had to come up with more isolation beds and ensure public education on COVID-19 prevention to reduce COVID-19 transmission. In terms of preparedness collaboration with community health workers, creation of access to community midwives and guidelines on maternal and child health strategies are needed to ensure impact of COVID-19 on maternal and child health services are alleviated(Kimani et al., 2020).

A literature review showed that Kenya lacked a COVID-19 implied mental health response plan however ministry of health provided a mental health first aid applicable to COVID-19. The literature review recommended implementation of a mental health response plan, training community health workers and investing in mobile health to have a wider reach (Jaguga & Kwobah, 2020).

A policy brief by United Nations Development (UNDP) indicated that Kenya would need to invest in preparedness through early detection of COVID-19 and treatment to save lives and improve treatment outcomes. The socio-economic impacts of COVID-19 to health and income avenues of vulnerable population needed to be taken into consideration in pandemic preparedness. (UNDP, 2020).

The reoccurrence of epidemics in Africa should provide a baseline for preparedness measures to be taken. At the national level in Kenya there was need for healthcare systems strengthening through deploying of more healthcare workers and addressing the healthcare infrastructure inadequacies such as testing capacity(Macharia et al., 2020).

Resources to respond to COVID-19 were inadequate nationally

In the response to COVID-19 the Kenyan economic sector began manufacturing local Personal Protective Equipment (PPEs), ventilators and contact tracing applications. The education sector with Kenyatta University on the lead manufactured ventilators and COVID-19 testing swabs (Mbogo, 2020). A survey on Kenya's COVID-19 response indicated that 99.99% of Kenyans had heard of COVID-19 showing awareness was good although 45% believed that hot climate slows down the spread of COVID-19 which is a misunderstanding. In the same survey the importance of physical distance, no handshakes and handwashing were captured. 61% of Kenyans were satisfied with the government's response to COVID-19 while 38% were dissatisfied. In terms of public health prevention measures 91% were in support of self-isolation, 98% supported banning of public gatherings to slow down the spread of COVID-19 and majority agreed that the measures had debilitating impacts on access to food and water due to low household income (Ipsos. (2020). Responding to COVID-19: Highlights of a Survey in Kenya, 2020).

Healthcare Staff welfare was a challenge in the COVID-19 pandemic - with limited resources and poor remuneration there was increased risk of contracting COVID-19. In Africa public health workers face immense challenges in the face of COVID-19 including an already overwhelmed healthcare system, stigma, fatigue and the psychological impacts of losing patient's and fellow medics. There is a limited supply of Personal Protective Equipment (PPE) in Africa and health workers were at risk of contracting COVID-19 and losing their lives. Africa's health care system needed to implement care for its workers through adequate remuneration, ensuring provision of PPEs, implementing telemedicine and partnering globally in preparing to respond to COVID-19 (Chersich et al., 2020).

COVID-19 response impacted the delivery of primary healthcare services (maternal and child health)

COVID-19 impacted access to healthcare services with maternal and prenatal services being the most affected. This is foreseen to impact the population's health in future. The observed 'pandemic fatigue' that resulted in a 57% use of mask by November 2020 from 81% in June

2020 was predicted to increase the spread of COVID-19 (“Socioeconomic Impacts of COVID-19 in Kenya on Households,” 2021). A study conducted to investigate the impact of COVID-19 on access to primary healthcare services showed reduced health seeking behavior by residents of slums in Kenya. In this study the residents reported fear of being diagnosed with COVID-19 as the biggest impediments to seeking healthcare or disease preventive services.

High cost of healthcare in the time of reduced household income was also a key factor. Services such as immunization, antenatal care, HIV and TB clinics witnessed low numbers as before COVID-19 pandemic. There is a perception that mental and gender-based violence service was inaccessible during COVID-19. Study participants chose to go to pharmacies and consult on phone. There was a breakdown in communication on how the healthcare services could still be accessed in the face of a pandemic (Ahmed et al., 2020).

A study conducted during the pandemic period of COVID-19 showed that the number of pregnant women going to antenatal clinics in Lamu County reduced from March 2020. In the health facility staff and resources previously allocated to maternal services were assigned to COVID-19 response and a number of maternity wigs were converted to isolation centers. This study recommended that measures had to be put in place to ensure that pregnant women have access to health services especially with movement restriction during curfew hours. (Wangamati & Sundby, 2020). The COVID-19 pandemic has increased the incidence of still births and decreased hospital deliveries due to fear of harassment by police during curfew and lockdowns. Fear of contracting COVID-19 from health facilities is also a hinderance to hospital visits. There is need for a community approach to maternal and child health services to alleviate this major gap (Kimani et al., 2020).

A study in western Kenya showed that response to COVID-19 is intertwine with existing TB, HIV/AIDS and cancer adding to the list of chronic conditions on the healthcare systems plate and adding to the comorbidities of existing chronic conditions. Those with cancer and diabetes are at a high risk with COVID-19 affecting access to treatment due to strain on existing healthcare resources. The onset of COVID-19 has added to already existing epidemics and continues to have its fair share of social implications (Geissler & Prince, 2020).

COVID-19 impacted individual households, elevated mental health illness and increased children susceptibility to sexual violence

COVID-19 had an impact on house hold income as indicted in a financial analysis done in rural Kenya. The results showed that the response to COVID-19 and preventive measures put in

place resulted in reduced house hold income due to loss of jobs while expenses on food remained the same in the studied households (Janssens et al., 2021). Apart from devastating economic effects COVID-19 resulted in a 33% decline in routine immunization in Kenya. A scheduled immunization was postponed from to February 2020 and was not done due to COVID-19. Under normal conditions measles vaccines are usually given at 9 months and 18months and boosters are given to children below the ages of 5 and 15 years to achieve heard immunity. This has resulted in a prediction of a measles outbreak due to COVID-19 response and control measures that restricted movement and brought in a measles immunity gap due to a missed country wide routine immunization (Mburu et al., 2021).

COVID-19 impacted mental well-being by elevating stress levels, depression and anxiety in the population. The healthcare budget mostly focuses on communicable disease while only 0.05% of the budget goes to mental health. With increased mental healthcare treatment need and shortage of workers the COVID-19 pandemic impacted delivery of mental health services to the population as Kenya has about 100 psychiatrists serving a population of 47 million Kenyans (Ochilo et al., 2020). COVID-19 has been predicted to increase the atherosclerotic cardiovascular disease (CVD) due to the oxidative stress, endothelial dysfunction apart from liver and kidney disease that it results in. This is especially true in patients with respiratory tract infection, diabetes, chronic obstructive pulmonary disease, renal disease and cigarette use. These risk factors are also precursors for CVD and hence COVID-19 is set to increase the burden of CVD if measures are not put in place to manage COVID-19 (Ogeng'o, j. et al 2020). COVID-19 impacted learning and online learning was introduced in response to the school closure policy by the government (Mbogo, 2020).

COVID-19 also increased children's susceptibility to sexual violence which was quite a sad occurrence and attributed to lockdowns, school closures and curfews that occurred over the COVID-19 pandemic. COVID-19 not only impacted primary healthcare but also socialization where children were victims of sexual offenders (Stevens et al., 2021).

Chapter Three

3.0 Methodology

This chapter comprises the descriptions of the study area, study population, conceptual framework and the methods used to address the study objectives. We described the methods used to collect data on the preparation made and response taken to COVID-19 in Belevue Hospital in Langata Sub-County, Nairobi County. A case study was carried out using data from qualitative methods (observation, in-depth interviews, focus group discussion) and a cross sectional study. A literature review was also done.

Data collection was focused on assessing the preparedness made by the hospital in terms of infrastructure, staff, medication and PPE availability during COVID-19 pandemic. Response made by the hospital was assessed in the hospital by examining mobilized resource, communication and awareness activities made, infection control activities implemented. Implementation of COVID-19 guidelines, protocols and inquiry on whether response to COVID-19 affected other primary healthcare services was assessed in the hospital.

3.1 Study Area within the context of Kenya and health service delivery

Kenya is in East Africa bordering Ethiopia in the north, Somalia to the east, Tanzania in the south, Uganda in the west and South Sudan in the northwest. Kenya has a land area of 580,876.3 square kilometer with a population density of 82 people per square kilometer. Nairobi which is the capital city of Kenya has a population density of 6,247 people per square kilometer over a land area of 703.9 square kilometer (Kenya National Bureau of Statistics, 2019). Nairobi County is the capital city of Kenya and has the highest COVID-19 cases in Kenya with the vast majority being attended to in public facilities, of which most were referral hospitals and Level 4 and Level 5 Sub- County hospitals such as Belevue Hospital . The cumulative cases in Nairobi were 100,965 as of 30th September 2021 (Statista,2021). There were 240.5 cases per 100,000 people by 27th July 2020 (Highlights, 2020). The area of study was Langata Sub-County in Nairobi Kenya. The sub-county borders Kibra Sub-County Kenya's largest slum . (Kenya National Bureau of Statistics, 2019).

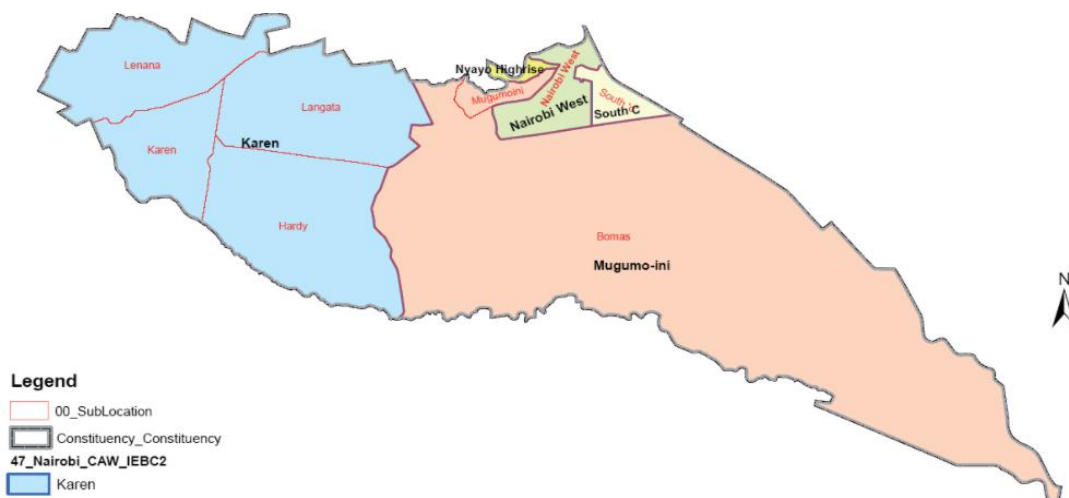
It is located to the south and south west of Nairobi's central business district and has five assembly wards that is Karen, Nairobi West, Mugumu-ini, South C, Nyayo Highrise . This Sub-County has a large number of level 5 and level 4 hospitals . Belevue Hospital has been in the front line in responding to COVID-19 pandemic and has isolation units, Intensive Care Units and High Dependency Units handling majorly COVID-19 patients apart from other patients.

Figure 4: Nairobi County



Source: The Guide Kenya

Figure 5: Langata Sub-County



Source: Independent Electoral and Boundaries Commission (IEBC) – 2012

Langata Sub-County is located in Nairobi County home to 4,397,073 Kenyans out of the total population of 47,564,296. (Kenya National Bureau of Statistics, 2019).

The residents in Langata Sub-County comprise Kenya's middle class, with congested estates. Belevue hospital is a private level 4 emergency and ICU center highly equipped to offer emergency services apart from outpatient and other specialist clinics. The hospital staff in Belevue Hospital provide a representative study population serving a large proportion of the population in Nairobi County in relation to COVID-19. The hospital has been in the front line

in Covid-19 response from the onset to date. Mobilization of resources to respond to COVID-19 occurs at county level then at sub-county level. Social workers provided social-culturally based responses to the study objectives.

3.2 Study Population

The study population for the current study were hospital staff (clinical services administrators, doctors, clinicians, nurses, public health workers, social workers and consultants).

3.3 Study Variables for the quantitative study

Based on the conceptual framework (figure 6) the preparedness factors form the backbone for health system preparedness and correspond to the response factors that form the outcome seen in a hospital set up during a pandemic situation as shown in table 3. Preparedness and response are a continuous cycle once you prepare and respond you evaluate prepare again and respond.

Table 3: Study Variables

Preparedness Variables	Response Variables
Criteria that define a case	Case status
Space - infrastructure	Clinical protocols – Implementation of MOH guidelines and protocols
Staff - human resource capacity	Testing capacity and logistics
Stuff - PPEs and medication	PPE & Isolation precautions – infection control implementation
System - coordination	Triage & cohorting – Contact tracing
	Staff/clinician welfare
	Communication & coordination
	Planning for a surge – resource mobilization
	Scarce resource allocation
	Response impact on PHC services

In light of this conceptual framework preparedness in the hospital was measured by a demand and supply health economic approach. The study comprised data from the onset on the COVID-19 pandemic to 27th June 2021. Space in terms of bed capacity and infrastructure was assessed from the onset of the pandemic to 27th June 2021. Staff numbers at the start of the pandemic to date were quantified by inquiring about whether the existing number at the onset of COVID-19 was sufficient or was there need for more staff, PPE and medication.

Response was measured by investigating if there was need to mobilize more resources, were the existing resources sufficient or was budget surpassed in procuring more to meet demand. Frequency of infection control was also assessed and seen to be increased from the onset of COVID-19. An assessment of resources that went toward contact tracing, implementation of

protocols and surveillance capacity was done. The impact of COVID-19 on primary healthcare services such as maternal and child health was investigated by looking at number of patients and staff at the onset of COVID-19.

3.4 Data Collection Methods

The study design was a case study that comprised of qualitative design that includes key informant interview and focus group discussion, observation of what was on the ground using an observation checklist and quantitative methods. These five methods were used to have comprehensive results and to allow triangulation of data.

3.4.1 Key Informant interviews

Hospital preparedness and response adequacy assessment from the onset of COVID-19 to date

Key Informant Interviews (KIIs) were used to assess the preparedness and response to COVID-19 of the hospital and also what it looked like at the beginning of the pandemic. It was done in person with one person at a time and yields in depth data on the research theme. Interviews require more time and resources to be effective. Qualitative data was collected through Key Informant Interviews (KII) with Key resource persons in the hospital including clinical services administrators, clinical and public health staff of the hospital. Training was done for data collectors who were recruited to conduct the qualitative interview. The qualitative data collector was a project management diploma holder with six years' experience in qualitative and quantitative data collection methods. Interview questions were developed from the topic guide and time was given to the interviewee to express their opinions(Paradis et al., 2016).

This data collection was conducted in Belevue Hospital. A structured in-depth qualitative questionnaire was used. Purposive sampling was used with respect to different clinical roles including clinical services hospital administration, doctors, clinicians, nurses, and consultants. Data saturation was the indication of sufficient sample size.

Two data collectors were hired. These data collectors had experience in conducting qualitative and quantitative data collection. They were trained for two weeks on how to conduct these interviews, transcription, coding and analysis of data. I was able to explain the data they needed to look out for. I came up with codes for the data collected with respect to the themes that the responses brought out. Arranging of the coded data into themes took time and together with the data collectors we transcribed the data and I was able to code it, analyze yielding eight preparedness and response themes and twenty-two preparedness and response sub-themes in the KII and FGD. These themes form the basis for healthcare system preparedness and response

guide that can be used to conduct similar analysis in health system preparedness and response globally. These interviews took place in-person as per the interviewer's preference and in line with Ministry of Health guidelines. The following objectives were addressed through KIIs with a proportion of the hospital clinical services administrative, clinical and public health staff: -

- I. The preparedness to COVID-19 based on:
 - **Adequacy** of established infrastructure in preparedness to COVID-19,
 - **Human resource capacity** to manage COVID-19 pandemic,
 - Quantification of medication and PPEs availability and effectiveness to manage COVID-19 pandemic.
- II. **Adequacy of overall response** to COVID-19 pandemic in the study hospital by: -.
 - Estimating/Identifying resource mobilization, communication and awareness, infection control implementation, contact tracing, surveillance, case definition and treatment to COVID-19,
 - Assess the impact of response made to COVID-19 pandemic on other primary healthcare services.

Inclusion Criteria

- Hospital staff of Belevue Hospital

Exclusion Criteria

- Those unwilling to participate/ refuse to give consent to participate
- Those newly transferred to the hospital

3.4.2 Quantitative survey

Hospital preparedness and response assessment

The main aim of this survey was to know the current status of hospital COVID-19 pandemic preparedness and response after a year of handling COVID-19 patients. This employed quantitative methods to quantify the level of preparedness and response of the healthcare system in Kenya to handle COVID-19. This was conducted in the hospital. Quantitative data was collected through a cross-sectional survey conducted with hospital staff including clinical services hospital administrators, doctors, clinicians, nurses, public health workers and consultants.

Study participants selection was purposive. As part of a case study the findings of the quantitative study were triangulated using findings from different sources of data including the in-depth interviews, FGD and observation (Noordzij et al., 2011).

A proportion of hospital staff (clinical services hospital administration, doctors, clinicians, nurses, public health workers and consultants) took part in the quantitative interview and were the participants of this through stratification. The study population was divided into strata and a proportion of each cluster or strata was sampled using systematic random sampling. A proportion of staff were selected and included those who had not participated in the KIIs. The survey was used to quantify the level of preparedness and response to COVID-19 by the hospital. The questions in the short survey (Appendix 3) were purely quantitative and were developed based on the conceptual framework developed by Anesi et al., 2020 on critical healthcare preparedness and response assessment areas.

Inclusion Criteria

- Hospital staff of Belevue Hospital

Exclusion Criteria

- Those unwilling to participate/ refuse to give consent to participate
- Those who participated in the KIIs

3.4.3 Focus Group Discussions

Healthcare system preparedness and response adequacy assessment

Focus Group Discussions bring out the social aspects of a research area. It captures a groups sentiments and reaction to others comments. It brings out diverse perspectives and enriches the data collection process (Paradis et al., 2016). This was conducted in the hospital with health workers including management, physicians, four community health workers and social workers. The key goal was to generate information around the perception on the level of preparedness and response to COVID-19.

Inclusion Criteria

- Belevue Hospital medical doctors, consultants, hospital managers, social workers and community health nurses

Exclusion Criteria

- Medical doctors, consultants, hospital managers, social workers and community health nurses unwilling to participate/give consent to participate

3.4.4 Observation

Adequacy of implementation of protocols and guidelines assessment

Observation helps to investigate and document every day occurrences concerning a research theme. It shows the real picture of how a situation is on the ground rather than explanations (Paradis et al., 2016).

Observation was applied in the hospital following COVID19 guideline and getting prior permission. Through observation we assessed the adequacy of implementation of protocols and guidelines, in the response to COVID-19 since the pandemic is still ongoing. Through observation key response activities and gaps were identified and documented with the aim of quantifying how much Kenya was prepared to respond to COVID-19. The data collected was based on a checklist developed using the conceptual framework (Anesi et al., 2020) and a study conducted in Idaho hospitals on COVID-19 preparedness (Kanwar et al., 2020) key indicators of adequate response to a pandemic in a hospital set up. The data collected was over a period of 1 week during the day time for a total of forty-five and a half hours cumulatively with the assistance of the quantitative data collector who was oriented on the protocols and guidelines to assess.

3.4.5 Literature Review

Overall preparedness and response of the Kenyan healthcare system to the COVID-19 pandemic

A literature review was conducted to gather published literature, grey literature/government and non-governmental reports that might have documented information about the preparedness and response of hospitals in Kenya to COVID-19. This literature review entailed information on databases, Ministry of Health website, Belevue Hospital and other relevant sites. This was used to supplement the primary information collected during the study.

The literature review was conducted from 3rd March 2021 to 27th June 2021. A literature search was done on PubMed and other databases of abstracts, full text and free full text or review and systematic reviews yielded 68 articles published between 2020 and 2021 of which 18 articles were used. The search terms used included “COVID Kenya” “COVID-19 Pandemic Kenya” “COVID-19 response Kenya” “COVID-19 preparedness Kenya” Gray literature yielded 49

results and 4 were used after further filtering of results. The literature used were in line with the research objectives.

Inclusion Criteria

- Published articles/reviews/reports, grey literature/government and non-governmental reports/articles on overall level of preparedness and response of the Kenyan healthcare system to the COVID-19 pandemic dating 2020 to 2021.

Exclusion Criteria

- Articles/Reports used in the initial literature review during research proposal development

3.5 Validity and Reliability

Questionnaires were developed using the study objectives and the chosen conceptual framework. The questionnaires ensured reliability as the results were consistent with each method giving results based on time of study. Validity in this study was ensured. The study was able measure all the preparedness and response variables hence answering all research objectives. A representative sample was selected through purposive sampling in the qualitative interviews and stratification then systematic random sampling for the quantitative survey. Questionnaires were developed in such a way that all relevant information to answer the objectives were included and accurately measured the area of interest. Reliability was ensured through pretesting of data collection tools and proper training of data collectors (Heale & Twycross, 2015)

3.6 Data Processing and Statistical Analysis

Quantitative data was analyzed descriptively using SPSS software to ensure outcomes are well presented in a palatable way with graphs, tables, pie charts and other relevant ways. Descriptive statistical summary's such as percentages were used to visualize the collected quantitative data based on the conceptual model by Anesi et al.,2020 and any describe potential trends. Qualitative data was transcribed from the paper notes used to collect the data. Each transcript had a unique identification participant number for confidentiality. The data was then coded based on repeated statements and the research questions and analyzed thematically using NVIVO software. Various themes were derived from this analysis that can be used in future for analysis of hospital pandemic preparedness and response data collected.

3.7 Ethical Considerations

Ethical clearance was obtained from Addis Ababa University, Center for Drug Development and Therapeutic Trials for Africa – Scientific and Ethics Review Committee, National Commission for Science, Technology & Innovation (NACOSTI) and hospital management of Beview Hospital. Consent was sought for any participants before being interviewed. Confidentiality and integrity were upheld of collected information. The information has only been analyzed and presented for research purposes. This study focused on the area of study and study population took into account the need for consent to participate in the study.

Ethical consideration related to COVID-19 prevention, data collection and confidentiality

All COVID-19 related ministry of health guidelines were adhered to during data collection. Prior permission was sought to assess the hospitals, interview people in the hospital. Masks were worn, social distance of 1.5 meters was applied and use of sanitizers and handwashing facilities was applied. All interviews were in-person interviews and there was no need for online interviews as earlier thought by key stakeholders working in the hospital. English or Kiswahili was used in the KIIs, focus group discussion and survey data collection methods depending on the preference of the respondent. Questionnaires and survey data were placed in steel lock cabinets once filled.

Data Collection

The proposal was formulated September 2020 to February 2021, approved on 16th February 2021 after it was defended successfully on 2nd February 2021. Ethical clearance was sought from Addis Ababa University, Center for Drug Development and Therapeutic Trials for Africa – Scientific and Ethics Review Committee, National Commission for Science, Technology & Innovation (NACOSTI) and hospital management of Beview Hospital. Ethical clearance, data collection, data analysis and thesis write-up were done from 3rd March 2021 to 27th June 2021. We used both quantitative data collection method and qualitative data collection methods (Key Informant Interview, observation of ministry of health COVID-19 protocols implementation and a focus group discussion) and a literature review of existing evidence. The data collection was done with the help of a qualitative and quantitative data collectors who were trained.

The KII, survey and observation were used to provide a clear assessment of the hospital's preparedness and response adequacy from the onset of COVID-19 to date. Using the qualitative and quantitative interviews we assessed preparedness in terms of infrastructure, human

resource capacity, resources, adherence to COVID-19 prevention protocols, preparedness and response system and impact of COVID-19 to PHC services. The usefulness of the FGD and literature review was to compare the case study findings to that of the overall healthcare system in Kenya using the same hospital COVID-19 pandemic preparedness and response objectives.

Permission was sought from the Human resource's manager to conduct a physical gathering and a focus group discussion (FGD). The hospital director, Managers and head of departments of the clinical or medical and nursing departments were consulted so as to allow team members to participate in the FGD. The FGD was held in the hospital with ten participants. The FGD aimed to assess Kenya's healthcare system preparedness and response taking into account different perceptions of the participants.

Throughout the data collection we ensured adherence to the recommended practices of a social distance of 1.5 meters, wearing masks and ministry of health protocols. We carried out an observation for one week in the hospital using a checklist adapted from a study conducted in Idaho (Kanwar et al., 2020) on COVID-19 hospital preparedness (Appendix 5). The time frame of one week was utilized to adhere to the COVID-19 protocols expected to be practiced in the hospital.

Observation was done with the objective of assessing adequacy of implementation of Ministry of Health (MOH) COVID-19 protocols and guidelines in preparedness and response to COVID-19. The documentation of the observation was based on a checklist presented in Appendix 6.

The questionnaires were filled using a black pen for integrity of the information and stored in a steel locked cabinet for confidentiality. Only CDT Africa and NACOSTI approved questionnaires were used. The interviews were conducted in face-to -face in the hospital. All Ministry of Health (MOH) hospital Infection Prevention (IPC) COVID-19 prevention protocols were followed as we collected data. Double masks were worn as part of the hospital policy, social distance of 1.5 meters was followed.

Name tags were worn as part of the hospital policy, strict adherence to hospital rules and policies was followed appropriately throughout the data collection period. The hospital provided meals as a courtesy to the data collection team and this was known after beginning data collection.

Chapter Four

4.0 Results

Introduction

In this chapter we report the findings that we have obtained from the different components of the study, namely; qualitative, quantitative, observation and a review of literature.

A total of seventeen key informant interviews were done with hospital staff that included clinical services administrators, clinical and public health staff of the hospital. Each interview took from forty-five minutes to one hour and forty-five minutes depending on the content the interviewee was willing to give.

In a quantitative survey with hospital staff including clinical services hospital administrators, doctors, clinicians, nurses, public health workers and consultants, a total of fifty-one respondents consented and participated.

In section 4.1 we will report information about the number of participants of the Key Informant Interview (KII), their demographic characteristics and themes that arose from the KII that compared the hospital preparedness response of the hospital from onset to date and the final conclusion to the COVID-19 outcome. We will also report about the Focus Group Discussion (FGD) participants, their demographic characteristics and the themes that arose on the perception of health system preparedness and the adequacy of the response.

In section 4.2 we will report findings from the survey that assessed current status of hospital preparedness and response adequacy of the study hospital.

In section 4.3 we have reported the findings from the observation designed to assess adequacy of implementation of COVID-19 protocols and guidelines in the hospital.

The literature review findings on overall preparedness and response of Kenya's healthcare system to the COVID-19 pandemic were summarized and added to the literature review section "*Preparedness and response to COVID-19 in Kenya*". The literature review was to ensure a proper picture of the outcome that can give broad conclusions using the measures used to assess the study hospital.

A total of seventy-two participants consented and took part in the study.

4.1 Findings from the qualitative study

Demographics of the Key Informant Interview (KII) participants is presented in table 4. The median age was 47 years and their age ranges from 27 to 62 years, 70.6% were married and 58.8% were female.

Table 4: Demographic characteristics of KII participants

Variable	Category	Number of participants
Age	27 - 32	3
	33 - 38	2
	39 - 44	2
	45 - 50	4
	51 - 56	3
	57 - 62	3
Sex	Male	7
	Female	10
Marital Status	Single (Not in marital union)	5
	Currently married	12
Education status	College	7
	University	10

Age and education status influenced the perception of the hospital's need for preparedness to COVID-19. A participant aged 51 stated "*I had to implement burial nursing in my department*" which meant nursing practices related to handling a corpse and one person whose age is 28 stated "I would seek guidance from my department head especially on COVID-19 prevention as I felt new to the situation". Gender related responses showed that both genders saw the need for psychosocial support in COVID-19 patient management. One participant stated "I really would advise the hospital implement a counselling system and debriefing because it is not easy". Another stated "There was no support". Interviewed persons were in the departmental head and managerial positions. The participant's family situation appeared to influence the level of precautions taken in Personal Protective Equipment (PPE) use with those having dependents being more cautious. A participant who was married stated "I had to shower before going home so that I do not put my family at risk". A participant who had a child said "I would

reach home and first shower before coming into contact with my baby”.

Table 5: Thematic presentation of hospitals preparedness and response to COVID-19

Theme – Preparedness (KII)
1. Unclear COVID-19 case Definition
2. Inadequate resources
• Inadequate Space (Beds)
• Employed staff
• Constrained medication and PPE supply (high demand)
3. At the onset of COVID-19 the hospital was not prepared (currently it is)
• Implementation of a pandemic system preparedness, coordination and communication at the onset of COVID-19
Theme – Response (KII)
4. Staff were aware of MOH COVID-19 protocols (implementation was challenging at the onset)
5. Response to COVID-19 faced major challenges
• Inadequate COVID-19 Testing capacity (outsourced)
• No isolation facility at the start of the pandemic (currently available)
• Triage and cohorting was stringent last year (currently relaxed)
• COVID-19 was stressful to cope with for healthcare staff
• Improvement of communication and coordination since the onset of COVID-19
• Scarce resource allocation in the COVID-19 surge situation
6. Response to COVID-19 greatly impacted delivery of primary healthcare services
Theme- (Overall preparedness and response - KII)
• The hospital was not prepared to respond to COVID-19 at the onset of the pandemic but currently it's prepared
Theme - (Kenyan healthcare system preparedness and response - FGD)
7. COVID-19 response could have utilized existing infectious disease response plans
• Quarantine system was insufficient
• Contact tracing was not well received by the public

• MOH prevention measures such as lockdown affected the public's health seeking behaviour negatively
• Desire for psychosocial support by health workers with loss of COVID-19 patients
• Inadequate vaccine coverage country wide
• Improved PPE and medical supply currently
• Jobs were created for healthcare workers
8. The healthcare system was not prepared to respond to COVID-19
• Resources were a major challenge (Stuff (PPE, medication, oxygen, isolation facilities, ICUs), staff, finances, testing capacity - inadequate)
• COVID-19 Medication was expensive
• Knowledge gap in pandemic response
• COVID-19 Case definition kept changing with each wave
• Healthcare workers experienced stigma

Focus Group Discussion (FGD)

Two participants were from management, two consultant physicians, four community health workers, and one social worker participated. Four of the participants had not participated in the other interviews or surveys. The males were three and females were seven. Five of the participants had studied up to masters or degree level and five had studied up to diploma level in healthcare. Their ages ranged from twenty-seven to forty years with a work experience of seven to fifteen years' experience in the healthcare profession. The focus group discussion took one hour thirty-one minutes. The themes arising from the various topics discussed are summarized in table 5.

4.2 Quantitative study findings

4.2.1 Survey

Demographics

Age of study participants were within the range of 26 to 50 years and the mean age was 34.2 years (figure 6).

Table 6: Quantitative survey study participant demographics

Characteristics	Response Category	Participant number	Percentage
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Age	26 - 31	23	45.1
	32 - 37	15	29.4
	38 – 43	5	9.8
	44 - 49	6	11.8
	50	2	3.9
Total		51	100
Sex	Male	34	66.7
	Female	17	33.3
Marital Status	Single (Not in marital union)	31	60.8
	Currently married	20	39.2
Education status	College	36	70.6
	University	15	29.4

More than half of the study participants were below the age of 37 years (74.5%) and only 3.9% were older than 49 years of age. Majority of the respondents were male (66.7%), single (60.8%) and had college level education (60.7%).

Table 7: Summary of results obtained from response given to the preparedness on different indicators

The qualitative survey quantified the current status of the hospital's preparedness and response to the COVID-19 pandemic (Table 7). Based on these findings the hospital lacked adequate resources (staff, medication, an isolation and PPEs) to prepare and respond to COVID-19. However, sanitizers and visual precautions were adequate. The case definition of COVID-19 was not clear and the response to COVID-19 impacted delivery of other primary healthcare services.

Hospital preparedness was assessed on the following dimensions of preparedness	Yes, it was prepared (Frequency)	Yes, it was prepared (Percent)	No, it was not prepared (Frequency)	No, it was not prepared (Percent)
Infrastructure	17	33.3	34	66.7
Staff (Human Resource capacity)	19	37.3	32	62.7
Visual precautions	51	100.0		
Medication	20	39.2	31	60.8

PPEs	17	33.3	34	66.7
Sanitizers	48	94.1	3	5.9
System (Response plan)	37	72.6	14	27.4
Conclusion (Overall preparedness)	17	33.3	34	66.7
Hospital response was assessed on the following dimensions of response	Yes, response was adequate (Frequency)	Yes, response was adequate (Percent)	No, response was not adequate (Frequency)	No, response was not adequate (Percent)
Having a clear case definition	14	27.5	37	72.5
Having a clear response Plan (Communication and coordination)	36	70.6	15	29.4
Having enough resources (PPEs, Medication, Isolation, facility)	18	35.3	33	64.7
Frequency of infection control	33	64.7	18	35.5
Implementation of COVID-19 Protocols (MOH Guidelines and Isolation protocols)	40	78.4	11	21.6
Impact of COVID-19 (Response to PHC Services)	41	80.4	10	19.6
Conclusion (Overall response to COVID-19)	20	39.2	31	60.8

4.3 Observation

Observation findings have been triangulated in the relevant section below.

Triangulation of findings

The KII, FGD and survey respondents stated the following from the interviews held. The data collected and what was observed form integral part of the below triangulation of the study findings.

Preparedness to Covid-19

In the KII overall, respondents indicated that the hospital was caught off-guard in 2020 but that they were fairly prepared in the year 2021. Respondents PID003 stated “*At first we were not prepared but now we are well prepared*”. Another respondent PID005 said “*Last year we were not prepared, now we have made sure equipment is available*”. Respondent PID001 said “*Last year we were poorly prepared but this year we are better off*” PID10 “*Before we were afraid to go and fetch a patient now, we are not*” PID004 “*To be honest last year we were caught off-*

guard". COVID-19 came in as a new disease and hospitals had to understand PPE and Isolation precautions. In 2020 patients used to be tested and isolated based on basic signs and symptoms of COVID-19. However, they are now isolated based on severity of symptoms.

Theme 1: Unclear COVID-19 Case Definition

The KII study participating respondents stated that the Covid-19 case definition was not clear, and was of a complicated nature at the start. But currently it's a bit better and clearer though COVID-19 keeps mutating and hence requiring changes to the case definition often. It also depended on the onset and symptoms of the patients. The case definition used in various research activities significantly varies. Currently the case definition has really changed.

Challenges in case definition from responses included convincing a patient to get tested for COVID-19 due to the stigma around it, verifying results and refusal of some treatment procedures. Patients would associate the COVID-19 symptoms to other respiratory disease in a case where initial diagnosis was poor or different from final diagnosis a participant stated PID001 "*when someone got tested and the results came back that's when we were sure of the symptoms*". It was difficult to verify the results of a patient with upper respiratory tract infection especially when the results were negative a participant stated PID007 "*Some patients you could find have all the flu symptoms but the result is COVID-19 negative*".

There were knowledge gaps because clinicians were dealing with the unknown a participant stated PID016 "*when you have an unknown thing you don't approach it very confidently*". But currently there is more knowledge about the disease. Handling a new disease meant information gaps hence requires research a participant stated PID001 "*At the beginning there were so many unknown but now we are at par with the world*".

The case definition became clearer with more data coming in and correlation of symptoms and laboratory results to chest x-ray are established. Each wave of COVID-19 had a different case definition with diarrhea and vomiting presenting in the second and third waves. The third wave had a severe form of COVID-19 where patients were taken directly to ICU. A respondent stated PID011 "*Case definition was not clear it was a new disease; didn't have classical symptoms as it progressed it became clearer*" PID009 "*The case definition was not clear COVID-19 kept changing there was fever at the start quite different from now*" PID011 "*We used the PCR results and chest x-ray to be sure we could not rely on symptoms only some were asymptomatic*". At first the mode of spread was not clear for team members that did not previously handle infectious diseases like Zika and Ebola. A participant stated PID017 "*The*

spread of COVID-19 is faster but can be better avoided” PID017 *“I have handled Zika and Ebola but most of my team haven’t experienced infectious disease”*.

In the **FGD** at the onset of COVID-19 the mode of spread was not clear for team members that had not handled infectious diseases like Zika and Ebola. A participant stated PID017 *“The spread of COVID-19 was faster but it’s prevention is relatively manageable”*. A participant stated PID010 *“Case definition kept changing when comparing with the WHO case definition”*. A participant stated PID017 *“It was anecdotal at first then in the second and third waves there was non-typical presentation of COVID-19”*. There was lack of proper information where screening, diagnosis and symptoms of COVID-19 were confusing to people hence a lot of miss information.

Theme 2: Inadequate resources

Space

In the KII in terms of hospital infrastructure at first no hospital was prepared, the hospital had to make changes to the existing wards and expand the Intensive Care Units (ICU). Where there were four beds only two beds were put due to the 1.5-meter distance rule. The hospital had standard beds and they increased more beds and units. The increased number of patient’s made the hospital increase space. At first the hospital was not aware about these issues. They had to build isolation wards and ICU. In 2020 the capacity was normal but in 2021 capacity is increased. In the first wave the hospital was not prepared, (hospital was prepared for few patients) in the second wave the hospital was prepared for an increased number of patients and in the third wave the hospital experienced a surge. After the surge in numbers occurred there was space scarcity.

Challenges faced included congestion, having to turn away patient’s, accommodating a smaller number of patients, having only one visitor per patient which was not well received by patients’ relatives, construction to add more beds for patients was challenging as construction takes time. Space was not enough and had to refer other cases of COVID-19 to other hospitals.

The hospital succeeded in avoiding cross contamination, construction was completed and the hospital was able to take in more patients, patient recovery, offices were converted to isolation rooms. The hospital was also able to map out areas in terms of green, yellow and red areas in relation to Infection Prevention and Control (IPC) as per the World Health Organization

(WHO) guidelines. A good outcome was that the patients brought in with early onset of symptoms recovered.

In the **FGD** another participant stated PID019 “*Countrywide the community infrastructure was not there and the stigma was too much*”. Supplies were inadequate and pricing was high due to closing of borders, panic and hoarding.

Staff

In the KII human resource capacity was inadequate at first which was a challenge for the hospital as it was overwhelmed. The workload was quite overwhelming and the hospital had to hire more staff as the units grew and work load increased. Human resource capacity was strained at first and was somehow adequate by August 2020. It was, strained again during the second wave of COVID-19. Staff were increased specially in ICU and critical care and also stopped fearing COVID-19. Currently the staff capacity is okay as staff were few but after COVID-19 the hospital had to employ more.

Dealing with COVID-19 was quite a challenge as nursing care resulted in fatigue and testing positive for COVID-19 was scary. Staff got COVID-19 especially in the first wave and staying home until one tested negative meant reduced staff capacity. Staff were not reassigned as a staff handling COVID-19 patients were not allowed to handle other patients. Locum staff were hired on part time basis especially for the isolation wards. However, hiring takes time and healthcare is always under staffed. More staff were hired and trained on IPC.

Stuff

In the KII medication and PPE supply was a challenge in 2020 because of the increased demand. Medication was inadequate for staff but it was available for patients. More drugs were introduced to the pharmacy a month after the onset of COVID-19. Medication quantity was reduced due to scrambling for available resources.

At first PPEs were expensive, scarce and had to be recycled. A participant stated PID005 “*One PPE costed between 3000 to 5000 Kenya Shillings*” PID001 “*One PPE was used per shift that is twelve hours and recycled*” especially by family visiting COVID-19 patients. There was also more demand for medication and PPE but the supply was limited. Another challenge was the vital drugs required could only be purchased once the patient’s relatives agree to the cost as they were quite expensive. In the first and second wave, the staff had to recycle masks by washing. This phenomenon was challenging. At the first instance supply was minimal across

all hospitals. In 2021 there is no demand for PPE from the start of the month of May. Availability for PPE was low due to low supply in the country and was very constrained last year. Sub-standard PPEs were in the market. Demand for medication and PPE was high last year. However, supply would take long due to scarcity in the market. In 2021 PPE are available as there is standard supply.

In the **FGD** there were gaps in finances especially for government to finance every single COVID-19 patient. Financing was the main gap, not many people could afford COVID-19 treatment costs. It was costly to set up COVID-19 quarantine and isolation centers. Medication was costly a participant stated PID018 *“Medication costed 160,000 Kenya shillings at first currently the same medication costs 8,000 Kenya Shillings”* yet there were still other drugs to purchase. Admission for COVID-19 was quite costly a participant stated PID018 *“admission costed up to 600,000 Kenya Shillings in some hospitals”*. There was oxygen shortage country wide and hospitals had to weigh the oxygen tanks to ensure they are full.

Country wide there was shortage of PPEs where health workers demonstrate and isolation facilities were inadequate. Trainings for healthcare workers was done at the onset of COVID-19. There were knowledge gaps among the healthcare givers. A participant stated PID026 *“PPEs were not enough and commercialized and could be used for up to three days”*.

Theme 3: At the onset of COVID-19 the hospital was not prepared (currently it is)

System

In the KII Preparedness was not well coordinated in the first wave as panic was too much however, in the second and third wave with information and coordination improved it was well done through the Clinical Operations manager. Communication was well coordinated between departments through telephone, landline or WhatsApp. There were weekly head of departments meetings. Ministry of health would come to fumigate and collect the body of the diseased in 2020. Each department had a team leader and the hospital had an IPC plan or framework that enabled a response system. At first government was very stringent on measures regarding immediate reporting of a COVID-19 case and spraying but in 2021 this is managed internally.

The hospital was not prepared to handle COVID-19 patients in 2020 but in 2021 they are better. Comparing March 2020 and the third wave of the COVID-19 pandemic there's more awareness, prevention, caution and improved response system. In 2021 there is acceptance of the system to accommodate COVID-19 response hence the structures are favorable. Visual

cautions are currently in use and there was a procedure for Personal Protective Equipment (PPE) donning and doffing (Appendix 6,7). Screening was strictly done at the entrance of the hospital, the hospital had to take measures to ensure awareness of the visual cautions.

Challenges faced included handling a large number of COVID-19 cases at ago. Information sharing was poor in terms of dissemination.

Findings from the **quantitative** study about the preparations made by the hospital and response outcome is summarized in table 10. Among the respondents 66.7% (34/51) stated that the hospital had inadequate infrastructure in preparation for COVID-19 response, 62.7% (32/51) stated that staff were not enough in preparation for COVID-19 response and all respondents stated that visual alerts and precautions were put in place in preparation for COVID-19 response. Based on the response of the study participants 60.8% (31/51) medication supply was insufficient 60.8% (31/51) and Personal Protective Equipment (PPE) were insufficient specifically eye protection gear and and face shield, face masks and gowns 66.7% (31/51). The hospital was putting alcohol based sanitizers and they regularly refilled 60.8% (48/51).

There was a system for pandemic response preparedness after the onset of COVID-19 72.6% (49/51).

In the **observation** a COVID-19 Case definition checklist was present in the hospital. A COVID-19 suspect designated entrance was not indicated on the checklist. However, there was a specific door used for this at the onset of the pandemic. There were no airborne precautions such as having precautions to minimize contact with droplets. There were visual alerts on the need for social distance on seats, hand washing but none on coughing etiquette. There was a display of PPE Requirements for all staff, patients and visitors including a donning and doffing procedure (Appendix 6,7,8,9) at the isolation facility. An isolation facility was available and it was well labelled with two entrances and the need for PPE well indicated. The hospital had isolation protocols and procedures known to clinicians and explained to patients. At the time of observation there was no contact tracing form or visitor's registry but on probing it was there last year. Alcohol-based sanitizers dispensers were available and regularly filled.

In the **literature review** there was lack of pandemic preparedness, a response plan and infrastructure. There was lack of PPEs to respond to COVID-19 nationally. COVID-19 management was costly to the healthcare system.

Response to COVID-19

Theme 4: Staff were aware of MOH COVID-19 protocols (implementation was challenging at the onset)

Clinical Protocols

The KII respondents mentioned the COVID-19 guidelines and protocols they were aware of were on testing, wearing PPEs such as masks, isolation, quarantine, treatment, regular handwashing, social distance of 1.5 meters, sanitization, timely diagnosis and self-isolation. Additionally, the hospital was not supposed to admit patients about to die to minimize number of deaths recorded in the hospital. This was verbally communicated to staff by management. There were no clear COVID-19 response protocols but there was a physician who implemented infectious disease guidelines.

The guidelines were produced by Ministry of Health (MOH), World Health Organization (WHO) and also there were hospital-imposed guidelines produced by the Clinical department and Infection Prevention and Control (IPC) team. They were shared via the hospital WhatsApp group, printed and put on walls per department and distributed as flyers.

The COVID-19 staff guidelines were difficult to implement as they took more time. Nonetheless it was mandatory to implement the guidelines. In 2020 it was hard trying to implement the guidelines due to constrained resources while 2021 it's easier due to more resources and information on COVID-19 prevention practices.

Most people complied with guidelines, but others did not. The MOH did a surprise visit to check implementation of guidelines and this brought the realization it was mandatory to implement the COVID-19 prevention protocols. Additional actions taken included closing of entrances to ensure screening is done in one open entrance.

The MOH guidelines were implemented and the implementation was challenging at the onset of COVID-19 but as of 2021 implementation is better. A participant stated PID004 *"More staff were infected in 2020 even though people were cautious last year compared to 2021"*. Another stated PID005 *"At the onset of COVID-19 it was easier to implement as people were afraid 2021 it's more tedious(not hard but not 100%)"*. In the beginning people were worried and anxious, few were reluctant in adhering. There was also resistance from relatives of patients. The protocols were likened to those of *"burial nursing"* by participant PID016 which she

explained upon probing is nursing practices related to handling of corpses. The protocols are more defined and better implemented in 2021.

In the **FGD** a participant stated PID051 *“Training and capacity building of already existing CHWs as all sub counties have a TB strategy”*. This would have assisted in avoiding stigma. A participant stated PID020 *“There was a lot of stigma around COVID-19 especially as a healthcare worker”*. A participant stated PID007 *“Investing in vaccination would also help a lot”*. On the flip side COVID-19 prevention clinical protocols were implemented and there was a marginal improvement in PPE provision.

Theme 5: Response to COVID-19 faced major challenges

Testing Capacity and Logistics

In the KII first wave there was no testing within the hospital and so it was outsourced. The hospitals testing capacity was inadequate in 2020 it was challenging and very expensive. More people wanted to know their status but testing sites were few.

The hospital had no testing capacity and outsourced PCR testing from Lancet pathology laboratory and Kenya Medical Research Institute (KEMRI). In 2021 testing is cheaper, faster, more testing sites are available and there are new ways of testing such as antigen testing was available in the hospital from November 2020. A respondent stated PID015 *“Testing logistics were challenging and hectic as it was 100 % outsourced, results turnaround time was 24 to 48 hours or even 72 hours (two to three days)”*. In 2021 results for PCR took twelve to twenty-four hours and Rapid antigen test results took less than twelve hours. Testing logistics are better in 2021. Response to COVID-19 was coordinated through clinical assessment and laboratory testing. Management of COVID-19 was through medication and testing for any comorbidities such as high blood pressure, diabetes, asthma, HIV status and kidney function. Response to COVID-19 was challenging in 2020 and is better in 2021.

In the **FGD** in 2020 testing capacity was low and majority could not afford to test. Vaccine's coverage in 2020 was low. A participant stated PID021 *“There is delay in receiving the second dose of the vaccine”*.

PPE and Isolation Precautions

In the KII infection control was implemented by wearing PPE, spraying, disinfecting, creation of more hand washing points and making sanitizers available. Cleaning was done according to

WHO start from green area and finish in red area, and there was introduction of biohazard containers and waste segregation. There was the introduction of an Infection Prevention and Control (IPC) team in May 2020 to implement infection control in each department. Staff were trained on donning and doffing of PPEs (Appendix 6,7). Frequency of spraying was once per week in 2020. PPEs were worn when going to isolation wards. In 2021 compliance to isolation precautions is less than 2020.

Isolation protocols were implemented late 2020 by introduction of an isolation ward a participant stated PID005 “patients with severe symptoms were isolated immediately and awaited results in isolation”. Wards were reduced and isolation areas increased. At the isolation area everyone had to be in PPEs and fumigation was done. A participant stated PID001 “*One could not access the isolation without PPEs*”. Fumigation was done once in two weeks. Isolation protocols were implemented through the IPC committee led by management.

Challenges included an isolation facility was not present at the start of the COVID-19 pandemic but presently it's there. The beds were not enough, the hospital was overwhelmed, some patients and relatives of patients were resistant to protocols by refusing to wear PPEs. A participant stated PID016 “*Staff were exposed to COVID-19 especially in the first wave where there was reusing of PPEs*”. At first there was no isolation hence there was mixing of patients, respondents were not sure if to use the same PPE or change but as of 2021 PPE is discarded after a ward round. A respondent stated PID013 “*Adherence at first was not good now it has improved*”. Procuring PPEs in 2020 was difficult and expensive making IPC difficult. Quality of PPEs in 2020 were lower than those in the market this year.

Some patients refused to use the Non-Invasive Ventilator (NIV). A participant stated PID012 “*I would put a patient on an NIV you come and find they removed it*”. Cross infection was controlled by assigning staff solely to isolation, restricting visitors, beds and partitioning were increased. A respondent stated PID013 “*In the first wave around ten staff got COVID-19 by the second and third waves only one got*”.

In the **FGD** isolation areas took time to set up and finances were not there.

Triage and Cohorting

In the KII the triage process was different and stricter it was carried out outside in a tent, in 2020, with a triage team comprising a nurse, doctor and porter. Triage for suspected and

confirmed cases was done in the isolation wards. A checklist of symptoms and a thermal gun was used. A participant stated PID003 *“If a patient’s temperature was above thirty-seven degrees centigrade the patient was taken directly to isolation”*. PID012 *“If the patient was in inpatient and they have COVID-19 they would be taken to isolation immediately, but if outpatient they test in the laboratory and were isolated awaiting results”*. As of 2021 triage is done indoors and is less stringent.

Surveillance activities included monthly reports on COVID-19 and daily reports to Langata Sub-County MOH. A report was done for all patients who tested positive for COVID-19. Hospitals COVID-19 statistics were sent to the MOH.

Challenges faced included patients refusing to test due to denial of symptoms such as high temperature and stating the test is expensive, which is the case. A participant stated PID001 *“At first the precautions were not taken seriously”*.

Sending surveillance reports by midnight was challenging when the hospital was overwhelmed with COVID-19 patients. Sampling logistics and contact tracing was challenging last year. Mutation of the virus was a challenge especially during triage with more asymptomatic cases. Triaged patients would give wrong contact information to avoid contact tracing which involved being tested under duress, quarantine in government facility if found positive for COVID-19 and stigma from your community. Participants stated PID007 *“Some patients refusing to wear masks”*. PID012 *“Triaging an asymptomatic COVID-19 patient could go the wrong way”*.

Key milestones met included learning, improving, following MOH guidelines and improvement of standard of equipment’s used. There was also purchase of triage equipment specifically for the isolation wards. Early diagnosis meant better management of a COVID-19 case.

Staff/Clinician Welfare

In the KII coping with COVID-19 as a healthcare worker or administrator was hard. The test was covered and medication was not hence staff had to buy their own medication and it was expensive. It took a toll especially losing patients in less than a week of admission. In terms of what went well there was perceived development of immunity, masking up and taking measures such as washing hands frequently, sanitizing and wearing a face shield when assessing patients. Adjustments of habits such as handshakes and hugging were made diluting socialization. At start of COVID-19 everyone was scared and anxious with time staff embraced

changes and coped well. Hospital took the loss of staff getting COVID-19 especially staff being home. The National Health Insurance Fund (NHIF) and private insurance were not covering COVID-19. This meant that staff had to cover COVID-19 treatments and received half pay while home recovering.

On a personal level respondents stated PID002 *“COVID-19 was stressful and scary especially treating patients with COVID-19”*. They stated that they felt isolated or secluded, stigmatized and it affected them socially. A participant stated PID013 *“The worry was the people staff go home to and people were scared when they heard you work in a hospital”* this was in 2020.

A participant stated PID007 *“Others took offence of those who kept to themselves”*. Some staff stated they did not test for COVID-19 for fear of a positive test result. There was a high-level discrimination of healthcare workers by the general public.

Coping mechanisms were mostly individual through caution and prayer as there was no counselling or support group. The reducing number of COVID-19 patients due to successful treatment and reduced mortality helped respondents to cope. Reading information and attending global trainings on COVID-19 helped respondents cope. A respondent with experience of infectious disease like Zika, Ebola made drew on their past experience to cope.

The most difficult thing about being a healthcare worker was the stigma around COVID-19. There was also the fear of taking COVID-19 back home to ones loved ones, seeing patients die affected the respondents. A participant stated *“COVID-19 was frustrating and when the patients were many it was overwhelming”*.

A participant stated PID016 *“Movement around the hospital was also challenging, going home very late as patients were many and still coming in early, loss of COVID-19 patient and testing positive for COVID-19 were challenging”*. Another stated, PID0015 *“Fatigue, loss of loved ones and a patient spitting or sneezing during sample collection were difficult moments for study respondents”*. There was minimal support available to staff such as antigen testing was available to staff.

In the **FGD** there was lack of psychosocial support of healthcare workers especially with numbers of COVID-19 patients lost, medical education on COVID-19 and PPEs for workers needed to be provided. Welfare of healthcare workers who contracted COVID-19 support was inadequate.

Resource Mobilization

In the *KII* the hospital tried to respond to the surge in COVID-19 cases but not as effectively as the number was overwhelming. In 2021 the cases were reduced compared to 2020. With a surge patients would be referred to other hospitals. A participant stated PID005 *“The third wave was the most severe whereby patients were taken to ICU straight”*. The hospital in 2021 ensuring the right medical supplies to avoid emergencies like in 2020. Mission hospitals brought COVID-19 patients to the hospital. A participant stated PID014 *“At first response to the surge in the first wave did not go too well and there are more staff members on locum basis”*.

Hospital beds were not enough hence patients would be referred to other hospitals in such an instance. Resource allocation towards COVID-19 response was a major priority area. As of 2021 bed capacity is increased and medical supplies are more. A participant stated PID001 *“Hospital beds were added and an isolation area too”*.

Hospital resource scarcity was there due to scarce supply and high demand. There was scarcity of PPE, medical supply and medication. Scarce resource allocation was done in outpatient and ICU especially of staff. Allocation of more resources (staff and medical supplies) to inpatient, ICU, isolation and critical care while reducing outpatient. Recycling of PPEs such as masks and washing gowns with chlorine was done.

Theme 6: Response to COVID-19 greatly impacted delivery of primary healthcare services

(Response to COVID-19 Impact on Primary Healthcare (PHC) Services delivered by the hospital)

In the *KII* the hospitals response to COVID-19 did have an impact to delivery of other PHC services at first where outpatient flow was affected, patients were reduced especially maternity whereby patients opted to deliver at home. A participant stated PID001 *“People didn’t go to the hospital for general checkups, routine clinics for fear of contracting COVID-19”*.

In 2021 the PHC services are still affected as out-patient flow is not compared to before onset and response to COVID-19. Response to COVID-19 also brought more of probing using questions than physical examining of patients to avoid contact with patient affecting healthcare delivery.

PHC services that were affected included immunization, maternity, outpatient numbers reduced and specialized clinics. Dialysis patients who came weekly, dental, diabetes clinics, medical camps, radiology, general ward and in patient were affected as space was taken up by COVID-19 patients. Patients would only come to hospital in emergency cases. High risk clinics or chronic patients did not come and Antenatal clinics (ANC) were largely unattended. It also impacted general ward admissions and outpatient clinics as doctors had to protect themselves.

In 2021 PHC service delivery is better compared to 2020, a participant stated PID010 *“last year patients feared going to hospital for fear of contracting COVID-19”*. Presently the hospital is continuously improving in terms of preparedness to COVID-19. The hospital was not prepared to respond to COVID-19 in 2020 but in 2021 the hospital is more prepared a respondent stated PID009 *“response is better as required equipment is currently readily available”*.

Theme 7: COVID-19 response could have utilized existing infectious disease response plans

Communication and Coordination

In the **KII** both staff and the public were aware of the hospitals COVID-19 response plan upon arrival. Quality assurance team helped in sensitization of the public. A respondent stated PID008 *“Security was there to implement the response plan to the public”*. At first it was strict but in 2021 it's relaxed.

Communication was conveyed through the Clinical Operation's Manager, landline, internal memos, online meetings and hospital WhatsApp group. Physical meetings were suspended in 2020 but in 2021 they are held physically due to low COVID-19 cases countrywide. Study participants stated there was need for Continuous Medical Education on COVID-19 prevention practices that were offered by the Sub-County Ministry of health but not as frequently as staff felt was needed. Communication within the hospital between staff on pandemic response is more effective or better in 2021 than in 2020.

In the **FGD** it was stated that PID017 *“the ministry of health could have leveraged on the multi drug resistant Tuberculosis systems/strategies of community management through Community Health Workers (CHWs) to ensure dissemination of information, contact tracing, community quarantine centers, treatment, community acceptance and integration”*. Disease management requires strong community pillars.

There was lack of experience in infectious disease management and there should have been strengthening of the existing Tuberculosis management structures for a better response. The quarantine system was not clear a participant stated PID005 “*people were kept for two weeks without results whether symptomatic or asymptomatic and people ran away from quarantine centers*”. There was no public education on COVID-19 worldwide and lack of PPEs in hospitals. Medical infrastructure to take care of patients was not there in terms of procurement of equipment, medical supply and vaccines took long.

In the **FGD** with curfews and lockdowns patients were not able to access healthcare in a timely manner. COVID-19 affected people’s perception of hospitals. Generally, health seeking behaviours reduced as people feared contracting COVID-19 from the hospitals.

In the **survey** on the hospital’s response to COVID-19 72.5% (37/51) stated that the COVID-19 case definition was not clear, there was proper communication and coordination in the hospitals COVID-19 response 70.6% (36/51); resources such as PPEs, medication and isolation facility was not adequate though present 64.7% (33/51) and that infection control was implemented and it was adequate 64.7% (33/51).

The ministry of health (MOH) COVID-19 protocols was implemented though implementation was inadequate 78.4% (40/51) and response to COVID-19 had an impact to delivery of other primary healthcare services (PHC) 80.4% (41/51).

In the **observation** the written COVID-19 protocols were printed and placed on walls. Waste management was well indicated around the hospital. Triage of patients was done indoors. Patients were placed in cohorts based on COVID-19 results. For inpatient admission purposes there was designated ICU and Isolation facility for COVID-19 positive patients.

Rapid testing was done in the hospitals laboratory and PCR was outsourced. Infection control was also done through spraying and this was observed once. Infection prevention and control precautions were displayed in the laboratory (Appendix 9).

In the **literature review** COVID-19 pandemic response resources to respond to COVID-19 were inadequate nationally. Healthcare staff welfare was a challenge in the COVID-19 pandemic especially with limited resources. National COVID-19 response impacted the delivery of primary healthcare services especially maternal and child health.

Summary of results

Theme 8: The healthcare system was not prepared to respond to COVID-19

In the *KII* the hospital at first was not prepared staff were afraid to go for patients even with PPEs, currently they are not. Preparedness was inadequate at first. August 2020 onwards the hospital has been prepared.

Triage, introduction of an isolation unit and medication for patients went well. Improvement in handling COVID-19 patients, diagnosis and patient improvement. Patients getting well if brought in early went well. Staff became more aware of the short comings of IPC and learnt a lot. Patients were handled well and staff on locum were scared but handled patients well. Knowledge on COVID-19 response improved.

There were serious gaps in preparedness and response at the beginning especially oxygen supply, when it ended at night, patient's coming in when symptoms are very severe and it's too late. Costing for COVID-19 treatment was also quite a burden to patient's relatives especially if in critical care. There was also a challenge in communication during response at first. Procuring medication with restricted movement and lockdowns was a challenge. Stigma around COVID-19 is still there towards those who develop COVID-19 and health workers in general.

The hospital's response to COVID-19 was typical and respondents had not heard other hospitals responding in different ways. Belevue hospital might have responded differently as other hospitals came to see what was different in their response. In other hospitals staff don't move near patients due to lack of PPE's. Response to COVID-19 was largely standard in hospitals. Other hospitals did not have PPEs and one had to work with what you have.

In the *KII* a clear illustration that a response plan had to be in place and a response system as the first preparation phases was made. Human resources (staff) had to be adequate, Infrastructure in terms of beds (space), medical supply and medication (stuff) had to be available as the second phase of preparedness. These two phases of preparedness lead to a coordinated pandemic response.

In the *FGD* the overall feeling was the healthcare system was not prepared just as other countries were not. This was seen in lack of space for COVID-19 patients. As a country the healthcare system was not prepared generally as expertise is there but resources were a

challenge. On the contrary a participant stated PID033 “*God came through and the young population who got COVID-19 were stable*”. The pandemic control plan operated at a 10% rate and there was continuous learning. In 2021 majority of hospitals have managed to have PPE readily available from a place of dire scarcity. Isolation facilities were built, trainings were given and PPEs became available locally. Job creation for the healthcare industry was also a positive outcome of the pandemic.

In the **survey** overall 66.7% (34/51) of the respondents said that the hospital was not prepared for COVID-19 and compromised to fully battle COVID-19. The overall perception of preparedness to COVID-19 was inadequate but available resources were utilized to ensure adequate response. The hospital was not prepared to respond to COVID-19 according to 60.8% (31/51).

In the **literature review** hospitals nationally were not prepared to respond to COVID-19. COVID-19 impacted individual households, elevated mental health illness and increased children susceptibility to sexual violence.

Chapter Five

5.1 Discussion

Pandemics are known to disrupt daily living and especially healthcare systems that are at the front line of pandemic response. This research set out to study the preparedness and response of a hospital in Langata Sub County Nairobi County to COVID-19. This study showed that at the onset of COVID-19 the hospital was not prepared but has made preparations continuously to ensure a coordinated response to COVID-19.

Preparedness was assessed by looking at staff, stuff, space and the hospitals system. In terms of preparedness the hospital had to add more staff, procure Personal Protective Equipment (PPE), medication and procure medical supplies to meet the surge situation that COVID-19 brought to the hospital. The hospital had to add beds, build an isolation facility specific to COVID-19 and have an Intensive Care Unit (ICU) specific to COVID-19 patients. There was increased demand for medication, oxygen and PPEs such as surgical and KN95 masks, gowns, country wide but the supply was inadequate at the onset of COVID-19. The hospital implemented a pandemic response plan last year and it has been revised as need arises.

In the KII hospital infrastructure was inadequate in 2020 but currently an isolation facility is in place hence currently more prepared for COVID-19 response than last year. More staff had to be deployed on locum basis as there was a strain. Medication and PPE supply was a challenge in 2020 due to supply, demand and cost. Medication and PPE are very expensive though the current supply is adequate. In the survey the hospital currently had sanitizers, visual precautions and a COVID-19 response plan. Human resource capacity, medication and PPE still pose a challenge due to expenses incurred. Overall, the hospital is still not prepared.

Observation highlighted the preparedness measures the hospital took to respond to COVID-19 with an isolation facility in place, visual alerts on social distance and wearing face masks, waste management and infection prevention. An isolation facility was there and PPE donning and doffing instructions were displayed. Alcohol based sanitizers were available and refilled. Having managed three waves of COVID-19 the COVID-19 MOH protocols such as triage were relaxed at the time of the study unlike at the onset of COVID-19 as per interviews conducted. Overall, the hospital was not prepared to respond to COVID-19 at the onset but currently all necessary measures have been taken to ensure an effective response to COVID-19 .

Similar to literature reviewed that showed the need to invest more in preparedness through hiring and training more healthcare workers, purchasing PPEs, adding hospital beds, ICUs and isolation facilities (Gathungu et al., 2020) (Kimani et al., 2020) the study confirms this. In the literature review there was also a need for a mental health response plan (Jaguga & Kwobah, 2020) Lack of pandemic preparedness response plan leading to a strained healthcare system (Wangamati & Sundby, 2020) and lack of masks to attend to COVID-19 patients was clearly displayed (Ouma et al., 2020).

Response was assessed by evaluation clinical protocols implemented, testing capacity, resource capacity, isolation precautions taken, triage, staff welfare, response coordination and the impact of COVID-19 to Primary Healthcare (PHC) Services. In the KII the Ministry of Health (MOH) COVID-19 protocols were adequately implemented at the time of the study however at the onset of the pandemic implementation was difficult. The hospital also formed an Infection Prevention and Control (IPC) team to ensure control of the spread of COVID-19 within the hospital by ensuring guidelines are circulated to staff, cleaning is done according to World Health Organization (WHO) waste is well managed and spraying is done in the hospital. In the KII the hospital outsourced COVID-19 testing at the onset but currently do rapid testing effective for patients who are infectious. The hospital had to do scarce resource allocation especially when there was a surge of COVID-19 patients. Hospital beds were added and referrals were done when the hospital capacity was full. Isolation protocols were implemented and there was resistance in triage of patients with COVID-19 symptoms and contact tracing was resisted. Medication and treatment for COVID-19 was quite expensive at first. Staff felt there was need for psychosocial support and more pay especially with the more hours they put in to save lives. Response was coordinated using the Infection Prevention and Control (IPC) team by ensuring that on the ground there is a ready team always to respond to COVID-19.

The major challenge was staff numbers and employment had to be done. The response to COVID-19 severely impacted delivery of other PHC services especially maternal and child health services, immunization and outpatient services. This was attributed to the general public's view of hospitals being a place they could contract COVID-19 hence only attended hospital in critical situations or consulted online.

In the KII scarce resource allocation was done of staff, PPE, medication in the case of COVID-19 surge in cases in the hospital. Communication and awareness of COVID-19 response plan was implemented in 2019 and is currently improved. Infection control implementation was

done regularly in 2019 and an IPC team was introduced. Surveillance included daily and monthly reports to the Langata Sub-County MOH. In the KII the hospital was not prepared to handle COVID-19 in 2019. In the survey currently the hospital has a pandemic response plan and are prepared for infection control. The COVID-19 guidelines and protocols are also well implemented. COVID-19 case definition still poses a challenge, resources (PPEs, medication and the isolation facility) are still not enough. COVID-19 response is still in need of improvement due to the gaps.

In the FGD the healthcare system was not prepared to respond to COVID-19. Resources such as staff, PPE, medication, oxygen, isolation facility, ICUs, finances and testing capacity were a major challenge. Treatment and care for COVID-19 patients is expensive. There were knowledge gaps in pandemic response. There was stigma of healthcare workers. Contact tracing and quarantine were not well coordinated. There is need for psychosocial support and inadequate vaccine coverage.

In the observation COVID-19 prevention protocols were on the walls, waste management was well indicated and triage was indoors. PCR was outsourced, rapid testing was done, infection control was done once and infection, prevention and control guidelines were observed in the laboratory.

In the literature reviewed the response to COVID-19 impacted access to health care services (“Socioeconomic Impacts of COVID-19 in Kenya on Households,” 2021) by affecting health seeking behaviour (Ahmed et al., 2020), mental health, (Ochillo & Elsie, 2020) maternal and child health, (Kimani et al., 2020) and added to chronic conditions the healthcare system had to deal with (Geissler & Prince, 2020). Socio-economic impacts of COVID-19 (UNDP, 2020) such as loss of jobs reducing household income were also highlighted (Janssens et al., 2021). This was clearly seen in the responses given in this case study.

Just like the Spanish Flu the COVID-19 pandemic took the healthcare system by surprise (Radin et al., 2012) and in Kenya three waves of the pandemic have taken place. In Kenya wearing of face masks, social distance and lockdowns were implemented so as not to overwhelm the healthcare system as in the Spanish Flu pandemic (Dwyer-Lindgren et al., 2019) but still this was not enough as per the study. Low Antiretroviral Therapy (ART) coverage has been linked to high burden of HIV/AIDs in Sub Saharan Africa (SSA) (Dwyer-Lindgren et al., 2019) similarly in this study low vaccine coverage in Africa is seen to continue the COVID-19 infectious cycle.

Poverty, socio-economic factors linked to HIV/AIDs in SSA (Radin et al., 2012) also played a role in severity of COVID-19. Just like H1N1 had unpredictable morbidity and mortality in a modern age of antivirals and vaccines ((Taubenberger & Morens, 2010a)) similarly COVID-19 according to this study took a toll on patients that seemed well and its case definition was unclear with the continuous mutation of the virus.

Ebola Virus Disease (EVD) had poor response due to minimal experience shortage of healthcare workers, poor health systems, inadequate surveillance strategies and poor national strategies (Coltart et al., 2017). In this study shortage of healthcare workers was quite the highlight and a break down in surveillance of COVID-19 with time. In terms of preparedness Sub Saharan Africa (SSA) has inadequate ICUs, an already overwhelmed healthcare system, lack of PPEs and a need to invest heavily in preparedness (Nuwagira & Muzoora, 2020) this was the case in COVID-19 preparedness and response that presented a crisis to the already overwhelmed healthcare system. Impacts of pandemic cannot be understated with H1N1 causing economic, health system and human resource strain on affected countries (Saunders-Hastings & Krewski, 2016). According to the literature review conducted during the study COVID-19 severely affected the economy by bringing loss of jobs reducing household income, loss of healthcare workers, causing a strain to the healthcare system hence lack of PPEs and socio-economic effects that continue to ravage the Kenyan economy. COVID-19 also brought mental health impacts that were unforeseen, changes in health seeking behavior, low uptake of immunization and maternal and child health services.

As with past pandemics lessons continue to be gathered on effective response measures (Saunders-Hastings & Krewski, 2016) as with the current COVID-19 pandemic. Proper surveillance and continuous monitoring are needed to properly characterize the COVID-19 pandemic that is continuously changing (Sohrabi et al., 2020). In this study surveillance was seen to have its shortcomings especially with a virus that kept mutating and an unclear case definition. The SSA healthcare system was wanting to handle high COVID-19 morbidity rates due to healthcare workers numbers capacity, resources like PPE and medication (Paintsil, 2020) the study hospital tried to respond to COVID-19 even with limited capacity. Additional ICUs beds, ventilators amidst health worker, medicine, PPE shortage (E. W. Barasa et al., 2020) this was done in the study hospital to respond to COVID-19. Response to COVID-19 posed challenges in testing capacity, decline in health seeking behaviors, PPE shortage and stigma of health workers (Highlights, 2020) which was a key finding in this study.

This study has contributed to the much-needed knowledge on preparedness and response to COVID-19 in Kenya and has actually shown that the literature reviewed had substantial ground on how pandemics like COVID-19 affect global, national and local health systems, economies, daily living and socialization. The results agree with the literature review done and provide a reference guide for ongoing COVID-19 response and lessons gathered. In theory preparedness to pandemics is much needed and in practice resources for preparedness provide the link to an effective response plan. The results show that the hospitals in Kenya are trying with the available resources even though inadequate and improvement is continuous.

This study has shown that the preparedness and response of the hospital to COVID-19 from the onset to current date has been improving and faces challenges in the event of a surge. This study also showed through the literature review that the healthcare system in Kenya was not prepared to respond to COVID-19 from the onset of the pandemic however at the present the healthcare system is well informed on COVID-19 preparedness measures and response strategies amidst resource shortages. Lessons continue to be gathered as the pandemic is ongoing.

5.2 Limitations

- The study was conducted at a time when majority of hospitals had suspended research, internships, attachments and hospital visits to avoid spread of COVID-19 hence approval to conduct this research took time and many hospitals (15) were approached to conduct this study. Medical insurance, utmost care and abidance by the hospital's staff rules, COVID-19 Protocols and regulations by the researcher and data collectors was taken in this research and it was quite costly in terms of monetary value.

5.4 Conclusion

This research aimed to identify preparedness and response to COVID-19 at the onset and ongoing of a hospital in Langata Sub County, Nairobi County. Based on the qualitative and quantitative data it can be concluded that the hospital was not prepared to respond to COVID-19 at the onset of the pandemic in terms of space, staff, stuff (resources) and system coordination however, capacity has been built and structures implemented hence the hospital is currently prepared and well equipped to respond to COVID-19 pandemic.

The research was successful in meeting the objectives of assessing preparedness and response to COVID-19 and gathered additional information on the Kenyan healthcare system COVID-19 situation. The study was done using mixed methods Key Informant Interview (KII), Quantitative survey, Focus Group Discussion (FGD), observation and a literature review to have comprehensive data on this research. The results matched the expectation especially with the fact that pandemics take countries by surprise and all measures taken are done to mitigate a catastrophic situation.

During the research new insight was gained on how healthcare workers really sacrifice their time to ensure the population is treated and remain healthy and how COVID-19 prevention measures should be taken seriously by the public. This research clearly illustrates that preparedness and response to COVID-19 is a continuous process for the hospital. Based on this research health practitioners should consider solutions to ensure adequate resource mobilization of staff, space and medical supplies especially in the case of a surge. Further research is required in socio-economic impacts of COVID-19. In future I do hope to undertake a systematic review on PPE effectiveness to COVID-19 to build on this research.

This study effectively showed how pandemics really overwhelm the healthcare system by creating an increased demand for medical supplies and the unforeseen increased costs to meet healthcare needs. This study was able to elaborate what the situation on the ground was in terms of hospital preparedness and response hence proves the reviewed literature is in fact a true picture of what is on the ground.

This study confirms that hospital preparedness and response rely heavily on the country's healthcare infrastructure, human resource capacity, medical supply, surveillance information and pandemic preparedness and response plans that should be in place before a pandemic hits. All these pillars form the backbone for adequate pandemic preparedness and response.

5.3 Recommendations

- Pandemic preparedness and response plans are needed in hospitals before the onset of a pandemic.
- There is a need for psychosocial support for healthcare workers as they continue to attend to COVID-19 patients. Counselling services for staff should be implemented especially debriefing after loss of patients.

- COVID-19 response was costly in terms of resources (infrastructure, staff, medication and PPEs) and case management there is need for a sustainable approach.
- Contact tracing and care for COVID-19 patients was cumbersome and could have utilized existing Tuberculosis management structures.
- The COVID-19 case definition was unclear as it kept changing with different variants and further research is required on symptoms for each variant.
- Implementation of COVID-19 protocols and guidelines posed a challenge especially with “pandemic fatigue” and continuous health education should be done among the public.
- In the study healthcare resources for routine hospital care were constrained in a pandemic scenario. Healthcare is always understaffed hence more healthcare workers are always needed. A local solution should continue to be implemented to address any shortages in Personal Protective Equipment (PPEs), oxygen and medication especially with increased demand and limited supply.
- The severe impact of COVID-19 response to delivery of other primary healthcare (PHC) services especially maternal and child health services show the need for response measures that do not interfere with PHC service delivery.
- Further research is needed on the socioeconomic impacts of COVID-19 especially with the arising data on mental health impacts, loss of jobs and increased social ills.

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Appendices

1. Ethical approval to conduct the study by Center for Drug Development and Therapeutic Trials for Africa – Scientific and Ethics Review Committee, College of Health Sciences, Addis Ababa University.
2. Introduction letter by Center for Drug Development and Therapeutic Trials for Africa, College of Health Sciences, Addis Ababa University to conduct the study.
3. National Commission for Science, Technology & Innovation (NACOSTI) Approval
4. Questionnaires/Surveys
5. List of MOH Protocols and guidelines in response to COVID-19
6. Observation Checklist
7. Putting on PPE

8. Taking off PPE
9. Facemask dos and don'ts
- 10.COVID-19 Staff Movement Process in Ward
11. IPC
- 12.Workplan
- 13.Approved Budget

Appendix 1: Ethical approval to conduct the study by Center for Drug Development and Therapeutic Trials for Africa – Scientific and Ethics Review Committee, College of Health Sciences, Addis Ababa University


Center for Innovative Drug Development and Therapeutic Trials for Africa
College of Health Sciences, Addis Ababa University

Date 16/02/21
Ref No. CDT/01/02/21

To Catherine Lydiah Wanjiru

Re: **Approval of the proposal "Preparation and response to COVID-19 pandemic in a national referral hospital in Roysambu Sub-County, Nairobi County, Kenya"**

Dear Catherine,

The Scientific and Ethics Review Committee of the Center for Innovative Drug Development and Therapeutic Trials for Africa (CDT-Africa), College of Health Sciences, Addis Ababa University, has reviewed and approved the above-referenced proposal. This approval is for a period of one year, from 12 February 2021 to 11 February 2022. Progress report shall be submitted every six months. Any change to the approved proposal must be reviewed and approved by the Committee through an amendment process prior to its implementation.

With regards,




Eyasu Makonnen, PhD
Professor of Pharmacology
Chair, Scientific and Ethics Review Committee, Center for Innovative Drug Development and Therapeutic Trials for Africa (CDT-Africa)
Deputy Head, CDT-Africa
College of Health Sciences
Addis Ababa University
Addis Ababa, Ethiopia

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P.O.Box 9086 Addis Ababa, Ethiopia

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Appendix 2: Introduction letter by Center for Drug Development and Therapeutic Trials for Africa, College of Health Sciences, Addis Ababa University to conduct the study.



Center for Innovative Drug Development and Therapeutic Trials for Africa
College of Health Sciences, Addis Ababa University

Date: 26/02/2021
Ref. No: CDT/0220/21

To: National Commission for Science, Technology and Innovation (NACOSTI)
Nairobi, Kenya

Subject: Letter of Introduction

Catherine Lidiah Wanjiru is a 2nd year MSc in Clinical Trials student at the Center for Innovative Drug Development & Therapeutic Trials for Africa (CDT-Africa). The MSc in Clinical Trials is developed by CDT-Africa as the only programme of its kind in the region to support clinical trials capacity in Eastern and Southern Africa.

Catherine is undertaking a study with a title "Preparation and response to COVID-19 pandemic in a national referral hospital in Roysambu Sub-County, Nairobi County, Kenya." as a fulfilment of her master's in Clinical Trials programme. The proposal has been approved by the ethics committee.

This communication is therefore to request your good institution to kindly support her with required information/data for her study.

Thank you very much.

Kind Regards,



Dr Abebaw Fekadu
Head, CDT-Africa
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Excellence



Innovation



Discovery



"An African Solution for a Global Problem"

Appendix 3: National Commission for Science, Technology & Innovation (NACOSTI) Approval

 REPUBLIC OF KENYA	
Ref No: 554568	Date of Issue: 02/March/2021
RESEARCH LICENSE	
	
This is to Certify that Ms., Catherine I. Wanjiru of Addis Ababa University, has been licensed to conduct research in Nairobi on the topic: Preparation and response to COVID-19 pandemic in a national referral hospital in Roysambu Sub-County, Nairobi County, Kenya, for the period ending : 02/March/2022.	
License No: NACOSTI/P/21/9321	
554568	
Applicant Identification Number	Director General NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
Verification QR Code	
	
NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.	

Appendix 4: Questionnaires/Surveys

Key Informant Interview

This is research on “Preparedness and response to COVID-19 pandemic in a hospital in Langata sub-county, Nairobi County”.

This study will assess preparedness and response to COVID-19 pandemic of Belevue Hospital in Nairobi County in Kenya at the start of the pandemic and currently.

A qualitative topic guide, quantitative survey, focus group discussion and observation will be used to collect necessary data. Belevue Hospital staff, hospital facility and internet will be the designated sources of information for this study.

Prior permission and ethical clearance will be sought. This study will be carried out ethically and uphold integrity and confidentiality of participant information with prior consent being sought and use of information gathered for research purposes only.

This study is expected to enumerate preparedness of the hospitals in Kenya to respond to COVID-19 taking Belevue Hospital as a case study. The results will inform policies on contagious disease outbreak surveillance, preparedness and response.

Consent

Are you willing to participate in this questionnaire? Yes () No ()

The information given on this questionnaire will be treated with absolute confidentiality and will be used only for the purpose of research. Please complete the questionnaire appropriately, truthfully and honestly.

Identification

Age.....

Hospital Name.....

Position in the hospital.....

ID Number.....

Marital status Single () married ()

Gender Male () Female ()

Education Level? Primary () Secondary () College () University ()

TOPIC GUIDE

A. Preparedness to COVID-19

Overall, how was the preparedness of the hospital for COVID-19?

Case Definition

In your experience how was the COVID-19 Case definition?

Probe: How was it at the beginning and currently?

Was there any challenge in this?

Probe: How clear was the case definition?

Space

What was your experience of how this hospital prepared hospital infrastructure with regards to COVID-19?

Probe: at the beginning, and more recently

What do you think were the key challenges faced?

Probe: How about the use of visual cautions?

What were some of the things that went well?

Staff

In response to COVID-19 pandemic how was the human resource capacity?

Probe: At the beginning and currently.

How adequate was staff capacity?

Probe: How was the number at the start of the pandemic and presently?

Was there a need to reassign staff or employ more staff? What happened? How was this handled?

Stuff

What was your experience in terms of medication supply?

What was your experience in PPE supply for staff in response to COVID-19?

Probe: How was PPE supply at the start of the pandemic and presently?

What would you say about the availability of PPEs?

System

How well-coordinated was the preparedness for COVID-19 response?

Probe: How was communication? How about coordination in the hospital?

In your opinion was the hospital prepared for COVID-19?

Probe: When you compare March and presently what would you say?

B. Response to COVID-19

Clinical Protocols

Please tell me about any guidelines or protocols about COVID-19 that you are aware of.

Who produced those guidelines?

How available were the guidelines?

What was your experience of trying to implement those guidelines?

Were the Ministry of Health COVID-19 guidelines and protocols implemented? How did you implement them? (If not) Why were they not well implemented?

Probe: How was the implementation at the onset of COVID-19? And presently?

Testing Capacity and logistics

In your experience how adequate was the hospital COVID-19 testing capacity?

Probe: How was testing at the start of the pandemic and presently?

How were the testing logistics?

PPE and Isolation Precaution's

How was infection control implemented in the hospital?

Probe: How was the frequency of infection control on the onset of the pandemic and currently?

How were isolation protocols implemented in the hospital?

Probe: Was there an isolation facility at the start of the pandemic? How about presently?

Did you face any challenges?

What went well?

Triage and Cohorting

How was the triage process in the hospital's response to COVID-19?

Probe: When you compare at the start of covid-19 and now how is it?

How were surveillance activities?

Probe: Were there challenges?

Probe: Were there key milestones met?

Staff/Clinician welfare

In terms of staff welfare how did you find coping with COVID-19 as a health worker/administrator?

How did it affect you personally? How about other people working with you?

What helped you to cope?

What were the most difficult things?

What kind of support was available to you?

Communication and coordination

In your experience were hospital staff and the public aware of the COVID-19 pandemic response plan in the hospital?

Probe: How was it at first and now?

How was communication conveyed in the hospital?

Probe: How effective was communication at first and now?

How was the response to COVID-19 coordinated?

Probe: How is it presently compared to the past?

Resource Mobilization

How well was the hospital able to respond to the COVID-19 surge in cases?

Probe: How are the cases now compared to the onset?

How was hospital resource allocation?

Probe: How was and is bed capacity?

Was there hospital resource scarcity at some point?

Probe: How was scarce resource allocation done?

Response Impact on PHC services

In your experience did the hospitals response to COVID-19 have an impact to delivery of other primary healthcare services?

Probe: Comparing at first and presently what would you say?

Which primary healthcare services were affected?

Probe: How is it now compared to when the pandemic started?

In your opinion was the hospital prepared to respond to COVID-19?

Probe: Comparing when the pandemic started and now?

C. Conclusion

Was the hospital prepared to respond to COVID-19 pandemic?

Probe: How was it at first and presently?

What went well?

Were there gaps in the preparation and response?

In general, was your hospitals COVID-19 response typical?

Might you have heard of other hospitals responding in different ways?

Why do you think there were differences in response?

Survey

This is a research on “Preparedness and response to COVID-19 pandemic in a hospital in Langata Sub-county, Nairobi County”.

This study will assess preparedness and response to COVID-19 pandemic of Belevue Hospital in Nairobi County in Kenya at the start of the pandemic and currently.

A qualitative topic guide, quantitative survey, focus group discussion and observation will be used to collect necessary data. Belevue Hospital staff, hospital facility and internet will be the designated sources of information for this study.

Prior permission and ethical clearance will be sought. This study will be carried out ethically and uphold integrity and confidentiality of participant information with prior consent being sought and use of information gathered for research purposes only.

This study is expected to enumerate preparedness of the hospitals in Kenya to respond to COVID-19 taking Belevue Hospital and Nairobi South Hospital (NSH) as a case study. The results will inform policies on contagious disease outbreak surveillance, preparedness and response.

Consent

Are you willing to participate in this survey? Yes () No ()

The information given on this survey will be treated with absolute confidentiality and will be used only for the purpose of research. Please complete the survey appropriately, truthfully and honestly.

Identification

Age.....

Hospital Name.....

Position in the hospital.....

ID Number.....

Marital status Single () married ()

Gender Male () Female ()

Education Level? Primary () Secondary () College () University ()

Questions

Was the hospital infrastructure adequate in terms of COVID-19? Yes () No ()

Were visual alerts and precautions put in place? Yes () No ()

Were alcohol-based sanitizer's put in place? Yes () No ()

Were they adequate and regularly refilled? Yes () No ()

Were the staff enough in terms of COVID-19? Yes () No ()

Was medication supply in terms of COVID-19? Yes () No ()

Were the below PPE's sufficient the in terms of COVID-19? Yes () No ()

Masks (N95/Surgical) Yes () No ()

Eye protection gear Yes () No ()

Full overall Yes () No ()

Face shield Yes () No ()

If yes were the PPE's effective in preparation for COVID-19 response? Yes () No ()

Is there a system for pandemic response preparedness? Yes () No ()

If yes as it well coordinated? Yes () No ()

In your opinion was the hospital prepared for COVID-19? Yes () No ()

RESPONSE TO COVID19

Were the Ministry of Health COVID-19 guidelines and protocols implemented?

Yes () No ()

Was the implementation adequate? Yes () No ()

In the COVID-19 response was there a proper case definition? Yes () No ()

Was it clear? Yes () No ()

Did the hospital have COVID-19 testing capacity? Yes () No ()

Was it adequate? Yes () No ()

Did staff have PPE to respond to COVID-19? Yes () No ()

In your opinion was the PPE supply adequate? Yes () No ()

Were isolation protocols put in place? Yes () No ()

Was there an isolation facility? Yes () No ()

If yes was it adequate? Yes () No ()

Was infection control implemented? Yes () No ()

Was it adequate? Yes () No ()

Was the public aware of the COVID-19 pandemic response plan? Yes () No ()

Was there effective communication in response to COVID-19? Yes () No ()

Was the hospital able to respond to the COVID-19 surge in cases? Yes () No ()

Were hospital beds enough? Yes () No ()

How was hospital resource allocation? Adequate () Scare() Inadequate ()

Did response to COVID-19 have an impact to delivery of other primary healthcare services?

Yes () No ()

In your opinion was the hospital prepared to respond to COVID-19? Yes () No ()

Any further comments

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Focus Group Discussion

This is a research on “Preparedness and response to COVID-19 pandemic in a hospital in Langata Sub-county, Nairobi County”.

This study will assess preparedness and response to COVID-19 pandemic of Belevue Hospital in Nairobi County in Kenya at the start of the pandemic and currently.

A qualitative topic guide, quantitative survey, focus group discussion and observation will be used to collect necessary data. Belevue Hospital staff, hospital facility and internet will be the designated sources of information for this study.

Prior permission and ethical clearance will be sought. This study will be carried out ethically and uphold integrity and confidentiality of participant information with prior consent being sought and use of information gathered for research purposes only.

This study is expected to enumerate preparedness of the hospitals in Kenya to respond to COVID-19 taking Belevue Hospital as case study. The results will inform policies on contagious disease outbreak surveillance, preparedness and response.

Consent

Are you willing to participate in this discussion? Yes () No ()

The information given on this discussion will be treated with absolute confidentiality and will be used only for the purpose of research. Kindly participate truthfully and honestly.

Identification

Age.....

Hospital Name.....

Position in the hospital.....

ID Number.....

Marital status Single () married ()

Gender Male () Female ()

Education Level? Primary () Secondary () College () University ()

Questions

How prepared was the healthcare system in Kenya to respond to COVID-19 pandemic?

Prepared () Not prepared ()

Do you have further comments on this?

Yes () No ()

If yes kindly comment.

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Were there gaps in the preparedness and response?

Yes () No ()

If yes kindly explain.

If No what went well?

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Appendix 5: COVID-19 Protocols and guidelines

1. [A Comprehensive Guide on Mental Health & Psychosocial Support during Covid-19 Pandemic](#)
2. [Circular on Suspension of Elective Surgical Procedures, March 25, 2020](#)
3. [Circular on Treatment of TB Patients during Covid-19 pandemic](#)
4. [Covid-19 SOP for Counsellors and Psychologists.](#)
5. [Covid-19 Guidance on Comprehensive HIV Service Delivery.](#)
6. [Covid-19 Q&A](#)
7. [Covid-19 Quarantine Protocols](#)
8. [Circular on NCDs Clinics During Covid-19 Outbreak](#)
9. [Case Definition for Covid-19 Circular, March 13, 2020](#)
10. [Case Definition for Covid-19, March 25, 2020](#)
11. [Community Health Strategy to Respond to Covid-19](#)
12. [Covid-19 Gated Community Response Guidelines](#)
13. [Environmental and social management Framework](#)
14. [Executive Order No. 2 of 2020, NERC on Covid-19](#)
15. [Final Adendum of Pediatrics guide on HBIC](#)
16. [Final Signed internship policy 2020](#)
17. [Final THS CERC ESMF 31st May 2020](#)
18. [Final Nutrition Messages for the Population](#)
19. [Form A: Application to Operate Food Business](#)
20. [Form B: Inspection Checklist for Reopening of Restaurants & Eateries](#)
21. [FORM C – Permit to operate food businesses](#)
22. [Form D-Inspection Checklist for operating Accommodation Facilities \(Hotels\) during the Covid 19 Pandemic](#)

23. [Guidance on Rational use of PPE_May, 2020](#)
24. [Guidance for Infection Prevention & Control for Covid-19 in Homes & Residential Community](#)
25. [Guidance for Nutrition Management of Covid-19 for Health Workers](#)
26. [Guidance on Mental Health & Psychosocial Support during Covid-19 Pandemic](#)
27. [Guidelines for food business Operators \(FBOs\) on reopening of Restaurants and eateries during Covid-19 Pandemic](#)
28. [Guidelines for Dental Practice during Covid-19 Pandemic](#)
29. [Guidelines on Continued Provision of Community Health Services.](#)
30. [Guidance for Implementing Home Care for People not Requiring Hospitalization](#)
31. [Home Based Isolation & Care Guidelines for Patients with Covid-19](#)
32. [Hospital Preparedness Checklist for Suspected or Confirmed 2019-Cov Patients](#)
33. [Infection control and waste management Plan](#)
34. [Interim Guidelines on handling decedents](#)
35. [Interim Guidance on Provision of Services for Non communicable Diseases \(NCDs\) During the COVID-19 Pandemic](#)
36. [Interim Guidance for Continuity of Trauma Care during Covid 19 Pandemic](#)
37. [Interim Guidance for Clinical Nutrition Management of Covid – 19](#)
38. [Interim Guidelines on Human Resource for Health during Covid-19](#)
39. [IFR Fact sheet for DRTB](#)
40. [ID-19 Community Health Response Standard](#)
41. [Interim Guidance for Health and Safety in Workplace](#)
42. [Interim Guidelines on Management of Covid-19 in Kenya](#)
43. [Interim Guidelines on Management of Covid-19 in Kenya](#)
44. [Interim Infection Prevention & Control Recommendations for Covid-19](#)
45. [Interim Guidance on Handling of Human Remains Infected with Covid-19](#)

46. Interim Guidance for Continuity of Nutrition Services in the Context of Covid-19 Pandemic
47. Interim Guidance for Public use of Face Masks
48. Kenya Community Health Policy Signed
49. Kenya Primary Healthcare, Strategic Framework¹³ signed
50. Kenya Primary Healthcare, Strategic Framework Signed
51. Kenya Community Health Policy Signed
52. Kenya LTBI_ Policy_2020
53. Kenya Essential Medicines List 2019
54. Kenya injectable free Regimen Policy 2020
55. Kenya Covid-19 RMNH
56. Kenya Covid-19 Emergency Response Project
57. LTBI Fact sheet
58. Labor Management Procedures Kenya Covid-19 Emergency Response Project
59. Malaria Control Interim Guidelines
60. Mwongozo DG signature
61. National Covid-19 Contingency Plan
62. OT GUIDELINES 2020
63. Occupational Safety and Health Advisory on Covid-19
64. People Living with HIV Guidelines.
65. Psychological First Aid Guide for Covid-19 Response
66. Physiotherapy Guidelines
67. Paediatric Covid Guidelines
68. Protocol HRH for Covid Draft with digital signature
69. Protocol for Management of Restaurants
70. Public Mental Health AW

71. Stakeholder Engagement Plan (SEP) Kenya Covid-19 Emergency Response Project
72. SOP for Handling Health Records & Information Management during Covid-19 Pandemic
73. SOP for Pre and Post-Test Counselling
74. SOPs for Counsellors and Psychologists in the MHPSS for Covid-19 Response.
75. Targeted Testing Strategy for Covid-19 in Kenya
76. World Bank Kenya Covid-19 Emergency Response Project

Source: Ministry of Health, 2020

Appendix 6: Observation Checklist

COVID-19 hospital Preparedness and response checklist			
Preparedness	Date	Observation	Initials
COVID-19 Case definition checklist			
COVID-19 suspect designated entrance			
Airborne precautions			
Visual alerts (social distance, hygiene, coughing etiquette)			
Display of PPE Requirements for all staff, patients and visitors			
Isolation facility			
Isolation protocols and procedures			
Contact tracing form/visitor's registry			
Alcohol-based sanitizers dispensers			
Response	Date	Observation	Initials
Written COVID-19 protocols			
Triage of patients			
Cohorting			
Testing (Rapid, PCR)			
Infection Prevention and Control (spraying)			

Appendix 7: Putting on PPE

BELEVIEW SOUTH HOSPITAL LTD.
Emergency & ICU Centre

South C, Sungura Lane,
Off Ole Shapara Avenue
P.O. Box 9527-00100, Nairobi
Cell: 0722 250 105
Email: beleviewhospital@gmail.com

HOW TO GUIDE - PUTTING ON PPE FOR CONTACT/DROPLET PRECAUTIONS

- 1 Perform hand hygiene**
Alcohol based handrub
Rub hands for 2030 seconds.
or
Water and soap
Wash hands for 4060 seconds.
- 2 Put on the gown**

- 3 Put on the mask**
Medical mask.

- 4 Put on eye protection**
Put on face shield or goggles.

- 5 Put on gloves**
Ensure glove is placed over the cuff of the gown.


Full PPE


World Health Organization

Appendix 8: Taking off PPE

**BELEVIEW SOUTH
HOSPITAL LTD.**

South C, Sungura Lane,
Off Ole Shapers Avenue
P.O. Box 9527-00100, Nairobi
Cell: 0722 250 105
Email: beleviewhospital@gmail.com

HOW TO GUIDE - TAKING OFF PPE FOR CONTACT/DROPLET PRECAUTIONS

Ensure that infectious waste containers are available for safe disposal of PPE. Separate containers should be available for reusable items.

Enter is important

1 Remove gloves



2 Remove the gown

Ensure gown is pulled away from the body during removal and that clothing does not become contaminated and dispose of them safely.



3 Perform hand hygiene

Alcohol based handrub
Rub hands for 2030 seconds.

or

Water and soap
Wash hands for 4060 seconds.



4 Remove eye protection

Remove face shield or goggles.



5 Remove the mask

Ensure you are taking the mask off from the straps, avoid touching the mask.



6 Perform hand hygiene

Alcohol based handrub
Rub hands for 2030 seconds.

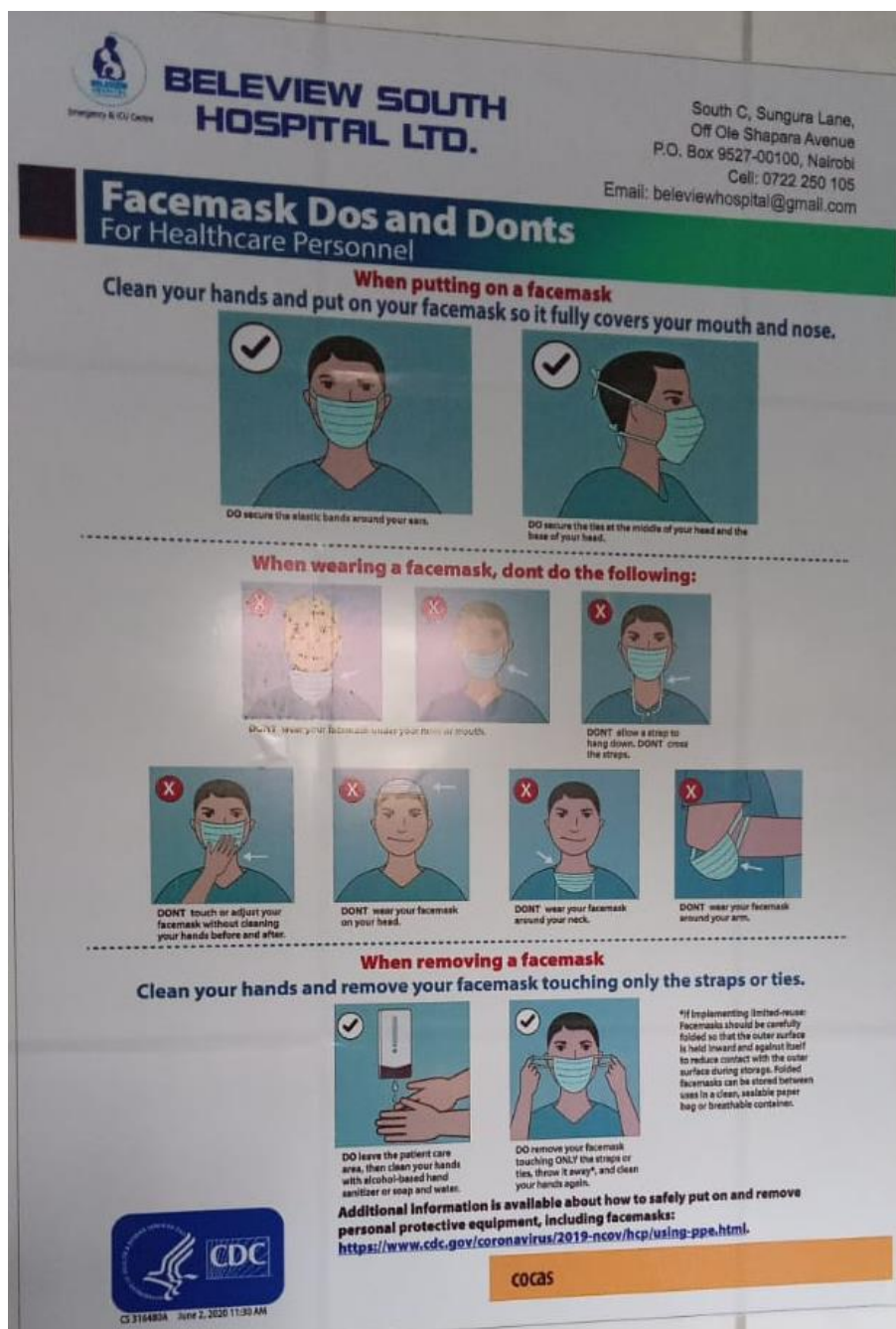
or

Water and soap
Wash hands for 4060 seconds.

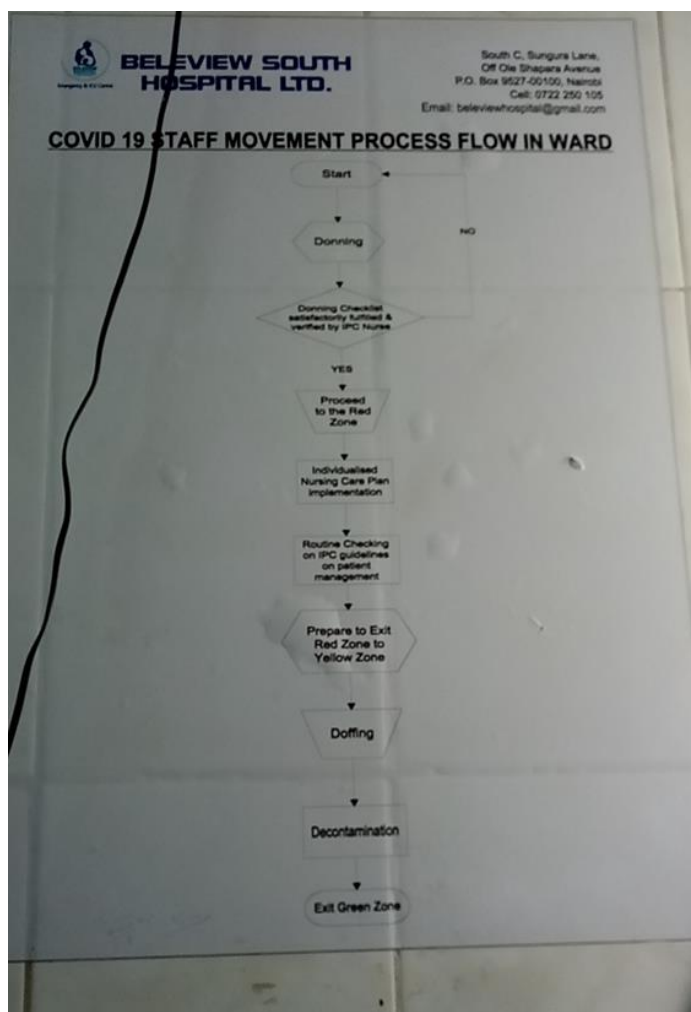


World Health
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Appendix 9: Facemask dos and don'ts



Appendix 10: COVID-19 Staff movement process flow in ward



Waste Segregation According to Different Colour Bags

Dispose of waste properly to protect yourself and those around you from infection, disease, and injury.

Please collect and store waste in the allocated colour coded bags for infection control purposes and cost effective waste removal and final disposal.

Pharmaceutical and Chemical waste

Expired, spilt or pharmaceutical products, vaccines, medication / chemicals that are no longer required.



General / Household Waste Only

Food, paper, packaging material, polythene, plastic bottles



Infectious waste

Gauze/dressing, blood, contaminated gloves, iv fluid lines



Pathological / Anatomical waste

Body parts, tissues, organs, fetuses, body fluids, lab cultures

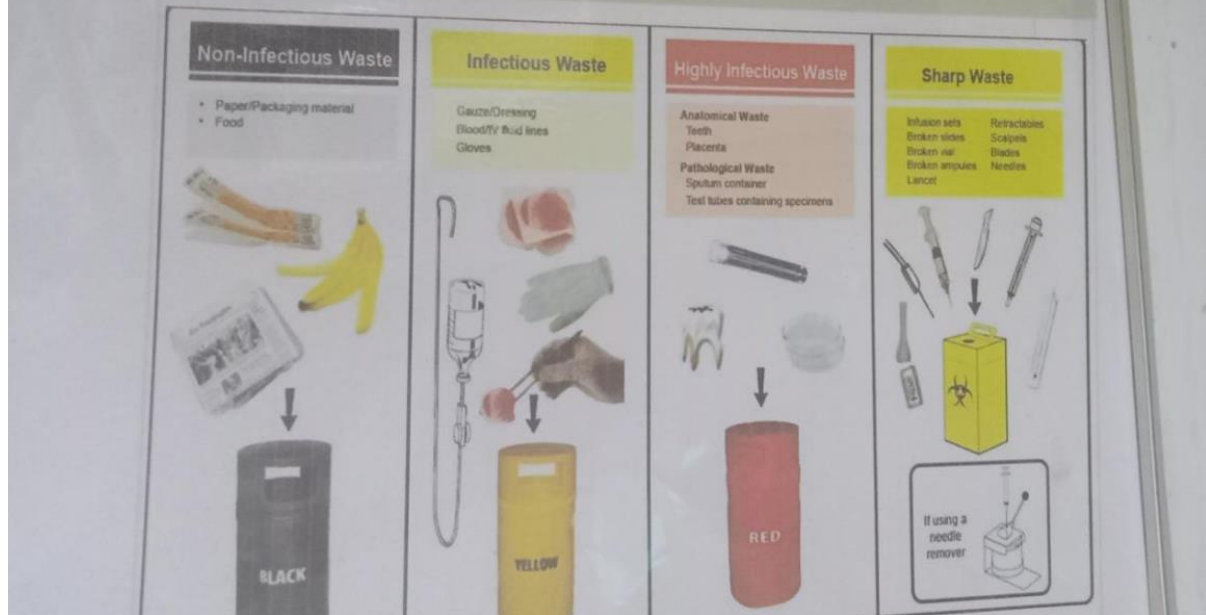


Sharps waste

Scalpel, blades, needles, lancets



Figure 14: Waste segregation



Appendix 12

Workplan

Activity	Timeline															
	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21
Proposal writing and review																
Proposal defense, AAU and NACOSTI approval																
Hospital management approval and data collection																
Data analysis																
Thesis write up and supervisor review																
Manuscript draft and submission																
Thesis Defense and approval																

Appendix 13

Approved Budget

Item	Description	Units	Unit Cost	Total Cost (ETB)
Data collection	KII Questionnaires	30	3*11pgs*30	990
	Surveys	150	3*3pgs*150	1,350
	NACOSTI permit and proposal copies	1	400	400
	Hospital specific Ethic permits	1		To be confirmed
	PPES (Masks, sanitizer)	3	1350*3	4,050
	COVID-19 insurance	1		24,000
	Data collectors	60 working days	450*40*2	36,000
	Transport to data collection sites	60 working days	200*60	12,000
	Airtime	4 months	900*4	3,600
	Internet costs	4 months	1000*4	4,000
	stationary	60 working days		400
Research Project write up	Thesis copies and binding			Upon completion
Total				87,190