

**IMPACT OF COVID-19 PANDEMIC ON UTILIZATION OF
CHEMOTHERAPY SERVICES BY PATIENTS ATTENDING
KENYATTA NATIONAL HOSPITAL, ONCOLOGY CLINIC**

IRENE MUMBI NJUNG'E

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*A research dissertation submitted in partial fulfilment of the
requirements for the Degree of Master of Pharmacy in Clinical
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UNIVERSITY OF NAIROBI DECLARATION OF ORIGINALITY FORM

Name of Student:	Irene Mumbi Njungé
Registration Number:	U56/35572/2019
College:	College of Health Sciences
School:	Pharmacy
Department:	Pharmaceutics and Pharmacy Practice
Course Name:	Master of Pharmacy in Clinical Pharmacy
Title of Work:	Impact of Covid-19 Pandemic on Utilization of Chemotherapy Services by Patients Attending Kenyatta National Hospital, Oncology Clinic

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This dissertation has been evaluated and approved with our permission as University supervisors:

1. Signature...  Date..18th November..2021
Dr. Sylvia Opanga, PhD
Department of Pharmaceutics and Pharmacy Practice
University of Nairobi.
2. Signature...  Date..22nd November.. 2021
Prof. Faith Okalebo
Department of Pharmaceutics and Pharmacy Practice
University of Nairobi.

DEDICATION

I dedicate this dissertation to my mum, Mary Njeri Kairu, for her prayers and unwavering support in my pursuit for success.

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ABBREVIATION AND ACRONYMS

AIDS	Acquired immunodeficiency syndrome
BMI	Body Mass Index
CTC	Cancer Treatment Centre
CCF	Congestive Cardiac Failure
COVID-19	Coronavirus disease 2019
HIV	Human Immunodeficiency Virus
KNH	Kenyatta National Hospital
MERS-COV	Middle-East Respiratory syndrome coronavirus
NCDs	Non-communicable diseases
OOP	Out of Pocket
PPE	Personal Protective Equipment
RNA	Ribonucleic acid
R_0	Reproduction number
SARS-COV	Severe Acute Respiratory Syndrome Coronavirus
USA	United States of America
WHO	World Health Organization

OPERATIONAL DEFINITION OF TERMS

Chemotherapy services- it is a service that involves the use of drugs in cancer patients with an intent to cure, improve the quality of life, slow disease progression and ameliorate symptoms.

Contagion- a contagious disease

Lead time- in inventory management it is described as the lapse in time between when an order is placed to replenish inventory and when the order is received

Oncology services- it is a service dedicated to the investigation, diagnosis and treatment of people with cancer. It includes; palliative medicine, radiation oncology, surgical oncology, medical oncology (chemotherapy, immunotherapy, hormone therapy and other drugs to treat cancer) and preventative medicine.

Parenteral Chemotherapeutic service- parenteral administration of any anti-cancer medicine that must be provided in a health care facility.

Refill- obtaining drugs from the Pharmacy

Reproduction number (R_0)- the average number of secondary cases of an infectious disease that one case would generate in a completely susceptible population

Utilization of chemotherapy service- in this context, it is the administration of parenteral chemotherapeutic agents to patients according to the scheduled visits which correspond to the treatment course

ABSTRACT

Background

The emergence of the novel Coronavirus has challenged the robustness of healthcare systems worldwide. Strategies instituted by various Governments' and healthcare institutions to combat the virus have been postulated to negatively impact on healthcare delivery. The complexity of managing COVID-19 has already affected management of diseases at risk especially the noncommunicable diseases like cancer. Additionally, empirical evidence regarding changes in healthcare utilization among patients during COVID-19 is limited.

Objective

The main objective of the study was to identify the changes in chemotherapy utilization before and during COVID-19, and also identify the possible determinants that influenced the utilization of chemotherapy during the COVID-19 pandemic

Methodology

The study was conducted at Kenyatta National Hospital-Cancer Treatment Centre (CTC). It was divided into two parts. The first part involved a descriptive cross-sectional study design. The study targeted adult patients on cancer chemotherapy attending the out-patient clinic. A simple randomization technique without replacement was used to obtain a representative sample of 241 participants. Data was collected using a researcher administered questionnaire and analysed using Stata version 13 software. Descriptive and inferential statistics were done. The level of significance was set at 0.05. Logistic regression was conducted to determine the variables that were independent predictors of chemotherapy utilization. The second part was a time series analysis of the chemotherapy attendance recorded from January 2019- December 2020 by the Health records department. The average quarterly scores were analyzed using an interrupted generalized linear regression analysis using R software.

Results

Among the 241 participants recruited, 36(14.9%) had missed at least one scheduled chemotherapy appointment while 205(85.1%) had not missed a single appointment since the inception of Covid-19. This indicated that the prevalence of missed chemotherapy appointment in this cohort was 14.9%. A phone call to the doctor during the tight Covid-19 restrictions and the marital status were positively associated with

missed chemotherapy appointments/visits; Adjusted Odds Ratio (AOR) 2.95, (95% Confidence Interval (CI):1.04;8.37) and AOR 3.55, (95% CI:1.04; 12.07) respectively. Independent risk factors for missed appointments were hike in fares AOR 4.56, (95% CI:1.35;15.47; p=0.015), rescheduled appointments AOR 7.84, (95% CI:2.66;23.08; p<0.001), comorbidity AOR 2.46, (95% CI:1.05;5.75;p=0.038), marital status AOR 6.31, (95% CI:1.36;29.23;p=0.019), and difficulty in getting an appointment AOR 31.50, (95% CI:4.32;229.70;p=0.001). Interrupted time series analysis was done to compare the chemotherapy attendances for the year 2019 and 2020. Notably, the chemotherapy attendance demonstrated that the attendance was already on a decline in 2019 even before Covid-19 began, however, a distinct decrease was observed in 2020 when the restrictions were put in place and this is corroborated with the results with a significant beta of -21.7(8.2). The attendance of chemotherapy thus declined over time by about 22 patients quarterly during the pandemic. A distinct change point was observed in the month of June 2020.

Conclusion

The emergence of Covid-19 along with the precautionary measures affected the delivery of chemotherapy services to cancer patients as illustrated by the decline in attendances in the year 2020 compared to 2019. Based on the findings of the study, a significant proportion of patients missed at least one scheduled appointment during the Covid-19 period. This was attributed to several factors which included, hike in fares, difficulty in getting an appointment, marital status(married), presence of a comorbidity and rescheduling of appointments. The decline in chemotherapy attendance due to the missed visits during Covid-19 period may have implications in the affected individuals such as disease progression. Effective follow up plans could be formulated to identify and offer appropriate treatment plans to the affected individuals so as to avert the negative consequences. Due to the observational nature of this study, the magnitude of the impact of Covid-19 pandemic on clinical outcomes of cancer patients was not established. Therefore, future research should be directed towards measuring the impact of Covid-19 on oncological outcomes.

CHAPTER ONE: INTRODUCTION

1.1 Background

Coronaviruses are a large family of enveloped RNA viruses that are found in animals and rarely in humans. These viruses affect almost every system in the body particularly the respiratory system. Six coronavirus species cause human disease; four species are clinically relevant and cause mild respiratory symptoms in immunocompetent individuals, whereas the other two strains namely, Severe Acute Respiratory Syndrome Coronavirus (SARS-COV) and Middle East Respiratory syndrome coronavirus (MERS-COV) are zoonotic in nature and have been associated with fatalities (1). A novel coronavirus disease 2019 (COVID-19) emerged from Wuhan City, China, in December, 2019. It later evolved into a global pandemic (1). The virus is different from both MERS-COV and SARS-COV. It is a new virus that has not been previously identified. COVID19 disease presents as an acute severe respiratory illness which is highly contagious and can spread from person to person (2). Although earlier reports indicate that the virus affects the respiratory system, recent studies have indicated the contrary whereby the virus has been shown to affect almost all systems in the body (3). The severity ranges from mild to severe and has been implicated with fatal consequences like multiple organ failure (3). The virus posed an unprecedented challenge to the global community by spreading rapidly to almost all countries in the world. None was spared and a global public health concern emerged that required urgent attention.

Following the pronouncement of COVID-19 as a pandemic by the World Health Organization (WHO) in March, 2020(4) governments worldwide announced a raft of new measures. Progressively, the virus was causing major disruptions in the healthcare systems in all regions worldwide (5). Kenya was not left behind; first case was reported by the Government on 13th March 2020 (6) and thereafter a number of rules and regulations were developed to try and combat the virus which was now spreading like bushfire. Among the policies unveiled included; curfews, lockdowns which limit movement from one area to another, social distancing; limited face to face interactions, wearing of face masks, and washing of hands. It was imperative for the Government and healthcare officials to plan ahead for the new normal.

Travel restrictions imposed by governments alongside border closures have impacted negatively on the healthcare systems. Lockdowns have brought about a unique

challenge to African countries. These countries rely heavily on developed countries for medicines (7). *“Prolonged lead-times in the procurement of health products have been observed”*. *“The increased shortage of available medicine and increased procurement lead-times during the pandemic, following the lockdown of major exporting countries, emphasized the need for autonomy in health infrastructure and pharmaceuticals as a national priority for Africa”* (8). As a result, drug supply chain logistics have been affected translating into limited availability of drugs and price inflation for some essential medicines. A review done in Africa on the response to the novel corona virus pandemic highlighted the challenges, successes and implications for the future in the continent (9). Some of the challenges pointed out include medicines shortage and this could be associated with four determinants namely; the market, supply chain, manufacturing and political will. These determinants are interconnected with each other and an inadequacy in any of them affects stocks and orders of medicines which impacts on patient care (9).

Up until now, every aspect of healthcare has been affected by the COVID-19 pandemic. Noncommunicable diseases and other infectious diseases have received less attention during this pandemic (WHO); consequently, this has had a profound effect on the continuum of care given to patients suffering from these diseases. A study done in the USA observed that there was a 43% reduction in acute cardiovascular hospitalizations in March 2020 compared with March 2019. Also, in-hospital mortality was on record high in patients admitted during the COVID19 pandemic, suggesting advanced disease complications (10). Out-patient services have equally been affected during the COVID-19 pandemic. A study done in India established that existing primary healthcare facilities could not provide optimal out-patient services and this was attributed to weak infrastructure, reassignment of health workers that was further compounded with an overwhelmed workforce (11). Non-communicable diseases accounts for majority of deaths globally, Cancer a non-communicable disease is ranked as the second leading cause of death (12). It is estimated that in 2018, 18.1 million new cancer cases and 9.6 million cancer related deaths were reported (12). Notably, cancer is a serious diagnosis that has received minimal attention in the wake of COVID-19. Cancer patients are considered a high-risk group for infectious diseases particularly COVID-19. A study conducted in China demonstrated that cancer patients have a higher risk for COVID-19 disease and its complications (13). This is largely

attributed to the immunosuppressed status of cancer patients which further increases their risk of infection (14).

In Kenya, it is estimated that approximately 7% of the country's mortality is due to cancer (15); hence making it the third leading cause of death. The major challenge for cancer patients is the inability to receive important medical services because of the pandemic (16). Kenya has few cancer facilities and they are predominantly located in urban areas. In rural areas, where majority of the Kenyan population live, lack cancer facilities, and this negatively impacts on both cancer patients and presumptive cases. Therefore, rural cancer patients are required to travel to urban areas for treatment. In the wake of COVID-19 pandemic, both rural and urban cancer patients have been grappling with a number of challenges (15). The policies enacted by the government due to the COVID-19 pandemic have affected timely access to healthcare services by these patients. Notably, the lockdown and curfew imposed by the Kenyan government impacted on patients seeking cancer care in cancer facilities that are located far away from their place of residence. Additionally, poverty, an overwhelmed health workforce, limited slots for consultations and COVID-19 measures are presumed to have negatively affected the uptake of cancer care in Kenya (15). Cancer care takes a multidisciplinary approach which brings all healthcare providers on board at different levels. The disease requires life-long treatment or management; thus, any deliberate disruption of care could result in serious clinical outcomes (17). The increased health burden which is inevitable in these patients requires all healthcare providers to give attention to all needs related to every aspect of cancer care.

Chemotherapy, a form of treatment in cancer care, is a priority for all patients in need of it. Access to cancer care by patients during this era of COVID-19 has proven to be a critical challenge (15) and chemotherapy is not an exception. This is an area that has not been extensively studied locally and so the study sought to highlight how the COVID-19 pandemic had influenced the utilization of chemotherapy services by cancer patients.

1.2 Problem Statement

Healthcare systems have experienced major disruptions due to the emergence of COVID-19 pandemic. The pandemic has exposed significant inequalities within healthcare systems worldwide (15). Healthcare service utilization by patients is suspected to be on a decline as demonstrated by several studies (10,11,14). In Kenya,

the emergence of COVID-19 resulted in the enactment of a number of policies by the Government. Lockdowns, travel restrictions, social distancing, curfews among others were enacted to reduce the spread of the virus in the general population. However, these regulations did not take into account the special needs of patients who seek care at distant health facilities particularly those with chronic diseases like cancer. Unlike COVID-19 which has received significant attention, cancer care is thought to have suffered immensely due to the pandemic (15). Moreover, cancer facilities in Kenya are reported to be more concentrated in urban areas than rural areas (15). Additionally, inter-county travel restrictions brought about difficulties in seeking care at distant hospitals for treatment. The re-allocation and dedication of in-patient facilities to the pandemic, due to the huge case burden has worsened the situation (15). Studies have reported that cancer patients are at an increased risk of COVID-19 infection than the general population (11). This trait in cancer patients is linked to immunosuppression thus warrants for timely cancer care. This also made patients to shun or delay seeking cancer care from hospital facilities for fear of contracting COVID-19 and the unforeseen oncological outcomes. Therefore, cancer patients on active chemotherapy need timely treatment and when patients are unable to access chemotherapy as prescribed, serious clinical outcomes become evident. The adverse outcomes are advancement of the disease, poor prognosis and sub-optimal therapeutic response. Locally, there is limited data on healthcare utilization during the COVID-19 pandemic. Evidence indicates that reduced or delayed healthcare utilization could have detrimental health consequences. Therefore, the study sought to determine the utilization trends of chemotherapy services before and during the COVID-19 pandemic. Additionally, the study also sought to identify the possible determinants that may have affected the attendance of patients scheduled for chemotherapy sessions.

1.3 Research Questions

1. What was the impact of Covid-19 on the utilization of chemotherapy services between January 2019 and December 2020 at Kenyatta National Hospital?
2. What are the barriers and challenges encountered by patients accessing chemotherapy services before and during the Covid-19 period?
3. What barriers impacted on access to chemotherapy drugs by patients during the pandemic?

4. What patient and institutional factors were associated with interruptions in the uptake of chemotherapy services, if any?

1.4 Main Objective

To evaluate the impact of COVID-19 pandemic on the availability and utilization of chemotherapy services by patients who were attending the Kenyatta National Hospital (KNH), Oncology clinic

1.4.1 Specific objectives

1. To compare chemotherapy utilization patterns before COVID-19 restrictions from January- December 2019 and during the COVID-19 period from January- December 2020
2. To identify the barriers and challenges that affected the access to chemotherapy services by patients before and during COVID-19 pandemic
3. To assess the price and availability barriers in patients' access to chemotherapy drugs during the COVID-19 pandemic
4. To identify possible patient and institutional factors associated with interruption of chemotherapy services

1.5 Justification

The increased uncertainty and anxiety during this COVID-19 era could have negatively impacted on healthcare service utilization and health seeking behaviour amongst cancer patients. This study sought to identify the reasons for the interruption of chemotherapy services and also highlight appropriate remedies that will mitigate against the negative effects of COVID-19 on access to treatment. Due to the nature of the disease(cancer), interventions could be developed in a priority-based approach that will ensure patients are served according to the severity of the disease. Furthermore, policymakers will receive relevant information on how the utilization of chemotherapy services has evolved during the COVID-19 pandemic, with a broader understanding of some of the factors that could have hindered the accessibility of such services.

Patients may have been afraid to visit hospitals for the typical face- face consultations with physicians and this adds to the risk. Therefore, this will aid Kenyatta National Hospital to devise strategies that will enable the patient to receive care without fear of contracting COVID-19 and hence improve their quality of life.

1.6 Hypothesis

1.6.1 Null hypothesis

There is no difference in the pre-COVID attendance (January-December 2019) and during COVID period attendance (January-December 2020).

1.6.2 Alternate hypothesis

Patient attendance in the oncology unit was higher before COVID-19 restrictions that is between January-December 2019, compared to the COVID period from January-December 2020

1.7 Delimitations

The study did not include cancer patients on other forms of cancer care for example radiotherapy, loco-regional interventional and surgical resection.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

In December 2019 WHO was informed of a cluster of pneumonia cases of unknown origin in Wuhan city, Hubei province, China (1). Subsequently, the WHO declared it as a public health emergency (4) which was later termed as a pandemic. The causative agent had not been identified and it was now causing serious health concerns. A series of intensive laboratory studies were conducted to identify the virus. One particular study done in a group of hospitalized patients in Wuhan City established that the causative agent was a variant of corona virus (1). A novel coronavirus was established, the virus was identified and named SARSCOV2, the virus responsible for the development of COVID-19 disease (18). Despite their existence, the clinical importance of human coronaviruses was not regarded until the outbreak of SARS, MERS and most recent COVID-19 (19). SARS was reported to have originated from South China, MERS originated from Saudi Arabia where it accounted for 80% of the illnesses and the most recent variant of coronavirus (SARS-COV-2) was initially reported to have originated from Wuhan city, China (1,19). It is worth noting that “SARS-COV-2 is closely related (with 88% homology) to two bat-derived severe acute respiratory syndrome (SARS)like coronaviruses, bat-SL-CoVZC45 and bat-SL-CoVZXC21, collected in eastern China, but unrelated to SARS-CoV (about 79%) and MERS-CoV (about 50%). Recent studies indicate that SARS-COV-2 might be able to bind to the angiotensin-converting enzyme 2 receptor in humans (20).

2.2 Epidemiology of COVID-19

Severity and transmissibility have been shown to be the most crucial factors that determine the outcome of an epidemic (21). A disease poses a great public health risk when it is very severe and has a high transmission rate. A study conducted on the cruise ship; Princess Diamond off the Japanese coast established that COVID-19 was a highly transmissible disease which was corroborated with a reproduction number (R_0) of 3.7 higher than in Wuhan (22). Although the environment in the ship favoured the transmissibility of COVID-19 due to the population density and confined space, the transmissibility of COVID-19 as reported by WHO is estimated at 1.9 (23). COVID-19 is therefore reported to have a higher reproduction number than its related coronavirus species; SARS and MERS (24) a characteristic that has enhanced the

rapid transmission of the virus globally. In Kenya, stringent measures were enforced to combat spread of SARS-COV-2 whose transmissibility had been shown to be higher in countries that had first-hand experience with COVID-19 pandemic. Routine media briefings by the Ministry of Health in the country established that the virus was spreading exponentially across all the forty-seven counties in the country (6).

2.3 Types of restrictions placed by Government and access to healthcare during COVID- 19 pandemic

Heads of Governments around the world introduced a number of containment measures. They included; travel restrictions, social distancing, curfews, stay-at-home orders and bans on gatherings (25).

2.3.1 Impact of stay-at-home orders and curfews on access to healthcare

Stay-at-home orders limits unnecessary movement. Enforcement of this policy reduces human interaction amongst individuals at varying degrees. Health facilities located far away from the patients' residence brought forth a unique challenge upon patients particularly with the enforcement of the stay-at-home orders. Location of health facilities determines the accessibility of healthcare services. In the USA, reports indicate that the state closure policy led to a 15% decline in outpatient visits during the beginning of the pandemic. Health officials were required to provide evidence-based data on the proportionality of the large restrictions and risk of contracting COVID-19 infection.

Curfews are intended to minimize non-essential interactions between people during certain hours. In light of COVID-19 pandemic, the Kenyan Government imposed dusk-to-dawn curfews. This adversely affected the night travels especially by patients seeking care at health facilities located in the major towns. An indirect healthcare cost that patients incur while accessing care at distant health facilities is the accommodation cost. To save on the accommodation cost, patients make night travels to evade it. With the enforcement of the night-time curfews, many patients reduced the night travels and this negatively impacted on their healthcare seeking behaviour and consequently healthcare service utilization (26).

2.3.2 Impact of travel restrictions

In the beginning of the COVID-19 pandemic, restrictions on travels between countries, counties and regions was imposed across the world to combat the spread of the virus. In Kenya, an executive order was made to lockdown a few major towns during the

beginning of the pandemic. Gichuna et al, highlights the plight of sex workers in Nairobi while accessing reproductive healthcare services under the inter-county travel restrictions. The cessation of movement did not take into account the health needs of the cohort particularly those who had travelled out of town. Access to alternative services to alleviate their health care concerns was a challenge. In addition, lack of healthcare facilities in certain areas contributed to missing of appointments and lack of drug supplies (26). A review done in the USA indicated that shutdown policies reduced the ambulatory visits for cancer appointments by 45% (27). Mandatory quarantine order for all travellers entering countries and those returning to their country of resident was a no bargain. The orders required individuals to stay at home at all times. For individuals on routine medical follow up, accessing treatment and other modalities, the policy fails to address their health concerns.

2.3.3 The Impact of Social Distancing and Ban on Gatherings

Social distancing limits physical contact. However, some may argue that the fundamental values of health and human rights are compromised with the enforcement of social distancing. The most vulnerable in the society are seen to be disadvantaged especially those that are under the care of caregivers. In healthcare settings, social distancing reduces the number of patients served, consequently the waiting time increases because of few numbers. Patients end up cancelling their appointments because of the long waiting time, such barriers deter patients from accessing healthcare services in a timely manner (25).

Ban on gatherings reinforced the concept of social distancing. These bans were applied to all and did not single out any group. Healthcare programs that encourage psychosocial support groups are adversely affected as the ban on gatherings deterred the assembly of such groups (25).

2.4 Institutional Factors Affecting Utilization of Healthcare during the COVID-19 Pandemic

The same way governments developed policies and enacted laws to combat the spread of COVID-19 disease, health institutions followed suit. COVID-19 pandemic disrupted the operations of many healthcare institutions; therefore, it was crucial for them to prepare well. Because of the fear of contracting the virus and the reallocation of healthcare resources towards COVID-19 preparedness, health facilities rescheduled appointments during the stay-at-home orders. The Stanford Health Care (tertiary

hospital) in the USA reported that appointments were rescheduled sixty days into the future early on when the pandemic struck. Moreover, in the acute phase of COVID-19, numerous studies have demonstrated how elective and nonurgent cases were deferred. The deferral included a collaborative engagement between the key referring departments. A sharp decline of visits was observed after the implementation of the rescheduling of appointments (28). Nikhil et al, further explains that the marked decline in healthcare utilization translates to delayed medical care. The far-reaching implications of COVID-19 on healthcare utilization may not be observed now, but long-term consequences are inevitable. Visitor restrictions are some of the policies that health facilities have implemented to improve on both patient and staff safety. Hospitals have prohibited the access of more than one visitor to one patient. A striking decline in hospital visits were observed (29). Patients who rely on caregivers for the provision of medical and medication support are significantly disadvantaged by the no visitor policy. Additionally, the caregivers act as a link between the patient and healthcare provider. There is risk of misinformation due to ineffective communication between the caregiver and healthcare worker. This could arise due to the limited contact between the two, also the no visitor policy further aggravates the situation as the caregiver may be absent altogether (29). The contagion of COVID-19 made facilities to limit the number of people allowed into the waiting rooms. This policy brought a unique challenge of ineffective communication between patients and healthcare providers. Communication is a fundamental process required by both healthcare workers and patients. Healthcare providers collect and convey relevant health information to their patients. On the other hand, patients relay their responses to healthcare which aid in making a diagnosis. The main challenge during COVID-19 is the difficulty in engaging patients from far due to social distancing. Additionally, the lack of PPE and provision for patients has hindered the typical face-to-face interactions between providers and patients for fear of contracting COVID-19 when visiting healthcare providers. Healthcare staff shortage due to the risk of exposure to COVID-19 necessitated the redirecting of staff from non-priority areas. Other health institutions re-employed retired staff; such adjustments increased staff capacity in response to COVID-19 preparedness (29). Unemployment, uninsured and people living below the poverty line face constant financial challenges when acquiring medications. Medication acquisition was a pre-existing challenge even before the COVID-19 pandemic began. A hospital in the USA circumvented this challenge by

designating pharmacists with new roles, their main objective was to assist patients with medication acquisition issues. They minimized interruptions of drug therapy and hospital readmissions. To ensure continuity of disease monitoring. The facility initiated a service sharing protocol between departments and this catered for patients who had no access to the retail pharmacy (29).

2.5 Patient Related Barriers for access to care during the COVID-19 pandemic

Access to quality healthcare service is a critical challenge facing healthcare systems around the world. Perceived barriers to healthcare utilization negatively impact on the clinical outcomes of patients. Therefore, strategies that assist in overcoming the barriers allow for ease of access to healthcare services. Several patient related barriers have been reported to affect the utilization of healthcare services during the COVID-19 pandemic. A study done in Saudi Arabia to assess for barriers of dental services utilization during the pandemic, established that anxiety and fear of contracting COVID-19 disease was the main reason that deterred patients from accessing dental services. High cost of treatment, lack of symptoms, long waiting time, lack of transport and difficulty in securing appointments with the lockdown policy in effect were reported as barriers to care (30). About 30% of the breast cancer patients cancelled oncology appointments due to COVID-19 outbreak. Patient contact with healthcare providers decreased significantly during the pandemic as opposed to before. Additionally, participants who had comorbidities cancelled their appointments more than those without (31). Widespread lockdown and fear of contracting COVID-19 has led to a decrease in healthcare service utilization. This has been demonstrated by several studies universally (5,10,14,32). Anxiety, travel restrictions, loss of income, availability of alternative healthcare services, sense of mastery are among the factors influencing healthcare service utilization in the midst of the pandemic (31).

2.6 Changes in The Economy and Impact on Healthcare

COVID-19 has inadvertently affected financial markets and to an extent the global economy. Additionally, the strategies adopted by various Governments in the fight of the pandemic, have equally affected the dynamics of the global economy. Many postulates that the dynamics of economics in the middle of a pandemic are secondary to the health effects (33). Quarantine and the self-isolation policies decreased demand, consumption and utilization of products and services. A study conducted to assess the

impact of COVID-19 pandemic on radiology services, reported that the demand for radiology services decreased steadily. Fear of contracting COVID19 deterred patients from seeking healthcare services which led to loss of revenue. In addition, health expenditures increased due to facility modification strategies in COVID-19 preparedness. Some facilities expanded their capacity for critical care beds, increased staffing levels and procured PPEs. Costs for emergency and critical care admissions doubled and the admissions were only limited to a number of days depending on the patient's clinical status (34). An econometric analysis of healthcare utilization in Kenya demonstrated that cost is a critical factor of healthcare service utilization. The study illustrates how out of pocket expenditure (OOP) is an apparent hindrance to healthcare utilization. Increase in the OOP expenditures resulted in the reduction of the number of visits (35).

2.7 Supply of Medicines in COVID-19 Pandemic

COVID-19 pandemic has disrupted transportation networks with the suspension of international flights worldwide and restrictions in cross-border movement and shipping. Many countries have limited the export of their medical and personal protective equipment supplies to other countries thus interfering with the distribution networks of the international supply chain (36).

According to Steele et al, India supplies 20% of all basic medicines to Africa while Africa contributes only 3% to the global medicine production. India imposed export restrictions on the export of 26 pharmaceutical components in the middle of the pandemic. Definitely such a move impacted significantly on countries which import raw materials from India (8). In Kenya and Rwanda, pharmaceutical industries suffered a major blow because of limited manufacturing capacity further aggravated by limited access to raw materials (7). Government lockdowns have affected the operations of factories particularly smaller industries. Additionally, the decline in demand due to state and border closures have led to scaling down of major industries. Kumar et al, reports that there have been major disruptions in the production and supply of contraceptives to low- and middle-income countries, this is as a result of closure of large pharmaceutical companies (37). Similarly, in Kenya, Gichuna et al, highlighted the disruption of supply for reproductive health commodities and this affected the delivery of routine reproductive healthcare services in public health centres. In the study, multiple respondents reported that there was scarcity of family

planning commodities and postnatal care products. Also, the delay in the transportation of family planning commodities to several counties was cited as a challenge (26).

2.8 Interaction between COVID-19 and Cancer

As Alexander et al, describes cancer care in the time of COVID-19, the study depicts it as a war on two fronts (38). The oncology community is faced with an unprecedented challenge during the COVID-19 pandemic. Globally, healthcare systems have had major disruptions since the inception of COVID-19 pandemic. They have been overwhelmed particularly with the ever-increasing numbers of COVID-19 infections. Cancer care is therefore presumed to take a paradigm shift in this unprecedented time majorly because focus has now been directed to COVID-19. Andrew et al, highlights the impact of COVID-19 on the different aspects of non-communicable diseases (39). Due to the re-allocation and reassignment of both resources and healthcare workers, chemotherapy, radiation therapy, surgery and palliative services may be delayed during such outbreaks.

A cross sectional study done on several oncology centres around the world, established that COVID-19 had unfavourable effects on cancer care. Variable degree of service disruption was reported from some centres with 88.2% of the oncology centres reducing their usual care. Causes of disruption included precautionary measures, overwhelmed system (19.9%), staff shortage (18%) and lack of access to medications (9.8%). In this study, it was reported that many patients missed chemotherapy sessions with about 46.4% of the centres reporting that more than 10% of their patients missed at least one chemotherapy session. The worse impact was noted in low-resource countries (39). Similarly, in Ghana the undesirable effects of Covid-19 on cancer care have been documented. Like many Low-Middle Income Countries, Ghana records high cancer incidences annually (40). With the emergence of COVID-19, the pre-existing health infrastructure in the country has been overstretched and aggravated by limited skilled staff. Access to cancer care by patients especially during the partial lockdown imposed by the government contributed to delay, abandonment or deferral of treatment (40).

Kenya has few healthcare facilities and healthcare providers that are dedicated to cancer treatment. During outbreaks or pandemics, the healthcare workforce is exposed to potential risks of contracting deadly diseases especially if appropriate measures are not implemented (15), as a result the continuity of healthcare services is disrupted.

2.9 Research gap

The COVID-19 pandemic has highlighted the importance of strengthening healthcare systems worldwide. The pre-existing healthcare infrastructure during the pandemic have been overstretched and overwhelmed (5). Non-communicable diseases are increasing at a concerning rate in the COVID-19 pandemic and this is attributed to the diverting of healthcare resources to COVID-19 response (39). Empirical evidence has limited information on the healthcare utilization trends in Africa, particularly now with the ongoing pandemic. This study will provide a unique perspective related to the changes of chemotherapy utilization before and during the COVID-19 pandemic. Therefore, the study aimed to address this notable gap in the context of chemotherapy utilization. Consequently, the findings of this study will contribute to existing literature locally.

3.0 Conceptual Framework

The framework illustrates the association between the independent and dependent variables. The independent variables (predictor variable) are divided into three; Pharmacy related factors, patient factors and logistical factors. These independent variables will potentially affect the scheduled chemotherapy visits (dependent variable). Other non-modifiable factors such as age, gender and the socioeconomic class are also interconnected and could influence the utilization of chemotherapy in terms of accessing it. Availability and cost of medications impacts on healthcare service utilization, consequently chemotherapeutics utilization will also be affected.

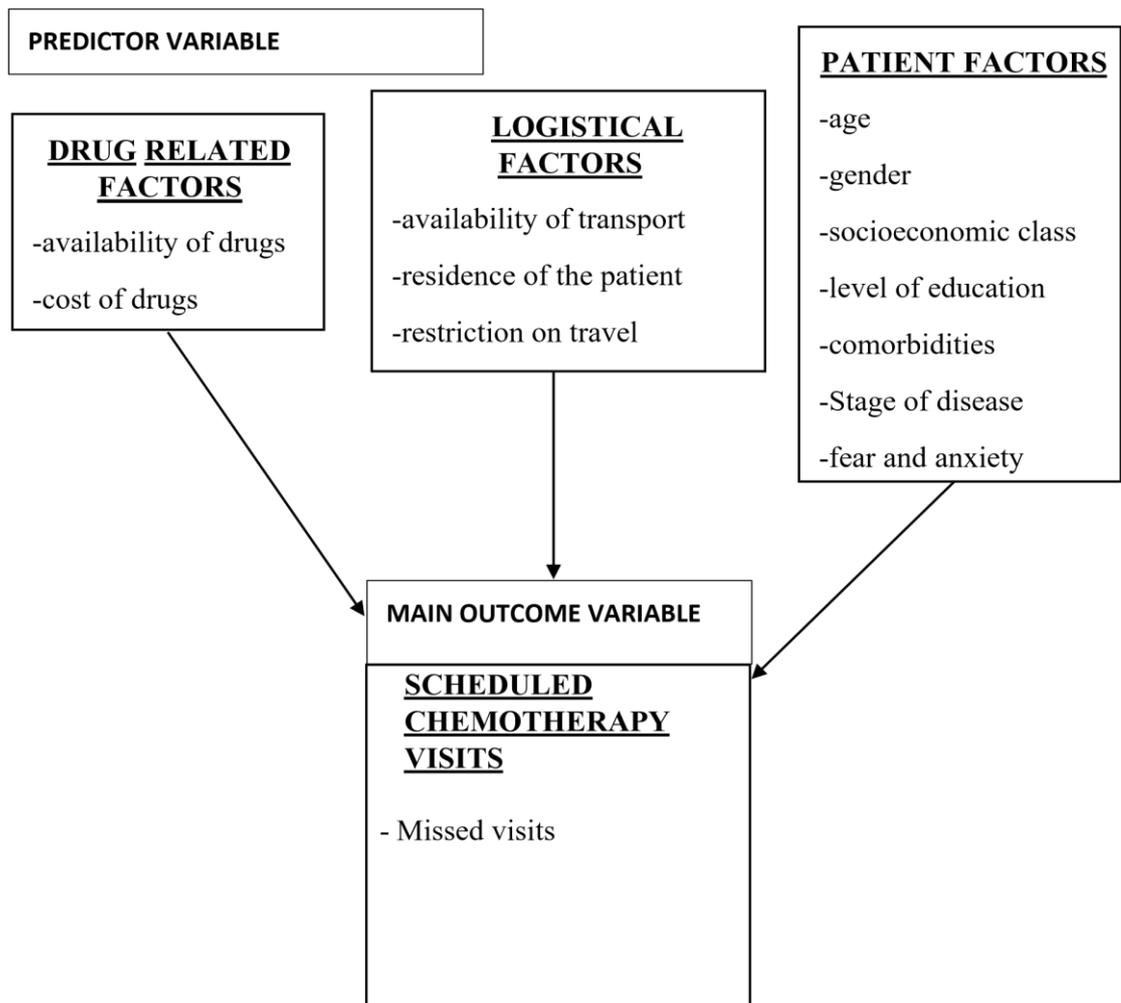


Figure 1: Conceptual Framework for determinants of utilization of chemotherapy during the COVID-19 pandemic

CHAPTER THREE: METHODOLOGY

3.1 Study Design

The study was carried out by the application of two study designs namely;

- i A descriptive cross-sectional study as a patient survey
- ii Time series analysis of the chemotherapy utilization at Kenyatta National Hospital (KNH) from January 2019-December 2020 as an assessment of patient attendance

The descriptive cross-sectional study design was used and it entailed patient interviews aimed at identifying the impact of travel restrictions on attendance as well as challenges and barriers in accessing the service. The study design was ideal because it provided large amounts of information through interaction with respondents on the variables that were investigated at a very short period of time.

The time series analysis of attendance of patients for chemotherapy is a quasi-experimental longitudinal study. This was the ideal study to use since it enabled one to assess the change in trends of chemotherapy utilization from when the COVID 19 pandemic began. It also included the pre-COVID period January 2019-December 2019 and COVID-19 period from January 2020-December 2020. It entailed review of records provided by the records department.

3.2 Study Site

Cross-sectional study (patient survey)

The study was conducted at Kenyatta National Hospital out-patient chemotherapy clinic. It is a tertiary, referral and teaching hospital located in Upper Hill area within Nairobi County. The hospital has a bed capacity of 2000. It is a multispecialty hospital receiving patients from within the country and beyond. Kenyatta National Hospital is among the few public health facilities in Kenya that offer comprehensive treatment for cancer. Information retrieved from the records at the chemotherapy out-patient clinic indicated that about 40 patients attend the clinic daily.

Time series analysis

Information on the number of adult patients attending chemotherapy clinic at Kenyatta National Hospital- Cancer Treatment Centre from January 2019-December 2020 was obtained from the health records department.

3.3 Study Population

Cross-sectional study (patient survey)

The study population included all adult cancer patients on chemotherapy visiting Kenyatta National Hospital- Cancer Treatment Centre at the out-patient clinic.

3.3.1 Case definitions

Given the wide scope of oncology services, the study was limited to those that did not require hospitalization such as surgical interventions or in-patient administration of medication. We also omitted diagnostic procedures, radiotherapy, and palliative care to make the study manageable. The key service from the perspective of a clinical pharmacist and supply of health technologies were of chemotherapeutic interventions. Chemotherapeutic services were categorized as: scheduled visits for refills of enteral and/or parenteral medicines which was either parenterally or enterally administered.

Refill- obtaining drugs from the Pharmacy

Parenteral Chemotherapeutic service- parenteral administration of any anti-cancer medicine that must be provided in a health care facility.

We did not focus on enteral administration as this could have been done by the patient at home. We focused on any type of parenteral out-patient chemotherapeutic that required administration at the facility.

The scheduled chemotherapy visits were identified from an Appointment Register. The records department at the CTC is the custodian of this document, it keeps a record of defaulters and those who attended. This helped as to ascertain that the patient was scheduled for the visits and the number of missed visits in-case the patient could not recall.

The utilization of chemotherapy was measured using the method of patient reported attendance. The problem with this method was that the patient may give inaccurate information. However, this was avoided by counter checking with the appointment register and hence avoided recall bias. This was measured during the administration of the structured questionnaires to the patients. They were presented as;

1. % of patients who reported and were able to keep all appointments during the period of strict lockdown.
2. %age of patients who missed at least one scheduled appointment

Consequently, we limited the oncological services to chemotherapy only as it was the focus of the principal investigator.

3.3.2 Patient selection criteria

3.3.2.1 Inclusion Criteria

Participants that were enrolled into the cross-sectional study met the following criteria;

- i. Aged 18 years and above
- ii. Those on ongoing cancer chemotherapy before the COVID-19 pandemic
- iii. Those that attended the out-patient clinic
- iv. Those that gave consent to take part in the study

3.3.2.2 Exclusion Criteria

- i. Participants on other forms of cancer treatment
- ii. Participants who declined to give consent to take part in the study
- iii. All hospitalized patients

3.4 Sampling and Sample Size Determination

The study sample size was determined using the Cochran (1977) formula (41). The researcher used this formula because the key outcome variable was the prevalence of patients who missed chemotherapy visits after the announcement of the pandemic.

The prevalence of chemotherapy utilization as demonstrated by Lou et al, is 25.6% (42) thus, the researcher utilized it to calculate the sample size using;

Equation 1: The Cochran formula for sample size computation

$$n = \frac{pqz^2}{e^2}$$

n is the sample size z is the standard deviation for 95% confidence level, z=1.96

p is the expected prevalence or incidence of the outcome of interest, p =0.256

q = 1-p; 1-0.256=0.744

e is the desired level of precision at 5%

$$n = (1.96^2). (0.256 * 0.744) / 0.05^2 = 293$$

The Cochran correction formula for a finite population was not applied so as to improve on the precision of the estimates.

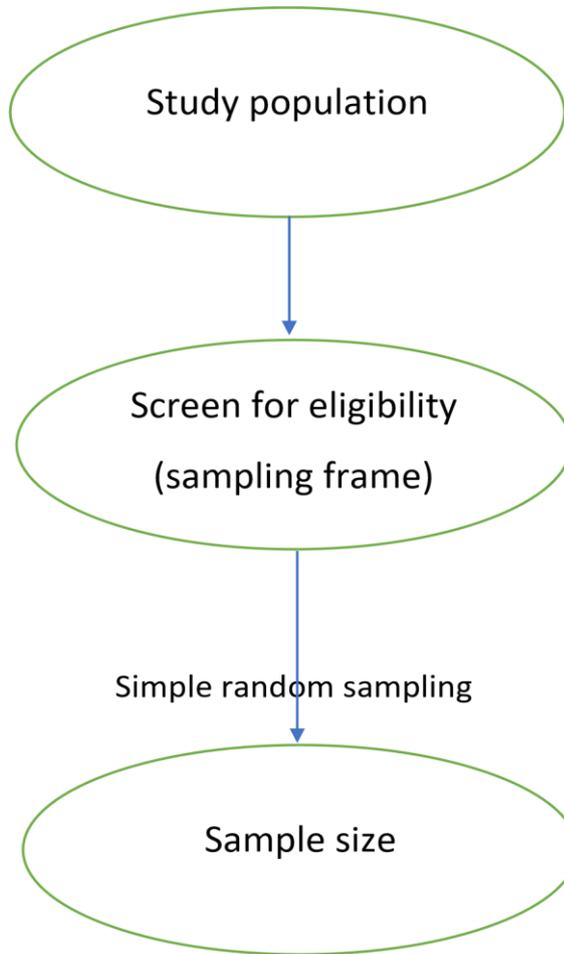
3.5 Sampling and Participant recruitment

3.5.1 Screening for eligibility

About 40 patients were booked to undergo chemotherapy daily and the names were entered into the appointment register at the KNH-CTC. The nurse on duty prepared files corresponding to the appointment register the day before chemotherapy sessions. The principal investigator went through these files to screen for eligibility using the eligibility criteria form (Appendix 1A) which formed the sampling frame. From the files the PI listed the eligible patients daily.

Activity Flow Diagram

Day before chemotherapy



Day of chemotherapy

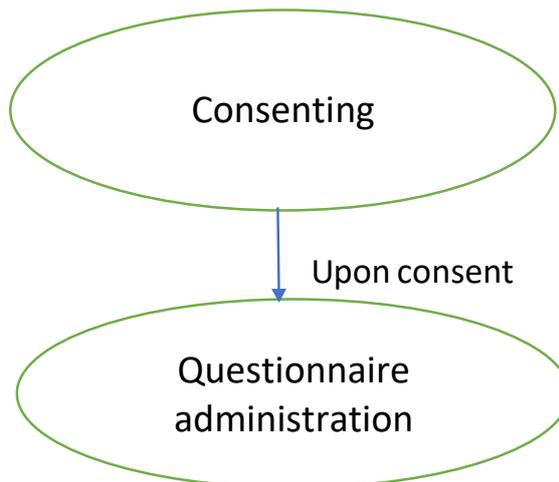


Figure 2: Activity flow diagram

3.5.2 Random sampling of patients who meet the inclusion criteria

So, we aimed to interview a maximum of fourteen patients in a day. Simple randomization without replacement was used to select patients who were taken through the consenting process. Each of the eligible patients were assigned a number and a table of random numbers in excel spread sheet was used to select the patients. The sampled patients were listed.

3.5.3 Consenting process

On the day of chemotherapy, the patients were approached for consenting before their sessions to avoid interruptions in the clinic and ensure smooth running. Patients started reporting to the clinic from 7 a.m. A list of the sampled patients was given to the nurse manning the reporting desk. After doing the necessary paper work the nurse was asked to direct the patients to the consenting room. The principal investigator took the patient through the voluntary consenting process, explained what the study involved and answered any question the participant may have had. This was carried out in a designated room particularly for the consenting and questionnaire administration at the cancer treatment centre. Therefore, protecting the patients' privacy and confidentiality. Each participant was allocated 10 minutes. The participants were allowed to voluntarily participate in the study by signing the consent form or placing a thumb print (as guided in Appendix 1B). Once the participants' consented, the questionnaires were administered to them by the principal investigator. Sampled patients who declined to participate were not replaced.

3.6 Variables

The main outcome variable was the scheduled visits for chemotherapy which was measured by assessing the number of missed visits. The predictor variables were divided into three main areas of focus which included;

1. Drug related factors- this was measured by assessing the availability and cost of drugs
2. Logistical factors- this was assessed by enquiring on the availability of transport, patient's residential area and the travel restrictions.
3. Patient factors- this assessed the sociodemographic characteristics of the patient, comorbidities, stage of disease and mental state (fear and anxiety).

The possible covariates in this study were age, gender, socioeconomic class and level of education.

3.7 Research Instruments

Data collection tools that were used to obtain and record information from the patients were researcher-administered questionnaires (Appendix 2). The questionnaire had three domains. First section contained information on the sociodemographic characteristics of the participant. Other parts of the questionnaire contained information related to the research objectives.

3.8 Pre-testing of the Research Instrument

Pre-testing questionnaires for validity and reliability was done on ten participants recruited for the pre-testing exercise at the Kenyatta National Hospital-Cancer Treatment Centre. The ten participants recruited were not included in the calculated sample size along with the data obtained. This exercise was done to identify the gaps in the questionnaire before carrying out the main process of data collection hence refine the questionnaire accordingly. The modified questionnaire was submitted to KNH-UoN ERC for final endorsement before use.

3.9 Data collection

1. Cross-sectional study

Data was collected using questionnaires (Appendix 2) and this was done at Kenyatta National Hospital-Cancer Treatment Centre (CTC) where patients received chemotherapy. Data collection was done on a daily basis before the patients had undergone chemotherapy sessions to avoid interruptions in the clinic and ensure smooth running. This began with consenting (as per appendix 1B) in a designated room in the cancer-treatment-centre which protected the patient's privacy and confidentiality and it took 10 minutes. Upon giving consent, administration of questionnaires was done by the principal investigator. Each participant was allocated 15 minutes for the questionnaire administration. We minimized interruptions of the clinic services by conducting the consenting process from 7-9 am before administration of the questionnaires. Patients reported from 7am and the clinical services began at 9am. With regard to administration of questionnaire, there were three options availed to the patients. The questionnaire was administered immediately after giving consent if the patients turn to receive chemotherapy had not reached. Secondly, the patients were asked if they were comfortable answering the questions during chemotherapy as they were receiving their infusion.

Lastly, patients were given the option of answering the questionnaire after chemotherapy before they left the clinic. At this time-point there was minimal interruption of routine clinical duties.

2. Time series

Summary data on chemotherapy attendance from January 2019-December 2020 at the oncology clinic was obtained from the health records department.

3.10 Quality assurance, Validity and Reliability

External validity ensured that the findings of the study could be generalized to the entire population. This was done by use of a simple random sampling method which ensured that a representative sample was selected. This sampling method minimized selection bias as all participants had an equal chance to be selected. Additionally, KNH serves a large population from all parts of the country, thus it was a suitable site for a good representation of the entire population.

Internal validity refers to how well the study was conducted to produce credible results. Data collection, management and analysis incorporated appropriate processes which maintained accuracy, completeness and integrity. A well-structured questionnaire with questions that were relevant to the study objectives were administered. Non-response bias associated with questionnaire use was minimized by ensuring that the participants fully comprehended the questions in the data collection tool, also the environment was conducive for the respondents' by upholding privacy, applying the COVID-19 protocol as per the MOH recommendations and away from distractions.

Reliability refers to the degree to which the method applied yielded consistent results when repeated. Reliability of the data collection tool was pre-tested to assess the reproducibility prior to carrying out the main study so as to ensure valid responses.

3.11 Data Management

The data collected was coded and entered into a password-protected excel sheet within 24hours of data collection. Double data entry was done. Backing up of data was done onto an external hard drive and into a Google Drive. To maintain privacy and confidentiality, unique serial numbers were used as identifiers instead of the respondents' real biodata. The collected data was stored securely under lock and key by the principal investigator and there was restricted access to the data.

3.12 Data analysis

Cross sectional study (patient survey)

Descriptive data analysis was performed using Stata version 13. Categorical variables were summarized as frequencies and proportions. Continuous variables were evaluated for normal distribution using the Shapiro-Wilk test and summarized as mean, median, standard deviation and the interquartile range. Bivariable analysis was conducted to evaluate for any association between the variables. If a statistical significance was observed the variable underwent multivariate analysis. Logistic regression analysis was applied to adjust for confounders. It assessed how age, gender, socioeconomic class and level of education affected the scheduled chemotherapy visits and hence the number of missed visits. The significance level was set at 5%.

Time series analysis

Data analysis was performed using R version 3.4.4 software. The study included all the attendance reports from January 2019-December 2020. The attendance data was divided quarterly.

A time series of the quarterly mean attendance values was plotted against time periods. A regression line was fitted into the plot. The aim of this analysis was to demonstrate the shift of chemotherapy utilization patterns before and during COVID-19. The change point was identified by establishing a model that best described non-attendance in the timeline. Initial summary statistics and plots were plotted. It included a scatter plot of the time series, which aided in the identification of the underlying trends, seasonal patterns and outliers.

Interrupted regression analysis was done using the equation below:

Equation 2: General equation for time series analysis

$$Y_t = \beta_0 + \beta_1 T_t + \beta_2 X_t + \beta_3 X_t T_t$$

Whereby:

Y_t represented the aggregated measures of attendance at the KNH-CTC at each equally-spaced time-point t ;

T_t represented a continuous variable showing time in quarterly periods since the pandemic

X_t a dummy variable by assigning “1” if a respondent attended the clinic and “0” for otherwise

β_0 represents the baseline level at $T=0$ β_1 represented the change in outcome associated with time unit increase (pre-intervention trend)

β_2 is the level change following the pandemic β_3

denotes the slope change following the pandemic

X_tT is the interaction term

If β_2 will be statistically significant, then COVID-19 will have caused a change immediately after its announcement, which will lead to an immediate increase or decrease in the number of patients attending the chemotherapy clinic.

If β_3 will be statistically significant, then COVID-19 will have caused a change in the attendance over a longer period of time.

3.13 Ethical Considerations

Approval to carry out the study was sought from the Kenyatta National Hospital/ University of Nairobi Ethics and Research Committee (KNH-UoN-ERC). Respondents' consent was sought individually and voluntarily free from any coercion. They were provided with a comprehensive description of the study before they gave informed consent.

Privacy and confidentiality were maintained by use of unique serial numbers instead of the respondents' real biodata. The data collected was password protected and was only accessible to the principal investigator not anyone else. There were minimal risks to the respondents as the procedures were non-invasive. Moreover, the study translated into immediate benefits to the respondents' whereby those that were in need of any assistance were referred to a social worker for further assessment, this was conducted by use of a referral form in (Appendix 1E) which captured all the details for referral. Those that needed assistance were identified by reasons that included, but were not limited to, patients who showed evidence of defaulting therapy by missing appointments, those that verbally expressed they had problems listed in the referral form, and also, outsourcing information from healthcare workers who directly attended to the patients and based on professional discretion a referral was done. Once referred the social worker was to assess the need and provide solutions to the patients' problem.

CHAPTER FOUR: RESULTS

4.1 Introduction

This chapter describes the results obtained after descriptive and inferential data analysis. It comprises of socio-demographic characteristics of respondents, trends of chemotherapy attendance and outlines other relevant findings based on the research objectives.

4.2 Socio-Demographic Characteristics of the Respondents

The socio-demographic characteristics of the study participants are summarized in Table 1.

The majority of the respondents were female 164 (68%). Most of the respondents recruited were above 50years (65%) with a mean age of 55years. The median age was 54years and their age ranged from 21-90 years. More than half of the participants 180 (74.7%) were not residing in Nairobi and this had implications with regard to access. With regard to marital status, majority were married 180 (74.7%). More than half of the participants reported that they were unemployed 167 (69.3%).

One hundred and fourteen (47.3%) participants reported that they had attained secondary level education while more than half of the respondents (N=241) were unemployed. Ninety-one (37.8%) participants had a comorbidity with the majority reporting to have only one comorbidity. The most prevalent comorbidity was hypertension at 23.7%. Only four (1.7%) participants took alcohol.

Table 1: Socio-Demographic Characteristics of the Respondents

Variable	Category	Frequency (N=241)	Percentage (%)
Gender	Male	77	32.0
	Female	164	68.0
Age Category	20-35 Years	18	7.5
	36-50 Years	66	27.5
	51-60 Years	76	31.7
	60+ Years	80	33.3
	non-response	1	0.4
Age	Mean; Median; Range; IQR	55.0; 54.0; 21-90; 17	
Residence	Outside Nairobi	180	74.7
	Within Nairobi	61	25.3
Marital Status	Single	53	22.0
	Married	180	74.7
	Widowed	8	3.3
Employment Status	Unemployed	167	69.3
	Self-Employed	53	22.0
	Employed	21	8.7
Level of Education	Primary and below	96	39.8
	Secondary	114	47.3
	Tertiary	31	12.9
Presence of Comorbidity	No	150	62.2
	Yes	91	37.8
Number of Comorbidities	None	150	62.2
	One	82	34.0
	Two	8	3.3
	Three	1	0.4
Alcohol Consumption	No	237	98.3
	Yes	4	1.7

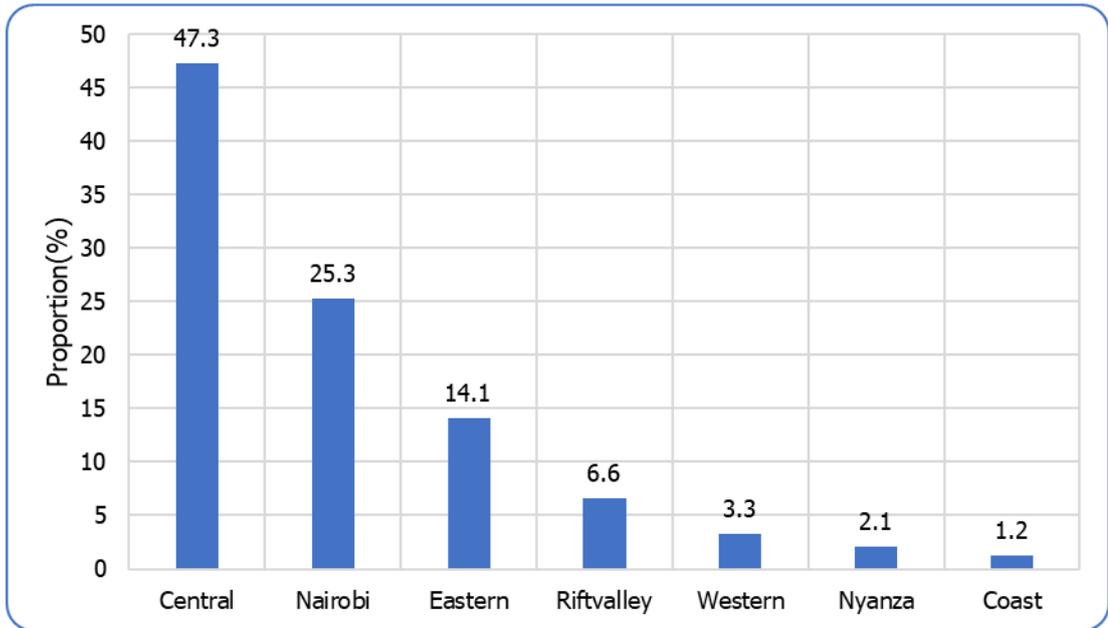


Figure 3: Distribution of respondents by region

4.3 Cancer related characteristics of the participants

Majority of the participants had breast cancer 79(32.8%), followed by cervical 36(14.9%), prostate 33(13.7%) and the remaining 93 participants had other cancer types as summarized in **Table 2**. Breast, cervical and prostate accounted for more than half of all the cancers. About 50(20.7%) cancer cases had not been staged and could not be categorized while the remaining 141 participants had their cancer staged. Nearly half were at the advanced stages as summarized in **Table 3**.

Table 2: Summary of the different cancer types among participants

Cancer Type	Frequency	Percent
1. Breast	79	32.8
2. Cervical	36	14.9
3. Prostrate	33	13.7
4. Colon	19	7.9
5. Nasopharyngeal	8	3.3
6. Endometrial	6	2.5
7. Lung	5	2.1
8. Oesopharyngeal	4	1.7
9. Multiple myeloma	3	1.2
10. Lymphoma	2	0.8
11. Leukemia	1	0.4
12. Hodgkin's lymphoma	1	0.4
13. Gastric	1	0.4
14. CLL	1	0.4
15. Anal	1	0.4
16. Osteogenic	1	0.4
17. Renal	1	0.4
18. Throat	1	0.4
19. Tongue	1	0.4
20. Others	37	15.4
Total	241	100

Table 3: Summary of the cancer stage among participants

Variable	Category	Frequency (N=241)	Percentage (%)
Cancer Stage	Stage I	17	7.1
	Stage II	54	22.4
	Stage III	73	30.3
	Stage IV	47	19.5
	Unknown/Un- staged	50	20.7

4.4 Utility of telemedicine

Twenty-seven (11.2%) participants had heard about telemedicine with only 2 (7.4%) of them having utilized telemedicine as a video consultation during the pre-COVID era. There was a statistically significant difference in the utilization of telemedicine before and during COVID-19 (**p=0.028**). There was an increase in the utilization of telemedicine in the COVID-19 period compared to before COVID-19 began. In addition, 19 (7.9%) participants made a phone call to the doctor during the COVID-19 period.

Majority of the respondents had fear of contracting COVID-19 while seeking medical care at the facility 146 (60.6%). With respect to other forms of therapy other than parenteral chemotherapy which all participants were on (N=241), 68 (28.2%) were on oral chemotherapy, 144 (59.8%) review and 7 (2.9%) had undergone a diagnostic test as shown in **Table 4**.

Table 4: Summary of telemedicine utility among participants and other characteristics

Heard about Telemedicine	No	214	88.8
	Yes	27	11.2
Utilize telemedicine before COVID (N=27)	No	25	92.6
	Yes	2	7.4
Made a phone call to the doctor during COVID	No	222	92.1
	Yes	19	7.9
Fear of Contracting COVID	No	95	39.4
	Yes	146	60.6
Other forms of therapy	Oral chemotherapy	68	28.2
Received	Review	144	59.8
	Diagnostic Test	7	2.9

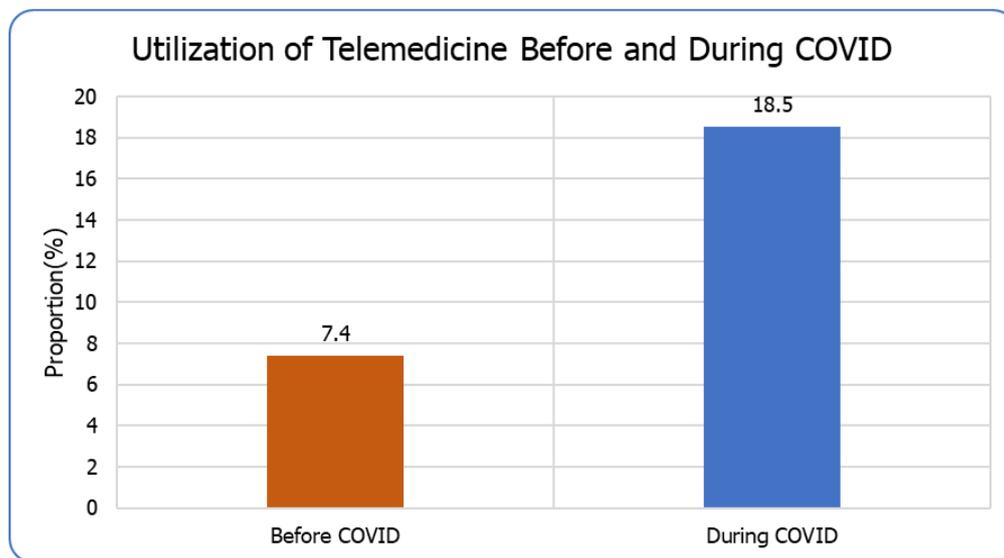


Figure 4: Utilization of telemedicine Before and during COVID 19; ($p=0.028$; Fisher's exact test)

4.5 Time Series of the chemotherapy attendance

Time series analysis of chemotherapy attendance was carried out and the attendances were plotted against the time periods (months) as shown in Figure 5. A regression line was fitted into the plot and a linear decrease in chemotherapy attendance was observed. The decrease seems to have started in the pre-COVID era (Jan-Dec 2019) and continued into the COVID-19 period (Jan-Dec 2020). The lowest plot Figure 5b showed that the rate of decline increased substantially after the Covid19 restrictions were put in place.

Notably, attendances of chemotherapy began increasing gradually after the sharp decline observed during COVID-19 restrictions, this occurred after the month of July when the restrictions were lifted but the attendance remained lower compared to similar months in the preceding year (2019).

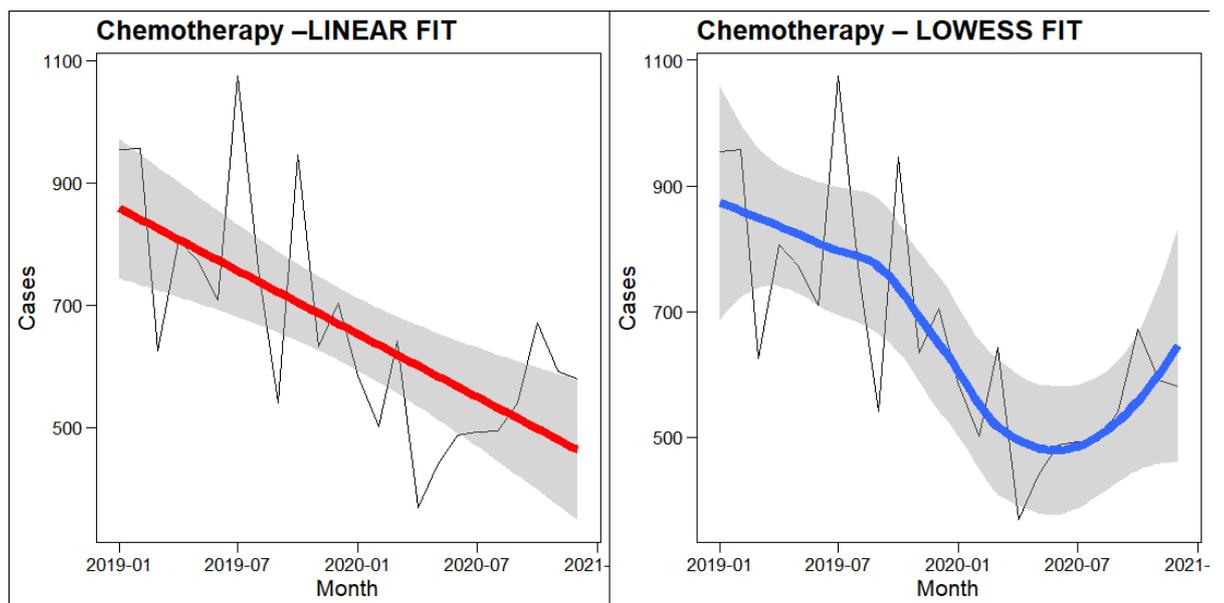


Figure 5: Attendance of KNH chemotherapy clinic, pre and during Covid19

Table 5: Trend in The Chemotherapy Attendance

Estimate	Total Cases		Chemotherapy		New Patients		Ongoing Patients	
	β (se)	p-value	β (se)	p-value	β (se)	p-value	β (se)	p-value
Intercept	1956.1(66.7)	<0.001	631.8(35.6)	<0.001	252.5(24.6)	<0.001	1703.3(52.7)	<0.001
Time	-49.9(11.1)	<0.001	-21.7(8.2)	0.016	0.5(4.1)	0.905	-45.7(8.8)	<0.001
Eventmarch2020	-1288.5(540.5)	0.027	-3570.1(1421.9)	0.022	-476.1(199.1)	0.027	-827.2(427.0)	0.067
Time*Event	130.1(59.6)	0.041	757.3(324.1)	0.031	50.8(22.0)	0.032	76.2(47.1)	0.121
(Time*Event) ²	-	-	-38.5(18.0)	0.046	-	-	-	-
Time ²	-	-	0.5(1.1)	0.625	-	-	-	-

Due to the non-linear characteristic of the graph, a quadratic model was fit for the attendance data as presented in Table 5. The time variable had a negative value of -21.7(Se 8.2) which confirmed the observation made that the attendance of chemotherapy declined over time by about 22 patients quarterly. At the time the Covid19 restrictions were implemented there was a sharp immediate drop in attendance which is shown by a significant beta coefficient.

4.6 Trends In The Out-Patient Attendance Before And During The Covid-19 Outbreak

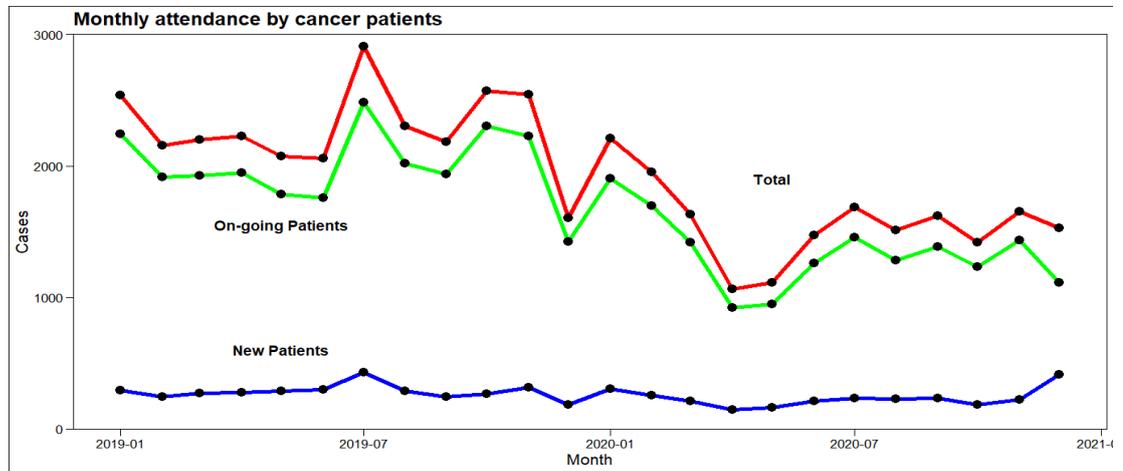


Figure 6: Trends In The Out-Patient Attendance Before And During The Covid-19 Outbreak

Figure 6 presents the time series graph of outpatient attendance by cancer patients. Three graphs are presented. These graphs include; Attendance by new patients, repeat attendance by on-going patients and total attendance

The graphs showed a strong seasonal pattern. Peak attendance generally occurred in the month of July and the lowest attendance was observed in December 2019. In the

months of January before the announcement of COVID-19 restrictions, attendance in January and February was notably less than attendance in the previous year. Reflecting the fact that from July the previous year there was a steady decline in repeat out-patient attendance even before the announcement of the COVID-19 restrictions. The decline persisted and reached its lowest point in April 2020, this applied to both new cases and repeat visits. After April the attendance improved reaching a peak in July and remained fairly constant until the end of the year. However, it was very clear that after the month of April the attendance was far less compared to similar months in the previous year. With regard to new patients, there was little seasonal variability with almost constant monthly attendance throughout the year. New patient attendance peaked in December 2020.

4.6.1 Trend in the Out-Patient Attendance

Owing to the fact that the total attendance and the attendance by on-going patients nearly mirrored each other. Trend-line was only fitted for the Total attendance.

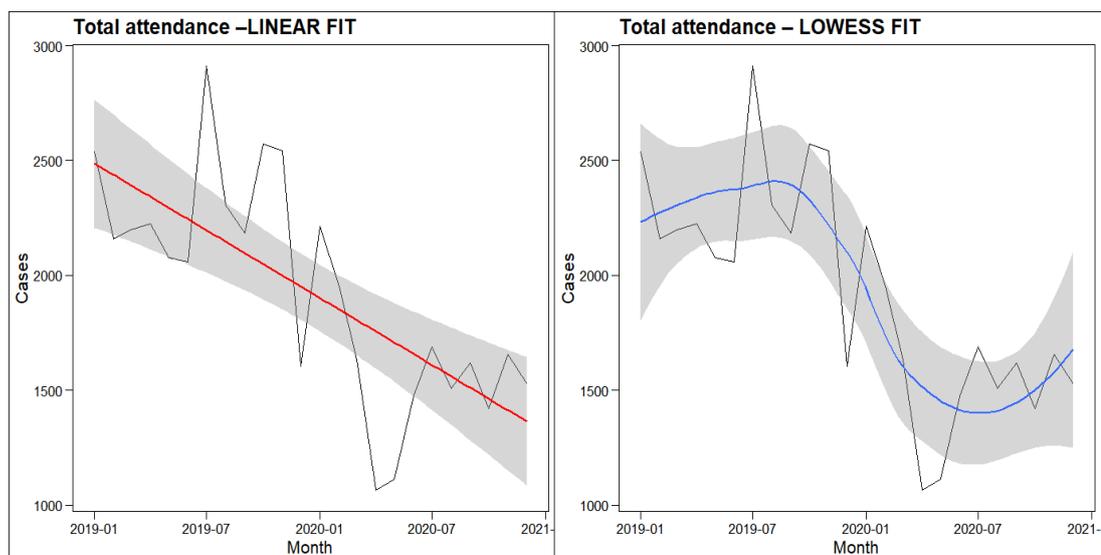


Figure 7: Trend in the Out-Patient attendance

The interaction term of the out-patient attendance ($p=0.041$) was statistically significant and this showed that the mean attendances were decreasing over time with a distinctively change point in June 2020. The out-patient attendance is an aggregate of new and old patients' attendance. For old patients, the $p=0.121$ was statistically insignificant as presented in Table 5.

4.6.2 Trend in Attendance of New Cancer Patients

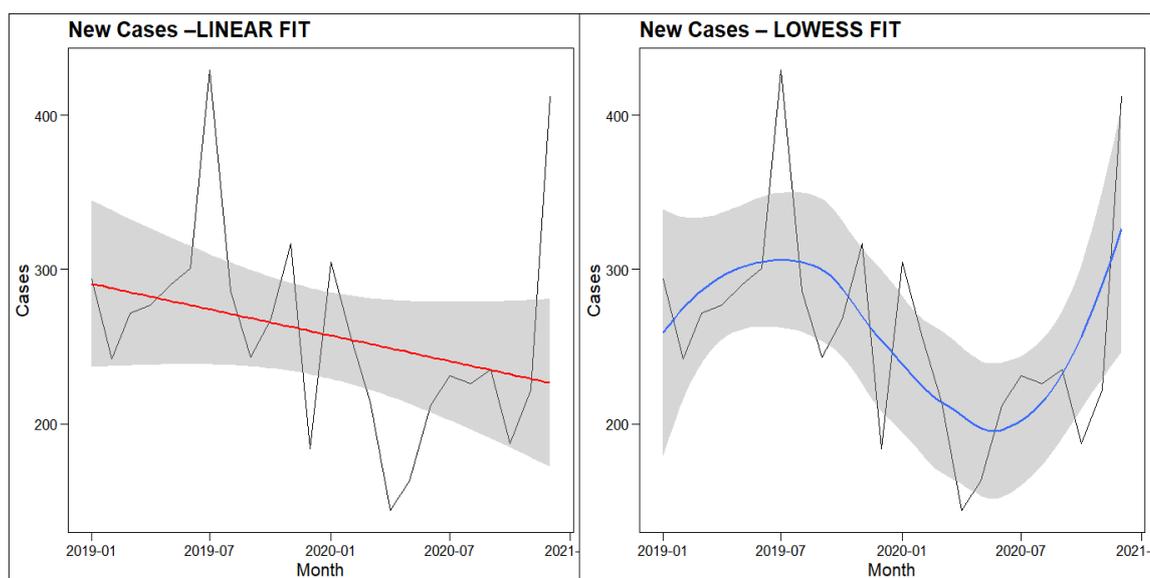


Figure 8: Trend in attendance of new cancer patients

According to the interaction term $p=0.032$ for the linear equation of new patients, it was found to be statistically significant and change point occurred in June. Although the mean attendances were decreasing, there was an overall increase in the number of new patients as shown in figure 8. The graph showed little seasonal variability.

4.7 Chemotherapy appointments and the initiation period

Two hundred and five (85.1%) study participants had their chemotherapy started before Covid-19 began and 36 (14.9%) were put on chemotherapy during the tight Covid-19 restrictions. Most of the participants 154 (63.9%) had been scheduled for 3-7 chemotherapy appointments when Covid-19 began in March 2020. Notably, thirty-six (14.9%) participants had missed at least one appointment depicting the prevalence of missed appointments while 205 (85.1%) did not miss a single appointment during the tight Covid-19 restrictions. Thirty-one (86.1%) participants out of the thirty-six who missed at least one appointment just skipped the appointment and waited until the lockdown was lifted while 4 (11.1%) received therapy from a nearby facility, and 1 (2.8%) participant was referred to a different health facility for assistance. For those on oral chemotherapy, 5 (7.4%) had no medicines and they just skipped their appointment, twenty-one (30.9%) bought from a chemist while more than half had large amounts of stock that they used during the lock-down period.

Table 6: Summary of missed chemotherapy appointments and the initiation period

Chemotherapy Initiation	Before Covid Restrictions	19	205	85.1
	During Covid Restrictions	19	36	14.9
Scheduled Chemo Appointments	3-7		154	63.9
	8-12		75	31.1
	13-17		12	5.0
Missed Appointments During Covid 19	No		205	85.1
	Yes		36	14.9
Arrangement for the Missed Visit (N=36)	Just Skipped and waited		31	86.1
	Received from a nearby Facility		4	11.1
	Referral		1	2.8
Arrangement for the Medication Refill (N=68)	Just Skipped and Waited		5	7.4
	Had significant stock		42	61.8
	Bought at a local Chemist		21	30.9

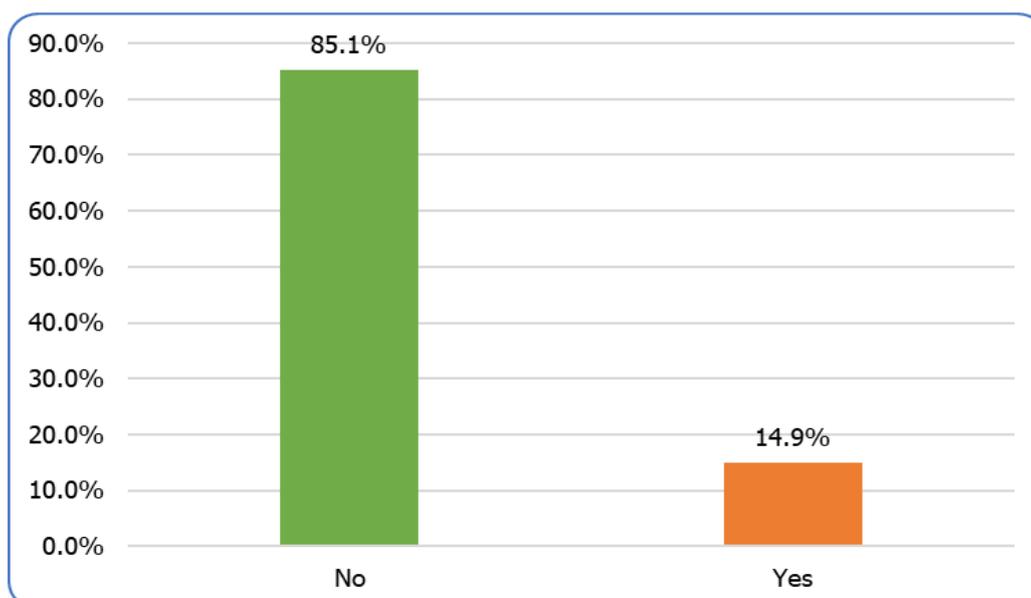


Figure 9: Missed appointment during Covid-19

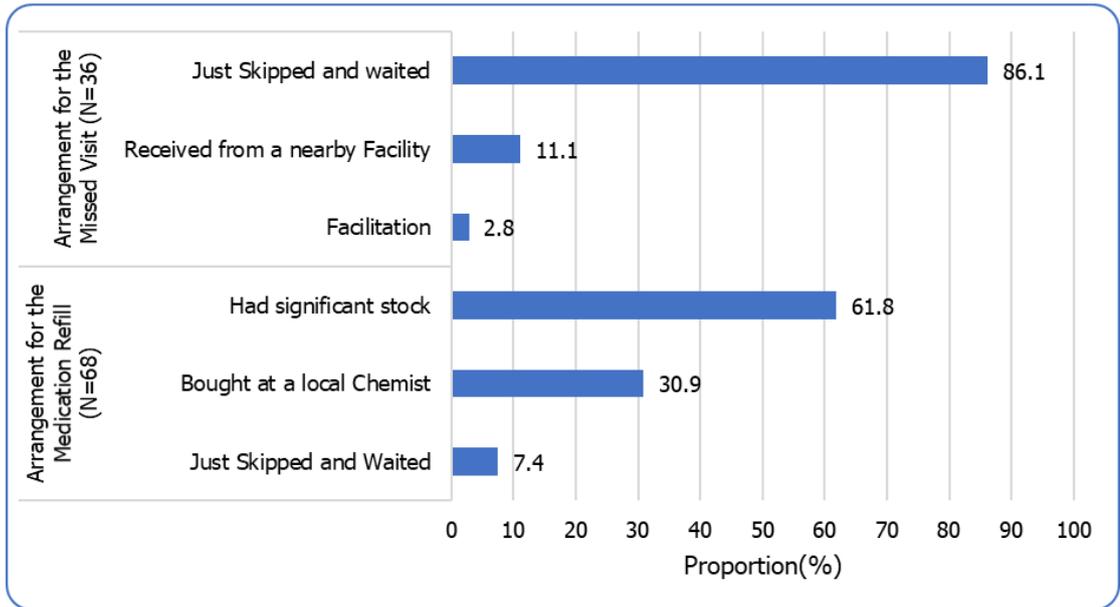


Figure 10: Arrangement for missed appointment

4.8 Challenges Encountered During and Before COVID 19

It is noteworthy that before Covid-19 began, more participants reported that they had not encountered a challenge while accessing chemotherapy services 55 (22.8%). Few participants 10 (4.1%) reported that they had not encountered any challenge. As shown in **Table 7**, many of the challenges that were encountered by participants were more prominent in the Covid-19 period than in the pre-Covid period and this is supported by the increase in numbers of the participants.

Table 7: Challenges Encountered During and Before COVID 19

Challenges	During COVID n(%)	Before COVID n(%)	p-Value
Loss of income	202(83.8%)	148(61.4%)	<0.001
Hike in fares	165(68.5%)	14(5.8%)	<0.001
Poor clinical outcomes vs Health workers strike	123(51.0%)	16(6.6%)	<0.001
Long waiting time	120(49.8%)	53(22.0%)	<0.001
Living out of Nairobi	112(46.5%)	57(23.7%)	<0.001
Rescheduled appointments	25(10.4%)	11(4.6%)	0.003
Others	24(10.0%)	18(7.5%)	0.377
None	10(4.1%)	55(22.8%)	<0.001
Difficulty getting an appointment	7(2.9%)	5(2.1%)	0.754

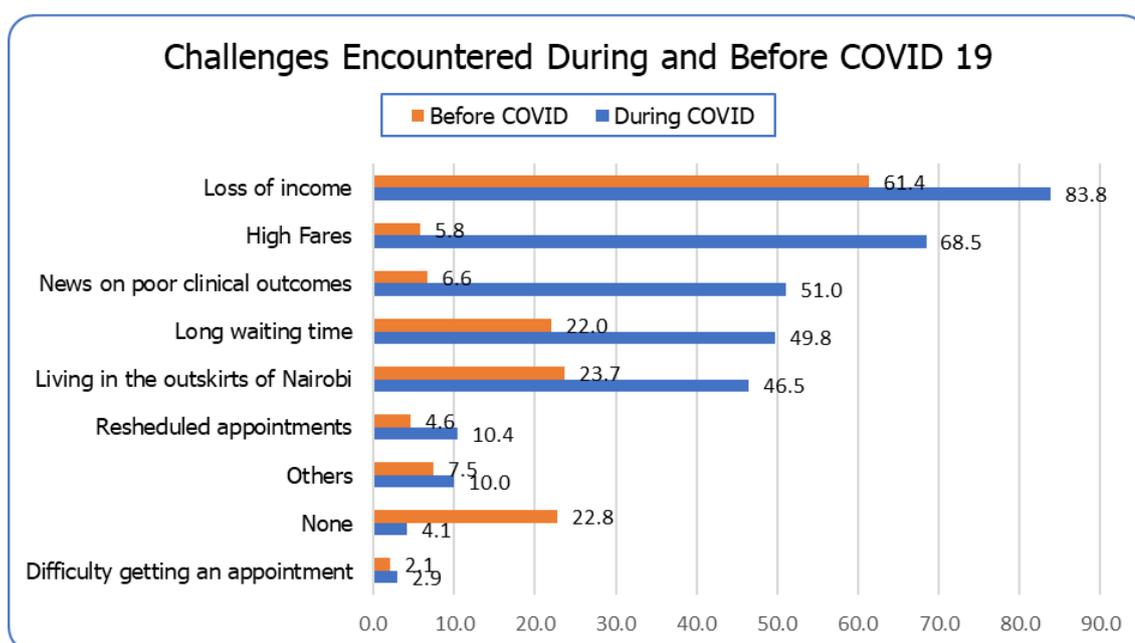


Figure 11: Challenges Encountered During and Before COVID 19

4.9 Medication availability and change in drug price

Before the inception of Covid-19, majority of the participants reported that medicines were readily available with only 1 (0.4%) participant having reported that they had poor access to medicines. A similar phenomenon was observed during the Covid-19 period with 8 (3.3%) participants having reported that they were hardly available. Figure 12 illustrates the effect of Covid19 on drug price.

Table 8: Medication availability

Medication Availability	Before COVID	During COVID	p-value
Always	40(16.6%)	25(10.4%)	<0.001
Most of the Time	87(36.1%)	61(25.3%)	
Sometimes	113(46.9%)	147(61.0%)	
Hardly Ever	1(0.4%)	8(3.3%)	

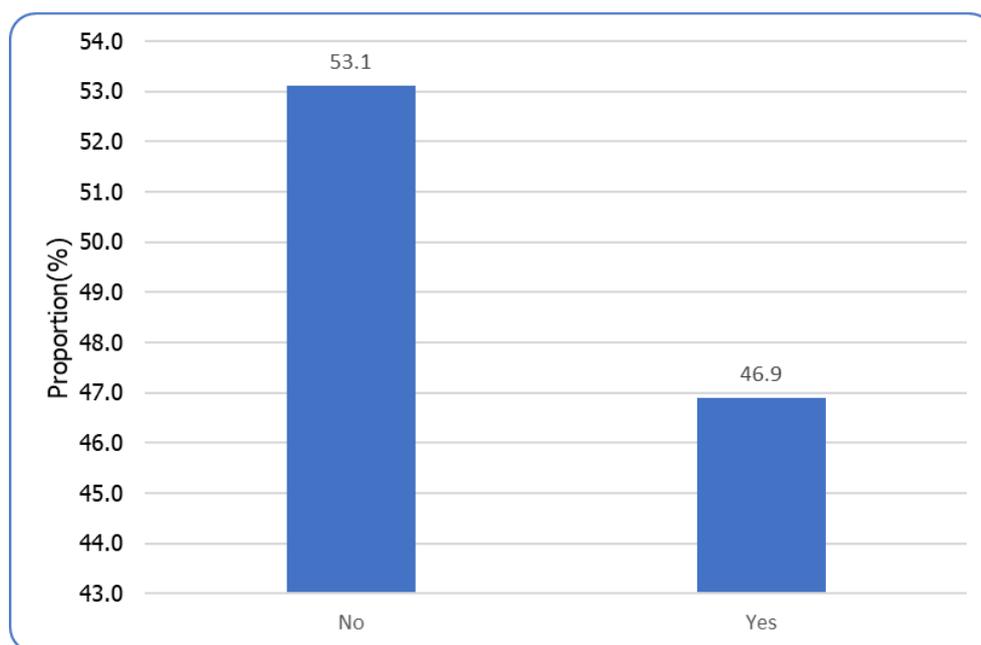


Figure 12: Change in drug price since the inception of COVID

4.10 Bivariate analysis for factors associated with missed appointments

Table 9: Challenges associated with missed appointments during COVID-19

Challenges During COVID	Category	Missed Appointments		O.R(95% C.I.)	p-value
		No	Yes		
Hike in fares	No	72(94.7%)	4(5.3%)	Ref.	
	Yes	133(80.6%)	32(19.4%)	4.33(1.47; 12.73)	0.008
Long waiting time	No	106(87.6%)	15(12.4%)	Ref.	
	Yes	99(82.5%)	21(17.5%)	1.50(0.73; 3.07)	0.268
Rescheduled appointments	No	191(88.4%)	25(11.6%)	Ref.	
	Yes	14(56.0%)	11(44.0%)	6.00(2.46; 14.66)	<0.001
Difficulty getting an appointment	No	203(86.8%)	31(13.2%)	Ref.	
	Yes	2(28.6%)	5(71.4%)	16.37(3.04; 88.09)	0.001
Living in the outskirts of Nairobi	No	117(90.7%)	12(9.3%)	Ref.	
	Yes	88(78.6%)	24(21.4%)	2.66(1.26; 5.61)	0.010
News on poor clinical outcomes	No	98(83.1%)	20(16.9%)	Ref.	
	Yes	107(87.0%)	16(13.0%)	0.73(0.36; 1.49)	0.392
Loss of income	No	32(82.1%)	7(17.9%)	Ref.	
	Yes	173(85.6%)	29(14.4%)	0.77(0.31; 1.90)	0.565
Others	No	187(86.2%)	30(13.8%)	Ref.	
	Yes	18(75.0%)	6(25.0%)	2.08(0.76; 5.65)	0.152
None	No	195(84.4%)	36(15.6%)	Ref.	
	Yes	10(100.0%)	0(0.0%)	0.00(0.00;0.00)	0.999

The variables that were positively associated with missed appointments were hike in fares, rescheduled appointments, difficulty in getting an appointment and living out of Nairobi whereas the other challenges did not have any statistically significant associations as summarized in Table 9.

4.11 Association between Socio-demographic characteristics and missed appointments

Participants who were married were 3.55 times likely to miss an appointment as compared to their single counterparts(**p=0.043**). Similarly, participants who made a call to the doctor were 2.95 times likely to miss an appointment than those who did not call(**p=0.041**).

Table 10: Socio-demographic traits associated with missed appointments

Variable	Category	Missed Appointments		O.R[95% C.I.]	p-value
		No	Yes		
Gender	Male	67(87.0%)	10(13.0%)	Ref.	
	Female	138(84.1%)	26(15.9%)	1.26(0.58; 2.77)	0.561
Age	20-35 Years	15(83.3%)	3(16.7%)	Ref.	
	36-50 Years	57(86.4%)	9(13.6%)	0.79(0.19; 3.28)	0.745
	51-60 Years	63(82.9%)	13(17.1%)	1.03(0.26; 4.08)	0.964
	60+ Years	70(87.5%)	10(12.5%)	0.71(0.18; 2.91)	0.639
Residence	Outside Nairobi	149(82.8%)	31(17.2%)	Ref.	
	Within Nairobi	56(91.8%)	5(8.2%)	0.43(0.16; 1.16)	0.095
Marital Status	Single	50(94.3%)	3(5.7%)	Ref.	
	Married/Ever Married	155(82.4%)	33(17.6%)	3.55(1.04; 12.07)	0.043
Employment Status	Unemployed	145(86.8%)	22(13.2%)	Ref.	
	Self-Employed	41(77.4%)	12(22.6%)	1.93(0.88; 4.23)	0.101
	Employed	19(90.5%)	2(9.5%)	0.69(0.15; 3.19)	0.638
Level of Education	Primary and below	77(80.2%)	19(19.8%)	Ref.	
	Secondary	99(86.8%)	15(13.2%)	0.61(0.29; 1.29)	0.196
	Tertiary	29(93.5%)	2(6.5%)	0.28(0.06; 1.28)	0.100
Comorbidity	No	132(88.0%)	18(12.0%)	Ref.	
	Yes	73(80.2%)	18(19.8%)	1.81(0.89; 3.69)	0.104
Alcohol Consumption	No	205(86.5%)	32(13.5%)	Ref.	
	Yes	0(0.0%)	4(100.0%)	UD	0.999
Cancer Stage	Stage I	14(82.4%)	3(17.6%)	Ref.	
	Stage II	43(79.6%)	11(20.4%)	1.19(0.29; 4.90)	0.806
	Stage III	66(90.4%)	7(9.6%)	0.49(0.11; 2.15)	0.348
	Stage IV	39(83.0%)	8(17.0%)	0.96(0.22; 4.12)	0.953
	Unknown/Un-staged	43(86.0%)	7(14.0%)	0.76(0.17; 3.34)	0.716
Chemotherapy initiation	Before Covid 19	173(84.4%)	32(15.6%)	Ref.	
	During Covid 19	32(88.9%)	4(11.1%)	0.68(0.22; 2.04)	0.487
Scheduled chemo appointments	3-7	135(87.7%)	19(12.3%)	Ref.	
	8-12	60(80.0%)	15(20.0%)	1.78(0.85; 3.73)	0.129
	13-17	10(83.3%)	2(16.7%)	1.42(0.29; 6.98)	0.665
Heard telemedicine	No	183(85.5%)	31(14.5%)	Ref.	
	Yes	22(81.5%)	5(18.5%)	1.34(0.47; 3.81)	0.581
Call to the doctor during COVID	No	192(86.5%)	30(13.5%)	Ref.	
	Yes	13(68.4%)	6(31.6%)	2.95(1.04; 8.37)	0.041
Fear of contracting COVID	No	85(89.5%)	10(10.5%)	Ref.	
	Yes	120(82.2%)	26(17.8%)	1.84(0.84; 4.02)	0.125

4.12 Multivariable analysis for predictors of Missed chemotherapy appointments

Logistic regression was done to establish the independent predictors of missed chemotherapy appointments.

Marital status was an independent predictor of missed chemotherapy appointments (AOR 6.31, (95%CI: 1.36,29.23; **p=0.019**). Participants who were married were 6.31 times more likely to miss an appointment as compared to their single counterparts.

Comorbidity was an independent predictor of missed chemotherapy appointments (AOR 2.46, (95%CI: 1.05, 5.75; **p=0.038**). Participants who had a comorbidity were 2.46 times more likely to miss an appointment as compared to those that had none which was statistically significant.

Hike in fares was also found to be an independent predictor of missed chemotherapy appointments (AOR 4.56, (95%CI: 1.35,15.47; **p=0.015**). Participants who experienced the hike in fares were 4.56 times more likely to miss an appointment.

Rescheduled appointments were found to be an independent predictor of missed chemotherapy appointments (AOR 7.84, (95%CI: 2.66, 23.08; **p<0.001**). Participants who had their appointments rescheduled were 7.84 times more likely to miss an appointment as compared to those that did not reschedule.

Difficulty getting an appointment was an independent predictor of missed chemotherapy appointments (AOR 31.50, (95%CI: 4.32, 229.70; **p=0.001**). Participants who had difficulty getting an appointment were 31.50 times more likely to miss an appointment and this finding was statistically significant as summarized in **Table 11**.

Table 11: Multivariate logistic regression analysis

Variable	Category	A.O.R.	95% C.I.		p-value
			Lower	Upper	
Marital Status	Single	Ref.			
	Married	6.31	1.36	29.23	0.019
Comorbidity	No	Ref.			
	Yes	2.46	1.05	5.75	0.038
Hike in fares	No	Ref.			
	Yes	4.56	1.35	15.47	0.015
Rescheduled appointments	No	Ref.			
	Yes	7.84	2.66	23.08	<0.001
Difficulty getting an appointment	No	Ref.			
	Yes	31.50	4.32	229.70	0.001

AOR-Adjusted Odds Ratio, C.I.-Confidence Interval

CHAPTER FIVE: DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

5.0 INTRODUCTION

This chapter discusses the key findings of the study. It is divided into three key areas which include discussion, conclusion, and recommendations.

5.1 DISCUSSION

We conducted this study to determine the impact of the restrictions put in place during the onset of Covid19 pandemic on outpatient attendance by cancer patients along with utilization of chemotherapy services. The utilization trends of scheduled chemotherapy services reduced substantially in 2020 compared with the corresponding time period in 2019. The decline was more marked in April to June 2020 and this could be attributed to the lockdown measures that were enacted by the government (15). A study done in Morocco aligns with our finding on the utilization of chemotherapy services, the study reported that the ambulatory chemotherapy sessions decreased significantly in 2020 compared to 2019. This decline was distinct in the month of April 2020 whereby there was a reduction of about 37% of the chemotherapy visits against March 2020(43). Additionally, several studies echo these findings by demonstrating that the ambulatory chemotherapy visits were affected in 2020 since the inception of the pandemic, more so in the month of April through to June 2020, an observation that was linked to the enactment and implementation of Covid19 containment measures(44,45).

Additionally, fear of exposure to Covid-19, reorganization of health resources by facilities which further limited patients' visits and economic barriers affected the attendance of patients for chemotherapy appointments(46,47). In our study we observed a significant proportion of the respondents had fear of contracting Covid19 although the fear did not deter them from seeking chemotherapy services contrary to the aforementioned studies. Several studies have shown that fear of exposure to a disease can counter the efforts made towards combating the public health concern(48). Health care providers should be tasked with the responsibility of providing clear and essential information to patients with an objective of minimizing anxiety and distress. It is also crucial that the information relayed to the public should only be from legitimate sources such as the government and this should be done in real time. In addition, the media should be guided by health officials on responsible journalism that

upholds the health of the people so as to safeguard against sensationalizing the public health concern which may induce more fear and distress.

According to a study done in China, patients with cancer are at a higher risk of contracting Covid19 with severe events(13), this finding prompted many jurisdictions to minimize in-person facility visits by cancer patients without compromising their cancer care. As a result, telemedicine was adapted to somewhat circumvent the problem while optimizing cancer care delivery(46). In our study, telemedicine was not widely adopted though a few patients were able to utilize it by making a call to their attending physician. Interestingly, telemedicine was found to have been utilized more in the pandemic period compared to before Covid-19 began, and this was done mostly via a telephone call as compared to a video consultation. Patients who made the telephone call were likely to miss a scheduled appointment and this qualifies the utility of telemedicine in cancer care delivery where an appropriate consultation can be done without compromising the intended therapeutic response. The potential value of telemedicine was demonstrated clearly by a study done in Australia, the benefits include; reduced exposure risk to Covid-19, reduced treatment costs and timely access to cancer care services by patients(47). The finding of this study on telemedicine use sets the pace for its application in practice. The unexpected characteristics of Covid-19 virus have disadvantaged persons who are immunocompromised particularly cancer patients(13), person to person contact has greatly reduced by the implementation of certain mitigation strategies such as social distancing and limited in-person hospital visits. These strategies have favored the adoption and implementation of telemedicine in bridging the gap between patients and healthcare providers more so in the vulnerable groups who are at increased risk of contracting Covid-19. However, the application of telemedicine to patients based on their vulnerability should be done on a case to case basis because there are no studies to support its applicability in all patients.

Before Covid-19 began the attendance was already on a decline and this showed that any decline in attendance that occurred after the COVID-19 restrictions could not be only attributed to the COVID-19 outbreak. The decrease could be hypothesized to be from the death of patients who were still on treatment, remission of the disease upon completion of therapy and treatment delays. Treatment delays are a consequence of uncommunicated day-of-treatment order changes, laboratory testing processes,

discrepancies in the care plan, delay of orders by physicians and also the lack of a health cover to cater for the treatment expenditure(49).

We found that about 14.9% of patients missed at least one scheduled appointment between March 2020 to December 2020 when the Covid-19 restrictions were in place. Our findings with regard to prevalence of missed chemo appointments is similar to a study done by Abdul et al on 365 health centers from 54 countries; about half of these centers reported that more than 10% of their patients missed at least one session. This figure is consistent with the prevalence of our study where 14.9% of the participants missed chemotherapy sessions(50). From the perspective of a clinician, missed chemotherapy sessions has dire consequences on treatment outcomes. This leads to disease progression leading to higher morbidity and mortality. Longer initiation time for adjuvant chemotherapy in colorectal cancer has been associated with an overall decrease in the survival(51). As demonstrated by Sud et al, a 6-month delay in surgery of certain solid tumors resulted in a significant proportion of deaths attributable to delay during the pandemic period. The study further reported that the delay could lead to disease progression to more advanced disease with increased cost in managing the disease either through surgery or chemotherapy(52). This finding gives us insights on how delay of treatment in cancer patients during the pandemic could eventually lead to poor clinical outcomes as seen with the excess deaths attributable to surgery delay. Given that a significant proportion missed a chemotherapy session it was critical to examine measures that patients took to mitigate the effects of missed appointments as well as reasons for absconding treatment. The main reasons for missed visits included, hike in fares, rescheduled appointments, living out of Nairobi and difficulty in getting an appointment. In Kenya, the implementation of the Covid-19 containment strategy affected the public transport system. Measures such as curfew, social distancing and travel ban from rural areas and other counties to the Nairobi county which harbors most of the cancer care facilities resulted in hike in fares enacted by the transport sector(15). As a result, the travel restrictions that were put in place by the government greatly hampered movement of cancer patients from their residence to the health facility for their chemotherapy appointments. Hike in fares was found to be an independent predictor of missed chemotherapy appointments in this study with an odds ratio of 4.56. Patients who experienced hike in fares and were unable to pay for the transport, they were likely to miss the appointment thus negatively impacting on timely access to cancer care. Likewise, the locality of the patient's physical residence was of

importance when the restrictions were implemented; the capital city Nairobi was on a total lockdown. This is corroborated by the findings of our study, where living out of Nairobi was associated with missed chemotherapy visits. A significant proportion of respondents (74.6%) lived out of Nairobi and this had implications with regard to access to cancer care. Consistent with our study, several studies reported that difficulty in travelling lead to reduction in attendance visits by patients with cancer(46,40). Rescheduling of appointments and difficulty in getting an appointment were associated with missed chemotherapy sessions and upon adjusting for confounders, they were still found to be independent predictors of missed chemotherapy sessions with an adjusted odds ratio of 7.84 and 31.5 respectively. The reorganization in the healthcare system in response to Covid-19 specifically cancer care led to disruptions in its delivery. In order to adhere to the laid down rules and regulations as per the Covid19 protocol, several adjustments were made in cancer care facilities and they included; rescheduling, delaying, and postponing of appointments all of which delayed timely access to cancer care(43,47). Although this finding highlights the implications of rescheduling or difficulty in getting an appointment, it does not put into perspective the magnitude of these adjustments on the general well-being of cancer patients in the long term. Hike in fares, rescheduled appointments, living out of Nairobi and difficulty in getting an appointment are all intertwined and have significant implications for practice in terms of timely access to cancer care. These limitations have a common denominator which is accessibility of cancer services and they can be averted by availing cancer care facilities close to the people especially those that are in the rural areas. In the event of a pandemic, appropriate strategies should be formulated and implemented without affecting the delivery of any health service.

Comorbidity was reported to be an independent predictor of missed chemotherapy appointments with an adjusted odds ratio of 2.46. The presence of a comorbidity or multi-comorbidity may influence the utilization of chemotherapy, concerns of increased toxicity, frailty and treatment delays have impacted negatively on the use of chemotherapy(53). There is paucity of information on the influence of comorbidity on chemotherapy use but few studies have hypothesized its presence with decreased chemotherapy use(54). The segregation of cancer services and other health services that are rendered to cancer patients who have comorbidities may hamper the holistic delivery of cancer care. Patients could benefit from a one stop health care delivery point at the cancer treatment center that takes into consideration the other health needs

of the cancer patients. Also, a prompt feedback mechanism can be designed to address any concerns raised by the cancer patients, either on the side effects of the medications prescribed or the diagnoses made and this qualifies the applicability of telemedicine as an intervention.

Multivariate analysis further revealed that marital status was an independent predictor of missed chemotherapy sessions with an adjusted odds ratio of 6.31. Respondents who were married were more likely to miss chemotherapy appointments compared to non-married individuals. Married people are presumed to lead an organized and planned life and this induces a healthier lifestyle. This finding is contrary to other studies which associate married people with good health seeking behaviors(16), however, a probable cause could be the aversion to contracting Covid-19 by married couples compounded with the risk of infecting their partner particularly when visiting the health facility.

5.2 STUDY LIMITATIONS

This study is not without limitations. First, the study was conducted in a single institution thus limiting the generalizability of results to other health institutions.

Second, the study only focused on one form of cancer treatment and did not include all the other modalities of cancer treatment. Therefore, the findings of this study can only be applied to those on chemotherapy.

5.3 STRENGTHS

The high-quality data on chemotherapy attendances from the health records department enabled us to evaluate utilization trends of chemotherapy attendances for the year 2019 and 2020.

5.4 CONCLUSION

Covid-19 pandemic impacted negatively on the utilization of chemotherapy service based on the substantial reduction in chemotherapy attendances in the year 2020 as compared to 2019. In light of these findings, policy makers could develop interventions geared towards mitigating the effects of the pandemic on cancer care delivery with special consideration on the long-term implications of the pandemic on the clinical outcomes of cancer patients.

5.5 RECOMMENDATIONS

5.5.1 Recommendations for policy and practice

Based on the findings of our study, the distance of the cancer facility in relation to the patient's physical residence impacted negatively on access to cancer care. Moreover, cancer treatment facilities are more concentrated in urban areas compared to rural areas. Decentralization of these cancer facilities particularly to the county referral hospitals would impact positively on the accessibility of cancer care, and also reduce the economic burden that is associated with the delivery of cancer care.

It is evident that telemedicine is revolutionizing the delivery of cancer care to patients by providing prompt feedback to both patients and healthcare providers. With the advent of Covid-19, telemedicine has helped bridge the gap brought about by the precautionary measures implemented against the pandemic. Of note, it has minimized the exposure risk to Covid-19, reduced treatment costs significantly and has allowed for timely access to services by patients. Moreover, accessibility to cancer care has increased significantly(47), therefore, telemedicine should be adopted in the delivery of cancer care but proper mechanisms should be put in place so as to safeguard the quality of care and also the interaction between provider and patients. In addition, patients booked for the telemedicine consultations should be evaluated on a case to case basis.

With the uncertainties' brought about by Covid-19 pandemic, appropriate modifications that still optimized the different modalities of cancer treatment could have reduced the frequency of visits to cancer care facilities without any interruption to medical care. In the case of chemotherapy, adjusting of dosing schedules or replacing intravenous drugs such as fluorouracil with an oral alternative like capecitabine could reduce hospital visits whilst protecting cancer patients from the dangers of Covid19 as they are a high-risk group. However, these modifications should be applied on a case by case basis and the drug substitution should be done with caution so as not to compromise the anticipated therapeutic response. Additionally, reorganization of healthcare resources such as the delivery of other health services alongside cancer care under the same roof would benefit patients who have

comorbidities' hence enhancing adherence to treatment for both cancer and the comorbid.

In the event of a public health problem like Covid-19 pandemic in this context, efforts should be directed towards ensuring that the general wellbeing of individuals is prioritized. Several studies have highlighted how fear and anxiety affected cancer patients to the extent that many were afraid to attend their appointments. Therefore, psychosocial support should be integrated and intensified in the management of cancer patients in the event of a public health emergency that might impact on them negatively. Furthermore, the public should be educated through public health campaigns and this can be incorporated in the mitigation strategies.

5.5.2 Recommendations for future research work

Future research work should be directed towards determining the utilization trends of the other modalities of cancer treatment and the reasons for the decrease in the utilization patterns for those modalities in the Covid-19 era.

Finally, we did not examine the implications of missed chemotherapy appointments on patients' oncological outcomes, therefore, this can form basis for future research work.

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APPENDICES

Appendix 1A: Eligibility Checklist

INCLUSION CRITERIA

The following 4 boxes must be ticked YES for the participant to be included in the study.

	YES	NO	
Age 18 years and above	<input type="checkbox"/>	<input type="checkbox"/>	
Participants on ongoing cancer chemotherapy before the COVID-19 pandemic	<input type="checkbox"/>	<input type="checkbox"/>	
Participants attended to at the out-patient clinic	<input type="checkbox"/>	<input type="checkbox"/>	
Those that will give consent to take part in the study	<input type="checkbox"/>	<input type="checkbox"/>	

EXCLUSION CRITERIA

The following 3 boxes must be ticked NO for the participant to be included in the study.

	YES	NO	
Participants on other forms of cancer treatment	<input type="checkbox"/>	<input type="checkbox"/>	
Participants who will decline to give consent to take part in the study	<input type="checkbox"/>	<input type="checkbox"/>	
All hospitalized patients	<input type="checkbox"/>	<input type="checkbox"/>	

If inclusion and exclusion criteria is met proceed to data collection form.

Appendix 1B: Consent Form

Title of the study: Impact of COVID-19 pandemic on the utilization of chemotherapy services by patients attending Kenyatta national hospital, oncology clinic

Institution: University of Nairobi, Department of Pharmaceutics and Pharmacy

Practice Principal Investigator: Dr. Irene Mumbi Njungé

Supervisors:

1. **Dr. Sylvia Opanga.**
2. **Prof. Faith Okalebo.**

Department of Pharmaceutics and Pharmacy Practice,

University of Nairobi, P.O. BOX 30197-00400, Nairobi.

Introduction

My name is Dr. Irene Mumbi Njungé, a student at the University of Nairobi, pursuing Master of Pharmacy in Clinical Pharmacy. The purpose of this consent form is to provide you with detailed information that will help you decide whether or not to be a participant in the study. I would like to invite you to participate in a study on the Impact of COVID-19 on the utilization of chemotherapy services by patients. With your permission, I will ask you questions on personal information and those that are related to the study objectives. This will take about 10 minutes of your time. If you decide to participate, I request you to sign your name on this form. If you have any additional questions now or later, please do not hesitate to ask. You will receive a copy of this form for your records.

Voluntary Participation

Your participation in this research is entirely voluntary. All the services you receive at this health facility will continue and nothing will change regardless of whether you chose to take part in this study or not. If you choose not to participate in this study, you will continue with your routine follow-up and treatment. If you may want to withdraw from the study, no injustice or loss of benefit will be administered to you.

Purpose of the study

The study seeks to assess the on-going effects of Covid-19 pandemic on ease of accessing chemotherapy services. The participants in this research study will be asked questions about how the status of chemotherapy service accessibility was before Covid-19 begun and during Covid-19 pandemic. There will be approximately 293

participants in this study and they will be randomly chosen. Therefore, we are asking for your consent to consider participating in this study.

What will happen if you decide to be in this study?

If you agree to participate in this study, the following activities will take place. A trained research investigator will administer a questionnaire to you through an interview. This will be conducted in a designated private area where you feel comfortable answering the questions. The interview will last approximately 15 minutes of your time. The area of interest in this study will cover certain elements such as your county of residence, challenges that you encountered while accessing chemotherapy service before Covid-19 begun and when it's still ongoing etc.

Risks

Due to the apparent risk of loss of privacy and confidentiality, the data collected will be password protected and only accessible to the principal investigator. The data will not be accessible to anyone else. Additionally, unique identifiers will be used to protect patient details. There will be minimal risks to the respondents as the procedures are non-invasive thus no harm or injury will be experienced.

Benefits

There is no monetary benefit in participating in this study, however, in the course of the interview a problem may be identified such as a treatment-related problem, financial assistance or need for material assistance and this will be resolved by initiation of a proper referral system to the social worker for further assessment. The long-term benefits of this study are inevitable. The information that you will provide us with in this study will assist in forecasting of chemotherapy needs in the event of a pandemic, hence optimize chemotherapy uptake among patients. Also, the information will add to existing literature as the world is still grappling with the ramifications of Covid-19 pandemic.

Confidentiality

Information that will be collected from this research project will be kept confidential and stored under lock and key. Any electronic information will be password protected. All the information obtained will only be restricted to the access of the researcher. Serial numbers will be used instead of the participants' name.

What if you want to ask any questions?

In case you have any questions or clarifications regarding the research, please get in touch with any of the following using the contacts given;

1. Dr. Irene Mumbi Njungé, P.O. BOX 230-00209, LOITOKTOK.
Tel: 0725469859
Email: renenju86@gmail.com
2. Lead Supervisor: Dr. Sylvia Opanga.
Department of Pharmaceutics and Pharmacy Practice,
University of Nairobi, P.O. BOX 30197-00400, Nairobi.
3. The Chairperson, KNH-UoN ERC Committee, P.O BOX 20723-00100,
Nairobi. Tel: 2726300/2716450 Ext 44102. Email: uonknh-erc@uonbi.ac.ke

If in agreement, kindly sign the participants consent form below;

CONSENT TO PARTICIPATE IN THE STUDY.

I have read and also been explained to the information in this consent form and I have fully understood it. The study objectives, processes, risks and benefits have been explained to me. My questions and concerns have been addressed. I understand that my participation is voluntary and I can withdraw from the study any time without injustice or loss of any benefit. I also know that all efforts will be made to keep information regarding my personal identity confidential.

Name of participant.....Date.....

Signature of participant.....

Researcher statement

I confirm that I have explained the details of the research to the participant and that he/she has understood.

Name of researcher.....Date.....

Signature of researcher.....

Appendix 1C: Maelezo kuhusu kushiriki katika utafiti

Kichwa cha utafiti:

Athari ya janga la COVID-19 juu ya utumiaji wa huduma ya dawa za saratani kwa wagonjwa wanaohudhuria hospitali ya kitaifa ya Kenyatta, kliniki ya saratani

Taasisi: Chuo Kikuu cha Nairobi, Idara ya mazoezi ya Famasia

Mchunguzi Mkuu: Dk Irene Mumbi Njungé

Watafiti wengine pia Wasimamizi: 1. Dk Sylvia Opanga.

2. Profesa Faith Okalebo.

Idara ya mazoezi ya Famasia, shule ya Famasia,

Chuo Kikuu cha Nairobi, P.O. BOX 30197-00400, Nairobi.

Utangulizi

Jina langu ni Dk. Irene Mumbi Njungé, mwanafunzi katika Chuo Kikuu cha Nairobi, Mwanafunzi wa shahada ya juu ya Dawa. Madhumuni ya fomu hii ya idhini ni kukupa maelezo ya kina ambayo yatakusaidia kuamua ikiwa utashiriki katika utafiti huu au la. Ningependa kukualika ushiriki katika utafiti huu ambao ni juu ya athari za COVID-19 katika utumiaji wa huduma ya dawa za saratani kwa wagonjwa. Kwa ruhusa yako, nitakuuliza maswali juu ya habari ya kibinafsi na yale ambayo yanahusiana na malengo ya utafiti. Hii itachukua kama dakika kumi ya wakati wako. Ukiamua kushiriki, ninakuomba utie sahihi jina lako kwenye fomu hii. Ikiwa una maswali yoyote ya nyongeza sasa au baadaye, tafadhali usisite kuuliza.

Utapokea nakala ya fomu hii kwa kumbukumbu zako.

Ushiriki wa Hiari

Ushiriki wako katika utafiti huu ni wa hiari kabisa. Huduma zote unazopokea katika kituo hiki cha afya zitaendelea na hakuna kitakachobadilika bila kujali ikiwa umechagua kushiriki katika utafiti huu au la. Ukichagua kutoshiriki katika utafiti huu, utaendelea na ufuatiliaji na matibabu yako ya kawaida. Ikiwa ungetaka kujiondoa kwenye utafiti, hakuna udhalimu au upotezaji wa faida.

Kusudi la utafiti

Utafiti huu unatafuta kutathmini athari zinazoendelea za janga la Covid-19 juu ya urahisi wa kupata huduma ya dawa za saratani. Washiriki katika utafiti huu wataulizwa

maswali juu ya jinsi hali ya upatikanaji wa huduma ya dawa za saratani ilikuwa kabla ya Covid-19 kuanza na wakati wa janga la

Covid-19. Kutakuwa na takriban washiriki 293 katika utafiti huu na watachaguliwa bila mpangilio.

Kwa hivyo, tunauliza idhini yako ya kuzingatia kushiriki katika utafiti huu.

Je! Ni nini kitatokea ikiwa utaamua kuwa katika utafiti huu?

Ikiwa unakubali kushiriki katika utafiti huu, shughuli zifuatazo zitafanyika. Mchunguzi wa utafiti aliyefundishwa atakupa hojaji kupitia mahojiano. Hii itafanyika katika eneo maalum la kibinafsi ambapo unahisi raha kujibu maswali. Mahojiano yatachukua takriban dakika 15 za wakati wako. Mambo muhimu ambayo yatafuatiliwa katika utafiti huu yatashughulikia mambo kama vile kaunti yako ya makazi, changamoto ambazo ulipata wakati wa kupata huduma ya chemotherapy kabla ya Covid-19 kuanza na wakati bado inaendelea na kadhalika.

Hatari

Kwa sababu ya hatari inayoonekana ya kupoteza faragha na usiri, data iliyokusanywa italindwa kwa nenosiri na kupatikana tu kwa mchunguzi mkuu. Takwimu hazitapatikana kwa mtu mwingine yeyote. Kwa kuongeza, vitambulisho vya kipekee vitatumika kulinda maelezo ya mgonjwa. Kutakuwa na hatari ndogo kwa wahojiwa kwani taratibu hazina uvamizi kwa hivyo hakuna madhara au jeraha litakalopatikana.

Faida

Hakuna faida ya kifedha katika kushiriki katika utafiti huu, hata hivyo, wakati wa mahojiano shida inaweza kutambuliwa kama shida inayohusiana na matibabu, msaada wa kifedha au hitaji la msaada wa vifaa na hii itatatuliwa kwa kuanzisha rufaa inayofaa mfumo kwa mfanyakazi wa kijamii kwa tathmini zaidi. Faida za muda mrefu za utafiti huu haziepukiki. Habari ambayo utatupatia katika utafiti huu itasaidia katika utabiri wa mahitaji ya dawa za saratani ikitokea janga, kwa hivyo kuongeza utumiaji wa dawa hizi kati ya wagonjwa. Pia, habari itaongeza kwenye fasihi zilizopo kwani ulimwengu bado unakabiliwa na athari za janga la Covid-19.

Usiri

Habari ambayo itakusanywa kutoka kwa mradi huu wa utafiti itahifadhiwa kwa siri na kuhifadhiwa chini ya kufuli na ufunguo. Habari yoyote ya elektroniki italindwa kwa siri. Habari yote iliyopatikana itazuiliwa tu na mtafiti. Nambari za mfululizo zitatumika badala ya jina la washiriki.

Je! Ikiwa unataka kuuliza maswali yoyote?

Ikiwa una maswali yoyote au ufafanuzi kuhusu utafiti, tafadhali wasiliana na yeyote aliye katika nafasi ifuatayo ukitumia anwani zilizopewa;

1. Dk Irene Mumbi Njungé, P.O. BOX 230-00209, LOITOKTOK.
Simu: 0725469859
Barua pepe: renenju86@gmail.com
2. Msimamizi Kiongozi: Dk. Sylvia Opanga.
Idara ya Dawa, Chuo Kikuu cha Nairobi, P.O. BOX 30197-00400, Nairobi.
3. Mwenyekiti, Kamati ya ERC ya KNH-UoN, P.O BOX 20723-00100, Nairobi.
Simu: 2726300/2716450 Ext 44102. Barua pepe: uonknh-erc@uonbi.ac.ke

Ikiwa unakubaliana, saina fomu ya idhini ya washiriki hapa chini;

RUHUSA KUSHIRIKI KATIKA UTAFITI.

Nimesoma na pia nimeelezwa habari katika fomu hii ya idhini na nimeielewa kabisa. Malengo ya utafiti, michakato, hatari na faida nimeelezwa. Maswali na wasiwasi wangu umeshughulikiwa. Ninaelewa kuwa ushiriki wangu ni wa hiari na ninaweza kujiondoa kwenye utafiti wakati wowote bila udhalimu au upotezaji wa faida yoyote. Ninajua pia kuwa juhudi zote zitafanywa kutunza habari kuhusu kitambulisho changu binafsi kuwa siri.

Jina la mshiriki Tarehe

Saina ya mshiriki

Taarifa ya mtafiti

Ninathibitisha kuwa nimeelezea maelezo ya utafiti kwa mshiriki na kwamba ameelewa.

Jina la mtafiti Tarehe

Saina ya mtafiti

Appendix 1D: ACCOUNTABILITY BOOK

SUMMARY OF PARTICIPANT RECRUITMENT PROCESS – accountability book

Form which will be filled before interview

Check if the 2 documents are available Code _____

Date recruited	CODE AT TIME OF RECRUITMENT	ELIGIBILITY OF PARTICIPANT (Check the form) (Fill if Eligible or Not)	Provided informed consent (Check if form is available) (Yes or No)	Reasons for Exclusion
7/7/2021	001	Eligible	No	No consent
7/7/2021	002	Not eligible	No form	Under 18

Appendix 1E: PARTICIPANT REFERRAL FORM

PARTICIPANT REFERRAL FORM

Date:
(Please fill out the form completely and legibly.)

PATIENT INFORMATION

NAME: **GENDER:**
DOB: **PHYSICAL ADDRESS:**
MOBILE:
GUARDIAN NAME: **RELATIONSHIP:**

CASE SUMMARY (limit to a max of three lines)

.....
.....
.....

REASON FOR REFERRAL (tick the appropriate box)

- | | |
|---|---|
| <input type="checkbox"/> Financial assistance | <input type="checkbox"/> Nutritional support |
| <input type="checkbox"/> Psychosocial counselling | <input type="checkbox"/> Material assistance e.g. breast prosthesis |
| <input type="checkbox"/> Enrollment for NHIF cover | <input type="checkbox"/> Therapy-related effects e.g. depression |
| <input type="checkbox"/> Referral for external source of assistance | <input type="checkbox"/> Adherence counselling |

Consent to release information

Signature below serves to authorize that the patient understands the purpose of the referral and disclosure of information.

Patient sign: Guardian sign: Date:

Details of referring Health care worker

Name: Sign:
Mobile:

Receiving department: Social medical worker

Sign:
Email:

APPENDIX 2: QUESTIONNAIRE

Date of Data Collection _____ Code Number _____

INSTRUCTIONS

Answer by ticking appropriately on the spaces provided.

Section A: SOCIO-DEMOGRAPHIC DATA

1. Gender: (0) Male (1) Female
2. Age in years.....
3. Which region in Kenya were you residing during the Covid-19 restrictions?
Nairobi North-eastern
Rift valley Western
Nyanza Central
Eastern Coastal
4. Marital status:
(0) Single (1) Married
5. Employment status:
(0) Unemployed (1) Self-employed (2) Employed
6. Educational level:
(0) None (1) Primary (2) Secondary (3) Tertiary
7. Weight (kg) Height (m)
8. Comorbidities: (0) None (1) HIV/AIDS (2) Diabetes Mellitus
(3) Hypertension (4) CCF (5) Anemia
(6) Renal failure (7) Others
If Others(specify).....
9. Does the participant smoke cigarettes: (0) No (1) Yes
10. Does the participant take alcohol: (0) No (1) Yes

Section B: PATIENT AND LOGISTICAL RELATED FACTORS

11. Which type of cancer are you suffering from?
Prostate Lung Ovarian Colon
Breast Cervical Others
12. Stage of disease
(0) Stage 1 (1) stage 2 (2) stage 3 (3) stage 4
13. When did you start your chemotherapy?
Before the Covid-19 restrictions
During the tight Covid-19 restrictions

14. How many scheduled chemotherapy appointments were you booked for since the beginning of the pandemic?

3-7

8-12

13-17

15. How many of the appointments in question 14 above have you missed since the beginning of COVID-19 pandemic?

none at least one

16. Have you ever heard of telemedicine?

(Be careful to define to the patient telemedicine as video consultation)

Yes No

If the answer to 15 above is Yes, ask question 16. If no, jump to question 17

17. Before the COVID-19 period, did you ever consider using telemedicine?

Yes No

18. During this COVID-19 period, did you ever consider using telemedicine?

Yes No

19. What type of treatment were you to receive during the scheduled appointment?

Parenteral chemotherapy

Medication refill of oral medication

Radiotherapy

Review

Diagnostic test

Other

20. If parenteral therapy/review visit was missed what arrangement was made?

Just skipped medicine and waited until after lockdown

Received therapy from a facility nearby

Referral

21. If a scheduled medication refill was missed, how did you get the medicines?

Just skipped medicine

Had sufficient stock

Bought at a local chemist / hospital

Used internet to buy

22. During COVID did you ever call your regular doctor/pharmacist by phone because a need arose?

Yes No

23. Did the fear of contracting COVID-19 prevent you from seeking chemotherapy services?

Yes No

24. What are some of the challenges you encountered during the lockdown period that prevented you from accessing chemotherapy services (tick whichever applies)?

Hike in fares

Long waiting time

Rescheduled appointments

Difficulty of getting an appointment with the lockdown

Living out of Nairobi during the lockdown

News on poor clinical outcomes in case one contracts COVID-19

Loss of income

Others

If,
Others(specify).....
.....

25. What are some of the challenges you encountered in the pre-COVID-19 period that prevented you from accessing chemotherapy services (tick whichever applies)?

Hike in fares

Long waiting time

Rescheduled appointments

Difficulty of getting an appointment

Living out of Nairobi

Healthcare workers strike

Loss of income

Others

If,
Others(specify).....
.....

Section C: DRUG RELATED FACTORS

26. As a result of COVID-19 related difficulty getting medicines, has your doctor/pharmacist ever recommended any of the following?

Changing to a different drug

Reducing dose or frequency

Changing from parenteral to oral drugs

Changing from oral to parenteral drugs

Switching to radiotherapy

Other

27. Were any one of your chemotherapy medications available before the COVID-19 pandemic begun?

Always Most of the time Sometimes

Hardly ever Never

28. Were any one of your chemotherapy medications available during the COVID-19 pandemic?

Always Most of the time Sometimes

Hardly ever Never

29. Has there been a considerable change in the price of your medications since the beginning of COVID-19 pandemic?

Yes No

If yes, which medicine?.....



UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19678 Code 00202
Telegrams: unakny
Tel: (254-20) 2726300 Ext 44355

KNH-UoN ERC
Email: uonknh_erc@uonbi.ac.ke
Website: <http://www.erc.uonbi.ac.ke>
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KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 720266-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/264

19th July, 2021

Dr. Irene Mumbi Njunge
Reg. No. U56/35572/2019
Dept. of Pharmaceutics and Pharmacy Practice
School of Pharmacy
College of Health Sciences
University of Nairobi



Dear Dr. Njunge

RESEARCH PROPOSAL: IMPACT OF COVID-19 PANDEMIC ON UTILIZATION OF CHEMOTHERAPY SERVICES BY PATIENTS ATTENDING KENYATTA NATIONAL HOSPITAL ONCOLOGY CLINIC (P120102/2021)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH-UoN ERC) has reviewed and **approved** your above research proposal. The approval period is 19th July, 2021 – 18th July, 2022.

This approval is subject to compliance with the following requirements:

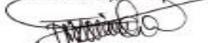
- i. Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
- ii. All changes (amendments, deviations, violations etc.) are submitted for review and approval by KNH-UoN ERC before implementation.
- iii. Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.
- iv. Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH- UoN ERC within 72 hours.
- v. Clearance for export of biological specimens must be obtained from KNH- UoN ERC for each batch of shipment.
- vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (Attach a comprehensive progress report to support the renewal).
- vii. Submission of an executive summary report within 90 days upon completion of the study.

Protect to discover

This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism.

For more details consult the KNH- UoN ERC website <http://www.erc.uonbi.ac.ke>

Yours sincerely,


PROF. M.L. CHINDIA
SECRETARY, KNH- UoN ERC

c.c. The Principal, College of Health Sciences, UoN
The Senior Director, CS, KNH
The Chair, KNH- UoN ERC
The Assistant Director, Health Information Department, KNH
The Dean, School of Pharmacy, UoN
The Chair, Dept. of Pharmaceutics and Pharmacy Practice, UoN
Supervisors: Dr. Sylvia Opanga, Dept. of Pharmaceutics and Pharmacy Practice, UoN
Prof. Faith Okalebo, Dept. of Pharmacology and Pharmacognosy, UoN

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KENYATTA NATIONAL HOSPITAL
P.O. Box 20723-00202 Nairobi

Tel.: 2726300/2726450/2726565
Research & Programs: Ext. 44705
Fax: 2725272
Email: knhrresearch@gmail.com

KNH/R&P/FORM/01

Study Registration Certificate

1. Name of the Principal Investigator/Researcher
Dr. Irene Mumbi Njunge
2. Email address: irene.njunge@gmail.com Tel No. 0725469839
3. Contact person (if different from PI).....
4. Email address: Tel No.
5. Study Title
IMPACT OF COVID-19 PANDEMIC ON UTILIZATION OF CHEMOTHERAPY SERVICES BY PATIENTS ATTENDING KENYATTA NATIONAL HOSPITAL ONCOLOGY CLINIC
6. Department where the study will be conducted CANCER TREATMENT CENTRE (CTC)
(Please attach copy of Abstract)
7. Endorsed by KNH Head of Department where study will be conducted.
Name: Dr. C. Mwangi Signature: [Signature] Date: 26/7/21
8. KNH UoN Ethics Research Committee approved study number P12010212021
(Please attach copy of ERC approval)
9. I IRENE MUMBI NJUNGE commit to submit a report of my study findings to the Department where the study will be conducted and to the Department of Medical Research.
Signature: [Signature] Date: 26/07/2021
10. Study Registration number (Dept/Number/Year) CTC / 118 / 2021
(To be completed by Medical Research Department)
11. Research and Program Stamp
[Stamp: 27 JUL 2021]

All studies conducted at Kenyatta National Hospital **must** be registered with the Department of Medical Research and investigators **must commit** to share results with the hospital.

IMPACT OF COVID-19 PANDEMIC ON UTILIZATION OF CHEMOTHERAPY SERVICES BY PATIENTS ATTENDING KENYATTA NATIONAL HOSPITAL, ONCOLOGY CLINIC

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18th November, 2021



19/11/2021