
UNIVERSITY OF LUSAKA

**SCHOOL OF POSTGRADUATE**

# EXPLORING DISPARITIES ON COVID-19 VACCINE AVAILABILITY IN SELECTED RURAL AND URBAN HEALTH FACILITIES. A CASE OF CHILANGA AND LUSAKA DISTRICT.

**BY**

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## DECLARATION

I, **Mpela Chibi** do hereby declare that this dissertation is my own original work. It has been guided and marked by my supervisor in accordance with the guidelines for Degree of Master of science in Public Health at University of Lusaka. It has not been submitted elsewhere for a degree at this or another University.

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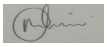
Signature:  Date: 29/08/2023

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I, guided, read this dissertation, and approved it for presentation. I am satisfied that this is the original work of the author under the name it is presented. I confirm that the work has been completed satisfactorily and ready for presentation.

Name of Supervisor: ……..Mowa Zambwe…… Date:……29/08/2023

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**DEDICATION**

I wholeheartedly dedicate this study to my beloved wife, Mwaka Faith Kasanga. Your unwavering support has been the cornerstone of my journey, and without it, I would not have reached this point. To my sons, Beswell Bwalya Chibi and Evan Mpela Chibi, your love and constant encouragement have fueled my determination to excel in my studies, as I aimed to pave the way for your promising futures.

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Lastly, I extend my heartfelt thanks to my family (My Mum, my brothers and sisters) for their unwavering support throughout my academic journey. Your encouragement has been my pillar of strength. To all of you, I hold deep affection and appreciation.

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## LIST OF ACRONYMS AND ABBREVIATIONS

| | | |
|---|---|---|
| **LMICs** | : | Low-middle income countries |
| **MOH** | : | Ministry of Health |
| **SSA** | : | Sub-Saharan Africa |
| **UNAIDS** | : | Joint United Nations Programme on HIV/AIDS |
| **US** | : | United States |
| **USA** | : | United States of America |
| **WHO** | : | World Health Organization |

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# ABSTRACT

The COVID-19 pandemic has had a devastating impact on global health, causing widespread illness, death, and economic disruption. In response, the global community has rallied to develop and distribute effective vaccines to protect people from the virus. The pandemic has highlighted the critical importance of widespread vaccination to prevent the spread of the virus and protect public health, this could only be achieved with a proper health system (CDC, 2021). However, there is growing evidence of disparities in Covid-19 vaccine availability between rural and urban, posing significant challenges to achieving equitable vaccine distribution and uptake.

The study was a descriptive cross sectional study design. It was conducted in six selected health facilities, three where located in Lusaka central district and the other three in Chilanga district respectively of Lusaka province. The study was conducted on 50 key health staff at selected health facilities and focal staff members at district health offices who were in charge of covid-19 vaccine campaign program. The primary data was collected using semi-structured questionnaires while secondary data was collected through desk research.

The study findings indicated that majority (66%) of the hospitals had confirmed of vaccines availability at their health facility in Lusaka central and less in Chilanga district. At the time of study 50% facilities in Lusaka central had covid19 stocks while 34% in Chilanga district facilities had covid19 and 16% had no covid19 vaccine stock. Lack of suitable transport for distribution was associated to stock out at facility level. While, reporting and requisition of covid19 stock at Chilanga district health office was done monthly according to the demand. Long waiting time for approval, unavailable stock and lack of transport at provincial level affected the availability of covid19 vaccine in the facilities.

The study shows some disparities between Lusaka urban health facilities and Chilanga rural health facilities with COVID 19 vaccine availability. COVID 19 vaccine was available in urban facilities as opposed to rural health facilities. Lusaka district was well stocked with mostly with all vaccine types, while Chilanga district had stock outs with some facilities having only 3 out of 4 vaccine types. The factors that contributed to this disparity were transport availability, storage facility, frequency of ordering and delivery waiting time.

# CHAPTER ONE

## 1.0 Introduction

Immunization is one of the most powerful and most cost-effective tools for improving public health. The benefits of immunization are enormous both to the family and society. Globally, immunization services have been the center of renewed interest with improved funding to improve services. Vaccination against Covid-19 is a good example of acquiring immunization. However, the current model of global vaccine distribution is based on financial competition for limited vaccine supplies, resulting in HICs getting first access to vaccines, with LMICs being forced to rely on voluntary donations through schemes (Sibeudu et al, 2019).

The first year of distribution, high income countries (HICs) achieved vaccination rates of 75-80% whilst low-middle income countries (LMICs) vaccinated 10%. This disparity in access of covid-19 vaccine has been one of the greatest failures globally, regional and locally during the pandemic. Consequently, Covid-19 vaccine inequity will have a lasting and profound impact on socio-economic recovery in LMICs countries without urgent action to improve supply. Furthermore, global Covid-19 vaccine inequity risks new variants emerging that may lead to high mortality, (Pilkington et al, 2022).

Study findings by different scholars in LMICs identified variations in availability and coverage of Covid-19 vaccines in rural versus urban communities. The factors affecting availability and utilization of the Covid-19 vaccine were not context specific. Consequently, the contradictory reports from studies done in different geographical settings. This demonstrate that the discrepancies in factors affecting availability of Covid -19 vaccines in different geographic settings should not be generalized but investigated for the interventions to be cost effective. This will help ration the limited resources by tailoring the interventions towards addressing specific challenges in distribution of Covid-19 vaccines encountered by different geographic settings (De pas et al, 2021).

## 1.1 Background

Zambia began administering COVID-19 vaccines in 2021, the Zambian Ministry of Health has long history of successful mass vaccination campaigns reaching over 3 million children during

child health week for instance in November 2020. However, it is unclear whether this will translate to acceptance of the Covid- 19, a novel vaccine targeted to adults. Evidence to date has shown that inequality in vaccination coverage in particular can have implications to wider society (Mudenda et al, 2021). Therefore, it is imperative to carry out this study and identify the factors affecting availability of covid-19 vaccines in different geographic locations of Zambia.

### 1.2 Statement of the problem

The Covid-19 pandemic has highlighted the critical importance of widespread vaccination to prevent the spread of the virus and protect public health, this could only be achieved with a proper health system (CDC, 2021). However, there is growing evidence of disparities in Covid-19 vaccine availability between rural and urban, posing significant challenges to achieving equitable vaccine distribution and uptake (Rosenbaum, 2021; CDC, 2021). According to recent data from the world health organization, as of 6th April 2023, there have been 343,415 confirmed cases of COVID-19 with 4,057 deaths. And as of 4 March 2023, a total of 13,614,983 vaccine doses have been administered and 80% of these vaccinations were concentrated in urban areas. A study by Bollyky et al. (2021) found that rural areas in low-income countries faced challenges in accessing Covid-19 vaccines due to lack of healthcare facilities, limited transportation options, and inadequate vaccine supply, resulting in lower vaccination rates compared to urban areas.

In Zambia like many other low income countries, similar disparities in Covid-19 vaccine availability in rural and urban areas are likely to exist, but with unique contextual factors and challenges. Limited healthcare infrastructure, inadequate vaccine supply, and challenges in vaccine distribution in remote areas may further exacerbate disparities in Covid-19 vaccine availability (World Health Organization, 2021; Bollyky et al., 2021).

These disparities in Covid-19 vaccine availability in rural and urban pose significant public health concerns, as they may lead to unequal health outcomes and widen the gap in achieving equitable vaccine distribution (Rosenbaum, 2021). Understanding the factors contributing to these disparities and identifying evidence-based interventions to address them is crucial for improving vaccine equity and mitigating the impact of the Covid-19 pandemic in low-income communities. Hence, the need to conduct this study on exploring disparities in Covid-19 vaccine availability in selected rural and Urban health facilities. A case of Chilanga and Lusaka district.

## 1.3 Justification of the Study

The Covid-19 pandemic has had a disproportionate impact on low-income communities, both in rural and urban areas, around the world (CDC, 2021; Robert Wood Johnson Foundation, 2021). Evidence suggests that there are significant disparities in Covid-19 vaccine availability in these communities, leading to uneven vaccine distribution and uptake, which can exacerbate health disparities and widen the gap in achieving equitable vaccine distribution (Rosenbaum, 2021; World Health Organization, 2021). Therefore, it is crucial to conduct a comprehensive exploration of these disparities to understand the factors contributing to them and identify evidence-based interventions to address the issue and reducing the impact of the pandemic in these vulnerable populations (CDC, 2021; Rosenbaum, 2021)**.** Therefore, the information that will be generated from this study will add on to the body of knowledge on the related topic to improve equitable availability and distribution of covid19 vaccines in most vulnerable areas such as rural areas.

## 1.4 Main Objective

Exploring Disparities in Covid-19 Vaccine Availability in selected Rural and Urban health facilities. A case of Chilanga and Lusaka district.

## 1.5 Specific Objectives.

1. To determine the availability of covid-19 vaccines in selected health facilities in Chilanga and Lusaka districts
2. To establish the means of distribution of vaccines in selected health facilities in Chilanga and Lusaka districts
3. To establish the availability of vaccine storage facilities in Chilanga and Lusaka districts

## 1.6 Research questions

1 What is the availability of covid-19 vaccines in selected health facilities in Chilanga and Lusaka districts?

2 What is the means of distribution of vaccines in selected health facilities in Chilanga and Lusaka districts?

3 What is the availability of covid-19 vaccine storage facilities in Chilanga and Lusaka districts?

## 1.7 Scope of the study

The study was done at clinics in Chilanga and Lusaka district. This is important to establish the availability of Covid-19 vaccines and the differences that exist in the different geographic locations,

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Introduction

The global Covid-19 vaccine rollout has highlighted inequities in the accessibility of countries to Covid-19 vaccines in different geographic areas. Populations in LMICs have found it difficult to have access to COVID-19 vaccines consequently affecting the vaccine impact and vaccination dropout. This chapter examined the gaps in study findings associated with inequality in vaccination coverage globally, regional and locally (De pas et al,2021).

## 2.2 Variation in availability of Covid-19 Vaccines Globally

The COVID-19 pandemic has had a devastating impact on global health, causing widespread illness, death, and economic disruption. In response, the global community has rallied to develop and distribute effective vaccines to protect people from the virus. However, despite the significant progress made in vaccine development and distribution, there are still significant disparities in vaccine availability between rural and urban areas.

This empirical study review aims to explore the availability of COVID-19 vaccines in rural and urban health facilities globally. The review will examine current research on the topic, including studies that identify factors contributing to vaccine disparities, strategies to address these disparities, and potential implications for global health.

### 2.2.1 Factors contributing to vaccine disparities

One of the main factors contributing to vaccine disparities between rural and urban areas is the uneven distribution of healthcare resources. Rural areas often have limited healthcare infrastructure, including a shortage of healthcare professionals, hospitals, and clinics. This can make it difficult for rural residents to access COVID-19 vaccines, particularly if they live in remote areas with limited transportation options.

In addition, vaccine supply chains can be challenging to establish in rural areas. The Pfizer-BioNTech and Moderna vaccines, for example, require ultra-cold storage, which can be difficult to maintain in areas without reliable electricity or refrigeration. This logistical challenge can make it difficult for rural health facilities to store and distribute vaccines, further contributing to vaccine disparities.

Another factor contributing to vaccine disparities is vaccine hesitancy. This is a phenomenon in which people are reluctant to get vaccinated due to concerns about the safety or effectiveness of the vaccine. Vaccine hesitancy can be particularly prevalent in rural areas, where there may be a greater mistrust of the healthcare system or limited access to accurate information about vaccines.

### 2.2.2 Strategies to address vaccine disparities

Addressing vaccine disparities between rural and urban areas requires a multifaceted approach. One strategy is to increase vaccine supply and distribution to rural areas. This can be accomplished through partnerships between local health departments and community organizations, as well as through mobile vaccination clinics that bring vaccines directly to rural communities.

Another strategy is to improve healthcare infrastructure in rural areas. This can include increasing the number of healthcare professionals in rural communities, as well as expanding telehealth services to improve access to healthcare for remote residents. Additionally, rural health facilities can work to establish stronger relationships with local communities to build trust and encourage vaccine uptake.

Finally, addressing vaccine hesitancy requires a targeted approach that addresses the specific concerns of rural residents. This can include providing accurate information about vaccine safety and effectiveness, as well as addressing concerns about vaccine side effects or the speed of vaccine development. Local community leaders and healthcare professionals can play an important role in building trust and encouraging vaccine uptake in rural areas.

### 2.2.3 Potential implications for global health

The availability of COVID-19 vaccines in rural and urban areas has important implications for global health. Addressing vaccine disparities can help to reduce the overall burden of disease and prevent the emergence of new variants of the virus. It can also help to promote global health equity, ensuring that all populations have access to life-saving vaccines.

Furthermore, addressing vaccine disparities in rural areas can help to improve overall health outcomes for these communities. By increasing access to healthcare and promoting vaccine uptake, rural residents may be better able to manage chronic health conditions, reduce the risk of infectious diseases, and improve overall quality of life.

Past studies have also examined the disparities in vaccine availability between rural and urban areas. For example, a study conducted by the US Centers for Disease Control and Prevention (CDC) found that rural residents were less likely to have received a COVID-19 vaccine compared to urban residents. The study also found that vaccine coverage varied significantly by state, with some states reporting higher vaccination rates in rural areas than urban areas.

Another study conducted in the United States found that rural counties had lower vaccination rates than urban counties, even when controlling for demographic and socio-economic factors. The study identified several factors contributing to vaccine disparities, including vaccine hesitancy, limited healthcare infrastructure, and lack of transportation options.

In Canada, a study found that rural areas had lower COVID-19 vaccination rates than urban areas, particularly in provinces with large rural populations such as Saskatchewan and Manitoba. The study identified limited access to healthcare resources and vaccine hesitancy as key factors contributing to vaccine disparities in rural areas.

Similarly, a study conducted in India found that rural areas had lower COVID-19 vaccination rates than urban areas. The study identified several factors contributing to vaccine disparities, including limited healthcare infrastructure, lack of awareness about vaccination, and concerns about vaccine safety.

These studies highlight the need for targeted strategies to address vaccine disparities in rural areas. By identifying the specific factors contributing to vaccine disparities, policymakers and healthcare professionals can develop targeted interventions to improve vaccine access and uptake in rural communities.

For example, in the United States, several states have implemented mobile vaccination clinics to reach residents in rural areas. These clinics bring vaccines directly to communities that may not have access to traditional healthcare infrastructure. In Canada, some provinces have established vaccination clinics in rural communities to improve vaccine access.

In India, local community leaders and healthcare professionals have worked to improve vaccine uptake by addressing vaccine hesitancy and providing accurate information about vaccine safety and effectiveness. These efforts have included community outreach programs, social media campaigns, and targeted messaging to address the concerns of rural residents.

Furthermore, global equitable access to Covid-19 vaccines is an important part of the worldwide effort to fight the disease. The World Bank and World Health Organization set a goal of 70% vaccination worldwide by mid-2022. Hence, governments and international agencies have put efforts to ensure availability and optimal utilization of the Covid-19 vaccine (Sibeudu et al, 2019).

However, it has become increasingly clear that the current situation is not an equitable, sustainable or efficient system to achieve the target especially in resource limited settings (Pilkingtone et al, 2022). Worldwide people die every year in resource limited setting as a result of inequalities in access to the existing covid-19 vaccines. It's unfortunate considering that covid-19 can be prevented by immunization. Earlier the challenges of Covid-19 vaccination were associated with hesitancy and refusal, currently it's associated with allocation challenges involving conflicts over priority access across to scarce vaccine doses (Sibeudu et al, 2019).

For instance, an exploit of cross sectional variation in rollout of Covid-19 vaccine globally revealed the determinants and their effects on health outcomes. The study established that the impact of vaccines varies depending on the stage of the outbreak, with an increase in vaccine rollouts being more likely to lead to a bigger decline in new cases. This suggested that vaccines needed to be channeled where possible to areas facing more acute outbreaks. In conclusion the determinants of vaccine rollouts in a cross-country setting suggested that from the supply side there were a lot variations e.g. countries' health infrastructures determined the speed of rollout in a given country setting (Deb et al, 2021).

Furthermore, Ali et al (2022) conducted a systematic review and meta- analysis in both high income and low and middle-income countries that revealed inequality in Covid-19 vaccination coverage and highlighted the complex landscape contributing to inequity. Another study assessing factors limiting immunization coverage in Dili, Timor-Leste in Asia concluded that good access to health facilities did not translate into uptake of immunization services. The reasons were complex and multifaceted relating to the health services' insufficient understanding and attention to their clients' needs. Clients in Dili were going to be motivated to be immunized if the health services were friendly and reliable (Amin et al, 2013).

Similarly, Wouters et al (2021) conducted a study on challenges in ensuring global access to covid-19 vaccines. The study concluded that there were dimensions of global vaccination challenges with distinct characteristics that lead covid-19 vaccines across generating trade-offs. This meant both

globally and nationally the availability of diversified sets of vaccine options was needed to bring the global pandemic under control.

## 2.3 Variation in availability of Covid-19 Vaccines in LMICs of Sub-Saharan Africa

The COVID-19 pandemic has created unprecedented challenges worldwide, including in Sub-Saharan Africa. As of 16th April 2023, there have been over 10 million confirmed cases of COVID-19 and over 200,000 deaths in Sub-Saharan Africa (World Health Organization, 2023). The availability of COVID-19 vaccines is crucial to mitigating the impact of the pandemic. However, there have been concerns about the equitable distribution of vaccines, particularly in rural and remote areas. This literature review aims to explore the availability of COVID-19 vaccines in rural and urban health facilities in Sub-Saharan Africa.

### 2.4 Disparities in COVID-19 vaccine availability in rural and urban areas

The COVID-19 pandemic has highlighted the inequalities in healthcare access between rural and urban areas in Sub-Saharan Africa. There is evidence to suggest that COVID-19 vaccine availability is not equitable between rural and urban areas. A study by Yaya and Yeboah (2021) found that rural communities in low- and middle-income countries face unique challenges in accessing COVID-19 vaccines. These challenges include inadequate vaccine supply, logistical challenges, and limited healthcare infrastructure in rural areas. Similarly, a study by Ratzan et al. (2021) found that COVID-19 vaccines were less available in rural areas in Africa due to supply chain issues, inadequate transportation, and lack of trained personnel.

There are also disparities in vaccine availability and uptake among different socioeconomic groups within both rural and urban areas. A study by Shrestha et al. (2021) in Nepal found that vaccine uptake was lower among individuals with lower levels of education and income, as well as those living in crowded housing conditions. In Nigeria, a study by Adedokun et al. (2021) found that vaccine uptake was lower among individuals with lower levels of education and those living in rural areas.

### 2.5 Efforts to improve COVID-19 vaccine availability in rural areas

To address the disparities in COVID-19 vaccine availability between rural and urban areas, several initiatives have been implemented in Sub-Saharan Africa. One such initiative is the use of mobile clinics to deliver vaccines to remote areas. A study by Oyewole et al. (2021) in Nigeria found that

mobile clinics were effective in increasing vaccine uptake in rural areas. The study found that the use of mobile clinics led to an increase in the number of people vaccinated in remote areas.

In addition, partnerships between the public and private sectors have been used to improve vaccine availability in rural areas. For example, in South Africa, the government has partnered with private companies to provide vaccines to rural communities (World Health Organization, 2021). This initiative has led to an increase in vaccine availability in rural areas.

Another approach to improving vaccine availability in rural areas is the use of community health workers (CHWs). CHWs are trusted members of the community who are trained to provide basic healthcare services. A study by Akinfaderin-Agarau et al. (2021) in Nigeria found that CHWs were effective in increasing vaccine uptake in rural areas. The study found that the use of CHWs led to an increase in vaccine uptake among children.

### 2.6 Efforts to improve COVID-19 vaccine availability in urban areas

Although there are fewer challenges in vaccine distribution and uptake in urban areas compared to rural areas, there are still disparities in vaccine availability and uptake among different socioeconomic groups within urban areas. To address this issue, several initiatives have been implemented in Sub-Saharan Africa.

One such initiative is the use of mass vaccination sites in urban areas. Mass vaccination sites are large-scale facilities where vaccines are administered to large numbers of people. A study by Ouma et al. (2021) in Kenya found that the use of mass vaccination sites was effective in increasing vaccine uptake in urban areas. The study found that mass vaccination sites were particularly effective in reaching younger age groups and people from lower socioeconomic backgrounds.

Another approach to improving vaccine availability in urban areas is the use of public-private partnerships. For example, in Ghana, the government has partnered with private sector organizations to establish vaccination centers in urban areas (World Health Organization, 2021). This approach has led to an increase in vaccine availability in urban areas.

### 2.7 Challenges to improving COVID-19 vaccine availability in Sub-Saharan Africa

Despite the efforts to improve COVID-19 vaccine availability in Sub-Saharan Africa, there are still several challenges that need to be addressed. One major challenge is the limited vaccine supply. Many countries in Sub-Saharan Africa have faced delays in vaccine shipments, resulting

in limited vaccine availability (World Health Organization, 2021). This has made it difficult to ensure equitable distribution of vaccines, particularly in rural areas.

Another challenge is vaccine hesitancy. Vaccine hesitancy is the reluctance or refusal to get vaccinated despite the availability of vaccines. A study by Ojo et al. (2021) in Nigeria found that vaccine hesitancy was a major barrier to vaccine uptake in both rural and urban areas. The study found that vaccine hesitancy was influenced by factors such as misinformation about the vaccine, distrust of the government, and religious beliefs.

In addition, there are also challenges related to vaccine storage and transportation. COVID-19 vaccines require strict temperature control, which can be challenging in areas with limited healthcare infrastructure and electricity supply (World Health Organization, 2021). This can lead to vaccine wastage and limit vaccine availability.

In urban areas, there are also disparities in vaccine availability and uptake among different socioeconomic groups. Efforts to improve vaccine availability in urban areas include the use of mass vaccination sites and public-private partnerships. However, there are still several challenges to improving vaccine availability, including limited vaccine supply, vaccine hesitancy, and challenges related to vaccine storage and transportation.

Addressing these challenges will require a concerted effort from governments, healthcare providers, and the public. Ensuring equitable vaccine distribution is essential to mitigating the impact of the COVID-19 pandemic in Sub-Saharan Africa.

Previous studies have also highlighted the disparities in healthcare access and resources between rural and urban areas in Sub-Saharan Africa. A study by Nabyonga-Orem et al. (2020) found that healthcare facilities in rural areas were often understaffed and lacked essential medical equipment and supplies. This lack of resources can also affect vaccine availability in these areas.

Another study by Modesti et al. (2018) found that people in rural areas had less access to healthcare services compared to those in urban areas. The study found that people in rural areas had to travel longer distances to access healthcare services, which can be a barrier to healthcare access, including vaccine availability.

These disparities in healthcare access and resources have been further compounded by the COVID-19 pandemic, which has strained healthcare systems in Sub-Saharan Africa. The limited healthcare infrastructure in rural areas and the inadequate supply of COVID-19 vaccines have made it difficult to ensure equitable vaccine distribution in these areas.

Efforts to address vaccine availability disparities in Sub-Saharan Africa have been ongoing. In Ghana, for example, the government has implemented a digital system to track vaccine distribution and monitor vaccine supplies in real-time (World Health Organization, 2021). This has improved the distribution of vaccines in urban and rural areas.

In Nigeria, efforts to address vaccine hesitancy include engaging community leaders and religious organizations in vaccine education and outreach (Ojo et al., 2021). This approach has been effective in increasing vaccine uptake in some areas.

However, more needs to be done to ensure equitable vaccine distribution in Sub-Saharan Africa. Governments need to prioritize vaccine distribution to rural areas and provide adequate healthcare infrastructure and resources to support vaccine distribution. Public health campaigns and education efforts are also necessary to address vaccine hesitancy and increase vaccine uptake.

In urban areas, efforts to improve vaccine availability include the use of mass vaccination sites and public-private partnerships. However, challenges such as limited vaccine supply, vaccine hesitancy, and challenges related to vaccine storage and transportation need to be addressed to ensure equitable vaccine distribution.

Addressing these challenges will require a concerted effort from governments, healthcare providers, and the public. Ensuring equitable vaccine distribution is essential to mitigating the impact of the COVID-19 pandemic in Sub-Saharan Africa.

In addition to the challenges faced in Sub-Saharan Africa, disparities in COVID-19 vaccine availability and distribution have also been observed in other parts of the world. In the United States, for example, there were initial disparities in vaccine distribution between urban and rural areas and between different racial and ethnic groups (Chen et al., 2021). These disparities were attributed to factors such as vaccine hesitancy, limited vaccine supply, and challenges related to vaccine storage and transportation.

However, efforts to address these disparities have been successful, with vaccine distribution becoming more equitable over time. In the United States, the Biden administration has implemented a national vaccination campaign aimed at increasing vaccine availability and distribution, particularly in underserved areas (The White House, 2021). Similar efforts are needed in Sub-Saharan Africa to ensure equitable vaccine distribution.

It is also important to note that vaccine availability is just one aspect of the COVID-19 pandemic response. Other measures such as testing, contact tracing, and treatment are also important in controlling the spread of the virus. In Sub-Saharan Africa, there have been challenges in implementing these measures, particularly in rural areas where healthcare infrastructure is limited (World Health Organization, 2021). Addressing these challenges will require a multi-faceted approach that involves improving healthcare infrastructure, increasing access to testing and treatment, and ensuring equitable vaccine distribution.

Sibeudu etal (2019) conducted a study and determined the levels of geographical differences in the utilization of routine immunization in rural and urban areas of Nigeria. The study established that Urban-rural differences existed in the utilization of routine immunization services. Health facilities distributing Covid-19 vaccines were more proximal to consumers in the urban community than the rural community with higher travel costs among rural dwellers.

Peacocke et al (2021) conducted a study that reviewed factors influencing equitable access of Covid-19 vaccine in LMIC settings. The study findings identified coverage towards vaccine manufacturing being of high importance in the supply of vaccines. In conclusion the exploration and scale-up of such capacities on the African continent is likely to prove to be a valuable investment to contribute to equitable access, even after the pandemic.

Similarly, a study by Singh and Chattu, (2021) emphasized on prioritizing equity in Covid -19 vaccine distribution and concluded that prioritizing the health disparities on the inequalities and inequities would lessen the gaps between the vaccination status of the rich and poor nations to promote equity, accessibility and global health security. Another study done in Zambia by Matenga et al, (2022) looked at motivating factors and barriers to uptake of Covid -19. In conclusion the social interactions regarding the covid-19 involved several factors that impede the uptake of the vaccine and there was need for education strategies and extensive community sensitization. Hence the gap and the need to look at factors affecting availability of Covid -19 vaccine in this study.

Majority of the studies in different clinical settings demonstrated that there were variations in factors affecting availability of Covid -19 vaccine in different geographic settings. Hence the need to investigate the factors contributing to availability of vaccines in order to obtain evidence based information tailored to specific settings of LMICs.

The availability of COVID-19 vaccines in rural and urban health facilities in Sub-Saharan Africa is not equitable, with rural areas facing unique challenges in accessing vaccines. Efforts to improve vaccine availability in these areas include the use of mobile clinics, partnerships between the public and private sectors, and the use of community health workers. In urban areas, efforts to improve vaccine availability include the use of mass vaccination sites and public-private partnerships. However, challenges such as limited vaccine supply, vaccine hesitancy, and challenges related to vaccine storage and transportation need to be addressed to ensure equitable vaccine distribution.

## 2.7 Availability of Covid-19 Vaccines in Zambia

Most studies in Zambia focused on hesitancy and refusal of the uptake of COVID -19. For instance, Mudenda et al (2021) conducted a study in Zambia that revealed that COVID-19 vaccine acceptance was low among the adult Zambian population despite awareness being high. Another study conducted by Phiri et al (2021) focused on understanding the association of covid-19 with the environment and social economic factors. The study concluded that the distribution was associated by population density and the findings were to be used as preliminary guide in the distribution of COVID-19. A search for published work on factors affecting availability of Covid-19 vaccine was futile.

Therefore, it's imperative to assess factors affecting availability of COVID-19 vaccine in rural versus urban areas. The findings will contribute in establishing local tailored strategies that will improve access to vaccines and equity in vaccine distribution in different geographical areas of Zambia. Ultimately achieving herd immunization preventing morbidity and mortality.

**2.1 Conceptual Frame Work**

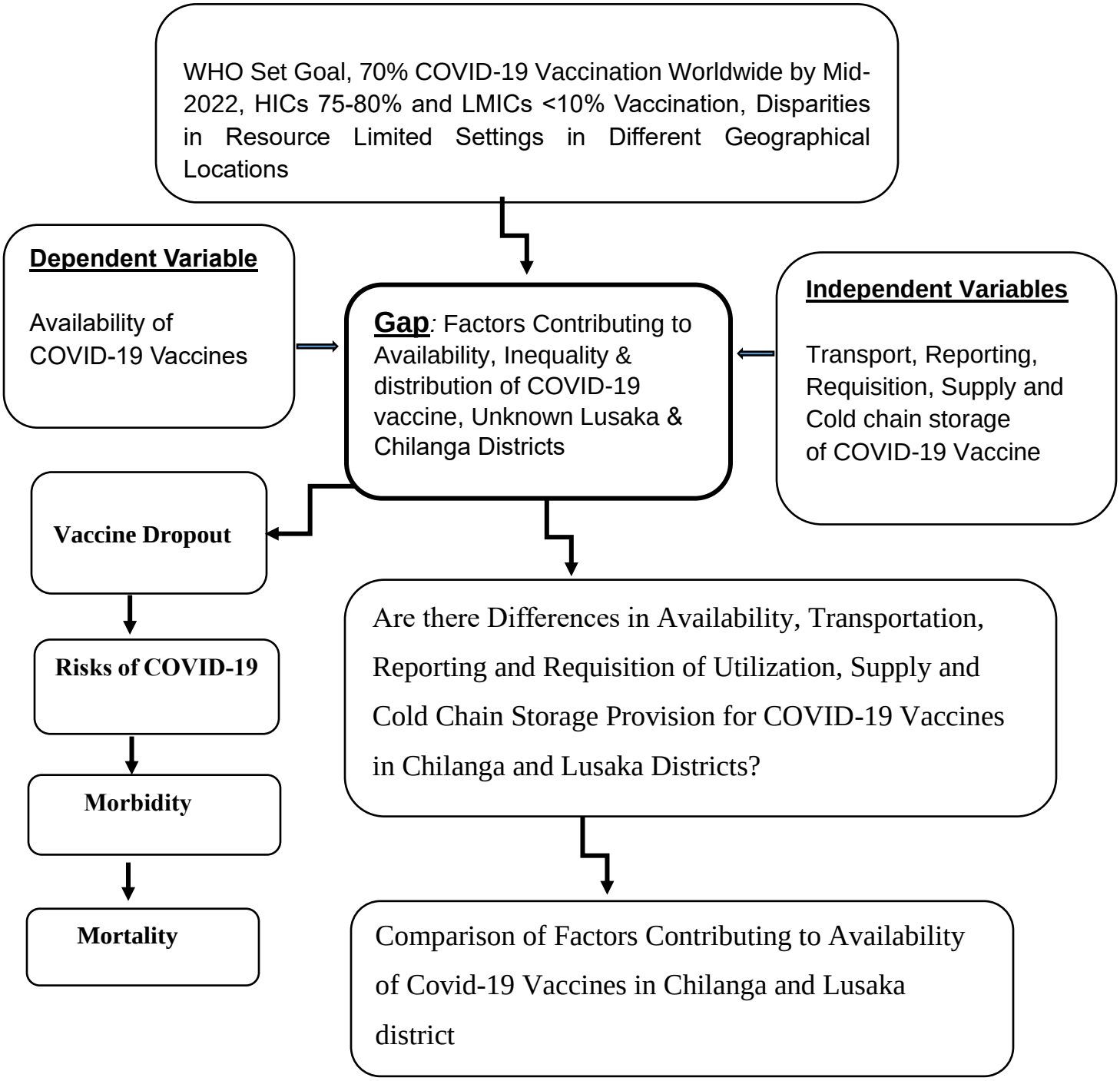



**Figure 1:** A Conceptual Framework Illustrating the gap in equality of Covid-19 vaccine distribution

# CHAPTER THREE

# METHODOLOGY

## 3.1 Introduction

This chapter highlights strategies that were used to collect and analyze data. It also justifies the choice of the research design, research instruments and procedures for data collection and analysis which were used.

## 3.2 Research Design

This was a descriptive cross sectional study design.

## 3.3 Study site

The study was conducted at 6 selected health facilities, which 3 were located in Lusaka district and 3 in Chilanga district respectively of Lusaka province. Lusaka district is located on central part of Lusaka province and boarders Chilanga, Kafue, Mumbwa and Chongwe districts and has a population of over 3,042,000 people. While Chilanga district is located southern part of Lusaka province and has a population of 225,276 people (ZSA, 2022).

## 3.4 Study population

The study population included key health staff at selected health facilities and focal staff members at district health offices who were in charge of covid-19 vaccine campaign program. Hospital records indicated 35 combined total health staff in-charge of covid-19 program from three selected health facilities in Lusaka central and 24 combined total of health staff spear headed covid19 campaign in Chilanga district at the time of study.

## 3.5 Sampling

The sample size for this population was determined by the use of following quantitative parameters: Proportion estimates (p) =0.5 Z-score at 95% confidence interval =1.96 Desired interval =±0.1 Standard error of proportion = (0.11/1.96) =0.056 Considering that the proposed proportion estimates lies between 10% and 90% extremes, a proportion therefore, of 0.056 will be used to come up with the desired sample size. Therefore, n=PQ/S. $E^2$ = (0.5x0.5)/ $(0.056)^2$ =50 Sample size (n) = 50 participants

## 3.6 Sampling Strategy

Purposeful sampling was used to recruit participants into the study. Respondents were selected in such a way that every person in the population had the same probability of being selected for the

study, and the selection of the individual did not affect selection of any other individual (creswell, 2002).

### 3.7 Data Collection

Data was collected using both primary and secondary sources. The primary data was collected using semi-structured questionnaires while secondary data was collected through desk research from health facility records such as the reports, books, registers and district health information system.

### 3.8 Data Management and Analysis

The data collected was checked concisely to eliminate misleading data. The analysis was purely based on respondents who had played a key role in covid19 vaccine management. Basically, the characteristics of this study population were demographic variables that were analyzed using descriptive tables. Analysis was done using SPSS version 16.0 Special Edition. The factors associated with unavailability of covid19 vaccine in selected health facilities in Chilanga and Lusaka district were assessed using univariate and multivariate logistic regression model. All the variables that were included in both the univariate and multiple regression model are outlined based on the literature review and also following the conceptual framework. All univariate analysis and all independent variables was considered to be significantly associated with unavailability of covid19 vaccines at 5 percent level (5%).

### 3.9 Piloting of the study tools

Piloting was conducted at Kalingalinga health Centre to ensure validity and reliability of the study tools before the actual study. Validity is the degree to which an instrument measures what is intended to measure (Polit and Hungler, 1995). Therefore, the following corrections to the study tools were done. Distribution of covid19 vaccine and quality of care received is associated with unavailability of covax.

### 3.10 Validity and Reliability of Study

A cross-sectional study design is less bias considering that data is readily available and not in a controlled condition. An appropriate tool for data collection will be used based on the knowledge from of previous studies (Mudenda et al, 2021). The data collecting tool will be pre-tested at a small scale before the actual data collection. Multivariate logistic analysis will account for confounders apart from outcome variables that may have effects on the outcome of the study.

### 3.11 Ethical Considerations

Ethical approval was sought from the University of Lusaka committee of ethics, clearance to conduct the study and obtain primary data from selected health facilities was obtained from the Lusaka District Health Office and the Officer In-charge at the facilities. Furthermore, the researcher ensured that participants understand the study objectives and sign consent forms. The collected information was kept confidential and used for the purpose of the study alone. Identity numbers were used instead of names for anonymity and confidentiality. Participant's autonomy was ensured, and participants were free to withdrawal from the study at any point without any punishment or inconvenience. Other ethical consideration included;

***The principle of justice***

*Right to fair treatment*: The researcher ensured that all participants were treated fairly and any participant who declined to participate (or who withdraw from the study after initial agreement) in a non-prejudicial manner; the researcher honored all agreements made with participants (including payment of any promised stipends); and the researcher gave participants access to research staff for desired clarification.

*Principle of non-maleficence:*

Freedom from harm: the research participants were not exposed to any physical or psychological harm. The ethical principles were strictly followed not to infringe the participants‟ rights and humanity. Participants were informed on their right to withdraw from the study at any time when they consent for participation in the study.

*Principle of autonomy*

The right to self-determination: According to Polit and Beck (2012) self-determination implies that prospective participants can voluntarily decide whether to take part in a study, without risk of prejudicial treatment. Therefore, the researcher ensured that participants were given full information about the study before taking part and were allowed to think about it and make an informed choice whether to take part or not.

*Principle of Beneficence*

The act of good will. The researcher ensured that participants did not bare any cost by taking part in the research and that the findings will be of benefit to address unavailability of covax in health facilities both in urban and rural.

# CHAPTER FOUR - DATA ANALYSIS

## 4.0 Introduction

This chapter represented study findings aimed at comparing factors contributing to availability of covid-19 vaccines in 6 selected health facilities in Chilanga and Lusaka district. The total sample size was 50 health care providers, 25 from each district respectively. The findings of the study were presented based on the following research questions;

1 What is the availability of covid-19 vaccines in selected health facilities in Chilanga and Lusaka districts?
2 What is the means of distribution of vaccines in selected health facilities in Chilanga and Lusaka districts?
3 What is the availability of covid-19 vaccine storage facilities in Chilanga and Lusaka districts?

## 4.1 SOCIAL DEMOGRAPHIC DATA OF PARTICIPANTS

Socio demographic characteristics of respondents that took part in the study was as presented in table4.1

Table 4.1: Socio Demographic characteristics of participants (n=50)

| **Gender** | **Frequency** | **Percentage** |
|---|---|---|
| Female | 24 | 48 |
| Male | 26 | 52 |
| **Total** | **50** | **100** |
| **Age** | | |
| 18-30 Years | 33 | 66 |
| 30 Years and above | 17 | 34 |
| **Total** | **50** | **100** |
| **Level of Education** | | |
| No schooling | 0 | 0 |
| Primary level | 0 | 0 |
| Secondary level | 0 | 0 |
| Higher level | 50 | 100 |

| | | |
|---|---|---|
| **Total** | **50** | **100** |
| **Employment Status** | | |
| Employed | 50 | 100 |
| Unemployed | 0 | 0 |
| Volunteer | 0 | 0 |
| **Total** | **50** | **100** |
| **Facility Staff** | | |
| Yes | 50 | 100 |
| No | 0 | 0 |
| **Total** | **50** | **100** |

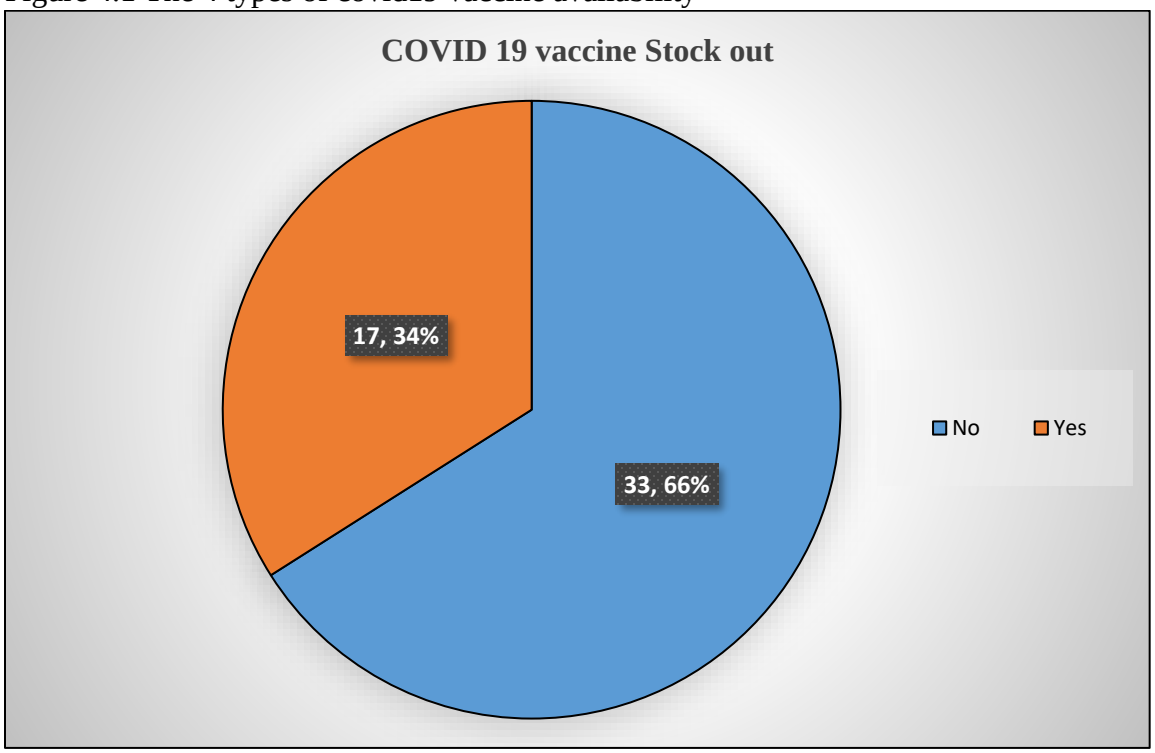
**Source; field data, 2023**

**Table 4.1** shows that more than half of the participants 26 (52%) were male, while the least participants were female. Majority of the respondents 33 (66 %) aged between 18-30 Years while 17 (34 %) were aged above 30 years. In addition, all the participants (50 participants) had attained higher education and were all government employees under ministry of health respectively.

## 4.2 COVID 19 VACCINE AVAILABILITY

Health workers were asked about the availability of COVID 19 vaccine, whether all vaccine types were available; Astrazeneca, Johnson and Johnsons, Pfizer and Sinopharm.

Figure 4.1 The 4 types of covid19 vaccine availability




**Source; field data, 2023**

**Figure 4.1** Revealed that Majority participants 33 (66%) had confirmed of vaccines availability at their health facility, while 17 (34%) had stock out of the COVID 19 vaccine.

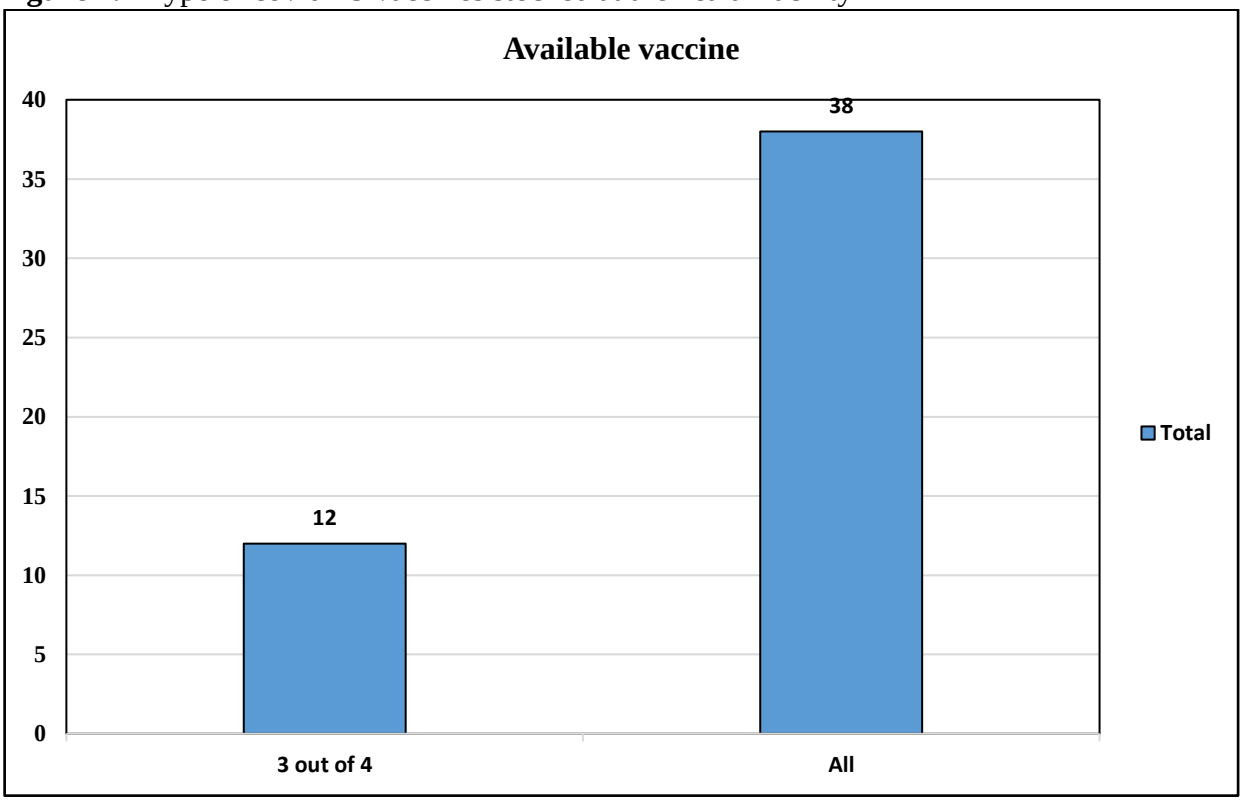
**Table 4.2** Vaccine stock out in 6 selected health facilities in Lusaka & Chilanga district

| | **Stock out in Lusaka district (3 hospitals)** | | **Stock out Chilanga district (3 hospitals)** | | **Total** |
|---|---|---|---|---|---|
| | **Yes** | **No** | **Yes** | **No** | |
| | 0 | 25 (50%) | 17 (34%) | 8(16%) | 50(100%) |
| **Total** | | 25 | 17 | 8 | |

**Source; field data, 2023**

Table 4.2 shows that all the 3 facilities in Lusaka district 25 (50%) always have COVID 19 vaccines in stock, while some facilities in Chilanga district 17 (34%) always have vaccines as opposed to other facilities 8 (16%) with covid 19 vaccine stock out**.**

**Figure 4.2** Type of covid-19 vaccines stocked at the health facility




**Source; field data, 2023**

**Figure 4.2** Indicated that most health facilities 38 (76%) had stocked all the four types of COVID 19 vaccines, while 12 (24 %) only stocked three out of four types of Covid19 vaccines.

**Table 4.3** Type of vaccines available

| **Available vaccines** | **Lusaka district (3 hospitals)** | **Chilanga district (3 hospitals)** | **Total** |
|---|---|---|---|
| All 4 vaccines | 21 (42%) | 17 (34%) | 38 (76%) |
| 3 out of 4 | 4 (8%) | 8 (16%) | 12 (24%) |

| | | | |
|---|---|---|---|
| **Total** | 25 (50%) | 25 (50%) | **50 (100%)** |

**Source; field data, 2023**

**Table 4.3** shows that, majority of the facilities in Lusaka district had all the 4 types of vaccines available 21 (42%) while, some facilities In Chilanga 8(16%) only have 3 types out of 4 vaccines were stocked.

## 4.3 Means of vaccine distribution in health facilities

Information from the respondents on how vaccines were distributed to various hospitals, such as mode of transportation and if transport was readily available.

**Table 4.4** Transportation of vaccines to the health facility

| | **Lusaka district (3 hospitals)** | | **Chilanga district (3 hospitals)** | | **Total** |
|---|---|---|---|---|---|
| | **Yes** | **No** | **Yes** | **No** | |
| **How Covid 19 vaccines are accessed** | | | | | |
| DHO delivers to the facility | 17 (24%) | | 5 (16%) | 4 (8%) | 26 (52%) |
| Facility picks up from DHO | 8 (16%) | | 12(24%) | 4 (8%) | 24 (48%) |
| **Total** | 25 (50%) | | 17(34%) | 8(16%) | 50(100%) |
| **Mode of transport used to transport vaccine** | | | | | |
| GRZ Land cruiser | 25 (50%) | | 0 | 3 (6%) | 28 (56%) |
| Motorbike | 0 | | 17(34%) | 5(10%) | 22 (41%) |
| **Total** | 25(50%) | | 17(34%) | 8 (16 %) | 50 (100%) |
| **Transport available** | | | | | |
| Yes | 25 (50%) | | 0 | 0 | 25 (50%) |

| | | | | | |
|---|---|---|---|---|---|
| No | 0 | | 17(34%) | 8 (16 %) | 25 (50%) |
| **Total** | 25 (50%) | | **17(34%)** | **8 (16%)** | **50 (100%)** |

**Source; field data, 2023**

**Table 4.4** shows that health facilities in Lusaka district with no COVID 19 stock out, have vaccines delivered by DHO 17(34%) is mostly delivered health facilities in Lusaka 22 (44%) pick up the COVID 19 vaccine from DHO. Facilities in Chilanga district with vaccine stock out 12 (24 %) pick up the vaccines from DHO. The GRZ Land cruiser is the vehicle used to deliver vaccines to health facilities in Lusaka district 25 (50%), while 17(34%) use the Motorbike to pick up vaccines in Facilities with stock out. Transport was not readily available in these facilities 17 (34%) while those without stock out 25 (50%) had transport available at all times.

## 4.4 Reporting & Requisition of covid19 vaccine

The participants were asked on how covid19 vaccine were requested from the ministry and stock out at the health facilities.

Health care providers were asked how usage of vaccines was reported and how the vaccines were ordered.

**Table 4.5** reporting and requisition of COVID 19 vaccine

| | **Lusaka district (3 hospitals)** | | **Chilanga district (3 hospitals)** | | **Total** |
|---|---|---|---|---|---|
| | **Yes** | **No** | **Yes** | **No** | |
| **Who orders the COVID 19 vaccine** | | | | | |
| Pharmacy staff | 6 (24%) | 19(58%) | 17(68%) | 8(32%) | (100%) |
| **Total** | **6** | **19** | **17** | **8** | **50 (100%)** |

| | | | | | |
|---|---|---|---|---|---|
| **Data capturing of vaccine usage** | | | | | |
| Stock control cards | 17 (34%) | 33 (66%) | 13 (52%) | 12 (48%) | **50 (100%)** |
| **Forms used when ordering vaccines** | | | | | |
| Requisition book | 11(44%) | 9(36%) | 5(24%) | 20(80%) | 50 (100%) |
| **Frequency of ordering vaccines** | | | | | |
| Demand driven | 18(72%) | 7(28%) | 4(16%) | 21(84%) | 50 (100%) |
| Monthly | 12(24%) | 14(28%) | 21(84%) | 4(16%) | 50(100%) |
| **Reasons of ordering vaccines** | | | | | |
| Demand | 21(84%) | 4(16%) | | | **50 (100%)** |
| **Period of delivery** | | | | | |
| One week | 20(80%) | 5 (20%) | 25(100%) | 0(0) | 25 (100%) |
| Same day of order | 0 | 1(36%) | 0(0) | 25(100%) | 18 (36%) |
| **Total** | **17 (34%)** | **33 (66%)** | | | **50 (100%)** |

| | | | | | |
|---|---|---|---|---|---|
| **Facility connected national grid Electricity Line** | | | | | |
| Yes | 25(100%) | 0(0%) | 14(56%) | | **50 (100%)** |
| No | 0(0%) | 0(0%) | 11(44%) | | |

**Source; field data, 2023**

**Table 4.5** Indicates that both in Lusaka and Chilanga district the Pharmacy staff 25 (100%) ordered the COVID 19 vaccine. All health facilities use Stock control cards 50 (100%) to capture vaccine usage. Most health facilities 34 (68%) use requisition book to order COVID 19 vaccine. Majority of the facilities in Chilanga 21 (84%) order the Covid19 vaccine monthly while 4 (16%) ordered based on demand. Participants from Lusaka health facilities 18 (72%), said they ordered based on demand and 4 (16%) said they ordered monthly. The table further revealed majority 20(80%) of respondents in 3 health facilities in Lusaka indicate that delivery of covid19 vaccine took over one week. While in some facilities 5(20%) they are delivered on the same day. The table further revealed that in Chilanga district all 25 (100%) respondents from 3 health facilities indicate that over a week covid19 vaccine delivery. It was also noted that all the 3 health facilities in Lusaka district were connected to nation electricity grid as shown by a 25 (100%) responses, while in Chilanga district majority 14 (56%) said yes the health facilities were connected to power and 11(44%) revealed that other facilities were not connected to power.

# CHAPTER FIVE-DISCUSSION OF FINDINGS

## 5.0 Introduction

The COVID 19 pandemic had created an immense global crisis causing severe damage to the sustainability of the human race. Vaccines increased the chance of preventing the transmission of the disease and protected people's lives. Therefore, the need to vaccinate the entire population against the COVID 19 virus that includes rural and urban population. Vaccine supply chains play an important role in ensuring functional immunization services (WHO/UNICEF, 2016), to ensure consistent and uninterrupted supply of vaccines (WHO, 2016) to prevent stock out. Therefore, the discussion was based on the findings of the three research objectives

## 5.1 Covid 19 Vaccine Availability

Stock out of COVID 19 vaccine has been a major issue in many African countries, many have relied on donations from philanthropic organizations and international aid agencies to bridge the gaps in supplies. Furthermore, the pandemic has disrupted supply chains and transport networks, making it difficult to distribute medical supplies to remote areas. Out of 50 health care providers, health facilities in Chilanga district 17 (34%) had stock out of the COVID 19 vaccine. This could be for the fact that demand for COVID 19 vaccines has been high, and many countries struggle to secure enough doses for their populations due to lack of financial support for the vaccine (Bollyky and Bown, 2020). These findings are in line with those of Iwu et al (2020) were a total of 49 (77%) health facilities had at least one stock out for at least one vaccine type. This study had same results, facilities in Chilanga district reported having only 3 vaccine types out of the four 8 (16%).

## 5.2 Means of Transportation of Covid19 Vaccines to Health Facilities

The availability of vaccines at healthcare facilities is closely linked to transport. Transport is essential in delivering vaccines to healthcare facilities on time. This ensures that the vaccines are available at the right place and time, reducing the risk of stock-outs and ensuring that vaccines are available to the people who need them. Delayed or inadequate transport can lead to a shortage of vaccines, affecting the availability of vaccines in healthcare facilities.

In this study, health facilities with stock out 17 (34%) had no transport readily available for COVID 19 vaccine delivery. Another contributing factor is the fact that, most facilities in Chilanga district 17 (34%) with stock outs had to pick up vaccines from the DHO by means of a motorbike whenever

it was available. These results are similar to those of Palafox et al. (2014), whose results indicates that delay in importation and difficulty in maintaining the delivery vehicles in the supply had an influence on vaccine stock out.

Furthermore, Cold Chain Logistics for COVID-19 vaccines, particularly those requiring ultra-cold storage like Pfizer-BioNTech's vaccine, need to be transported within a specific temperature range. Cold chain logistics, which involve refrigerated storage and transportation, are essential to maintain the integrity of the vaccines. This method requires specialized refrigerated trucks or temperature-controlled containers.

However, the study findings on transport and cold storage for vaccine during transportation revealed that in Chilanga district they were in inadequate.

### 5.3 Reporting And Requisition of Covid19 Vaccine

Reports and requisitions play a crucial role in the process of ordering vaccines. They help in tracking the inventory and ensure that the right amount of vaccines is available at the right time hence prevent the stock from running out.

Both Requisition book and Supply Vouchers were used in all the facilities for vaccine stock management. Most orders were made monthly 26 (52%) while delivery of vaccines was after a week. The explanation for this could be because health facilities ordered the vaccine on a monthly basis and not mainly on demand like facilities from Lusaka. In conjunction with the prolonged waiting time for the delivery, it contributed to vaccine stock out. These results are contrary to those of Iwu etal (2020), in this study most standard stock management procedures were not adhered to, as these procedures were mostly handled by health care workers who either required formal training or refresher training on vaccine management but Similarly, another study discovered that delay in the distribution was due to delay in the submission of inventory reports, coupled with inaccurate reports and transportation challenges such as breakdown of vehicles (Jatau et al.2015).

Vaccines require proper storage conditions to maintain their potency hence, prevent any damage or degradation to the vaccines. All health facilities in this study 50 (100%) had a cold chain and electricity connected, this was an advantage as there was no wastage of the vaccine. Contrary to this, Shittu et al., (2016) reported substandard, inadequate vaccines storage facilities. In agreement

to these findings Surakat et al (2018) in a survey among 62% of health workers, mentioned inadequate storage facilities as one of the challenges encountered.

# CHAPTER SIX-RECOMMENDATION & CONCLUSION

## 6.0 Introduction

In this chapter included the recommendations of the study that were suggested as per study objective findings. And the conclusion of the study was rendered according to study results.

## 6.1 Recommendations

1. The need to restructure the stock management and information system by reinforcing the use of digital information systems such as mobile use of mobile devices. Digital technology may improve visibility of vaccine stock levels making them visible for managers to make informed decisions when the stock is running low as opposed to Manual reporting systems which are labour intensive and tend to overburden health care workers. Efficient inventory monitoring system will ensure that vaccines are always available in stock in health facilities.
2. Continued training of health workers and assigning specific roles to specific personnel. The managers should always supervise and support health workers involved in stock management, to ensure that they follow standard stock management guidelines and respond when reports indicate vaccine shortages.
3. Implement a better distribution system to ensure that vaccines are available in all health facilities at all times. Delivery transport should be available at all times to improve on the response time. This will ensure a highly effective supply chain that delivers a continuous, uninterrupted supply of vaccines at all levels up to the service delivery level.

## 6.2 Conclusion

The study shows some disparities between Lusaka urban health facilities and Chilanga rural health facilities with COVID 19 vaccines availability. COVID 19 vaccine was available in urban facilities as opposed to rural health facilities. Lusaka district was well stocked with mostly with all vaccine types, while Chilanga district had stock outs with some facilities having only 3 out of 4 vaccine types. The factors that contributed to this disparity were transport availability, storage facility, frequency of ordering and delivery waiting time**.**

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