

**SEROPREVALENCE, KNOWLEDGE, ATTITUDES, AND PRACTICES OF PEOPLE  
TO COVID-19 IN CHILILABOMBWE AND LUSAKA DISTRICTS OF ZAMBIA.**

**BY**

**SAMPA MERCY**

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**LUSAKA**

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## DECLARATION

I, **MERCY SAMPA**, do hereby declare that this dissertation represents my original work. It has been presented in accordance with the guidelines for MSc Dissertation of The University of Zambia. It has not been submitted before for the award of any degree or examination in to this or any other University.

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## ABSTRACT

The COVID-19 pandemic has had a profound effect on global health, economies, and societies. Understanding the seroprevalence, as well as the knowledge, attitudes, and practices (KAP) of individuals toward COVID-19, is essential for effective public health interventions. This study aimed to assess the seroprevalence of COVID-19 antibodies and the KAP of residents in Chililabombwe and Lusaka districts, Zambia. A cross-sectional study was conducted with a representative sample of 179 participants from two Zambian districts. COVID-19-specific antibodies were detected using serological tests to determine seroprevalence, while a structured questionnaire evaluated participants' knowledge, attitudes, and practices regarding COVID-19. Descriptive statistics and chi-square tests were used to analyze associations between categorical variables, and binary logistic regression was employed to identify potential risk factors for SARS-CoV-2 seropositivity. The overall seroprevalence of COVID-19 antibodies was 9.5% (95% CI: 6.0-14.7), reflecting notable exposure within the districts. Seroprevalence was higher in Chililabombwe (11.0%; 95% CI: 6.1-19.1) compared to Lusaka (8.0%; 95% CI: 3.9-15.5). The study found variations in seroprevalence based on age, gender, and education level, with higher rates among individuals aged 40-49 (13.6%; 95% CI: 4.7-33.3), females (12.6%; 95% CI: 7.4-20.8), and those with no education (22.2%; 95% CI: 6.3-54.7). However, these differences were not statistically significant ( $p > 0.05$ ). Both seropositive and seronegative participants exhibited moderate knowledge and attitudes, alongside high levels of preventive practices, indicating a shared understanding of health risks. Lower knowledge, attitudes, and practices were strongly associated with higher seropositivity. Confidence in preventing future pandemics was expressed by both groups, with only marginal differences between them. This study highlights important insights into the seroprevalence and KAP regarding COVID-19 in selected Zambian districts. The findings emphasize the need for targeted public health initiatives to close knowledge gaps like comparisons of KAP and seroprevalence between regions and information sources and their influence on attitudes towards COVID-19, dissemination of accurate information, and promotion effective preventive behaviours. These efforts could help limit the spread of COVID-19 and strengthen community resilience in response to the pandemic.

## **DEDICATION**

This piece of writing is being dedicated to the next generation of scientists and researchers who will shape the future of knowledge and innovation. It is with great admiration and anticipation that I offer this dedication, recognizing the pivotal role they will play in advancing our understanding of the world.

To the young minds driven by curiosity, passion, and the thirst for discovery, this dedication is an acknowledgment of the profound impact you will have on society. Your relentless pursuit of answers and your unwavering commitment to pushing the boundaries of knowledge will pave the way for ground-breaking advancements and transformative breakthroughs.

May you embrace the challenges that lie ahead with unwavering determination and resilience. The torch is now being passed on to you, the next generation of scientists and researchers.

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## LIST OF ABBREVIATIONS

%	Percent
ACE 2	Angiotensin-converting enzyme 2
ANOVA	Analysis of Variance
CDC	Centers for Disease Control and Prevention
Cdna	Complementary Deoxyribonucleic Acid
CI	Confidence Interval
CRISPR	Clustered Regularly Interspaced Short Palindromic Repeats
CSO	Central Statistical Office
ELISA	Enzyme-linked Immunosorbent Assay
KAP	Knowledge Attitudes and Practices
MERS-CoV	Middle East Respiratory Syndrome Coronavirus
mRNA	Messenger Ribonucleic Acid
MoGE	Ministry of General Education
NAAT	Nucleic Acid Amplification Tests
nsp	nonstructural proteins
OR	Odds Ratio
O.D	Optical Density
PCR	Polymerase Chain Reaction
RBD	Receptor Binding Domain
RDT	Rapid diagnostic test
RNA	Ribonucleic Acid
SARS-CoV	Severe Acute Respiratory Syndrome Coronavirus
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus 2

sp	Structural proteins
SPSS	Statistical Package for Statistical Analysis
WHO	World Health Organization

## CHAPTER ONE

### 1.0 INTRODUCTION

#### 1.1 Background

Coronavirus disease of 2019 (COVID-19), is a respiratory disease resulting from infection with the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It first emerged in Wuhan, China, in December 2019 and swiftly disseminated across the globe (Khan, 2020). The World Health Organization (WHO) declared the COVID-19 outbreak a global pandemic on March 11, 2020, due to its wide and persistent spread worldwide (World Health Organisation., 2022). The virus, SARS-CoV-2, responsible for COVID-19, exhibits similar disease-causing traits to both severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome (MERS-CoV) (Wong and Saier, 2021). It can also reside in the body for up to two weeks without producing any noticeable symptoms (Kontou, 2020).

The genetic material of SARS-CoV-2 comprises four key proteins essential to its structure. These proteins encompass the Spike (S) protein, responsible for binding to the host cell via the receptor-binding domain (RBD); the Nucleocapsid (N) protein, which forms the structural helical nucleocapsid and is pivotal in transcription; the Envelope Protein (E), a crucial component involved in various aspects of the virus's life cycle like assembly, envelope formation, and pathogenicity; and the Membrane Protein (M), a structural protein that determines the shape of the viral envelope (Khan, 2020).

The principal route of transmission among humans primarily involves inhaling airborne droplets exhaled by infected individuals and direct contact of these droplets, which carry the virus, with the eyes, nose, or mouth. Additionally, transmission may take place when individuals make contact with their eyes, nose, or mouth using hands that have been exposed to the virus (Wei *et al.*, 2020). People who have contracted COVID-19 display a wide range of clinical signs and symptoms, including fever, respiratory problems or breathlessness, fatigue, muscle aches, reduced ability to taste or smell, headaches, and sensations of nausea or vomiting (Adam *et al.*, 2022). Furthermore, COVID-19 infection has the potential to result in serious complications, including kidney failure, severe pneumonia, acute respiratory syndrome, and fatality (McCallum *et al.*, 2020).

In Zambia, the first documented case of COVID-19 was identified in a married couple who had returned from a trip to France. Following established protocols for monitoring individuals with a recent history of international travel, they were subjected to port-of-entry surveillance and were closely monitored for a period of 14 days. On March 18, 2020, they were identified as suspected cases based on the development of respiratory symptoms. Subsequent testing confirmed their positive diagnosis for COVID-19 (Chipimo *et al.*, 2020). In an effort to control the transmission of the disease, the nation implemented non pharmacological intervention strategies including the promotion of hand hygiene through alcohol-based hand sanitizers, maintaining a minimum physical distance of at least one meter between individuals, the use of masks, and adherence to proper coughing etiquette (covering the nose and mouth with a bent elbow). Later on, vaccines were made available and vulnerable segments of the population were vaccinated (Naiyer *et al.*, 2021).

Studies have shown that COVID-19 spreads in different ways because of the different national measures in place and the knowledge, attitude, and practices (KAP) of the citizens. Usually, the KAP surveys represent specific study populations and display what is known, believed or done about specific scientific subjects (Sarria-Guzmán *et al.*, 2021). In the context of COVID-19, or during other health crises and emergencies, it is essential that the public exhibit adequate knowledge, correct attitudes, and proper practices as forms of intervention (Lee *et al.*, 2021).

It is difficult to gain a comprehensive understanding of the full extent of the spread of COVID-19 pandemic in Zambia. Nevertheless, it is believed that the true number of cases might be greater, as it is linked to the quantity of tests conducted. Given that Zambia faces limitations in its testing capacity, the actual prevalence of the disease may be underestimated (Adam *et al.*, 2022). In order to efficiently control and limit the spread of the disease, individuals need to gain pertinent information regarding the ailment (Ugwu *et al.*, 2020). The primary aim of this study was therefore to assess the seroprevalence of SARS-CoV-2 through the utilization of commercially available test kits. The findings were intended to aid in gaining insights into the extent of previous population exposure to the virus. Additionally, the research investigated the levels of knowledge, attitudes, and practices (KAP) regarding COVID-19 among residents in specific districts of Zambia and examined how these factors influenced their serological status.

## **1.2 Statement of the problem**

The COVID-19 statistics for Zambia's daily updates indicated a cumulative total of over 349,287 positive cases with a 4,069 death toll as of August, 2023 data (Ministry of Health, 2023). Despite the substantial advancements on a global scale in diagnosing COVID-19 using molecular techniques, notably RT-PCR, the true count of individuals carrying the virus remains uncertain. This uncertainty arises from the fact that a considerable portion of those infected exhibit no symptoms, and even those with mild symptoms might not seek medical help (Christian Hoffmann, 2020) and therefore never counted among the exposed. Moreover, various factors, including socioeconomic status, test kit availability, and proximity to the nearest healthcare facility could impact individuals' capacity to undergo testing. This complexity hinders the determination of the true disease prevalence within the nation.

## **1.3 Justification of the study**

The objective of the study was to determine the prevalence of Covid-19 antibodies in certain regions of Zambia, namely the Lusaka and Chililabombwe districts. The study also included an examination of the participants' knowledge, attitudes, and practices regarding the disease, as well as how these factors interacted with their serological results. These insights will aid policymakers and disease control experts in developing targeted approaches for managing the disease in the study districts. Additionally, the research has revealed gaps in knowledge that require further investigation to improve our understanding of the disease's epidemiology. Nonetheless, the identification of anti-SARS-CoV-2 antibodies through serological assays may assist in approximating the number of individuals who have been exposed to the virus and may have contracted the infection. Furthermore, understanding the knowledge, attitudes, and practices of individuals concerning their exposure to the virus can facilitate the development of precisely targeted prevention messaging and other strategies designed to control the disease. This study, however, goes beyond just the biological aspect—it provides a comparative analysis of both seroprevalence and KAP across the two study districts, offering a more comprehensive understanding of the interplay between biological markers and behavioral factors.

## **1.4 Research questions**

The study was set to answer the following questions:

1. What was the sero-prevalence of antibodies to SARS-CoV 2 in Chililabombwe and Lusaka districts of Zambia?
2. What Knowledge, Attitude and Practices do people have about Covid-19 and how does this influence their serological status?

## **1.5 Objectives**

### **1.5.1 Main objective**

To determine the seroprevalence of SARS-CoV-2 antibodies in adults and investigate the Knowledge, Attitudes, and Practices of COVID-19 in Chililabombwe and Lusaka district of Zambia.

### **1.5.2 Specific objectives**

1. To determine the prevalence of SARS-CoV-2 antibodies in Chililabombwe and Lusaka districts.
2. To identify risk factors associated with seropositivity to SARS-Cov-2.
3. To assess the levels of public knowledge, attitudes and practices towards COVID-19 in selected districts of Zambia.
4. To determine the association between serological status and knowledge, attitude and practice.

## CHAPTER TWO

### 2.0 LITERATURE REVIEW

#### 2.1 Coronavirus

Coronaviruses are a diverse family of viruses primarily affecting mammals and birds. Among the most notable members of this family are Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV), Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), and Middle East Respiratory Syndrome Coronavirus (MERS-CoV). This literature review synthesizes key findings regarding the disease aetiology, transmission dynamics, pathogenesis, clinical manifestations, diagnostic approaches, and the epidemiological landscape and Knowledge, Attitude and Practices of COVID-19.

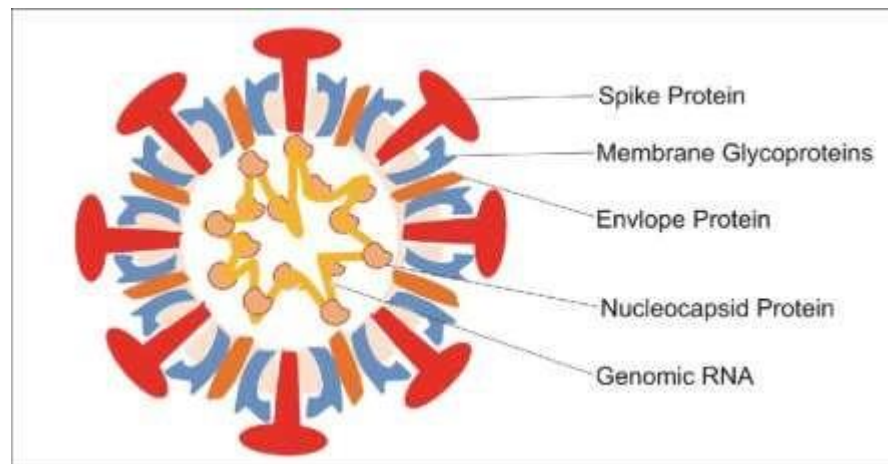
#### 2.2 Disease aetiology

The SARS-CoV-2 virus belongs to the subfamily Orthocoronavirinae of the family Coronaviridae. Generally, Coronaviruses (CoV) are considered infectious agents for mammals or zoonotic (Agrahari et al., 2021).

The first emergence of such viruses was seen in Guangdong Province, China, in around 2002-2003, when SARS-CoV caused an outbreak of severe respiratory illness (Peiris, et al., 2003). Studies suggest that the virus likely originated in bats and was transmitted to humans through intermediate hosts such as civet cats (Li, et al., 2005). MERS-CoV was first identified in 2012 in the Middle East, particularly Saudi Arabia, and has caused sporadic outbreaks (Zaki, et al., 2012).

According to research, SARS-CoV-2 shares genetic similarities with SARS-CoV, and its spike (S) protein structure closely resembles that of viruses causing other respiratory infections such as MERS-CoV (Feng, 2024). The virus gains entry into the body primarily through the respiratory tract. SARS-CoV-2 binds to angiotensin-converting enzyme 2 (ACE2) receptors on the surface of human cells, facilitating its entry into host cells, particularly those in the respiratory system. However, several factors may contribute to the severity of COVID-19, including age, underlying health conditions (such as cardiovascular disease, diabetes, and obesity), and immune status (Theodore, et al., 2023).

SARS-CoV-2 is genetically distinct from SARS-CoV and has undergone several mutations from the onset of the pandemic. For this reason, it has exhibited high transmissibility and resulted in a wide range of symptoms from mild to severe respiratory illness (Zhu, et al., 2020). It assumes the form of an enveloped spherical virus, possessing four structural proteins (sp) and sixteen non-structural proteins (nsp). These structural components encompass the Spike (S) protein, Nucleocapsid (N) protein, Envelope Protein (E), and Membrane Protein (M) (Khan, 2020). Its RNA is arranged in the 5'-3' orientation, rendering it a positive-sense RNA virus that can be directly utilized as messenger RNA (mRNA). The S protein is composed of dual subunits: S1, which functions as a domain for binding to receptors, and S2, which forms the stalk of the spike structure. The envelope and shape of the virus is determined by the E and M protein, while the N protein form the nucleocapsid on the genome (Figure 2.1) (Agrahari, et al., 2021)



**Figure 2.1** Structure of SARS-CoV-2. SARS-CoV-2 (Source: Agrahari et al., 2021).

Over time, SARS-CoV-2 has undergone changes, resulting in the emergence of different variants (World Health Organisation., 2022). The current variants of concern, as recognized by the Centers for Disease Control and Prevention (CDC) (Centers for Disease Control and Prevention, 2022) are the Delta and Omicron variants. Previously, variants of concern included Alpha, Beta, and Gamma variants (McDermott *et al.*, 2020).

### **2.3 Transmission**

The primary method of COVID-19 transmission has been identified as the dissemination through respiratory droplets or contaminated hands originating from individuals who are infected (Zhou, 2021). When an individual with respiratory symptoms comes into proximity with a susceptible person, transmission through droplets can occur (Karimzadeh *et al.*, 2020). The microorganisms are primarily found within tiny droplets nuclei and aid airborne transmission. These nuclei can remain suspended in the air for prolonged periods, potentially facilitating transmission to individuals at distances greater than one meter (Bulut, 2020). Furthermore, there is evidence indicating the potential for transmission through contaminated surfaces near infected individuals. An individual who touches these surfaces and subsequently touches their nose, eyes or mouth may be at risk of COVID-19 infection (Almudarra *et al.*, 2021).

### **2.4 Pathogenesis and clinical signs**

Primarily, Covid-19 infection can affect individuals across various age ranges. The prevalent clinical manifestations observed in adults with COVID-19 encompass symptoms such as a dry cough, sore throat, fatigue, headache, and a sensation of difficulty in breathing (Karimzadeh *et al.*, 2020).

Following transmission, SARS-CoV-2 attaches to the surface of the epithelial membrane in the oral cavity and the mucosal membranes of the conjunctiva. The attachment is mediated by the S protein, which binds to the ACE-2 receptor on host cells. This receptor is abundantly present in airway epithelial cells, vascular endothelial cells, intestinal cells, and especially in alveolar cells (Vasireddy *et al.*, 2021). The binding triggers the fusion of the viral lipid membrane with the host cell membrane, facilitating the internalization of the virus. At this point, an individual is asymptomatic (Chowdhury *et al.*, 2022). Once inside the host cell, the cellular machinery engages with the viral RNA, leading to the synthesis of structural proteins and the replicase. Viral replication takes place within the host cell's Golgi apparatus and endoplasmic reticulum (Karimzadeh, et al., 2020). Moderate COVID-19 infection then results when there is significant viral congestion in the pulmonary alveoli. Further replication results in severe COVID-19 infection with hindered gas exchange (Chowdhury *et al.*, 2022). Throughout the replication process, errors

in copying the genetic material can occur, resulting in mutations that give rise to new variants (Adam *et al.*, 2022).

## **2.5 Diagnosis of COVID-19**

According to the World Health Organization (WHO), a COVID-19 patient is an individual with an acute respiratory illness and was in contact with a confirmed case of SARS-CoV-2 or contaminated medium (World Health Organisation., 2022). Diagnosis of COVID-19 is based on the symptoms and signs that a person might have. The CDC recommends collection of specimens from the upper respiratory tract (Centers for Disease Control and Prevention, 2022). Tests that are performed for the diagnosis of COVID-19 include those that target the nucleic acid (molecular tests), antigen and serological tests. Because of its low cost, low and middle-income countries have utilized the antigen rapid diagnostic test (Ag RDT). Studies indicate that it has a high sensitivity and specificity and could complement RT-PCR for the detection of SARS-CoV-2 antibodies, mostly for the purpose of screening (Olalekan *et al.*, 2020). Additionally, a positive test result can be confidently accepted as a diagnosis of acute COVID-19 infection attributed to the high sensitivity and specificity. The RDT is done through a nasopharyngeal swab as the nasopharyngeal secretions are the preferred specimen (Jacobs *et al.*, 2020).

## **2.6 Molecular tests**

Currently, the most dependable method for detecting SARS-CoV-2 infection is through real-time reverse transcription polymerase chain reaction (RT-PCR). This technique pinpoints distinct genetic sequences of the virus, confirming its presence in samples collected from the upper respiratory tract, e.g. swabs taken from the nasopharynx or oropharynx. However, due to limited resources in developing countries, testing is predominantly prioritized for individuals exhibiting symptoms, severe cases, and those with suspected exposure. Occasionally, testing may extend to individuals who have come into contact with confirmed cases (Mesina *et al.*, 2021).

Molecular based tests that amplify genetic material are also called Nucleic Acid Amplification Tests (NAAT). Examples of methods used in NAAT include polymerase chain reaction (PCR), real-time quantitative reverse transcription-PCR, loop-mediated isothermal amplification (LAMP), clustered regularly interspaced short palindromic repeats (CRISPR) and Recombinase

Polymerase Amplification (RPA) (Chan *et al.*, 2020). Molecular tests detect genetic material of SARS-CoV-2 (McIntosh, Hirsch, & Bloom, 2021) and they have the ability to show current infection with SARS-CoV-2 (Rubegwa, 2015). Coronavirus detection using PCR requires that there is a first step of reverse transcription that converts RNA into complementary DNA (cDNA) (Rong *et al.*, 2021). Real-time quantitative reverse transcription-PCR is used for coronavirus detection due to its relatively high sensitivity, specificity and involves simple quantitative analysis compared to RT-PCR. The protocol of RT-PCR assay targets the RNA dependent RNA polymerase (RdRp), nucleocapsid (N), spike (S), and envelope (E) genes (Chan, et al., 2020). This test is used to detect SARS-CoV-2 RNA from the upper respiratory tract and it is the most widely used diagnostic test for COVID-19 (Thudium *et al.*, 2021). These tests have high stability and accuracy therefore they are used in hospitals and medical institutions (Adam *et al.*, 2022). The PCR requires centralized laboratories and trained personnel to be efficiently managed (Chan *et al.*, 2020).

Nucleic acid amplification tests (NAAT) are currently the most reliable diagnostic method used. This method works well given the correct use and the availability of needed material. Mostly, the NAAT requires trained experts to carry out tests and special machines to read the results. Sometimes, turnaround time for the test is longer. Overall, the cost of running this test is high (Zsófia *et al.*, 2021).

## **2.7 Serology tests**

Serological laboratory examinations encompass techniques such as immunochromatography assays and ELISA (Chan *et al.*, 2020). These methodologies possess the capability to identify SARS-CoV-2 antibodies within blood samples. A positive outcome from an antibody test may indicate exposure to COVID-19 or potentially signify the detection of antibodies prompted by the COVID-19 vaccine. Nonetheless, not all SARS-CoV-2 antibody tests have the capacity to identify vaccine-induced antibodies (Food and Drug Agency, 2022). A negative result from a SARS-CoV-2 antibody test implies the absence of detected virus-specific antibodies in the bloodstream. This could also signify the absence of prior SARS-CoV-2 infection or highlight a scenario where the test fails to identify antibodies despite their presence, yielding a false negative outcome (Daka, 2014).

Serological tests are quite simple to perform, which is useful for measuring how common SARS-CoV-2 is. While these tests are affordable and easy to use for screening, they should not be used for diagnosis of the currently SARS-CoV-2 infection or COVID-19 in clinical settings (Rubegwa, 2015). This is because these tests are likely to give a negative result even with antibodies present, especially if the number of antibodies is too low for the test to detect (Rong *et al.*, 2021).

## **2.8 Epidemiology of COVID-19**

Since the emergence of the COVID-19 outbreak in Wuhan, China, the disease has disseminated globally with varying levels of prevalence (Rong *et al.*, 2021). Bats have been proposed as potential reservoir hosts for SARS-CoV-2 and potential sources of human infection. However, the exact pathways of animal-to-human transmission remain unknown (Salvagno, 2021). Research carried out in Spain involving healthcare workers (HCWs) demonstrated that the prevalence of SARS-CoV-2 antibodies varied from 9.3% to 10.3%. The results suggested that the prevalence of SARS-CoV-2 antibodies among HCWs was marginally greater than what was observed among the general populace (Christian Hoffmann, 2020). A different seroprevalence investigation carried out within Spain, focusing on a broader community, revealed that women exhibited a greater seroprevalence compared to men, with percentages of 6.43% and 4.28%, respectively (Montenegro *et al.*, 2020). In a separate study conducted in Spain on the seroprevalence of SARS-CoV-2 among the general population, no difference in seroprevalence was found between females and males. The seroprevalence was 5.0% by point-of-care test and 4.6% by immunoassay (Pollan *et al.*, 2020).

In Iran, a study conducted among the general population revealed that the prevalence of antibody seropositivity was 17.1% (Poustchi *et al.*, 2020). The authors further noted that the adjusted seroprevalence varied significantly depending on the city of sampling, suggesting that variations among individual cities might be due to the implementation of epidemic protocols at different time intervals. The study's findings indicated that the actual prevalence of seropositivity in Iran was likely to be considerably higher than the reported rates based solely on confirmed COVID-19 cases (Poustchi *et al.*, 2020).

Furthermore, a seroprevalence study was conducted in high-density communities in Saudi Arabia, aiming to assess the magnitude of COVID-19 cases using serology. The study revealed that the

overall seroprevalence of the SARS-CoV-2 antibody was 50.2%. The researchers emphasized the need for further studies to be conducted as evidence of seroprevalence is crucial for estimating and monitoring the increasing burden of COVID-19 (Almudarra *et al.*, 2021). Many African governments implemented stringent non pharmacological measures to curb virus spread, including avoiding physical contact, practising social distancing, frequent hand hygiene, and wearing face masks. As a result, the case fatality ratio (CFR) for COVID-19 in Africa appears to have been lower than the global CFR. However, limited testing capacity suggests a substantial number of cases may have been overlooked (Soy, 2020).

The epidemiological landscape of COVID-19 in Zambia has been relatively well-defined (WHO, 2023). The Ministry of Health (MOH) reported the first COVID-19 case in March 2020, and as of August 17<sup>th</sup>, 2023, the country had seen approximately 349,287 confirmed cases and 4,069 deaths. Data from the Zambia National Public Health Institute (Ministry of Health Zambia - National Public Health Institute, 2022) indicate that Zambia has administered at least 9,309,866 doses of COVID vaccines. Individuals were fully vaccinated, with an additional 1,185,031 citizens receiving booster shots. Generally, in Zambia, a significant population-based seroprevalence survey of SARS-CoV-2, spanning six districts, was reported. This study aimed to assess the scale of SARS-CoV-2 transmission in the country. The combined measured prevalence of SARS-CoV-2 was found to be 10.6% (with a 95% CI of 7.3-13.9). The researchers concluded that the actual number of SARS-CoV-2 infections might surpass the officially recorded count in these six districts, emphasizing the importance of early isolation of infected individuals and timely identification of their contacts (Mulenga *et al.*, 2021). In Malawi, a seroprevalence study utilizing ELISA, which focused on healthcare workers (HCWs), found that the adjusted seroprevalence of SARS-CoV-2 antibodies was 12.3% (CI of 8.2-16.5). The study proposed that the elevated seroprevalence of SARS-CoV-2 antibodies among HCWs could be attributed to their early exposure to the virus (Chibwana *et al.*, 2020).

## **2.9 Response of public health system to COVID-19**

COVID-19 compelled nations to implement unprecedented strategies geared towards reducing the spread of the disease and managing the illness (Adam *et al.*, 2022). In line with this, Zambia, like many other countries, adopted non-pharmaceutical intervention strategies such as social

distancing, prohibiting large gatherings/events, shutting down schools and businesses, imposing international travel restrictions, and mandatory usage of masks to curtail the spread of the virus (Muzyamba, 2021).

Partners to the healthcare system provided assistance personal protective equipment (PPE) like masks, face shields, gloves, oxygen apparatus, supplies for patient management, diagnostic materials, essential safety laboratory facilities, vital medications, and vaccines (Ministry of Health, 2022). These resources were instrumental in helping manage the pandemic.

## **2.10 Prevention and control**

Efforts to minimize spread of COVID-19 include isolation, quarantine and clinical management of patients (Güner *et al.*, 2020). In order to prevent the spread of COVID-19 a well maintained, ventilated and air conditioning space or room is a likely aid to decrease transmissions. The following methods have proven to assist in controlling the disease: Maintaining a social distance of at least one meter, wearing a mask, frequent washing of hands with soap, using an alcohol-based hand sanitizer, covering nose and mouth with a bent elbow or tissue when sneezing or coughing (World Health Organisation., 2022). Isolating infected people is the primary measure to interrupt transmission (Harapan *et al.*, 2020).

Several medications have been approved by the U.S. Food and Drug Administration (FDA) that assist in relieving symptoms. These include; antiviral medicine remdesivir (Veklury), Barticitinib, Chloroquine, Hydroxychloroquine, Vitamin C, Paracetamol, Oral Antiviral medications such as Paxloid and Molnupiravir (Agrahari *et al.*, 2021).

COVID-19 vaccines are now available on the market. The main types of vaccines available in Zambia include; Biotech Pfizer, Johnson & Johnson, Oxford AstraZeneca, Moderna and Sinopharm vaccines as well as boosters that are recommended to maintain immunity against the disease and this further prevents spread of the virus (Ferorolli *et al.*, 2021; Shreya, 2021). Currently in Zambia, there has been over 9 million full vaccinations as mentioned in section 2.6. COVID-19 vaccines are effective at preventing infection, serious illness and death. COVID-19 vaccines are further effective at decreasing the risk of experiencing severe COVID-19 disease and in an event that a vaccinated person gets infected they are likely to experience much milder symptoms (Bernal,

2021). In addition, studies have shown that booster doses assist in providing higher levels of protection (Forni *et al.*, 2021).

The pandemic has also seen massive utilization of non-conventional methods in the prevention of COVID-19. These include use of herbs and home/traditional remedies like steam inhalation (Paudyal *et al.*, 2022).

### **2.11 Knowledge, attitude and practices**

Studies have shown that increased awareness amongst populations is a major determinant for the prevention of diseases. Notably, knowledge and attitude are principal markers of awareness that need to be studied in various social contexts (Fatema *et al.*, 2017). Furthermore, others have shown that health education programs on COVID-19 are important in helping the population maintain appropriate practices (Qutob and Awartani, 2021). The knowledge, attitudes, and practices towards COVID-19 affects the adherence to control measures in place (Rugarabamu *et al.*, 2020). The containment of a disease is usually possible with the change in behaviors as preventive measures. For this reason, understanding the pertaining knowledge on the awareness about COVID-19 is critical (Paudel *et al.*, 2020). Studies indicate that behaviors and attitudes towards a disease are affected by outbreaks. Additionally, public knowledge and attitudes towards pandemics are linked to panic emotions, which then have an impact on measures of control (Faisal *et al.*, 2021).

According to research, acquisition and understanding of health or disease is essential for effective management of health or disease. If an individual is able to understand the facts of a disease, for example COVID-19, that knowledge will be translated into practical health-promoting behaviors. This then improves the health conditions of that individual. Similarly, attitude guides individuals' behaviors and prompts individuals' intention to take certain action (Luo *et al.*, 2022). Some studies have revealed individuals with high knowledge scores have better health practices as compared to those with low scores (Liu *et al.*, 2020). During the COVID-19 pandemic, knowledge directly affected both the attitudes and practices of individuals. This included risks and efficacy beliefs, personal hygiene, and social distancing practices (Lee *et al.*, 2021). More studies on the COVID-19 pandemic show that when knowledge had a good score, both the attitudes and practices were satisfactory (Sadaatjoo *et al.*, 2019).

Most studies have primarily focused on either seroprevalence or knowledge, attitudes, and practices (KAP) within specific demographics or regions, often overlooking direct comparisons across different groups.. This is, therefore, what this study intends to delve into. Furthermore, there is limited research on long term effects of COVI-19 (long COVID). Understanding the seroprevalence may just begin providing insight on such aspects. Finally, it is important to establish the role of misinformation/information and its sources in shaping attitudes towards COVID-19.

## CHAPTER THREE

### 3.0 MATERIALS AND METHODS

#### 3.1 Study design

This study was cross-sectional in design.

#### 3.2 Study site

The study was conducted among residents of Lusaka and Chililabombwe districts in Zambia (Figure 3.1). These districts were purposefully selected due to their strategic roles as transit hubs and their geographical location within provinces reporting the highest cumulative Covid-19 cases in the country. Chililabombwe is the major boarder town into the Democratic Republic of Congo and hosts one of the largest cross boarder markets (Kasumbalesa border market) in Zambia, while Lusaka hosts the Kenneth Kaunda International airport, the largest and busiest in the country. According to Ministry of Health data from 2023, Lusaka province had a total of 94,242 COVID-19 cases, while Copperbelt province had 47,795 cases.

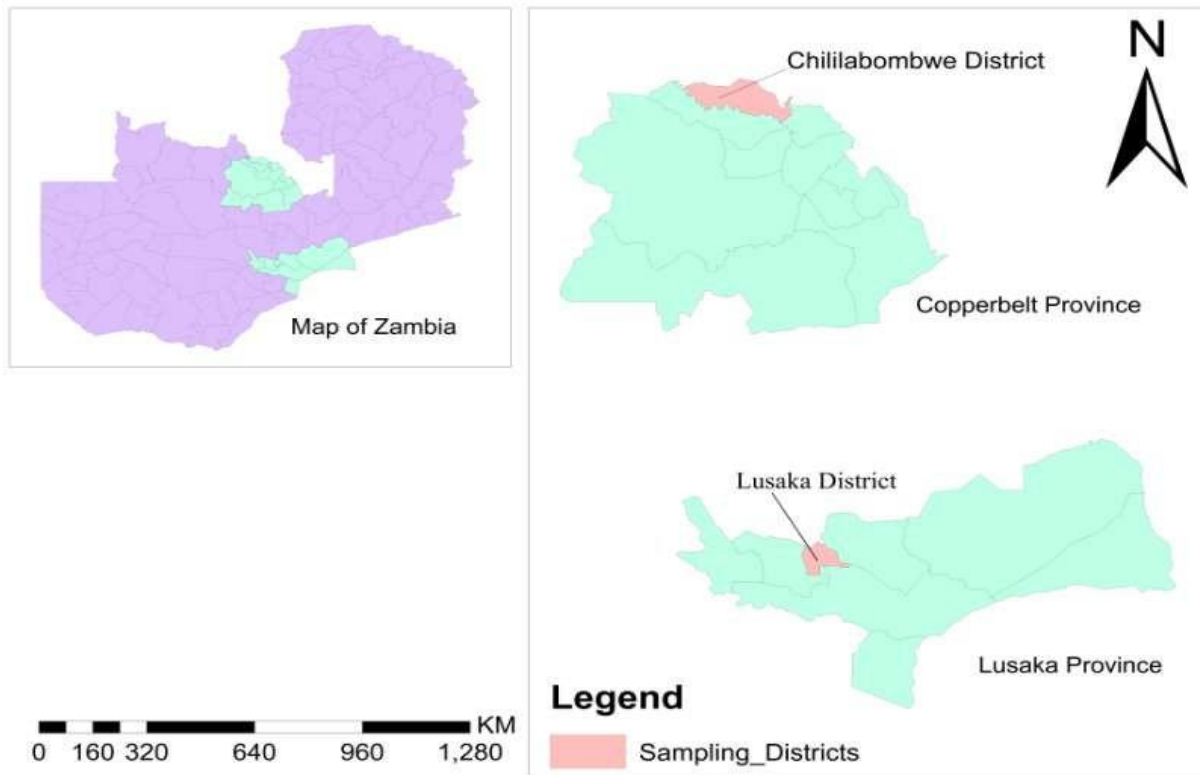
##### 3.2.1 Lusaka district

Lusaka district is situated in the central part of Zambia (Figure 3.1) and represents the country's capital city which is approximately 360Km<sup>2</sup>. This district is situated at an elevation of 1280m above sea level. As per the Zambia Statistical Agency (ZSA) data from 2022, its population was around 2,567,093. The district hosts government institutions, embassies, international organizations, and relatively advanced healthcare infrastructure, including an airport that facilitates local and international business activities. It also provides modern amenities like shopping malls, hotels, recreational facilities, and restaurants. In Lusaka, this study was carried out at Mtendere, Kalingalinga, Chelstone, and Matero Health Facilities.

##### 3.2.2 Chililabombwe district

Chililabombwe is located in the Copperbelt province (Figure 3.1) and covers an area of approximately 1,650 square kilometers. The district is primarily urban with a population of 124,577 (ZSA, 2022). It is also notable for sharing a cross-border market known as Kasumbalesa, with the Democratic Republic of Congo, influencing its social and economic dynamics

significantly. It is renowned for hosting the nation's largest mines, such as Nchanga Mine and Konkola Copper Mines (KCM). The town offers various amenities and services, including schools, healthcare facilities, and shopping centers, to cater for the local population. In Chililabombwe district, the focus was also on health facilities in the Kakoso Zone, particularly Lubengele, Kasumbalesa, and Kakoso Health facilities.



**Figure 3.1** Map of the Study Area

### 3.3 Sample Size and Sampling

The sample size was determined using the formula recommended by (Charan and Biwas 2013) with 13.5% previous prevalence of SARS-CoV-2 in Zambia (Shanaube *et al.*, 2022) and 95% confidence level and 5% absolute error.

$$N = \frac{Z^2 * P (1-P)}{d^2}$$

where;

N = sample size

Z = statistic corresponding to 95% confidence level

P = prevalence

d = absolute error

Here is the formula with the actual values substituted:

$$N = \frac{(1.96)^2 \times 0.135 \times (1 - 0.135)}{(0.05)^2}$$
$$N = \frac{(3.8416) \times (0.135) \times (0.865)}{0.0025}$$
$$N = \frac{0.4488}{0.0025} = 179.4$$

The calculated sample size became 179. After considering to sample equal numbers in both districts, the resulting sample size was 88 and 91 participants for Lusaka and Chililabombwe, respectively.

### **3.4 Eligibility criteria for participants**

### **3.5 Inclusion criteria**

The study involved individuals who visited a health facility, were 18 years of age or older, residing in the district of interest, and expressing their willingness to participate in the research.

### **3.6 Exclusion criteria**

The study excluded individuals who visited the health facility but chose not to participate, as well as those who were acutely ill or required urgent medical attention.

### **3.7 Participant Sampling**

Participants were randomly selected from individuals visiting selected health facilities in Lusaka and Chililabombwe to ensure a representative sample. After obtaining informed consent, each participant underwent a nasopharyngeal swab collected by a medical officer. The COVID-19 Rapid Diagnostic Test (RDT) was performed using the Sure Status® kit (Premier Medical Corporation), which has a sensitivity of 94.16% and specificity of 100.0% (Katzenschlager et al, 2022). Test results were interpreted and communicated to each participant, and findings were recorded in a structured questionnaire.

Following screening, participants completed a questionnaire capturing demographic information, knowledge, attitudes, and practices (KAP) related to COVID-19. Those who tested positive were immediately advised to seek medical attention.

Approximately 5 ml of venous blood samples from either the median cubital or cephalic vein and placed them into plain 7.0 mL vacutainers. Each vacutainer was then marked with a unique code for identification. Following collection, the blood samples transported to the laboratory. At the laboratory, they were refrigerated at a temperature of 2-8 degrees Celsius until use and centrifuged at 1500 rpm for 10 minutes, either on the same day or the following day. Subsequently, after sedimentation, the specimens were stored at -20 degrees Celsius in compliance with a cold-chain protocol until they were transported to the University of Zambia, School of Veterinary Medicine Public Health Laboratory. During transportation, the specimens were kept on ice in cooler boxes for processing.

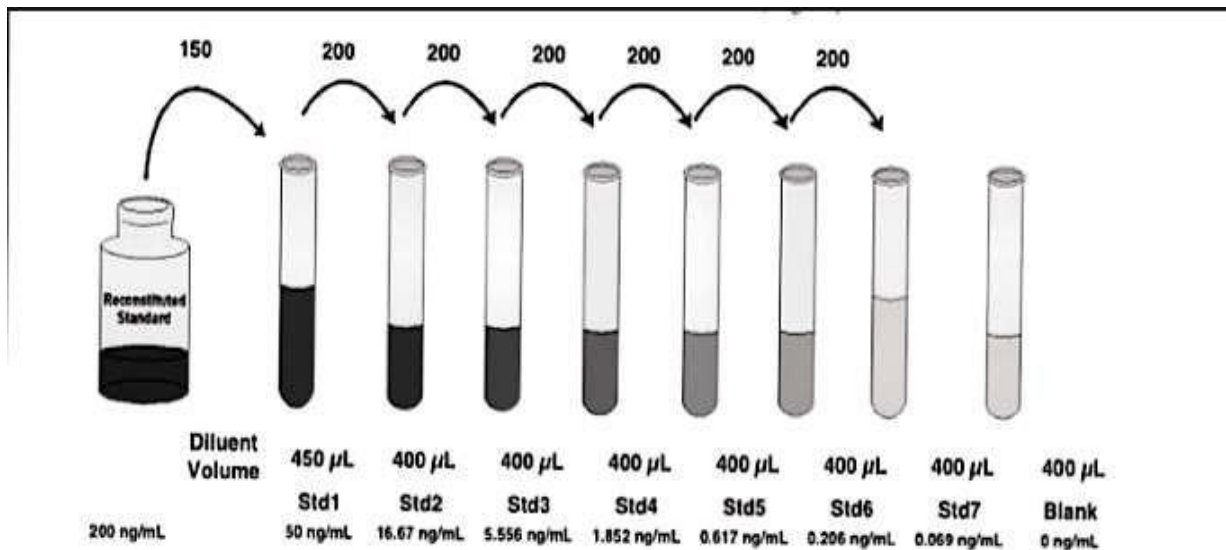
For each person from which blood was collected, a structured questionnaire was administered to evaluate demographic information; COVID-19 symptoms; household COVID-19 cases; perception of SARS-CoV-2 infection risk; adherence to recommended prevention measures. Their Knowledge, Attitudes, and Practices regarding COVID-19 were assessed according to the questionnaire attached in Appendix IV.

### **3.8 Detection of human SARS-CoV- 2 antibodies**

The Invitrogen™ Human SARS-CoV-2 N ELISA (Thermo Fisher catalogue number EH490 RB) was employed to detect and quantify the level of human SARS-CoV-2 Nucleocapsid in serum samples. The test kit has an intra-assay precision (precision within an assay): CV% < 10% and inter-assay precision (precision between assays): CV% < 12%, analytical sensitivity 0.069 ng/mL and assay range 0.069-50 ng/mL as per manufacturer's instructions. Importantly, this test is specific to the Nucleocapsid (N) protein of SARS-CoV-2. Unlike some other assays, it does not detect the Spike (S) protein that is produced as a response to vaccination. This means that the test can accurately differentiate between natural infection (which produces N protein) and vaccine-induced immunity (which stimulates the production of the S protein).

The ELISA test was done on a 96 well-plate. In the first step, 100µL of standard solution was added to the wells. The standard was prepared by adding 600 µL of 1X Assay Diluent (diluted 5-fold with distilled water) to a vial to create a 200 ng/mL standard solution. Then, 150 µL of the COVID-19 N Protein standard solution from the vial was mixed gently with 450 µL of 1X Assay Diluent to produce a 50 ng/mL standard solution. A 50 ng/mL standard solution was used to produce a dilution series of eight wells as depicted in Figure 3.2.

For the sample each well was each filled with 100 µL of diluted human sera samples. The cells were covered and incubated for 2.5 hours at room temperature with gentle shaking. Afterward, the washing process was carried out four times using phosphate-buffered saline (PBS) to remove unbound antigens.



**Figure 3.2** Representation of Diluted Standards during the ELISA experiment (extract from Human SARS-CoV-2 ELISA Kit Product Information Sheet).

Next, 100 µL of a biotin mixture was dispensed into each well using a multi-well pipette. The plate was covered and incubated at room temperature with gentle shaking on the orbital shaker for one hour. After incubation, the plate was washed four times with 270 µL of a phosphate-buffered saline solution. After that, 100 µL of Streptavidin-HRP solution was added to each well, left at room temperature for 45 minutes, and thereafter, washed four times with 270 µL of the cleaning solution. Following this, 100 µL of TMB was added to each well, and the plate was incubated at

room temperature for 30 minutes. The process was halted by adding 50  $\mu$ L of a stop solution to each well, and absorbance values were measured at 450 nm using a micro well plate reader. As per the protocol, a concentration of  $< 0.206$  ng/mL for SARS-CoV-2 antibodies was considered indicative of a positive presence.

### **3.9 Data analysis**

Data was entered into Microsoft Excel and statistical analyses were conducted using IBM SPSS version 26 (SPSS Inc. Chicago IL) and GraphPad Prism (version 9.0). The study's primary outcome was the percentage of the study population that had potentially developed antibodies against SARS-CoV-2 through ELISAs (Seroprevalence). Seroprevalence was determined as a proportion of individuals with a positive test result for total antibodies and was presented as a percentage along with corresponding 95% confidence intervals (CI). The Pearson Chi-squared test was used to determine the differences in the knowledge, attitudes and practices. A stepwise binary logistic regression was used to determine predictors of being positive to SARS-Cov-2. All variables with p-values less than 0.250 in the bivariate analysis were included in the model. A non-significant Hosmer and Lemeshow test and a significant omnibus test for model coefficients indicated that the model fitted the data. All statistics were considered significant at a  $p \leq 0.050$ .

The questionnaire was divided into four sections: demographics, knowledge, attitudes, and practices. Participants responded with "Yes" or "No," with correct answers scoring 1 and incorrect answers scoring 0. The participants' knowledge, attitudes, and practices were assessed by summing the correct responses, and the mean score was calculated. Higher scores indicated better knowledge, attitudes, or practices. The KAP levels of participants were categorized as high, moderate, or low based on predetermined thresholds using Bloom's cut-off criteria (Memon et. al., 2020). According to these criteria, scores above 60 indicate a high level of KAP, scores between 25 and 59 represent moderate levels, and scores below 25 suggest a low level.

### **3.10 Ethical statement**

The study was approved by Excellence in Research Ethics and Science (ERES) CONVERGE IRB (Reg No.2022-June-014) and the National Health Research Authority (NHRA) (Reg No. NHRA000003/19/01/2023). Further permission was sought from the Ministry of Health and authorization to enter health facilities was obtained from the Provincial Health Office, District

Health Offices and personnel in-charge of each health facility. Confidentiality of personal information was upheld throughout the study by ensuring that participants' information was anonymous and identities withheld. In addition, access to research data was restricted to the research team. Participation in this survey was entirely voluntary and not compensated. Informed consent was sought from all those that agreed to participate in the study and information collected from the participants was used only for research purposes.

## CHAPTER FOUR

### 4.0 RESULTS

#### 4.1 Socio-demographic characteristics of study participants

Nearly half (84) of the respondents were male while slightly more than half (95) were female. Over half (94) of the respondents were aged between 18 and 29 years, while the lowest distribution was above 50 years (15). The majority of respondents had gone beyond secondary education (133), while a minority had no formal education (9). Overall, Chililabombwe had slightly more (91) respondents than Lusaka (88). (Table 4.1). Employment status indicates a fairly even split, with 52.0% employed and 48.0% were unemployed.

**Table 4.1** Socio-demographic characteristics of seropositive study participants

Variable	Categories	Frequency	No. positive (%)	95% CI for %
Overall		179	17 (9.5)	6.0-14.7
District	Chililabombwe	91	10 (11.0)	6.1-19.1
	Lusaka	88	7 (8.0)	3.9-15.5
Gender	Male	84	5 (6.0)	2.6-13.2
	Female	95	12 (12.6)	7.4-20.8
Age group (Years)	18 – 29	94	10 (10.6)	5.9-18.5
	30 – 39	48	3 (6.2)	2.1-16.8
	40 - 49	22	3 (13.6)	4.7-33.3
	Above 50	15	1 (6.7)	1.2-29.8
Marital status	Married	75	8 (10.7)	5.5-19.7
	Single	102	8 (7.8)	4.0-14.7
	Widow/widower	2	1 (50.0)	9.5-90.5
Level of Education	College/University	60	2 (3.3)	0.9-11.4
	Secondary	73	9 (12.3)	6.6-21.8
	Primary	37	4 (10.8)	4.3-24.7
	No education	9	2 (22.2)	6.3-54.7
Employment status	Employed	93	9 (9.7)	5.2-17.4
	Unemployed	86	8 (9.3)	4.8-17.3

## **4.2 Knowledge, Attitudes, and Practices Concerning COVID-19**

### **4.2.1 Knowledge about COVID-19**

Table 4.2 shows that most (52.94%) seropositive participants correctly identified the virus as the cause of COVID-19, although many (47.05%) mistakenly thought it was caused by bacteria. Seronegative participants were more accurate in identifying the virus. Both groups recognized common symptoms like coughing, runny nose, and fever, with seropositive participants being more aware of runny nose and seronegative participants identifying it correctly as a symptom more often.

Regarding transmission, both groups understood that close contact with an infected person was a primary method, while the seronegative group had slightly better awareness of transmission through handshakes. Recognition of air droplets as a transmission method was lower in both groups.

A large majority in both groups believed that COVID-19 could be cured, with few participants thinking otherwise. Most identified health personnel as the appropriate means of curing COVID-19, with very few mentioning herbal remedies or praying. Both groups demonstrated a moderate level of knowledge on COVID-19.

**Table 4.2** Participants knowledge on COVID-19

<b>Variable</b>	<b>Levels</b>	<b>Frequency of seropositive</b>	<b>Proportion (%)</b>	<b>Score (%)</b>	<b>Frequency of seronegative</b>	<b>Proportion (%)</b>	<b>Score (%)</b>
<b>What is the causative agent for COVID-19?</b>	Bacteria	8	47.05		27	16.7	
	Virus	9	52.94	52.94*	135	83.33*	83.33
<b>Signs/ symptoms of COVID-19</b>	Coughing	6	35.3		81	50	
	Runny nose	9	52.9	30.78*	73	45.1	40.38*
	Headache	1	5.9		53	32.7	
	Fatigue	2	12.8		23	14.2	
	Fever	8	47		97	59.9	
<b>How can a person get COVID-19?</b>	Through handshake	6	35.2		53	32.7	30.03*
	Air droplets	3	17.6		47	29	
	Close contact with infected person	7	41.2	31.3*	46	28.4	
<b>Do you think COVID-19 can be cured?</b>	Yes	15	88.2	88.2*	123	75.9	75.9*
	No	2	12.8		39	24.1	
<b>How can COVID-19 be cured?</b>	Herbal remedies	0	0		14	8.6	
	Praying	1	5.9		2	1.2	
	By health personal	13	76.5	76.5*	117	72.2	72.2*
<b>Average score on knowledge of COVID-19</b>				55.94**			52.68**

% = Percentage; \* = Proportion considered as knowledge score; \*\*=Average knowledge score

#### 4.2.2 Respondents who have ever heard of COVID-19

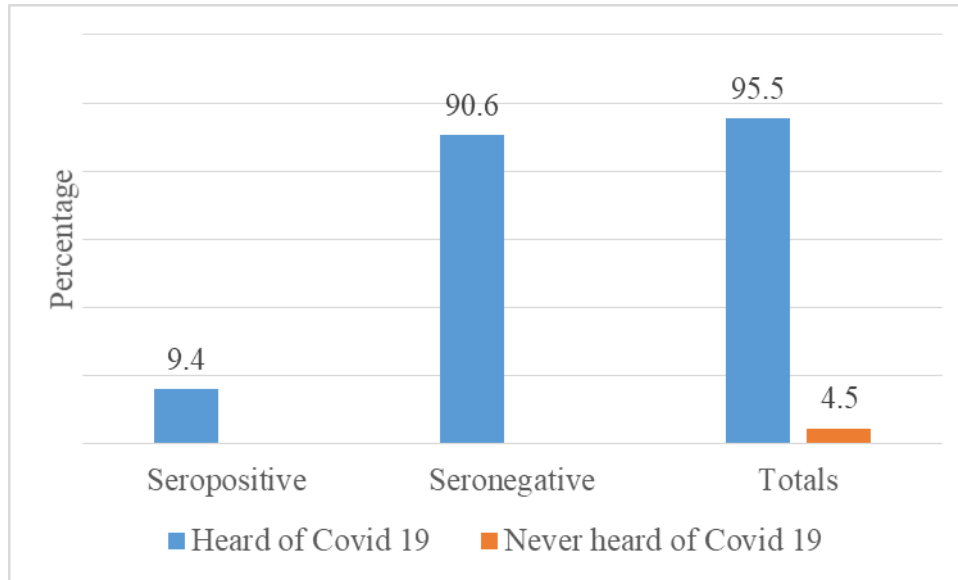
Table 4.3 shows the association between respondents' KAP with SARS-CoV-2 positivity. In terms of knowledge, seropositive individuals with low knowledge had a significantly higher prevalence of (7%) compared to moderate (3%) and high (7%) ( $p = 0.003$ ). For attitude, seropositive individuals with a low attitude score had the highest prevalence (10%), followed by high (4%) and moderate (3%) ( $p = 0.002$ ). Finally, regarding practices, seropositive individuals with low practices had the highest prevalence (4%), followed by moderate (7%) and high (6%) ( $p = 0.002$ ).

**Table 4.3** Association of Knowledge, Attitude, and Practices with SARS-CoV-2 positivity.

Explanatory variables	Percent of seropositive respondents	<i>P</i> -value
<b>Knowledge</b>		
Low	20.0	0.003
Moderate	2.97	
High	16.28	
<b>Attitude</b>		0.002
Low	22.22	
Moderate	3.23	
High	9.76	
<b>Practices</b>		0.002
Low	40.0	
Moderate	6.25	
High	10.53	

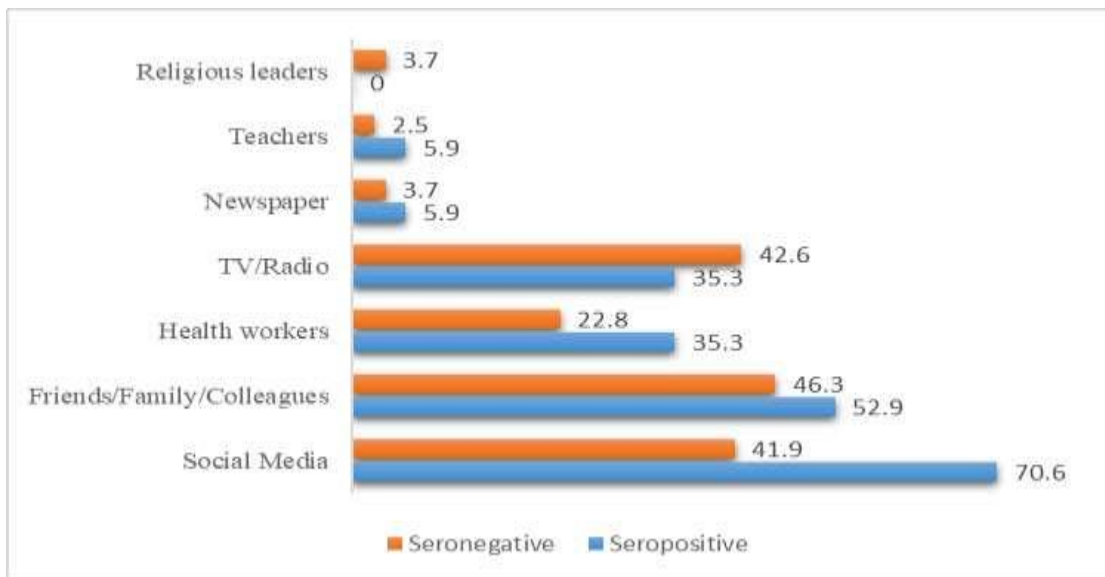
#### 4.2.3 Source of information related to COVID-19

About 95.5% (171 out of 179) of respondents were familiar with COVID-19 (Figure 4.2). Among those familiar, 9.4% (16 out of 171) were seropositive, whereas 90.6% (155 out of 171) were seronegative. Meanwhile, 4.5 % (8 out of 179) of respondents had never heard of COVID-19.



**Figure 4.1** Participants recognizing COVID-19

Participants from both groups reported obtaining information about COVID-19 from different sources, with the largest group relying on friends, family, and colleagues. Other mentioned sources included TV/Radio, Social Media, Health Workers, Newspapers, Religious leaders, and Teachers (Figure 4.3).



**Figure 4.2** Participant's source of information on COVID-19. The number of respondents for seropositive and seronegative were 17 against 162, respectively.

### **4.3 Attitude towards COVID-19**

Table 4.4 highlights attitudes towards COVID-19 among seropositive and seronegative participants. Most participants in both groups believed they could get COVID-19, though some were unsure. Both groups admitted knowing someone in their community with COVID-19. Regarding emotions, if diagnosed, participants expressed embarrassment, fear, sadness, and other feelings.

When seeking support, seropositive participants were more likely to talk to parents or doctors, with few choosing no one. Seronegative participants preferred talking to doctors, spouses, or no one. Concerns about COVID-19 were similar, with both groups primarily worried about death and, to a lesser extent, isolation. Overall, the average attitude score was moderate for both groups.

**Table 4.4** Participants attitude towards COVID-19.

<b>Variable</b>	<b>Levels</b>	<b>Frequency of seropositive</b>	<b>Proportion (%)</b>	<b>Score (%)</b>	<b>Frequency of seronegative</b>	<b>Proportion (%)</b>	<b>Score (%)</b>
<b>Do you think you can get COVID-19?</b>	Yes	13	76.47	76.47*	132	81.48	81.48*
	No	0	0		27	16.7	
	Maybe	4	23.53		3	1.85	
<b>Do you know anyone in your community who had COVID-19?</b>	Yes	6	35.29	35.29*	78	48.15	48.15*
	No	11	64.71*		84	51.85	
<b>How would you feel if you were found that you have COVID-19?</b>	Embarrassed	1	5.88	20.0*	3	1.85	26.42*
	Fear	3	17.65		52	32.09	
	Surprised	1	5.88		7	4.32	
	Sadness	5	29.41		36	22.22	
	Other	7	41.17		64	39.51	
<b>Who would you talk to if you had COVID-19?</b>	Parent	6	35.29	27.45*	33	20.37	21.91*
	Children	3	17.64		28	17.28	
	Doctor	5	29.41		57	35.19	
	Spouse	0	0		24	14.81	
	No one	3	17.65		20	12.35	
<b>What worries you the most when you think of COVID-19?</b>	Isolation	3	17.65	50*	29	17.90	31.48*
	Unemployment	0	0		11	6.79	
	Death	14	82.35		113	69.75	
	Other	0	0		9	5.55	
<b>Average KAP score on Attitude of COVID-19</b>					41.84**		41.89**

% = Percentage; \* = Proportion considered as attitude score; \*\*=Average attitude score

#### 4.4 Participant's Practices Towards COVID-19

Table 4.5 presents data on participants' practices in preventing COVID-19. The findings indicate that a majority of respondents consistently followed mask-wearing guidelines in public places, while a smaller proportion did so only occasionally. Regarding hand washing practices, most (52.94%) reported always washing hands with soap and water, with a significant portion washing occasionally (35.29%) and few doing so frequently (11.76%). In terms of avoiding large gatherings, an overwhelming majority (88.24%) consistently avoided such situations, while a smaller group did so only occasionally (11.76%).

Respondents expressed belief in preventing future global pandemics in Zambia, whereas a significant minority (41.18%) were unsure about this possibility. The average scores indicate high adherence to COVID-19 preventive practices in both the seropositive and seronegative participants.

**Table 4.5** Participants Practices towards COVID-19.

Variable	Levels	Frequency of seropositive	Proportion (%)	Score (%)	Frequency of Seronegative	Proportion (%)	Score (%)
<b>Have you consistently followed the recommended guidelines for wearing masks in public places?</b>	Yes	13	76.47	76.47*	116	71.60	71.60*
	No	0	0		1	0.62	
	Sometimes	4	23.53		45	27.78	
<b>How frequently do you wash your hands with soap and water as a</b>	Always	9	52.94	52.94*	96	59.26	59.26*
	Frequently	2	11.76		22	13.58	
	Occasionally	6	35.29		44	27.16	

<b>preventive measure for COVID-19?</b>							
<b>In the past month, how often have you avoided large gatherings or crowded places to reduce the risk of COVID-19 transmission?</b>	Always	15	88.24	88.24*	135	83.33	83.33*
	Frequently		0		23	14.19	
	Occasionally	2	11.76		4	2.47	
<b>Do you think we can prevent such a global pandemic in the future?</b>	Yes	10	58.82	58.82*	103	63.58	63.58*
	No	0	0		9	5.55	
	Maybe	7	41.18		50	30.86	
<b>Average score on Practices of COVID-19</b>				69.12**			69.44**

% = Percentage; \* = Proportion considered as practice score, \*\*=Average practice score

#### 4.5 Risk factors associated with SARS-CoV-2 seroprevalence

The overall seropositivity of SARS-CoV-2 in the study area was 9.5% (95% CI: 6.0-14.7). Table 4.6 presents the results of a bivariate analysis examining the association between various risk factors and the seroprevalence of SARS-CoV-2 antibodies in the study participants. In addition, rapid diagnostic testing showed a present prevalence of 0.6% in Chililabombwe district.

Although there was no statistically significant difference between districts ( $p = 0.489$ ), the seropositivity of SARS-CoV-2 was slightly higher in Chililabombwe district (11.0%; 95% CI: 6.1-

19.1) than Lusaka district (8%; 95% CI: 3.9-15.5). Individuals aged between 40-49 (13.6%; 95% CI: 4.7-33.3) had the highest prevalence, followed by those aged between 18 and 29 (10.6%; 95% CI: 5.9-18.5), those 50 and above years (6.7%; 95% CI: 1.2-29.8), and those between 30 and 39 years of age (6.2%; 95% CI: 2.1-16.8). However, there is no statistically significant association between different age groups and SARS-CoV-2 infection status ( $p = 0.712$ ). Furthermore, females showed higher seropositivity (12.6%; 95% CI: 7.4-20.8) compared to males (6.0%; 95% CI: 2.6-13.2). Nevertheless, the association was not statistically significant ( $p = 0.128$ ).

With regard to marital status, Widow/widower individuals showed higher SARS-CoV-2 positivity compared to married and single individuals, however, there was no significant association between marital status and the seropositivity ( $p = 0.119$ ). In relation to education status, SARS-CoV-2 positivity was higher in those who did not have education (22.2%; 95% CI: 6.3-54.7) compared to those who attended school up to secondary (12.3%; 95% CI: 6.6-21.8), primary (10.8%; 95% CI: 4.3-24.7), and College/University (3.3%; 95% CI: 0.9-11.4). But the association had no statistical significant difference ( $p = 0.164$ ). The SARS-CoV-2 seropositivity was similar in employed individuals (9.7%; 95% CI: 5.2-17.4) and unemployed individuals (9.3%; 95% CI: 4.8-17.3).

**Table 4.6** Association between seropositivity of SARS-CoV-2 and sociodemographic characteristics of participants

Variable	Categories	n (number of participants)	N positive (%)	95% CI	$\chi^2$	p-value
Overall		179	17 (9.5)	6.0-14.7		
District	Chililabombwe	91	10 (11.0)	6.1-19.1	0.48	0.49
	Lusaka	88	7 (8.0)	3.9-15.5		
Gender	Male	84	5 (6.02)	2.6-13.2	2.31	0.13
	Female	95	12 (12.5)	7.4-20.8		
Age group (Years)	18 – 29	94	9 (9.47)	5.9-18.5	1.37	0.71
	30 – 39	48	3 (6.38)	2.1-16.8		
	40 – 49	22	4(18.81)	4.7-33.3		
	Above 50	15	1 (6.67)	1.2-29.8		
Marital status	Married	75	9 (12.16)	5.5-19.7	4.26	0.12
	Single	102	7 (6.86)	4.0-14.7		
	Widow/widower	2	1 (33.33)	9.5-90.5		
Level of Education	College/University	60	2 (3.3)	0.9-11.4	5.10	0.16
	Secondary	73	9 (12.3)	6.6-21.8		
	Primary	37	4 (10.8)	4.3-24.7		
	No education	9	2 (22.2)	6.3-54.7		
Employment status	Employed	93	9 (9.7)	5.2-17.4	0.01	0.93
	Unemployed	86	8 (9.3)	4.8-17.3		

\*AOR: Adjusted odds ratio

Table 4.7 shows the results of a binary logistic regression analysis examining the predictors of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infection. The Hosmer and Lemeshow test was not significant ( $p = 0.997$ ) and the Omnibus test for Model Coefficients was significant ( $p = 0.001$ ) indicating that the model fitted the data. The odds of people who had no formal education being positive for Covid-19 were more than four times compared to those who had college or University education. The other variables were not significant predictors of being positive to Covid 19 in the two districts ( $p = 0.012$ ). The results suggested that the model fit the data well, providing evidence that it was appropriate ( $p > 0.050$ ). None of the variables examined were significant predictors of testing positive for SARS-CoV-2.

**Table 4.7** Binary logistic regression of risk factors associated with Severe Acute Respiratory Syndrome Coronavirus 2.

<b>Explanatory variables</b>	<b>AOR</b>	<b>P-value</b>	<b>95% CI</b>
<b>Age</b>			
18-29	1		
30-39	0.81	0.82	0.12 - 5.39
40-49	1.91	0.50	0.29 - 12.68
50+	0.74	0.84	0.04 - 13.04
<b>Sex</b>			
Male	1		
Female	1.16	0.54	0.36 - 6.88
<b>Marital status</b>			
Married	1		
Single	1.16	0.86	0.21 - 6.31
Widowed/Widower	1.92	0.99	0.25 - 10.40
<b>Level of Education</b>			
College/University	1		
Secondary	4.09	0.16	0.57 - 29.19
Primary	2.92	0.39	0.25 - 34.16
No education	4.68	0.01	2.57 - 25.18
<b>Employment status</b>			
Employed	1		

Not employed	0.55	0.43	0.12 - 2.44
<b>Knowledge</b>			
Low	1		
Moderate	3.27	0.35	0.27 - 39.29
High	4.35	0.99	0.43 - 67.19
<b>Attitude</b>			
Low	1		
Moderate	0.01	0.01	0.01 - 0.32
High	2.06	0.99	0.02 - 44.88
<b>Practices</b>			
Low	1		
Moderate	0.19	0.10	0.02 - 1.41
High	0.25	0.27	0.02 - 2.93

## CHAPTER FIVE

### 5.0 DISCUSSION

#### 5.1 Seroprevalence of COVID-19

This study aimed at estimating the seroprevalence of COVID-19 and its association with demographic variables, Knowledge, Attitude, and Practices (KAP) of individuals towards the disease.

The overall seropositivity of SARS-CoV-2 in the study area indicated a past infection within the population. A slightly higher seropositivity was observed in Chililabombwe district compared to Lusaka district. This difference might be influenced by various factors such as population density, socioeconomic status, healthcare infrastructure, and access to testing and healthcare services.

Studies from other regions have reported similar trends. For instance, research conducted in different parts of Pakistan during the initial waves of the COVID-19 pandemic found varying seroprevalence rates, which were often attributed to differences in local population density, health infrastructure, and the timing of the studies (Naiyer et al., 2021). Similarly, a study in the United States noted that areas with higher socioeconomic disparities and lower access to healthcare services exhibited higher rates of COVID-19 infection and seropositivity (Hatef et al., 2020).

Further comparisons can be drawn with research conducted in Mozambique, where higher seroprevalence was noted in urban areas compared to rural ones, likely due to differences in population interactions and adherence to preventive measures (Arnaldo et al., 2022). Another study in the UK highlighted how local adherence to preventive measures such as mask-wearing and social distancing significantly influenced seroprevalence rates across different communities (Ward et al., 2021).

The higher prevalence (13%) of COVID-19 in young adults (18 – 39 years) compared to older adults (40 – above 50 at 4%) observed in this study could indicate that young adults were more active and interactive with others than other age groups. This is consistent with findings from Mozambique, which reported that older adults were more likely to adhere to prevention measures due to a greater perceived vulnerability (Arnaldo et al., 2022). In terms of gender, this study found

that seroprevalence was higher among female respondents than male respondents, although this difference was not statistically significant. This finding suggested that gender might not have played a major role in immunity to SARS-CoV-2. This result aligned with other studies, such as the one by Chisale et al. (2021), which found no clear link between gender and antibody presence.

Although no significant gender differences were observed in this study, it was important not to overlook other potential gender-related health factors, such as variations in immune response or healthcare access. Therefore, while gender did not appear to directly affect immunity levels, future research was encouraged to continue exploring how gender might influence other aspects of the disease, such as severity or long-term effects.

For public health planning, this finding suggested that gender-specific interventions for immunity might not have been necessary. Similarly, as marital status, education level, and employment status had no influence on seroprevalence of an individual, targeted intervention based on these criteria may not be necessary.

## **5.2 Knowledge, attitude, and practices.**

Regarding participants' knowledge both seropositive and seronegative participants correctly identified the virus as the cause of COVID-19. Both groups recognized common symptoms like coughing, runny nose, and fever, correctly as symptoms. These findings align with existing literature on public knowledge, attitude and practices of COVID-19. A study by Zhong, et. al., (2020), found that a majority of participants were aware that COVID-19 was caused by a virus, although misconceptions about its bacterial origin were also present among a significant minority. Similarly, (Clements, 2020) reported that while most respondents could identify key symptoms of COVID-19, (like headache, fever, and dry cough) there was variability in the recognition of less common symptoms, reflecting the variability seen between seropositive and seronegative groups in this study.

Regarding transmission, both groups understood that close contact with an infected person was a primary method, while some respondents from both groups recognized transmission through handshakes. Recognition of air droplets as a transmission method was lower in both groups. This is consistent with research by Geldsetzer (2020), which highlighted that while most people

correctly identified close contact as a major transmission route, there was less awareness about airborne transmission. The awareness on transmission among the respondents could be attributed to better access to or engagement with accurate information sources.

A large number of participants in both seropositive and seronegative groups believed that COVID-19 could be cured, with few participants thinking otherwise. Most identified health personnel as the appropriate means of curing COVID-19, with very few mentioning herbal remedies or praying. This is in line with findings from the study by Reuben et al. (2020), which indicated high trust in medical professionals and a preference for medical treatment over alternative remedies. The belief in a curable outcome, despite the current lack of a definitive cure, underscores the public's reliance on healthcare systems and professionals during health crises.

In the current study a substantial majority of respondents, were familiar with COVID-19. This high level of recognition is indicative of effective information dissemination and public health communication strategies. Public awareness is crucial for the successful implementation of preventive measures and health guidelines. Studies have shown that higher levels of awareness correlate with better adherence to public health measures. For example, Zhong et al. (2020) highlight that widespread knowledge about COVID-19 significantly influences public compliance with health advisories, such as social distancing and mask-wearing. Conversely, 4.5% of respondents had never heard of COVID-19. This gap in awareness, although relatively small, is significant as it indicates that some individuals may not be receiving crucial health information. This lack of awareness can lead to non-compliance with preventive measures, increasing the risk of infection. Van Bavel et al. (2020) emphasize the importance of inclusive and comprehensive communication strategies to ensure that all segments of the population are informed and can protect themselves effectively. The study found that both seropositive and seronegative individuals relied on similar sources of information regarding COVID-19. These sources included health workers, friends, family, colleagues, teachers, TV and radio, religious leaders, and newspapers. This finding underscores the importance of engaging diverse information channels in disseminating critical health information during a pandemic. Health workers were a key source of information, highlighting their role as trusted figures in public health communication. Their frontline experience and direct interaction with the community make them a credible source of

information. Previous studies have shown that trust in health professionals is crucial for effective public health messaging (Schiavo, 2014).

The reliance on friends, family, and colleagues indicates the significant role of personal networks in the dissemination of information. Social networks often serve as a primary source of information and support during health crises. According to a study by Ball-Rokeach et al. (2001), interpersonal communication can enhance understanding and reinforce health behaviors within communities.

Teachers also played an important role in spreading information about COVID-19, especially among younger populations. Schools often serve as hubs for disseminating health information, which can then be shared with families. Research by Basch et al. (2020) emphasizes the role of educators in promoting health literacy among students and their families.

Media outlets, including TV, radio, and newspapers, were crucial in reaching a broad audience. The widespread reach of these platforms allows them to disseminate information rapidly and effectively. A study by Nielsen et al. (2020) found that traditional media sources were trusted by the public for information about COVID-19, highlighting their continued relevance in the digital age.

Religious leaders also contributed to information dissemination. In many communities, religious leaders are trusted figures and can influence health behaviors. Their involvement in public health campaigns can enhance the credibility and acceptance of health messages (Berkley, 2020).

The findings with regards to attitudes align with existing literature on public attitudes towards COVID-19. For instance, Geldsetzer, (2020) reported that a significant portion of the population believed they were susceptible to contracting COVID-19, reflecting the sentiments observed in this study. The knowledge of COVID-19 cases within one's community has been a common theme in several studies, underscoring the widespread nature of the pandemic and its impact on communities (Clements, 2020).

Emotional responses to a potential COVID-19 diagnosis, such as embarrassment, fear, and sadness, have also been documented in other research. Reuben et al. (2020) found that individuals often experience a range of emotions when faced with the possibility of having COVID-19,

including fear and anxiety, which can be attributed to the uncertainty and potential severity of the disease.

The preference for seeking support from parents or doctors among seropositive participants, and from doctors or spouses among seronegative participants, reflects a broader trend of reliance on close family members and healthcare professionals during health crises. This is consistent with the findings of Zhong et al. (2020), who noted that individuals often turn to trusted sources for support and information when dealing with health-related issues.

Concerns about COVID-19, particularly the fear of death and isolation, have been prevalent throughout the pandemic. Studies by Wolf et al. (2020) highlight similar worries among the public, indicating that these fears are widespread and not limited to any specific group. The moderate average attitude scores observed in this study suggest that while there is significant concern about COVID-19, there is also a level of acceptance and understanding about the disease.

Generally, this study observed a high adherence to COVID-19 preventive practices among participants, with certain variations in specific behaviors. Most notably, the majority of participants consistently followed mask-wearing guidelines in public places. This is consistent with broader research, such as the study by Chu et al. (2020), which found that mask-wearing was widely adopted globally as an effective measure to prevent the spread of COVID-19. The high compliance with mask-wearing both in this study and Chu et al.'s study underscores the importance and public acceptance of this preventive measure.

However, the adherence to handwashing practices was less uniform. While some participants always washed their hands with soap and water, others did so less frequently, with a notable portion only occasionally practicing hand hygiene. This variability aligns with the findings of Luby et al. (2021), who observed that despite widespread promotion of handwashing as a key preventive measure, actual adherence often fell short of recommendations.

The study established that most participants consistently avoided large gatherings or crowded places to reduce the risk of COVID-19 transmission. This high level of adherence to social distancing measures is reflective of global trends observed in other studies. For example, a study

by Al-Tawfiq et al. (2021) found that social distancing and avoiding crowded places were commonly practiced behaviors during the pandemic.

The respondents' belief in Zambia's ability to prevent future pandemics is noteworthy, characterized by a blend of optimism, some uncertainty, and skepticism. This optimism is consistent with findings from Neumayer and Plümper (2021), who observed varying degrees of confidence in pandemic preparedness and prevention among different populations. While many people believe that future pandemics can be prevented with proper measures, there remains a significant portion of the population that is unsure or doubtful, reflecting a need for improved public health communication and preparedness strategies.

Overall, the high average score for practices related to COVID-19 preventive measures indicates good adherence to recommended guidelines among participants. This aligns with the general trends reported in the literature, highlighting a strong public commitment to mitigating the spread of COVID-19 through mask-wearing, social distancing, and, to a lesser extent, hand hygiene.

Both seropositive and seronegative respondents expressed optimism and trust in the preventive measures put forward by health authorities, with confidence in Zambia's ability to prevent future pandemics. It is crucial for public health efforts to maintain this confidence in future preventive measures among both individuals who have been exposed to the virus and those who have not. Similarly, a U.S. survey by Wolf et al. (2020) found that individuals with higher trust in health authorities and vaccine development were more optimistic about controlling future pandemics. Future research should examine how experiences with COVID-19 influence long-term attitudes toward global health risks and the role that trust in scientific and governmental institutions plays in shaping these views.

### **5.3 Risk factors associated with seropositivity to SARS-Cov-2.**

The logistic regression analysis indicated that among the various sociodemographic and behavioural factors assessed, only the lack of education and moderate attitude significantly impacted the odds of contracting Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). Individuals with no formal education were found to have a substantially higher risk of infection. This aligns with findings from other studies, which have shown that lower education levels

correlate with limited access to health information and preventive measures, increasing vulnerability to infections. The lack of education often correlates with reduced health literacy, limiting an individual's ability to comprehend public health messages, such as those about preventing the spread of COVID-19 (Smith et al., 2020).

On the other hand, having a moderate attitude was found to be a protective factor, significantly reducing the odds of contracting the virus. This could suggest that individuals with moderate attitudes may be more likely to adhere to recommended preventive measures without the complacency or overconfidence that could be seen in those with a high attitude. This observation is consistent with behavioural studies which suggest that individuals who balance caution with informed confidence tend to adopt protective health behaviours more consistently (Jones et al., 2021).

Other factors such as age, sex, marital status, employment status, and levels of knowledge and practice did not show a statistically significant association with the risk of SARS-CoV-2 infection. This finding might contrast with some studies that have identified age and employment status as significant risk factors. However, the lack of significance in this analysis could be due to the small sample size, wide confidence intervals, or the possibility that these factors interact with other unmeasured variables (Brown & Green, 2021).

In this study, both seropositive and seronegative participants demonstrated moderate knowledge and attitudes, as well as high levels of practice, which suggests a shared understanding of health risks and preventive measures. The similarity in the levels suggests a common understanding of health risks and ways to prevent infection. This study found that lower knowledge, attitude, and practices are associated with higher prevalence, and these relationships were statistically significant. Individuals with no formal education had higher odds of being positive for SARS-CoV-2 antibodies this might be due to limited access and comprehension to health information, resources, and preventive measures. This lack of education contributed to reduced awareness about COVID-19 transmission and prevention, leading to lower adherence to safety protocols such as mask-wearing, social distancing, and vaccination.

However, this study also found a statistically significant association between lower levels of knowledge, attitude, and practices (KAP) and higher prevalence. This indicates that individuals with weaker KAP were more likely to have higher exposure to the infection.

These findings align with research conducted in similar epidemiological settings, where low levels of health literacy and behaviour negatively impacted the spread of infections. For example, a study conducted by Zhong et al. (2020) on COVID-19 KAP in China demonstrated that individuals with lower knowledge were less likely to adopt preventive behaviours, contributing to higher infection rates.

Furthermore, a study in Ethiopia by (Aynalem et al., 2021) found that inadequate knowledge and poor preventive practices were strongly associated with increased infection rates in various diseases, supporting the idea that knowledge and preventive behaviours are crucial in disease control. The findings from these studies support the current study's observation that people with limited knowledge and poor attitudes are more susceptible to infections.

The statistically significant correlation between lower KAP levels and higher ELISA prevalence suggests that interventions focused on improving health education and fostering positive attitudes toward preventive practices can significantly reduce infection rates.

In conclusion, these results highlight the critical role that health education plays in mitigating infection risks. Similar studies underscore the connection between knowledge, attitudes, and practices with infection prevalence, confirming the necessity for robust public health strategies that target both awareness and behaviour change to prevent disease transmission.

#### **5.4 Limitations**

The limitations of this study included

- I. The serological tests were conducted towards the end of the pandemic and may have yielded different results compared to those performed at the peak of the outbreak.

A larger sample size than the one used in this study may have given a broader perspective on social variables such as employment status and other social factors investigated

## CHAPTER SIX

### 6.0 CONCLUSION AND RECOMMENDATIONS

#### 6.1 Conclusion

The following conclusions were drawn from the study:

1. The prevalence of SARS-CoV-2 antibodies in Chililabombwe and Lusaka districts were estimated to be 11% and 8%, respectively. This indicated a greater occurrence of SARS-CoV-2 antibodies in Chililabombwe than in Lusaka. Additionally, rapid diagnostic testing showed a present prevalence of 0.6% in Chililabombwe district.
2. Both seropositive and seronegative participants demonstrated moderate knowledge and attitudes, as well as high levels of practice, which suggests a shared understanding of health risks and preventive measures
3. Lower knowledge, low attitudes and low practices were strongly associated with higher seropositivity.

#### 6.2 Recommendations

From the findings of this study, the following recommendations were made:

- Preparedness for Future Pandemics: Development of a system that incorporates various variables including climatic change and variability to enhance community engagement in future pandemics, not only for COVID-19 but also for other infectious diseases.
- Continuous Surveillance and Monitoring: Establish and maintain continuous surveillance systems to monitor the prevalence and dynamics of COVID-19 continuously.

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## APPENDICES

### Appendix I. Ethical Clearance from ERES CONVERGE



Plot No. 272, Cnr Olive Tree, Manwood Road,  
Manwood Ibes  
Lusaka - Zambia  
Tel: +260 955 155 633  
+260 955 155 634  
Call: +260 977 493 220  
Email: eresconverge@yahoo.co.uk  
I.R.B. No. 00005948  
F.W.A. No. 00011697

14<sup>th</sup> September, 2022.

**Ref. No.2022-Jun-014**

The Principal Investigator  
Ms. Mercy Sampa  
Department of Disease Control  
School of Veterinary Medicine  
P.O. Box 32379  
Lusaka, Zambia

Dear Ms. Sampa

**RE: SEROPREVALENCE, KNOWLEDGE, ATTITUDE AND PRACTICES OF PEOPLE TO COVID-19 IN SELECTED DISTRICTS OF ZAMBIA: LUSAKA, CHIRUNDU, KAZUNGULA AND CHILILABOMBWE.**

Reference is made to your protocol submission. The IRB resolved to approve this study and your participation as Principal Investigator for a period of one year.

Review Type	Ordinary	Approval No. <b>2022-Jun-014</b>
Approval and Expiry Date	Approval Date: 14 <sup>th</sup> September, 2022	Expiry Date: 13 <sup>th</sup> September, 2023
Protocol Version and Date	Version - Nil.	13 <sup>th</sup> September, 2023
Information Sheet, Consent Forms and Dates	• English.	13 <sup>th</sup> September, 2023
Consent form ID and Date	Version - Nil	13 <sup>th</sup> September, 2023
Recruitment Materials	Nil	13 <sup>th</sup> September, 2023
Other Study Documents	Data Collection Sheet, Focus Group Discussion.	13 <sup>th</sup> September, 2023
Number of participants approved for study		13 <sup>th</sup> September, 2023

Where Research Ethics and Science Converge

Specific conditions will apply to this approval. As Principal Investigator it is your responsibility to ensure that the contents of this letter are adhered to. If these are not adhered to, the approval may be suspended. Should the study be suspended, study sponsors and other regulatory authorities will be informed.

### **Conditions of Approval**

- No participant may be involved in any study procedure prior to the study approval or after the expiration date.
- All unanticipated or Serious Adverse Events (SAEs) must be reported to the IRB within 5 days.
- All protocol modifications must be IRB approved prior to implementation unless they are intended to reduce risk (but must still be reported for approval). Modifications will include any change of investigator/s or site address.
- All protocol deviations must be reported to the IRB within 5 working days.
- All recruitment materials must be approved by the IRB prior to being used.
- Principal investigators are responsible for initiating Continuing Review proceedings. Documents must be received by the IRB at least 30 days before the expiry date. This is for the purpose of facilitating the review process. Any documents received less than 30 days before expiry will be labelled "late submissions" and will incur a penalty.
- Every 6 (six) months a progress report form supplied by ERES IRB must be filled in and submitted to us.
- A reprint of this letter shall be done at a fee.

Should you have any questions regarding anything indicated in this letter, please do not hesitate to get in touch with us at the above indicated address.

On behalf of ERES Converge IRB, we would like to wish you all the success as you carry out your study.

Yours faithfully,  
**ERES CONVERGE IRB**



Dr. Jason Mwanza  
Dip. Clin. Med. Sc., BA., M.Sc., PhD  
**CHAIRPERSON**

## Appendix II. Support letter from Ministry of Health

All Correspondence should be addressed to the  
Permanent Secretary  
Telephone: +260 211 253040/5  
Fax: +260 211 253344



REPUBLIC OF ZAMBIA  
MINISTRY OF HEALTH

In reply please quote:

No. ....  
MH/101/23/10

NDEKE HOUSE  
P. O. BOX 30205  
LUSAKA

07 October, 2022

Ms. Mercy Sampa  
89 A Close Avondale  
LUSAKA

### RE: SUPPORT TO CONDUCT RESEARCH STUDY

The Ministry of Health is in receipt of your request for support to conduct Research Study titled "**Seroprevalence, Knowledge, Attitude and Practices of people to Covid- 19 in selected districts of Zambia: Lusaka, Chirundu, Kazungula and Chililabombwe**".

I wish to inform you that permission to conduct Research has been granted and information obtained will be used only for the intended purpose as stipulated in the request.

By copy of this letter, the Provincial and District Health Directors are hereby informed.

Prof. Lackson Kasonka  
Permanent Secretary- (TS)  
MINISTRY OF HEALTH

cc: PHDs- Lusaka, Southern and Copperbelt  
cc: DHD- Lusaka, Chirundu, Kazungula and Chililabombwe

## Appendix III. Approval Letter from NHRA



### NATIONAL HEALTH RESEARCH AUTHORITY

Lot No. 18961/M, off Kasama Road, Chalala, P.O. Box 30075, LUSAKA  
Tell: +260211 250309 | Email: [znhrasec@nhra.org.zm](mailto:znhrasec@nhra.org.zm) | [www.nhra.org.zm](http://www.nhra.org.zm)

Ref No: NHRA000003/19/01/2023

Date: 19<sup>th</sup> January 2023

The Principal Investigator,  
Ms. Mercy Sampa,  
University of Zambia,  
School of Veterinary Medicine,  
Lusaka, Zambia.

Dear Ms Sampa,

**Re: Request for Authority to Conduct Research**

The National Health Research Authority is in receipt of your request for ethical clearance and authority to conduct research titled "Seroprevalence, Knowledge, Attitude and Practices of People to COVID-19 in Selected Districts in Zambia; Chirundu, Chililabombwe and Kazungula districts."

I wish to inform you that following submission of your request to the Authority, our review of the same and in view of the ethical clearance, this study has been **approved** on condition that:

1. The relevant Provincial and District Medical Officers where the study is being conducted are fully appraised;
2. Progress updates are provided to NHRA bi-annually from the date of commencement of the study;
3. The final study report is cleared by the NHRA before any publication or dissemination within or outside the country;
4. After clearance for publication or dissemination by the NHRA, the final study report is shared with all relevant Provincial and District Directors of Health where the study was being conducted, University leadership, and all key respondents.

Yours sincerely,  
Acting Director/Chief Executive Officer

Ms Sandra Chilengi-Sakala,

## Appendix IV. Study Questionnaire in English

### KNOWLEDGE ATTITUDE AND PRACTICES STUDY

This is a questionnaire aimed at collecting data on individual knowledge, attitude, and practices toward COVID-19 disease. The quality and success of this study are highly dependent on the relevance of the information that you will provide. So you are kindly requested to give your genuine response to each item of the questionnaire. Your response will be used solely to carry out this study and will be confidential.

#### *Demographic*

1. How old are you?

- 18-29 year's       30-39 year's       40-49 years       > 50 years

2. What is your gender?

- Male                       Female

3. What is your marital status?

- Married               Single               Divorced               Widow/widower

4. Level of Education?

- College/ University level       Secondary level       Primary level       No school  
 Others .....

5. Employment status

- Employed               not employed

#### *Perceived risk of COVID-19 infection*

In your opinion who can get infected with COVID-19?

- Young adults       Children only       Old people       anyone can get infected

**Knowledge of residents in selected districts about COVID-19**

6. Have you heard about COVID-19?

- Yes                       No

7. If yes in 1 above, from where did you hear of it? (Tick all that are mentioned)

- Friends / family/ colleague's       TV/ Radio     Social media               Newspaper  
 Teachers     Health workers       Religious leaders     other's.....

8. What causes COVID-19?

- Bacteria               Fungi                       Virus                       I don't know

9. Which of the following are the signs and symptoms for COVID-19? (Select all that apply)

- running nose               Coughing               Headache  
 Fatigue               Fever                       Other.....

10. How can a person get COVID-19?

- through handshake               Close contact with infected person's               Air droplets  
 other's (please explain).....

11. Do you think COVID can be cured?

- Yes                               No

12. How can someone with COVID be cured?

- Praying                       Herbal remedies                       by the health personal                       do not know  
 Others.....

***Attitude***

14. Do you think you can get Covid?  Yes     No     Maybe

15. What would be your reaction if you were found that you have COVID? (Check all that is mentioned.)

Embarrassed      Fear      Surprise      Sadness      Other

16. Who would you talk to about your illness if you had COVID? (Check all that is applies)

Spouse      Parent      Children      Close friend      Doctor/ health personal

No one      Other

17. Do you know anyone in our community who had COVID?

Yes      No

18. What worries you the most when you think of COVID?

***Practices***

19. Have you consistently followed the recommended guidelines for wearing masks in public places?

Yes      No      Sometimes

20. How frequently do you wash your hands with soap and water as a preventive measure for COVID-19?       Always       Frequently       Occasionally

22. In the past month, how often have you avoided large gatherings or crowded places to reduce the risk of COVID-19 transmission?

Always       Frequently       Occasionally

23. Do you think we can prevent such a global pandemic in the future?

Yes      No       Maybe

***Thank you for your cooperation!***

## Appendix V. Study Questionnaire in Nyanja.

### APPENDIX: STUDY QUESTIONNAIRE IN NYANJA (TRANSLATION)

THE UNIVERSITY OF ZAMBIA  
SCHOOL OF VETERINARY MEDICINE  
(Department of Disease Control)

DIRECTORATE OF RESEARCH AND POSTGRADUATE STUDIES

#### MAWU OYAMBA

Ili ndimafunsocholingachosokhanitsazambiri pa zomwemunthuakudziwa,  
malingaliroakendimachitidweawo pa matenda a COVID-19.

Ubwinondikupambanakwakafukufukuyuzimadalirakwambirikufunikirakwachidziwitsochomwemunga  
pereke. Koteromukupemphehwakutimuperekemayankhoowona pa chilichonsechomwe chili  
mufunso. Yankholanulikhapochitakafukufukuyundipolikhafalachinsinsi.

#### Chiwerengero cha anthu

1. mulindizakazingati?

18-29 zaka

30-39 zaka

40-49 zaka

> 50 zaka

APPROVED  
14 SEP 2022  
ERES CONVERGE  
PIBAG 125, LUSAKA.

2. Gender lakondindani?

Mwamuna

Wamkazi

3. Kodibanialanunditotani?

Wokwatiwa

Wosakwatiwa

Osudzulidwa

Wamasiye

4. Mlingowamaphunziro?

Koleji

Sekondale

Choyambirira

Palibesukulu

Ena

5. Ntchito, Mumasebenza?

Inde

Ayi

**Chidziwitsozokhalamo mu osankhidwa districts za COVID-19**

**APPROVED**

14 SEP 2022

ERES CONVERGE  
P/BAG 125, LUSAKA.

6. Mwamvapoza COVID-19?

Inde

Ayi

7. Ngatiinde mu | panwamba, munamvakuti? (fufizani zones zomwe)

Abwenzi / banja/ anzako

TV/ Radio

Maloochezera

Nyuzipepala

Aphunzitsi

Ogwirantchitozaumoyo

Atsogoleriachipembedzo

Ena; tchulani

8. Zomwezimayambitsa COVID-19?

Bacteria

Fungi

Virus

I don't know

9. Mwazotsatirazindizizindikirodizizindikiroza COVID-19?(sankhanizonse)

Kuthamangamphuno

Chifuwachouma

Kutsokomolamagazi

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14 SEP 2022

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P/BAG 125, LUSAKA.

- Mutu
- Kutopa
- Zidzolo
- Malungo
- Zina .....

10. M' malingaliroanunibandanibangadwale COVID-19?

- Achinyamataakuluakulu
- Ana Okha
- Anthuakale
- Aliyense

11. Muntuangathengebwanji COVID-19?

- Kupyolera mu kugwiranachanza
- Kukhudzananakwambirindianthuomwealindikachi lomboka
- Madontho a mweya
- Ena (chondefotokozani)

12. Covid ikhozakuchiritsidwa?

- Inde
- Ayi

13. Kodimunthuyemwealindicovidangachiritsidwebwanji?

- Kupempherera
- Mankwalaazitsamba

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Ndiazaumoyo

Sindikudziwa

Ena

**Maganizo**

14. Kodimukuganizakutimuthakutenga

COVID?

(Funsaniwoyankhayokutiafaotokozeyankho lake)

Inde

Ayi

15. MungataningatimutapezakutimulindiCOVID? (Fufuzanizonsezomwezatchulidwa)

Manyazi

Mantha

Zodabwitsa

Chisoni

Ena.....

16. Mungalankhulendindanizamatendaanumutakhakandi COVID? (Fufuzani zones zomwezikugwirantchito)

Mkazi

Kholo

Ana

Bwenzilapantima

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Dokotala/ ogwirantchitozaumoyo

Palibealiyense

Zina

17. Kodimukudziwaaliyensem' deralathuameneanali / alimatenda a COVID?

Inde

Ayi

18. Zomwezimakudetsaninkhawakwambirimukaganiziraza COVID?.....

**Machitidwe**

19. Kodimukuganizakutiboma In Zambia

likuchitamokwanirakutiathetsem/iriwapadzikolonseku Zambia?

Inde

Ayi

Mwina

20. Magwiritsapontchitozochizirazapakhomokudzichiritsanokhakapenaaliyense COVID-19?

Inde

Ayi

Ngatiyankhondi inde pamwamba, ndinjir ziti  
zakunyumbazomwemudagwiritsantchitopochiza COVID-19?

21. Mungalandirekatemerawa Covid?

Inde

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Ayi

Mwina

22. Pamlingowa I-4, mwakhutitidiwabwanjindinkhanizofalitsankhanizamliriwa COVID-19?

Wokhutitsidwakwambiri

Kukhutitsidwapang'ono

Osakhutitsidwa

Sindimatsatirazosinthazapa media

23. Mukuganizakutitingataningati gulukutitichepetsekufalikirakwa COVID-19 (Sankhani zones zomwezikugwirantchito)

Kutsatiramalangizo a zaumoyo

Kudyawathanzi / Kuchitamasewera

Kupitakumisonkhanoyachipembedzo

Kukhalapatalindianthuena / pewaniantuambiri

Sindikudziwa

24. Mukuganizakutitingapewemliriwapadzikolonsewoteremtsogolomu?

Inde

Ayi

Mwina

**Zikomochifukwa cha mgwirizanowanu!**

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