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EFFECTS OF COVID 19 ON THE ACCESSIBILITY OF ROUTINE IMMUNISATION SERVICES IN HARARE CITY, ZIMBABWE

BY

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Abstract

Childhood routine immunisation service accessibility during pandemics is a worrying global problem that disrupts progress in the fight against Vaccine Preventable Diseases (VPDs). The decrease of immunisation coverage during pandemics indicates a high risk of child morbidity and mortality from vaccine preventable deaths. This study sought to establish the compliance level and uncover the reasons and barriers for late access to immunization appointments during the Covid 19 pandemic in Harare City Family Health Service clinics (FHS). A cross-sectional analytical study design was used to explore the determinants of immunisation service accessibility in Harare City Family Health Services clinics. Primary data was collected from caregivers of under five children who accessed immunisation services in Harare Family Health Service clinics and questionnaires were administered to 273 study participants. A convenient and simple random sampling technique was used to select study participants. Data were analysed using Epi Info version 7. Descriptive statistics were based on frequencies and percentages. Chi-square test, bivariate and multivariate analysis were used for analytical statistics. The median age of the participants was 34. Level of compliance to scheduled immunisation services indicated that majority 158 (58%) of the under-five's caregivers reported late and 115 (42%) reported on time for immunisation appointments. Socio-demographic characteristics that were found to be significantly associated with delayed utilisation of immunisation services were: age (x^2 = 25.3, p<0.001) and place of residents (x^2 = 47.7, p<0.001), multivariate analysis results of socio-demographic characteristics associated with late access were: age 50+ years (AOR 8.0; p=0.003) and residing in Mabvuku (AOR 16.6, p<0.001) and Mufakose (AOR 11.8, p<0.001). Socio-demographic characteristics such as sex, religion, marital status, employment status were not found to be associated with access to immunization services (p>0.050). A significant association between late immunisation and service delivery factors was noticed: experiences at health facilities (AOR=2.7, p=0.018), shortage of healthcare staff (AOR=2.8, p=0.023), vaccine stock outs (AOR=2.5, p=0.037) suspension of health facilities (AOR=2.1, p=0.032) and waiting time (AOR= 2.8, p=0.018). The association between late access to immunisation services and caregivers' concerns were significantly determined by Covid 19 regulations (AOR 2.3, p=0.015), fear to contract Covid 19 (AOR 4.8, p<0.001), shortage of transport (AOR 2.8, p=0.028) and use of public transport (AOR 0.2, p=0.002). During the Covid 19 pandemic, caregivers encountered challenges in accessing immunisation services at FHS clinics. Therefore, the study recommends Harare City Health Department to introduce immunisation home visits during pandemics.

Key words: Access; Caregivers; Children; Covid 19; Routine Immunisation Services

Declaration Page

I declare that this dissertation is my original work except where sources have been cited and acknowledged. The work has not been submitted nor will it be submitted to another university for the award of a degree.

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List of Acronyms

BCG	Bacille Calmette Guerin
CHW	Community Health Workers
DTP	Diphtheria-Tetanus-Pertussis Vaccine
EPI	Expanded Program on Immunisation
FHS	Family Health Service
OPV/IPV	Oral and Inactivated Polio Vaccine
PCV	Pneumococcal vaccine
PENTA	Pentavalent
PPE	Personal Protective Equipment
RHW	Rural Health Workers
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2
SSA	Sub-Saharan Africa
TCV	Typhoid Conjugate Vaccine
TD	Tetanus Diphtheria
UHC	Universal Health Coverage
VPDs	Vaccine Preventable Diseases
WHO	World Health Organisation
ZEPI	Zimbabwe Expanded Programme on Immunisation

Definition of Key Terms

Caregiver	A person who regularly looks after a child, sick, elderly or disabled person.
Covid 19	An infectious disease caused by the SAR-CoV-2 virus.
Children	A young human below the age of puberty.
Heath facility	Healthcare institution that typically provides specialized treatment for patients.
Immunisation service	The process of making a person immune or resistant to an infectious disease typically by the administration of a vaccine.

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CHAPTER ONE INTRODUCTION

1.1 Introduction

Immunisation services are key in reducing morbidity and mortality in children under five years of age. The routine immunisation program is a primary strategy of the Expanded Program on immunisation (EPI), which protects children from vaccine preventable diseases (VPDs) by delivering effective vaccines worldwide. Childhood vaccines are found to be the most cost effective approach for reducing childhood disease burden especially when compared with interventions such as clean water and improved sanitation which can also reduce disease burden but require expensive and time consuming infrastructural investments (Adamu, Jalo, Habonimana,. & Wiysonge 2020).

In recent times, routine vaccination has been supplemented with additional efforts to optimize community coverage. The additional efforts implemented by governments to optimize community coverage include community outreaches and immunisation campaigns. As a result of those initiatives the full vaccination rates of children in low-income countries increased from below 50% to 80% during the past two decades (Nandi & Shet 2020).

1.2 Background of the study

At a global level, the routine child immunisation coverage increased worldwide in the past two decades. However, since the onset of the Covid 19 pandemic (Coronavirus Disease of 2019), immunisation services have been greatly affected, resulting in the decrease of childhood routine immunisation coverage globally. World Health Organisation (WHO) (2021) indicated that global immunisation coverage dropped from 86% in 2019 to 83% in 2020.

Covid 19 is a respiratory disease which is caused by a novel corona virus called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (Gorbalenya, & Siddell. 2019).

The first case of Covid 19 was reported in China on 31 December 2019 (WHO, 2020). Thereafter, numerous cases were reported in Italy, France, USA, UK and the rest of the world. By March 11 2020, the World Health Organization (WHO) had recognised the spread of Covid 19 as a pandemic due to the alarming levels of spread and severity of the disease (WHO 2020).

The spread of Covid 19 affected economies worldwide as all governments focused on combating the morbidity and mortality caused by the disease. Additionally the health delivery systems of both high and low to middle income countries were under pressure, affecting access to routine health services globally.

In Zimbabwe, the Covid 19 pandemic came at a time when the health care delivery system was already grappling with shortages of drugs, medical supplies and the response to Covid 19 was initially impacted by a strike of medical doctors and nurses who were requesting for adequate Personal Protective Equipment (PPE) and appropriate remuneration among other grievances (Makurumidze 2020).

The first case of Covid 19 in Zimbabwe was recorded on the 21st of March 2020 in Victoria Falls. Thereafter, more cases were reported in Harare and Bulawayo and the rest of the Country. This resulted in the Government of Zimbabwe taking action by instituting a tight lockdown on 31 March 2020 (Makurumidze 2020). The lockdown imposed by the Government restricted the movement of people including some healthcare workers. Since then, most hospitals and health facilities suspended some

of the services that were deemed ‘non-essential’ and only catered for emergency cases and thus reducing access to other essential services which include immunization (Makurumidze 2020).

In many countries healthcare resources were channelled to the prevention and treatment of Covid 19 in order to curb the spread of the pandemic thus leading to the disruption of routine immunisation services amongst other healthcare services. The disruption of routine immunisation services specifically poses adverse effects on health and on the maintenance of herd immunity against VPDs (Bednarek & Klepacz 2020). An increase in the number of unvaccinated children increases the risk of VPDs outbreaks globally.

According to Kampmann, Saso & Skirrow (2020) finding the balance between guarding against the spread of Covid 19 versus controlling well known preventable disease is delicate and difficult. For instance, recent modelling by Kampmann et al. (2020) predicted that not maintaining routine immunisation childhood immunisation in Africa can lead to more childhood deaths.

1.3 Statement of the Problem

In Zimbabwe, Covid 19 and its associated lockdowns affected access to immunisation services for children under the age of five (Makurumidze 2020). In the City of Harare health service delivery was disrupted as most clinics faced challenges in meeting the monthly immunisation coverage targets. In Harare Province, from January to September 2019, the penta 3 coverage which is the main immunisation indicator was 93% and in 2020 during the same period of the year the penta 3 coverage decreased to 84% (Harare City Health Immunisation Register 2020). The

reduction of the immunisation coverage rate might be an indication that less children were vaccinated in 2020 due to the Covid 19 pandemic.

Immunisation programmes rely heavily on properly functioning health systems and a stable operational environment. Due to tight travel restrictions in the first quarter of 2020 and prevailing challenges within the health delivery system, Harare City Health officials closed some Family Health Clinics and suspended immunisation outreach programs. Since then, a decrease of the routine immunisation coverage was noticed. Therefore, this study sought to assess the effects of Covid 19 on the utilisation of routine immunisation services.

1.4 Research Objectives

1.4.1 Broad Objective

To establish the compliance level and uncover reasons, barriers for delayed access to immunization services among caregivers of children under five years in seven Harare City clinics during the Covid 19 pandemic.

1.4.2 Specific Objectives

i. To determine the level of compliance to scheduled immunisation appointments among caregiver's of under-fives in Harare during the Covid 19 pandemic.

ii. To establish the socio-demographic characteristics associated with the delayed access to immunisation services among caregivers of under five children in Harare during the Covid 19 pandemic.

iii. To determine the service delivery factors and caregiver's concerns that are associated with late access to immunisation services in Harare during the Covid 19 pandemic.

1.5 Research Questions

i. What is the level of compliance to scheduled immunisation appointments among caregivers of under-fives in Harare during the Covid 19 pandemic?

ii. What are the socio-demographic characteristics associated with delayed access to immunisation services among caregivers of under-fives in Harare City clinics during the Covid 19 pandemic?

iii. Which service delivery factors and caregiver's concerns are associated with late access to immunisation services in Harare City clinics during the Covid 19 pandemic?

1.6 Significance of the study

The research aimed to provide recommendations that can address barriers and challenges encountered by caregivers of under five children in accessing immunisation services during the Covid 19 pandemic and other future pandemics. The study can provide information that may guide policy makers in formulating policies that enable caregivers to access immunisation services during pandemics.

1.7 Delimitations

Even though access to health services is an issue affecting most people in Zimbabwe during the Covid 19 pandemic the researcher narrowed it down to caregivers of under 5's in consideration of how vulnerable the children are to VPDs if there are not vaccinated on time.

The study setting was chosen to be Harare FHS clinics because they offer and prioritise routine immunisations. The study did not require health status of the participants. Healthcare workers were excluded from the study as they have a higher chance of utilizing health care services during the pandemic.

1.8 Limitations

The study was conducted in Harare City and it focused on caregivers of under five children who accessed Harare City Clinics during the period July 2020 to July 2021.

CHAPTER TWO LITERATURE REVIEW

2.1 Introduction

Immunisation is a fundamental health service that needs to be prioritised for the prevention of communicable childhood diseases. The EPI recommended vaccinations include Bacille Calmette Guerin (BCG), Oral and Inactivated Polio vaccine (OPV/IPV), Pentavalent, PCV10, Rotavirus, Measles and Typhoid Conjugate Vaccine (TCV). Health Manager's normally consider three doses of pentavalent vaccine as one of the standard measures for indicating the scale and reach of routine immunisation services (Amna et al., 2020).

2.1.1 Expanded Programme on Immunization

The EPI Programme was launched in 1974 by the World Health Organization. Since then immunization has been one of the most cost-effective public health intervention for reducing VPDs globally (Mashingaidze, Wiysonge & Hussey 2015). The EPI programme is a blueprint in managing technical and managerial functions needed to vaccinate children with a limited number of vaccines providing protection against polio, measles, whooping cough, diphtheria and tetanus (Shen, Fields & McQuestion 2014).

The major aim of EPI was to offer multiple vaccines to all children under the age of five years through a schedule of child immunization visits (Shen et al., 2014). In developing countries the scheduling of immunization visits and meeting the targets was difficult to achieve as most health systems are frail and under resourced. Since the launch of the EPI the vaccine coverage levels were less than 5% until 1990 when most developing countries institutionalized immunization programs based on the EPI

blueprint and by 1991 a vaccination coverage of 80% was achieved (Shen et al., 2014).

To achieve a further increase in the vaccination coverage, countries were expected to adopt WHO policies, standards and guidelines. In the majority of countries, the program provided leadership and a range of other functions that helped to build strong governance, organization and management (Shen et.al 2014). To achieve a rise in the immunization coverage more health workers were trained to meet the demand needs (Shen et.al 2014).

There have been several efforts over the years, these include Global Alliance for Vaccines and Immunization, universal childhood immunization and the Global Vaccine Action Plan to improve immunization coverage (Mashingaidze et al., 2015). The efforts combined regional strategies such as the WHO African regional office EPI strategic plan of actions implemented in the period 2001-2005 and the Reaching Every District approach. The efforts resulted in an increase of the immunization coverage globally.

Since the launch of EPI in 1974 there has been substantial progress in the performance of the EPI in Africa. The introduction of meningococcal group A, hepatitis B vaccines across the continent indicate development and growth. However according to the national to immunization coverage scorecards for 2015 which indicated a polio and measles outbreaks and drop outs which indicated EPI failure. Upon realisation of the EPI failures strategies to improve immunization services were put in place (Mashingaidze et al., 2015). Over the year performance of the EPI programme was substantial up until the disruption of immunization services by the Covid 19 pandemic.

Table 2.1 below shows the EPI recommended vaccines and the VPDs covered by each vaccine:

Table 2.1: Vaccines and VPDs covered

Vaccine	Vaccine Preventable Disease
BCG	Tuberculosis
OPV/IPV	Polio
Pentavalent	Diphtheria, Tetanus, Pertussis, Haemophilus influenza and Hepatitis B
PCV	Pneumococcal
Rotavirus	Diarrhea
Measles vaccine	Measles
TCV	Typhoid

According to WHO (2020) childhood vaccines save an estimated 2-3 million lives worldwide every year. However, due to high levels of migration and disruption of health services, outbreaks of VPDs continue to occur in conflict affected regions including in low to medium income countries, causing numerous deaths. A study conducted Syria in 2019, indicated that the disruption of health services due to on-going conflict and economic decline in the country contributed greatly in the breakdown of immunisation coverage thus leading to increased risk for VPD's in the Middle East region .(WHO, 2019).

In the WHO Europe Region, large-scale immunisation implementation across the Europe has resulted in significant reductions in illness, disability and death from VPDs. The WHO European Region has to date maintained polio-free certifications since June 2002, a result achieved through strong national immunisation systems, sustained high vaccination rates and high-quality disease surveillance efforts (WHO, 2020).

Global estimations indicate that the EPI in low and middle-income countries (LMICs) prevented more than two million child deaths since its initiation in 1974 (WHO, 2019). Ames et al (2017) indicated that although Africa made some progress

in immunisation services, large numbers of children remain unvaccinated. Reasons for consistently low immunisation coverage rates in Africa include poor service delivery, long waiting hours at health facilities and inadequate knowledge on immunisation amongst caregivers.

Additionally in some African countries the decreasing incidence of VPDs has diminished the public's memory of the devastation caused by VPDs leading to a rise in vaccine hesitancy which leads to VPD outbreaks (Nandi and Shet 2020). Several studies suggest that imparting knowledge to caregivers on the importance of immunisation can contribute to huge increases of immunisation coverage rates (Ames et al., 2017).

Sustainable Development Goal 3 aims to ensure good health and wellbeing (United Nations International Children's Emergency Fund (UNICEF) 2015). Access to immunisation services is fundamental to the progressive realization of the Sustainable Development Goal 3 target of Universal Health Coverage (UHC). In Sub-Saharan Africa (SSA) barriers that include supply-side factors such as availability of commodities, accessibility to health service and demand-side factors at the contextual and individual level contribute to unequal vaccination coverage (Achieng et al., 2020). In addition, previous studies conducted in SSA have indicated that factors such as exposure to media and access to health facilities negatively affect immunisation coverage (Achieng et al., 2020).

In Zimbabwe, the EPI is one of the key interventions aimed at reducing VPDs such as pneumonia, diarrhoea and measles which are the third, fourth and fifth leading causes of mortality in children under five years of age respectively. According to the Zimbabwe Expanded Programme on Immunisation (ZEPI) a child is deemed fully

immunised after receiving one dose of BCG Vaccine, three doses each of Pentavalent, three doses of Pneumococcal Vaccine, one dose of Measles Vaccine and two doses of Rotavirus (Ministry of Health and Child Care (MoHCC) 2014).

The Government of Zimbabwe and partners have over the years made a lot of progress in increasing immunization coverage. In 2014, it was reported that Zimbabwe was the only Sub-Saharan country to have met the Global Vaccine Action Plan threshold of 80% or higher coverage of diphtheria-tetanus-pertussis vaccine (DTP3), which is used as a proxy indicator to measure performance of routine vaccine delivery (Bangura, Xiao, Qiu., Ouyang. & Chen, 2020).

Since the start of Covid 19 in 2019, routine childhood immunisation services have been disrupted on a global scale that is unprecedented since the inception of EPI in the 1970's. From the time when Covid 19 started, more than half of the countries globally, have reported moderate-to-severe disruptions of immunisation services thus leading to a decrease in immunisation coverage (WHO, 2020).

When the scheduled immunization appointments are not followed the threshold protective levels will not be maintained allowing the microorganism to resurface and cause VPD's. During pandemics and endemics large proportion of children are not vaccinated due to various factors associated with the pandemic or endemic. The under vaccination of children during pandemics affects negatively the herd immunity.

2.2 Conceptual Framework

A conceptual framework is a theoretical structure of assumptions, principles and rules which are used to make conceptual distinctions and organize ideas. Strong conceptual frameworks capture real concepts and ideas in a way that is easy to

remember and apply. According to Spencer, Arpin, Johnson & Nathawad (2020) the access to a health care system can be influenced by socio-demographic characteristics, characteristics of health services, geographical location, user's attitude, perception and expectations and financial accessibility. The immunisation accessibility conceptual framework presented in Fig 2.1 below presents key aspects that influence the utilization of routine immunisation services.

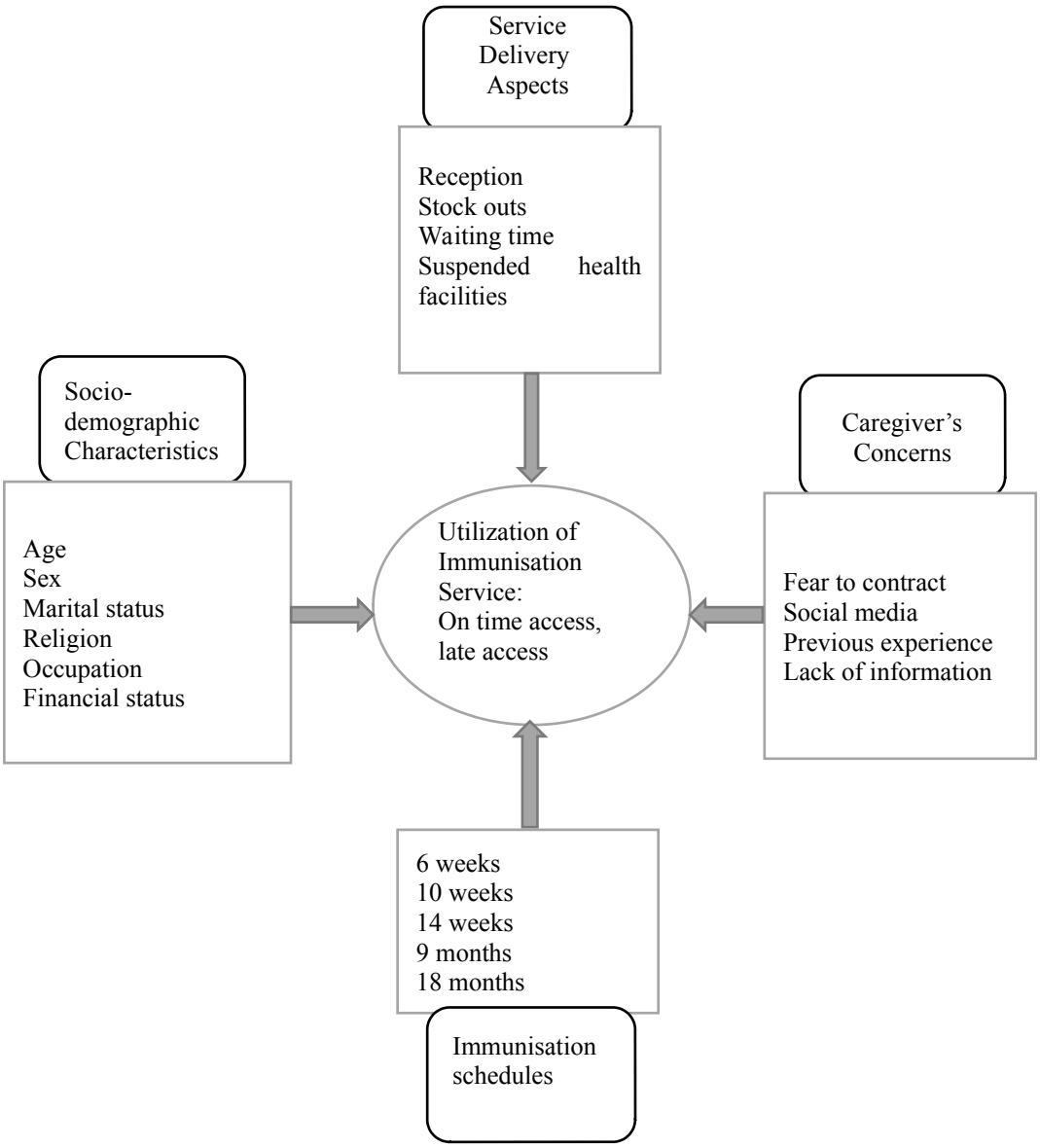

Figure 2.1: Immunisation Accessibility Conceptual Framework

The immunisation accessible conceptual framework in **Fig 2.1** was categorised into four components representing aspects that were used to establish factors influencing the accessibility of immunisation services in Harare. The four components include scheduled immunisation services, socio-demographic characteristics, health services aspects and caregiver/demand concerns.

2.2.1 Scheduled Immunisation Services

Immunisation schedules guide caregivers on the dates and on the vaccines to be offered at a particular stage in life so as to prevent vaccine preventable diseases amongst children below the age of five years. The compliance to scheduled immunization appointments reduces VPD's and related mortality.

2.2.2 Socio-demographic characteristics

Socio-demographic characteristics are of importance as they give a clear picture of caregiver's characteristics that act as access barriers to immunisation services. Some socio-demographic characteristics such as knowledge/ educational level help to improve the health seeking behaviours.

2.2.3 Care givers concerns

Caregiver's/demand concerns is another component of importance to the study as it establishes caregiver's perceptions and experiences that influence greatly the access to immunisation services.

2.2.4 Service delivery aspects

Service delivery issues are also an important component on the accessibility and utilisation of immunisation services. According to Bangura et al., (2020) convenient and reliable health services help patients to adopt health seeking behaviours as this motivates patients to frequently seek medical attention. Research has shown that healthcare services enhances the willingness of clients to utilize healthcare services so as to improve health.

In summary the study examined the four components on the immunisation accessibility conceptual framework scheduled immunisation services, socio-demographic characteristics, health services aspects and caregiver/demand concerns to understand their contribution to the utilization of immunisation services in the City of Harare during the on-going Covid 19 Pandemic.

2.3 Caregiver's level of compliance to scheduled immunisation appointments

Immunisation care-seeking behaviours are greatly important for compliance to planned vaccine schedules and in ensuring the efficacy of vaccines to prevent child morbidity and mortality from vaccine preventable diseases. Table 2.2 below presents the immunisation schedule for Zimbabwe.

Table 2.2: Zimbabwe Childhood Immunisation Schedule

	Age	Vaccine	Dose
Primary Course	Birth	BCG (Bacilli Calmette Guerin)	0.5mls
	6 weeks	Rotavirus	1.5mls
		OPV 1 (Oral polio vaccine)	2-3 drops
		PENTA (Pentavalent)	0.5mls
		PCV 1 (Pneumococcal vaccine)	0.5mls
	10 weeks	Rotavirus 2	1.5mls
		OPV 2	2-3 drops
		PENTA 2	0.5mls
		PCV 2	0.5mls
	14 weeks	OPV 3	2-3 drops
		Penta 3	0.5mls
		PCV 3	0.5mls
		IPV 1 (Inactivated polio vaccine)	0.5mls
	9 months	IPV 2	0.5mls
		MR 1 (Measles and rubella vaccine)	0.5mls
		TCV(Typhoid Conjugate Vaccine)	0.5mls
Boosters	18 months	DTP (Diphtheria Tetanus and Pertussis)	0.5mls
		OPV	2-3 drops
		MR 2	0.5mls
	5 years	TD 1 (Tetanus Diphtheria)	0.5mls
For girls only	10 years	TD 2	0.5mls
	10 years	HPV 1(Human Papillomavirus vaccine)	0.5mls

11 years	HPV 2	0.5mls

Children in Zimbabwe receive their first vaccine, BCG at Birth or at first contact with health care providers after birth. Thereafter, from 6 weeks onwards, children are provided with a combination of Rotavirus, OPV, PENTA, PCV, IPV, MR and TCV vaccines and boosters until they reach 18 months old. Additionally TD and HPV vaccines are provided for girls at five, ten and 11 years. The maximum age limit for BCG in Zimbabwe is 11 months, Rota virus 32 weeks and Pentavalent 23 months (Medicines Control Authority Zimbabwe (MCAZ), 2013).

According to a report published by WHO, 2020 disruptions of immunization services were widespread in 2020, with the WHO Eastern Mediterranean Region and Southern East Asian Regions most affected. The number of children not receiving even their first vaccinations increased as access to health services and immunization outreach were suspended in some clinics. On a global level 23 million children missed basic vaccination appointments and majority of countries in 2019 experienced a decline in immunisation compliance levels.

Additionally in all regions, there was an increase in numbers of children missing vital first vaccine doses in 2020; millions more miss later vaccines. In 2020, 3.5 million missed their first dose of diphtheria, tetanus and pertussis vaccine (DTP-1) while 3 million more children missed their first measles dose (WHO, 2020).

According to Brambilla et al., (2020) a study conducted in Italy that involved 1,500 children aged 0–11 years resulted in one in three parents postponing children's vaccination appointments during the first months of Covid 19 pandemic. The age group that was mainly affected was the 0–2 years, with a decrease in hexavalent, measles-mumps-rubella-varicella (MMRV), anti-meningococcal and anti-

pneumococcal vaccines. Furthermore the findings of the study revealed that lack of information regarding functional health facilities played a major role in the parent's decision to postpone scheduled vaccination appointments (Brambilla et al., 2020). The study recommended that various childhood routine immunisation studies conducted during the Covid 19 pandemic show a reduction in the caregiver's vaccine compliance rate.

A study conducted in Italy, involving 223 primary care healthcare workers indicated that during the Covid 19 pandemic, 98.2% of the health care workers reported a general decline in outpatient visits during the pandemic. The study further revealed that 93.3% of health care workers continued to vaccinate during the pandemic, however 31.7% reported a reduction in parent's compliance to scheduled vaccination appointments (Brambilla et al., 2020).

Moreover in Sindh Pakistan a 51% reduction in immunizations compliance level was noted during the lockdown compared to baseline, and the decrease was varied across districts and provinces. On average, 8438 children per day missed routine immunizations, 37.8% of children had possibly not had any contact with the immunization services during the Covid 19 pandemic. A significant decrease in the daily average number of vaccine doses administered for all the antigens. For tetanus vaccinations, there was a 28.8% significant reduction in daily average tetanus vaccinations administered during the lockdown compared to baseline vaccinations (Amna et al., 2021).

Due to the disruption of health services by the Covid 19 pandemic, in 2020 around 7.7 million children missed out on vital doses of Polio, Measles and Diphtheria vaccines in the WHO African region. Nigeria, Ethiopia and the Democratic Republic

of Congo were reported to be among the top 10 countries globally to record the greatest number of unvaccinated children in 2020 for the first dose of Measles and Diphtheria. Overall, during the Covid 19 pandemic Africa accounts for the highest percentage of zero dose in the world (WHO, 2021).

Furthermore despite efforts to scale up immunization campaigns during the Covid 19 pandemic, 7.7 million children in Africa that missed DTP-1 vaccines contribute 45% of the global statistics. In the WHO African Region a reduction in the immunisation coverage has been reported. Coverage for DTP-3 decreased from 74% to 72%, and for MCV1 decreased from 70% to 68%. The decrease in the immunisation coverage indicate the non-compliance of caregivers to scheduled appointments (WHO 2021).

Moreover Amna et al. (20121) used data on demographic and health survey of African countries which include Ethiopia, Uganda, Kenya, Tanzania and Burundi and checked on rates of fully immunized child for BCG, polio and diphtheria as per WHO recommendations for children under five years. The observation was that the compliance to scheduled immunization appointments varied significantly by country. The study further revealed that the majority of children in all countries had been administered with atleast one dose but most of the caregivers were late for the immunization appointments.

Additionally in Ethiopia and Uganda less than 50% were partially immunized the study revealed that the level of compliance to scheduled immunization services depended on the availability of functioning health facilities. The study recommended the need for each country to examine political stability and economic status to ensure children are vaccinated on time.

Bell, Clarke, Mounier-Jack & Paterson (2020).conducted a study on maternal health and routine immunization status in Kenya. The study established that the majority of children vaccinated for BCG poliomyelitis, diphtheria and measles were late for immunization services. The findings clearly indicate that there was lack of compliance to scheduled immunization appointments. The conclusion of the study was that caregivers who had lower secondary education were not able to follow up scheduled vaccination appointments.

Therefore health education and immunization counselling sessions were seen a necessity to the so as to increase the compliance level amongst the caregivers. The study recommended health education to enable caregivers to understand the benefits of immunization services. The study also pointed out that the government and healthcare practitioners to pay particular attention to caregivers with lower than secondary education.

Bell et al., (2020) indicated that children aged 2 to 59 months suffered severe pneumonia in western Kenya due to non-compliance of caregivers to scheduled routine immunization appointments. The study conclude that lack of timely vaccinations and delays in seeking treatment were the factors associated with that with the severe outbreak of pneumonia. The study recommended health educations on the importance of timely vaccinations study recommended more health education on importance of timely vaccinations, and the training of community health workers to educate the community on adherence to scheduled immunization appointments.

2.4 Caregiver's socio-demographic characteristics that influence the access to immunisation services

2.4.1 Religion of caregivers

Religion plays a major role in the accessibility and utilisation of routine immunisation services. A study conducted by January, et al., (2011) on religious factors determining immunisation and healthcare seeking behaviours in Zimbabwe revealed the constraining and overriding influence of the apostolic religion and doctrine on uptake of maternal and child health services are including vaccination. The caregivers cited religious doctrine beliefs, practices and sanctions as some of the reasons for vaccine hesitancy.

Additionally in the apostolic church the negative perceptions of modern medicines and health services are embedded in the religious views that ascribe their use to the lack of faith on the healing power of God (January et al., 2011). The apostolic doctrine perceives modern medicine and vaccines as dangerous and the cause of diseases or deaths.

In Zimbabwe, the affiliation to the apostolic religion and other religious groups, is a significant contributory factor in reducing use of modern health services. In addition, the martyring of children over radical religious doctrine and beliefs is considered to be predicated on God's will which then raises fundamental challenges for women or caregivers from the apostolic church to access routine immunisation services (UNICEF 2016).

2.4.2 The influence of autonomy on the utilization of immunisation services

In a study on the impact of women's autonomy on the children's immunization status it was found that autonomy influence greatly on the immunisation status of children

as most women consult the husband first on whether to report for immunisation appointments or not (Bells et al., 2020). The decision making controls are directly or indirectly associated with the cultural conditions of the society this is consistent with similar findings from a study conducted in India and Nepal which established that the proportion of independent decision making of women is very small when compared to the joint decision making with the husband.

The findings on the impact of women's autonomy on the health of a child as reported by Bednarek & Adam (2020) are consistency with the findings of a study conducted in India on women's health and child health. The study established that women autonomy increase preventive care services including uptake of immunization services.

A study that was conducted in Nigeria also indicated that urban women have more decision-making powers as compared to their rural counterparts this has been noticed by the high level of compliance to scheduled immunization appointments amongst urban women. Furthermore literate women have more autonomy than illiterate women because they know their rights and the benefits of reporting for immunization appointments on time (Bells, 2020)

2.4.3 Income levels of caregivers

Most of the caregivers during the Covid 19 pandemic lost their jobs and this has contributed to low uptake of immunization schedules as the income levels were affected (WHO 2020). In general the level of family income has been associated with access to immunization services by many however in different countries and communities there are various studies that indicated the role of caregiver's income level in relation to the completion of immunization schedules. A study conducted in

Nigeria by Rahji & Ndikom (2013) indicated that children of parents of lower socio-economic status have reported poor completion of immunization regimen than children of parents of higher socio-economic status. This is consistent with the findings of a study conducted in Ethiopia which established that children of wealthy families are more likely to complete their immunization regimen than children from poor families (Abdulraheem & Onajole, 2011).

However in a study conducted in Norway on human papillomavirus, polio, measles, tetanus, whooping cough and diphtheria vaccine uptake it was found that overall caregiver's income was not associated with immunization initiation (Rahji & Ndikom 2013). The findings indicate that there are other factors contributing to low immunization uptake amongst caregivers.

A study conducted in Sierra Leona noted that although the healthcare system offer free services to children under 5 years patient turnout for child vaccines was significantly impacted since the onset of Covid 19. The study noted that the cost of transport services to reach health centres were prohibitive for people to access immunisation services during the Covid 19 pandemic due to the Covid 19 related drops in income and business lockdowns (Buonsenso, Cinicola, Kallon & Lodice, 2020).

2.4.4 The influence of occupation on immunisation status

Bangura et.al (2020) conducted a study in SSA which indicated that the nature of a caregiver's occupation contributes greatly to the accessibility of immunisation services as some caregivers miss or do not take their children for vaccination because of work commitment on the scheduled immunization dates. The study noted that housewives were more likely to comply with higher coverage of full immunization

status than other occupations such as public or private employees. The study recommended that immunisation services should be offered during weekends or public holidays so that employed caregivers can access (Bangura et.al 2020).

Findings from a study conducted in Sinana District of Ethiopia which consisted of 591 children aged 12–23 months established that occupation is associated with child immunisation uptake. The proportion of children who were not vaccinated were found to be high among caregivers who were housewives. Furthermore caregivers whose occupation were in the private and public sectors were found to have completed their immunization schedules.

Samra, Anwar, Khan, & Jeelani, (2015) conducted a study in Bangladesh to evaluate the impact of occupation on the utilization of routine immunization services. The study established that educated mothers had the knowledge on the importance of immunization schedules but due work pressure they tend to report late for immunization appointments.

2.4.5 Marital status of caregivers

In various studies the marital status of a caregivers is reported to have an influence towards childhood immunisation status (Acheabong et al., 2018). In a study conducted in Ghana it was established that divorced caregivers delay or miss immunisation appointments. The findings are consistent to the results of a study conducted in Nigeria which established that married caregivers were observed to have adequate knowledge which increases the likelihood of achieving a higher rate of immunized children than their counterparts who were divorced. The study concluded that married caregivers get support from their partners on better ways of

achieving good health status for their offspring (Chris-Otubor, Dangiwa, Ior, Anukam,. 2015)

Samra et al., (2015) revealed that females that get married at an early age are not able to complete immunization schedules unlike elderly females. The study recommended that the government invest in education, for knowledge acquired enable caregivers to understand the importance and benefits of immunization thus improving vaccination coverage.

2.4.6 Level of education of caregivers

Studies done in Uganda indicate that level of education of caregivers, awareness of availability of immunisation services, health seeking behaviours and distance to the service delivery points are the main factors affecting immunisation service accessibility in Uganda. In response to the gaps identified, the Ministry of Health in Uganda instituted strategies such as radio talk shows, outreach programmes in a bid to change attitudes towards childhood immunisation and the strategies improved patient's health seeking behaviours (Ames et al.,2017).

Studies conducted in several African countries suggested that adequate maternal knowledge on immunization is an independent determinant of immunization coverage. A study conducted by Das, Lassi, Naseem, Salam. & Siddiqui (2021) further indicated that maternal education on the benefits of routine immunization has a positive influence on the decision made by caregivers on whether to fully immunize the child or not. These findings are consistent with the results of a study conducted in Ethiopia which established that lack of awareness about immunization contributes to low immunization coverage (Etana & Deressa 2012).

Das et al., 2020 carried out studies in Ethiopia to assess the uptake of immunization services among children aged 12-24% months and the factors the influencing the uptake of immunization services. The survey indicated that 74.6% of children not vaccinated and 36.6% of children fully vaccinated. The factors identified to influence the uptake of immunization included low and no educational background and age of caregiver. The study recommended that to increase uptake to immunization services caregivers should be educated on the importance of scheduled immunization appointments. Caregivers were also encouraged to seek delivery services from health facilities so that they get proper information on vaccination schedules thus reducing the incidence of missed opportunities.

2.4.7 The influence of place of residents on immunisation status

Mutua, Kimani & Remare, (2011) noted that the immunization of children is influenced by household assets, place of residents, and ethnicity. The study concluded that residents in the slums were not routinely vaccinated. The study recommended that programs involving caregivers of low economic status should be established so that children receive immunization doses on time.

2.5 The influence of service delivery on the accessibility of immunization services among caregivers

The utilization of vaccination services at a global level decreased by 31%. In the private sector, the provision of immunization services decreased by 46.9%. The most affected vaccines were for hepatitis A, oral poliovirus, pneumococcal conjugate and measles. In the public sector the number of vaccine doses administered decreased by 20% and the most affected reductions were detected for the oral poliovirus and measles vaccines (WHO 2020).

2.5.1 Health worker attitude

A study conducted in Zimbabwe by UNICEF (2016) on factors influencing healthcare service utilisation highlighted the importance of health workers and caregiver's relationship in influencing the uptake of vaccination services for children. The ill-treatment of caregivers by health workers especially when they miss scheduled appointments in the child health card may result in some caregivers skipping subsequent appointments or stop accessing the child immunisation services due to fear of reprisal.

Additionally the study further indicated that health workers hardly commit time to explain the vaccines, symptoms of the disease prevented by the vaccine, the benefits of vaccination and the importance of respecting the vaccination schedule but merely serve caregivers passively. Without heightened awareness and adequate knowledge of the importance of vaccination the compliance to vaccination diminishes (UNICEF, 2016).

2.5.2 Health Service disruption

Pandemics disrupt the functioning of health systems. For example the Ebola outbreak in 2014 to 2015 caused major disruptions in the access to immunisation and health service accessibility in Guinea, Sierra Leone and Liberia (Fan et al., 2017). During the period of intense Ebola transmission in West Africa, state regulations to curb the spread of the Ebola outbreak led to the decline of immunisation coverage and patients lacked access to immunisation services as many health facilities were closed and other clinics operated at lower capacity than usual. The Ebola era led to a disruption of medical logistics supplies and staff shortages in health facilities (Fan et al., 2017).

Moreover, immunisation services were not easily accessible to caregivers in Ebola affected countries and patients underutilised health facility settings due to fear of contracting Ebola infection. The disruption of immunisation services in West Africa led to a decline of more than 25% in the monthly number of children vaccinated against measles. During this period there was an increase in measles incidence and a decline in the mean age of measles cases reported in Liberia, Sierra Leone and Guinea. The Ebola outbreak led to persistent gaps in immunisation coverage that was documented until two years after the end of the Ebola outbreak (Goiton et al., 2020).

Access to routine immunization services has been disrupted as a result of the Covid 19 lockdown, leading to an increased risk of a resurgence of measles and polio outbreaks. Shortages of hexavalent vaccine, which protects against six child killer diseases. Globally, oral polio vaccine that is administered at birth and at nine months of age was reported to be in short supply thus putting children at high risk of VPD's (WHO 2020).

A study conducted in Northern Africa established that more than one third (34%) of caregivers skipped the vaccine appointment. The reasons for disrupted services varied as caregivers indicated that children were not immunized on time because of vaccination appointments postponed, closure of the health facilities and vaccine stock outs contracting Covid 19 (Goiton et al., 2020).

According to Goiton et al., (2020) due to trade restrictions during pandemics health facilities encounter challenges such as drug shortages and difficulties in transporting vaccines and these factors have been indicated to contribute to the low immunisation uptake and low immunisation services accessibility. Furthermore Goiton et al., (2020) indicated that the stock-outs experienced during the Covid 19 pandemic were

due to the disruptions in global manufacturing and supply chains, border closures, and restrictions on local mobility.

Shortage of equipment during pandemics such as PPE hinders the accessibility of routine immunisation services as employees tend not to report for work with the fear of exposing themselves to the pandemic and caregivers are disadvantaged as they will not be assisted. Additionally the accessibility of immunisation services is greatly affected as the health facilities will not function properly leading to the suspension of services in some health facilities (Goiton et al., 2020).

During the Covid 19 pandemic, the shortage of transportation services that facilitate movement of health workers to health facilities has also led to the difficulties in maintaining routine immunisation services as workers report to work late and will not be able to attend to many patients per day thus contributing to low immunisation coverage and demotivation of patients (Adamu et.al 2020).

In Zimbabwe, a number of hospitals and clinics in Masvingo Province suspended immunisation services as a result of Covid 19 and this led to the late immunization of under five children since most clinics were closed. The reasons for the suspension of immunization services included lack of personal protective equipment, health worker fear of contracting Covid 19 and facilities preparing for upsurge of Covid 19 cases. (WHO, 2020).

Outreach activities play a major role in increasing routine immunization coverages. A study conducted in Pakistan indicated that during the first few weeks of lockdown a decline of 79.3% for all vaccines was reported due to the suspension of outreach activities. The study further established a 52.5% drop in the daily average number of

immunization doses administered due to the lack of immunizations outreach sites during the lockdown (Amna 2020).

Due to the spread of Covid 19 many countries temporarily suspended mass vaccination campaigns against diseases such as polio, measles, tetanus, typhoid and cholera. The mass vaccination campaigns were suspended so as to adhere to WHO Covid 19 regulations that include the regulation of maintaining physical distancing. In particular measles and polio vaccination have been greatly affected (Goiton 2020).

Several studies have shown how health emergencies have affected existing health systems and health seeking behaviours. In West Africa during the Ebola epidemic the disruption of vaccination campaigns resulted in a 25%-75% reduction in the immunization coverage rates. (Amna 2021).

According to a study conducted in Liberia by Gianluca, et al (2015) factors that contribute to failure to complete the vaccination schedules was inaccessibility of immunization services and stock outs of immunization vaccines. The study concluded that children were partially immunized and some did not get timely vaccinations due to the suspension of health facilities during the Ebola era. Gianluca et al. (2015) suggested that to improve immunization services during endemics routine immunisation services should not be suspended.

2.6 Influence of caregivers concerns on the accessibility of immunisation services during pandemics

2.6.1 Distance to health facilities

During epidemics, distance is a challenge encountered in accessing immunisation services as some health facilities suspend immunisation outreach programmes to curb the spread of diseases. In a study conducted in SSA , place of residence of the

caregivers was reported as determinants of full immunisation of a child as some caregivers decided not to access immunisation services because of long distances travelled to health facilities (Bangura et.al 2020).

Various studies in developing countries suggest that walking, and distance are major factors that influence the utilization of health services (Rahman & Obaida 2010). In a study conducted in Nigeria long walking distances was found to be a key factor associated with incomplete vaccinations and missed opportunities (Abdulraheem & Onajole 2011).

Distance from a health facility was found to be an important predictor of immunization status. Distance has an implication in accessing the health facilities for immunization services. Reports of studies indicate that caregivers that live near a health facility offering immunization services are more likely to access immunization services on time than those living in area where there are no health facilities providing immunisation services close to them (Rahman & Obaida-Nasrin 2010).

Similar studies in developed countries suggest that walking or travelling time and distance are key factors that influence the uptake of healthcare services (Rahman & Obaida-Nasrin 2010). Ina study on the reasons for incomplete vaccination and factors influencing missed appointments among children in Awe Nigeria findings indicated that long walking distances and long waiting time at health facilities are key factors associated with poor completion of immunisation schedules (Abdulraheem & Onajole 2011).

2.6.2 Lack of information

Lack of information and negative perception of modern child health services and vaccines contribute to caregivers not accessing immunisation services. In a study

conducted by UNICEF (2016) lack of information on the available immunisation services was reflected by caregivers to be a major drawback in accessing immunisation appointments on time.

Diamant et.al (2018) noted that during epidemics, perceptions of patients influence greatly the uptake of immunisation services as the public receives a lot of misleading information on epidemic spread from social media and that in turn affects health care seeking behaviour as patients perceive information from social media to be reliable. The study by Diamant et al., (2018) revealed that reliance on social media information poses implications for health-related decision making as women tend to avoid accessing routine immunisation services based on the misleading information from social media.

2.6.3 Fear of contracting Covid 19

According to Alsuhaibani & Alaqeel (2020) the fear of contracting Covid 19 has been identified to be the most common reason for caregivers not accessing routine immunisation services. Moreover, the fear of being recognized as a Covid 19 case and the associated stigmatization also has an impact on the uptake of routine child healthcare during a pandemic as caregivers tend not to access routine immunisation services.

Bell, Clarke, Mounier-Jack & Paterson (2020) conducted a study in England which noted that caregivers concerns around the safety of accessing immunisation services and the fear of contracting Covid 19 normally results in delays or missed appointments for child immunisation. The study further indicated that majority of the caregivers opt to wait to attend after the peak of Covid 19 infections have passed. The study recommended the introduction of childhood immunisation home visits.

According to Ministry of Public Health (2019) during the height of Covid 19 pandemic visits to health services reduced in the effort of reducing the spread of Covid 19. The avoidance of immunization visits was attributed to caregiver's fear of contracting Covid 19 hence caregivers de-prioritized health care appointments adding to the risk of VPD's.

2.6.4 Lockdown restrictions

During the lockdown period, under five children have fallen behind schedule for critical immunizations due to decreased accessibility to routine immunization services, leaving children at high risk for VDPs. Moreover a study conducted in Pakistan indicated that some caregivers (44%) were hesitant to leave home because of lockdown restrictions on movement (Goiton et.al 2020).

Myths and misinformation surrounding vaccinations and rumours around Covid 19 compound the existing problem of vaccine hesitancy. Furthermore, factors including restriction on movement and unavailability of public transportation has played a major role in the drop in coverage.

2.6.5 Waiting time at health facilities

According to Tao et.al (202) waiting for more than 30 minutes at a health facility for immunization contributes to an increase of incomplete immunization status. As the waiting time increase exposure time also increases thus putting caregivers at high risk of contracting Covid 19. As result of the waiting time caregivers may discontinuous from the immunization program thus leaving children at a high risk of VPDs.

2.7 Chapter Summary

This chapter presented local, regional and international literature linking childhood routine immunisation services during pandemics to socio-demographic characteristics, health services aspects and caregiver/demand concerns as provided for by the immunisation accessibility conceptual framework. The researcher presented the literature linking it to the conceptual framework.

CHAPTER THREE METHODOLOGY

3.1 Research Design

An analytical cross-sectional study was conducted to investigate the factors associated with the accessibility of immunisation services among caregivers of under five children during the Covid 19. An analytical cross sectional study design is a type of quantitative study that analyses data from a population or a representative subset, at a specific point in time (Schmidit & Brown, 2019).

An analytical cross sectional study design was the most appropriate design for this study as cross sectional designs provide a snapshot that can be used to assess the burden of disease or health needs of a population (Schmidit & Brown, 2019). In the case of this study, it was important to establish how the on-going Covid 19 pandemic has affected access to child immunisation services by taking a snapshot of Harare City Clinics between the period of July 2020 to July 2021.

3.2 Study setting

The study was carried out in Harare City. The City of Harare's Health Department has Infectious Diseases Hospitals, Poly clinics, Satellite clinics and FHS clinics. The study focused on FHS clinics only because they provide and prioritize antenatal, postnatal care services as well as immunization services

The City of Harare Health Department has 7 FHS clinics: of them Mabvuku FHS, Greendale FHS, Eastlea FHS, Highlands FHS, Braeside FHS, Mufakose FHS and Belvedere FHS and all were included in the study.

3.3 Study Population

Caregivers of under five children who reported at the 7 FHS clinics for immunization services during the study period.

3.3.1 Inclusion Criteria

The inclusion criteria:

- Caregivers of children under five years assisted atleast once in the 7 FHS clinics for childhood routine immunization services.
- All caregivers who are able to provide informed consent

3.3.2 Exclusion criteria

- Caregivers of children under five years who were not previously assisted in any one of the 7 FHS clinics for childhood routine immunisation service.
- All patients under 18 years old

3.4 Sample size

According to a study conducted in Zimbabwe by WHO in 2020, the penta 3 coverage was indicated to be 77% (World Health Organisation, 2020). Penta 3 is the main immunisation indicator because it is a 5 in 1 vaccine. When a child receives a penta 3 vaccine it is an indication that the child is immunised against the child killer diseases. The penta 3 coverage indicated by the study conducted by WHO represents the proportion of children who accessed penta 3 immunisation services during the Covid 19 period in 2020.

Based on the Dobson's formula for sample size calculation:

$$n = \frac{z^2 \times p(1-p)}{d^2}$$

Where:

N=sample size

z^2= 1.96 (Statistic corresponding to level of confidence)

P= 77% (proportion of children who accessed health facilities for penta 3 vaccine)

d^2= 0.05 (margin of error)

A minimum sample size of 272 was required for this study. Considering the possibility of non-response which was expected to be 10%, using formula: minimum sample size ÷ response rate (272 ÷ 0.9 = 302) the maximum sample size was therefore 302. Hence the study recruited 273 participants.

3.4.1 Sample per study site

All the 7 Harare FHS clinics were included for the study. The sample size per clinic is shown in table 3.1

Table 3.1: Sample size per study site

FHS clinic	Immunisation population	Sample size
Belvedere	1 045	(1 045/10 490) x 273= 27
Braeside	850	(850/10 490) x 273= 22
Greendale	600	(600/10 490) x 273= 16
Eastlea	920	(920/10 490) x 273=24
Highlands	750	(750/10 490) x 273=20
Mabvuku	3 125	(3 125/10 490) x 273=81
Mufakose	3 200	(3 200/10 490) x 273=83
Grand Total	**10 490**	**273**

3.5 Sampling Procedure

Convenient sampling technique was used to select participants. Patients that met the inclusion criteria and gave informed consent were recruited during routine immunisation appointments. Simple random sampling using the hat method was further used to select study participants. This method ensured that each study participant has an equal chance of being selected thus minimising selection bias.

3.6 Study Variables

3.6.1 Dependent variable

The dependent variable for the study was accessibility of immunisation service during the Covid 19 pandemic.

Table 3.2: Dependent Variable

Variable	Description	Code
Immunisation service accessibility.	Respondents were asked to indicate whether they utilized all the immunisation appointments on time during Covid 19 pandemic.	Late = 0 On time = 1

3.6.2 Independent Variables

The independent variables for the study are described in table 3.2 below:

Table 3.3: Independent Variable

Variable	Description	Code
Age group	Age group in years of respondents	35 and below=1 35 and above= 2
Sex	Sex of respondents	Female= 1 Male= 2
Marital status	Marital status of respondent	Single= 1

		Married= 2
Employment	Employment status of respondent	Employed= 1 Unemployed= 2
Health worker's reception	Caregiver's perception on the reception of health workers	Satisfactory= 1 Unsatisfactory =2
Functionality of health facilities	Availability of immunisation services all the time	Available=1 Unavailable= 2
Are there caregivers concerns that made you access or not access immunisation services on time	Views and experiences of caregiver leading to the utilisation of services	Yes= 1 No= 2

3.7 Data Collection instruments

A semi-structured questionnaire with the following sections was developed: socio-demographic characteristics, immunisation schedule, health service delivery and caregiver/demand concerns sections. The questionnaire was developed in English and translated to local language Shona.

3.7.1 Pretesting of instruments

According to (Alsuhaibani M. & Alaqeel A., 2020), data collection tools should be pretested before actual data collection. The questionnaire was administered to caregivers who were not participants of the study in order to ensure that the questions were relevant and clearly articulated. The questionnaire was pretested at Mabvuku Poly clinic among thirty respondents to check accuracy and relevance. The reasons for the pretesting were:

- To refine the questionnaire.
- To assess the question's validity'
- To assess the likely reliability of the collected data

- To check the research methods used.
- To avoid problems in recording the data.

3.8 Data Collection Procedure

The questionnaire was interviewer administered. The caregivers who were selected for the study were booked for an interview at a place which was convenient and confidential within the FHS clinic.

The purpose of the interviews were to assess the contribution of individual characteristics, scheduled immunisation appointment compliance, service provision aspects and caregiver's demand concerns on the accessibility of immunisation service in FHS clinics. After the interviews, study participants were asked for permission to view their child record books. This was done to supplement findings from the interviews. The participants were interviewed between July and August 2021.

3.9 Data management

Completed questionnaires were first numbered in chronological order from 1 to 273, and then checked one by one for completeness, errors and inconsistencies. This process constituted the data cleaning process. The cleaned questionnaires were placed in a lockable drawer and later entered into Epi Info 7 by the researcher.

All entered questionnaires were cleaned against the hard copy (original) questionnaires to check and correct possible data entry errors by the researcher. A dataset was stored on an external drive under lock and key in another drawer.

3.10 Data analysis

Data was analysed using Epi info 7. Categorical data such as sex, employment status, religion and place of residents were summarized using frequencies and percentages while continuous data such as age were presented using descriptive statistics. A chi-square test was used to measure association between socio-demographic characteristics and routine immunisation status. A 95% confidence interval was adopted which implied that the significant threshold was set at 0.05. Any p-value found to be less than 0.05 was considered subject to rejection of the hypothesis thus implying that it was statistically associated to the accessibility of immunisation services.

Bivariate analysis was performed to identify which of the independent variables were significantly associated with a late access to immunisation appointments. In the bivariate analysis any factor with a p-value > 0.25 was not considered an important covariate of late access to immunisation appointments. Results were presented in terms of Odds Ratio (OR), 95% Confidence Interval CI and p values.

Multivariate logistic regression was also performed to control for possible confounding. All variables with a p-value ≤ 0.25 in the bivariate analysis were included in the multivariate logistic regression model to identify their combined effect on late access to immunisation appointments. Independent variables with p≤ 0.05 were considered significant. Results were presented in terms of Adjusted Odds Ratio (AOR), 95% Confidence Interval (CI) and p-values.

3.11 Dissemination of findings

The researcher will disseminate the findings through presentations at Harare City Department to the Directorate. Fliers with relevant information will also be issued at

Harare City Clinics to health workers involved in immunisation services. The findings will also be disseminated through reports, seminars, conferences, staff wellness programs and publication in peer reviewed journals.

3.12 Ethical considerations

Research which involves human beings should be guided by ethical guidelines. Research ethics are guidelines that safe guard against any harm and protect rights of human beings in research. The researcher is aware that some ethical issues such as respect, informed consent, beneficence, non-malfeasance, veracity and justice should be adhered to during the data collection process. The following section gives a summary of this ethical considerations that the researcher abided to.

3.12. 1 Ensuring participants will be given informed consent

The researcher provided the study participants with an information sheet detailing all information about the research process. A consent form was given to study participant retaining the right to consent voluntarily and free from exploitation and coercion. This was further enhanced by the participant's right to self-determination and autonomy during the study. The study participants were requested to voluntarily sign the informed consent form (appendix IV) before taking part in the study.

3.12.2 Ensuring confidentiality and anonymity

To ensure that the identity of study participants was protected; the completed questionnaires did not carry any identifying information. Recognising that study participants may have never been part of research before, the researcher incorporated a process of on-going consent or "process consent" which means that at every phase of the questionnaire completion process the participant's involvement was renegotiated. The study participants had the right to withdraw from the research and

this was made explicit on the information sheet and verbally reiterated at the time of the data collection process.

3.12.3 Ensuring that permission is obtained

It is important that official channels are cleared by formally requesting permission to carry out a study. For this study, permission to carry out the study was sought from City of Harare Health Directorate, Harare City Health Ethics Committee, Africa University Faculty of Health Sciences and the Africa University Research Ethics Committee.

CHAPTER FOUR RESULTS

4.1 Introduction

In this chapter the researcher presents the results of the study. Descriptive statistics on socio-demographic characteristics of the study participants and analytical statistics in the form of tables and graphs are presented. Results were interpreted to give meaning to analytical and descriptive data.

4.2 Data Presentation and Analysis

4.2.1 Socio-demographic Characteristics of Participants

A total of 273 study participants were interviewed, the study population consisted of both male 5(1.8%) males and 266 (97.4%) females. Two participants (0.7%) did not write their response. Age of caregivers was categorized into five groups. The age range was 18 to 60 years with a median age of 34.

Marital status of participants drew the following responses: divorced 13 (4.9%), married 216 (80.6%), separated 17 (6.3%), single 12 (4.5%), and widowed 10 (3.7%). Only 19.4% of the participants were not married whilst the majority of the participants (80%) were married.

The majority of the participants 87.6% (240) were Christians whilst 0.4% (1) were Muslim and 12.1% (23) had unspecified religions. Employed 8.8% (24), self-employed 18% (49) and unemployed 73.3% (200).

Table 4.1 shows the socio-demographic characteristics of study participants.

Table 4.1: Socio-Demographic Characteristics of Participants

	Total (n=273)	
	Frequency	**Percent**
Gender		
Male	5	1.8%
Female	266	97.4%
Non-response	2	0.7%
Age of caregiver (Years)		
18-20	14	5.1%
20-30	80	29.3%
30-40	65	23.8%
40-50	37	13.6%
50+	77	28.2%
Marital status		
Divorced	13	4.9%
Married	216	80.6%
Separated	17	6.3%
Single	12	4.5%
Widowed	10	3.7%
Religion		
Christian	240	87.6%
Muslim	1	0.4%
Other	23	12.1%
Employment status		
Employed	24	8.8%
Self-employed	49	17.9%
Unemployed	200	73.3%
Place of Residents		
Belvedere	27	9.9%
Braeside	22	8.1%
Eastlea	16	5.9%
Greendale	24	8.8%
Highlands	20	7.3%
Mabvuku	81	29.7%
Mufakose	83	30.4%

4.2.2 Level of compliance to scheduled immunisation appointments

Scheduled immunization appointment status is an important indicator that gives a clear picture on the proportion of caregivers reporting on time and those reporting late for scheduled appointments. Majority of caregivers reported late for immunization appointments during the Covid 19 pandemic. For the 273 caregivers that participated in the study 115 (42.1%) reported on time whilst 158 (57.9%) reported late for the immunization appointment. Table 4.2 gives detailed immunization appointment status during the Covid 19 pandemic.

Table 4.2: Scheduled immunisation appointment status

n=273	**On Time n=115**		**Late n=158**		**Total**
Immunisation Schedule	**Frequency**	**%**	**Frequency**	**%**	**Frequency**
6 weeks	17	40.5%	25	15.8%	42
10 weeks	16	34.8%	30	65%	46
14 weeks	25	47.1%	28	52.8%	53
9 months	20	38.5%	32	61.5%	52
18 months	37	46.3%	43	53.8%	80

Table 4.2 shows that of the 42 caregivers that reported for the 6 weeks immunisation appointment 40.5% (17) reported on time and 59.5% (25) of the reported late. At 10 weeks a total of 46 caregivers reported for the appointment, only 34.8% (16) were on

time whilst 65% (30) reported late. Moreover, for those 53 caregivers who reported for the 14 week immunisation appointment 47.2% (25) reported on time and 52.8% (28) reported late for the immunisation appointment.

Of the 52 caregivers that reported for the 9 months immunisation appointment, 38.5% (20) reported on time while 61.5% (32) reported late. Out of 80 caregivers that reported for the 18 months' appointment 46.3% (37) reported on time whilst 53.8% (43) reported late. Fig 4.1

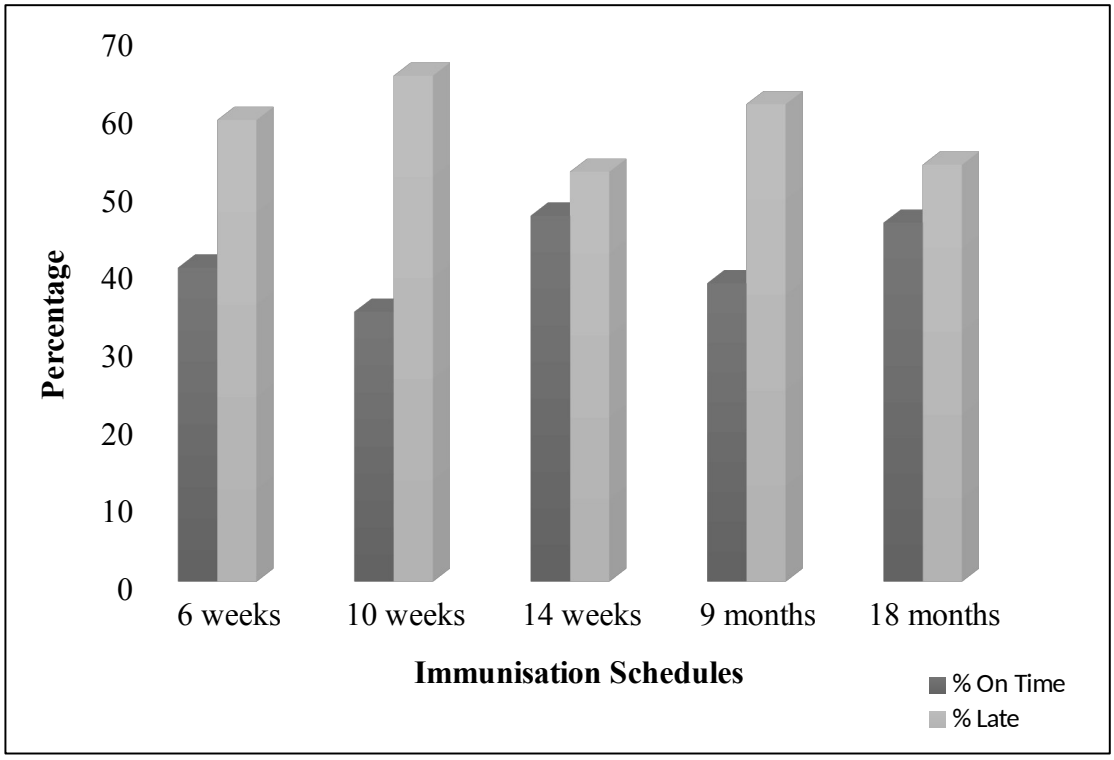

Figure 4.1: Level of compliance to scheduled immunisation appointments

4.2.3 Socio-demographic Characteristics influencing late access to immunization services

The chi-square test analysis tested the hypothesis that there was no statistical association between late access to immunisation services during Covid 19 and socio-demographic characteristics. Table 4.3 below shows the results.

Table 4 3 Socio-demographic characteristics versus immunisation status

Characteristic	Percent	Df	P-Value
Gender			
Male	1.9%	2	$x^2 = 1.5$
Female	96.8%		P = 0.477
Non-responses	1.3%		
Age of caregiver (Years)			
18-20	3.2%	4	$x^2 = 25.3$
20-30	27.9%		P= 0.001**
30-40	19.6%		
40-50	10.1%		
50+	39.2%		
Marital status			
Divorced	3.9%	4	x^2 =1.9
Married	79.7%		P = 0.741
Separated	7.8%		
Single	4.6%		
Widowed	3.9%		
Religion			
Christian	87.9%	2	x^2 =0.9
Muslim	0.6%		P = 0.642
Other	11.4%		
Employment status			
Employed	8.2%	2	$x^2 = 0.2$
Self-employed	17.7%		P = 0.9148
Unemployed	74.1%		
Place of Residents			
Belvedere	9.5%	6	x^2 =47.7
Braeside	8.9%		P = 0.001**
Eastlea	14.6%		
Greendale	10.76%		
Highlands	12.66%		
Mabvuku	22.15%		
Mufakose	21.52%		

Df =Degrees of freedom

Two of the demographic characteristic variables were significantly associated with late immunisation status. These demographic characteristics include age of caregiver and place of residents of participants. The results indicated that there was an association between age and reporting late for scheduled immunisation appointments (χ^2 = 25.3, P<0.001). Place of residents was also found to be significantly associated with reporting late for scheduled immunisation appointments (χ^2 = 47.7, p<0.001) in Harare FHS clinics (Table 4.3).

Table 4.4 below shows a detailed bivariate and multivariate logistic regression analysis output showing the association between socio-demographic characteristics and the immunisation status. The logistic regression analysis tested the association at a confidence interval of 95%. Only one age group and two residential areas in Harare were found to be statistically associated with late access to immunisation services.

Multivariate logistic regression analysis indicated the actual age groups and the place of residents that were statistically significant to late access to immunisation appointments. The participants that were above 50 years were eight times late for immunisation appointments than the younger age groups (AOR 8.0, p=0.003).

Place of residents which include Mabvuku (AOR 16.6, p <0.001) and Mufakose (AOR 11.8, p < 0.001) were found to be significantly associated with late access to immunisation services. The findings indicate that caregivers from Mabvuku are 17 times likely to be late for immunization services than caregivers from other residential area. Moreover caregivers from Mufakose were likely to be 12 times late than caregivers from other residential areas. Participants from the two residential areas highlighted that their place of residents are high density areas and due to high population in the areas Covid 19 can be spread easily hence they tend not to access

immunisation services when the Covid 19 cases are on the rise . Lockdown restrictions were also stricter in high residential suburbs with a heavy police presence on the roads thus causing residents to avoid immunisation appointments.

However residential areas such as Belvedere, Braeside, Greendale, Eastlea and Highlands were not significantly associated with late access to immunization services.

Table 4.4: Logistic regression analysis output for socio-demographic characteristics

*OR=Odds Ration; ** significant; * marginally significant*

Variable	Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value2
Female	1	-	1	-
Male	1.1 (0.2-6.7)	0.912	-	-
Non-response	152780.2 (0.0-1.0)	0.970	-	-
Age of caregiver 10-20yrs	1	-	1	-
Age of caregiver 20-30yrs	2.2 (0.7-7.2)	0.189*	1.8 (0.5-6.6)	0.399
Age of caregiver 30-40yrs	1.6 (0.5-5.4)	0.417	1.5 (0.4-5.7)	0.581
Age of caregiver 40-50yrs	1.4 (0.4-4.9)	0.627	1.2 (0.3-5.2)	0.799
Age of caregiver 50+yrs	7.4 (2.2-25.5)	0.001**	8.0 (2.0-31.9)	0.003**
Divorced	1	-	1	-
Married	1.5 (0.5-4.7)	0.469	1.5 (0.4-5.9)	0.561
Separated	2.8 (0.6-12.7)	0.181*	1.9 (0.3-12.5)	0.459
Single	1.6 (0.3-7.9)	0.543	1.7 (0.3-10.9)	0.599
Widowed	1.8 (0.3-9.3)	0.511	0.8 (0.1-6.7)	0.846
Christian	1	-	1	-
Muslim	54747.6 (0.0-1.0)	0.969	-	-
Other	0.9 (0.4-1.8)	0.694	-	-
Employed	1	-	1	-
Self-employed	1.1 (0.4-3.0)	0.808	-	-
Unemployed	1.2 (0.5-2.8)	0.682	-	-
Belvedere	1	-	1	-
Braeside	0.9 (0.4-2.3)	0.815	0.8 (0.3-2.3)	0.714
Eastlea	2.3 (0.9-5.7)	0.072*	2.4 (0.9-6.6)	0.093
Greendale	1.2 (0.5-3.1)	0.645	1.4 (0.5-3.9)	0.474
Highlands	1.7 (0.7-4.1)	0.256	1.7 (0.6-4.9)	0.296
Mabvuku	13.9 (4.1-47.8)	0.000**	16.6 (4.6-60.2)	0.001**
Mufakose	10.0 (3.5-33.9)	0.000**	11.8 (3.5-39.1)	0.001**

4.2.4 Service delivery and demand factors influencing caregiver's access to immunization services during the Covid 19 pandemic

4.2.5 Service delivery factors

Participant's experiences at health facilities contributed to the late utilization of immunization services during the Covid 19 pandemic. Previous bad experience at health facilities demotivated 172 (63%) participants to report on time for the immunization appointments and the experiences also motivated 101 (37%) participants to be on time for the scheduled appointments.

Majority of the participants 239 (89.5%) indicated that health care workers in Harare FHC clinics were welcoming and this motivated them to report on time for their immunization appointments whilst 34 (10.5%) participants indicated that they found the attitudes unwelcoming thus demotivating caregivers to access immunization appointments on time.

The participants indicated that the bad reception they got from the clinics contributed 12.9% (42) to the late reporting to immunization appointments whilst 87.1% (231) felt that health care worker attitudes were positively contributing to their reporting on time for immunization appointments.

Due to the rescheduling of appointments in Harare FHS clinics because of Covid 19 restrictions 180 (65.9%) participants reported late for immunization appointments whilst 93 (34.1%) reported on time after the rescheduling of appointments.

Shortage of healthcare practitioners in clinics made the majority of participants 175 (64.1%) to avoid appointments thus reporting late whilst 98 (35.9%) report on time for the appointments despite the shortage of healthcare practitioners.

Moreover 65.2% (178) of the participants indicated that the frequent stock outs of immunisation vaccines contributed to the late utilization of immunisation services whilst 95 (34.8%) reported that they have never encountered the challenge of vaccine stock outs thus they immunize their children on time.

One hundred and fifty participants (55%) reported that the shutdown of health facilities contributed to the late utilization of immunisation services whilst 123 (45.1%) participants indicated that they did not encounter any challenges as a result of the shutdown of health facilities thus they managed to access immunisation services on the scheduled dates.

Majority of the participants 78.4% (214) reported long waiting times to be a demotivating factor that contributed to late utilization of immunisation services whilst 21.6% (59) indicated that they are attended to within a short period of time. (Figure 4.2)

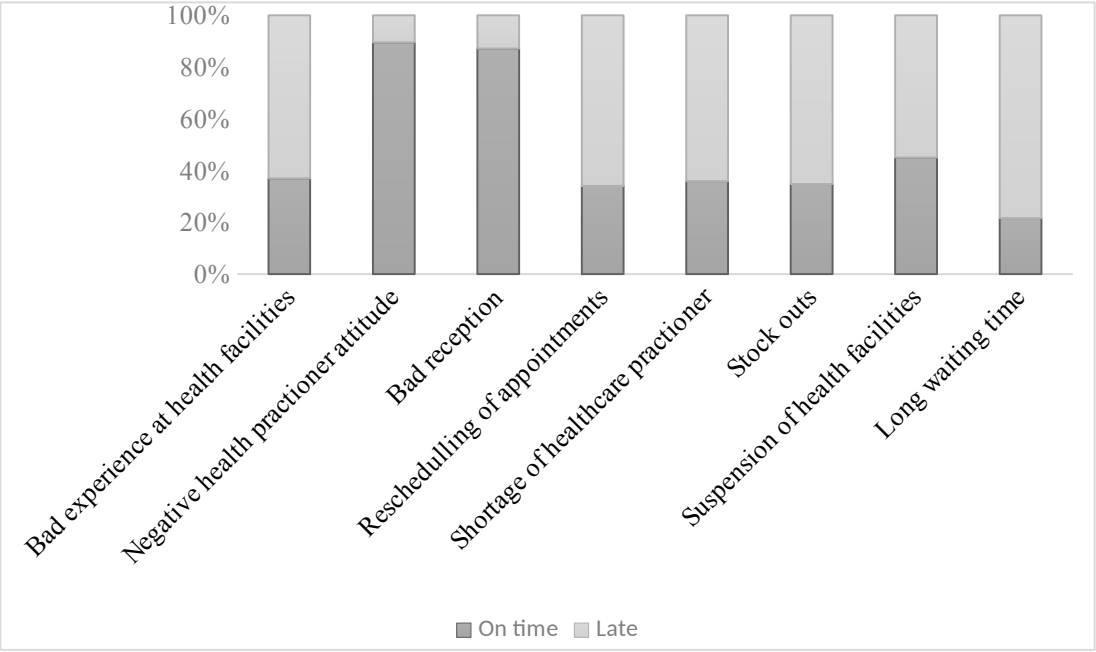

Figure 4.2: Service Delivery factors influencing access to immunisation services

Table 4.5: Service Delivery factors influencing late access to immunisation services

Variable	Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value2
Health Service Delivery				
Previous bad experience at health facilities	12.4 (6.9-22.3)	0.001**	2.7(1.2-5.9)	0.018**
Negative health practitioner attitude	1.9 (0.8-4.6)	0.125*	-	-
Bad reception	1.5 (0.7-3.1)	0.329	-	-
Rescheduling of appointments	11.9 (6.6-21.9)	0.001**	-	-
Shortage of healthcare practitioner	13.2 (7.2-24.1)	0.001**	2.8 (1.2-6.7)	0.023**
Stock outs	9.8 (5.5-17.6)	0.001**	2.5 (1.1-57)	0.037**
Suspension of health facilities	6.1 (3.6-10.4)	0.001**	2.1 (1.1-4.3)	0.032**
Long waiting time	6.6 (3.4-12.9)	0.001**	2.8 (1.2-6.7)	0.018**

*OR= Odds Ratio; ** significant; * marginally significant*

After controlling other variables through multivariate logistic regression, five service delivery variables remained independently associated with late access to immunisation services. The following service delivery factors were found to be influencing late access to immunisation services; previous bad experiences at health facilities (AOR=2.7, p-value=0.018) were 2.7 times more likely to influence late access of immunization services, shortage of healthcare staff (AOR=2.8, p-

value=0.023) was 2.8 time more likely to influence immunisation services than other service delivery factors, vaccine stock outs (AOR=2.5, p-value=0.037) was 2.5 time more likely to influence immunization services than other service delivery factors, suspension of health facilities (AOR=2.1, p-value=0.032) was 2.1 times more likely to influence late and long waiting time (AOR= 2.8, p-value=0.018) 2.8 times more likely to influence late access to immunization appointments than other service delivery factors.

However service delivery factors that include negative healthcare practitioner attitude and the bad reception at health facilities were not significantly associated with late access to scheduled immunization appointments.

4.2.6 Demand concern factors influencing the access to immunisation services

Covid 19 regulations made 57.9% (158) of participants to access immunisation services late whilst 42.1% (115) were not affected.

Majority 72.9% (199) of the participants accessed immunisation services late due to fear of contracting Covid 19 whilst 27.1% (74) accessed on time because they were not worried about contracting Covid 19.

Majority 61.1% (165) reported negative social media information contributed to the late access of immunisation services whilst in 38.9% (108) it had no influence. Moreover 64.1% (175) of participants reported that shortage of transport was a challenge which contributed to late access to immunisation services, 35.9% (98) reported that they never faced transport challenges since the onset of Covid 19 pandemic hence they reported on time for scheduled immunisation appointments.

Two hundred and fourteen (78.4%) participants who used public transport reported that it made them to avoid accessing immunisation services thus resulting in late

access to immunisation services whilst 59 (21.6%) participants indicated that use of public transport never demotivated them to access immunisation services on time (Table 4.6).

Table 4.6: Demand Concern factors influencing immunisation status

n=273	**On Time**		**Late**	
	n=115		**n=158**	
Variable	**Frequency**	**%**	**Frequency**	**%**
Covid 19 regulations	115	42.1%	158	57.9%
Fear to contract Covid 19	74	27.1%	199	72.9%
Negative social media information	108	38.9%	165	61.1%
Shortage of transport	98	35.9%	175	64.1%
Use of public transport	59	21.6%	214	78.4%

Table 4.7 below shows logistic regression analysis output for the demand concern factors that influence late access to immunisation services.

Demand Concern factors that were statistically associated with late utilisation of immunisation services included Covid 19 regulations (AOR 2.3, p-value=0.015), fear to contract Covid 19 (AOR 4.8, p-value<0.001), shortage of transport (AOR 2.8, p-value=0.028 and use of public transport (AOR 0.2, p-value=0.002) (Table 4.6). Covid 19 regulations were 2.3 times more likely to influence the delay of access to immunization appointments, shortage of transport was 2.8 more times likely to influence the accessibility of immunisation services than other demand concern factors. Moreover fear of contracting Covid 19 was 4.8 times more likely to influence access to immunization services than other demand concern factors, use of

public transport was also found be 0.2 times more likely to influence late access to immunization services than other demand concern factors. However there was no significant association between negative social media information and late access to immunization services.

Variable	Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value2
Demand Concern Factors				
Covid 19 regulations	6.9 (4.0-11.8)	0.001**	2.3(1.2-4.5)	0.015**
Fear to contract Covid 19	14.2 (7.1-28.5)	0.001**	4.8 (1.9-11.8)	0.001**
Negative social media information	6.1 (3.6-10.5)	0.001**	-	-
Shortage of transport	5.9 (3.4-10.3)	0.001**	2.8 (1.1-6.9)	0.028**
Use of public transport	0.6 (0.4-1.1)	0.129*	0.2 (0.1-0.6)	0.002**

Table 4.7: Demand Concern factors influencing late immunisation utilisation of immunisation services
*OR= Odds Ratio; ** significant; * marginally significant*

CHAPTER FIVE DISCUSSION AND CONCLUSION

5.1 Introduction

In this chapter, the researcher gives a summary of the study process, findings and discussion on how the objectives of the study were met. The researcher will also provide recommendations to policy makers and the City of Harare Health department on how best to assist caregivers of under five children in view of the outcomes of the study. Lastly, areas for further study will be suggested in this chapter.

5.2 Discussion

5.2.1 Level of compliance to scheduled immunisation appointments

Based on the findings of the study, immunisation uptake during the Covid 19 pandemic revealed low utilisation of immunisation services implying that immunisation services were not easily accessed by all participants. Majority of the participants 158 (57.9%) did not comply to scheduled immunisation appointments thus resulting in late reporting to immunisation appointments whilst 42.1% (115) complied to the scheduled immunisation services during the Covid 19 pandemic. Non-compliance to immunisation appointments may lead to an outbreak of VPD's.

These results are similar to the results of a recent study conducted in a rural area in Southern Africa which highlighted that there was an increase in non-compliance which contributed to the delay of access to immunisation appointments (Baghdadi L., Hassounah M., Khaliffa R., Suwaidna H. & Younis A., 2021) . Moreover, the findings established that majority of the participants 65.2% who reported for the 10 weeks appointments were late for the immunisation appointments. These results are consistency with those of a study conducted in Eastern Africa by Baghdadi and

colleagues (2021) which indicated that due to stock outs of vaccines, vaccination delays were highest for certain ages (Bhaghdadi et al. 2021).

According to WHO (2020) non-compliance with the stipulated National Immunisation Schedules, delaying or avoiding scheduled immunisation appointments during pandemic puts children's lives at a high risk of VPDs due to the reduction of herd immunity for VPDs among under-fives and as a result this may lead to increased child morbidity and mortality from VPDs.

5.2.2 Socio-demographic characteristics influencing the accessibility of immunisation services

The socio-demographic characteristics that were found to be associated with late reporting to immunisation services included age and place of residency. The age group of 50 years and above was found to be significantly associated to late reporting and avoidance of scheduled child immunisation appointments in Harare FHS clinics during the Covid 19 pandemic. Participants from the age 50+ years indicated that there were the most vulnerable age group with various underlying conditions hence to protect themselves they avoided immunisation services during a surge in Covid 19 cases. These findings are supported by the results of a study conducted in South Korea which indicated that the age group of 50 years and above was significantly associated with the avoidance of healthcare services during the Covid 19 pandemic (Lee and You 2021).

Furthermore the findings also showed that participants who resided in Mabvuku and Mufakose were significantly associated with late utilisation of child immunisation services during the Covid 19 pandemic. Participants from Mabvuku and Mufakose residential areas indicated that the residential areas have high population rates which

ease the spread of Covid 19 virus hence they tend to avoid immunisation services when the Covid 19 cases are on the rise. A study conducted in Korea by Lee and You (2021) supports these findings as it revealed that various residential areas in Korea were associated to the late and avoidance of healthcare service during the Covid 19 pandemic.

However demographic characteristics such as sex, employment status, marital status and religion were not found to be significantly associated with late access to immunisation appointments. Das et al. (2021) found the association between sex and immunisation services during the Covid 19 pandemic. However, this study did no find an association between sex and the access to immunisation appointments in Harare FHS clinics.

5.2.3 Service Delivery factors influencing access to immunisation services

Previous bad experiences encountered by caregivers at health facilities during the Covid 19 pandemic were found to be significantly associated to late utilisation of immunisation clinics in Harare FHS clinics. Majority of the participants indicated that precautionary measures in FHS clinics were not adhered to hence the vast majority of the participants developed a positive attitudes towards immunisation appointments thus avoided immunisation services as a way of protecting themselves from contracting Covid 19.

Das et al. (2021) found out that during the peak of the Covid 19 pandemic healthcare workers were unavailable for the immunisation services due to the social distancing restrictions. Das et al. (2021) findings are consistent to the results of the current study which established that shortage of healthcare practitioners in Harare FHS clinics contributed to the late utilisation of immunisation services as caregivers were

at times hesitant to report for immunisation appointments. Participants indicated that due to the shortage of healthcare practitioners their lives were put at risk as the healthcare practitioners that attended to Covid 19 patients were the same attending to under five children. Such experiences made caregivers avoid accessing immunisation appointments as they felt there were being exposed to Covid 19.

Several participants in the current study cited stock outs of vaccines at clinics as a reason for late utilisation of immunisation services. Participants indicated that the shortage of vaccines demotivated caregivers to report for immunisation services on time as the appointments were postponed several times due to vaccine stock outs. This trend during pandemics is supported by Abbas et al. (2020) who found that during the Ebola era channelled towards Ebola response leaving immunisation services under resourced thus affecting immunisation status of under five children.

Long waiting hours which were spent by participants waiting to be attended to was found to be statistically associated to late utilisation of immunisation services as this demotivated the majority of caregivers to access immunisation services on time.

However bad reception and negative attitude by healthcare practitioners were found not to be significantly associated with late access to immunization services.

5.2.4 Demand concern factors influencing the accessibility of immunisation services

Access to immunisation services has been a challenge due to the Covid 19 pandemic which has necessitated social distancing and lockdown measures to curb the spread of Covid 19 (Abbas et al., 2020). A study conducted in South Africa indicated that immunisation visits declined by over 50% immediately after the Covid 19 lockdown. The findings are consistency to the results of the current study which established that

Covid 19 regulations were found to be significantly associated to the late utilisation of immunisation services in Harare FHS clinics during the Covid 19 pandemic.

Baghdadi et al. (2021) reported that caregivers delayed for scheduled immunisation vaccination because of Covid 19 fears. The results of the study support the findings of the current study which indicated that there is an association between fear of contracting Covid 19 and the late access to scheduled immunisation appointments. Majority of the participants indicated that Covid is a deadly disease and they had fear of contracting the virus when they associate with other caregivers at the FHS clinic. The participants also highlighted that they report for immunisation appointments after a process of contemplation to overcome their fears.

Shortage of transport was found to be significantly associated with late access to immunisation appointments as the caregivers indicated that at times they were hesitant to access immunisation services due to transport shortages. A study conducted in Saudi Arabia also indicated that caregivers delayed for immunisation services because of transport shortages during the Covid 19 pandemic (Das et al., 2021). Additionally, use of public transport was found to be associated with delaying to immunisation appointments as caregivers feared contracting Covid 19 while enroute to health facilities.

5.4 Conclusion

From the outcomes of the study it can be concluded that immunisation services were greatly affected by the Covid 19 pandemic. The socio-demographic characteristics that influenced access to immunisation services negatively include age and place of residents. Furthermore experience at health facilities during Covid 19, shortage of health care workers, stock outs, suspension of health facilities and waiting time were

service delivery factors that influenced immunisation services negatively. Demand concern factors that include Covid 19 regulations, fear to contracting Covid 19, transport shortages and the use of public transport also influenced immunisation services negatively.

5.6 Recommendations

Vaccination delay leaves children vulnerable to VPDs. Therefore, Harare City Health Department should introduce immunization home visits during pandemics so that children under the age of five years receive vaccines on time. City Health Directorate might need to consider opening health facilities during lockdowns and also deploying adequate staff in clinics so as to attend to patients efficiently to reduce waiting and exposure time as well as preventing the spread of Covid 19.

Policy makers, Ministry of Health and City Health Directorate to formulate policies and interventions such as awareness campaigns that help to control level of fear and anxiety amongst caregivers during the Covid 19 pandemic and future pandemics so that caregivers access immunisation services on time.

To reduce stock outs of vaccines in health facilities the City of Harare Health Department needs to make sure that the child immunisation programme is being fully funded so that children receive vaccines on time.

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Appendices

Appendix: Data analysis plan

Variables	**Classification of variables**	**Statistical test**	**Statistical Package**
Dependent variable (Immunisation service accessibility)	Numerical	Chi-square, Bivariate and Multivariate logistic regression	Epi Info 7
Independent variable (Socio-demographic Characteristics)	Categorical	Chi-square/logistic regression	Epi Info 7
Independent variable (Health Service delivery aspects)	Numerical	Bivariate/Multivariate logistic regression	Epi Info 7
Independent variable (Demand Concerns)	Numerical	Bivariate/Multivariate logistic regression	Epi Info 7

Appendix II: Questionnaire on Accessibility of Immunisation Service -English Version

CAREGIVER'S QUESTIONAIRRE

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS **Participant Code:** **Health Facility:**			
NO	**Question**	**Response**	**Code**
1	Sex **(SEX)**	M=1 F=2	**[ ]**
2	Age of caregiver **(AGE)**		
4	Religion **(RELIG)**		
5	Marital status **(MARST)**	Single=1 Married =2 Widowed =3 Divorced =4 Separated=5	**[ ]**
6	Employment Status **(EMPST)**	Employed = 1 Self-Employed = 2 Unemployed = 3	**[ ]**
7	Does your employment status has an influence on you taking your child for immunization?	Yes = 1 No = 2	
8	Place of residents		

SECTION B: IMMUNISATION SCHEDULES		
9. Please tick your child's schedule		
	6 weeks	☐
	10 weeks	☐
	14 weeks	☐
	9 months	☐
	18 months	☐

SECTION C: HEALTH SERVICE DELIVERY ASPECTS			
Do the following health service factors influence you to access immunisation services during the Covid 19 pandemic?			
NO	**Item**	**Response**	**Code**
10	Suspension of health facility	Yes = 1 No = 2	**[ ]**
11	Stock outs	Yes = 1 No = 2	**[ ]**
12	Long waiting time	Yes = 1 No = 2	**[ ]**
13	Bad reception	Yes = 1 No = 2	**[ ]**
14	Rescheduling of appointments	Yes = 1 No = 2	**[ ]**
15	Negative health practitioner's attitude	Yes = 1 No = 2	**[ ]**
16	Shortage of healthcare practitioners	Yes = 1	**[ ]**

		No = 2	
17	If there are any health service factors that influence the utilization of immunzation services or any challenges encountered please indicate.		

SECTION D: DEMAND CONCERNS			
Do the following demand aspects influence you to access immunization services during the Covid 19 pandemic?			
18	Fear to contract Covid 19	Yes = 1 No = 2	**[ ]**
19	Negative social media information	Yes = 1 No = 2	**[ ]**
20	Previous bad experience at health facility during Covid 19	Yes = 1 No = 2	**[ ]**
21	Transport shortage	Yes = 1 No = 2	**[ ]**
22	Covid 19 regulations	Yes =1 No = 2	**[ ]**
23	;Long walking distance	Yes = 1 No = 2	
24	Is the transport fee too much for you?	Yes = 1 No = 2	**[ ]**

25	Use of public transport	Yes = 1 No = 2	
26	If there are other demand aspects that influence you to utilize immunisation during Covid 19 or any challenges encountered please indicate.		

SECTION E: SERVICE ACCESSIBILITY STATUS			
I am going to ask you on the immunization accessibility status during the Covid 19 pandemic.			
27	Immunisation utilization status	On time = 0 Late = 1	**[ ]**
28	If you were ever late how many times did you miss your appointments	Once= 1 Twice = 2 More than three times=3	**[ ]**

Appendix III: Questionnaire on Immunisation Service Accessibility -Shona Version

BEPA REMUBVUNZO REZVE KUBAIWA KWEVANA MUDENDA REDZIWAMUPENGO

CHIKAMU CHOKUTANGA: NHOROONDO YEUPENYU **ZITA REKIRINIKI:**			
NO	**Mubvunzo**	**Mhinduro**	**Code**
1	Munhu rudziyi	Murume = 1 Mukadzi = 2	**[ ]**
2	Makore ekuberekwa kwemubereki		**[ ]**
3	Makore ekuberekwa emwana		**[ ]**
4	Chitendero		**[ ]**
5	Makawana/ Kuwanikwa here	Handina=1 Ndakawana=2 Ndakafirwa=3 Takarambana =4 Takapesana = 5	**[ ]**
6	Munoenda kubasa here	Ndinoenda= 1 Ndinozviitira = 2 Handiende= 3	**[ ]**
7	Kuenda kwenyu kubasa kunokutadzisai kunobaisa mwana here?	Hongu = 1 Kwete = 2	**[ ]**
8	Nzvimbo yamunogara		

CHIKAMU CHECHIPIRI: NGUVA YAKATARWA YEKUBAISA VANA		
9. Sarudzai nguva yakatarwa yasvika mwana		
	Vhiki rechitanhatu	☐
	Vhiki regumi	☐
	Vhiki regumi neina	☐
	Mwedzi wechipfumbamwe	☐
	Mwedzi wegumi nenomwe	☐

CHIKAMU CHECHITATU: ZVIRI MAERERANO NERUBATSIRO RAMUNOWANA KUCHIPATARA			
Zvidomwa zviri pasi izvi pane zvamakasangana nazvo here zvinoita kuti musada kubaisa mwana kuKiriniki mundenda redzihwamupengo?			
NO	**Item**	**Response**	**Code**
10	Kuvharwa kwemakiriniki	Hongu = 1 Kwete = 2	**[ ]**
11	Kushaikwa kwemishonga	Hongu = 1 Kwete = 2	**[ ]**
12	Nguva yamunotora makamirira kubatsirwa	Hongu = 1 Kwete = 2	**[ ]**
13	Kugamuchirwa/ kubatsirwa kwamunoitwa	Hongu = 1	**[ ]**

		Kwete = 2	
14	Kupihwa rimwe zuva rekubaisa mwana	Hongu = 1 Kwete = 2	**[ ]**
15	Kupopota kwana nyamukuta	Hongu = 1 Kwete = 2	**[ ]**
16	Kushomeka kwana nyamukuta	Hongu = 1 Kwete = 2	**[ ]**
17	Kana pane zvimuri kusangana nazvo sunungukai kunyora.		

CHIKAMU CHECHINA: ZVIRIMAERERANO NEMAGARIRO NEMAFUNGIRO EVABEREKI			
Zvidomwa zviri pasi izvi pane zvinoita kuti mubaisa vana kuKiriniki here mundenda redzihwamupengo?			
18	Kutya kutapukirwa dzihwamupengo	Hongu = 1 Kwete = 2	**[ ]**
19	Zvamunonzwa parunhare mbozha, pawairesi	Hongu = 1 Kwete = 2	**[ ]**
20	Zvamakasangana nazvo kuKiriniki mundenda redzihwamupengo	Hongu = 1 Kwete = 2	**[ ]**
21	Kushaikwa kwechekufambisa	Hongu = 1 Kwete = 2	**[ ]**
22	Mitemo yekudzivirira dzihwamupengo	Hongu =1	**[ ]**

		Kwete = 2	
23	Mufambo uripo kubva kumba kuenda kuchipatara	Hongu = 1 Kwete = 2	
24	Mari yamunoda yekufambisa kunobaisa mwana yakakuwandirai here?	Hongu = 1 Kwete = 2	**[ ]**
25	Zvekufambisa zvinoshandiswa nevanhu vakawanda	Hongu = 1 Kwete = 2	
26	Kana paine zvimwe zvinokutadzisai kunobaisa mwana sunungukai kuzvidoma.		

CHIKAMU CHECHISHANU: ZVIRI MAERERANO NEKUBAISWA KWEVANA			
Ndavakukubvunzai maererano nemabaisiro evana mundenda redzihwamupengo			
27	Mamiriro ekubaisa mwana	Kubaisa nenguva = 0 Ndakambononoka = 1	**[ ]**
28	Kana makambononoka kubaisa mwana makanonoka kangani?	Kamwechete = 1 Kaviri = 2 Kanopfuura katatu =3	**[ ]**

Appendix IV: Informed Consent form- English version

Consent Form

Introduction

My name is Noreen Gonye. I am a student from Africa University attached at Harare City Health. I am currently conducting a research on the accessibility of immunisation services in Harare City clinics during the Covid 19 pandemic. The aim of the research is to shed light on the accessibility barriers to immunisation services during the pandemic. The results obtained from this study will help to better the accessibility of immunisation services during pandemics.

Purpose of the study

Every child has the right to immunisation services for growth purposes and caregivers are responsible for the growth of their children. The study intends to identify the deteminants of immunisation service accessibility during pandemics so as to reduce deaths of under 5 children.

Type of research intervention

The research will involve me asking you a few questions for about 30 minutes. The questions are on your concerns and experiences in accessing immunisation services during the Covid 19 pandemic. Some of the questions involve personal and confidential information. Feel free to stop me at any question if you feel uncomfortable with the questions.

Benefits

There is no financial benefit for you participating in the study but the information we get may be used by policy makers to formulate policies that can help caregivers to access immunisation services during pandemics.

Confidentiality and consent

Your name shall not be obtained during this interview and your answers are confidential. You do not have to take part in this interview if you do not want to answer any questions that you are not comfortable with. You have the right to end the interview at any time you want to.

Sharing the Results

The results of the study will be shared with Harare City Health Department including all the health facilities and Africa University faculty, but nothing in the report will be attributable to you.

Right to Refuse or Withdraw

As mentioned earlier, you have the right to refuse or withdraw from the study at any time. You will not be penalized for that.

Who to Contact

If ever you think or find something you may want to discuss or share after the interview, feel free to contact me or any of your clinicians. You may ask me any questions if you want.

Part II: Certificate of Consent

Having been invited to take part in the study, I have read the above information and understood it. I was given a chance to ask questions where I did not understand and the questions were answered to my satisfaction. I therefore, voluntarily consent to take part in the study.

Do you consent to be interviewed? Yes ☐ No ☐

If no written informed consent is granted, do not proceed with the interview

Participant Signature……

Date……..

Investigator's

Signature……...Date…….

Appendix V: Informed Consent Form - Shona Version

Nhanganyaya

Zita rangu ndinoitwa Noreen Gonye. Ndiri mudzidzi wepa Africa University, mukuzadzikisa zvidzidzo zvangu ndiri kushanda kuHarare City Health Department. Ndiri kuda kuitawo wongororo yezva kubaiswa kwevana kumakiriniki munguva yedenda redziwamupengo. Donzvo rewongororo iyi nderekuda kuona zvimhingamupinyi zvinoita kuti vabereki kuti vasaende kunobaisa vana. Zvichabuda muongororo iyi zvinogona kuzobatsira kuti vabereki vakwanise kuenda kunobaisa vana nguva dzose.

Chinangwa cheongororo

Mwana wese ari pasi pemakore mashanu anokedzero yekunobaiwa izvo zvinoitawo kuti vana vakure vane utano, vabereki vese vanofanira kuenda kunobaisa vana kuitira kuti vakure pasina hurwere hwevana. Ongororo iyi inoda kubuditsa zvisakisi zvinoita kuti vana vabaiwe kana kuti vasabaiwe nenguva kuitira kuti pawanike nzira dzekubatsira nadzo vabereki kuti vana vabaiwe neguva uye kuitira kuti vabereki vasarasikirwe nehupenyu hwevana.

Maitirwe eongororo

Muongororo muchabvunzwa mibvunzo ingatora chinguva chinenge minhasvi makumi matatu. Mibvunzo iyi inosanganisira zvimwe zvamunosangana nazvo nemafungiro enyu maererano nekubaisa vana munguva yedenda redziwamupengo. Mimwe yemibvunzo yacho inogona kuva yezvakakosha nezvakavanzika zvenyu. Sunungukai kundimisa pane upi zvawo mubvunzo kana monzwa kumanikidzika kupindura mubvunzo wacho.

Mubairo

Kupinda muongororo iyi hakuna mubairo wemari kana chimwe chinhu. Zvichabuda muongororo zvinogona kushandiswa nevatungamiri vezvemutemo kuti zvikubatsirei kuti vana vabaiwe nenguva munguva yedenda redziwamupengo kana mamwe matenda achauya.

Tsindidzo

Humbowo huchabuda muongororo nenhaurwa dzose zviri pakati penyu neni. Hakuna mumwe munhu asiri muongororo ino achaona zvatataurirana. Gwaro nyorwa richabuda muongororo iyi harizoratidzi zvatataurirana izvi uye hapana chichanongedza kwamuri.

Kugoverwa kwezvichabuda muongororo

Zvichabuda muongororo zvichapiwa kuvatungamiri veHarare City Health Department nevadzidzisi vekuAfrica University. Imi munogona kuziva zvabuda musarudzo pamunouya.

Kodzero yekuramba kana kubuda muongororo

Sekurehwa kwazvamboitwa kwekutanga kwegwaro rino mune kodzero yekuramba kupinda muongororo kana kubudira pamunoda. Hamuzombopiwa mhosva yekuramba kana kubuda muongororo.

Kana mukada wekutaura naye

Mukanzwa kuda kubvunza mimwe mubvunzo nyangwe mushure menhaurirano ino sunungukai kundibvunza kana kubvunza vana mazvikokota venyu vanokubatsirai pakiriniki pano. Kana pane zvimwe zvamungada kubvunza bvunzai zvenyu.

CHITUPA CHEMVUMO YEKUPINDA MUONGORORO

Mushure mekunge ndaziviswa nezveongororo iyi uye ndakumbirwa kupinda muongororo, ndaverenga mashoko akanyorwa pamusoro apo ndikaanzwisisa. Ndapiwa mukana wekubvunza pandanga ndisinganzwisise uye zvatsanangurwa zvandigutsa. Nekudaro ndinozvipira zvisina kumanikidzwa kupinda muongororo iyi.

Munobvuma here kupinda muurongwa uyu? Hongu ☐ Kwete ☐

Kana pasina mvumo yapihwa wongororo haienderere mberi.

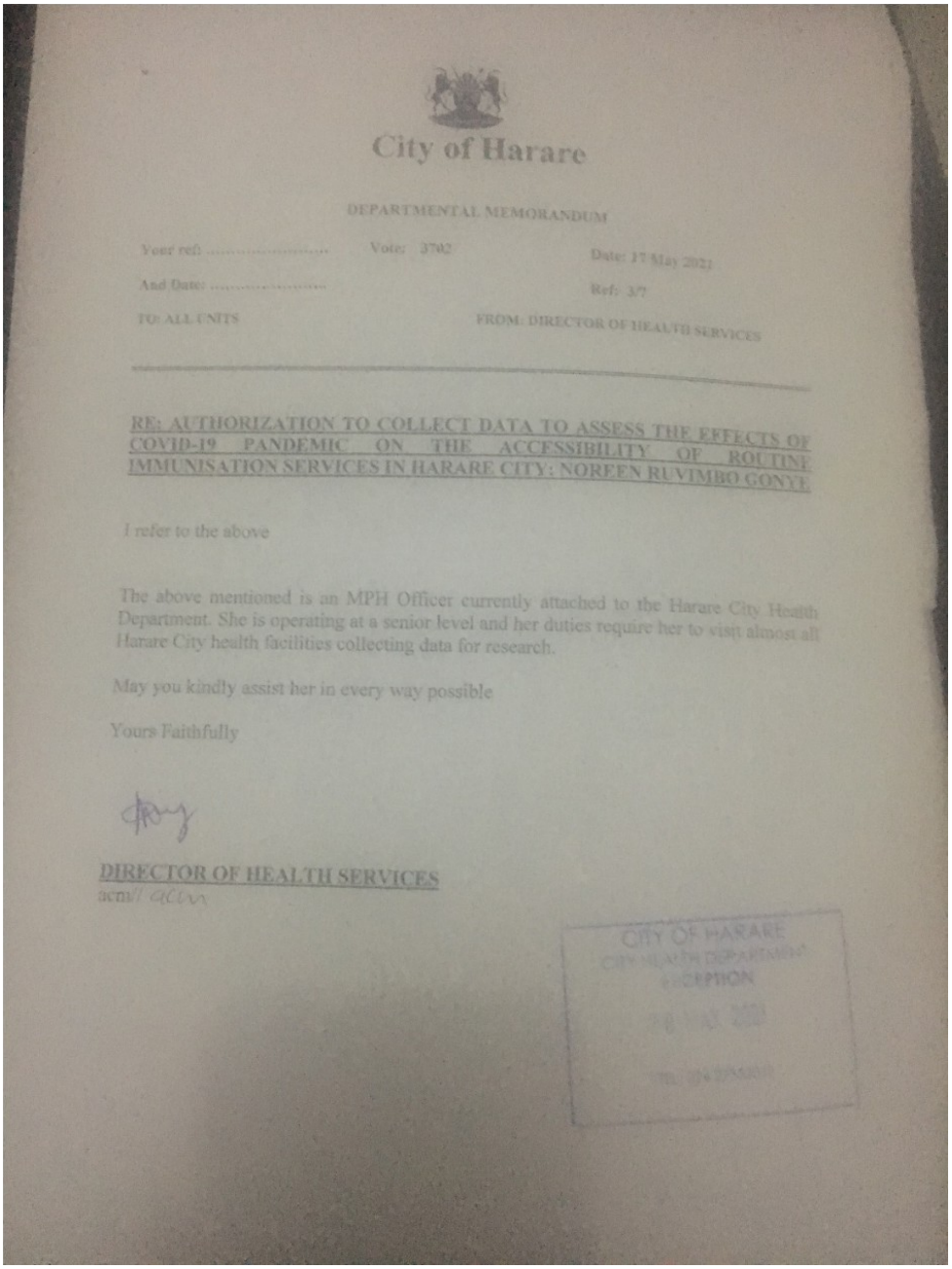
Rupawo rwomubatsiri……

Zuva……..

Rupawo

rwomudzidzi……...Zuva……

Appendix VI: Permission letter from field supervisor



City of Harare

DEPARTMENTAL MEMORANDUM

Your ref: ..... Vote: 3702 Date: 17 May 2021

And Date: ..... Ref: 3/7

TO: ALL UNITS FROM: DIRECTOR OF HEALTH SERVICES

RE: AUTHORIZATION TO COLLECT DATA TO ASSESS THE EFFECTS OF COVID-19 PANDEMIC ON THE ACCESSIBILITY OF ROUTINE IMMUNISATION SERVICES IN HARARE CITY: NOREEN RUVIMBO GONYE

I refer to the above

The above mentioned is an MPH Officer currently attached to the Harare City Health Department. She is operating at a senior level and her duties require her to visit almost all Harare City health facilities collecting data for research.

May you kindly assist her in every way possible

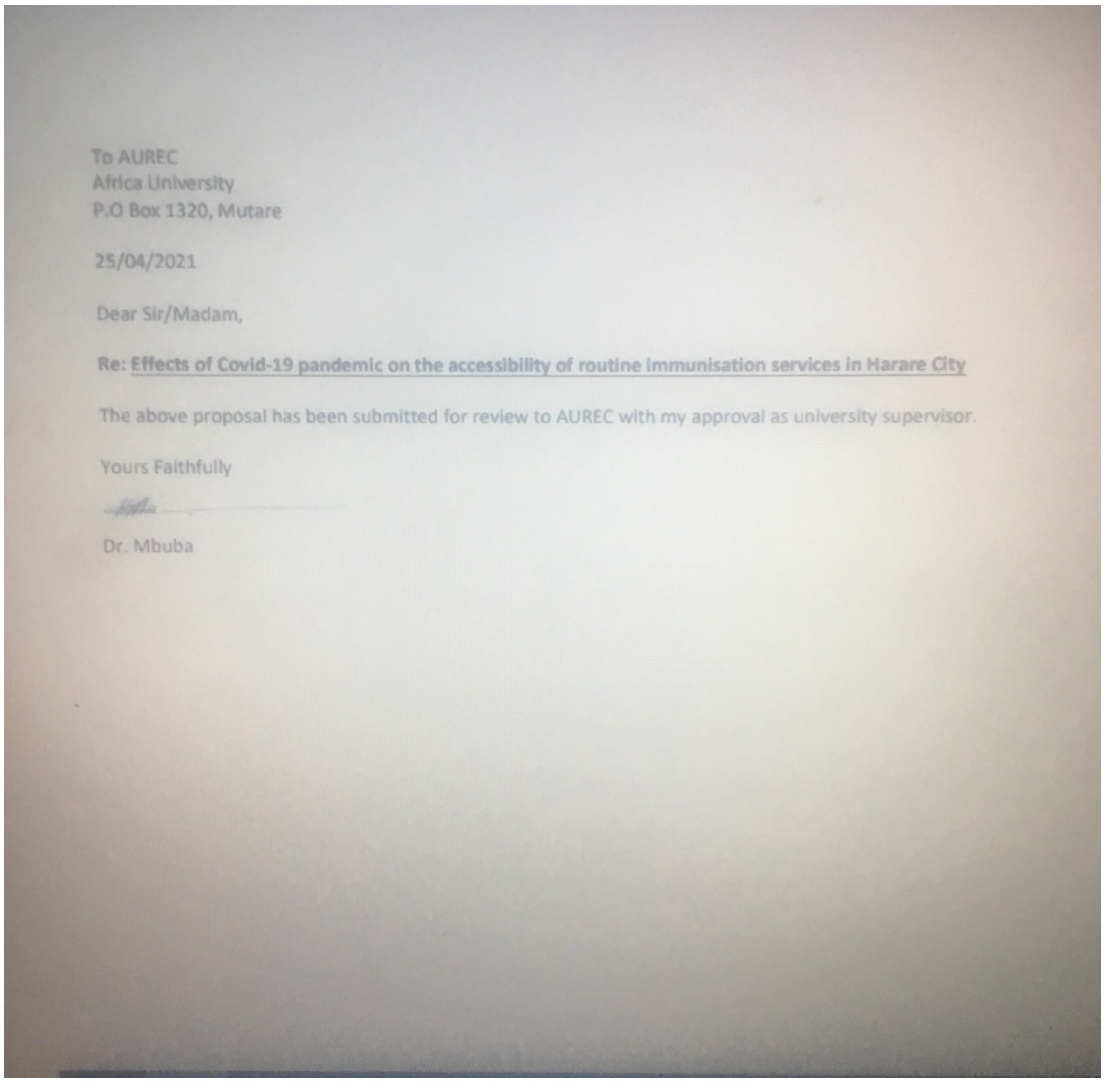
Yours Faithfully

DIRECTOR OF HEALTH SERVICES

acm// qcvvv

CITY OF HARARE
CITY HEALTH DEPARTMENT
RECEPTION

Appendix VII: Permission letter academic supervisor



To AUREC
Africa University
P.O Box 1320, Mutare

25/04/2021

Dear Sir/Madam,

Re: Effects of Covid-19 pandemic on the accessibility of routine immunisation services in Harare City

The above proposal has been submitted for review to AUREC with my approval as university supervisor.

Yours Faithfully

Dr. Mbuba

Appendix VIII: Permission letter AUREC

AFRICA UNIVERSITY
A United Methodist-Related Institution
Investing in Africa's future

AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

P.O. Box 1320 Mutare, Zimbabwe, Off Nyanga Road, Old Mutare-Tel (+263-20) 60075/60026/61611 Fax: (+263 20) 61785 website: www.africau.edu

Ref: AU2118/21

16 June, 2021

Noreen Ruvimbo Gonye
C/O CHANS
Africa University
Box 1320
Mutare

RE: EFFECTS OF COVID 19 ON THE ACCESSIBILITY OF ROUTINE IMMUNISATION SERVICES IN HARARE CITY, ZIMBABWE, 2021

Thank you for the above titled proposal that you submitted to the Africa University Research Ethics Committee for review. Please be advised that AUREC has reviewed and approved your application to conduct the above research.

The approval is based on the following.

a) Research proposal
b) Data collection instruments
c) Informed consent guide

- **APPROVAL NUMBER** AUREC 2118/21
  This number should be used on all correspondences, consent forms, and appropriate documents.
- **AUREC MEETING DATE** NA
- **APPROVAL DATE** June 16, 2021
- **EXPIRATION DATE** June 16, 2022
- **TYPE OF MEETING** Expedited
  After the expiration date this research may only continue upon renewal. For purposes of renewal, a progress report on a standard AUREC form should be submitted a month before expiration date.
- **SERIOUS ADVERSE EVENTS** All serious problems having to do with subject safety must be reported to AUREC within 3 working days on standard AUREC form.
- **MODIFICATIONS** Prior AUREC approval is required before implementing any changes in the proposal (including changes in the consent documents)
- **TERMINATION OF STUDY** Upon termination of the study a report has to be submitted to AUREC.

Yours Faithfully

MARY CHINZOU – A/AUREC ADMINISTRATOR [illegible] AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE