Chapter one

The research problem

1.0 Introduction

HIV infection was first discovered in 1980s in Zimbabwe. The government had designed many strategies to deal will HIV infection. These strategies included use of standardised guidelines and policies such as HIV policy and HIV treatment guidelines. These measures were designed to prevent HIV drug resistant infection by promoting viral load suppression. The level of preparedness to deal with factors contributing to development of drug resistant HIV infection amongst adult people living with HIV was established. This chapter provided background information to the problem, statement of the problem, research questions and objectives, significance of the study, delimitations and limitations of the study. A summary of the chapter was provided.

1.1Background to the study

The natural history of HIV infection had being changed by the use of antiretroviral medicines. According to WHO (2018) the newly diagnosed patients who were commenced on ART medicines had achieved viral load suppression and immune system restoration. Also during treatment patients had reported to have been developed HIV virus resistant strains. The widespread use of ARV medicines and the increased chance of survival of patients on ARV medicines made transmission of HIV resistant strains more likely (Addendum; 2018). HIV virus resistant strains had been reported in infections acquired through sexual contact, Mother to child and contact with infected blood (WHO; 2018). As a result transmitted drug resistance (TDR) HIV infection had become a contemporary issue. Active surveillance of HIV drug resistant infection provided important information about the factors involved in the transmission of HIV resistant strains and in the selection of ART components. Therefore, active surveillance played a major role in the design of strategies to control the evolution and emergence of resistance.

The fight against HIV infection was made very easy by the widespread use of antiretroviral therapy (WHO; 2018). The use of antiretroviral medicines did not achieve viral suppression alone. Patients worked closely with health care workers in managing HIV infection. Patients assisted to choose and monitor their treatment carefully by expert Health care workers. Close monitoring of patients by experts health care workers helped patients to adhere to treatment

despite many obstacles that arose during the course of treatment. Development of HIV drug resistant infection was one of the obstacles. HIV drug resistance was a result of poor adherence to treatment and wrong prescription especially in children and adults. When patients were started on treatment there was need to counsel them on the impacts of poor adherence. Drug sensitivity tests were needed to be conducted to detect the type of the virus. Failure to provide comprehensive counselling package resulted in the emerging of HIV virus strains which were untreatable with current Anti retroviral medicines. HIV drug resistant infection resulted from mutations in the genetic structure of the virus (Siwela; 2011). These mutations included changes in the HIV viral proteins. HIV virus mutations were common because the virus replicates rapidly (Prasad and Pan War; 2002).

Salvana (2018) stated that the best approach to prevent HIV drug resistance infection was health education provision. The information on mutation was essential in prevention of HIV drug resistant infection. The information was widely found on the internet, journals, magazines and televisions. To access the information on the internet one needed technology, such as Television, computer and internet. These technologies were not available to all clients who needed the information. This study established that information on HIV drug resistant infection prevention was not being accessed and given to patients living with.

Joint United Nations Programme on HIV/AIDS (2017) set global goals which included increasing number of people on ART with viral load suppression. This was driven by the dual aim of eliminating AIDS as a public health contemporary issue and ending all new HIV infections by the year 2030. Zimbabwe was one of the countries in sub Saharan Africa implementing this goal.

Around the year 2000 the provision of ART services had increased in all the health care facilities and communities. This resulted in the gradual increase in the number of HIV drug resistant virus strains (ART guideline; 2016). This virus strain had been reported to compromise the effectiveness of ARV regimes in use currently. WHO (2018) urged that high level of HIV drug resistant infection could compromise the ability of the nations to reach the UNAIDS goal of having 90% of patients on ART medicines reporting viral load suppression.

More so, According to Chimbetete (2018) report on untreatable HIV infection high level of HIV Drug resistant virus strain indicated gaps in the delivery of ART services. Gaps such as: suboptimal retention of patients on ART medicines, poor adherence to ARV medicines,

unknown treatment outcome, and stock out of ARV medicines. These were labelled as signals for the need of HIV programme improvement.

This study looked at the existing gaps and the interventions in place to prevent and manage HIV drug resistance virus infection. Apart from this the study focused on the factors which were affecting monitoring of patients on ART which were fuelling Drug resistant HIV. How patients on ART were being monitored? For example antiretroviral medicines stock out was the talk of the day in most health care facilities in Tsholotsho District. Stock out of ART medicines had contributed to frequent change in Patient regimes. This supported the idea given by Kityo (2007) which highlighted that patients develop HIV drug resistant infection because of frequent stock out of ARV medicines. Poor adherence to ART medicine was a major problem being faced by patients on ART due to side effects, lack of disclosure especially in children and adolescents, and lack of motivation (WHO; 2006). The study had identified that the adult patients were also facing challenges in disclosing their HIV status. Facilities were performing dismally on Patient retention with scores ranging from 20% to 60% EPMS data and SIMS assessment (2017). Retention of clients on ART was a big challenge due to migration and lack of employment in Tsholotsho. Migration of patients on ART had made it difficult to evaluate clients on ART and monitor their treatment outcomes. As a result many patients were given treatment outcome of lost to follow. These patients with lost to follow outcome were likely to develop HIV drug resistant infection.

Nachman (2017) stated that it was impossible to prevent particular diseases from entering the United States. He highlighted that diseases can travel across the national boundaries and there was no way to prevent an infection from getting on a plane, boat or car. Nachman (2017) recommended that the best approach was to consider where the infected person had came from, carefully select a regimen to treat that disease, and then check if that regimen was working. According to ZIPHIA (2018) report the 45 % of adult populace of Tsholotsho district travel to neighbouring countries annually. This promoted transmission of and acquisition of drug resistant infection among adults. The duty of health care workers was to ensure that HIV drug resistant infection was prevented identified and treated according. This study established the degree at which patients and health care workers were capacitated to identify and treat early HIV drug resistance HIV. Early identification and management of drug resistant HIV may help to reduce the spread.

Furthermore, On 20 July 2017 WHO published national survey results from studies which were conducted in several countries which revealed an increase in the number of HIV drug resistant infections. WHO report (2017) warned that the emerging threat of HIV drug resistant infection could undermine global progress in treating and preventing HIV infection if early interventions were not implemented.

WHO (2017) reported that six of the eleven countries which were surveyed in Africa, Asia and Latin America had more than 10% of patients who were commenced on ARV medicines with HIV virus strain which was resistant to ARV medicines which were in use. It was also highlighted that when a threshold of 10% was reached countries needed to review their HIV treatment programmes.

In 2018 Newlands private clinic, in Zimbabwe had reported 4 cases of HIV drug resistant infection amongst adolescents. These four adolescent were not on any medicines. This indicated the increased risk of spreading HIV drug resistant infection to the entire population. This study provided factors that could have contributed to the emerging of HIV Drug resistant infection.

According to Ghebreyesus (2018) HIV drug resistant infection occurred because of poor adherence to prescribed ARV medicines. Also people had no consistent access to quality HIV treatment and care. He went on to urge that when people had HIV virus strain which was resistant to ARV medicines they start to show signs of treatment failure. They may also be in a position to transmit drug resistant viruses to other people. This was said to be possible because of the increased level of HIV resistant virus strain in their blood. When this occurred patients needed to be switched to new effective ARV medicines. These new regimes were very expensive and difficult to get by many countries. This raised the issue of what factors were contributing to the development of HIV Drug resistant infection. Questions such as were ART medicine adequate to meet the needs of the patients or the patients were getting adequate supply of ART medicines became paramount.

According to WHO 2017 report on the studies that were conducted in China and similar study in Barcelona 36.7 million people were living with HIV in the world. About 19.5 million people were said to be on ART medicines by 2016. The majority of people were doing well and treatment had proved to be effective in suppressing HIV virus. A growing number of the

patients on ART were reported to be experiencing signs and symptoms of HIV drug resistant infection. This showed that there were factors which were affecting the effectiveness of ART world wide. This study managed to establish the factors which were affecting Tsholotsho patients who were failing on ART medicines.

Hader (2017) highlighted that Support systems help a patient's ability to take medications. These included housing, transportation, food insecurity, and financial ability to fill the prescriptions. Use of simple medication with few side effects and that required only one pill per day. In most health facilities in Tsholotsho District patients' collected ART medicine from the health care facilities and very few sites were conducting community out –reach on hard to reach areas. Transport cost was very high to go to health facilities to collect medicines as a result some patients sent friends to collect their medicines. This affected adherence monitoring and client treatment evaluation.

Increasing HIV drug resistant infection trends might lead to more infections and deaths. Mathematical modelling study cited in WHO (2018) report revealed that additional 135 000 deaths and 105 000 new infections would occur in five years time if no adequate measures are taken. Also cost for HIV treatment and care would escalate by US$ 650 million. This study provided a strong knowledge base to policy makers and decision makers on how to get geared to deal with the impacts of HIV drug resistant infection.

The studies concluded that tackling HIV drug resistant infection required active involvement of multiple partners. As a result a five-year Global Action Plan called for joined effort in prevention, monitoring and responding to HIV drug resistant infection. Also to protect the ongoing progress made toward achievement of the sustainable development goal of ending AIDS epidemic by 2030.To achieve this WHO developed monitoring tools which were aimed at improving quality of treatment programmes and the transition to new effective ART regimes.

1.1.2 Learning from other researchers

Researchers from Philippines warned that a new drug-resistant subtype of HIV could worsen the epidemic in a country and had serious implications worldwide. According to Multicentre AIDS cohort study conducted by Kleebeger et al (2001) on 539 patients, 77% of them were on 3 or more medication. The following reasons for poor adherence were provided:

- Patients highlighted that they forgot to take medicines.
- Sometimes people fail to adhere to prescribed medicines due to changes in daily routines.
- Other patients highlighted that they may be away from home and it may be difficult to take medicines in time.
- Poor adherence was said to be due to avoidance of side effects by the patients.
- Some patients just felt depressed and lost interest in taking the medicines.
- The tablets that need to be taken may be too much.
- Instruction provided by the health care workers was conflicting.
- Fear of being seen by others taking medicines.

According to Sanzero (2009) adherence intervention study conducted on 24 ART patients adherence declines over time. This could be the reason for HIV patients developing HIV drug resistant.

1.2. Statement of the problem

There are several strategies that were put in place to ensure that ART medicines achieve their primary goal of prolonging life and suppression of the viral load. These strategies are aimed at preventing drug resistant HIV in Zimbabwe and in the world at large. WHO recommended use of new guidelines and close monitoring of all clients who are on ART and those starting antiretroviral medicines? Zimbabwe has over 13000 people living with HIV who are resistant to currently available Medicines DHIS (2012). According to Medical experts people can become drug resistant after defaulting treatment, not adhering to prescribed doses and via direct infection of a drug resistant strain of the virus. 1.3 million Zimbabwean has been estimated to be living with HIV and greater than 10% of those are said to be resistant to antiretroviral available medicines. Tsholotsho district had 15000 patients who were on ART. 250 of them were on second line antiretroviral medicines.

Zimbabwe had economic hardships which pushes its citizens to migrate all over the world in search of greener pastures. Not all clients who leave the country to get employment in other

countries are in a position to continue taking their ART medicines. Patients may fail to continue taking ART due to transport cost involved, lack of knowledge on availability of referral systems, fear of disclosure of HIV status to nurses and friends in a foreign land, and the belief that good diet will suppress the viral load.

HIV drug resistant may negatively affect the progress made in dealing with HIV infection in Zimbabwe. HIV Drug resistant may lead to increase in mortality; currently mortality and morbidity rate are over 12%. To manage the burden of HIV/AIDS, the government of Zimbabwe has to divert a lot of funds which are meant for developmental projects to procure more medicines to treat the HIV drug resistant infection, Government expenditure on health issues will shoot up. The increase in the work load in the health care facilities might compromise the quality of care rendered by understaffed and poorly equipped health facilities. HIV drug resistant may increase the number of orphans and child headed families. The child bearing age group is greatly affected by HIV infection. This might increase responsibilities on the elderly of taking care of the orphans. Economy of the country might not progress; instead it might deteriorate as its source of labour may be devastated. Resources that were allocated to improve the economy may be reallocated to fight HIV drug resistance. As a result the economy of Zimbabwe will remain stagnant or deteriorate. Funds may be diverted to purchase technology to detect HIV gene mutations and more efficacy medicines which are more expensive. It should be remembered that second line ARVs cost 24% more than the first line ARVs.

1.3 Research objectives

1. To assess level of information that is already known on HIV Drug resistant infection.
2. To determine factors leading to the development of HIV drug resistant infection
3. To identify signs and symptoms of HIV drug resistant infection
4. To evaluate effectiveness of measures in place to prevent the development of HIV drug resistance infection.

1.4 Research questions

The study provided answers to the following questions on the factors contributing to the emerging of drug resistance HIV infection:

1. What concept of HIV drug resistant infection is already known?
2. What factors are contributing to the development of HIV drug resistant infection?
3. What are the signs and symptoms of HIV drug resistant infection?
4. How effective are the measures which were designed to prevent HIV drug resistant infection?

1.5 Significance of the study

The investigation of the level of preparedness to deal with factors contributing to development of HIV drug resistant infection helped to identify existing gaps in the HIV treatment and care programme. The study findings might be used to improve the delivery of OI/ART services in the following ways:

1.5.1 Ministry of health and child care

The Ministry of Health and Child Care might use the study findings to identify gaps in standard operation procedures currently in use. Apart from that the results of the study might be used to formulate policies and guidelines which are more effective in addressing causes of HIV drug resistant infection in Zimbabwe.

1.5.2 Provincial HIV and district management team

The provincial management team of HIV programme might be able to evaluate the systems in place in different institutions within the province. Gaps and omissions contributing to development of HIV Drug resistant may be identified. Possible solutions might be formulated and implemented.

1.5.3 People living with HIV

People living with HIV infection might gain knowledge on how to prevent HIV drug resistant infection. Patients might also develop sense of ownership of OI/ART programme as they might take full responsibility of their action. Patients might be in a position to follow the prescribed medication according to the instruction.

1.5.4 Local Authority

The study findings might be used by local authority to mobilise resources that are needed to monitor clients who are on ART. Technology such as viral load testing machine, testing tubes and reagents might be sourced. Local authority might advocate for behavioural change programmes in the community. Behavioural change programme promote positive living amongst adult people who are on ART. This may help in building of healthy communities.

1.5.5 Future researchers

The study findings might be used by future researchers as a resource material. The future researchers might use the findings of the study to identify the gaps that need to be investigated. Future researchers might also use the study findings to refine the area of study phenomenon.

1.5.6 **Health care workers**

Nurses might be able to assess their systems and processes in place to identify the root cause of HIV drug resistant in their institutions. Health care workers might be in position to improve the quality of adherence counselling offered to people living with HIV infection. Above all, health care workers might open up to new strategies in the fight of HIV pandemic.

1.6 Limitations

The researcher depended greatly on the supervisor for guidance. The researcher self sponsored the study. Time factor was a constraint as the researcher was a full time employee of MOHCC and had a lot of duties assigned to her by the organisation. Also being an adult learner with many responsibilities the time spent on the study activities was limited. HIV drug resistant infection was not a familiar condition to many health care workers this limited the study participants to only those working in departments that provided care to people living with HIV.

1.7 Delimitations

The study focused only on the factors contributing to HIV drug resistant infection amongst adult patient who were on ART who had failed first line medicines. Only registered patients at X District Hospital OI clinic were considered. X District Hospital was one of the districts in Matabeleland North Province.

1.8 Definition of terms

- **Appointment:** Date given to patient by health care worker to come back to collect medicines
- **ART:** Antiretroviral therapy
- **ARV:** Antiretroviral
- **Drug** any substance that when injected causes a physiological change in the body
- **Drug resistant HIV**: This is when the HIV virus starts to change its genetic makeup that are resistant to certain HIV drugs or classes of ARV medicines.
- **Factor:** A circumstance, fact or influence that contributes to a result
- **HIV:** Human Immunodeficiency Virus
- **Mutation:** A permanent alteration in the RNA sequence that makes up a gene

1.9 Summary

This chapter focused on the background information to the study. Level of preparedness to deal with factors that were contributing to the emerging of HIV drug resistance infection was established. Statement of the problem was provided. Study questions were formulated. Study objectives were set. The significance of the study was highlighted. The study limitations and delimitations were provided. Key terms used in the study were defined. The next chapter reviewed related literature to the study.

Chapter Two

Review of related literature to the study

2.0 Introduction

In this chapter the researcher revealed related literature and theoretical framework of the study on factors leading to emerging of HIV drug resistant infection. Theoretic framework was defined as the structure that can hold or support a theory of the research study. It introduced and described the theory which explained why the research problem under study existed. Theoretical frame work of this study consisted of the purpose of the health belief model, conceptual bases and description of the model. This chapter also looked into the following: explanation of HIV drug resistant infection drives of HIV drug resistant infection, signs and symptoms of HIV drug resistant infection and measures to prevent HIV drug resistant. The chapter ended with a summary.

2.1 Theoretical framework

The study based on Health belief model which assessed the patient readiness to deal with factors contributing to Drug resistant HIV. This model was once used in studies which assessed the problem of poor adherence in China and in Zimbabwe. Health Belief Model (HBM) was designed by G.M. Hochbaum, 1950s; subsequently modified by other authors.

2.1.1 Purpose of Health belief model

This model disseminates a person's beliefs into four categories: perceived susceptibility, perceived severity, perceived benefits and perceived barriers. This in depth approach helped the researcher to examine patient's beliefs regarding to HIV drug resistance infection in a more holistic way. Also the researcher was assisted by the model to remember that people's health choices were based not only on rational thought but also on emotions, habits, social conditioning and personal preference. The model stimulated critical thinking in the researcher that helped her to come up with more effective social teaching methods, treatment strategies around HIV drug resistance infection. Above all the researcher was in a position to put forward recommendations that might help in the development of educational and social awareness programmes that can change behaviour amongst people living with HIV infection.

2.1.2 Conceptual Basis of health belief model (HBM)

The HBM was founded on attempts to integrate stimulus-response theory with cognitive theory in explaining behaviour. The design of the HBM was influenced by Kurt Lewin's theories which state that perceptions of reality, rather than objective reality, influence behaviour. Earlier stimulus-response theory had stressed the importance of the consequences of behaviour in predicting actions, while cognitive theory modified this by stressing the relevance of the person's subjective valuations, and their judgment of the likelihood that an action would have desired consequences. This combined approach was termed value-expectancy theory: reinforcements and incentives do not influence action directly, but via influencing the person's valuation of the action and their judgment of the likelihood that it will produced results. In this perspective, health behaviours are influenced by a person's desire to avoid illness or to get well, and by their confidence that the recommended action will achieve this. This implied a phenomenological approach: it is not the actual world, but the person's perceptions of it that influence their behaviour. It extended the descriptive approach of associating health behaviours with demographic factors such as social class, and emphasized the role of personal characteristics and perceptions.

2.1.3 Description

The HBM breaks down health decisions into a series of stages and offers a catalogue of variables that influence health action; it does not provide a model of exactly how these operate. In the HBM, the likelihood that a person will follow a preventive behaviour is influenced by their subjective weighing of the costs and benefits of the action; the perception involves the following elements in the figure below

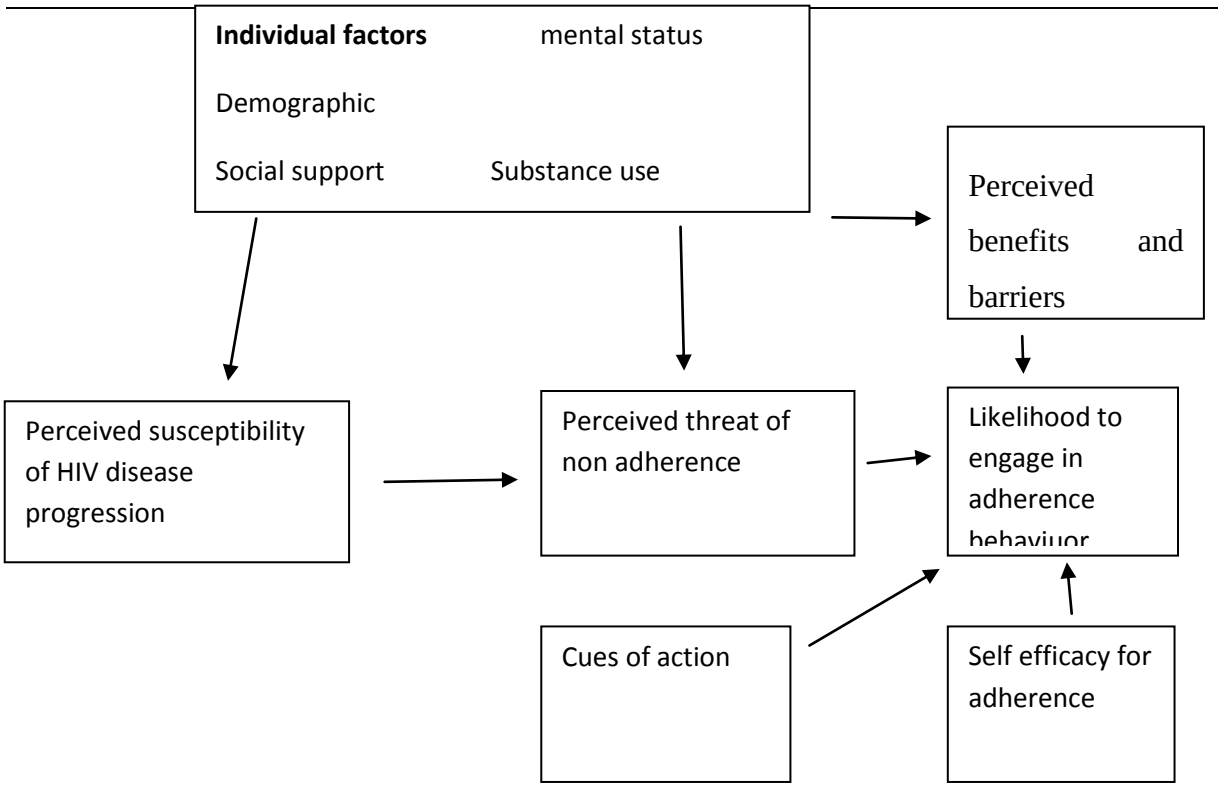


Figure 1: The variables in the Health Belief Model adapted from Rosenstock, Janz and others.

Perceived severity: The individual's belief that HIV disease progression has serious consequences may motivate one to take medicines as prescribed. But if an individual feels that the consequences of HIV progression are mild, one can stop taking her /his medications. This may result in development of HIV Drug resistant infection.

Perceived benefits: The individual's belief that adherence to ART would reduce susceptibility to HIV disease progression or disease severity may force one to adhere to treatment. When a patient lacks perceived benefits of taking ARV medicines one cannot adhere to treatment. One may perceive no benefit from taking ARV. Instead, he/she may see HIV infection as a curse. He or she may be more worried with the side effects of the medicines rather than therapeutic effect.

Perceived barriers: The individual's belief that the materials, physical and psychological costs of adhering to ART outweigh the benefits may cause one to stop taking ARV. Treatment defaulter remains being a factor that may contribute to HIV drug resistant infection.

Cues to action: The individual's exposure to factors that promote adherence to ART.

An individual exposed to factors that promote adherence during ART initiation phase tends to have good adherence profile. Reminders in form of use of alarm, appointment calls and date given by the health care workers may assist the client to remember time to take her/his medications plays an important role in good adherence promotion.

Self-efficacy: The individual's confidence in her ability to successfully adhere to ART prevents development of drug resistant HIV. Adults' people who are on ART are intrinsically motivated to take their medicines. When they stop taking their medicines indicates a problem.

Individual factors: Good support system may help the individual to adhere to prescribed treatment regime. If the support system is weak, one may find it hard to adhere to treatment. Mental status of patient influence the way the patient will take her medicines. If the patient is depressed and confused she or he has high risk of forgetting to take her medicines.

Age of the patient has an impact on how one would adhere to medicines. Elderly people and children on ART dependent greatly on treatment supporters on how to take medicines if a treatment supporter forgets the time to administration prescribed medicines and the date of review the patient may miss her /his appointment and daily doses

Substance use: Substances use impact on how people take their medicines. Patients who abuse substances such as drugs and alcohol may have challenges with adhering to prescribed medicine.

2.2 Concept of HIV drug resistance infection

According to WHO (2018) HIV drug resistant means that the HIV virus reproduces itself in the presence of antiretroviral medicines. This is supported by Jaffe (1998) who defines HIV drug resistance as HIV virus which is resistant to current available antiretroviral medicines. From the two authors given above one concludes that HIV drug resistant is a result of antiretroviral medicines failure to suppress viral load or to prevent the HIV virus from replicating. This can happen as a result of a prolonged period of time on treatment, or more commonly as a result of sub-optional treatment adherence.

Retroviruses such as HIV have a high mutation rate so every now and then the virus will reproduce a copy with errors (Meyer; 2009). The wild type viruses occur naturally. Non mutated form of the viruses is more sensitive to Anti retroviral medicines. When ART medicines are given inadequate supply the virus can multiple to a point that the viruses which are resistant may become the primary population in the viral load.

Depending on the specific mutation it is possible for people to become resistant to a drug they have newer taken, this is called cross infection. The mutation makes copies of them, gradually increasing the level of the virus in the person living with HIV. Meaning treatment may no longer be effective.

2.2.1 Development of HIV drug resistance infection

HIV drug resistant virus may be transmitted from one person to another through the following ways: unprotected sex, contact with infected blood through broken skin and sharing of needles with someone who is infected with a drug resistant variant (Boulle; 2006).

Apart from the mode of transmission highlighted above HIV drug resistance mutations may occur both before and during HIV treatment. A full detail of how it may happen is given below:

2.2.1.1 Transmission of drug resistant HIV

Many HIV positive people now take HIV drugs. If someone has developed resistance to one or more of these HIV drugs and has unprotected sex or shares needles with someone who may be not infected with the virus. It may be possible that they may infect their partners with a drug resistant variant. In US and other countries where HIV treatment was widely used five to twenty percent of new HIV cases involved strains of the virus that were resistant to one or more ARV medicines (Boulle; 2006).

2.2.1.2 While using pre exposure prophylaxis PrEP

Truvada was approved by the US to be used as pre exposure prophylaxis. Zimbabwe has adopted it in 2016. Truvada may be taken by HIV negative people to reduce the risk of acquiring HIV infection. There may be a potential risk for people using Truvada as PrEP if they become infected with the virus and may not be detected quickly, and the person continues using PrEP. Their newly acquired virus may develop resistance to one or both of the medicines in Truvada.

2.2.1.3 During treatment

Even if someone was infected with HIV that doesn't contain drug resistance mutation, genetic changes still occur over time, even before treatment was started. This may create a large mixture of viruses in the body. When treatment may be introduced wild type virus may reduce but the mutated variant may continue to multiple in the presence of ARV medicines.

2.3 Drives of HIV drug resistance infection

WHO (2017) highlighted that HIV drug resistant infection is caused by a change or mutation in the genetic structure of HIV that affects the ability of a particular medicine or combination

of medicines to block replication of the virus. Plantler (2009) highlighted that HIV drug resistance can be a result of mutation due to poor adherence to prescribed medicines. HIV drug resistance can arise from a range of different factors which can be split up into four broad categories Patient, programming, drug regime and virus specific drives of drug resistance.

A number of individual led reasons highlighted that patients may stop taking their medicines as prescribed, increasing their risk of developing drug resistant mutation. They could be the result of lack of understanding of HIV, treatment and implication of stopping their medication Siwela (2011). Also patient may stop taking medicines because of fear of taking many medicines. Patients may forgetful to take their medicines frequently especially when disclosure process was not facilitated and there is poor support system. Undiagnosed depression may lead to one stopping taking her or his medicines. Some patients' abuse substance or alcohol abuse as a result they do not stick to prescribed time of taking medicines.

2.3.1 Program factors

The challenges arise from the delivery of large scale or country level HIV treatment programme which in turn affect an individual's ability to stick to a treatment regime. Drug stock out promote development of drug resistant HIV as patients cannot get their drug because the pharmacy may not have the treatment.

Poor drug procurement and supply chain management may lead to stock out of anti retrovirus medicine. Poorly resourced human capital especially when the health care providers who are offering HIV/AIDS service care not trained on how to prescribe and prepare patient adequately. Patients may receive under dosed or received wrong prescriptions.

Poorly equipped laboratory may result in limited regular viral load testing, meaning health care workers cannot properly monitor for the emergence of HIV drug resistance.

Poorly resourced treatment programme may also be the result of weak monitoring and evaluation of care outcomes and also for decentralisation service delivery.

2.3.2 Drug and treatment regime factors

Robertson (2009) Regime and treatment specific factors refers to the selection of specific ARV that may increase or decrease the likelihood of HIV drug resistance with different types of drugs and drug classes having varying genetic barrier to resistance.

2.3.3 Viral factors

Virus related factors refer to resistance that arise by nature of the HIV type or subtype that may affect a drug regime. HIV2 is resistant to non nucleotide reverse transcriptase inhibitors so people with this strain of HIV may develop drug resistant HIV infection. If someone is infected with HIV that doesn't contain drug-resistance wild-type virus genetic changes can occur over time (Siwela; 2011). Mutations can even occur before treatment is started. This may lead to creation of a large mixture of virus in the body. These variants contain mutations that may cause partially or fully resistance to antiretroviral medicines. Mono-therapy should never be used to treat HIV. This study established that sites offering ARV medicines were not using mono therapy.

Combination of HIV drug treatment reduce great amount of wild-type virus (WHO; 2017). The virus accumulates enough mutations which lead to a high level of resistance to the drugs being used. The viral load will increase and CD4 cells will drop. Mutations may also cause cross resistance (Sinouss et al; 2015). This means that HIV resistance to one drug can automatically become resistant to other drugs in the same class. The study evaluated the level of preparedness to monitor for emerging drug resistant through CD4 cell monitoring in people living with HIV.

2.3.4 Patient related factors

2.3.4.1 Poor treatment adherence

Nachega (2007) explains that for HIV medicines to work effectively they must be taken exactly as prescribed and consistently. Incorrect taking of medications can cause the amount of HIV drug to decrease in the bloodstream. HIV can reproduce more freely and accumulate additional mutations when the drug levels become too low. Grant (2001) identified the following challenges that contribute to poor adherence to treatment: side effects, a hectic schedule, tiredness to take medicines or forgetfulness. The study established the extent to which issues of poor adherence were being addressed by the guidelines.

2.3.4. 2 Poor absorption

HIV medicines must not only be taken on scheduled time (Nachega; 2007). They need to be absorbed effectively into the bloodstream. Poor medication absorption can result in too low level of the medicine in the blood stream. This may allow for HIV reproduction and the accumulation of drug-resistance mutations.

ARV medications have dietary requirements which can affect absorption (Nachega ; 2007). The study checked whether these dietary requirements were known by health care workers.

Grant (2001) also highlighted that HIV infection and medicines may cause diarrhoea and vomiting. This may cause HIV drugs to be excreted from the body before they are absorbed. The study assessed for level of preparedness by health facilities to deal with side effects of ARV medicines.

2.4 Signs and symptoms of drug resistant HIV?

According to WHO (2016) Viral load was the golden standard tool available to determine if HIV treatment was working. A viral load which is undetectable was an excellent sign that treatment was working correctly

According to Wainbergy (2011) viral load may also show when treatment is not working properly when:

- Within the first six months of starting a new HIV drug regimen viral load fails to fall to undetectable levels.
- Viral load goes from being undetectable to detectable.
- High viral load continues to increase while the person is on antiviral medicines

The drug resistance tests were carried out to determine why the viral load was increasing. The tests helped to determine if the virus had become resistant to the medications taking by the patient and whether the patient was affected by drug resistant strain of HIV (WHO; 2016).

The study evaluated the tests that were being carried out at district hospitals to determine the presence of drug resistant HIV. The study also established the interventions that were in place for clients with high viral load.

2.4.1 HIV drug resistant tests

According to ARV treatment guidelines (2016), including those produced by the U.S. Department of Health and Human Services (DHHS) and the International AIDS Society-USA (IAS-USA), recommend drug-resistance testing for all HIV-positive people. These tests should be used:

2.4.1.1 When HIV is first diagnosed

HIV drug resistance test should be done at the time of diagnosis of HIV infection (Harmer; 2011). This may help to determine if one is infected by a drug-resistant strain of HIV. It may also help to identify the medicines the virus is resistant to. Studies that have been conducted in US had revealed that accurate results for HIV drug resistance may be obtained when tests were done at time of HIV diagnosis. Soon after a drug-resistant strain enters the body may start to reproduce. Over time, a wild-type strain of HIV can emerge, forcing the drug-resistant strain(s) to hind and escape detection using drug-resistance testing (Siwela; 2011). This means that the tests may not produce reliable information if too much time has passed since infection occurred.

The study assessed the time the viral load test were done to all newly diagnosed clients. Also the guideline for viral load collection schedule was analysed to check if the importance of conducting HIV drug test at diagnosis was highlighted. The guideline was silent about the need to collect viral load at the time of ART initiation.

2.4.1.2 If treatment doesn't appear to be working.

Parklin (2011) stated that treatment may appear to be not working when viral load fails to become undetectable after a new treatment was started. The test needed to be conducted while the patient was still on the same treatment regimen or within four weeks of discontinuing the regime. This study garnered information on when the health care workers suspected treatment to be not working. The standard operation procedures were evaluated and checked whether they were being followed.

Grant (2001) highlighted that if drug resistance was not identified by drug test other causes could be looked into such as poor adherence, absorption difficulties or drug–drug interactions. These problems could be remembered before resistance mutations are thought

of. This study explored whether the health care workers were well equipped with knowledge to exclude other causes of treatment failures.

2.5 Measures to reduce HIV Drug resistance infection

According to UN general Assembly (2016) Good adherence to an effective HIV treatment regimen reduces the risk of drug resistance.

Kityo (2007) gave the following tips on medication adherence for people living with HIV:

- Patients should be initiated on HIV treatment which is more effective to them. Antiretroviral treatment should be individualised. In Zimbabwe ART treatment were standardised and the options were limited. This study helped to evaluate the processes and systems in place to determine the effectiveness in prevention of HIV drug resistance.
- Patients should keep their medical appointments dates so that the health care provider can monitor the HIV treatment. Appointments are a good time for patients to ask questions and ask for help to manage problems that make it hard to follow an HIV regimen. The study assessed whether the patients were adhering to their appointments dates. The study revealed that the majority of patients were respecting their appointment dates. But there was a group of patients which was facing challenges with keeping the appointment dates. Furthermore, the study discovered that patients were given time to ask questions on problems that affecting them while they were on treatment.
- Patients should have adequate information on drug resistance HIV. Every review clients should be assessed for either immunological failure or clinical failure.
- Good support system was a critical measure in prevention of drug resistance HIV. Good support system reduces the risk of defaulting medicines by patients on ART.

2.6 Summary

This chapter provided theoretical frame work to the study. Related literature to the study was reviewed HIV drug resistant infection was explained in detail. Factors which drove the emergence of drug resistant HIV were discussed, ways in which HIV drug resistance virus was transmitted were provided. Finally the measures which man be implemented to prevent HIV infection were highlighted.

Chapter three

Research Methodology

3.0 Introduction

This chapter focused on the methodology of the study. This included research paradigm, research design, and population, sampling procedures, research instruments, ethical considerations, data collection and data analysis procedures. The chapter ended with a summary.

3.1 Research Paradigm

A paradigm is a shared world view that represents the beliefs and values in a discipline and that guides how problems are solved (Schwandt, 2001). This study used a constructivism paradigm. Constructivists recognize that reality is a product of human intelligence interacting with real world experience. This paradigm accepts reality as a construct of human mind and is perceived to be subjective. Mertens (2009) states that there are many intangible realities as people are constructing them. Reality is therefore, mind dependent and a personal or construct. This paradigm helped the researcher to understand the experiences of people living with HIV on the factors leading to development of HIV drug resistance infection. Also the research took place in a natural setting where the participants made their living.

The goal of the study was to establish the degree of preparedness on factors which were contributing to the emerging of HIV drug resistant amongst people living with HIV. The researcher believed that this theoretical stance and deep analysis revealed reality on the level of preparedness on factors leading to the emerging of HIV drug resistance.

3.2 Research design

According to Polit and Beck (2009) a research design is the overall plan for addressing a research question including strategies for enhancing the study integrity. This is supported by Treece and Treece (1986) who define a research design as a scheme of action framework for answering the research question. This study used mixed research methods which is a methodology for conducting research that involves collecting, analysing and integrating quantitative and qualitative (Lewis; 2012). The approach provided a better understanding of the research problem of HIV drug resistant infection. A qualitative data consisted of open ended information were gathered through use of interview from patients study participants.

Quantitative data included close ended information such as behaviour that was contributing to emerging of HIV drug resistant infection were gathered. By mixing both quantitative and qualitative research and data the researcher gained in-depth of understanding of factors leading to HIV drug resistant infection. Also weaknesses of using each approach alone were minimised.

This study used sequential exploratory design. In this design qualitative data collection analysis was followed by quantitative data collection and analysis (Lewis; 2012). The priority was given to the qualitative aspect of the study and the findings were integrated during the interpretation phase of the study. This design was easy to implement because the steps fall into clear and separate stages. It was easy to describe and the result of the study were easy to report. However, the researcher needed a substantial length of time to complete all data collection phases. The researcher was willing to change her direction as a result of revelation of new data and new insights. Data were collected through use of unstructured in depth interview and questionnaires techniques. This means that the researcher conducted a guided conversation where open ended questions were asked. Unstructured interview allowed researcher to adapt and change the questions based on the respondent's answer.

3.3 Study Population

A population is a large group of all the things with specific characteristics from which the sample is selected (Creswell; 1993). Kumar (2010) defines a population as an entire set of units for which the survey data are used as study elements. According to 2015 census data Tsholotsho district had total number of 16590 people who were on ART. According to District Health information data 2012 system X District hospital had 4100 patients on ART. Amongst them 100 patients had failed First line ART medicines. There were 40 health care workers who were providing services to the patients living with HIV. The targeted population was the health care workers offering ART Services (HIV Mentor, HIV focal person, Lab scientist and OI nurses) and patients on second line of antiretroviral medicines. The study used a study population composed of:

- 100 patients on second line ART who were registered at X District Hospital.
- 36 health care workers working at X District Hospital
- 1 HIV mentors,
- 1HIV focal person,
- 1Lab scientist

- 1 OI nurses

3 .4 Sampling

Chelisa and Preece (2000) define sampling as a process of selecting a subset of the population to represent the entire study population. Sampling of study participants helped the researcher to reduce bias. It also reduced cost in time as subsets of the targeted population were selected to represent the entire population. The researcher was able to generalize the study findings.

Beck and Polit (2010) define sample size as the number of subjects in a sample. The researcher used a smaller sample size as it was hard to find the patients on second line.

The study sample size was obtained by calculating 10% of the total study population. Leedy (1986) highlighted that a sample size should be 10% of the study population. This study use a sample size of (10/100*140= 14).

Table 1: Sample size c**alculation table**

Category	Study population	Study population expressed as % of sample size	Number to participate
OI patients on second line	100	100/140* 14	10
Health care workers	40	40/140*14	4
Total	140	140/140*14	14

The researcher used convenient sampling and purposive sampling to select study participants. The study used convenient sampling to select 10 patients who were on second line ARV medicines. These were the patients who had failed on first line of ART medicines. 4 Experts nurses were selected by purposive sampling (1 Head mentor,1 HIV focal person,1 OI nurse and 1 lab scientist). This was because their role in the organisation met the purpose of the study. They were the experts of the study required information.

3.5 Data generating technique

The researcher generated data from health care workers through use of written communication. Data from patients were generated through verbal administration of pre determined questions of unstructured interview.

3.6 Data generating instruments

The study used unstructured interview and questionnaires to collect data. The unstructured interviews were used to collect data from patients who were on ART. Questionnaires were used to collect data from the health care staff.

3.6.1 Unstructured interview

Unstructured interview refers to as discovery interviews and more like a guided conversation than a strict structured interview. It uses open ended questions that can be asked in any order. Some questions might be added or missed as interview progresses. The researcher will write a list of questions; he will then ask the participants these questions and the participants will provide answers. As the researcher will interacting with the participant he or she will be observing for feelings and attitude that will be attached to provide answers to the questions after interpreting what is expected and then document their answers.

- Unstructured interview helped the researcher to be flexible when administering the pre determined questions.
- The researcher obtained quality data through use of open ended questions. This allowed the respondents to talk in some depth, choosing their own words. This helped the respondents to develop a real sense of person's understanding of HIV drug resistance infection.
- Unstructured interview helped the researcher to collect information which was relevant to the study.
- Open ended questions helped the participants to express themselves clearly and deeply. This helped the researcher to observe for the emotions attached to the answers provided.
- Use of unstructured interview technique helped the researcher to actively listen to the answers provided to pick up themes and the main ideas presented.

3.6.1.1 Challenges faced when using the unstructured interviews:

- However unstructured interviews are very flexible. Unstructured interview consumed a lot time

- The researcher spent more time on establishing rapport.
- It was very critical for the researcher to know when to probe because not all the required information was elicited by the respondents spontaneously.
- Participants took time to open up during the interview as a result the interviewing time was individualised and long.
- Irrelevant information was provided by the respondents. The researcher had to simplify the questions to met the level of respondents since their educational level were not the same

3.6.2 Questionnaires

A questionnaire is a set of questions used to collect information in a survey (Encarta dictionary; 2018). It can also be defined as a list of questions, the answers to which are recorded by the study participants who read the questions, interpret what is expected and then write down the answers (Kumar; 2010).

- Questionnaires helped the researcher to collect data over a short period of time. The questionnaires were distributed to the study participants and they were given time to respond to the questions on their own time. The questionnaires were collected after five days.
- The use of questionnaire on health care workers helped the researcher to obtain quick result. This was possible because the questionnaires were distributed to the study participants at once and all the participants were able to complete the questionnaires within five days.
- Health care workers were very busy due to staff shortages but they enjoyed completing the YES / NO questions.
- Questionnaires were answered during spare time by health care workers

3.6.2.1 The researcher faced the following challenges when using the questionnaires

- The handwriting of one of the respondents was not all clear.
- One of the questionnaires was lost by the respondents. The researcher had to give a second copy of the questionnaire to the respondents. This increase cost on printing of questionnaires

- HIV Drug resistant infection was unfamiliar to most health care workers. 50% of them even verbalised that the required information was challenging.

The research instruments which were used in this study had the following structure:

Section A

Demographic data

Section B

Assessment of the level of preparedness in terms of: structure, process and outcome. All the questions were designed in a manner that answered the four research questions.

3.6.3 Validity and reliability

Validity is the extent to which an instrument measures what is expected or designed to measure (Mann; 2015). Reliability is a degree to which a research instrument produce stable and consistent results (Kane; 2014). Operational definitions should be precise such that all persons following the same procedure will produce the same results.

To check for validity and reliability the researcher conducted a pilot study at Y district hospital using the study population of patients who were on second line treatment who had failed on the first line treatment and also HIV Focal person. They had similar characteristics with those who participated in the final study. The pilot study was conducted on the 15 /05/2019.

3.7 Data generating procedures

The researcher obtained a confirmatory letter from the chairperson of faculty of adult education to confirm that she is a student at Midlands State University carrying out a research as part of fulfilment of master of Adult Education Degree. Permission was requested from X District Hospital Medical Officer and at Z District Hospital Medical Officer to carry out the study and pilot study. Data was obtained using unstructured interviews and questionnaires. The instruments had pre determined questions written in English. The researcher started by giving a brief introduction of self and the purpose of the study to all the study participants. This was followed by a detailed explanation, permission to interview study participants was obtained. The study participants were asked to sign a consent form which was pinned on the questionnaire for each participant. The participants were asked to follow instructions on the questions and the verbal instructions given during the interview. The researcher explained all what the study was about. The participants were asked questions during face to face dialogue

with the researcher. The interviews were conducted in room 8B at OI department. Privacy was maintained by ensuring that all doors were closed and there were no unnecessary disturbances during the interview time.

The questionnaires were distributed to the study participants and they were left for a period of five days for them to complete at their spare time. Also the researcher maintained privacy during data collecting by questionnaires by giving clear instructions: not to enter names on the questionnaires.

3.8 Data presentation

Data that was collected from the health care workers and the patients were presented in the form of tables, pie charts and bar graphs for easy analysis

3.9 Data analysis

Data analysis is the process of transferring collected data and reorganising it, so that the researcher may draw some conclusions (Howard; 2017). Data analysis is the process of bringing order, structure and meaning to the collected data such that the researcher can make sense of it in relation to the study questions and research objectives. Marshall and Rossman (2006) noted that it is a messy, ambiguous and time consuming, creative and fascinating process. Qualitative data analysis is a search for general statements about relationship among categories of data. The collected data were grouped and placed in categories according to certain properties. The collected data were then presented in form of pie charts, tables and bar graphs for easy analysis. Themes were drawn.

3.10 Data management plan

Completed questionnaires were kept under key and lock cupboards to maintain confidentiality and prevent unauthorised access. When the study was completed the materials used to collect data were burnt to protect data from being accessed by non study participants.

3.11 Ethical consideration

Ethics

Ethics are norms which differentiate the accepted and unaccepted behaviours (Polit and Hunger; 2001).

This study will observe the following ethics:

3.11.1 Full disclosure

According to Christensen and Kockrow (2006) full disclosure means that the researcher explains to the study participants their rights, purpose of the study and the nature of the study The researcher informed the study participants that they all had the right to withdrew

participating at anytime when they felt like and that would not affect their future relations with health care workers. Also that would not result in ill-treatment of any when they visit the health care facilities.

3.11.2 Informed consent

It refers to adequate information given to participants so that they are able to make an informed decision about whether to participant or not (Polit and Hunger; 2001).

The researcher explained to the participants that the research was for academic purposes and was not attached to any monetary value. Study participants were informed that they had right to terminate their participation at any time and their ability to perform in future studies would not be compromised. It was also explained that refusing to participate would not led to victimisation of any patient at any health facility. The researcher informed the participants that the study results might assist the government, health sector and the local authority to come up with strategies to prepare for emerging HIV resistance infection which might be relevant to Zimbabwean situation and local environment.

3.11.3 Anonymity

Polit and Hunger (2001) state that anonymity is when a participant who participated in a study and data that he or she has provided can- not be linked. To ensure anonymity the researcher instructed the study participants not to write their names, addresses and any information that could lead to their identification. Clear instructions were provided on the questionnaires to ensure that anonymity is maintained.

3.11.4 Confidentiality

Polit and Hunger (2001) defines confidentiality as a pledge that information may not be publicly reported and accessed by anyone who is not involved in the study. Questionnaires were kept under key and lock to maintain confidentiality. Study participants were treated with respect and dignity. Information collected from patients care booklets, viral load registers and these data sources were not left in open places. After conducting the research the questionnaires were burnt to prevent access to data by unauthorised person.

3.11.5 Protecting harm

The researcher observed the following ethical considerations: protect the study subjects from harm: Full disclosure, informed consent, anonymity and confidentiality. The study participants were protected from physical, mental and psychological and emotional harm.

Comprehensive information on drug resistant HIV was provided and the purpose of the study. Study participants made their own free informed consent. The anonymity of the study participants was maintained by use of pseudo names on questionnaires. Confidentiality was maintained by keeping all patients information under lock and key which were used during the study.

3.11.6. Honesty

The researcher reported study findings as accurately as possible. The researcher did not add or substrate any information captured by the study instrument. This ensured study integrity. Honesty in reporting study findings helped the researcher to produce a validity study results free from bias.

3.12 Summary

The Chapter described the research methodology that included the research paradigm, research design, study population, sampling procedures, data generating technique, data generating instrument, reliability and validity, data generating procedure, data presentation, data analysis, data management plan and ethical consideration..

Chapter four

Data presentation, analysis and discussion

4.0 Introduction

The previous chapters have discussed the following: research problem, literature review and research methodology. The study focused on finding answers on the following research questions: what concept's of HIV drug resistant infection is already known, what factors are contributing to the development of HIV drug resistant infection, what are the signs and symptoms of HIV drug resistant infection. How effective are the measures in place to prevent development of HIV drug resistant infection. In this chapter data were presented in form of tables, pie chart and bar graphs, analysed and discussed. The chapter was organized in the following manner: demographic data and grouped data according to the research question it provided answers to.

4.1 Demographic Data

4.1.1 Demographic data of health care worker study participants

Figure 2: Distribution of health care worker study participants by designation
N= 4

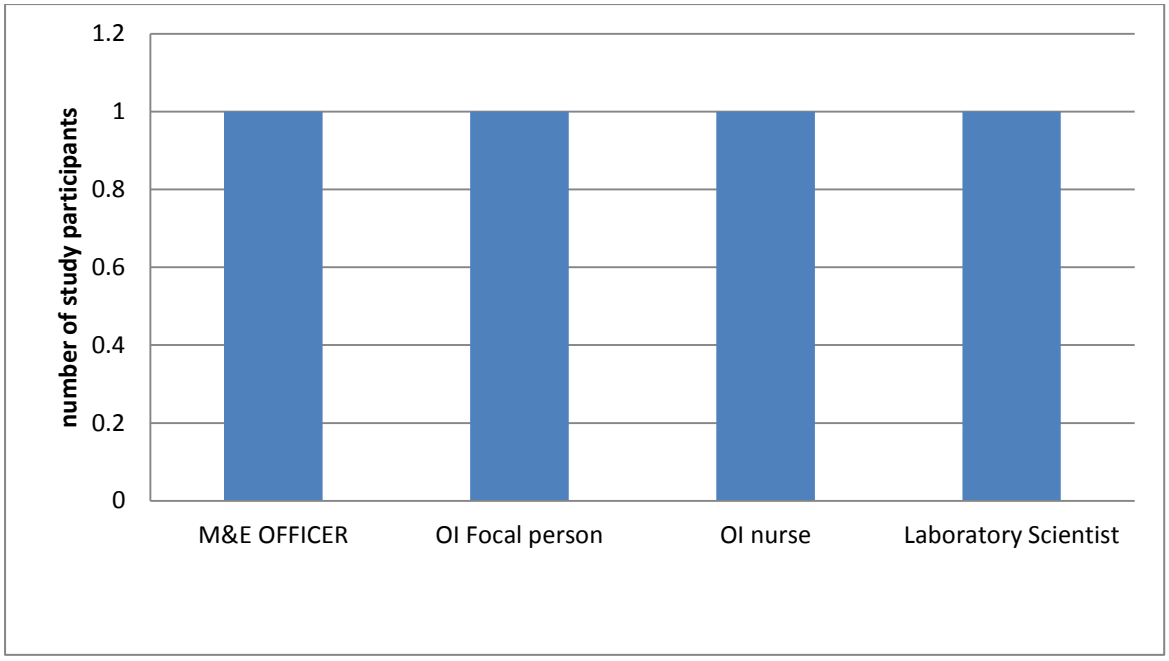
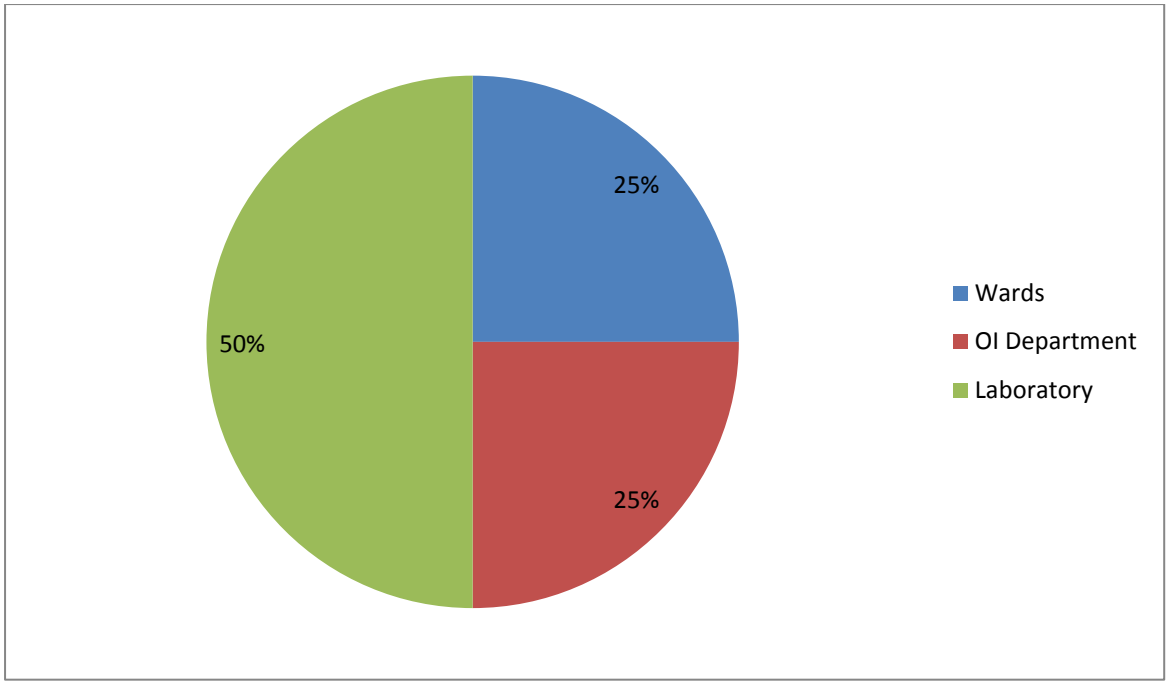


Figure 2 above shows distribution of the study participants by designation of health care workers. The study used equal number of health care workers as study participants from different categories. Each category contributed 1(25%) of the study participants. 1 (25%) of the study participants were Monitoring and Evaluation officers. 1(25%) of the healthcare workers who participated in the study were OI focal persons. 1(25%) of the healthcare workers who participated were the laboratory scientists. Lastly 1(25%) of the health care workers who participated were the OI nurses.

Figure 3: Distribution of healthcare worker study participants by the department they worked

N=4



The figure 3 above shows the distribution of the health care worker study participants by the department they worked. The study used four healthcare workers who were selected by purposive sampling technique. 2(50%) of the health care study participants came from the Opportunistic infection department. 1(25%) of the healthcare who participated in the study came from the wards. Lastly, 1(25%) of the health care participated in the study work in the laboratory.

Figure 4: Distribution of health care worker study participants by years of experience

N=4

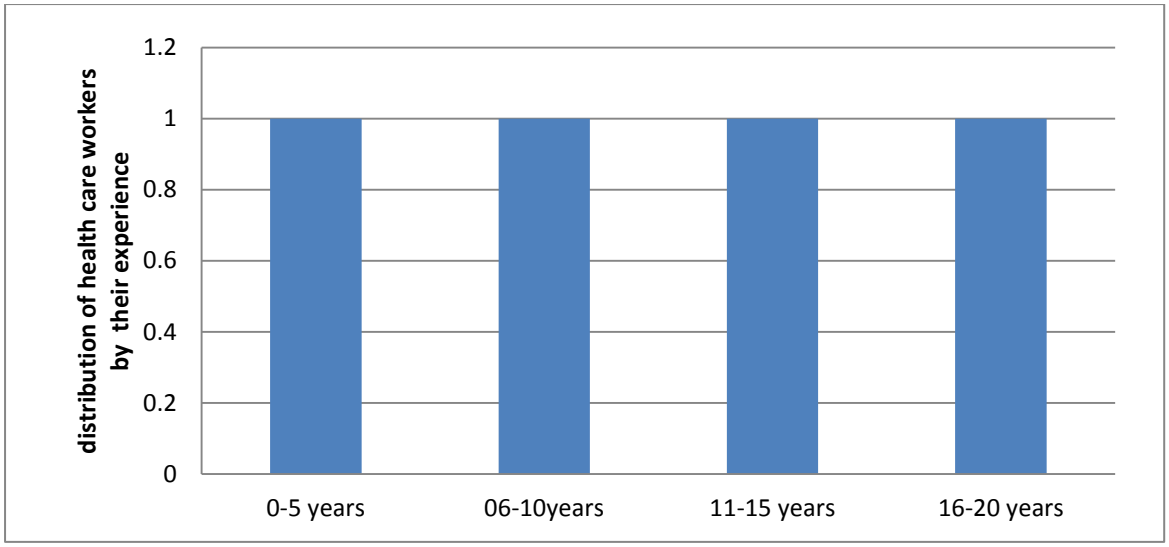


Figure 4 above shows the distribution of health care workers by years of experience. Four health care workers were used as study participants. 1(25%) of the health care workers who participated had worker experience (0-5) years. Also 1(25%) of the healthcare workers who participated had work experience between (6-10) years. More so, 1(25%) of the health care workers who participated had work experience between (16-20) years.

4.1.2 Demographic data of patient study participants

Figure 5: Distribution of patient study participants by their age

N=10

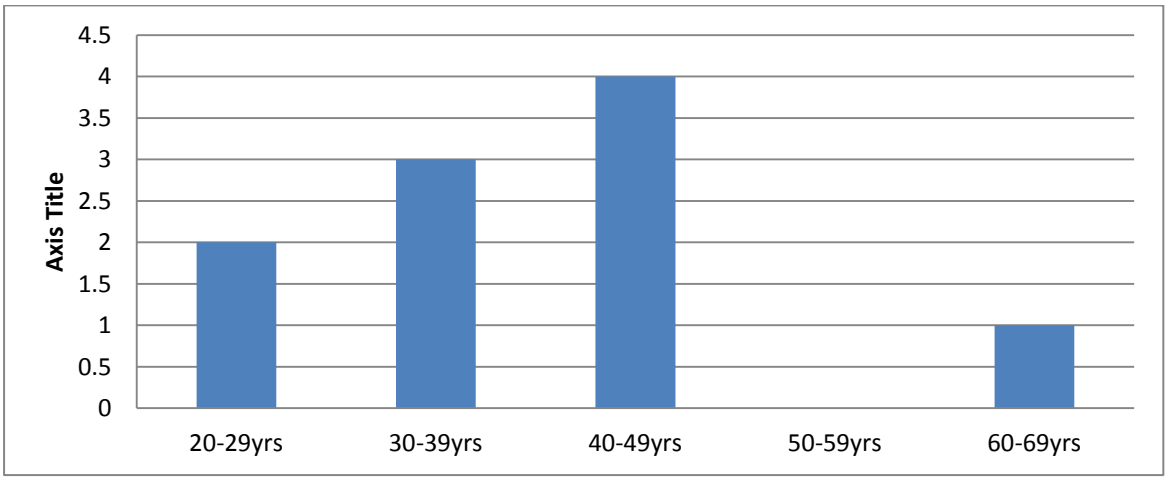


Figure 5 above shows the distribution of the patient study participants by their age. The highest 4(40%) of the patients who participated in the study were between age group 40-49 years. Second highest 3(30%) of the patient study participants were between 30-39 years. This was followed by 2(20%) of the patients participated in the study who were between 20-

29 years. Lastly, 1(10%) of the patient study participants were between 60-69 years. The age group 50-59 years had no participant.

Figure 6: Distribution of the patient study participants by their occupation

N=10

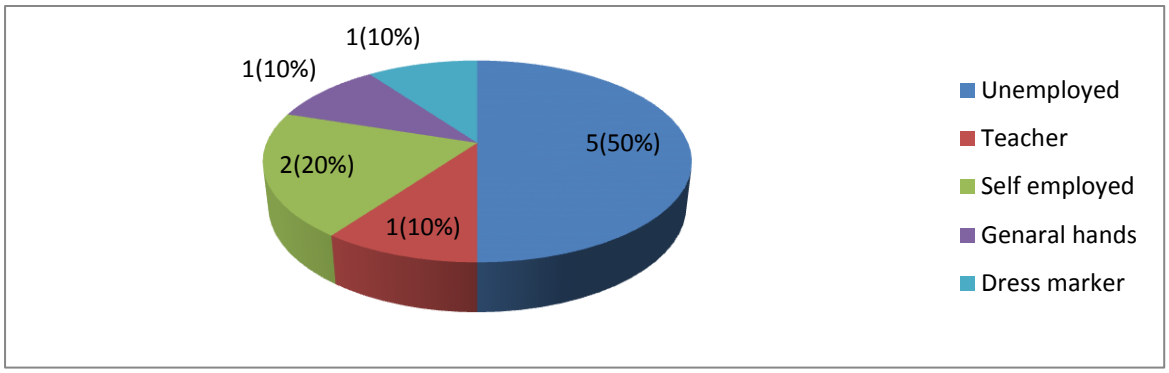


Figure 6 above shows the distribution of the patients study participants by their occupation.

5(50%) of the study participants were unemployed. 2(20%) of the patients study participants were self employed. 1(10%) of the patient study participants was employed as a general hand. Another 1(10%) of the patient study participants was employed as a teacher. Lastly, 1(10%) of the patient study participants was employed as a dress marker.

Figure 7: Distribution of patient study participants by their level of education

N=10

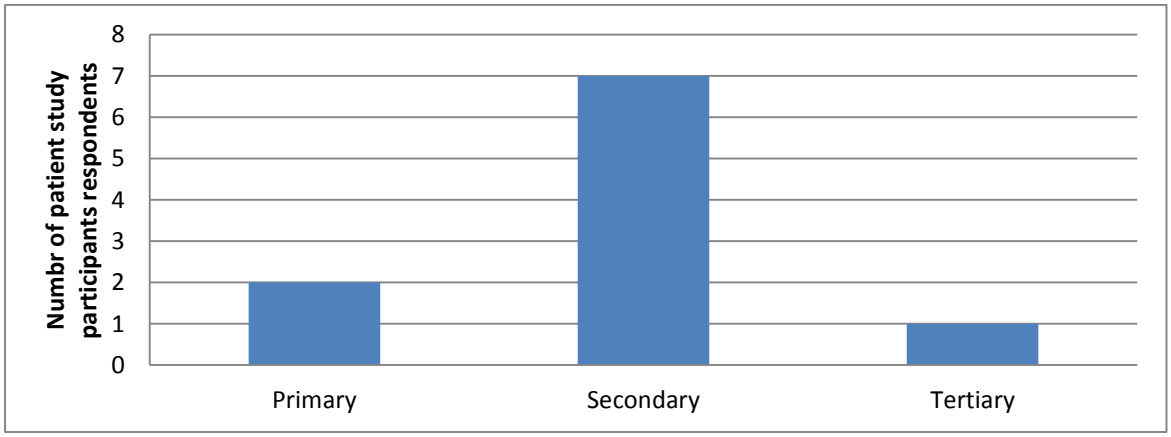


Figure 7 above shows the distribution of patient study participants by their level of education. 7(70%) of the patient study participants had attained secondary level education. 2(20%) of

the patient study participants had acquired primary level education. Lastly, 1(10%) of the patient study participants reached tertiary education level.

Table 2: Distribution of patient study participants by their religion

N=10

Religion	**Number of respondents**
Christian	8
Non Christian	2

Table 2 above shows the distribution of patient study participants by their religion. 8(80%) of the study participants were Christians. 2(20%) of the patient study participants were not Christians.

4.2 What concept of HIV drug resistant infection is already known?

4.2.1 Concept of HIV drug resistant infection provided by health care worker study participants

Table 3: Distribution of healthcare worker study participants by ability to define the term HV drug resistant infection

N=4

Respondent number	**Definition of HIV drug resistant infection provided by health care workers**	**Correct/incorrect**
1	HIV drug resistant is when HIV virus becomes resistant to the ARVs in a human body after the second viral load has been collected and the client has undergone 3 enhanced adherence counselling and still viral load is greater than 1000 copies per mil	correct
2	HIV drug resistant infection is when the drug is no longer working effectively than what is expected	correct

3	HIV drug resistant infection is the infection resulting from changes in HIV Virus structure and the virus is not sensitive to ARV medicines	correct
4	HIV drug resistant infection is HIV infection which occurs in patients with Tuberculosis	incorrect

Table 3 above shows the distribution of health care workers who participated in the study by the ability to define the term HIV drug resistant infection. 3(75%) of the study participants defined the term HIV drug resistant correctly. The term HIV drug resistant infection was defined as when HIV virus becomes resistant to the ARVs in a human body after the second viral load has been collected and the client has undergone three of enhanced adherence counselling and the viral load remains higher than 1000 copies per mil. The second respondents defined HIV drug resistant infection as when the drug is no longer working effectively than what is expected. The third respondents defined HIV drug resistant as the infection resulting from changes in the HIV virus structure and the virus is not sensitive to ARV medicines.

1(25%) of the study participants gave an incorrect definition of HIV drug resistant infection. HIV drug resistant infection was defined as HIV infection that occurs in patients with tuberculosis.

4.2.2 Concept of HIV drug resistant infection provided by patient study participants

Table 4: Distribution of patient study participants by knowledge on the meaning of the term HIV drug resistant infection

N=10

Respondent number	**Definitions provided**	**Correct /incorrect**
1	No definition provided	n/a
2	HIV drug resistant infection is infection which cannot respond to ARVs medicines	correct
3	HIV drug resistant infection is HIV virus which cannot be treated with ARVS	Correct

4	No definition provided	n/a
5	No definition provided	n/a
6	HIV drug resistant is a HIV virus that does not respond to ARVS	Correct
7	HIV drug resistant infection is HIV virus which cannot be treated with ARVS	correct
8	No definition provided	n/a
9	No definition provided	n/a
10	HIV drug resistant infection is the type of HIV that is resistant to ARVs that a Patient will be taking	correct

Table 4 above shows the distribution of patients study participants by the ability to define the term HIV drug resistant infection. 5(50%) of the patient study participants gave correct meaning of the term HIV drug resistant infection. The following definitions were provided correctly: 2(20%) of the patients study respondents defined HIV drug resistant infection as HIV infection which cannot respond to ARVs medicines.2 (20%) as the patient study participants defined HIV drug resistant infection as HIV virus which cannot be treated with ARVs. 1(10%) of the patient study participants defined HIV drug resistant infection as a type of HIV infection that is resistant to ARVs that a patient will be taking.

The other 5(50%) of the patient study participants did not provide a definition to the term drug resistant infection.

4.3 What factors are contributing to the development of HIV drug resistant infection?

4.3.1 Factors contributing to HIV drug resistant infection provided by health care study participants

Table 5: Distribution of health care study participants by knowledge on the causes of HIV drug resistant infection they provided

N=4

Causes of Drug resistant infection provided	**Number of study participants who provided the cause**

Poor adherence to treatment	2
Unprotected sex with infected person with drug resistant infection	2
Defaulting treatment	2
Missing daily doses of ARVs medicines	1
Multiple sexual partners	2

Table 5 above shows the distribution of health care workers by the knowledge on causes of HIV drug resistant infection. 4(100%) of the health care study participants were able to give at least one cause of HIV drug resistant infection. The following causes were provided: 2(50%) of the health care study participants gave poor adherence to treatment as the cause of HIV drug resistant infection. 2(50%) of the health care study participants gave unprotected sex with infected person with drug resistant infection as the cause of HIV drug resistant infection. Also 2(50%) of the health care study participants gave defaulting treatment as a cause of HIV drug resistant infection. 1(25%) of the study participants mentioned missing daily doses of ARVs medicines as the factor that may led to HIV drug resistant infection in a patient who is on art for some time.

Table 6: Distribution of health care worker study participants by knowledge of shortage of ARVs in the past 12 months

N=4

Name of ARV medicine out of stock	**Number of respondents given the ARV medicine**
Zidovudine and Abacavir	1
Cotrimoxazole	1
Not aware of the stock out of ARVs	2

Table 6 above shows the distributions of health care workers study participants by their knowledge on the shortage of ARV in the past 12 months. Zidovudine and Abacavir were reported to be out of stock by 1(25%) of the health care worker study participants. 1(25%) of health care worker study participants also mentioned that Cotrimoxazole was out of stock. 2(50%) of the health care workers were not aware of the shortage of the ARVs.

Table 7: Distribution of health care worker study participants by access to literature with HIV drug resistant infection information

N=4

Respondents number	Literature with HIV drug resistant information available	Information available
1	Available	Meaning of HIV drug resistant infection and causes
2	Available	Poor adherence
3	Available	Information not mentioned
4	Not available	Nothing documented

Table 7 above shows the distribution of the health care worker study participants by access to literature with HIV drug resistant infection information. 3(75%) of the health care worker study participants reported that they had access to literature with HIV drug resistant information. The following information was available: Meaning of HIV drug resistant infection, causes and poor adherence which was mentioned by 2(20%) of the study participants. The 1(25%) of the health care worker stated that there was information of HIV drug resistant infection but he did not specify the information. 1 (25%) of the health care worker study participants said there was no literature with HIV drug resistant information.

Table 8: Distribution of health care worker study participants by knowledge on the availability of HIV drug resistant infection guidelines

N=4

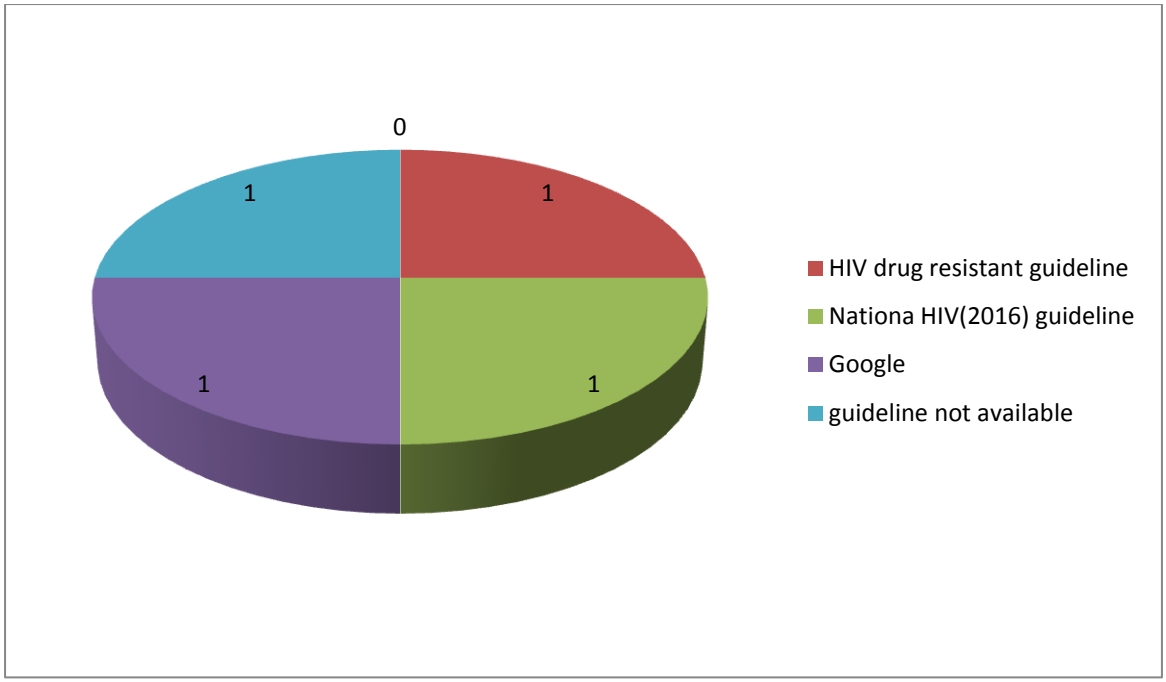


Table 8 above shows the distribution of healthcare study participants by knowledge on availability of guideline. 1 (25%) of the health care study participants gave National HIV (2016) guideline as the guideline for HIV drug resistant infection. Google was given by 1 (25%) of the study participants as the available resource reference for HIV drug resistant infection.1(25%) of the study participants gave HIV drug resistant guideline**.** Lastly the guideline was reported to be not available by 1(25% of the health care study participants.

Figure 9: Distribution of health care worker study participants by knowledge on when treatment failure is being diagnosed

N=4

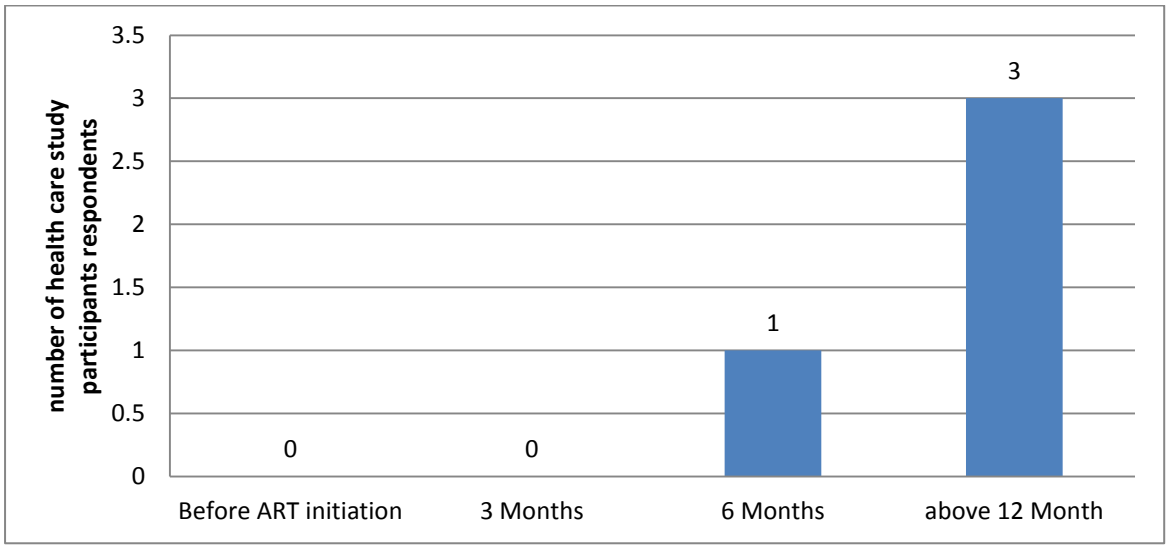


Figure 9 above shows the distribution of the health care workers study participants by knowledge on when treatment failure is being diagnosed. 3(75%) of the health care study participants highlighted that treatment failure is usually diagnosed after 12 months on ART. 1(25%) of the health care worker study participants stated that treatment failure is diagnosed after 6 months on ART. None of the health care worker study participants mentioned that treatment failure can be diagnosed before ART initiation and after three months on ART medicines.

Table 9: Distribution of health care worker study participants by client retention challenges faced

N=4

Client retention challenges	**Number of respondents**
Patients not coming for review	2
Files not being updated, incomplete documentation	1
Shortage of staff	1

Table 9 above shows the distribution of the health care worker study participants by knowledge on client retention challenges. 2 (50%) of the health care study participants stated that the facilities were facing client retention challenges emanating from the factors such as patients not coming for reviews. 1(25%) of the health care study participants said files were not being updated by health care workers and the documents were not being completed. Shortage of healthcare staff was highlighted by 1(25%) of the study patients as a challenge of client retention

Table 10: **Distribution of health care worker study participants by knowledge on the cohort of patients failing on ART treatment**

N=4

Answer	**Number of respondents**
Newly initiated on ART	0
3 Months on ART	0
6 Months on ART	0
7-12Months	0

13-24Months	1
>25Months	3

Table 10 above shows the distribution of health care worker study participants by the knowledge on cohort of patients who were failing on first line treatment. 3(75%) of the health care worker study participants stated that patients who were more than 25 months on ART were failing first line treatment. 1(25%) of the health care worker study participants highlighted that patients on first line were failing ART between 13-24 months. No (0%) of the health care study participants highlighted that patients were diagnosed treatment failure at time of ART initiation, at 3 months on ART, at 6 months on ART and 6-12 Months on ART

Table 11: Distribution of the health care worker study participants by knowledge on how to review clients with high viral load

N=4

Answer	**Number of respondents**
Monthly for three months	3
Monthly for three months then 2months	1

Table 11 above shows the distribution of health care workers by knowledge on how patients with high viral load were to be reviewed. 3(75%) of the health care worker study participants gave monthly review for three months as the schedule for reviewing patients with high viral load. The other 1(25%) of the health care study participants gave monthly review for three months then patients to be reviewed after two months

Table 12: Distribution of health care worker study participants by challenges highlighted to be contributing to treatment failure

N=4

Challenge provided	**Number of respondents**
Poor adherence	3
Poor adsorption	0
Loss of appetite	0

Diarrhoea, vomiting and nausea	1
None of the above	0

Table 12 above shows the distribution of the health care worker study participants by challenges highlighted to be contributing to treatment failure. 3(75%) of the health care worker study participants gave poor adherence as the challenge being contributing to treatment failure. 1(25%) of the study health care worker study participants stated that diarrhoea, vomiting and nausea were the challenges contributing to treatment failure. None of the health care study participants gave loss of appetite, poor absorption as challenges contributing to treatment failure

Figure 10: Distribution of health care worker study participants by knowledge on number of clients who were collected viral load blood samples

N=4

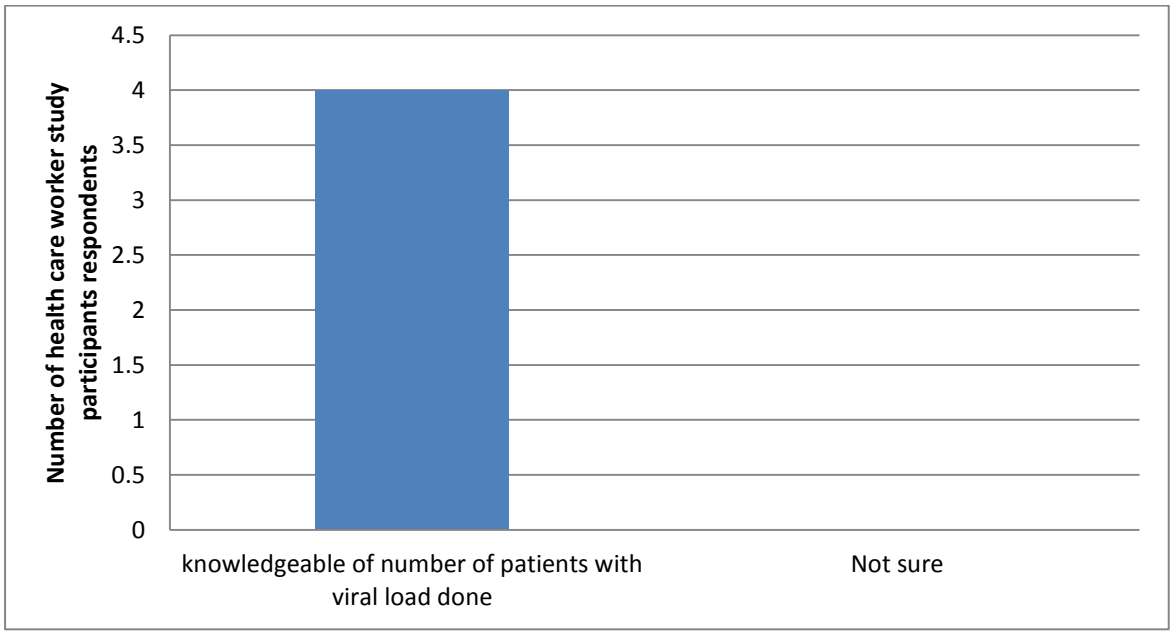


Figure 10 above shows distribution of health care study participants by knowledge on number of patients who were collected viral load blood samples. 4(100%) of the health care study participants were aware of patients who were collected blood sample for viral load. None 0 (0%) was not aware that patients with high viral load were being collected viral load blood samples.

Table 13: Distribution of health care worker by knowledge on the side effects which were frequently reported by patients failed treatment

N=4

Side effect	Number of respondents
Diarrhoea	1
Nightmare	1
Anaemia	1
Vomiting	1

Table 13 shows the distribution of the health care study participants by knowledge of side effects frequently reported by the patients with treatment failure.

1(25%) of the health care study participants highlighted Diarrhoea as a side effect that was reported by patients with treatment failure. 1(25%) of the health care study participants gave nightmare as side effect of ARV that was experienced by patients with treatment failure.1 (25%) of the health care worker study participants mentioned anaemia as side effect of ARV frequently reported by patients with treatment failure. Lastly, 1(25%) reported vomiting as side effect commonly presented with patients with treatment failure.

Table 14: Distribution of health care worker study participants by time taken to switch patients to new effective regime

N=4

Time taken	Number of respondents
0-3mnths	3
4-6months	1

Table 14 above shows the distribution of health care work study participant by the time that was taken to switch patients to a new effective ART regime from a failing regimen. 3(75%) of the study participants said patients were switched to a new regime within period of three months.1(25%) of the health care worker study participants mentioned that patients with

treatment failure were switched to other regimes within 4-6months after receiving their second high viral load results.

4.3.2 Factors provided by patient study participants as contributing to the development of HIV drug resistant infection

Table 15: Distribution of patient study participants by knowledge on the causes of HIV drug resistant infection

N=10

Causes provided	Number of respondents
Poor adherence, missing dose, missing review, taking inadequate ARVs medicines and treatment defaulting	2
Per vaginal bleeding	2
Drinking ARVs with alcohol	2
Infected by a virus which is resistant to ARVs	1
No conditional change	1
Inconsistent and incorrect use of condoms, forgetting to take medicines, lack of food and having multiple sexual partners	2

Table 15 above shows the distribution of the patient study participants by the knowledge on the causes of HIV drug resistant infection. 10(100%) of the patient study participants were knowledgeable of the causes of HIV drug resistant infection. 2(20%) of the patient study participants highlighted the following causes of drug resistant infection: Poor adherence, missing dose, missing review, taking inadequate ARVs medicines and treatment defaulting.

2(20%) of the patients study participants said vaginal bleeding was a cause of HIV drug resistant infection. Also the other 2(20%) of the study participants mentioned drinking ARV medicines with alcohol was contributing to treatment failure.

1(10%) of the patent study participants state that drug resistant HIV infection was a result of being infected by a resistant strain of HIV virus.

Lastly the 1(10%) of the patient study participants highlighted that failure of condition of patient to improve once the patient has been commenced on ART is a cause of HIV drug

resistant infection. 2(20 %) of the patient study participants highlighted that HIV drug resistant infection may be caused by inconsistent and in correct use of condom, forgetting to take medicines, lack of food and having multiple sexual partners.

Table 16: Distribution of patient study participants by ARV side effects experienced

N=10

Side effects experienced	Number of respondents
Nausea and vomiting	2
Diarrhoea and loss of appetite	1
Feeling of un-wellness	1
Anaemia, nightmare, headache	1
No side effects experienced	5

Table 16 above shows the distribution of patient study participants by the ARV side effects they had experienced. 5(50%) of the patient study participants had history of ARV medicine side effects experience. 2(20%) experienced nausea and vomiting side effects. Diarrhoea and loss of appetite was reported by one (10%) study participants. 1(10%) of the patient study participants experienced feeling of un-wellness. Lastly 1(10%) of the patient study participants had experienced three side effects namely anaemia, nightmare and headache. The other 5(50%) of the patient study participants had not experienced ARV medicine side effects.

Table 17 Distribution of the patient study participants by knowledge of factors contributing to treatment failure

N=10

Factors provided	Number of respondents
Social issues: lack of support system, lack of food and poverty	**3**
Economic issues: lack of transport money	**1**
Behavioural issues: Poor adherence, treatment defaulting, alcohol consumption, not using condoms, multiple sexual partner and ignorance	**6**

Figure 17 above shows the distribution of the study participants by the knowledge of factors that are contributing to treatment failure. 10(100%) of the patient study participations were knowledgeable of the factors which are contributing to treatment failure. 3(30%) of the patient study participants provided social factors such as lack of support system, lack of food and poverty. Lack of transport money to come for review was an economic factor which was highlighted by 1(10%) of the patient study participants. 6 (60%) of the patient study participants provided behavioural factors which included poor adherence, treatment defaulting, alcohol consumption, not using condoms, multiple sexual partner and ignorance.

Figure 11: Distribution of patient study participants by the length of time they received viral load results.

N=10

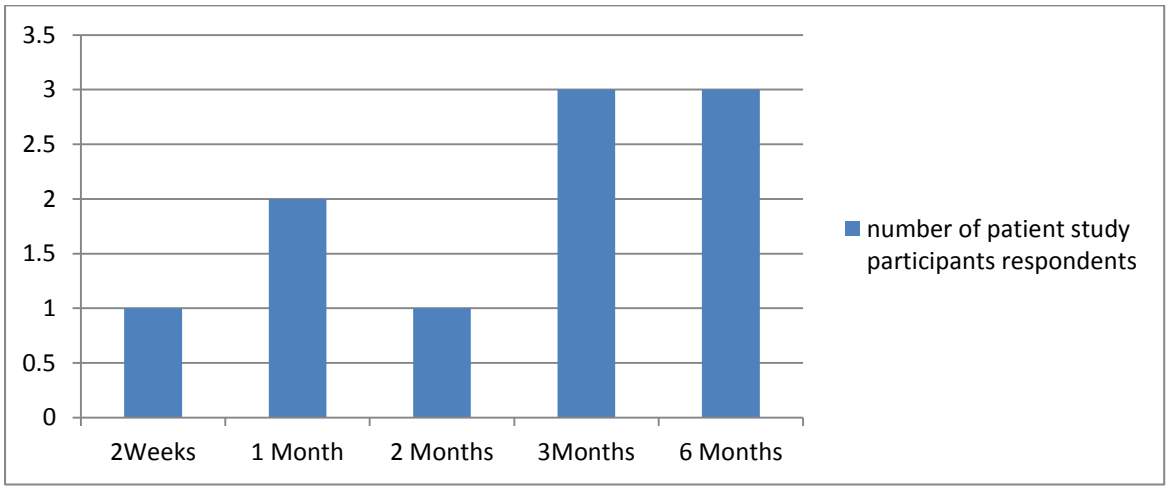


Figure 11 above shows the distribution of study participants by length of time they received their viral load results. 3(30%) of the patient study participation reported that they received their viral load results after six months. Also 3(30%) of the patient study participation said they received viral load results after 3 months. 2(20%) of the patient study participants highlighted that they received viral load results after one month. 1(10%) of the patient study participation gave 2months as the period patients were receiving their viral load results. Finally the 1(10%) of the patient study participants confidently said that patients were receiving the viral load result within 2 weeks.

Figure 12: Distribution of patients study participation by knowledge on when viral load is being monitored.

N=10

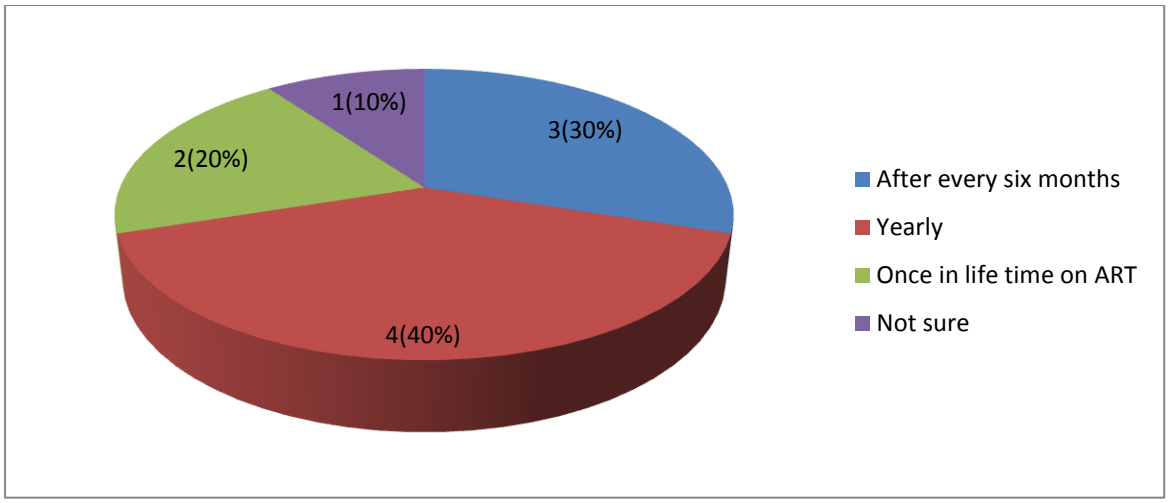


Figure 12 above shows the distribution of patient study participants by knowledge on when viral load was being collected. 4(40%) of the patient study participants stated that viral load was monitored yearly. 3 (30%) of the patient study participants highlighted that viral load was monitored after every six months. 2(20%) of the patient study participants stated that viral load was collected once in life time on ART. Finally, 1(10%) of the patient study participants were not sure of when viral load blood sample was to be collected**.**

Table 18: Distribution of patient study participants by the availability of time to take ARV medicines reminders

N=10

Answer	**Number of respondents**
Use of cell phone alarm reminder	4
Use of bed time	1
Watch/clock reminder	2
No specific time to take ARV medicines	3

Table 18 above shows the distribution of patient study participants by the availability of time to take ARV medicines. 4(40%) of the patient study participants used cell alarm reminder to remember time to take medicines. 1(10%) of the patients study participants used bed time as

their time to take ARV medicines. Watch and clock reminder were used by 2(20%) of the patients study participants as a reminder to take medicines 3(30%) of the patient study participants had no specific time to take ARV medicine.

Table 19: Distribution of the patient study participants by the challenges they faced to keep appointment dates

N=10

Challenge faced	**Number of respondents**
Transport cost	5
Lack of permission from the supervisors at work to attend clinic visits	2
Crossing the flooded rivers during rainy season	2
Cross boarder dealer	1

Table 19 above shows the distribution of patient study participants by the challenges they faced to keep their appointment dates. 5(50%) of the patient study patients faced transport money challenges. 2(20%) of the patient study participants had faced challenges of obtaining permission to attend clinic visits from the immediate supervisor at the workplace. 2(20%) of the patient stud participants had challenges of crossing the flooded rivers during the rain seasons. Lastly, 1 (10 %) of the study participant was a cross boarder dealer he faced challenges of transport break downs and sometimes the review date was forgotten.

Table 20: Distribution of patient study participants by reasons of defaulting ARV treatment

N=10

Reason provided	Number of respondents
Never defaulted treatment	7
Tiredness of taking ARV medicines	1
Had an affair with a HIV negative partner	1
Had gone for holiday	1

Table 20 above shows the distribution of the study participants by history of defaulting ARV treatment. 7(70%) of the patient study participants had never defaulted ARV treatment. 1(10%) of the patient study participants defaulted treatment because of tiredness to take ARV medicines. The 1(10%) of the patient study participants had an affair with a HIV negative partner. lastly, 1(10%) of the patient study participants had gone for holiday.

Figure 13: Distribution of the patient study participants by the distance they travel to access their ARV medicines

N=10

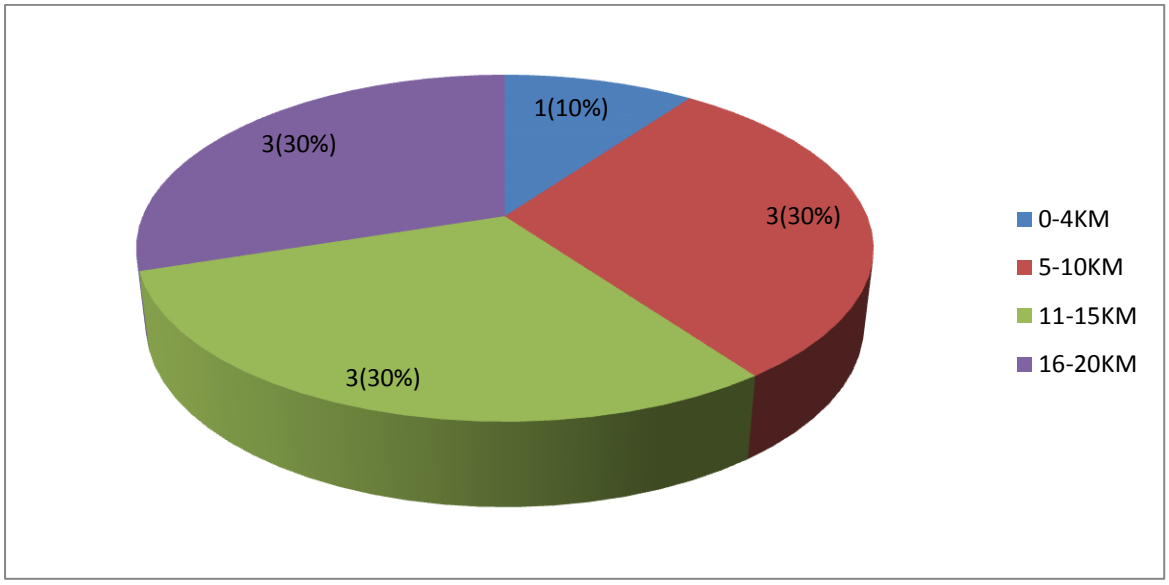


Figure 13 above shows the distribution of the patient study participants by the distance travelled to access ARV medicines. 3(30%) of the patient study participants travelled 16-20km to reach health facilities offering ARV medicines. 3(30%) of the patient study participants reported that they had travelled 11-15km. 3(30%) of the patient study participants travelled 5-10km. lastly, 1(10%) of the patient study participants travelled 0-4km.

Figure 14: Distribution of the patient study participation by their view of the treatment they received from the healthcare workers.

N=10

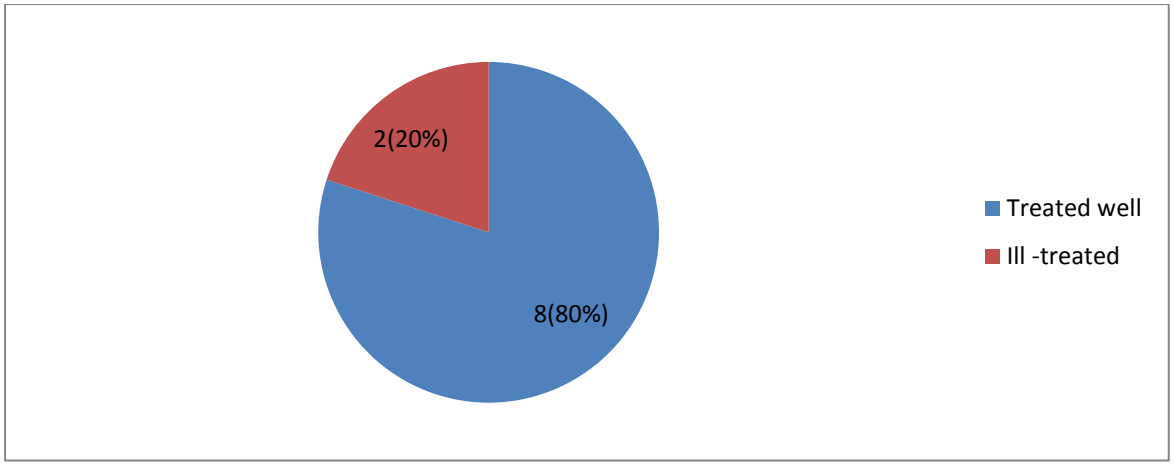


Figure 14 above shows the distribution of the patient study participants by their view of the treatment they received from the healthcare workers. 8(80%) of the patient study participation stated that they were treated well by health care workers. 2(20%) of the patient study participants highlighted that they were ill-treated by the healthcare workers

4.4 What are signs and symptoms of HIV drug resistant infection?

4.4.1 Signs and symptoms of HIV drug resistant infection provided by health care worker study participants

Table 21: Distribution of health care worker study participants by knowledge on signs and symptoms of HIV drug resistant infection

N=4

Sign and symptom provided	Number of respondents
High viral load	4
Opportunistic infections	4
Failing cell differentiated cell count	1
Poor response to ARV treatment	1

Table 21 above shows the distribution of the health care study participants by their knowledge on the signs and symptoms of HIV drug resistant infection. 4(100%) of the health care participants provided high viral load and presence of opportunistic infection as signs and symptom of drug resistant infection. 1(125%) of the health care study participants

highlighted that drug resistant infection may present with failing cd4 cell count. Poor response to ART medicines was a sign of drug resistant HIV infection given by 1(25%) of the health care study participants.

4.4.2 Signs and symptoms of HIV drug resistant infection provided by patient study participants

Table 22: Distribution of patient study participants by knowledge on the signs and symptoms of the HIV drug resistant infection

N=10

Answer	Number of respondents
Recurrent infection	4
High viral load	3
Chronic diarrhoea and weight loss	2
Vaginal bleeding	1

Table 22 above shows the distribution of the patient study participants by knowledge on the signs and symptoms of the HIV drug resistant infection. All 10(100%) of the patient study participants were able to give signs and symptoms of HIV drug resistant infection. All 4(100%) gave recurrent infection as sign and systems of Drug resistant infection. 3(75%) highlighted that patient with HIV drug resistant infection would present with high viral load. More so, chronic diarrhoea and weight loss was presented as sign and symptom of HIV drug resistant infection were mentioned by 2(20%) of the patient study participants. Vaginal bleeding was said to be the sign of HIV drug resistant infection by the 1(10%).

4.5 How effective are the measures in place to prevent the development of HIV drug resistant infection?

4.5.1 Measures in place to prevent the development of HIV drug resistant infection provided by health care worker study participants

Table 23: Distribution of health care worker study participants by knowledge on viral load monitoring schedule

N=4

Schedule	Number of respondents
After 12 months on ART	4
6 months on ART	4
3 months on ART	0
On day of starting ART	0
On the day of Testing HIV positive	0

Table 23 above shows the distribution of the health care workers by knowledge on when viral load monitoring is recommended to be done. 4(100%) of the health care workers highlighted that viral load should be monitored after patient completed six months on ART and also after twelve months on ART. No one 0(0%) gave 3months, on day of starting ART and on the day of testing as ideal time for viral load monitoring.

Table 24: Distribution of health care worker study participants by knowledge on HIV drug resistant infection detecting tests

N=4

Name of test	Number of respondents
Viral load	2
Resistant drug test	1
Genotype	1

Table 24 above shows the distribution of health care workers by their knowledge on the tests that were used to test for HIV drug resistant infection. 2(50%) of the study participants gave viral load as the test used to test for HIV drug resistant infection. Also 1(25%) of the health care worker study participants gave HIV resistant drug test. Lastly, 1(25%) of the study participants mentioned Genotype test as the test done to test for HIV drug resistant infection.

Table 25: Distribution of health care worker study participants by knowledge on prevention of HIV drug resistant infection

N=4

Preventive strategy provided	**Number of participants provided the strategy**
Good adherence	4
Keeping review dates	1
Health education	1
Constant supply of ARV	1

Table 25 above shows the distribution of health care workers participants by knowledge on HIV drug resistant infection. 4(100%) of the participants were knowledge of the preventive measures of HIV drug resistant infection. 4(100%) of the health care workers study participants gave good adherence as a preventive measure to prevent HIV drug resistant infection. Keeping of review dates to take medicines was provided by 1(10%) as a means of preventing HIV drug resistant infection. HIV drug resistant infection can be prevented by ensuring constant supply of ARV medicines this was said by 1(10%) of health care study participants.

Figure 15: Distribution of health care worker study participants by knowledge of trained health care workers on 2020 strategy

N=4

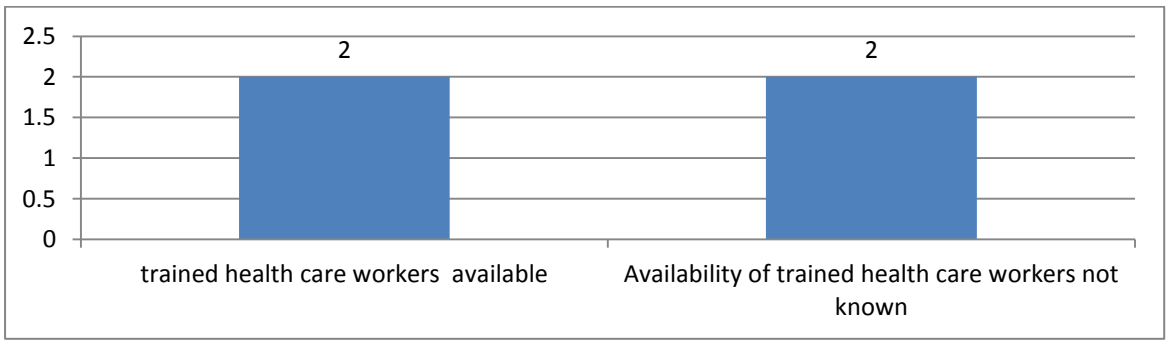


Figure 15 above shows the distribution of the health care workers by knowledge on the health care workers who were trained on 2020 HIV strategy. 2(50%) of the health care workers study participants were aware of the health care workers who were trained on the 2020 HIV

strategy. Whilst the other 2(50%) were not aware of health care workers who were trained on 2020 strategy.

Figure 16: Distribution of health care worker study participants by knowledge on provision of health education talk on HIV drug resistant infection

N=4

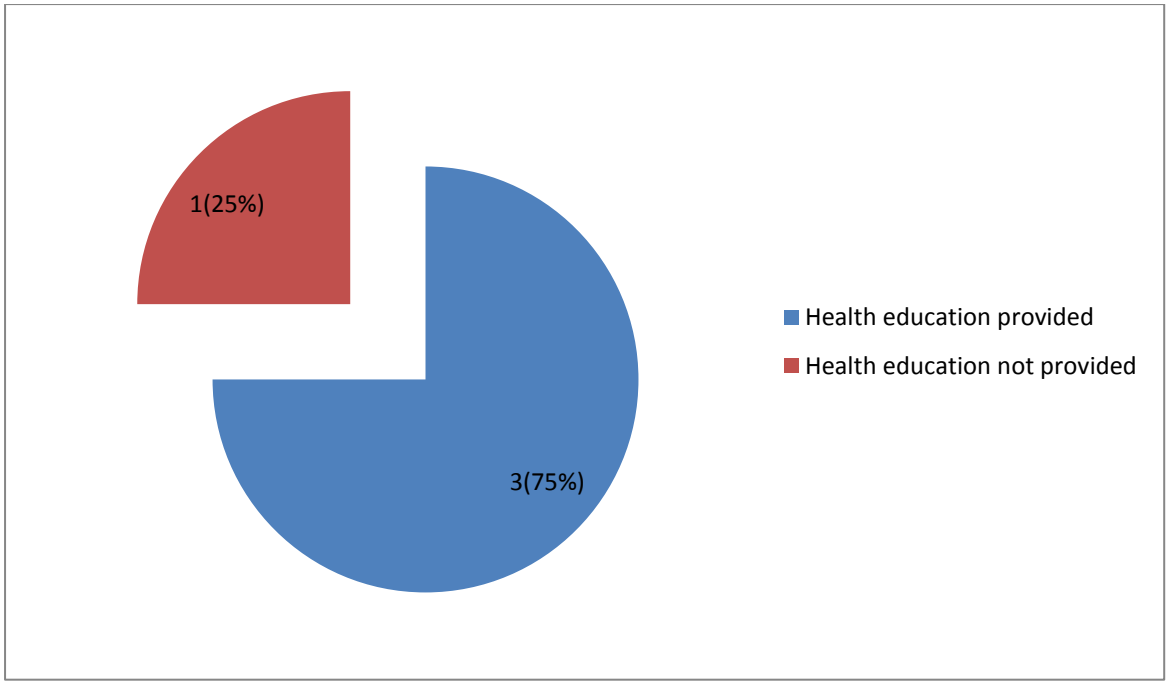


Figure 16 above shows the distribution of the health care worker study participants by knowledge on provision of health education talk to patients on HIV drug resistant infection. 3(75%) of the health care study participants agreed that health education talks on HIV drug resistant infection were being provided to clients. 1(25%) of the health care worker study participants stated that no health education talks on HIV drug resistant infection were conducted.

Table 26: Distribution of health care study participants by time adherence counselling provided

Answer provided	Number of respondents
When patient start ART	1
When told that they had viral load	1
When adherence calculation was below 80%	1
Adherence counselling not provided	1

Table 26 above shows distribution of the health care workers study participants by time they received adherence counselling. 1(25%) of the health care worker study participants mentioned that adherence counselling was given to patients when they started ART. 1(25%) also state that adherence counselling was provided when the patients were told that they had high viral load. Apart from that adherence 1(25%) of the health care study patients state that counselling was provided when adherence calculation was below 80%. 1(25%) of the health care worker study participants said adherence counselling was not being conducted.

Table 27: Distribution of health care study participants by knowledge on the number of health care workers who were trained to switch patients to second line/third line

N= 4

Answer	Number of respondents
Trained staff available	3
Trained staff not available	1

Table 27 above shows the distribution of health care worker study participants by knowledge on the number of health care workers who were trained to switch patients to second line or third line. 3(75%) of the health care workers were knowledgeable of the availability of the health care workers who were trained to switch patient to second or third line. 1(25%) of the health care worker study participants were not aware of the availability of the health care workers who were trained to switch patients to second or third line of ART medicines

Table 28: Distribution of health care worker study participants by knowledge on test conducted by the lab

N=4

Answer	Number of respondents
CD4 and Viral load	4
Gene expert	3
Urea and electrolyte	1
Full blood count	1
Urinalysis	1

Table 28 above shows the distribution of the study participants by knowledge on the functionality of the laboratory. 4(100%) of the health care worker study participants were aware that CD4 and Viral load is being processed at the laboratory. 3(75%) of the healthcare study participant was sure that gene expert was being done by the laboratory. 1(10%) state that urea and electrolyte , full blood count and urinalysis were being processed by the laboratory.

4.5.2 Measures in place to prevent the development of HIV drug resistant infection provided by patient study participants.

Table 29: Distribution of patient study participants by adherence counselling received.

N=10

Answer	**Number of respondents**
When ART was started	6
When told l had a high viral load	1
First 3 months of staring ART	1
Did not receive adherence counselling	2

Table 29 above shows the distribution of the study participants by the adherence counselling received. 6(60%) of the patient study participants received adherence when they were started on ART. Adherence counselling was provided to 1 (10%) of the patient study participants

when high viral load results was issued out. Also the other 1(10%) of the patient study participants received adherence counselling first three months of starting ART. 2(20%) of the participant study participants did not receive adherence counselling.

Table 30: Distribution of the patient study participants by the disclosure process done

N=10

Disclosure done to	Number of respondents
Family and friends	2
Sister	3
Friends alone	1
Husband	1
Children	1
Did not disclose	2

Table 30 above shows the distribution of patient study participants by disclosure process done. 2(22, 2%) of the patient study participants had disclosed their HIV status to s the family and friends. Also 33.3% of the patient study participants disclosed to the sister. The 1(11, 1%) of the patient study participants disclosed to friends only. 1(11,1%) of the patient study participants disclosed to the husband. Children were informed about the HIV status by 1(11, 1%). 2(22.2%) of the patient study participants did not disclose their HIV status to anyone

Figure 17: Distribution of patient study participants according to measures to be taken to prevent Treatment failure

N=10

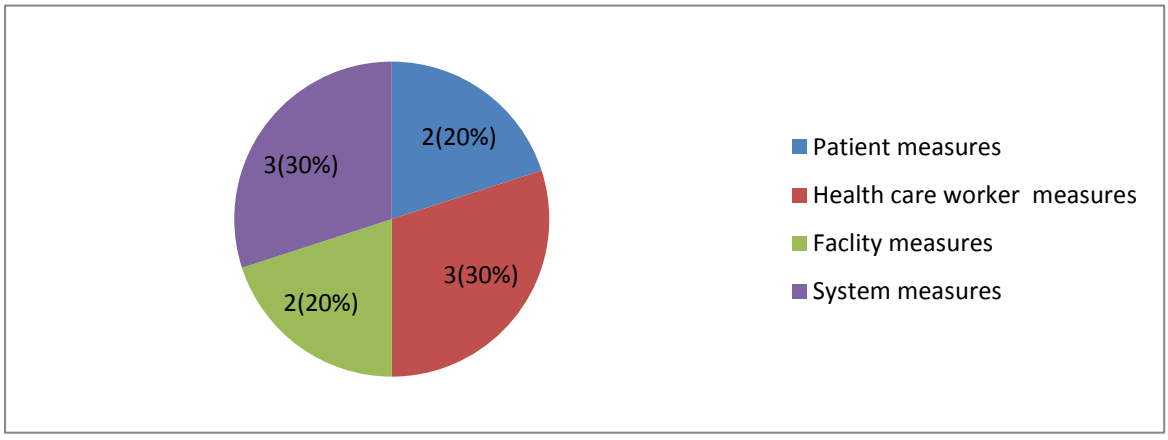


Figure 17 above shows the distribution of the patient study participants by the measures they provided that may be implemented to prevent treatment failure. 3(30%) of the study participants provided health care worker measures. 3(30%) of the patient study participants provided health system measures. 2(20%) of the patient study participants provided facility measures. Lastly, the 2(20%) of the patient study participants provided patient measures.

4.5 DISCUSSION

In this section the study findings obtained from study sample of four health care workers who were selected by purposive sampling method and ten patients who were on second line of ART medicines will be discussed. The study findings answered the following research questions: what concept's of HIV drug resistant infection is already known, what factors are contributing to the development of HIV drug resistant infection, what are the signs and symptoms of HIV drug resistant infection. How effective are the measures in place to prevent development of HIV drug resistant infection.

4. 5.1 Concept of HIV drug resistant infection

Concept of HIV drug resistant infection was provided by both the health care worker and the patient study participants. The term HIV drug resistant infection was defined correctly in four different ways. The following definitions were provided: Firstly, HIV drug resistant infection was defined as a type of HIV virus that is resistant to anti retroviral medicines .This definition had the highest frequency amongst the study participants. Secondly HIV drug resistant infection was defined as well as the type of HIV infection in which the HIV virus develops resistant to current ARV medicines. Thirdly, HIV drug resistant was referred to as HIV infection which cannot be treated. Fourthly HIV drug resistant was defined as 'HIV infection that is resistant to the ARVs medicines that the patient will be taking". These definitions were in line with the definition given by WHO (2018) which defines HIV drug resistant infection as infection resulting from the HIV virus which replicates itself in the presence of antiretroviral medicines. Also the given definitions were supported by the definition of HIV drug resistant infection given by Jaffe (2018) who defines HIV drug resistant infection as HIV virus which is resistant to current available antiretroviral medicines. The study findings revealed that the majority of the health care workers and patients had knowledge of HIV drug resistant infection. This indicated that health care

workers were in position of giving comprehensive information on HIV drug resistant to patients so that patients take charge of their lives in the prevention of HIV drug resistant infection.

However the study participants were able to explain the concept of HIV drug resistant infection it was noticed that there were some health care workers and patients who were unable to define the term. The following incorrect definitions were given: HIV drug resistant infection was defined as infection that occurs in patients with TB infection. Health care study participants who worked in Laboratory and 50% of the patients who were interviewed had no knowledge of the term HIV drug resistant infection. The study finding revealed that inability of health care workers to explain what was HIV drug resistant infection could be the reason why patients were developing HIV drug resistant infection. Therefore health care worker study participants needed more information on HIV drug resistant infection so that they become competent to health educate patient.

Also the study findings revealed that lack of knowledge in health care worker can affect delivery of health education talks provided to patients. Patients may fail to receive key information .Therefore patients needed more information on HIV drug resistant infection. Therefore health promotion officer needed to ensure that IEC materials on HIV drug resistant infection were designed and distributed by the Ministry of Health and Child Care to all level of care.

4.5.2. Factors contributing to the emerging of HIV drug resistant infection

Study participants composing of health care workers and patients on ARV medicine gave a variety of factors that could contribute to the development of Drug resistant infection. Health care and patient study participants highlighted that factor such as treatment defaulting and poor adherence to time of taking medicines and prescribed dosages were a common cause of HIV drug resistant infection in patients who had failed on ART medicines. This was supported by Planter (2009) who highlighted that HIV drug resistant infection could be a result of treatment defaulting and poor adherence to ARV Medicines. The patient study participants highlighted that HIV drug resistant may be transmitted by taking under dose of ARV medicines. This was supported by Operational differentiated care service delivery manual (2016) which stated that health care workers should prescribe adequate doses for patients. The study finding revealed that these operational procedures were not being consulted by health care workers during consultation time.

Apart from the above given factor it was also highlighted that multiple sexual partners and engaging in unprotected sexual activity with a person infected with HIV drug resistant infection increase the risk of acquiring HIV drug resistant virus strain . This school of thought was strongly supported by Boulle (2006) who highlighted that HIV resistant infection is transmitted from one person to another through unprotected sex, contact with infected blood and sharing of needles with person infected with HIV drug resistant infection. Patients who had failed treatment admitted that they had multiple concurrent sexual partners. This indicated that HIV drug resistant infection may be acquired from a patient infected with resistant HIV virus strain. The study findings revealed that multiple sexual partner was a factor that would lead to development of HIV drug resistant infection. Therefore, health care workers needed to strength behaviour change strategies and condom distribution practices as preventive measures of HIV drug resistant infection.

More so, it was highlighted that HIV drug resistant infection was a result of missing ARV medicine doses. Patients who had history of treatment failure admitted that they had missed doses of ARV medicines because of several reasons such as lack of reminders to take medicines, travelling long distances to access health facilities offering ARV medicines and financial constraints. The following reminders were known by the patients watch, cell phone alarm and being reminded by a person one stays with. Hade (2017) supported the information provided by the health care workers by urging that support system help a patient's ability to take medicines such as transport and food security. The study findings revealed that lack of transport support would lead to high rates of treatment defaulting amongst patients on ART this was supported by Siwela (2011) who stated that patients who miss some of their ARV doses had high risk of developing HIV drug resistant mutations. This implies that factors that could lead patients to miss their ARV medicines need to be explored in-depth during counselling sessions.

Furthermore, ARV medicines were not available in most health care facilities. The following regimes were reported to be out of stock Abacavir, Cotrimoxazole, Tenolam, Zidolam for both children and adults. Shortage of ARV medicines indicated interrupted supply of ARV medicines to patients. This contributed to missing of doses and treatment defaulting by patient intentionally. This was supported by Chimbetete (2018) who highlighted issues of stock out of ARV medicines amongst other factors that fuel HIV drug resistant development. Also the study findings were supported by Planter (2009) who stated that drug stock out promote development of drug resistant HIV virus strain as it may cause patients not to get

their ARV medicines from the pharmacy. Shortages of ARV medicines was one of the challenges which were highlighted by Plantler (2009) as challenges arise from the delivery of large scale or country level HIV treatment programme which in turn affect an individual's ability to stick to a treatment regime. The study finding revealed that drug stock out could promote the development of drug resistant HIV amongst patients on ART medicines. Therefore, health facilities needed to be well stocked with adequate ARV medicines which are essential in delivery of HIV treatment and care programme. This could only be possible if health care facilities could maintain good stock control and management of ART medicines.

In addition to the above factors it was noticed that health care workers were not all aware of shortage of ARV medicines in health facilities. The ARV situation in other health facilities was only known by HIV focal person. This revealed a gap in line of communication amongst health care workers especially the clinicians and the pharmacy department. Therefore, update platforms such as weekly ARV medicine status by pharmacy department to clinicians were needed.

Furthermore, lack of access to literature with HIV drug resistant infection was given as an important factor that was causing HIV drug resistant infection by health care workers. The study findings revealed that health care workers had only information on the causes of HIV drug resistant infection which was only limited to adherence counselling session package. They depended on internet for information and they had no access to medical journals and other nursing web sites.

The facility had no hard copies of literature with HIV drug resistant information. This clearly explained the reason why half of the patients failed to explain what was HIV drug resistant was all about. The study actually revealed that the Health care workers were only knowledgeable of causes of HIV drug resistant infection but not on how it may be prevented, diagnosed and managed. This implies that patients developed HIV drug resistant infection due to lack of adequate information provided by health care workers**.** Therefore, more access to literature with HIV drug resistant infection was needed to be designed and distributed to all levels of health care in all languages.

Amongst other factors highlighted by health care workers was the issue of lack of guidelines. The researcher noted that health care workers had different knowledge on the availability of

HIV drug resistant infection. The health care workers were divided into two groups: one of the groups was believing that HIV drug resistant guidelines were available and the other group which was sure that the guideline was not yet designed by the Ministry of health and Child Care. Those who believed that guidelines were available were asked by the researcher to show the guideline it was not available at the health facility. Unsteady, there brought ART 2016 and National HIV guidelines which were wrong guidelines. Goggle search was even mentioned as a guideline in use for HIV drug resistant infection by health care workers. There was only one health care worker who was a focal person of HIV programme who was sure that HIV Drug resistant guideline was not yet designed by the Ministry of Health and Child Care.

The study findings actually revealed that wrong guidelines were being used to manage HIV positive patients with signs and symptoms of treatment failure suggestive of HIV drug resistant infection. This indicated that lack of standardised care of managing HIV positive patients could fuel the development of HIV drug resistant infection. Therefore the Ministry of health and child care needed to design HIV drug resistant infection guidelines as a matter of urgent since the country already has patients with HIV drug resistant virus strains.

The majority of the health care worker study participants highlighted that they were diagnosing treatment failure on patients who had been on ART medicines for more than six months. This was supported by ART (2016) guidelines which recommended viral load to be done at month six and month twelve, there after yearly on patients on ART. The study identified the gap on health care workers on need to collect viral load and drug resistant test at the time of diagnosis of HIV infection. This is what was encouraged by Harmer (2011) who stated that HIV drug resistance test should be done at the time of diagnosis of HIV infection. Early detection of the HIV strain type in patients infected with HIV would help to ensure provision of proper management and reduction of mortality and morbidity cases associated with HIV drug resistant infection.

Also health care worker study participants reported that patients who had taken ART medicines for period 12 months and above were presenting with treatment failure. This showed that patient monitoring system was not effective to pick HIV drug resistant infection early. This is supported by Boule (2009) who urged that even if someone was infected with HIV that doesn't contain drug resistance mutation, genetic changes still occur over time, even before treatment was started. This ends up creating a large mixture of viruses in the body.

When treatment is introduced wild type virus will reduce but the mutated variant will continue to multiple in the presence of ARV medicines. The study findings revealed that patients who had being on ART for a long time had high risk of developing HIV virus gene mutation. Also adherence to prescribed treatment decline over time. Therefore continuous adherence counselling was needed to all clients on ART.

No report was brought forward for treatment failure amongst naive clients, 3 months on ART and 6 months on ART. This indicated lack of viral load monitoring at this stage of ARV care. Therefore Ministry of Health and Child Care needed to adopt monitoring of viral load at time of diagnosis and drug sensitivity test.

The health care worker study participants did not have the same information on patient retention challenges. There was a group of the health care workers who highlighted that the health care facility was facing client retention challenges. The facility was facing challenges of patients working in South Africa who failed to come for reviews and monitoring of viral load. These were the patients who presented with high viral load and advanced signs and symptoms of treatment failure. Apart from this the health care workers were not updating the files and registers were incompletely documented. As a result it was hard for the health care workers to track patients because tools that were designed to point out whether a patient had missed a review were not being completed. Shortage of staff was given as a reason why health care workers were not completing the registers. This indicated lack of knowledge on the importance of complete documentation. The facility had 5 nurses, two nurse aides, 2 data clerks and 2 primary counsellors. The study revealed defects in human resource management at the facility.

The other group of the health care worker study participants mentioned that they were not facing retention challenges. This was not supported by the information documented in the patient care booklets. Cohort analysis conducted revealed that patient retention percentage was at 35%. The study finding actually revealed that health care workers were not updating their monitoring tools such as patient care booklets and registers.

Other health care workers did not provide an answer to the question asked on retention challenges. This showed that there were not aware of the retention challenge prevailing. The study therefore revealed the need to update data capturing tools such as the patient care booklets and the registers

It was also noted that health care worker study participants were knowledgeable on how patients with high viral load were to be reviewed. Patients with high viral load were reviewed monthly for three consecutive months while receiving enhanced adherence counselling. This was support by ART 2016 and standard operation procedure which were in place.

However there were some health care workers study participants who believed that patients with high viral load were being reviewed monthly for three months then every 2 months. This was not supported by the ART (2016) guidelines and standard operating procedures. This revealed that schedule for review dates were determined by the patient condition and level of understanding.

Patients and health care workers mentioned that diarrhoea, vomiting and nausea were contributing to treatment failure. Grant (2001) also highlighted that HIV infection and medicines may cause diarrhoea and vomiting. This showed that patients developed treatment failure because of co infections which lowered their body immunity.

Also Grant (2001) highlighted that HIV infection and medicines may cause diarrhoea and vomiting. This may cause HIV drugs to be excreted from the body before they are absorbed. ART medicine usual cause vomiting and nausea this indicated that when patients developed treatment failure due to ART side effects it's an indication of poor management of ARV side effects. The health care worker study participants reported nightmares as side effect of ARV medicines. This side effect was included in the list of common side effects provided by ART (2016) guideline which highlighted that effavirenz can cause central nervous system disturbances such as nightmares, dizziness and confusion. This indicated that patients stopped taking medicines because of the extreme vivid dreams caused by Effavirenz. This indicated that inadequate information on major side effects such as nightmares caused by Effavirenz were not discussed during counselling session in preparation of ART initiation.

Anaemia was also given as a common side effects reported by many patients failing ARV treatment. Anaemia in patients on ART indicated lack of monitoring of full blood count. Patients stopped taking ARV medicines because of fatigue that was associated with low haemoglobin level. The study revealed that patients were not being checked full blood count every visit. This was against ART guidelines which recommend patients to be monitored haemotogical functions on monthly bases.

None of the health care worker study participants reported poor absorption and loss of appetite as a challenge affecting patients who failed first line treatment**.** Grant (2001) highlighted that if drug resistance was not identified by drug test other causes could be looked into such as poor adherence, absorption difficulties or drug–drug interactions. The study findings revealed that health care workers and patients needed to be informed of all other side effects of ARV medicines that may contribute to treatment failure.

High viral load amongst patients on ART was given as a factor contributing to Treatment failure. There was a group of health care workers who were aware of patients with high viral load. These were the Health care workers who were providing enhanced adherence counselling and close monitoring patients for signs and symptoms of new opportunistic infections.

The other group of health care worker study participants were not aware of patients with high viral load. These were health care workers who were treating patients failing on ART medicines as normal patients and even giving 3-6 months reviews instead of one month review to patients with high viral load. This indicated lack of monitoring of patients with high viral load. Delay in switching to new effective regimes. The study finding revealed that health care workers were not sharing information on patient issues. Therefore the OI team needed to start conducting weekly debriefing meetings with other stakeholders.

All of the health care workers were knowledgeable of the patients who had collected blood sample for viral load. But the health care workers were not sure of the number of patients actually collected the blood sample for viral load. Answers like: 'lam not sure / I don't know were provided'. This indicated lack of monitoring of patients with high viral load. Therefore, there was need to keep a record of all patients with high viral load results and when they were due for blood sample collection.

The study findings revealed that patients were being delayed to be switched to effective regimes. The health care worker study participants gave average of 0-3 months as the ideal time taken to switch patients to a new regime after Enhanced adherence counselling. The challenges highlighted were delay in receiving the second viral load results. Tracking of patients were done but patients had gone to South Africa and Botswana. Such a delay may be associated with quick spread of HIV drug resistant infection. The delay was not support by HIV 2016 guideline.

The health care study participants gave different opinions on reasons why patients were failing on ARV medicines The following opinions were suggested treatment defaulting due to lack of transport cost challenges and long distance travelled as the major causes for treatment failure. Transport cost was reported to be unaffordable. Patients were travelling average of 40km to and from the health care facility. Hade (2017) supported the information provided by the health care workers by urging that support system help a patient's ability to take medicines such as transport and food security. The study findings revealed that lack of transport support would lead to high rates of treatment defaulting amongst patients on ART.

Also the health care worker study participants gave inconsistent and incorrect use of both female and male condoms as the cause of treatment failure. This was the group of the health care workers who admitted that Health care workers did not provide comprehensive information on safer sex. Demonstrations on condom use needed to be conducted during counselling sessions. Also the majority of the patient study participants highlighted behavioural problems such as: Inconsistent and incorrect use of condoms. Patients highlighted that sometimes they faced challenges of accessing condoms especial at community level. Condom access points were few or there were not there at all. Therefore condom access points needed to be increased.

Other causes which were provided were: hunger, tiredness, lack of disclosure and lack of information on treatment failure causes. Poor nutrition was given as a factor that contributed to HIV drug resistant infection by. ARV medications have dietary requirements which can affect absorption (Nachega ; 2007). Poor nutrition lower body immunity and may make the patient vulnerable to opportunistic infections. This indicated a need for provision of supplementary food to patients on ART with altered nutrition less than body requirements. The study findings revealed that patients develop HIV drug resistant infection due to several reasons such as malnutrition. Therefore district nutritionist needed to provide health education on balance diet to all patients on ART medicines.

Tiredness was mentioned as well as a cause for development of HIV drug resistant infection. This was supported by Grant (2001) who identified the following challenges that contribute to poor adherence to treatment: side effects, a hectic schedule, tiredness to take medicines or forgetfulness. As patients took medicines for a long time they may get tired and stop taking medication especially if inadequate information was provided during initial counselling

sessions. Good support system and in-depth adherence counselling strategies would help to prevent treatment failure.

Disclosure issues were stated by health care workers as a factor contributing to treatment failure. This was supported by Siwela (2011) who stated that patient may stop taking medicines because of fear of taking many medicines. Patients may forgetful to take their medicines frequently especially when disclosure process was not facilitated and there is poor support system. Patients who developed treatment failure due to lack of disclosure indicated lack of disclosure information provision and assessment for readiness to disclosure by health care workers during counselling session. Disclosure process rehearsals needed to be included in the package of comprehensive counselling so as to identify strengths and weakness of the patient to disclosure his or her HIV positive status to someone else. Therefore primary counsellors needed mentorship on disclosure process counselling

Substance abuse was said to be causing treatment failure by the patients study participants. This was supported by Siwela (2011) who highlighted that some patients' may abuse substance or alcohol abuse as a result they do not stick to prescribed time of taking medicines. The study findings revealed that HIV drug resistant infection may be caused by poor adherence due to substance abuse which alters the level of consciousness. The patients needed continuous counselling on effects of substance use on their adherence. Patients were developing treatment failure because of forgetting to take medicines. One of the patient study participants says 'l was forgetting to take my medicines for six months'. Also the same patient said she had no food to eat and she used to feel nauseated so she decided to stop taking her medicines.

Patients gave lack of conditional change as a factor that contributed to his treatment failure. According to WHO (2018) patients on ART were expected to have their condition improved. Poor response to ARV medicines was believed to lower the drive to take medicines and the patient lose the perceived benefits of taking ARV medicines. As a result the patient decided to stop taking their medicines. Development of HIV drug resistant infection may become evident. The goal of ART was to suppress viral load. Suppressed viral load provided strong immunity that was resistant to infection and patient condition improved.

The patient study participants reported that they had experienced side effects of ART medicines. The following side effects were experienced: nausea and vomiting. Nightmares, anaemia, headache, swollen eyes diarrhoea and loss of appetite. Feeling of un-wellness was

reported as side effects of ARV. This was known only by the patients. This was supported by Grant (2001) who identified the following challenges that contributed to poor adherence to treatment: side effects, a hectic schedule or forgetfulness. The study findings revealed that the majority of patients experienced nausea and vomiting. These side effects were considered to be mild side effects of ARV medicines. Surprisingly patients developed treatment failure. This indicated that individualised care was not being provided by health care worker. Individualised care would have helped health care workers to manage such side effects. Therefore, health care workers, patients needed more training on side effects identification and management

Social issues, economic issues and behavioural issues were provided that may lead to treatment failure. Social issues such as lack of support system lack of food, poverty and lack of treatment supporters. One of the patient study participants reported that it was difficult to remember time of appointments and taking medicines especially during the time of acute phase. This indicated that treatment buddies need to be identified at the time of enrolment into care of an HIV positive client. The study findings reviewed that not all patients were assisted by health care workers to identify treatment buddies. Nachega (2007) explains that for HIV medicines to work effectively they must be taken exactly as prescribed and consistently. Incorrect taking of medications can cause the amount of HIV drug to decrease in the bloodstream. HIV may reproduce more freely and accumulate additional mutations when the drug levels become too low. The study findings revealed that HIV drug resistant may be due to failure to follow prescribed doses of ARV medicines by the patients. Therefore, health care workers needed to provide comprehensive counselling on good adherence to prescribed doses of ARV medicines.

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Other factors which were provided were ignorance and other conditions not given priority treatment such as diabetes mellitus which lower body immunity. The study identified that not all the factors that may contribute to treatment failure were known by the patients. Factors like poor absorption and use of expired medicines were not known. Therefore, patients needed counselling on all possible causes of HIV drug resistant infection.

The patient study participants mentioned that viral load was being monitored after every six months. This was not supported by HIV national guidelines (2016) which state that viral load should be conducted after 6 months on ART, at month 12 on ART, thereafter yearly. This

explained why the laboratory experienced stock out of reagents. Stock out of reagents in the laboratory could be a result of under stocking since they order reagents based on ART population. Poorly equipped laboratory may result in limited regular viral load testing, meaning health care workers cannot properly monitor for the emergence of HIV drug resistance (Planter ;2009). Some of the patients said that viral load was being monitored yearly on patients have being on ART for twelve months and more. This was supported by national ART 2016 guidelines and standard operating procedures. Also the patient study participants stated that viral load was monitored once in life time while one will be on ART. These were the patients who did not bother self to demand for repeat viral load after the baseline. The study findings revealed that patients had different information on when the viral load was to be collected. This indicated lack of adequate information provided to patients by health care workers on viral load monitoring.

Surprisingly, other patients were not even sure when the viral load monitoring was supposed to be monitored. This was the group of the patients who did not bother self to demand collection of viral load blood sample. This indicated that patients were not all informed about when viral load was to be collected. Therefore health education talks needed to be conducted to all patients in the morning and to all those patients who may present after the morning sessions. Each consultation room needed to assess each patient for eligibility for viral load collection.

According to the laboratory that was processing viral load blood samples. Patients were expected to receive their viral load results after 2 weeks. Patients received their viral load results after one or two, some after three and even after six months. This was outside the expected time to receive viral load results. However, there were some patients who were able to receive their viral load within two weeks which was the stipulated time. The following changes were highlighted for delay to receive viral load results. The laboratory was reported to have stock out of reagents for viral load blood sample processing. Also the laboratory had few viral load processing machines for example the district had four viral load machines and each process two sample in eight hours. This revealed that the laboratory was not in position to process viral load blood sample for the entire district ART population. As a result patients were not switched to more effective regimes in time. Also high death rates reported amongst patients on ART with high viral load. Such delays may fuel spread of HIV drug resistant infection. This implies that more gene machines were needed by the district laboratory and

the laboratory needed to be well equipped to ensure continuous processing of viral load blood samples.

There were patients who had history and with no history of defaulting treatment but all had failed on ART medicines. This indicated that HIV drug resistant infection could be caused by other factors besides defaulting ART medicines. Some of the patient said, 'l was tired of taking medicines' This revealed need for continuous adherence counselling amongst patients on ART. Other patient had a new affair with HIV negative partner. They feared losing the partner so they decided to stop taking their medicines. This showed lack of empowerment to disclose HIV status to sexual partners. The study findings revealed that lack of disclosure would fuel transmission of HIV drug resistant infection.

Patients default treatment because they had gone for holiday for three months. Defaulting of treatment because of travelling to other places indicated poor nurse patient's relationship. Lack of information on what to do when a patient run out of medicines while in other places. Nurse patient dialogue was needed at all level of care.

The majority of the patients travelled long distance to access ARV medicines. The distance travelled ranged from 0- 20 km to the health facility. The study findings revealed that distance travelled by the patients had great impact on the ability to access ARV medicines. Distance also contributed to poor adherence especially when the patient was sick. Therefore outreach programmes were needed to be strengthened. Community ART support groups needed to be increased in communities which were far from the health care facilities

Patients had no same feelings towards health care workers. There were patients who liked the way they were treated by health care worker. Those patients who disliked the treatment they got from the health care workers gave the following reasons: Health care workers were blamed for taking long to switch patients to effective regimen. Staff shortage was reported to be compromising quality of health care provided to patients. Patients reported that due to staff shortage they were waiting for services for a long time. The study finding reviewed critical shortage of staff at OI department.

Patients also reported that they were being shouted by health care workers and this caused them to prefer sending other person unlike them attending the review. This resulted in lack of monitoring of patients on ART. As a result early signs of treatment failure were left unobserved. Therefore health care workers needed to be reminded on professionalism. Each

department needed to have a suggestion box and other patient feedback mechanisms so as to evaluate quality of care rendered to patients.

Also lack of privacy was given as a reason why patients did not like the treatment they got from the health care workers. The study findings revealed that doors of consultation rooms were kept open. This showed lack of privacy indeed. Lack of privacy led to failure to discuss with health care workers challenges they were facing. Therefore consultation rooms needed privacy. The study recommended hospital management team to provide new doors to all OI consultation rooms.

4.5.3 Signs and systems of HIV drug resistant infection

The signs and symptoms of HIV drug resistant infection were given by both the health care and patient study participants. The following signs and symptoms were highlighted: both health care worker and patient study patients state that treatment failure may be seen by high viral load. This was supported by the information provided by Wainbergy (2011) who urged that HIV drug resistant infection was detected by high viral load which continues to increase while the patient was on ART. Patients even specified the viral load result which is considered to be high. It was said high viral load is any viral load reading copies that was above a 1000 copies in a mil of blood. According to WHO (2016) Viral load was the golden standard tool available to determine if HIV treatment was working. A viral load which was undetectable was an excellent sign that treatment was working correctly. This was supported by WHO (2016) ART guidelines which stated that high viral load indicate Virological failure. This implies that viral load was a common sign and symptom that was well known by the health care workers and patients that suggest treatment failure.

Apart from the above points the health care workers also gave development of opportunistic infections on patients who were on ART medicines as a sign of treatment failure. Tuberculosis and Cryptoccoccal meningitis were given as examples of opportunistic infections suggestive of treatment failure. This was supported by WHO (2016) staging of HIV guideline which placed these infection on AIDS stage.

Besides the two opportunistic given by health care workers patient study participants gave the following infections as infections that may indicate treatment failure: chronic diarrhoea in a patient on ART was suggestive of presence of HIV drug resistant infection. This was

supported by WHO (2016) staging of HIV infection guideline which placed chronic diarrhoea under advanced stage of HIV called AIDS stage.

Failing of CD4 cell count was given by the health care worker study participants as a sign of treatment failure suggestive of HIV drug resistant infection. This was supported by the ART guideline (2016) which highlighted that fall of CD4 cell count was suggestive of immunological failure. This indicated limited knowledge among health care workers on the significant of CD4 cell count as early indicator for treatment failure. The study findings revealed that CD4 cell count significance to health care workers was only limited to baseline information.

Poor response to ART medicines was given by the health care worker study participants as the sign of HIV drug resistant infection. Weight loss, poor appetite, chronic diarrhoea and presence of opportunistic infections were given as signs and symptoms suggestive of poor response to ART medicines. This was supported by the information provided by WHO (2018) on signs of treatment failure. This indicated a small group of health care workers who were knowledgeable of early indicators of HIV drug resistant infection. The majority of health care workers were in need to learn more of signs and symptoms of HIV drug resistant infection in order for them to be more vigilant in monitoring for HIV drug resistant infection.

The patient study participants gave the following signs and symptoms were highlighted: patients with HIV drug resistant would present to health care facility with recurrent infections. This was correct and well supported by ART guidelines 2016 which stated that treatment failure may be seen by frequent illnesses.

Weight loss was stated as early sign of treatment failure. Patients on ART were expected to gain weight (WHO; 2018). Loss of weight indicated treatment failure or presence of opportunistic infection. The patient care booklets had missing weights. If patients are not weighed every visit this will result on failure by health care workers to identify early signs of treatment failure.

Vaginal bleeding was mentioned by patient study participants as a sign and symptom of HIV drug resistant infection. Vaginal bleeding in patient on ART indicated cancer of the cervix and fibroid in the uterus and other gynaecological problems. These cancers were reported to be common when ART medicines fail to suppress viral load (WHO; 2017).

The study findings revealed that patients had strong experience on signs and symptoms of treatment failure that suggested drug resistant infection. Despite deep understanding of signs and symptoms of HIV drug resistant infection patients needed more information on action to take when one notice these signs and symptoms. Therefore patients needed health education and community dialogues on HIV drug resistant infection.

4.5.4 Measures in place to prevent HIV drug resistant infection

One of the measures that were in place was the collection of viral load in a scheduled manner. The health care worker study participants were knowledgeable on when to collect viral load blood samples from patients who were on ART. The study findings revealed that patients were being collected viral load blood sample at month six on ART. This was supported by Wainbergy (2011) who stated that viral load shows when treatment was not working after six months of starting ART medicines.

Also the health care worker study participants stated that viral load was being monitored after 12 months on ART medicines initiation and there after yearly on patients with viral suppression. This was according to National ART guidelines (2016) of Zimbabwe. The information provided by health care workers was not in line with the information documented in patient care booklet which revealed haphazard collection of viral load blood samples. This indicated that health care workers faced challenges in following the stipulated schedule for collection of viral load. Highlighted challenges were: shortage of viral load machine cartilage and reagent, stock out of sample collection tubes, and patients did not come for review.

None of the health care worker study participants gave three months, on the day of testing HIV positive and on the day of starting ART as the time when viral load were to be collected. This indicated defects in the national ART guideline which was silent on the importance of collecting viral load sample on naive clients at the highlighted time schedules above. Viral load done at time of diagnosis of HIV infection would help to known the strain acquired by the patient. This would help in the diagnosis of HIV drug resistant infection early and reduce mortality and morbidity that may be associated with HIV drug resistant infection. Therefore there was need for MOHCC to review ART national Guideline to incorporate key issues that address HIV drug resistant infection.

The health care study participants also gave viral load test as a measure that was put in place to monitor the ART treatment effectiveness. This was strongly supported by the (2016) ART

guidelines which recommended viral load test to be used as a gold standard test in the detection of Virological failure on patients on ART. The study findings revealed that district laboratory was in position to carry out viral load test but the capacity was limited. The district viral load machines were not adequate to conduct test for all patients who were in need. Therefore the district needed more viral load machines.

Another measure that was given by the health care study participants was resistant drug test which was a necessary test in the diagnosis of HIV drug resistant infection. This was the test done to detect HIV Virus drug sensitivity to available ART medicines. This was supported by Grant (2011) who stated that drug resistant tests were required to detect drug resistant HIV strains. The study findings revealed that such an important test in detection of HIV drug resistant infection was only familiar to small number of health care workers.

In addition to the above mentioned test genotype test was given by the health care worker study participants as a measure that was adopted to detect HIV drug resistant infection. This was the test recommended by ART guideline (2016) and WHO (2018) as a mandatory test done before switching patients who failed on second line to third line ART medicines. The same test was recommended to be done to detect HIV drug resistant infection. Surprisingly, experienced health care workers were not aware of such test. This showed that health care worker's knowledge on ART guidelines were scanty. Also they did not read through the ART guideline. Therefore healthcare workers needed to be sensitised on genotype test for detection of HIV drug resistant infection.

Training of health care workers in 2020 strategies was implemented as a measure to prevent HIV drug resistant infection. The study findings revealed that the health care worker study participants were aware of 2020 strategy. The strategy was known by health care workers who worked at OI department. The other health care workers who worked at laboratory and wards were not aware of the strategy. This indicated poor feedback mechanism system. Lack of feedback amongst the health care workers would lead to lack of standardisation of health care services. Therefore the health care workers needed to strengthen their feedback mechanisms. Also they needed to come up with innovative ways of giving feedback on latest information of HIV infection. All first and middle managers needed to be reminded to keep up to date record of trainings and workshops provided to the subordinates.

Ministry of Health and Child care has adopted health education as a preventive measure in the treatment of HIV drug resistant infection. Salvana (2018) stated that the best approach to

prevent HIV drug resistance infection was health education provision. The health care worker study participants stated that health education on HIV drug resistant infection was given to patients on daily basis. This was not supported by the health education topics discussed by health care workers with the patients documented in the education health book.

Patients highlighted that they received health education on HIV drug resistant infection when it was discovered that their viral load was high above 1000 copies. The study findings revealed lack of documentation of health education information given to patients. Therefore there was need for nurse in charge to supervise documentation of health education register.

There was a portion of the health care workers who highlighted that they were not conducting health education talks to the patients. lack of HIV drug resistant information amongst health workers was attributed to lack of literature with HIV drug resistant infection. This showed that health care workers were not well equipped with skills to explore the internet and other medical websites to garner information. Therefore the health care workers needed information communication technology skills for them to access medical web sites enriched with HIV drug resistant information so that they will provide health education talks.

Adherence counselling was a measure designed to assist patients to take their medicines correctly. This was supported by WHO (2018) which highlighted that HIV drug resistance was a result of poor adherence to treatment and wrong prescription especially in children and adults. **T**he health care worker study participants agreed that patients were being counselled on good adherence to treatment. This counselling was given to patients when they started ART medicines and when their viral load became high. On subsequent visits patients were not given adherence counselling except when the adherence calculation was below 80%.

The above answer given by the health care workers was supported by the patient study participants who stated that they received adherence counselling. The patients who received adherence counselling received it on the day when they were started on ART. This was in line with as WHO (2018) which stated that patients should receive adherence counselling on the impact of poor adherence. Patients highlighted that they started ART when they were very sick and some of the key messages discussed during counselling were not remembered.

The patient study participants who received adherence counselling stated that they received adherence counselling when they were told that their viral load was too high. This indicated that patients received adherence counselling very late. Adherence counselling goal was to

ensure good adherence to prescribe medicines and treatment modalities. Patients who developed treatment failure indicated loop holes in the counselling process or health care workers awareness of significance of adherence counselling to patients.

The patients who received adherence counselling received it monthly for three consecutive months when they started ART. There was no subsequent adherence counselling provided. The study revealed that counselling guidelines were not being followed. There was no standardised adherence counselling schedule. Therefore there was need for standard operating procedures on adherence counselling.

The patient study participants highlighted that they did not receive adherence counselling. These patients were said by the health care workers to have been transferred in from other health facilities. This indicated defects in the transfer information provided by transferring facility. Also indicated lack of assessment of all transferred in patients by the receiving facility. The study findings concluded that adherence counselling was not being done to old patients who were on ART for long time during subsequent visits. Therefore in service training on adherence counselling needed to be conducted to all primary counsellors. Nurse in charges to supervise and monitor counselling sessions to ensure quality information provision to patients**.**

Other health care workers stated that patients were not given adherence counselling. Despite that adherence counselling were not offered health care workers conducted adherence calculation of pill count every visit. Sometimes patients were not bringing the remained tables to health care facility. Study findings revealed that adherence counselling was lacking and it could be the reason why patients were developing treatment failure, and would develop HIV drug resistant infection.

There other measure was the present of health care workers who were trained to switch patients to second and third line regimes. These trained nurses worked at OI department. They had undergone on job training. The study findings revealed that these trained health care workers were not known by all health care workers. This indicated that there was a group of health care workers who did not know where and how to refer patients who needed to be switched to effective treatment regimes. Plantler (2009) urged that poorly resourced human capital especially when the health care providers who are offering HIV/AIDS service care not trained on how to prescribe and prepare patient adequately. Patients may receive under dosed or received wrong prescriptions. The study finding revealed that lack of

knowledge on availability of health care workers trained to switch patients had contributed to delay in switching the patients to effective regimes. Therefore, there was need to sensitise the health delivery system members on referral pathway for patients with treatment failure.

Availability of functional laboratory was given as a measure in place to prevent HIV drug resistant infection. Health care worker study participants highlighted that the district laboratory was functioning well. The district laboratory was expected to process the following tests CD4 cell count, viral load, Gene Expert, U&E, FBC and urinalysis. Health care worker study participants were aware that the laboratory was processing CD4 cell count and viral load specimens. These were the health care workers who were collecting blood sample for CD4 cell count and viral load. It was also given by health care workers that laboratory was processing gene expert samples. These were the health workers who would screen patients for tuberculosis.

The health care workers were aware that laboratory was processing U&E blood samples. These were the health care workers who were monitoring the functioning of the kidney on patients with high viral load.

Full blood count of patients on ART was being monitored to assess patients for anaemia. Lastly the health care workers highlighted that the laboratory was doing urinalysis. These were the health care workers who were screening patients for co infection such diabetics' mellitus and urinary tract infection. These infections can lower body immune system.

The study findings indicated that there were some tests which were not known by the health care workers such as genotype and drug resistant test. Therefore the laboratory department needed to sensitise the health team regularly on the investigations being conducted.

The health care workers who participated in the study highlighted good adherence to treatment (time of taking medicines, prescribed doses) as a measure that prevent HIV drug resistant infection. This was supported by Kityo (2011) who urged that patients needed adequate information on how to take their medicines for them to maintain their adherence percentage at optimal level.

Also health care study participants stated that keeping of appointment dates by the patients prevented HIV drug resistant infection from developing. These were the health care workers

who would counsel patients on importance of following the scheduled appointments. Good adherence to scheduled appointment review dates would help to maintain continuous supply chain and availability of ARV medicines with the patients. This indicated that compliance to scheduled appointment dates would help in the prevention of HIV drug resistant emanating from interrupted supply of ART medicines.

More so the health care workers gave health education as a measure that might be taken to prevent HIV drug resistant infection. The study revealed that health care workers were not providing health education to patient on HIV drug resistant infection. The study findings supported the thoughts brought forward by early thinkers who provided background information to the study. Salvana (2018) was one of them who urged that patient developed HIV drug resistant infection because of lack of knowledge on the condition. Also Salvana (2018) highlighted that the best approach to prevention of HIV drug resistant infection was health education provision. Therefore health care workers needed to provide health education talks either as group talks or through mass media to all patients who were on ART.

Furthermore the health care workers who participated in the study gave constant supply of ARV medicines as a measure that would prevent HIV drug resistant infection. These were the health care workers who would strive to maintain ARV medicine adequate stocks. Stock out of ARV medicines would result in patients missing some doses. As a result HIV drug resistant Mutations may occur. The study findings were supported by the information provided in a report by Chimbetete (2018) which highlighted that HIV drug resistant infection indicates gaps in ART service delivery such as stock out of ARV medicines. The study findings revealed shortage of ARV medicines in health care facilities in the past 18 months in Tsholotsho District. This indicated that shortage of ARV medicines would fuel development of HIV drug resistant infection in Zimbabwe. Therefore, uninterrupted supply of ARV medicines to all facilities in Zimbabwe remains critical and to be addressed as a matter of urgency.

Disclosure process was provided as a measure that was in place to ensure good adherence to ARV medicines. The study findings revealed that patient managed to disclose their HIV status to the following person: family, friends, sister, husband, children, and wife. The study findings indicated that patients had a wide choice of whom to disclose their HIV status to. When patients fail on treatment when they had disclosed their HIV status to someone else indicated lack of information on the roles of treatment supporter and the reasons for

disclosing to someone else. Treatment failure in patients who had disclosure their HIV status indicated lack of support from the treatment bubby. Therefore the patients and treatment bubby needed to be informed on the role they need to play as treatment supporters. This would help to prevent HIV drug resistant infection due to treatment defaulting.

The study also revealed that not all patients were able to disclosure their HIV status for various reasons such as fear of being discriminated especially, when the patient may be employed. This indicated that the working group of patients on ART may face challenges in disclosing their status to their employers for several reasons. As a result the patients would face challenges in keeping the review dates. Therefore health care workers needed to assess for readiness to disclose during counselling sessions. Disclosure demonstration techniques needed to be discussed during counselling session to empower patients with skills needed in disclosing process models

Patients gave selected time to take medicine as a measure to prevent HIV drug resistant infection. The study findings revealed that there were patients who had specific time to take medicines. These were the patients who had received adherence counselling and tools that promote adherence. The following reminders were provided wrist watch, alarm clock, and phone clock. Despite having these reminders patients developed treatment failure. This indicated that there were other factors which were contributing to the development of HIV drug resistant infection. Factors such as infected by drug resistant HIV virus strain.

There were other patient study participants who had no specific time to take their ARV medicines. This indicated that treatment failure was caused by poor adherence to time of taking ARV medicines. Lack of scheduled time may lead to development of gene mutation. Therefore patients needed counselling on good adherence and the impact of poor adherence counselling.

Patients on ART were being given appointments to collect their ART medicines. The study findings revealed that not all patients faced challenges of honouring review dates. This indicated that other factors could have contributed to treatment failure. Factors such as inconsistent and incorrect use of condoms due to unavailability off condoms at health care facilities during reviews might be the cause.

There was a group of patients who had faced challenges in honouring review dates. The following challenges were highlighted: transport challenges one of the patient stated that she depended on money which was coming from children working in South Africa and the money delayed coming. The other challenge highlighted was lack of permission granted by the employer to leave job and attend the review date.

Some patients who lived near big rivers gave challenge of crossing flooded rivers during rainy season. Lastly, the patient who faced challenges of honouring review dates highlighted that he was a cross boarder dealer so it was difficult to attend the reviews. The study findings revealed that health care workers were not implementing individualised client model that demanded each patient to be treated as a unique patient with unique need to be met. Therefore health care workers needed to strengthen differentiated care service delivery models

The patient study participants gave different possible solution to the development of treatment failure. System measures which included health facilities to strengthen outreach ART programme such as ART refill in community and viral load collection. Health facility needed to have flexible appointment dates. The patients needed to be involved in selection of dates for their reviews.

Patient measures were also given which included: patient nutrition was provided as a measure that would prevent HIV drug resistant infection. The local authority and Ministry of health and child care needed to come up with innovative ways that would provide food in the community such as command farming.

Health care measures which included: provision of adherence counselling to patients at the begging of ART treatment and throughout life, community dialogue and sensitisation meetings on HIV drug resistant infection. Also the health care workers needed to be capacitated and supported with skills and knowledge on HIV drug resistant infection through in service training and workshops.

Patient study participants provided facility measures. It was highlighted by the patient study participants that there was need to allocate staff to OI department to improve on the effectiveness of nurses. Facility needed to have flexible appointment review dates. Patients needed to be involved in scheduling the review dates.

The study findings revealed shortage of resources such as reagent, specimen collection tubes as a challenge faced by the facilities in the implementation of HIV programme that would contribute to development of HIV drug resistant infection. Therefore the health facility needed to be staffed with competent nurses, well equipped laboratory for them to detect HIV drug resistant infection early.

4.6 Summary

In this chapter data were presented in form of bar graphs, tables and pie chart. Data were also analysed. Study findings were discussed in detail. The degree to which the study questions were answered was established. Study findings were compared with information already known from other sources. The next chapter will provide study summary, conclusions and recommendations

Chapter 5

Summary, Conclusions and Recommendations

5.0 Introduction

In this chapter the researcher provided the summary of the study. The study was summarised from chapter one to chapter four. Key points from each chapter were discussed. The study conclusions were drawn based on the ability of the study findings to answer study questions and study objectives. Recommendations were made to Ministry of health and child care, Tsholotsho District hospital, local authority, patients, health care workers and future researchers.

5.1 Summary

The study was conducted in Mat North province at one of its district Hospital. The purpose of the study was to investigate level of preparedness to deal with factors contributing to the emerging of drug resistant infection amongst adult patients on ART. The study answered the following research questions:

1. What concept of HIV drug resistant infection is already known?
2. What factors are contributing to the development of HIV drug resistant infection?
3. What are the signs and symptoms of HIV drug resistant infection?
4. How effective are the measures in place to prevent the development of HIV drug resistant infection

In chapter one the background information to the study topic was provided. Information was provided from global view, regional view, national view and local view on the HIV drug resistant infection. Studies which were conducted by other researchers were revealed and great arguments were borrowed. The statement of the problem was clearly spelt out. Study questions were formulated and the study managed to provide answers to the research questions. Measurable study objectives were formulated and the study findings met the set study objectives. The study had assessed health care worker and patients' knowledge on the factors contributing to the development of HIV drug resistant infection. The study was only limited to X district hospital because of financial and time constraints. Also the study was limited only to patients who had failed on ART medicines.

In chapter two the researcher reviewed literature that was related to HIV drug resistant infection. There was limited literature with HIV drug resistant infection. The researcher based mainly on goggle scholar, standard operating procedures for information. The information helped the researcher to provide theoretical framework for the study. Also the information helped the researcher to define the concept of HIV drug resistant infection. More so the researcher was oriented to factors that were known by other researchers that were known to contribute to HIV drug resistant infection. More so the information obtained from literature review helped the researcher to come up with recommended tests needed to diagnose HIV drug resistant infection. Possible solutions to the study were provided.

In chapter three the study focused on research methodology. The study was guided by constructivist paradigm principles. The study used qualitative research design. The study focused on population of four health care workers and ten patients who had failure first line treatment. The study used two research instruments: questionnaire which was administered to four health care workers. Unstructured interviews used to collect data from patients.

In chapter four data was analysed and presented in form of pie charts, tables and bar graphs. The findings revealed that there were some health care workers who were unable to explain what HIV drug resistant infection was. Causes of HIV drug resistant were known by health care workers. The finding revealed that health care workers were knowledgeable about the signs and symptoms of HIV drug resistant infection. Health care workers had no knowledge on the importance of collecting viral load at time of diagnosis HIV. Health care workers were aware that viral load was monitored at six months, at 12 months then yearly. Health care workers were knowledgeable on how HIV drug resistant infection would be prevented**.** Not all health care workers were aware that ARV medicines were in short supply such as Zidolam paediatric, Abacavir Paeds and adult formulae and Cotrimoxazole. The study findings reviewed that literature with HIV drug resistant infection was not available. Health care workers were depending greatly on goggle search for information. The study also reviewed that there were no guidelines for HIV drug resistant infection. Furthermore, the study findings revealed that patient retention was a big challenge faced by the health care workers.

The study also revealed that health education talks on HIV drug resistant infection were not been conducted. The study revealed that patients who were above 12 months on ART were

developing treatment failure. Health care workers scheduled patients appointments according to guidelines and extra reviews were prescribed by nurses depending on patients' conditions.

Health care workers were not aware of other challenges that contribute to poor adherence such as absorption and loss of appetite.

Heath care workers were not providing adherence counselling to all patients with treatment failure. The number of patients who collected viral load was not known by the health care workers. There was need for proper documentation. Health care workers were knowledgeable of frequently reported side effects of ARV medicines. The study also revealed that tests which were supposed to be done to all the patients on ART were not known by the health care workers. The laboratory was functioning well.

The study revealed that the occupation of the patient affected their ability to attend to the appointment dates. The study revealed that treatment failure was more in patients who reached secondary education and it was low in patients with tertiary education.

The study revealed that religion played a major role in development of HIV drug resistant infection. Patients were aware of causes and signs and symptoms of HIV drug resistant infection. HIV drug resistant was not the result of side effects of ARVs.

The study also revealed that patients delayed to receive their viral load results as a result they were switched to effective ARV medicines very late. Schedule for collection of viral load was not known by the patients.

The study revealed that standard operation procedures were available but not being followed. Patients were facing disclosure challenges to their employers due to fear of being discriminated. Patients on ART had no scheduled time to take medicines. There were patients who took medicines when they just felt like. The study revealed that there were many reasons that could have contributed to lack of honouring of the review dates. These included transport challenges and bad weather conditions such as flooding of rivers during rainy season. Apart from the above findings the study findings revealed that patients travelled long distances to access the health facilities. Not all patients were happy with the quality of the care they were receiving from the health care workers. Patients reported that health care workers were shouting them.

Lack of resources was identified by the study as challenges that would fuel developing of HIV drug resistant infection.

Lastly the study findings revealed that there were so many possible measures that may be implemented to prevent HIV drug resistant infection. The following measures were provided,

System measures which included health facilities to strengthen outreach ART programme such as ART refill in community and viral load collection. Health facility needed to have flexible appointment dates. The patients needed to be involved in selection of dates for their reviews.

Health care measures which included: provision of adherence counselling to patients at the begging of ART treatment and throughout life, community dialogue and sensitisation meetings on HIV drug resistant infection. Also the health care workers needed to be capacitated and supported with skills and knowledge on HIV drug resistant infection through in service training and workshops.

Patient study participants provided **facility measures**. It was highlighted by the patient study participants that there was need to allocate staff to OI department to improve on the effectiveness of nurses. Facility needed to have flexible appointment review dates. Patients needed to be involved in scheduling the review dates.

Patient measures were also given which included: patient nutrition was provided as a measure that would prevent HIV drug resistant infection. The local authority and Ministry of health and child care needed to come up with innovative ways that would provide food in the community such as command farming.

5.2 Conclusion

The study managed to achieve the set objectives to a greater extent. Predetermined research questions were answered. The study was conducted and completed within the set time frame. The assessment of health care knowledge on factors contributed to HIV drug resistant infection was done. Patient assessment and hospital environment were assessed. The assessment revealed that health care workers had limited knowledge on HIV drug resistant infection. Also health care workers had no HIV drug resistant guidelines that guided the provision of health care provision. Viral load results were taking long to come. The laboratory faced problems of reagents and laboratory staff were not trained to do genotyping

test which was mandatory in the diagnosis of HIV drug resistant infection. There was shortage of ARVs medicines such as Abacavir, Cotrimoxazole Tenofovir and Zidovudine. There was no literature with HIV drug resistant infection. Ministry of health and child care had no HIV drug resistant guidelines.

Nurses had limited information on HIV drug resistant infection this made it difficult to offer health education talks on HIV drug resistant infection.

Hospital environment was assessed health care workers were collecting viral load but number of the patients who had collected viral load were not known. Viral load were been collected haphazardly.

Patients were assessed on knowledge of factors contributing to HIV drug resistant: not all patients were able to explain what was meant by HIV drug resistant infection. Patients were knowledgeable of signs and symptoms of HIV drug resistant infection. Factors contributing to emerging of HIV drug resistant infection were known. Tests to detect HIV drug resistant were not known by all the health care workers

Patients were not aware when viral load needed to be monitored. Transport cost and bad weather conditions were highlighted by the patients as challenges contributing to treatment defaulting.

The study was successful because the selected study participants participated well, no one withdrew. All study participants were protected from harm. The study participants showed interest in the study because the topic was an eye opener. The study revealed their strengths and weaknesses in the health system service delivery. Also opportunities and threats in the environment were revealed.

The study provoked critical thinking amongst health care workers who were preaching gospel of ending HIV new infection by 2030 ignoring monitoring for development of drug resistant HIV infection. As this type of HIV infection may be difficult to treat. Research questions were answered.

To a lesser extend the study was affected by limited time as the researcher was on full time employment, student and household wife. There were few patients who had treatment failure and their reviews were spaced. The researcher ended visiting patients at their home places to collect data.

5.3 Recommendations

The following recommendations were made to Ministry of Health and Child Care, X district hospital executive team, local authority, patients and future researchers.

5.3.1 Ministry of health and child care

- Monitoring and evaluation officers to design adherence counselling standard operational procedures that provide comprehensive information to patients on HIV drug resistant infection.
- Monitoring and evaluation officers to review the monitoring and evaluation checklist used to monitor the implementation of HIV programme so that indicators that points to HIV drug resistant infection may be included.
- Policy makers to design HIV drug resistant infection guidelines
- Health Promotion Officers to design HIV drug resistant infection literature in all languages
- Ministry of Health and Child care director to provide budget for training of health care workers on HIV drug resistant infection

5.3.2 X District Hospital Executive Team

- Hospital management team to provide new doors to all OI consultation rooms so that privacy prevail during counselling and consultation of all patients on ART.
- District medical officer to advocate for training of health care workers on HIV drug resistant infection so that the health care workers becomes competent to health educate patient on prevent of HIV drug resistant infection and how to manage it.
- OI focal person to conduct on job training of health care workers on HIV drug resistant infection
- Matron of the hospital to come up with feedback mechanism on trainings and workshops attended by the staff on HIV drug resistant infection to ensure that new strategies that are aimed at prevention of HIV drug resistant infection are shared amongst staff.
- Health promotion officer to promote community dialogue on HIV drug resistant infection

5.3.3 Local authority

- District administrator to advocate for food supplement from NGOs, local authority and the Ministry of Health and Child Care for people living with HIV.
- Community leaders to engage in promotion of behavioural change activities such as condom promotion, health education on HIV drug resistant infection and dialogues with other stakeholders.
- Local authority to mobilise resources needed to provide quality health care service such procurement of Viral load machines, reagents and ARV medicines

5.3.4 Patients

- Patients to receive comprehensive information on HIV drug resistant infection to ensure deeper understanding of HIV drug resistant infection on what it is and how can it be prevented.
- Patients to take charge of their treatment review to overcome challenge of poor patient retention prevailing in health care facility.
- Patient to attend counselling session on subsequent visits for them to be empowered with skills necessary for disclosure
- Patient to be capacitated to join community ART refill group, family ART groups and clubs.

5.3.5 Future researcher

- There is need to identify other issues that were not identified by this study that are contributing to development of HIV drug resistant

5.3.6 Health care workers

- All health care workers to be computer literate so that they can use internet to explore content rich medical web sites so that they can access information of HIV drug resistant infection

- Health care workers to be reminded of professionalism by their mediate supervisors in order to address negative health care staff attitude which was highlighted by the study participants
- Sister in charge of the OI department to increase number of community ART support groups, community ART refill groups model, family ART refill model and clubs for young people in order to reduce distance travelled by patients to access their medicines.

5.4 Summary

This chapter summarised the study from chapter one to chapter four. Major ideas discussed on each chapter were highlighted. Major study conclusions were drawn. Recommendations directed to several stakeholders were provided.

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Appendix 1

Letter requesting permission from investigator

Midlands State University

P O Bag 9055

Gweru

28/03/2019

The District Medical Officer

Tsholotsho District Hospital

P O Box 100

Tsholotsho

Dear Madam/Sir

Ref: AN APPLICATION FOR PERMISSION TO CARRY OUT A RESEARCH STUDY AT YOUR INSTITUTION.

I am requesting for permission to conduct a research study on the health care workers and OI patients who are receiving care at OI clinic. The research topic is as follows: A study to investigate preparedness to deal with the factors contributing to the emerging of HIV drug resistance infection amongst adult patients on ART. A case study of Tsholotsho District hospital OI clinic

It is a requirement for the partial fulfilment of the Master of adult education degree that I am undertaking at Midlands State University.

I hope my request will be regarded.

Thank you in advance.

Yours faithfully

Chiratidzo Dube

Registration Number: R123970M

Letter of authority to carry out the study

Tel Nos: 0378 – 216, 204
Fax Nos. 0378 – 207

Telegraphic Address
"TSHOLOTSHOHOSP"

Tsholotsho District Hospital
Box 100
Tsholotsho
Zimbabwe
0378 -203 –

05 April 2019.

CHIRATIDZO DUBE: REG NO: R123970M

Permission is granted to conduct Research with the topic "A study investigation preparedness to deal with factors contributing to HIV drug resistant infection amongst adult patients on ART. A case study of Tsholotsho District OI clinic"

You are encouraged to share with us the findings of your study.

A/DMO M MOONGA

District Medical Officer-Tsholotsho

Appendix 3

Informed consent

A study to investigate preparedness to deal with the factors contributing to the emerging of HIV drug resistance infection amongst adult patients on ART: A case study Tsholotsho district hospital OI clinic

I**nvestigato**r: Chiratidzo Dube

Chiratidzo Dube is a student studying for master of adult education degree at Midlands State University. It is part of the training requirements to carry out a research study on any topic. The study is about preparedness to deal with factors contributing to emerging of HIV drug resistant infection amongst adult patients on ART. The procedure includes responding to questionnaires. The procedure involves no harm to you and your family

You are under the obligation to participate in the study and have the right to withdraw at any time and your decision will not affect you in any way pertaining to accessing health care service at Tsholotsho District Hospital

The information you give will be treated with strict confidentiality. Please your name will be not written on the questionnaire.

You may contact me on **0772658616**

Subject signature.....Date.....

I have explained this study to the above subject and have sought the informed consent

Investigator signature.....Date.....

QUESTIONNAIRE FOR HEALTH CARE WORKERS

A STUDY TO INVESTIGATE FACTORS CONTRIBUTING TO EMERGING OF HIV DRUG RESISTANT INFECTION AMONGST ADULT PATIENTS ON ART: A CASE STUDY OF TSHOLOTSHO DISTRICT OI CLINIC

Introduction

My name is Chiratidzo Dube. I am studying master of adult education degree at Midlands State University. The research study is conducted in partially fulfilment of the masters of adult education degree. All the information provided will be used for the completion of the project only. In this regard, may you respond to the questions asked honestly and correctly.

INSTRUCTION

The information you provide will be treated confidentially. May you not write your names on the questionnaire. Respond to questions asked below by providing appropriate answers.

Section A

Personal Data

Designation.....

Department.....

Qualification.....

Years of experience.....

SECTION B

Health care worker assessment of knowledge on HIV drug resistance

1 What is HIV drug resistant Infection?

.....

.....

.....

2 Do you know the causes of HIV drug resistance infection? YES / NO

If YES, state the causes

.....

.....

.....

3 Do you know the signs and symptoms of HIV drug resistance infection? YES/NO

If YES, list the signs and symptom below:

.....

.....

.....

4 How often do you monitor viral load of HIV patient on ART?

Indicate your answer on the YES/NO column

Answer	YES	NO
On the day a client is tested HIV positive		
When we start ART medicines		
AT 3 Months on treatment		
6months after starting ART medicine		
After 12months on treatment then yearly		

5 How can HIV drug resistant infection be detected?

.....

.....

.....

.....

6 Can HIV drug resistant infection be prevented? YES/NO

If YES, how can it be prevented?

.....

.....

.....

.....

7 Are there any health care workers trained on 2016-2020 Strategy?

YES	
NO	
NOT SURE	

If YES how many were trained?

.....

.....

If NO, who is assisting you to implement the strategy?

.....

.....

8 In your own opinion why are patients failing on first line medicines?

.....

.....

.....

9 In the past 12 months did you encounter shortage of antiretroviral medicines?

If YES, which commodities were out of stock?

.....

.....

.....

10 Do you have access to literature with drug resistance information? YES/NO

If YES, which information do you have on HIV drug resistance infection?

.....

.....

11 Do you have HIV drug resistant guidelines? YES/NO

If NO, what is your reference source?

.....

.....

.....

SECTION C

Patient assessment

1 At what point of care are you diagnosing treatment failure?

TICK ( ) on the appropriate box below:

Before starting ART	
At 3months on ART	
At 6months on ART	
At 12 months	
Above 12 months	

2 Are you facing client retention challenges?

If yes, what are the challenges?

.....

.....

.....

.....

3 Do you give health education to patient on HIV drug resistance infection? YES /NO

If YES, how often do you conduct Health education talks on HIV drug resistance infection?

.....

.....

If NO, why are you not conducting Health education Talks on HIV drug resistance Infection

.....

.....

.....

(Verify *with health education registers*)

4. Which cohort of patients is presenting with treatment failure?

Tick on appropriate answer below:

Newly diagnosed	
3months on ART	
6months on ART	
6-12months on ART	
12-24 months	
➢ 24months	

5 What are the commonly highlighted challenges contributed to treatment failure at your facility?

Tick on appropriate answer below:

Poor adherence	
Poor absorption	
Loss of appetite	
Diarrhoea	
Vomiting and nausea	
None of the above	

.....

.....

.....

6 How often do you review clients with high viral load results?

.....

.....

.....

.....

(Verify with ten patient care booklets of patients with high viral load)

7 Do you provide adherence counselling to OI patients?

YES/NO

If YES, how often are you providing adherence counselling at your facility?

.....

.....

8 Do you have patients with high viral load on second line of antiretroviral medicines? YES/ NO

If YES, how many patients with high viral load are on second line of antiretroviral medicines?

.....

.....

If NO, what measures are in place to ensure good adherence?

.....

.....

Hospital environment process assessment

1. Do you have clients on second line ART regime? YES/NO

If YES, how many did you collect viral load in the past 18months

.....

.....

.....

2 Which side effects of antiretroviral medicines were reported by clients who failed 1st line regime?

.....

.....

.....

.....

3 How long do you take to switch patients with high viral load to another regimen?

.....

.....

4 Do you have anyone who is trained to switch patients to second line? Yes/NO

If NO, Who does the switch?

.....

.....

5 Do you have a functional laboratory?

If yes, which investigations are done to patients on antiretroviral medicines?

.....

.....

.....

.....

THANK YOU FOR YOUR PARTICIPATION.

STAY BLESSED

QUESTIONS FOR UNSTRUCTURED INTERVIEW FOR ADULT PATIENTS ON ARV TREATMENT

Introduction

My name is Chiratidzo Dube. I am studying master of adult education degree at Midlands State University. The research study is conducted in partially fulfilment of the masters of adult education degree. All the information provided will be used for the completion of the project only. In this regard, may you respond to the questions asked honestly and correctly. You are allowed to terminate participation at any given time.

SECTION A

PERSONAL DATA

Age Occupation

Period on ART Level of education

Religion

SECTION B

1 Do you know the meaning of HIV drug resistant infection? YES/NO

If yes what is HIV drug resistant infection

.....

.....

.....

2 Do you know the causes of HIV drug resistant infection? YES/NO

If YES, what are the causes?

.....

.....

.....

.....

.....

3 Do you know the signs and symptoms of HIV Drug resistant infection? YES/NO

If YES, What are the signs and symptoms?

.....

.....

.....

.....

4 Have you ever experienced side effects of ARV? YES/NO

If YES, What were the side effects?

.....

.....

.....

.....

5 What factors do you think could have contributed to your treatment failure?

.....

.....

.....

.....

6 How long does it take to receive Your Viral load result?

Tick on the appropriate box

2 weeks	
1 Month	
2Months	
3Months	
6 Months	

7 How often is your Viral Load Monitored?

.....

.....

.....

.....

8 Did you ever counselled on importance of good adherence? YES/NO

If YES, when?

.....

.....

.....

9 Did you disclosure your HIV status to anyone? YES/NO

If YES, to WHO?

.....

.....

If NO , Why?

.....

.....

10 Do you have specific time to take your medicines? YES/NO

If YES, what reminds you to take your medicines?

.....

.....

11 Do you face challenges with keeping appointment dates? YES/NO

If YES, What were the challenges?

.....

.....

.....

12 Did you ever default treatment? YES/NO

If YES what were the reasons?

.....

.....

.....

.....

13 How long do you travel to access your ARV medicines?

.....

.....

.....

14 Do you like the treatment you receive from HCW during your review time? YES/NO

If NO, what do you not like?

.....

.....

.....

15 What do you think can be done to prevent treatment failure?

.....

.....

.....

.....

THANK YOU FOR YOUR PARTICIPATION