



RISK FACTORS ASSOCIATED WITH ARV TREATMENT FAILURE AMONG PEOPLE LIVING WITH HIV IN HIWOT FANA SPECIALIZED UNIVERSITY HOSPITAL

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Abstract

This paper presents the findings of a study conducted to analyze the reasons for taking antiretroviral medications among patients living with HIV and their association with treatment outcomes in Ethiopia. The study focused on understanding adherence patterns, the stage of HIV infection, duration of antiretroviral therapy (ART), viral load levels, and treatment regimens among patients. The majority of patients in the study initiated antiretroviral therapy based on their CD4 count, in line with current HIV treatment guidelines. Adherence to antiretroviral medications was found to be critical for achieving viral suppression and preventing drug resistance. Furthermore, the study revealed that a significant proportion of patients initiated antiretroviral therapy at a later stage of HIV disease, highlighting the importance of strategies to improve early diagnosis and promote early initiation of ART to improve health outcomes. Monitoring viral load levels after the start of ART was crucial in assessing treatment effectiveness. The study also found that the majority of patients were on first-line treatment, while a small proportion required second-line treatment due to treatment failure or drug resistance. However, some patients experienced side effects, suggesting the need for research into strategies to mitigate these effects and promote adherence. In conclusion, this study underscores the importance of patient adherence to antiretroviral medications for successful HIV treatment. The findings emphasize the need for early diagnosis, timely initiation of ART, and regular monitoring of patients' health to achieve and maintain optimal health outcomes among those living with HIV.

Keywords: Antiretroviral medications; Adherence; HIV treatment; viral load; Treatment outcomes

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1.0 INTRODUCTION

Human Immunodeficiency Virus (HIV) remains one of the most significant global health challenges, with over 38 million people living with the virus worldwide as of 2019 (Lalhrumawii, et al., 2022). The advent of Antiretroviral (ARV) therapy has significantly improved the quality of life and survival rates for People Living with HIV (PLHIV) by effectively suppressing viral replication and restoring immune function (Mwamuye, 2022). However, despite these remarkable advancements, ARV treatment failure continues to hinder successful HIV management, leading to increased morbidity and mortality rates (Nastri et al., 2023).

Hiwot Fana Specialized University Hospital, located in Harar, Ethiopia, plays a crucial role in providing comprehensive HIV care and treatment services to a significant number of PLHIV in the region. While the hospital has made substantial

progress in expanding access to ARV therapy, it faces challenges in identifying and addressing the risk factors associated with treatment failure among its HIV-positive population. Therefore, investigating the factors contributing to ARV treatment failure is of paramount importance to enhance the effectiveness of the hospital's HIV management program and improve the overall health outcomes of PLHIV in the region.

This paper aims to systematically analyze and identify the risk factors associated with ARV treatment failure among PLHIV attending Hiwot Fana Specialized University Hospital. By identifying these factors, healthcare providers can tailor interventions and strategies to mitigate treatment failure risks and enhance treatment adherence. Furthermore, the findings of this study may have broader implications for HIV management programs in Ethiopia and other resource-limited settings with similar healthcare challenges.

To achieve these objectives, we will conduct a retrospective cohort study using data from the hospital's HIV treatment database. The study will encompass a comprehensive analysis of various demographic, clinical, and behavioral factors that may influence ARV treatment outcomes. By shedding light on the specific risk factors impacting treatment failure, this research endeavors to make valuable contributions to the field of HIV care and treatment in resource-constrained settings.

2.0 METHODOLOGY

2.1 Study Area and Period

The Hiwot Fana Specialized University Hospital, in East Hararge, Ethiopia hosted the study. The hospital's primary area of expertise was general medicine. The hospital's advantage was that it had been a teaching hospital until 2011, when it changed to becoming a regional hospital serving the eastern section of the nation. Additionally, it provided specializations that small clinics could not offer health care services to those residing in and around the village of Baite, where there was considerable unemployment (between 75 and 80 percent), and many of the underprivileged depended on farming as a source of income. The study was carried out from September to December 2022.

2.2 Study design, Target population, Inclusion and exclusion criteria and Sample Size calculation

The source population consisted of medical files of HIV-positive children who had enrolled for Antiretroviral Therapy (ART) at the Hiwot Fana Specialized University Hospital. The research population comprised medical records of HIV-infected children and adolescents who had received ART for at least six months at the aforementioned study site. All medical records of HIV-positive children and adolescents who had received ART at the Hiwot Fana Specialized University Hospital for at least six months were included, while those lacking complete information on their haemoglobin (Hgb) levels, CD4 count, WHO clinical stage, ART adherence, type of regimen, weight, height, or age were excluded.

To determine the appropriate sample size, the researchers utilized the single population proportion formula $[(Z/2)^2 * p * (1 - p)] / d^2$, making assumptions of a 95% confidence interval

(CI), a marginal error (d) of 5%, $Z/2 = 1.96$, and a population proportion (P) of 50%. After calculating the initial sample size, the necessary total sample size was determined using the correction formula $(Nf = n / (1 + n/N))$. Subsequently, patients who met the inclusion criteria and had complete charts at the time of data collection were selected using simple random sampling method.

2.3 Data Collection Method and Study Variables

Structured questionnaires were utilized to collect data for the study, which were adapted from the 2014 National Guidelines for Comprehensive HIV Prevention, Care, and Treatment published by the Ethiopian Federal Ministry of Health. Additionally, the gadget used for data collection was modified based on the children and adolescents' ART monitoring record book.

The study gathered the following information from the patients' medical records:

1. Haemoglobin (Hgb) value
2. CD4 cell count
3. Type of ART regimens used
4. WHO clinical stages
5. Tuberculosis (TB) screening results
6. ART adherence
7. Other clinical characteristics at baseline and after ART initiation

In this study, treatment failure was considered the dependent variable, while the independent variables included age, sex, religion, and sociodemographic characteristics of the children and adolescents. Moreover, medical conditions and laboratory data, such as CD4 cell count, WHO clinical stages, and presence of opportunistic infections, were also treated as independent variables. Furthermore, the type of ART regimens administered to the patients and the year of ART initiation were included as independent variables in the analysis.

2.4 Data quality control, Data Processing and Analysis

The questionnaire was pre-tested on 5% of respondents who were not participants in the actual study, using an appropriate design to validate the results. Data collectors underwent comprehensive training before commencing the real data collection, and the questionnaire was carefully examined and verified for accuracy. Throughout the data collection process, the main investigator oversaw the procedure and provided

daily guidance to the data collectors. Advisors were also involved to ensure the integrity and approval of the entire research workflow.

After data collection, a thorough cleaning process was performed, and the data were entered into Epi-info version 3.5.3. Subsequently, the information was transferred to statistical analysis software, specifically the Statistical Package for Social Science (IBM Corporation, Armonk, NY, USA) version 20.

Descriptive statistics, presented in tables, were employed to describe the characteristics of the research participants. To identify variables associated with treatment failure, a bivariable binary logistic regression model was developed. The model's goodness-of-fit was assessed using the Hosmer-Lemeshow goodness-of-fit test.

To control for potential confounders, predictor variables with a p-value of less than or equal to 0.2 in the bivariable analysis were included in the multi-variable analysis. The degree of relationship between the variables was determined by calculating the crude odds ratio (COR) and adjusted odds ratio (AOR), along with their corresponding 95% confidence intervals (CI).

In the multi-variable regression model, a p-value equal to or below 0.05 was considered statistically significant, indicating the presence of a significant association between the predictor variables and treatment failure.

2.5 Ethical Considerations

The study was conducted only after obtaining approval for the research protocol from the Ethical Review Committee. Additionally, a permission letter was sought from the chief clinical director of the Hiwot Fana Specialized University Hospital, granting access to the medical records for the study.

To ensure the confidentiality of participants, all information obtained from them was coded. Since the study involved a retrospective analysis of medical records and not direct interaction with the participants, a consent waiver to participate in the study was obtained from the ethical review board. This meant that formal written consent from individual participants was not required, as the data collected were anonymized, and the privacy of the patients was upheld.

Throughout the research process, the study strictly adhered to ethical principles and guidelines, safeguarding the rights and well-being of the participants while maintaining the confidentiality of their information.

3.0 RESULTS

3.1 BASELINE ART INFORMATION AND CLINICAL CHARACTERISTICS

3.1.1 Reasons for taking ARTs

The study surveyed a total of 331 people living with HIV at Hiwot Fana Specialized University Hospital in East Hararge Ethiopia. The reasons for patients taking antiretroviral medications were analyzed and categorized into four groups. The CD4 only group had the highest percentage of respondents, with 54.98% of the total. The next most common group was clinical and CD4, which represented 32.63% of the respondents. The viral load only group represented 9.37% of the respondents, while the clinical only group represented the smallest proportion of respondents, with only 3.02% of the total. These results indicate that the majority of the patients were taking antiretroviral medications based on their CD4 count, while a smaller proportion were taking the medications based on a combination of their clinical condition and CD4 count or viral load. A very small proportion were taking the medications based solely on their clinical condition (Figure 1).

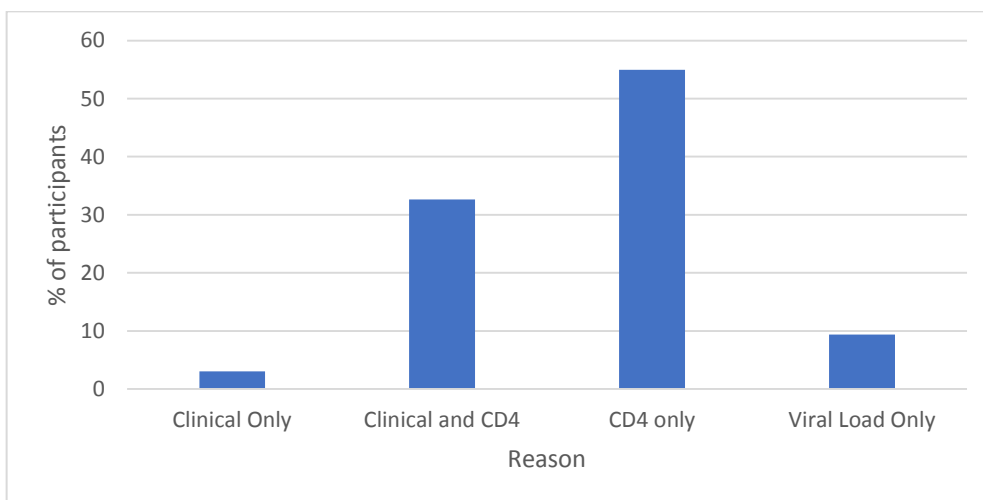


Figure 1: Figure of the various reasons for taking ARTs

3.1.2 CD4 count of participants

The 350-499 cells/mm group had the highest percentage of respondents, with 35.95% of the total. The next most common group was the 200-349 cells/mm group, which represented 32.93% of the respondents. The at or <250 after clinical failure group represented 10.57% of the respondents, while the 100-200 cells /mm group and the <100 cells/mm group represented 10.88% and 5.14% of the respondents, respectively. The

>500 cells/mm group represented the smallest proportion of respondents, with only 4.53% of the total. These results indicate that the majority of the patients had a CD4 count between 350-499 cells/mm, with a smaller proportion having a CD4 count between 200-349 cells/mm, and an even smaller proportion having a CD4 count below 200 cells/mm. Only a small proportion of patients had a CD4 count above 500 cells/mm (Figure 2).

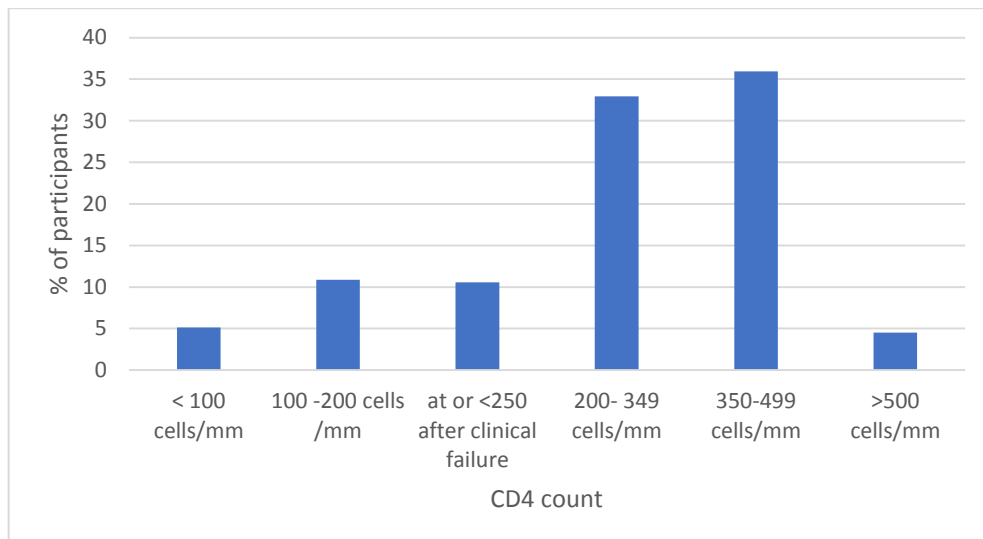


Figure 2: CD4 count of all participant

3.1.3 WHO HIV stage of participants at time of ART treatment initiation

The stage of HIV infection among the patients was analyzed and categorized into four groups based on the WHO categories. The majority of the patients were in stage one (78.2%). The next most common stage was stage two, representing 14.5% of the patients. A smaller proportion of patients were in stage three (5.1%), while the smallest proportion of patients were in stage four (2.1%) (Figure 3.12). These results indicate that the

majority of the patients were in the early stages of HIV infection, with only a small proportion of patients being in the later stages of the infection.

3.1.4 Viral load at initiation, three months and six months

The viral load among patients after the start of antiretroviral therapy (ART) was analyzed and categorized into four groups based on the results of the viral load tests conducted at initiation, 3 months, and 6 months. The majority of patients

had a viral load between 50-999 c/ml at all three time points, with percentages ranging from 87.92% to 92.75%. The next most common viral load category was >1000 c/ml, which represented 9.97%, 6.04%, and 4.23% of patients at initiation, 3 months, and 6 months, respectively. Only a very small proportion of patients had a viral load below 50 c/ml at the three time points. The unknown viral load category, representing patients whose viral load test results were not available,

accounted for a small proportion of patients at each time point. These results indicate that the majority of patients had a detectable viral load after the start of ART, with only a small proportion achieving an undetectable viral load. However, there was a decrease in the percentage of patients with a viral load >1000 c/ml over time, indicating that ART was effective in suppressing viral replication in a majority of patients (Figure 3).

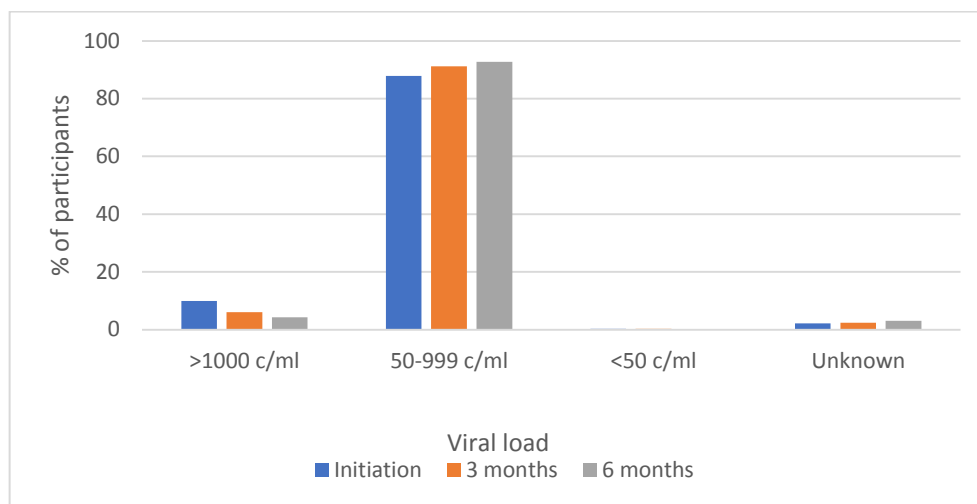


Figure 3: Viral load at the initiation of treatment, 3-months and 6-months after ART treatment

3.1.5 Months on ART treatment and Medication that patients/participants have been prescribed

The duration of time patients had been taking antiretroviral therapy (ART) was analyzed and categorized into three groups. The majority of patients (68%) had been taking ART for more than 12 months. The next most common duration group was 6-12 months, representing 30.2% of patients. Only a very small proportion of patients (1.8%) had been taking ART for less than 6 months.

These results indicate that the majority of patients had been taking ART for a relatively long period of time, with a smaller proportion having been on ART for a shorter duration. This suggests that the patients have been consistently accessing and adhering to ART, which is important for achieving optimal health outcomes. Out of the total 331 respondents, the majority (99.70%) had no prior exposure to ART, while only one patient (0.30%) had prior exposure through post-exposure prophylaxis.

The majority of patients (93.05%) were on first line treatment, which is typically the initial treatment regimen prescribed to patients with HIV. A smaller proportion of patients (6.95%) were on second line treatment, which is used when patients experience treatment failure or develop drug resistance to their initial treatment. No patients

were on third-line treatment, which is typically used as salvage therapy for patients who have developed resistance to both first and second-line treatments.

3.1.6 Adherence to ART treatment regimen

The majority of patients (89.43%) had good adherence to their ART treatment, indicating that they were taking their medications as prescribed. A smaller proportion of patients (9.06%) had fair adherence, indicating that they missed some doses of their medications. Only a small proportion of patients (1.51%) had poor adherence, indicating that they were not taking their medications as prescribed.

These results indicate that the majority of patients were adherent to their ART treatment, which is important for achieving viral suppression and improving overall health outcomes. However, there is still a proportion of patients who had fair or poor adherence, which can lead to treatment failure, drug resistance, and disease progression. It is important for healthcare providers to monitor and address adherence issues to ensure optimal treatment outcomes.

3.1.7 Occurrence of opportunistic infections among HIV patients

The prevalence of opportunistic infections among patients was analyzed and categorized into four groups: tuberculosis, bacterial pneumonia, skin infections, and none. The majority of patients (61.03%) did not have any opportunistic infections. Skin infections were the most prevalent opportunistic infection, affecting 26.59% of patients. Bacterial pneumonia was present in 7.55% of patients, while tuberculosis was present in 4.23% of patients (Figure 4).

These results indicate that a significant proportion of patients had opportunistic infections, which can worsen the prognosis of HIV and AIDS. It is important for healthcare providers to identify and treat opportunistic infections in a timely manner to improve patient outcomes. Additionally, measures to prevent and reduce the incidence of opportunistic infections, such as vaccination and infection control practices, should be implemented

to improve the overall health of patients with HIV/AIDS. Out of the total 331 respondents, only a small proportion of patients (3.02%) had a history of past TB treatment, while the majority of patients (96.98%) did not have a history of past TB treatment.

These results indicate that the majority of patients did not have a history of past TB treatment, suggesting that they were not co-infected with TB at the time of their HIV diagnosis or that they were treated and cured of TB prior to the HIV diagnosis. However, a small proportion of patients had a history of past TB treatment, highlighting the importance of screening and managing co-infections among patients with HIV. It is essential to identify and treat TB in patients with HIV as TB is a major cause of morbidity and mortality in this population.

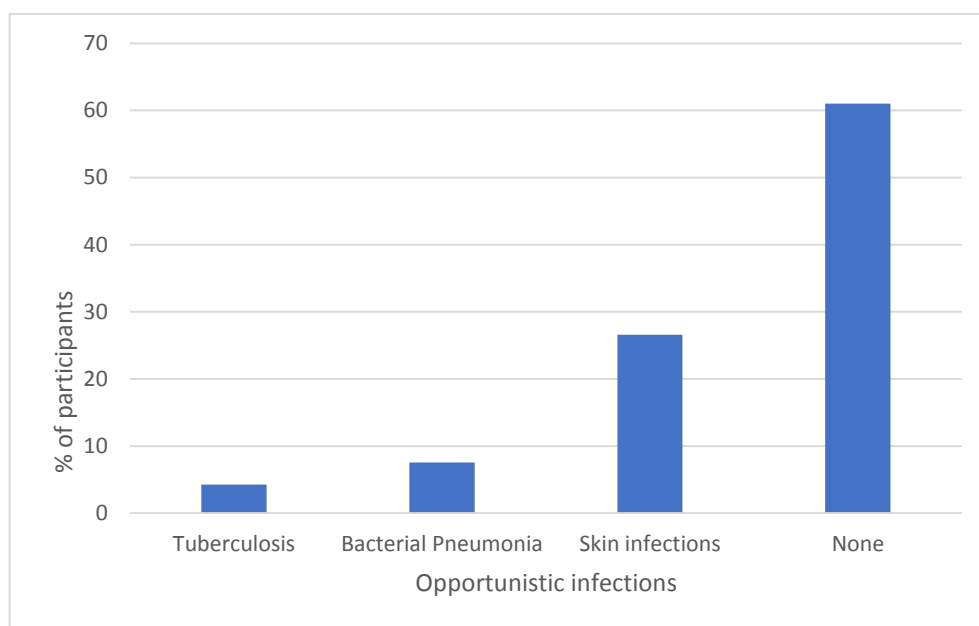


Figure 4: Prevalence of opportunistic infections among patients/participants

3.2 ASSOCIATION WITH RISK FACTORS THAT CONTRIBUTE TO TREATMENT FAILURE.

3.2.1 Reasons for taking ARTs

The majority of patients (62.54%) reported that they were taking ART because their doctor told them to. Another common reason for taking ART

was to avoid getting symptoms of HIV, reported by 25.68% of patients. A smaller proportion of patients (11.48%) reported that they were taking ART to get cured of HIV. Only a very small proportion of patients (0.30%) reported that they did not know why they were taking ART (Figure 5).

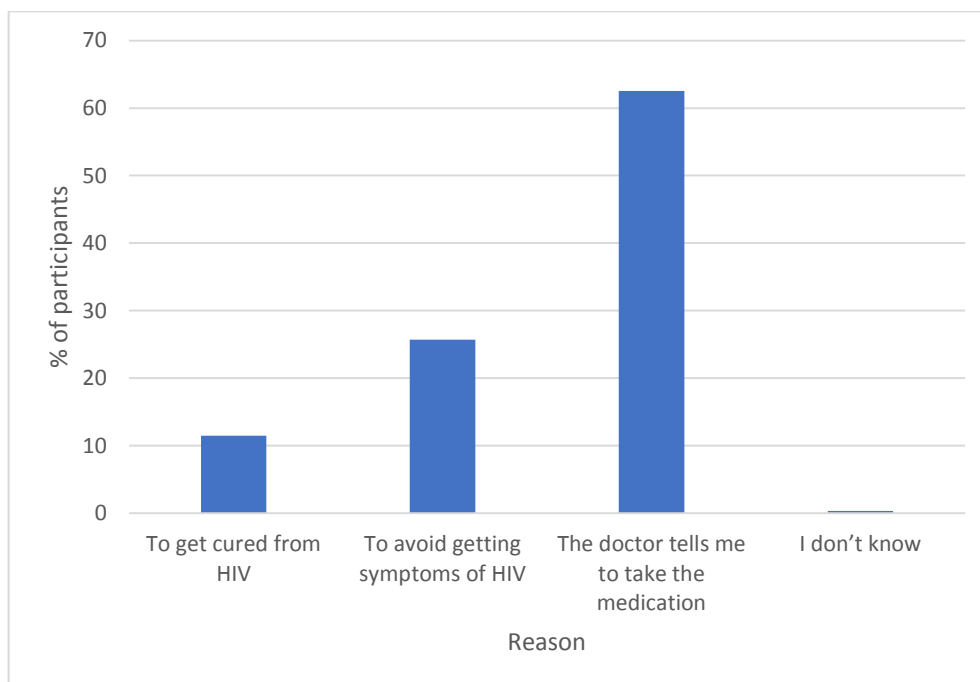


Figure 5: Reasons given by participants for taking ARTs

3.1.2 Health of patients after taking ARVs and Symptoms experienced by patients after 6 months of ART treatment

The health status of patients after the start of antiretroviral (ARV) treatment was analyzed and categorized into four groups: worse, the same, better, and much better. The majority of patients (87.31%) reported that their health had improved after starting ARV treatment, while only a small proportion of patients (1.51%) reported that their health had worsened. A smaller proportion of patients (6.95%) reported that their health status had remained the same, while a very small proportion of patients (4.23%) reported that their health had significantly improved.

The study data analyzed various symptoms reported by patients while taking ART. These symptoms were categorized into seven groups: nausea, vomiting, diarrhea, abdominal pain, rashes/skin lesions, dizziness, and other symptoms. The most common symptom reported by patients was abdominal pain, which was reported by 34.14% of patients. Nausea was the second most commonly reported symptom, affecting 26.89% of patients. Vomiting was reported by 15.71% of patients, while only a small proportion of patients reported diarrhea (3.02%) or rashes/skin lesions (1.51%). Dizziness was reported by 7.55% of patients. The remaining symptoms were grouped as "other," which affected 22.66% of patients.

3.2.3 Reasons why some patients don't take their medication and Knowledge on consequence of non-adherence to HIV medication

The majority of patients who did not take their medication (88.82%) reported other reasons, which were not specified in the study data. This suggests that there may be a range of factors influencing medication adherence that are not captured in the study. However, a smaller proportion of patients reported specific reasons, such as simply forgetting (8.76%) and experiencing side effects (4.23%). Only a very small proportion of patients reported not having enough pills (0.60%) or not having access to the clinic to get pills (0.91%).

Patients were asked to choose from four options: "The symptoms of HIV may return/increase," "The HIV drugs can stop working," "My heart will stop working," or "I don't know." The majority of patients (73.11%) reported that the symptoms of HIV may return or increase if they do not take their medications regularly. A smaller proportion of patients (12.99%) reported that the HIV drugs can stop working if they do not take them regularly. Only a very small proportion of patients (0.60%) reported that their heart will stop working if they do not take their medications regularly, and a small proportion (13.29%) reported that they do not know what will happen (Figure 6).

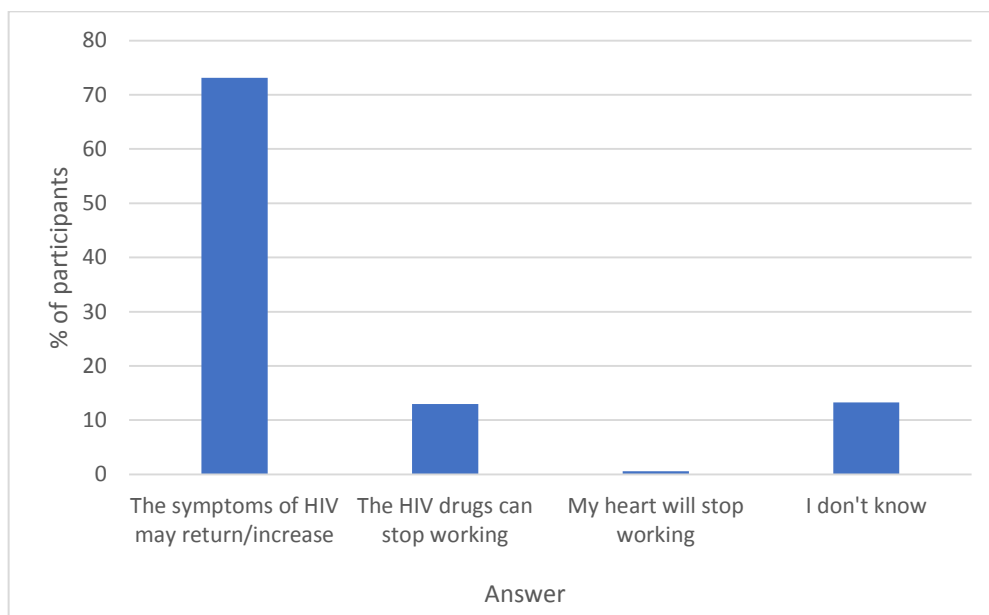


Figure 6: Knowledge on consequence of non-adherence to HIV medication

3.2.3 Associated symptoms experienced by patients

The patients were asked if they had experienced any of the following symptoms: chest pain, hypersensitivity or allergic reaction, bilateral flank pain. Patients had the option to respond "None of the above." The majority of patients (77.95%) reported that they had not experienced any of the listed symptoms. Among those who reported symptoms, chest pain was the most commonly reported (18.43%), followed by hypersensitivity or allergic reaction (2.42%) and bilateral flank pain (1.21%). The patients were also asked if they smoke or drink alcohol. In response to the question about smoking, 58 patients (17.52%) reported that they currently smoke, while 243 patients (73.41%) reported that they do not smoke. Additionally, 30 patients (9.06%) reported that

they used to smoke in the past. In response to the question about alcohol consumption, 27 patients (8.16%) reported that they currently drink alcohol, while 287 patients (86.71%) reported that they do not drink alcohol. Additionally, 17 patients (5.14%) reported that they used to drink alcohol in the past.

3.2.4 Causes of treatment failure

The figure below shows the cause of HIV treatment failure among the participants in the study. Out of the 331 participants, 304 (91.8%) did not experience any failure of their HIV treatment. However, a small proportion of the participants, 13 (3.9%), experienced virological failure, 6 (1.8%) experienced immunological failure, and 8 (2.4%) experienced clinical failure (Figure 3.36).

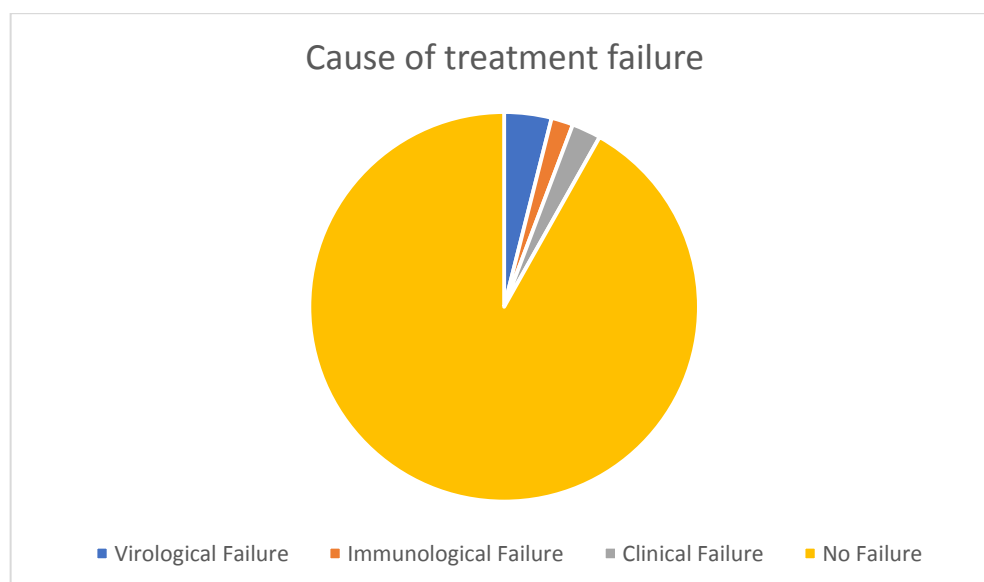


Figure 7: Cause of treatment failure among HIV patients

4.0 DISCUSSION

The analysis of reasons for taking antiretroviral medications found that the majority of the patients were taking the medications based on their CD4 count, while a smaller proportion were taking the medications based on a combination of their clinical condition and CD4 count or viral load. These findings are consistent with current HIV treatment guidelines, which recommend initiating antiretroviral therapy based on CD4 count or viral load (Pérez Molina et al., 2023). However, it is important to note that adherence to antiretroviral medications is critical for achieving and maintaining viral suppression and preventing the development of drug resistance (Meireles et al., 2023; Brattgård et al., 2022). Poor adherence is a common issue among people living with HIV, and can lead to treatment failure and increased risk of HIV transmission (SeyedAlinaghi et al., 2023). The findings of this study highlight the need for strategies to improve adherence to antiretroviral medications among patients living with HIV, such as patient education and counselling, adherence support services, and simplified treatment regimens (UNAIDS, 2021).

The majority of the patients had a CD4 count between 350-499 cells/mm, with a smaller proportion having a CD4 count between 200-349 cells/mm, and an even smaller proportion having a CD4 count below 200 cells/mm. These findings suggest that a significant proportion of patients may be initiating antiretroviral therapy at a later stage of HIV disease, which can lead to increased risk of opportunistic infections and mortality (UNAIDS, 2021). Early initiation of antiretroviral therapy is crucial for achieving and maintaining good health outcomes for people living with HIV (Hung et al., 2022; Toska et al., 2023). HIV treatment guidelines recommend initiating antiretroviral therapy as soon as possible after diagnosis, regardless of CD4 count, in order to achieve viral suppression and reduce the risk of HIV transmission (Sarigül Yıldırım et al., 2023). The findings of this study underscore the need for strategies to improve early diagnosis of HIV and promote early initiation of antiretroviral therapy among patients living with HIV, such as expanding access to HIV testing and treatment services, increasing public awareness about the importance of HIV testing and treatment, and addressing structural barriers to accessing care (Eaton et al., 2022).

The analysis of the stage of HIV infection among patients found that the majority of the patients were in stage one, with a smaller proportion of patients being in stage two, three, and four. These findings suggest that a significant proportion of patients may have been diagnosed early and initiated antiretroviral therapy promptly, which is important for achieving and maintaining good health outcomes. Early diagnosis and treatment of HIV is crucial for improving health outcomes and preventing transmission of the virus (Gandhi et al., 2023). The WHO clinical staging system is a useful tool for assessing the severity of HIV infection and guiding treatment decisions, as it takes into account both the clinical and immunological status of the patient (WHO, 2022). However, it is important to note that the stage of HIV infection may not always accurately reflect the clinical status of the patient. Some patients may have advanced disease despite having a relatively high CD4 count, while others may have minimal symptoms despite having a low CD4 count (WHO, 2022). Therefore, clinical and laboratory monitoring of patients living with HIV is essential for ensuring timely and appropriate management of the disease.

The analysis of the duration of time patients had been taking ART found that the majority of patients had been taking ART for more than 12 months. This suggests that the patients have been consistently accessing and adhering to ART, which is important for achieving optimal health outcomes. Adherence to ART is crucial for viral suppression and preventing drug resistance, which can lead to treatment failure and increased morbidity and mortality (Lai., 2023). The findings also indicate that the vast majority of patients (99.7%) had no prior exposure to ART, which suggests that access to ART in the study setting may still be limited. This is consistent with previous research indicating that many people living with HIV in low- and middle-income countries still lack access to ART, despite global efforts to scale up treatment (Burke et al., 2023). Ensuring universal access to ART is critical for achieving the global targets of 90-90-90 by 2020 and ending the AIDS epidemic by 2030 (Frescura et al., 2022). This requires not only increasing the number of people who are initiated on ART but also ensuring that they remain on treatment and achieve viral suppression. To achieve this, efforts to strengthen health systems, improve adherence support, and address barriers to access and retention in care are needed (UNAIDS, 2019).

The analysis of viral load levels among patients after the start of ART found that the majority of patients had a detectable viral load, with only a small proportion achieving an undetectable viral load at the three time points. However, there was a decrease in the percentage of patients with a viral load >1000 c/ml over time, indicating that ART was effective in suppressing viral replication in a majority of patients. These findings highlight the importance of regular monitoring of viral load levels among patients receiving ART. Viral load monitoring is critical for assessing the effectiveness of ART in suppressing viral replication, detecting treatment failure and drug resistance, and guiding treatment decisions (Boyce et al., 2022). In addition, viral load monitoring can also help to identify patients who may benefit from adherence support and interventions to improve treatment outcomes (Laurenzi et al., 2022). It is worth noting that achieving an undetectable viral load is a key goal of HIV treatment, as it is associated with improved clinical outcomes and reduced transmission risk (Liu et al., 2022).

The finding that the majority of patients were on first-line treatment aligns with the standard protocol for treating HIV. First-line treatment is the recommended initial treatment for patients with HIV, as it is typically effective and well-tolerated. The small proportion of patients on second-line treatment is also consistent with previous studies, which have reported that approximately 5-15% of patients require second-line treatment due to treatment failure or drug resistance. A study reported that 89.5% of patients were on first-line treatment, while 10.5% were on second-line treatment (Katgı et al., 2022). These findings are similar to the current study, which reported that 93.05% of patients were on first-line treatment, while 6.95% were on second-line treatment. Overall, the findings of the current study are consistent with previous research conducted in Ethiopia and elsewhere, indicating that first-line treatment is the most commonly prescribed treatment regimen for patients with HIV, while a small proportion of patients require second-line treatment due to treatment failure or drug resistance. These findings highlight the importance of early diagnosis and access to effective treatment regimens for patients with HIV.

The high percentage of patients with good adherence to ART treatment in this study is

encouraging, as good adherence is essential for achieving optimal health outcomes and preventing the development of drug resistance. These findings are consistent with other studies conducted in Ethiopia, which have also reported high levels of adherence among patients on ART (Sefah et al., 2022; Asaolu et al., 2022). However, it is important to note that some patients in this study had fair or poor adherence, which may be associated with a higher risk of treatment failure and the development of drug resistance. Efforts to improve adherence to ART treatment among patients should focus on addressing the barriers to adherence, such as medication side effects, stigma, and lack of social support. Strategies such as patient education, counselling, and reminder systems have been shown to be effective in improving adherence among patients on ART (Pugh et al., 2022). Regular monitoring of adherence and timely interventions to address non-adherence are also important for ensuring optimal health outcomes among patients with HIV.

The findings of this study suggest that the majority of patients living with HIV in this particular setting do not have opportunistic infections, which is a positive outcome of effective antiretroviral therapy. The prevalence of tuberculosis in this study was relatively low compared to other studies in Ethiopia, which have reported higher rates of tuberculosis co-infection among people living with HIV (Getaneh et al., 2022). The relatively low prevalence of tuberculosis in this study may be due to the fact that patients were receiving effective antiretroviral therapy, which is known to reduce the incidence of tuberculosis in people living with HIV (Abdool Karim et al., 2011). Overall, the findings of this study suggest that effective antiretroviral therapy is being provided to patients living with HIV in this particular setting, as evidenced by the low prevalence of opportunistic infections and the high proportion of patients with good adherence to their treatment regimen. However, further research is needed to understand the factors contributing to the prevalence of skin infections and to continue efforts to reduce the incidence of tuberculosis among people living with HIV in this and other settings in Ethiopia.

4.3 Association with risk factors that contribute to treatment failure.

The finding that a significant proportion of patients reported taking ART to avoid getting symptoms of HIV is also consistent with previous studies. A study conducted in South Africa found

that fear of developing symptoms was one of the main reasons for initiating ART among patients (Huber et al., 2023). This highlights the importance of patient education and counseling on the benefits of early ART initiation. Overall, the study provides insights into the reasons for ART initiation among patients in Ethiopia. However, further studies with larger sample sizes are needed to confirm these findings and to identify additional factors that may influence ART initiation and adherence. The finding that the majority of patients reported improved health after starting ARV treatment is consistent with previous studies conducted in Ethiopia and elsewhere. A study conducted in southern Ethiopia found that the majority of patients reported improved health after starting ARV treatment (Barata et al., 2023). Similarly, a study conducted in South Africa found that the majority of patients reported improvements in their general health, as well as a reduction in HIV-related symptoms, after starting ARV treatment (Steinert et al., 2022). The small proportion of patients who reported worsened health after starting ARV treatment could be due to a number of factors, such as side effects of the medication or other underlying health conditions. It is important for healthcare providers to monitor patients for any adverse effects of ARV treatment and adjust their treatment regimen as needed. The findings of this study indicate that patients on ART in the study area commonly experience abdominal pain, nausea, and vomiting as side effects of the medication. These findings are consistent with studies conducted in other parts of Ethiopia and in other low-income countries. For example, a study conducted in Northern Ethiopia found that nausea, vomiting, and abdominal pain were among the most commonly reported side effects of ART (Mulisa et al., 2022). It is important to note that the prevalence of side effects may vary depending on factors such as the specific medications used, the patient's age and health status, and the duration of treatment. Therefore, it is essential for healthcare providers to monitor patients closely for side effects and to provide appropriate management when necessary. Overall, these findings highlight the need for continued research into effective strategies to mitigate the side effects of ART, particularly in resource-limited settings. This can include the use of alternative medications, dose adjustment, and supportive care to manage symptoms. The finding that the majority of patients in this study reported taking their HIV drugs once a day is consistent with other studies conducted in Ethiopia and elsewhere.

The finding that the majority of patients in the study sample kept their HIV medication in the original package or tin is consistent with other studies that have reported high levels of adherence to medication packaging recommendations among people living with HIV/AIDS in Ethiopia (Belay et al., 2022). Keeping medication in the original package or container is an important aspect of medication adherence and has been linked to improved health outcomes among people living with HIV/AIDS (Lima et al., 2017). This finding highlights the need for continued efforts to promote and reinforce the importance of medication packaging adherence among patients living with HIV/AIDS.

The finding that the majority of patients in this study (73.11%) reported that the symptoms of HIV may return or increase if they do not take their medications regularly is consistent with other studies in Ethiopia and other resource-limited settings. Similarly, a study conducted in Uganda found that the fear of treatment failure and the return of HIV-related symptoms were major motivators for adherence to ART among patients (Alhassan et al., 2022). The finding that only a small proportion of patients (12.99%) in this study reported that the HIV drugs can stop working if they do not take them regularly may indicate a lack of knowledge or understanding among patients about the development of drug resistance. This highlights the need for improved patient education and counseling about the importance of adherence to prevent the development of drug resistance.

The findings suggest that a significant proportion of patients in the study were not taking any prophylaxis for opportunistic infections, which may increase their risk of developing these infections. This highlights the need for improved access to and use of prophylaxis in HIV care. A study conducted in Ethiopia found that the use of Cotrimoxazole prophylaxis was associated with a significant reduction in morbidity and mortality among HIV-positive patients (Lelisho et al., 2022). The findings indicate that the majority of patients did not experience the listed symptoms, which is a positive outcome. The symptoms reported by a small proportion of patients are important to monitor as they could be indicative of underlying health issues that require attention. The relatively low prevalence of reported symptoms in this study is consistent with some previous studies conducted in Ethiopia, which have reported low rates of adverse drug reactions and side effects

among patients on ART (Birhane et al., 2018; Tesfaye et al., 2019). However, more research is needed to explore the prevalence of adverse drug reactions and side effects in different populations of patients living with HIV.

The findings indicate that a relatively small proportion of patients in the study reported current smoking and alcohol consumption. The prevalence of current smoking in this study (17.52%) is lower than the national prevalence of 20.9% reported in a national survey in Ethiopia in 2016 (Asfaw et al., 2018). Similarly, the prevalence of current alcohol consumption in this study (8.16%) is lower than the national prevalence of 30.7% reported in the same survey (Asfaw et al., 2018). However, it is important to note that the study sample may not be representative of the general population, and self-reported data on smoking and alcohol consumption may be subject to social desirability bias. Other studies have reported varying prevalence rates of smoking and alcohol consumption among people living with HIV/AIDS. For example, a study in South Africa reported a smoking prevalence of 33% among people living with HIV/AIDS (Mdege et al., 2015), while a study in Uganda reported a prevalence of 13.7% (Wanyenze et al., 2008). A study in Nigeria reported a prevalence of alcohol consumption of 9.9% among people living with HIV/AIDS (Oshiname et al., 2010), while a study in Uganda reported a prevalence of 31% (Wanyenze et al., 2008). The variations in prevalence rates may be due to differences in study settings, sample sizes, and methods of data collection. Furthermore, the study found that a significant proportion of the respondents had a history of substance abuse, with 30.5% of the total reporting substance abuse. This is a concerning finding, as substance abuse is known to increase the risk of HIV transmission through risky behaviors such as unprotected sex and needle sharing (National Institute on Drug Abuse [NIDA], 2021). The findings of this study are consistent with other studies conducted in Ethiopia, which have also reported a high prevalence of substance abuse among people living with HIV (Dessie et al., 2019; Tadesse et al., 2020). This highlights the need for targeted interventions to address substance abuse among people living with HIV, as part of a comprehensive approach to HIV prevention and management.

Based on the data it can be seen that a total of 27 patients experienced treatment failure, while the

majority of patients (304) did not experience any failure. Among the 27 patients who experienced treatment failure, virological failure was the most common cause (13 patients), followed by clinical failure (8 patients) and immunological failure (6 patients). These results suggest that virological failure is the most significant cause of treatment failure among children living with HIV at Hiwot Fana Specialized University Hospital in East Hararge Ethiopia. It is important to note that these findings are consistent with other studies conducted in Ethiopia and other countries. For instance, a study conducted in Addis Ababa, Ethiopia, found that virological failure was the most common cause of treatment failure among adults living with HIV (Teklay et al., 2020). Similarly, a study conducted in South Africa found that virological failure was the most significant cause of treatment failure among children living with HIV (Davies et al., 2017). The high prevalence of virological failure in this study may be due to several factors, including poor adherence to treatment, drug resistance, and inadequate healthcare services. Adherence to treatment is essential for the success of antiretroviral therapy, and poor adherence can lead to virological failure (Nachega et al., 2014). In addition, drug resistance can occur due to factors such as suboptimal dosing, treatment interruptions, and incorrect drug regimens (Gupta et al., 2015).

5.0 CONCLUSION

This study provides important insights into the current status of HIV treatment and care in a particular setting in Ethiopia. The findings highlight the importance of adherence to antiretroviral medications for achieving and maintaining viral suppression, the need for early initiation of antiretroviral therapy to improve health outcomes and prevent transmission, and the importance of regular monitoring of viral load levels to assess treatment effectiveness. Finally, the study emphasizes the importance of effective antiretroviral therapy in reducing the incidence of opportunistic infections and improving health outcomes for people living with HIV. Overall, these findings underscore the importance of continued efforts to strengthen HIV treatment and care in Ethiopia and elsewhere to achieve the global targets of 90-90-90 by 2020 and end the AIDS epidemic by 2030.

The study revealed that healthcare providers play a crucial role in initiating ART among patients, and fear of developing symptoms is a common

reason for initiating treatment. Patients commonly experience side effects such as abdominal pain, nausea, and vomiting, highlighting the need for effective strategies to mitigate these side effects. The study also provides valuable insights into the experiences and behaviors of patients living with HIV in Ethiopia. The findings highlight the importance of regular medication adherence to prevent the return of symptoms and the development of drug resistance. The study also highlights the need for increased access to and use of prophylaxis for opportunistic infections among HIV-positive patients. Additionally, the study reveals concerning rates of substance abuse and the need for targeted interventions to address this issue.

The data indicates that virological failure is the most common cause of treatment failure among children living with HIV at Hiwot Fana Specialized University Hospital in East Hararge Ethiopia. This finding is consistent with other studies conducted in Ethiopia and other countries, highlighting the importance of addressing adherence to treatment, drug resistance, and healthcare service delivery to improve treatment outcomes for HIV-positive children. The high prevalence of virological failure in this study calls for the implementation of interventions that target improving adherence to treatment and reducing drug resistance, such as patient education and counseling, clinical monitoring, and the use of more effective antiretroviral regimens.

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7.0 REFERENCES

1. Lalruaimawii, I., Danturulu, M.V., Rai, S., Chandrashekar, U.K. and Radhakrishnan, R., 2022. Determinants of stigma faced by people living with Human Immunodeficiency Virus: A narrative review from past and present scenario in India. *Clinical Epidemiology and Global Health*, p.101117.
2. Mwamuye, I.C., 2022. Clinical Outcomes of the "Test and start" Anti-retroviral Therapy Programme among People Living with HIV in Mombasa, Kilifi and Kwale Counties in Coastal Kenya (Doctoral dissertation, JKUAT-COHES).
3. Nastri, B.M., Pagliano, P., Zannella, C., Folliero, V., Masullo, A., Rinaldi, L., Galdiero, M. and Franci, G., 2023. HIV and drug-resistant subtypes. *Microorganisms*, 11(1), p.221.
4. Pérez Molina, J.A., Crespillo-Andújar, C., Zamora, J., Fernández-Félix, B.M., Gaetano-Gil, A., López-Bernaldo de Quirós, J.C., Serrano-Villar, S., Moreno, S., Álvarez-Díaz, N. and Berenguer, J., 2023. Contribution of low CD4 cell counts and high HIV viral load to the efficacy of preferred first-line antiretroviral regimens for treating HIV infection: A systematic review and meta-analysis. *Clinical Infectious Diseases*, p.ciad177.
5. Meireles, G., Nobre, A.A., Cardoso, S.W., Velasque, L., Veloso, V.G., Grinsztejn, B. and Luz, P.M., 2023. Real-world effectiveness of WHO recommended first-line antiretroviral therapies: a cohort study from a middle-income country. *AIDS care*, pp.1-13.
6. Brattgård, H., Björkman, P., Nowak, P., Treutiger, C.J., Gisslén, M. and Elvstam, O., 2022. Factors associated with low-level viraemia in people with HIV starting antiretroviral therapy: a Swedish observational study. *Plos one*, 17(5), p.e0268540.
7. SeyedAlinaghi, S., Mirzapour, P., Pashaei, Z., Afzalian, A., Tantuooyir, M.M., Salmani, R., Maroufi, S.F., Paranjkhoo, P., Maroufi, S.P., Badri, H. and Varshochi, S., 2023. The impacts of COVID-19 pandemic on service delivery and treatment outcomes in people living with HIV: a systematic review. *AIDS Research and Therapy*, 20(1), p.4.
8. Hung, C.C., Phanuphak, N., Wong, C.S., Olszyna, D.P. and Kim, T.H., 2022. Same-day and rapid initiation of antiretroviral therapy in people living with HIV in Asia. How far have we come?. *HIV medicine*, 23, pp.3-14
9. Toska, E., Zhou, S., Chen-Charles, J., Gittings, L., Operario, D. and Cluver, L., 2023. Factors associated with preferences for long-acting injectable antiretroviral therapy among adolescents and young people living with HIV in South Africa. *AIDS and Behavior*, 27(7), pp.2163-2175.
10. Sarıgül Yıldırım, F., Candevir, A., Akhan, S., Kaya, S., Çabalak, M., Ersöz, G., İnan, D., Ceren, N., Karaoğlan, İ., Damar Çakırca, T. and Özer Balin, Ş., 2023. Comparison of Immunological and Virological Recovery with Rapid, Early, and Late Start of Antiretroviral Treatment in Naive Plwh: Real-World

- Data. International Journal of General Medicine, pp.1867-1877
11. Eaton, E.F., Burgan, K., McCollum, G., Levy, S., Willig, J., Mugavero, M.J., Reddy, S., Wallace, E., Creger, T., Baral, S. and Fogger, S., 2022. Expanding access to substance use services and mental health care for people with HIV in Alabama, a technology readiness assessment using a mixed methods approach. *BMC health services research*, 22(1), p.919.
 12. Gandhi, R.T., Bedimo, R., Hoy, J.F., Landovitz, R.J., Smith, D.M., Eaton, E.F., Lehmann, C., Springer, S.A., Sax, P.E., Thompson, M.A. and Benson, C.A., 2023. Antiretroviral drugs for treatment and prevention of HIV infection in adults: 2022 Recommendations of the International Antiviral Society–USA Panel. *JAMA*, 329(1), pp.63-84
 13. WHO-World Health Organization, 2022. WHO guideline for the treatment of visceral leishmaniasis in HIV co-infected patients in East Africa and South-East Asia. World Health Organization.
 14. Lai, H., Li, R., Li, Z., Zhang, B., Li, C., Song, C., Zhao, Q., Huang, J., Zhu, Q., Liang, S. and Chen, H., 2023. Modelling the impact of treatment adherence on the transmission of HIV drug resistance. *Journal of Antimicrobial Chemotherapy*, p.dkad186.
 15. Burke, R.M., Twabi, H.H., Johnston, C., Nliwasa, M., Gupta-Wright, A., Fielding, K., Ford, N., MacPherson, P. and Corbett, E.L., 2023. Interventions to reduce deaths in people living with HIV admitted to hospital in low- and middle-income countries: A systematic review. *PLOS Global Public Health*, 3(2), p.e0001557.
 16. Frescura, L., Godfrey-Faussett, P., Feizzadeh A, A., El-Sadr, W., Syarif, O., Ghys, P.D. and on and behalf of the 2025 testing treatment target Working Group, 2022. Achieving the 95 95 95 targets for all: A pathway to ending AIDS. *PLoS One*, 17(8), p.e0272405.
 17. Boyce, C.L., Beck, I.A., Styrchak, S.M., Hardy, S.R., Wallner, J.J., Milne, R.S., Morrison, R.L., Shapiro, D.E., João, E.C., Mirochnick, M.H. and Frenkel, L.M., 2022. Assessment of minority frequency pretreatment HIV drug-resistant variants in pregnant women and associations with virologic non-suppression at term. *Plos one*, 17(9), p.e0275254.
 18. Laurenzi, C.A., Melendez-Torres, G.J., Page, D.T., Vogel, L.S., Kara, T., Sam-Agudu, N.A., Willis, N., Ameyan, W., Toska, E., Ross, D.A. and Skeen, S., 2022. How do psychosocial interventions for adolescents and young people living with HIV improve adherence and viral load? A realist review. *Journal of Adolescent Health*, 71(3), pp.254-269.
 19. Liu, P., You, Y., Liao, L., Feng, Y., Shao, Y., Xing, H., Lan, G., Li, J., Ruan, Y. and Li, D., 2022. Impact of low-level viremia with drug resistance on CD4 cell counts among people living with HIV on antiretroviral treatment in China. *BMC Infectious Diseases*, 22(1), p.426.
 20. Katçı, N., Çimen, P., Akyol, M., Gürsoy, P. and Ağuloğlu, N., Comparison of Alectinib/ Crizotinib Data in First-Line Therapy in Patients with Anaplastic Lymph omaki nase-Positive Nonsmall Cell Lung Carcinoma with Poor Prognostic Features for Alectinib.
 21. Sefah, I.A., Mensah, F., Kurdi, A. and Godman, B., 2022. Barriers and facilitators of adherence to antiretroviral treatment at a public health facility in Ghana: a mixed method study. *Hospital Practice*, 50(2), pp.110-117.
 22. Asaolu, O.S. and Agbede, C., 2022. Factors Influencing Medication Adherence Among Young People Living with HIV In Niger State, Nigeria. *Open Journal of Medical Research (ISSN: 2734-2093)*, 3(1), pp.12-19.
 23. Pugh, L.E., Roberts, J.S., Viswasam, N., Hahn, E., Ryan, S., Turpin, G., Lyons, C.E., Baral, S. and Hansoti, B., 2022. Systematic Review of Interventions Aimed At Improving HIV Adherence to Care In Low-And Middle-Income Countries. *Journal of Infection and Public Health*.
 24. Getaneh, T., Negesse, A., Dessie, G. and Desta, M., 2022. The impact of tuberculosis co-infection on virological failure among adults living with HIV in Ethiopia: A systematic review and meta-analysis. *Journal of Clinical Tuberculosis and Other Mycobacterial Diseases*, 27, p.100310.
 25. Huber, A., Hirasen, K., Brennan, A.T., Phiri, B., Tcherini, T., Mulenga, L., Haimbe, P., Shakwelele, H., Nyirenda, R., Matola, B.W. and Gunda, A., 2023. Uptake of same-day initiation of HIV treatment in Malawi, South Africa, and Zambia as reported in routinely collected data: the SPRINT retrospective cohort study. *Gates Open Research*, 7.
 26. Barata, T.Y., Abiso, G., Israel, E., Molla, S. and Wolka, E., 2023. Incidence of Mortality and Its Predictors Among Adult Human Immune Virus Infected Patients on Antiretroviral Therapy in Wolaita Sodo University Comprehensive Specialized Hospital, Southern Ethiopia: A

- Retrospective Follow-Up Study. HIV/AIDS-Research and Palliative Care, pp.361-375.
27. Steinert, J.I., Shenderovich, Y., Smith, M., Zhou, S., Toska, E. and Cluver, L., 2022. Economic Well-being and Associated Mediating Pathways to Improved Antiretroviral Therapy Adherence Among Adolescents Living With HIV: A Prospective Cohort Study in South Africa. *Journal of Acquired Immune Deficiency Syndromes* (1999), 91(4), p.343.
 28. Mulisa, D., Tolossa, T., Bayisa, L., Abera, T. and Wakuma, B., 2022. First-line virologic-based ART treatment failure and associated factors among adult HIV Positives in Southwest Shoa, Central Ethiopia. *Journal of the International Association of Providers of AIDS Care (JIAPAC)*, 21, p.23259582221111080.
 29. Belay, Y.A., Yitayal, M., Atnafu, A. and Taye, F.A., 2022. Patient experiences and preferences for antiretroviral therapy service provision: implications for differentiated service delivery in Northwest Ethiopia. *AIDS research and therapy*, 19(1), p.30.
 30. Alhassan, Y., Twimukye, A., Malaba, T., Myer, L., Waitt, C., Lamorde, M., Colbers, A., Reynolds, H., Khoo, S. and Taegtmeier, M., 2022. 'I fear my partner will abandon me': the intersection of late initiation of antenatal care in pregnancy and poor ART adherence among women living with HIV in South Africa and Uganda. *BMC pregnancy and childbirth*, 22(1), pp.1-14.
 31. Lelisho, M.E., Wotale, T.W., Tareke, S.A., Alemu, B.D., Hassen, S.S., Yemane, D.M., Korsas, B.B. and Bedaso, N.G., 2022. Survival rate and predictors of mortality among TB/HIV co-infected adult patients: retrospective cohort study. *Scientific Reports*, 12(1), p.18360.