CONTRIBUTING FACTORS TOWARDS ADHERENCE TO ANTIRETROVIRAL THERAPY AMONG PEOPLE LIVING WITH HIV AT A UNIVERSITY TEACHING HOSPITAL IN NIGERIA

By

EZE ROSEMARY ADA

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

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Chairman : Professor Norhasmah binti Sulaiman, PhD
Faculty : Medicine and Health Sciences

Nigeria is ranked second in Sub-Saharan Africa, behind South Africa, and third globally, behind India, in terms of illness burden (HIV). In 2019, 1.9 million Nigerians were living with human immunodeficiency virus and acquired immunodeficiency syndrome (HIV/AIDS), with a prevalence of 1.4 percent among adults. In 2017, only 33% of persons living with HIV were receiving treatment. Compliance to antiretroviral therapy (ART) is a complicated process influenced by a variety of factors, and various studies have sought to identify the hurdles and facilitators to ART adherence using socio-ecological model. The findings imply that HAART medication non-adherence is a complicated issue involving multiple levels of the system. The current study aimed to determine the contributing factors towards adherence to ART at Ahmadu Bello University Teaching Hospital Zaria Nigeria (ABUTH) using a social ecological framework, which consist of individual level, community level and interpersonal level.

From June to September 2019, a cross-sectional study, utilising a systematic random sampling procedure. Respondents aged 18 to 64 living with HIV on ART at ABUTH, Zaria, Kaduna State, were invited to participate in the study; adults who were too sick owing to an illness or mental issue throughout the research period, such as infectious illnesses or Alzheimer`s disease, were not considered eligible. A 6-item scale from the US Household Food Security Survey Module was used to assess food insecurity The 10-item CES-D scale was used to assess respondents' depression symptoms, and the CASE Adherence test was utilised to examine adherence to ART. The functional social support questionnaire (FSSQ) developed by Duke and UNC was adapted to assess the respondents' social support network's strength. The respondents' perceptions of stigma were assessed using a questionnaire adapted from Wright's HIV stigma scale, Adult AIDS Clinical Trials Group questionnaire was modified to assess respondents' drug and alcohol consumption, as well as the side effects of antiretroviral medication. HIV Knowledge Questionnaire 18 was used to assess people living with HIV's HIV-related

knowledge and beliefs about Medicines Questionnaire (BMQ) was adapted to access patients' beliefs and concerns regarding the necessity for prescription medication to control their illness. Data on socio-demographic and 24-hour dietary recalls were obtained through face-to-face interviews. Anthropometric measurements including weight, height were conducted. Pearson's chi-square or Fisher exact tests were used to explore the association between adherence to ART as a dependent variable and the independent variables. A multivariate regression analysis was undertaken to identify the contributing factors towards adherence to ART among people living with HIV on ART in ABUTH. Starting with simple logistic regression with p 0.25. Using an entry variable selection, multiple logistic regression with a 95% confidence interval was performed. The alpha 0.05 significance level was used.

Results indicated that, among 385 respondents the prevalence of adherence to ART among adults on ART in ABUTH was 54% in which (67.5%) were female and (32.5%) were male. Most of the respondents were aged 49-64 years old (50.9%), about (44.9%) of the respondents attended tertiary level of education. Most of the respondents (76.1%) were depressed and more than half of respondents were moderate alcohol drinkers (51.4%). Majority of the respondents (81.3%) had poor knowledge towards HIV transmission and ART.

Majority of the respondents (87.0%) displayed low food security. More than half of the respondents (52.5%) were within the normal BMI classification and (40.3%) were over-weight. Most of the respondents (74.8%) displayed moderate diet diversity. Male and female respondent achieved 75% and 76% of energy intake of RDA respectively and 64% and 60% protein intake of RDA respectively. About 48.1% of the respondent experience side-effect from the medication. Most of the respondents (75.3%) were unsatisfied with the health-care service. More than half of the respondents (55.8%) had negative perceptions (beliefs) of personal need for the medication, while 42.3% of the respondents had more concerns about the potential negative effects of the medication. About 25.7% of the respondents could not disclose their status to anyone due to fear of rejection, and about 44.7% of the respondents face high stigma and discrimination from people and 42.1% of the respondents face poor social support from people.

Significant association was found between age (χ^2 =9.179, p <0.01), education (χ^2=8.458, p <0.01), occupation (χ^2 =9.061, p <0.01), marital status (χ^2 =7.293, p <0.05), BMI (χ^2 =12.387, p <0.01), diet diversity (χ^2 =10.255, p <0.01), food insecurity (χ^2 =11.446, p <0.01), depression (χ^2 =13.245 p <0.05), knowledge (χ^2 =12.304, p <0.05), difficulties getting ART on time (χ^2 =10.773, *p* <0.01), distance to clinic (χ^2 = 10.477, *p* <0.01), respondents beliefs (χ^2 =12.812, *p* <0.05), disclosure to family member (χ^2 =10.431, *p* <0.05) stigma/discrimination (χ^2 =11.692, *p* <0.05), social support (χ^2 =34.797, *p* <0.01) and adherence to ART.

Multiple logistic regression revealed that respondents who were self-employed increased the odds by two times (AOR = 2.646, 95% CI: 1.335, 5.241) and government employed increased the odds of non-adherence to ART by 2.8 times more than respondents who

were unemployed (AOR = 2.842, 95% CI: 1.542,5.240). Respondents who were (divorced or widow) were two times more likely to become non-adherence to ART (AOR = 2.016, 95% CI: 1.111, 3.660). Respondents who were food insecure were 1.2 times more likely to be non-adherence to ART (AOR = 1.220, 95% CI: 1.642, 2.319). Respondents who had low dietary diversity were 1.7 times more likely to be non-adherence (AOR = 1.792, 95% CI: 1.023, 3.139) and respondents who had negative perceptions of personal need for the ART were 1.5 times more likely to be non-adherence to ART (AOR= 1.525, 95% CI: 1.958-2.427), respondents who had more concerns about the potential negative effects of the ART medication were 1.3 times likely to be non-adherence to ART (AOR= 1.362, 95% CI: 1.751-2.005). Respondents who had poor social support increased the odds by threefold of non-adherence to ART (AOR = 3.956, 95% CI: 2.424, 6.456).

In conclusion, adherence to antiretroviral therapy (ART) remains a major challenge for people living with HIV/AIDS in Nigeria. Factors associated with adherence to ART identified in this study were occupation, marital status, food insecurity, dietary diversity, patient belief and social support. Health care personnel must be aware of these concerns and the belief of the respondents towards medicine. Workplace regulations must be in place to assist persons with chronic conditions such as HIV/AIDS in sticking to their treatment regimens. Improved food shortages can result to better compliance with treatment and care guidelines, intervention studies are needed to figure out how to reduce non-adherence. Family, friends and community must play a role in encouraging people living with HIV to adhere to antiretroviral medication. Patient-centered measures should be taken to establish appropriate adherence-enhancing interventions. Health care providers and HIV control programme implementers should emphasize on adverse drug reactions.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

FAKTOR PENYUMBANG KE ARAH KEPATUHAN TERAPI ANTIRETROVIRAL DALAM KALANGAN ORANG YANG HIDUP DENGAN HIV DI HOSPITAL PENGAJARAN UNIVERSITI DI NIGERIA

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Nigeria berada di kedudukan kedua di Afrika Sub-Sahara, di belakang Afrika Selatan, dan ketiga di dunia, di belakang India, dari segi beban penyakit (HIV). Pada tahun 2019, 1.9 juta orang Nigeria hidup dengan virus kurang imun manusia dan sindrom kurang daya tahan melawan penyakit (HIV/AIDS), dengan prevalensi 1.4 peratus di kalangan orang dewasa. Pada tahun 2017, hanya 33% orang yang hidup dengan HIV yang menerima rawatan. Pematuhan kepada terapi antiretroviral (ART) adalah proses rumit yang dipengaruhi oleh pelbagai faktor, dan pelbagai kajian telah berusaha untuk mengenal pasti halangan dan fasilitator kepada pematuhan ART menggunakan model sosio-ekologi. Penemuan menunjukkan bahawa ketidakpatuhan ubat HAART adalah isu rumit yang melibatkan pelbagai peringkat sistem. Kajian semasa bertujuan untuk menentukan faktor penyumbang ke arah pematuhan kepada ART di Hospital Pengajaran Universiti Ahmadu Bello Zaria Nigeria (ABUTH) menggunakan rangka kerja ekologi sosial, yang terdiri daripada peringkat individu, peringkat komuniti dan peringkat interpersonal.

Dari Jun hingga September 2019, kajian keratan rentas, menggunakan prosedur persampelan rawak yang sistematik. Responden berumur 18 hingga 64 tahun yang hidup dengan HIV pada ART di ABUTH, Zaria, Negeri Kaduna, telah dijemput untuk mengambil bahagian dalam kajian; orang dewasa yang terlalu sakit akibat penyakit atau masalah mental sepanjang tempoh penyelidikan, seperti penyakit berjangkit atau penyakit Alzheimer, tidak dianggap layak. Skala 6 item daripada Modul Tinjauan Keselamatan Makanan Isi Rumah AS telah digunakan untuk menilai ketidakamanan makanan Skala CES-D 10 item digunakan untuk menilai gejala kemurungan responden, dan ujian Kepatuhan CASE digunakan untuk memeriksa pematuhan kepada ART. Soal selidik sokongan sosial berfungsi (FSSQ) yang dibangunkan oleh Duke dan UNC telah disesuaikan untuk menilai kekuatan rangkaian sokongan sosial responden. Persepsi responden terhadap stigma dinilai menggunakan soal selidik yang diadaptasi daripada

skala stigma HIV Wright, soal selidik Kumpulan Ujian Klinikal AIDS Dewasa telah diubah suai untuk menilai pengambilan dadah dan alkohol responden, serta kesan sampingan ubat antiretroviral. Soal Selidik Pengetahuan HIV 18 telah digunakan untuk menilai orang yang hidup dengan HIV pengetahuan berkaitan HIV dan kepercayaan tentang Soal Selidik Ubat (BMQ) telah disesuaikan untuk mengakses kepercayaan dan kebimbangan pesakit mengenai keperluan untuk ubat preskripsi untuk mengawal penyakit mereka. Data mengenai sosio-demografi dan imbasan diet 24 jam diperolehi melalui temu bual bersemuka. Pengukuran antropometrik termasuk berat, ketinggian telah dijalankan. Ujian chi-square Pearson atau Fisher tepat digunakan untuk meneroka perkaitan antara pematuhan kepada ART sebagai pembolehubah bersandar dan pembolehubah tidak bersandar. Analisis regresi multivariate telah dijalankan untuk mengenal pasti faktor penyumbang ke arah pematuhan kepada ART dalam kalangan orang yang hidup dengan HIV pada ART di ABUTH. Bermula dengan regresi logistik mudah dengan p 0.25. Menggunakan kemasukan pemilihan pembolehubah, regresi logistik berganda dengan selang keyakinan 95% telah dilakukan. Aras keertian alpha 0.05 telah digunakan.

Hasil menunjukkan bahawa, di antara 385 responden, prevalensi kepatuhan terhadap ART di kalangan orang dewasa pada ART di ABUTH adalah 54% di mana (67.5%) adalah wanita dan (32.5%) adalah lelaki. Sebilangan besar responden berumur 49-64 tahun (50.9%), kira-kira (44.9%) responden mengikuti peringkat pengajian tinggi. Sebilangan besar responden (76.1%) mengalami kemurungan dan lebih daripada separuh responden adalah peminum alkohol sederhana (51.4%). Majoriti responden (81.3%) mempunyai pengetahuan yang rendah mengenai penularan HIV dan ART.

Sebilangan besar responden (87.0%) menunjukkan keselamatan makanan yang rendah. Lebih daripada separuh responden (52.5%) berada dalam klasifikasi BMI normal dan (40.3%) mempunyai berat badan berlebihan. Sebilangan besar responden (74.8%) menunjukkan kepelbagaian diet sederhana. Responden lelaki dan perempuan masing-masing mencapai 75% dan 76% pengambilan tenaga RDA, kuman setiap berat badan sebanyak 50g/kg dan 40g/kg protein dan 64% dan 60% pengambilan protein RDA masing-masing. Kira-kira (48.1%) responden mengalami kesan sampingan dari ubat. Kebanyakan responden (75.3%) tidak berpuas hati dengan perkhidmatan penjagaan kesihatan. Lebih separuh daripada responden (55.8%) mempunyai persepsi negatif (kepercayaan) tentang keperluan peribadi terhadap ubat, manakala 42.3% daripada responden mempunyai lebih kebimbangan tentang potensi kesan negatif ubat. Kira-kira 25.7% daripada responden tidak mendedahkan status mereka kepada sesiapa kerana takut dipinggirkan, dan kira-kira 44.7% daripada responden menghadapi stigma dan diskriminasi yang tinggi daripada orang ramai dan 42.1% daripada responden menghadapi sokongan sosial yang lemah daripada orang ramai.

Perkaitan yang bererti dijumpai antara usia (χ^2=9.179, p<0.01), pendidikan (χ^2=8.458, p<0.01), pekerjaan (χ^2=9.061, p<0.01), status perkahwinan (χ^2=7.293, p<0.05), BMI (χ^2=12.387, p<0.01), kepelbagaian diet (χ^2=10.255, p<0.01), ketidakamanan makanan (χ^2=11.446, p<0.01), kemurungan (χ^2=13.245, p<0.05), pengetahuan (χ^2=12.304 , p<0.05), kesukaran mendapatkan ART tepat pada waktunya (χ^2=10.773, p<0.01), jarak

ke klinik (χ^2=10.477, p<0.01), kepercayaan responden (χ^2=12.812, p<0.05), pendedahan kepada ahli keluarga (χ^2=10.431, p<0.05) stigma/diskriminasi (χ^2=11.692, p<0.05), sokongan sosial (χ^2=34.797, p<0.01) dan kepatuhan kepada ART.

Regresi logistik pelbagai mendedahkan bahawa responden yang bekerja sendiri meningkatkan kebarangkalian sebanyak dua kali (AOR = 2.646, 95% CI: 1.335, 5.241) dan pekerja kerajaan meningkatkan kebarangkalian ketidakpatuhan kepada ART sebanyak 2.8 kali lebih banyak daripada responden yang menganggur (AOR = 2.842, 95% CI: 1.542,5.240). Responden yang (bercerai atau janda) dua kali lebih cenderung untuk tidak mematuhi ART (AOR = 2.016, 95% CI: 1.111, 3.660). Responden yang tidak terjamin makanannya adalah 1.2 kali lebih cenderung untuk tidak mematuhi ART (AOR = 1.220, 95% CI: 1.642, 2.319). Responden yang mempunyai kepelbagaian diet rendah 1.7 kali lebih cenderung tidak patuh (AOR = 1.792, 95% CI: 1.023, 3.139) dan responden yang mempunyai persepsi negatif terhadap keperluan peribadi untuk ART adalah 1.5 kali lebih cenderung tidak kepatuhan terhadap ART (AOR = 1.525, 95% CI: 1.958-2.427), responden yang mempunyai lebih banyak kebimbangan mengenai kemungkinan kesan negatif ubat ART adalah 1.3 kali berkemungkinan tidak mematuhi ART (AOR = 1.362, 95% CI : 1.751-2.005). Responden yang mendapat sokongan sosial yang lemah meningkatkan kemungkinan tiga kali ganda ketidakpatuhan terhadap ART (AOR = 3.956, 95% CI: 2.424, 6.456).

Kesimpulannya, pematuhan kepada terapi antiretroviral (ART) kekal sebagai cabaran utama bagi penghidap HIV/AIDS di Nigeria. Faktor-faktor yang dikaitkan dengan pematuhan kepada ART yang dikenal pasti dalam kajian ini ialah pekerjaan, status perkahwinan, ketidakamanan makanan, kepelbagaian diet, kepercayaan pesakit dan sokongan sosial. Kakitangan penjagaan kesihatan mesti menyedari kebimbangan ini dan kepercayaan responden terhadap perubatan. Peraturan tempat kerja mesti ada untuk membantu orang yang mempunyai keadaan kronik seperti HIV/AIDS dalam mematuhi rejimen rawatan mereka. Kekurangan makanan yang dipertingkatkan boleh menyebabkan pematuhan yang lebih baik terhadap garis panduan rawatan dan penjagaan, kajian intervensi diperlukan untuk memikirkan cara mengurangkan ketidakpatuhan. Keluarga, rakan dan komuniti mesti memainkan peranan dalam menggalakkan orang yang hidup dengan HIV untuk mematuhi ubat antiretroviral. Langkah-langkah yang mengutamakan pesakit harus diambil untuk mewujudkan intervensi yang meningkatkan pematuhan yang sesuai. Penyedia penjagaan kesihatan dan pelaksana program kawalan HIV harus memberi penekanan kepada tindak balas buruk ubat.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

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LIST OF ABBREVIATIONS

AACTG	Adult AIDS Clinical Trials Group
ABUTH	Ahmadu Bello University Teaching Hospital
AIDS	Acquired immunodeficiency syndrome
ART	Antiretroviral therapy
ARV	Antiretroviral Drugs
BMI	Body mass index
BMQ	Beliefs about Medicines Questionnaire
CASE	Center for Adherence Support Evaluation
CES-D	Center for Epidemiologic Studies Depression Scale
FAO	Food and Agriculture Organization
FSSQ	Functional Social Support Questionnaire
HAART	Highly Active Antiretroviral Therapy
HIV	Human immunodeficiency virus
HIVKQ	HIV Knowledge Questionnaire
NACA	National Agency for the Control of AIDS
NGOs	Non-Governmental Organisations
NYAM	New York Academy of Medicine's
PEPFAR	President's Emergency Plan for AIDS Relief
PLWHIV	People Living with HIV
RDA	Recommended Dietary Allowances
SD	Standard Deviation
SEM	Social Ecological Model
UNAIDS	United Nations Programme on HIV/AIDS
USDA	United State Department of Agriculture
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

In this chapter, the background of this study, its problem statement, significance of the study, research question, research objectives, null hypothesis and conceptual framework of the study are presented.

1.1 Background

The human immunodeficiency virus (HIV) is a virus which damages an infected person's immune system. The virus attacks immune system cells, causing their depletion, particularly the CD4 positive T cells. If left ignored, it can progress to acquired immunodeficiency syndrome (AIDS), a secondary immunodeficiency. This is a disease in which opportunistic infections and secondary malignancies develop, resulting in a severe and life-threatening condition. For more than two decades, HIV pandemic and AIDS have been major health and socioeconomic issues. In 2015, the Joint United Nations Programme on HIV/AIDS reported that 36.7 million individuals worldwide were living with HIV, with a worldwide HIV prevalence of 0.8 percent, as well as 2.1 million people were newly infected. AIDS-related illness claimed the lives of 1.1 million people in the same years, despite the fact that antiretroviral therapy (ART) was available to 17 million people. Moreover, statistics have shown that 35 million people of the 78 million people who became HIV-infected died from AIDS disease since the beginning of the epidemic (UNAIDS, 2016). In 2019, there were about 38 million people living with HIV/AIDS around the world. There were 36.2 million adults and 1.8 million children under the age of 15 among them. In 2019, an estimated 1.7 million people worldwide were infected with HIV. Since 2010, the figure for HIV news has been 23% decreasing. Of adults, 1,5 million and 150,000 infections of children under 15 years of age (UNAIDS,2019). Antiretroviral medication (ART) was available to 25.4 million HIV-positive people worldwide (67 percent) at the end of 2019. This means that 12.6 million individuals are still awaiting their turn. Access to HIV therapy is critical in the global drive to eradicate AIDS as a public health threat (UNAIDS,2019).

Nearly one in every 20 adults in Sub-Saharan Africa has HIV, accounting for roughly 69 percent of the global load, with the Caribbean, Eastern Europe, and Central Asia following closely behind (UNAIDS, 2012). In 2015, it was projected that 6.5 million people in Western and Central Africa were living with HIV (PLHIV), with women accounting for 60% of the overall population of PLHIV and 410 000 new infections documented (UNAIDS, 2016). Furthermore, for 26 nations in Sub-Saharan Africa, the prevalence of HIV among urban women is 1.6 times higher than that of rural women and men (WHO, 2016). Nigeria is ranked second in Sub-Saharan Africa, behind South Africa, and third globally, behind India, in terms of illness burden, according to the United Nations (UNAIDS, 2015). The region most affected by HIV is East and South Africa (UNAIDS 2019). It comprises approximately 6.2% of the world's population, but more than half (54%) of the world's total HIV population (20.6 million people). In 2018,

800,000 new HIV infections occurred, less than half of the total world, and 5 million people living with HIV live in West and Central Africa, 450,000 are children (UNAIDS, 2019). When compared to East and Southern Africa, the prevalence of HIV among adults is 1.5 percent, which is quite low. There is a lot of variety between countries, with Mauritania having 0.2 percent and Equatorial Guinea having 7.1 percent. In 2018, 64% of HIV-positive patients were aware of their condition. Antiretroviral treatment was available to 79 percent of individuals who were aware (ART). About 76 percent of individuals on therapy were virally suppressed (UNAIDS, 2019).

According to data, 3.5 million Nigerians were living with HIV/AIDS in 2015, 1.8 million children were orphaned owing to AIDS, and 180 000 people died from AIDS in the same year (UNAIDS, 2015). In the year 2015, the adult prevalence was 3.1 percent, with 250,000 new infections and 24 percent of adults receiving antiretroviral medication (UNAIDS, 2016). In 2019, 1.9 million Nigerians were living with HIV/AIDS, with a nationwide prevalence of 2.8 percent and a prevalence of 1.4 percent among adults. Since 2010, there has been a 26% reduction in AIDS-related mortality, from 72 000 to 53 000. However, in the same period, there have been an increase in new HIV infections from 120 000 to 130 000, 53% in treatment and 42 percent in the number of people living with HIV viral suppression (UNAIDS, 2019). From a peak of 2.2 million in 2005 to an estimated 1.8 million in 2010 (WHO, UNAIDS, United Nations International Children's Emergency Fund, 2011), the mortality rates each year from AIDS-related illness has progressively decreased. In 2015, the figure was at 1.1 million (UNAIDS 2016). Combined antiretroviral therapy (ART) has significantly reduced the morbidity, death and infection of people with HIV infection (UNAIDS 2016). However, in the year 2020, Nigeria had 1.7 million HIV-positive persons and 49 thousand persons died as a result of AIDS in that year, including both adults and children. With 20 thousand deaths, male adults were the group with the highest number of deaths (Statista, 2020). This might be due to the global pandemic that affect the world as a result insufficient ART medication supplies in the country.

Adherence is defined as a patient's ability to stick to a treatment plan, take drugs at the prescribed times and frequencies, and adhere to dietary and other prescription limitations (Sahay, 2011). Adherence refers to the capacity to take prescribed drugs according to the indicated dosages and timings, as well as any additional instructions, such as taking them on an empty stomach or after meals (Paterson, Swindells, Mohr, et al, 2000). Since its inception in 1996, antiretroviral treatment (ART) has considerably reduced HIV/AIDS-related mortality and morbidity (Reynolds, 2004; Huang et al., 2013). In improving HIV/AIDS patients' prognosis and quality of life, and reducing diseases progression and death, antiretroviral therapy (ART) has been an important part of (UNAIDS, 2012). Increased availability to ART has also been shown to reduce the risk of HIV transmission to sexual partners by 96 percent (Havlir and Beyrer, 2012). ART is an important predictor of survival among HIV/AIDS patients (Horizons/Population Council, 2012). To avoid the formation of resistant HIV strains, achieve long-term HIV suppression, reduce CD4 cell destruction, prolong life, and promote healthy lifestyles, patients must adhere to ART at a rate of more than 95 percent (Machtinger and Bangsberg, 2005). Poor adherence to ART, on the other hand, can pose a serious public health risk and limit the effectiveness of HIV treatments (Molassiotis et al., 2002). Poor ART adherence results

to greater hospitalization rates, higher health-care costs, reduced performance, family and community disturbance, and increased morbidity and mortality in low and middle-income countries (Steel et al., 2007).

The social ecological model is based on premise that behavior has multiple levels of influence and that no single factor can explain why some individuals in similar environments are at higher risk of ART non-adherence (Diez,2001; Golden & Earp, 2012). Individual and household level characteristics play a role in adherence to ART, according to a study. For instance, the type of dosing schedule, as well as previous or predicted side effects, as well as insecure housing and a lack of family support, have all been linked to adherence (Young et al. 2014). Another explanation is that a patient drug addict (patient level) follows peer advice and rejects to use the medicine (microsystem), gains market access to illegal antiretroviral drug products, and becomes a health burden (exo-system). While these are fictional situations, they show how complex, interconnected multilevel components combine to cause non-compliance with HAART. Non-adherence to ARV therapy, on the other hand, has been linked to factors like unemployment, resettling, cultural and religious beliefs, abusive relationship, and the lack of health care centres in Uganda, South Africa, Kenya, and Zimbabwe, according to studies (Coetzee, Kagee & Vermeulen, 2011; Reniers & Armbruster, 2012). As a result, utilising the socio-ecological model, this study was carried out with the goal of examining the contributing factors towards adherence to ART among HIV adults in Ahmadu Bello University Teaching Hospital Zaria.

1.2 Problem statement

For some years, the Human Immunodeficiency Virus (HIV) has been a major challenge in worldwide health and development. The HIV pandemic has had a huge impact on Sub-Saharan Africa, yet there has been significant progress. The HIV epidemic in Nigeria is widespread, with considerable variations in prevalence within the country. Sub-Saharan Africa has the highest number of people living with HIV infection. The overall incidence of HIV/AIDS has decreased from 270,667 in 2010 to 227,518 in 2014, however there is still decreased in adherence to ART (NACA, 2015).

In 2017, only 33% of HIV-positive patients were receiving treatment (UNAIDS,2018). However, in 2018, an estimated 1.8 million people in Nigeria were infected with HIV (1.3 percent of the total population), with 1.1 million (64 percent) getting antiretroviral therapy (ART) (NAIIS, 2018). Once the viral load is lowered to undetectable levels, effective ART reduces morbidity and mortality among HIV patients and prevents HIV transmission (Rodger et al., 2016; Cohen et al., 2016). Nigeria is still a long way from attaining the worldwide goal of putting 90 percent of HIV-positive persons on antiretroviral therapy (ART).

However, studies have showed that non-adherence is linked to a variety of elements that differ depending on the environment. In East Jerusalem, for example, knowledge was related to non-adherence (Najjar et al., 2015). Study done in Kenya, younger age, rural residence, and substance use were all significant factors (Mukui et al., 2016). In Malawi, non-adherence to ART was attributed to internal migration, insufficient counselling, and spouse's inability to provide help and assistance (Gugsa et al., 2017). The biggest challenges to ART adherence, was identify as ART adverse effects, low self-efficacy, low response to therapy, low treatment satisfaction, and mental distress were all investigated in a study conducted in Romania. (Dima et al.,2013).

Compliance to ART is a complicated process influenced by a variety of factors, and various studies have sought to identify the hurdles and facilitators to ART adherence using socio-ecological model (Mills et al., 2006; Posse et al., 2008; Mills et al., 2006). Age, sex, ethnicity, HIV status disclosure, and forgetfulness have all been documented to play a role in predicting ART adherence at the individual level (Simoni et al., 2008). Individual-level characteristics, on the other hand, can only account for a small percentage of non-adherence variability (Berben et al., 2012). Excellent interpersonal interactions between patients and caregivers or treatment supporters, such as healthcare practitioners, an intimate partner, family members, and friends, have been observed to predict good adherence (Berben et al., 2012; Haskard et al., 2009). Community-level variables such as poverty, HIV-related stigma, and prejudice against ART patients, in contrast to interpersonal factors, provide hurdles to ART adherence (Merten et al., 2010). In addition to community-level considerations, healthcare policy-level elements such as HIV treatment standards, regulations, and best practises are critical in ensuring that the continuum of care is adhered to and maintained (Mugavero, 2016). This model proposes that an individual's behaviour is linked to a dynamic network of interpersonal traits, community factors, and existing health regulations (Golden & Earp, 2012; Mayer et al., 2013). Other factors that influence adherence, according to findings from earlier studies in Sub-Saharan Africa, include patient factors (such as socioeconomic status, education, literacy, and so on), treatment regimen, illness features, patient-provider relationships, and clinical environments (Coetzee et al., 2011; Wagner et al., 2004; Memiah et al., 2014).

Another factor was identified by study done by Oku & Monjok, (2014) which found out that insufficient understanding about HIV/AIDS or ARVs, as a result of traditional healers in most African nations causing to many HIV/AIDS patients believing they have been cursed and as a result of that leads to non-adherence. Along with cultural beliefs, religion can lead some PLWHA astray, with the assumption that they can only be cured by praying (Kim et al., 2016). According to the gender role strain theory, which assumes that male sexual behaviours conform to cultural norms, HIV-positive women are more likely to report non-adherence to ARVs, non-condom use, and fear of physical assault by their sexual partners, and hence choose not to disclose their status (Naidoo et al., 2013). Other research (Bolsewicz et al., 2015; Joshi et al., 2014; Sahay et al., 2011) found multiple hurdles to optimal adherence to ART in both developed and developing countries, which could be divided into patient-related, medication-related, and health system–related aspects (Kumar et al., 2014). Other studies have identified ART side effects, social stigma, depression, non-disclosure of HIV status, unemployment, food

insecurity, alcohol/substance abuse, alternative forms of therapy, insufficient follow-ups, stock outs, work and family responsibilities, low self-efficacy, low treatment satisfaction, and distance to clinics as barriers to ARV medication adherence (Shubber et al., 2016; Dima et al., 2013). There is little data on the levels of adherence to antiretroviral medication (ART) and the factors that influence adherence among HIV/AIDS patients in Nigeria.

Based on a review of the literature, some studies have been conducted in other parts of Africa, but few have been conducted in other parts of Nigeria such as study done by Bello et al., (2011) in Ilorin, another study done in Southwest Nigeria by Afe et al., (2018) and also study done in Ile-Ife by Okunola et al., (2017) on Socio-cultural factors influencing adherence to antiretroviral therapy. However, none have been conducted in the rural areas of Zaire Kaduna state on contributing factors to compliance to ART among adults living with HIV.

A study was conducted using a social ecological framework, which is a method which assist in the interpretation of medication adherence behaviour by analysing the relationships of socio-ecological systems such as the person, micro-system, meso-system, exo-system, macro-system, and crono-system, according to Castro et al., (2015). The findings imply that HAART medication non-adherence is a complicated issue involving multiple levels of the system. Individuals with depression encounter stigmatising prejudice (exo-system) and a low social support on a personal basis (micro-system), leading to additional unhappiness and non-adherence to HAART treatment.

In this study contributing factors towards compliance to antiretroviral therapy (ART) among HIV-positive adults were investigated. In order to achieve this, the socio-ecological model was used as the theoretical base underpinning of this study.

1.3 Significance of the Study

Treatment adherence is critical to the long-term success of comprehensive HIV care. Retention of patients on antiretroviral medication (ART) is the most critical aspect of treatment for reducing disease transmission and increasing the wellbeing for HIV infected Persons. Adherence to antiretroviral therapy (ART) is a complicated behaviour that is influenced by a number of factors. Factors associated to adherence to ART have been established in previous studies in different African nations which identify the factors associated to non-adherence to ART.

However, there are limited and recent studies done in Nigeria on factors associated to adherence to ART and none has been done to Zaire on the contributing factors towards compliance to antiretroviral therapy (ART) among HV adults. By identifying characteristics that contribute to adherence to ART among adults at Ahmadu Bello University Teaching Hospital in Zaria, this study filled a gap. In order to identify factors

affecting treatment adherence at various levels and to lead efforts to increase ART adherence, the socio-ecological framework was used as the conceptual foundation in this research.

Results from this research provides insight on the contributing factors towards compliance to ART among HV-infected adults, and then recommendations were given based on the findings of the study. The findings of the study could provide data on factors that could either prevent or encourage adherence to antiretroviral therapy (ART) to the Nigerian government, and encourage the creation of a variety of interventions that could be used to improve adherence to ART among patients in this location, as well as other settings with similar features. Also, findings from the study may help inform policies to resolve structural and social factors to ART adherence among HIV infected persons, a highly vulnerable population to treatment failure, poor health outcomes, and early mortality.

1.4 Research questions

1. What is the prevalence of adherence to ART among people living with HIV in Ahmadu Bello University Teaching Hospital Zaria?
2. Is there an association between individual level [socio-demographic factors (gender, age, ethnicity, religion, educational level, duration of treatment, household size, monthly income, occupation and marital status] patient-related factors (drug and alcohol, knowledge, depression, food security status, BMI, dietary diversity), medication-related factor (side-effect), interpersonal level [cultural-related factors (beliefs and patient preference for medicine, stigma and discrimination, disclosure of HIV status, social support), community level [health care-related factors (limited availability and accessibility of ART, patient, nurse and other provider relationship, availability of counseling service) and adherence to ART among people living with HIV on ART in Ahmadu Bello University Teaching Hospital Zaria?
3. What are the contributing factors towards adherence to ART among people living with HIV on ART in Ahmadu Bello University Teaching Hospital Zaria?

1.5 Research objectives

1.5.1 General objective

To identify contributing factors towards adherence to ART among people living with HIV in Ahmadu Bello University Teaching Hospital Zaria Nigeria.

1.5.2 Specific objectives

1. To determine the prevalence of adherence to ART among people living with HIV in Ahmadu Bello University Teaching Hospital Zaria
2. To determine the individual level [socio-demographic factors (gender, age, ethnicity, religion, educational level, duration of treatment, household size, monthly income, occupation and marital status], [patient-related factors (drug and alcohol, knowledge, depression, food security status, BMI, dietary diversity], [medication-related factor (side-effect]
3. To determine the interpersonal level [cultural-related factors (beliefs and patient preference for medicine, disclosure of HIV status, stigma and discrimination, social support], community level [health care-related factors (limited availability and accessibility of ART, patient, nurse and other provider relationship, availability of counseling service] among people living with HIV in Ahmadu Bello University Teaching Hospital Zaria.
4. To determine the association between individual level (socio-demographic factors, patient-related factors, medication-related factor), interpersonal level (cultural-related factors), community level (health care-related factors) and adherence to ART among people living with HIV in Ahmadu Bello University Teaching Hospital Zaria
5. To determine the contributing factors towards adherence to ART among people living with HIV in Ahmadu Bello University Teaching Hospital Zaria.

1.6 Null hypothesis

1. There are no association between individual level (socio-demographic factors), (patient-related factors), medication-related factor, interpersonal level (cultural-related factors), community level (health care-related factors) and adherence to ART among people living with HIV in Ahmadu Bello University Teaching Hospital Zaria.
2. There are no significant association between the contributing factors and adherence to ART among people living with HIV on ART in Ahmadu Bello University Teaching Hospital Zaria.

1.7 Conceptual framework

Figure 1.1 shows the conceptual framework adopted from Diez, 2001; Golden & Earp, 2012. In this framework the contributing towards adherence to ART in Ahmadu Bello University Teaching Hospital Zaria were clearly presented. The determinants in this study was examined using the socio-ecological model and was characterized as individual level including (socio-demographic factors (gender, age, ethnicity, religion, educational level, duration of treatment, household size, monthly income, occupation, marital status) patient-related factors (drug and alcohol, knowledge, depression, food security status, BMI, dietary diversity), medication-related factor (side-effect). Other independent variables include interpersonal level such as cultural-related factors (beliefs and patient preference for medicine, stigma and discrimination, disclosure of HIV status, social support) and community level such as health care-related factors (limited availability and accessibility of ART, patient, nurse and other provider relationship, availability of counseling service). Compliance to antiretroviral therapy (ART) was the contingent criterion in this study. The independent variables are represented in the squares while the dependent variable is described in the circle.

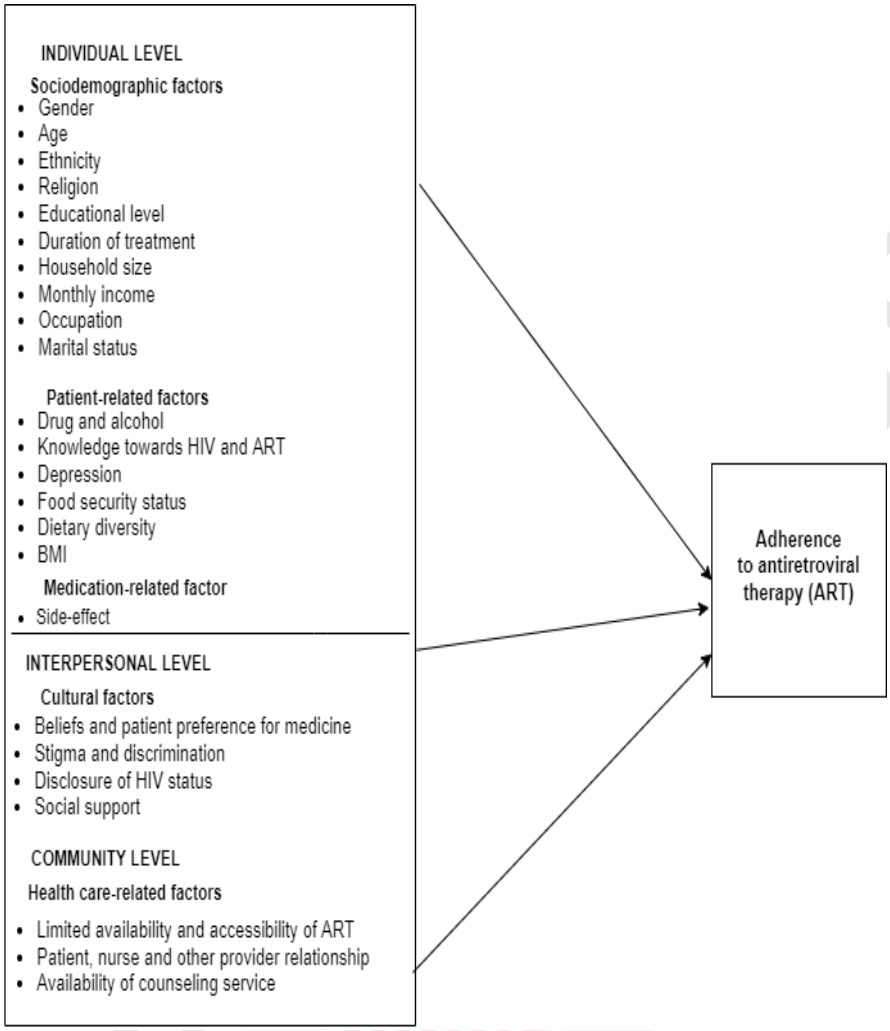

Figure 1.1 : Conceptual framework (Socio-ecological model on ART adherence)
Diez, 2001; Golden & Earp, 2012

1.8 Operational definition

Table 1.1 : Operational definition

Adherence to ART	Adherence to antiretroviral therapy is characterised as a patient's ability to stick to the antiretroviral treatment plan, take drugs at the prescribed times and frequencies, and adhere to food and medication limitations.
Drug and alcohol	Drug and alcohol are substances which has a physiological effect when ingested or otherwise introduced into the body and alcohol is a liquor that contains ethanol and has the potential to intoxicate drinkers, and it can be burned as fuel.
Knowledge towards HIV and ART	Defined as the understanding and knowledge about the virus (HIV) and the treatment (ART).
Depression	Depression is a common mental disorder characterized by persistent sadness and other symptoms. It is accompanied by disturbance in carrying out daily living activities and may lead to suicide.
Food insecurity status	People who lack physical, social, or economic access to sufficient safe and nutritious foods that fulfil their dietary needs and food choices for an active and healthy life are said to be food insecure.
Body mass index (BMI)	(BMI) is the respondents weight in kilograms divided by the square of height in meters. A high BMI can indicate high body fatness.
Dietary diversity	Dietary Diversity is defined as the number of different foods or food groups consumed over a given reference period.
Side-effect	Side effect is an unintended, negative reaction to a medicine or treatment.
Beliefs and patient preference for medicine	Defined as the "relative desirability or acceptability to patients of specified alternatives or choices among outcomes or other attributes that differ among alternative health interventions.
Stigma and discrimination	Stigma is when someone sees the respondents in a negative way because of their mental illness while discrimination is when someone treats respondent in a negative way because of their mental illness.
Disclosure of HIV status	The process of revealing a person's HIV status, whether positive or negative, is known as disclosure. The index person's HIV status is normally revealed voluntarily, but it can also be revealed by others with or without the index person's consent.
Social support	Social support is generally defined as "the perception or experience that one is loved and cared for by others esteemed and valued, and part of a social network of mutual assistance and obligations.
Limited availability and accessibility of ART	Limited amount of ART and limited ART clinic around the environment.
Patient, nurse and other provider relationship	A patient-physician relationship exists when a physician serves a patient's medical needs. Generally, the relationship is entered into by mutual consent between physician and patient.
Availability of counseling service	Define as a process through which clients work one-on-one with a trained mental health clinician in a safe, caring, and confidential environment.

REFERENCES

Abayneh, W., Obse, N., & Naba, T. (2017). Factors associated with level of adherence to antiretroviral therapy in people living with HIV/AIDS at Adama Hospital Medical College Art Clinic, Oromiya Regional State, Ethiopia. *International Journal of HIV/AIDS Prevention, Education and Behavioural Science*, *3*(3), 22.

Abdulrahman, S. A., Rampal, L., Othman, N., Ibrahim, F., Kadir Shahar, H., & Radhakrishnan, A. P. (2017). Socioeconomic Predictors of Adherence Behavior Among HIV-Positive Patients Receiving Antiretroviral Therapy in Selangor, Malaysia. *Asia Pacific Journal of Public Health*, *29*(4), 304-314.

Abera, A., Fenti, B., Tesfaye, T., & Balcha, F. (2015). Factors influencing adherence to antiretroviral therapy among people living with HIV/AIDS at ART Clinic in Jimma University teaching hospital, Southwest Ethiopia. *J Pharma Reports*, *1*(101), 2.

Aberman, N. L., Rawat, R., Drimie, S., Claros, J. M., & Kadiyala, S. (2014). Food security and nutrition interventions in response to the AIDS epidemic: assessing global action and evidence. *AIDS and Behavior*, *18*(5), 554-565.

Achappa, B., Madi, D., Bhaskaran, U., Ramapuram, J. T., Rao, S., & Mahalingam, S. (2013). Adherence to antiretroviral therapy among people living with HIV. *North American journal of medical sciences*, *5*(3), 220.

Addo-Atuah, J., Gourley, D., Gourley, G., White-Means, S. I., Womeodu, R. J., Faris, R. J., & Addo, N. A. (2012). Accessibility of antiretroviral therapy in Ghana: Convenience of access. *SAHARA-J: Journal of Social Aspects of HIV/AIDS*, *9*(2), 74-87.

Adefolalu, A., Nkosi, Z., Olorunju, S., & Masemola, P. (2014). Self-efficacy, medication beliefs and adherence to antiretroviral therapy by patients attending a health facility in Pretoria. *South African Family Practice*, *56*(5), 281-285.

Adeniran, A., Atilola, O., Esther, O., Fisher, O., & Odugbemi, B. (2019). Medication belief, locus of control, and adherence among patients on highly active anti retro viral therapy in Lagos, Nigeria. *Journal of AIDS and HIV Research*, *11*(5), 32-37.

Adeniyi, O. V., Ajayi, A. I., Ter Goon, D., Owolabi, E. O., Eboh, A., & Lambert, J. (2018). Factors affecting adherence to antiretroviral therapy among pregnant women in the Eastern Cape, South Africa. *BMC infectious diseases*, *18*(1), 175.

Adje, D. U., Williams, F. E., Bezugbe, C. N., & Dangiwa, D. A. (2018). Assessment of ART knowledge and adherence to ARVs among PLWHA accessing care in two Nigerian Military HIV/AIDS Treatment sites. *Annals of Health Research*, *4*(1), 43-52.

Afe AJ, Motunrayo O, Ogungbade GO (2017) Factors Influencing Adherence to HAART among Patients Living with HIV Infection in Southwest Nigeria: A Cross- Sectional Analysis. J HIV Retrovirus. Vol. 4 No. 1:1

Agu, K. A., RC, K., MA, I., & PG, I. (2011). Medication Adherence and Risk factors for non-adherence among patients taking Highly Active Antiretroviral Therapy. *West African Journal of Pharmacy*, *22*(1).

Ahmed, C. V., Jolly, P., Padilla, L., Malinga, M., Harris, C., Mthethwa, N., ... & Preko, P. (2017). A qualitative analysis of the barriers to antiretroviral therapy initiation among children 2 to 18 months of age in Swaziland. *African Journal of AIDS Research*, *16*(4), 321-328.

Ahmed, S. I., Farooqui, M., Syed Sulaiman, S. A., Hassali, M. A., & Lee, C. K. (2019). Facilitators and barriers affecting adherence among people living with HIV/AIDS: A qualitative perspective. *Journal of patient experience*, *6*(1), 33-40.

Ajani, S. (2010). An assessment of dietary diversity in six Nigerian states. *African Journal of Biomedical Research*, *13*(3), 161-167.

Akwiwu, U. N., & Akinbile, L. A. (2017). Dietary intake adequacy of people living with HIV/AIDS in rural communities of Imo State, Nigeria. *Journal of Agricultural Extension*, *21*(1), 218-230.

Allard, J. P., Aghdassi, E., Chau, J., Tam, C., Kovacs, C. M., Salit, I. E., & Walmsley, S. L. (1998). Effects of vitamin E and C supplementation on oxidative stress and viral load in HIV-infected subjects. *Aids*, *12*(13), 1653-1659.

Amare, T. W., Melkie, E. Y., Teresa, K. B., & Melaku, K. Y. (2015). Factors associated with dietary diversity among HIV positive adults (≥ 18 years) attending ART clinic at Mettema hospital, Northwest Ethiopia: cross-sectional study. *Journal of AIDS and Clinical Research*, *6*(8).

Amico KR, Toro-Alfonso J, Fisher JD. An empirical test of the information, motivation and behavioral skills model of antiretroviral therapy adherence. AIDS Care. 2005 Aug;17(6):661-73. doi: 10.1080/09540120500038058. PMID: 16036253.

Ammassari, A., Trotta, M. P., Murri, R., Castelli, F., Narciso, P., Noto, P., et al. (2002). Correlates and predictors of adherence to highly active antiretroviral therapy: Overview of published literature. Jaids-Journal Of Acquired Immune Deficiency Syndromes, 31, S123-S12.

Ammon, N., Mason, S., & Corkery, J. M. (2018). Factors impacting antiretroviral therapy adherence among human immunodeficiency virus–positive adolescents in Sub-Saharan Africa: a systematic review. *Public health*, *157*, 20-31.

Amoran, O. E. (2012). Predictors of disclosure of sero-status to sexual partners among people living with HIV/AIDS in Ogun State, Nigeria. *Nigerian journal of clinical practice*, *15*(4), 385-390.

Andini, S., Yona, S., & Waluyo, A. (2019). Self-efficacy, depression, and adherence to antiretroviral therapy (ART) among Indonesian women with HIV. *Enfermeria clinica*, *29*, 687-690.

Anema, A., Chan, K., Chen, Y., Weiser, S., Montaner, J. S., & Hogg, R. S. (2013). Relationship between food insecurity and mortality among HIV-positive injection drug users receiving antiretroviral therapy in British Columbia, Canada. *PloS one*, *8*(5), e61277.

Anema, A., Weiser, S. D., Fernandes, K. A., Ding, E., Brandson, E. K., Palmer, A., ... & Hogg, R. S. (2011). High prevalence of food insecurity among HIV-infected individuals receiving HAART in a resource-rich setting. *AIDS care*, *23*(2), 221-230.

Ankomah, A., Ganle, J. K., Lartey, M. Y., Kwara, A., Nortey, P. A., Okyerefo, M. P. K., & Laar, A. K. (2016). ART access-related barriers faced by HIV-positive persons linked to care in southern Ghana: a mixed method study. *BMC infectious diseases*, *16*(1), 1-12.

Anyaike, C., Atoyebi, O. A., Musa, O. I., Bolarinwa, O. A., Durowade, K. A., Ogundiran, A., & Babatunde, O. A. (2019). Adherence to combined Antiretroviral therapy (cART) among people living with HIV/AIDS in a Tertiary Hospital in Ilorin, Nigeria. *The Pan African Medical Journal*, *32*.

Atukunda, E. C., Musiimenta, A., Musinguzi, N., Wyatt, M. A., Ashaba, J., Ware, N. C., & Haberer, J. E. (2017). Understanding patterns of social support and their relationship to an ART adherence intervention among adults in rural Southwestern Uganda. *AIDS and Behavior*, *21*(2), 428-440.

Atuyambe, L. M., Ssegujja, E., Ssali, S., Tumwine, C., Nekesa, N., Nannungi, A., ... & Wagner, G. (2014). HIV/AIDS status disclosure increases support, behavioural change and, HIV prevention in the long term: a case for an Urban Clinic, Kampala, Uganda. *BMC Health Services Research*, *14*(1), 1-11.

Audain, K. A., Zotor, F. B., Amuna, P., & Ellahi, B. (2015). Food supplementation among HIV-infected adults in Sub-Saharan Africa: impact on treatment adherence and weight gain. *Proceedings of the Nutrition Society*, *74*(4), 517-525.

Avong, Y. K. (2012). Adherence to anti-retroviral therapy in the federal capital territory, Abuja, Nigeria.

Awofala, A. A., & Ogundele, O. E. (2018). HIV epidemiology in Nigeria. *Saudi journal of biological sciences*, *25*(4), 697-703.

Axelsson, J. M., Hallager, S., & Barfod, T. S. (2015). Antiretroviral therapy adherence strategies used by patients of a large HIV clinic in Lesotho. *Journal of Health, Population and Nutrition*, *33*(1), 1-9.

Aye WL, Puckpinyo A, Peltzer K. Non-adherence to anti-retroviral therapy among HIV infected adults in Mon State of Myanmar. BMC Public Health (2017) 17:391 pmid:28476150

Azia, I. N., Mukumbang, F. C., & van Wyk, B. (2016). Barriers to adherence to antiretroviral treatment in a regional hospital in Vredenburg, Western Cape, South Africa. *Southern African journal of HIV medicine*, *17*(1), 476. https://doi.org/10.4102/sajhivmed.v17i1.476

Bakal, D. R., Coelho, L. E., Luz, P. M., Clark, J. L., De Boni, R. B., Cardoso, S. W., ... & Grinsztejn, B. (2018). Obesity following ART initiation is common and influenced by both traditional and HIV-/ART-specific risk factors. *Journal of Antimicrobial Chemotherapy*, *73*(8), 2177-2185.

Bam, K., Rajbhandari, R. M., Karmacharya, D. B., & Dixit, S. M. (2015). Strengthening adherence to Anti Retroviral Therapy (ART) monitoring and support: operation research to identify barriers and facilitators in Nepal. *BMC health services research*, *15*(1), 1-11.

Banagi Yathiraj, A., Unnikrishnan, B., Ramapuram, J. T., Kumar, N., Mithra, P., Kulkarni, V., ... & Thapar, R. (2016). Factors influencing adherence to antiretroviral therapy among people living with HIV in Coastal South India. *Journal of the International Association of Providers of AIDS Care (JIAPAC)*, *15*(6), 529-533.

Banteyerga, H., Aklilu, K., Laura, N., Kerry, M., & Rohini, P. (2003). Exploring HIV and AIDS Stigma and Related Discrimination in Ethiopia: Causes. *Manifestations, Consequences and Coping Mechanisms*.

Baraki, A. G., Gezie, L. D., Zeleke, E. G., Awoke, T., & Tsegaye, A. T. (2019). Body mass index variation over time and associated factors among HIV-positive adults on second-line ART in north-west Ethiopia: a retrospective follow-up study. *BMJ open*, *9*(9), e033393.

Barnhart, M., & Shelton, J. D. (2015). ARVs: the next generation. Going boldly together to new frontiers of HIV treatment.

Becker, N., Cordeiro, L. S., Poudel, K. C., Sibiya, T. E., Sayer, A. G., & Sibeko, L. N. (2020). Individual, household, and community level barriers to ART adherence among women in rural Eswatini. *PloS one*, *15*(4), e0231952.

Beer, L., & Skarbinski, J. (2014). Adherence to antiretroviral therapy among HIV-infected adults in the United States. *AIDS Education and Prevention*, *26*(6), 521-537.

Bello, S. I. (2011). HIV/AIDS patients' adherence to antiretroviral therapy in Sobi Specialist Hospital, Ilorin, Nigeria. *Glob J Med Res*, *11*(2), 16-25.

Bendal, R. B., & Afifi, A. A. (1977). Comparison of stopping rules in forward regression. *J Am Stat Assoc*, *72*(357), 46-53.

Berben L, Dobbels F, Engberg S, Hill MN, de Geest S. An Ecological Perspective on Medication Adherence. West J Nurs Res. 2012; https://doi.org/10.1177/0193945911434518

Berhe, N., Tegabu, D., & Alemayehu, M. (2013). Effect of nutritional factors on adherence to antiretroviral therapy among HIV-infected adults: a case control study in Northern Ethiopia. *BMC infectious diseases*, *13*(1), 1-9.

Bezabhe, W. M., Chalmers, L., Bereznicki, L. R., Peterson, G. M., Bimirew, M. A., & Kassie, D. M. (2014). Barriers and facilitators of adherence to antiretroviral drug therapy and retention in care among adult HIV-positive patients: a qualitative study from Ethiopia. *PloS one*, *9*(5), e97353.

Bickel, G., M. Nord, W. Hamilton and J. Cook. 2000. Guide to measuring household food security. Analysis, Nutrition and Evaluation, Food and Nutrition Service, USDA, USA. https://www.ers.usda.gov/media/8282/short2012.pdf

Bisallah, C. I., Rampal, L., Lye, M. S., Mohd Sidik, S., Ibrahim, N., Iliyasu, Z., & Onyilo, M. O. (2018). Effectiveness of health education intervention in improving knowledge, attitude, and practices regarding Tuberculosis among HIV patients in General Hospital Minna, Nigeria–A randomized control trial. *PloS one*, *13*(2), e0192276.

Black AE, 2000a. Critical evaluation of energy intake using the Goldberg cut-off for energy intake: basal metabolic rate. A practical guide to its calculation, use and limitations. International Journal of Obesity and Related Metabolic Disorders, 24(9), 1119-1130.

Black AE, 2000b. The sensitivity and specificity of the Goldberg cut-off for EI:BMR for identifying diet reports of poor validity. European Journal of Clinical Nutrition, 54(5), 395-404.

Boateng, D., Kwapong, G. D., & Agyei-Baffour, P. (2013). Knowledge, perception about antiretroviral therapy (ART) and prevention of mother-to-child-transmission (PMTCT) and adherence to ART among HIV positive women in the Ashanti Region, Ghana: a cross-sectional study. *BMC women's health*, *13*(1), 1-8.

Bolsewicz, K., Debattista, J., Vallely, A., Whittaker, A., & Fitzgerald, L. (2015). Factors associated with antiretroviral treatment uptake and adherence: a review. Perspectives from Australia, Canada, and the United Kingdom. *AIDS care*, *27*(12), 1429-1438.

Bonnington, O., Wamoyi, J., Ddaaki, W., Bukenya, D., Ondenge, K., Skovdal, M., ... & Wringe, A. (2017). Changing forms of HIV-related stigma along the HIV care and treatment continuum in sub-Saharan Africa: a temporal analysis. *Sexually transmitted infections*, *93*(Suppl 3).

Boretzki, J., Wolf, E., Wiese, C., Noe, S., Balogh, A., Meurer, A., ... & Spinner, C. D. (2017). Highly specific reasons for nonadherence to antiretroviral therapy: results from the German adherence study. *Patient preference and adherence*, *11*, 1897.

Boyer, S., Clerc, I., Bonono, C. R., Marcellin, F., Bilé, P. C., & Ventelou, B. (2011). Non-adherence to antiretroviral treatment and unplanned treatment interruption among people living with HIV/AIDS in Cameroon: Individual and healthcare supply-related factors. *Social science & medicine*, *72*(8), 1383-1392.

Breckenridge, A. (2009). Pharmacology of drugs for HIV. *Medicine*, *37*(7), 374-377.

Briefel, R. R., Sempos, C., McDowell, M. A., Chien, S., & Alaimo, K. (1997). Dietary methods research in the third National Health and Nutrition Examination Survey: underreporting of energy intake. The American journal of clinical nutrition, 65(4), 1203S-1209S.

Broadhead, R. S., Heckathorn, D. D., Altice, F. L., van Hulst, Y., Carbone, M., Friedland, G. H., et al. (2002). Increasing drug users' adherence to HIV treatment: results of a peerdriven intervention feasibility study. Soc Sci Med, 55(2), 235-24

Broadhead, W. E., Gehlbach, S. H., De Gruy, F. V., & Kaplan, B. H. (1988). The Duke-UNC Functional Social Support Questionnaire: Measurement of social support in family medicine patients. *Medical care*, 709-723.

Calder, C. L., O'Hara, H., Tabatabai, M., Maxwell, C. J., Marryshow, S., Ahonkhai, A. A., ... & Aliyu, M. H. (2020). Adherence to Combination Antiretroviral Therapy among Pregnant Women Enrolled in a HIV Prevention Program in Rural North-central Nigeria. *International Journal of Maternal and Child Health and AIDS*, *9*(1), 81.

Camargo LA, Capitão CG, Filipe EMV. Saúde mental, suporte familiar e adesão ao tratamento: associações no contexto HIV/Aids. Psico-USF. 2014;19(2):221-32. doi: https://doi.org/10.1590/1413-82712014019002013 https://www.scielo.br/j/pusf/a/4ksgWN8bcKNTCrYsBqvDPXx/?lang=pt

Campbell, L., Masquillier, C., Thunnissen, E., Ariyo, E., Tabana, H., Sematlane, N., ... & Wouters, E. (2020). Social and Structural Determinants of Household Support for ART Adherence in Low-and Middle-Income Countries: A Systematic Review. *International journal of environmental research and public health*, *17*(11), 3808.

Cantrell, R. A., Sinkala, M., Megazinni, K., Lawson-Marriott, S., Washington, S., Chi, B. H., ... & Stringer, J. S. (2008). A pilot study of food supplementation to improve adherence to antiretroviral therapy among food insecure adults in Lusaka, Zambia. *Journal of acquired immune deficiency syndromes (1999)*, *49*(2).

Carey, M. P., & Schroder, K. E. (2002). Development and psychometric evaluation of the brief HIV Knowledge Questionnaire. *AIDS education and prevention*, *14*(2), 172-182.

Castro, E. M., Santiago, L. E., Jimenez, J. C., Dávila-Vargas, D., & Rosal, M. C. (2015). A social-ecological view of barriers and facilitators for HIV treatment adherence: Interviews with Puerto Rican HIV patients. *PloS one*, *10*(9), e0125582.

Chaiyachati, K. H., Ogbuoji, O., Price, M., Suthar, A. B., Negussie, E. K., & Bärnighausen, T. (2014). Interventions to improve adherence to antiretroviral therapy: a rapid systematic review. *Aids*, *28*, S187-S204.

Chen, W. T., Wantland, D., Reid, P., Corless, I. B., Eller, L. S., Iipinge, S., ... & Webel, A. R. (2013). Engagement with health care providers affects self-efficacy, self-esteem, medication adherence and quality of life in people living with HIV. *Journal of AIDS & clinical research*, *4*(11), 256.

Chesney, M. (2003). Adherence to HAART regimens. Aids Patient Care And Stds, 17(4), 169-177.

Chesney, M. A. (2000). Factors affecting adherence to antiretroviral therapy. *Clinical Infectious Diseases*, *30*(Supplement_2), S171-S176.

Chirambo, L., Valeta, M., Kamanga, T. M. B., & Nyondo-Mipando, A. L. (2019). Factors influencing adherence to antiretroviral treatment among adults accessing care from private health facilities in Malawi. *BMC public health*, *19*(1), 1-11.

Chop, E., Duggaraju, A., Malley, A., Burke, V., Caldas, S., Yeh, P. T., ... & Kennedy, C. E. (2017). Food insecurity, sexual risk behavior, and adherence to antiretroviral therapy among women living with HIV: a systematic review. Health care for women international, 38(9), 927-944.

Claxton, A. J., Cramer, J., & Pierce, C. (2001). A systematic review of the associations between dose regimens and medication compliance. *Clinical therapeutics*, *23*(8), 1296-1310.

Coetzee, B., Kagee, A., & Vermeulen, N. (2011). Structural barriers to adherence to antiretroviral therapy in a resource-constrained setting: the perspectives of health care providers. *AIDS care*, *23*(2), 146-151.

Cohen MS, Chen YQ, McCauley M, et al.; HPTN 052 Study Team. Antiretroviral therapy for the prevention of HIV-1 transmission. N Engl J Med 2016;375:830–9. PMID:27424812https://doi.org/10.1056/NEJMoa1600693

Coleman, M. & Alonso, A. (2016). A Qualitative Study Exploring How Family Planning Beliefs and Attitudes Contribute to Family Planning Behavior in Rural, Southeastern Kenya: Application of the Social Ecological Model. World medical and health policy,8.4. 364-381.

Corless, I. B., Wantland, D., Kirksey, K. M., Nicholas, P. K., Human, S., Arudo, J., ... & Holzemer, W. L. (2012). Exploring the contribution of general self-efficacy to the use of self-care symptom management strategies by people living with HIV infection. *AIDS patient care and STDs*, *26*(6), 335-343.

Croome, N., Potter, L., Bere, T., Nyamayaro, P., Machando, D., Hughes, L. D., ... & Kidia, K. (2020). Medication beliefs among people living with HIV taking antiretroviral treatment in Zimbabwe: a qualitative study. *Journal of Global Health Reports*, *4*, e2020101.

Damulira, C., Mukasa, M. N., Byansi, W., Nabunya, P., Kivumbi, A., Namatovu, P., ... & Ssewamala, F. M. (2019). Examining the relationship of social support and family cohesion on ART adherence among HIV-positive adolescents in southern Uganda: baseline findings. *Vulnerable children and youth studies*, *14*(2), 181-190.

Dang, B. N., Westbrook, R. A., Black, W. C., Rodriguez-Barradas, M. C., & Giordano, T. P. (2013). Examining the link between patient satisfaction and adherence to HIV care: a structural equation model. *PloS one*, *8*(1), e54729.

de Fatima Bonolo, P., Ceccato, M. D. G. B., Rocha, G. M., de Assis Acúrcio, F., Campos, L. N., & Guimarães, M. D. C. (2013). Gender differences in non-adherence among Brazilian patients initiating antiretroviral therapy. *Clinics*, *68*(5), 612-620.

Deeks, S. G., Lewin, S. R., & Havlir, D. V. (2013). The end of AIDS: HIV infection as a chronic disease. Lancet [Internet].

Demessie, R., Mekonnen, A., Amogne, W., & Shibeshi, W. (2014). Knowledge and adherence to antiretroviral therapy among adult people living with HIV/AIDS at Tikur Anbessa Specialized Hospital, Ethiopia. *Int J Basic Clin Pharmacol*, *3*(2), 320-30.

Denison, J. A., Koole, O., Tsui, S., Menten, J., Torpey, K., Van Praag, E., ... & Bangsberg, D. R. (2015). Incomplete adherence among treatment-experienced adults on antiretroviral therapy in Tanzania, Uganda and Zambia. *AIDS (London, England)*, *29*(3), 361.

Dessie, G., Wagnew, F., Mulugeta, H., Amare, D., Jara, D., Leshargie, C. T., ... & Burrowes, S. (2019). The effect of disclosure on adherence to antiretroviral therapy among adults living with HIV in Ethiopia: a systematic review and meta-analysis. *BMC infectious diseases*, *19*(1), 1-8.

Dibaba, B., & Hussein, M. (2017). Factors associated with non-adherence to antiretroviral therapy among adults living with HIV/AIDS in Arsi zone, Oromia. *Journal of AIDS and Clinical Research*, *8*(1).

Diez Roux AV. Investigating neighborhood and area effects on health. AmJPublic Health. 2001;91(11):1783–9

Dima, A. L., Schweitzer, A. M., Diaconiță, R., Remor, E., & Wanless, R. S. (2013). Adherence to ARV medication in Romanian young adults: self-reported behaviour and psychological barriers. *Psychology, health & medicine*, *18*(3), 343-354.

Dror DK, Allen LH. Vitamin E deficiency in developing countries. Food Nutr Bull. 2011 Jun;32(2):124-43. doi: 10.1177/156482651103200206. PMID: 22164974.

Dworkin, B., Wormser, G. P., Rosenthal, W. S., Heier, S. K., Braunstein, M., Weiss, L., ... & Weiselberg, S. (1985). Gastrointestinal manifestations of the acquired immunodeficiency syndrome: a review of 22 cases. *American Journal of Gastroenterology (Springer Nature)*, *80*(10).

Earnshaw, V. A., Smith, L. R., Chaudoir, S. R., Amico, K. R., & Copenhaver, M. M. (2013). HIV stigma mechanisms and well-being among PLWH: a test of the HIV stigma framework. *AIDS and Behavior*, *17*(5), 1785-1795.

Ebuy, H., Yebyo, H., & Alemayehu, M. (2015). Level of adherence and predictors of adherence to the Option B+ PMTCT programme in Tigray, northern Ethiopia. *International Journal of Infectious Diseases*, *33*, 123-129.

Ehlers, V. J., & Tshisuyi, E. T. (2015). Adherence to antiretroviral treatment by adults in a rural area of Botswana. *curationis*, *38*(1), 1-8.

Ejigu, M., Desalegn, Z., Mulatu, B., & Mosisa, G. (2020). Adherence to Combined Antiretroviral Therapy and Associated Factors Among People Living with HIV Attending Nekemte Specialized Hospital, Oromia, Ethiopia: A Cross-Sectional Study. *HIV/AIDS (Auckland, NZ)*, *12*, 97.

Ekama, S. O., Herbertson, E. C., Addeh, E. J., Gab-Okafor, C. V., Onwujekwe, D. I., Tayo, F., & Ezechi, O. C. (2012). Pattern and determinants of antiretroviral drug adherence among Nigerian pregnant women. *Journal of pregnancy*, *2012*.

Elul, B., Basinga, P., Nuwagaba-Biribonwoha, H., Saito, S., Horowitz, D., Nash, D., ... & Asiimwe, A. (2013). High levels of adherence and viral suppression in a nationally representative sample of HIV-infected adults on antiretroviral therapy for 6, 12 and 18 months in Rwanda. *PloS one*, *8*(1), e53586.

Erlwanger, A. S., Joseph, J., Gotora, T., Muzunze, B., Orne-Gliemann, J., Mukungunugwa, S., ... & Mangwiro, A. Z. (2017). Patterns of HIV care clinic attendance and adherence to antiretroviral therapy among pregnant and breastfeeding women living with HIV in the context of Option B+ in Zimbabwe. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, *75*, S198-S206.

Eyassu, M. A., Mothiba, T. M., & Mbambo-Kekana, N. P. (2016). Adherence to antiretroviral therapy among HIV and AIDS patients at the Kwa-Thema clinic in Gauteng Province, South Africa. *African journal of primary health care & family medicine*, *8*(2), 1-7.

Eze J.I. University of Glasgow; 2009. Modeling HIV/AIDS Epidemic in Nigeria. (Ph.D. thesis) Available: < http://theses.gla.ac.uk/642/1/2009EzePhD.pdf> (accessed 6 February 2013)

Ezechi, L. O., Musa, Z. A., Otobo, V. O., Idigbe, I. E., & Ezechi, O. C. (2016). Trends and risk factors for obesity among HIV positive Nigerians on antiretroviral therapy. *Ceylon Medical Journal*, *61*(2).

Falang, K. D., Akubaka, P., & Jimam, N. S. (2012). Patient factors impacting antiretroviral drug adherence in a Nigerian tertiary hospital. *Journal of pharmacology & pharmacotherapeutics*, *3*(2), 138.

Fanta. 2001. HIV/AIDS: A Guide for Nutrition, Care and Support. www. fantaproject.org. Tanggal akses 1 Agustus 2007.

FAO. Guidelines for Measuring Household and Individual Dietary Diversity. Rome, Italy: FAO; 2010

Federal Ministry of Health, Nigeria. Nigeria HIV/AIDS Indicator and Impact Survey (NAIIS) 2018 technical report. Abuja, Nigeria: Federal Ministry of Health, Nigeria; 2020. http://ciheb.org/media/SOM/ Microsites/CIHEB/documents/NAIIS-Report-2018.pdf

Fisher, W. A., Fisher, J. D., & Harman, J. J. (2003). The information-motivation-behavior skills model: A gender social psychological approach to understanding and promoting health behavior. In J. Suls & K. Wallston (Eds.), Social psycholgoical foundations of health and illness. Malden, MA: Blackwell.

Fogarty, L., Roter, D., Larson, S., Burke, J., Gillespie, J., & Levy, R. (2002). Patient adherence to HIV medication regimens: a review of published and abstract reports. Patient Educ Couns, 46(2), 93-108

Fonsah, J. Y., Njamnshi, A. K., Kouanfack, C., Qiu, F., Njamnshi, D. M., Tagny, C. T., ... & Kanmogne, G. D. (2017). Adherence to antiretroviral therapy (ART) in Yaoundé-Cameroon: association with opportunistic infections, depression, ART regimen and side effects. *PLoS One*, *12*(1), e0170893.

Fourney, A. M., & Williams, M. L. (2003). Formative evaluation of an intervention to increase compliance to HIV therapies: the ALP project. Health Promot Pract, 4(2), 165-170.

Gary, F. A., Yarandi, H. A., & Mathunjwa-Dlamini, T. R. (2015). Factors Influencing HIV-positive Expectant Mothers' Adherence to ARV Prophylaxis (PMTCT) in a Healthcare Facility in the Hhohho Region. *Swaziland. IJSAT*, *5*.

Gebre, B. B. (2019). Factors associated with alcohol use disorder among people living with HIV/AIDS attending art Clinic, Mizan Tep University teaching hospital, south West Ethiopia. *Hiv/aids (Auckland, NZ)*, *11*, 239.

Gedle, D., Gelaw, B., Muluye, D., & Mesele, M. (2015). Prevalence of malnutrition and its associated factors among adult people living with HIV/AIDS receiving anti-retroviral therapy at Butajira Hospital, southern Ethiopia. *BMC nutrition*, *1*(1), 1-11.

Gedle, D., Mekuria, G., Kumera, G., Eshete, T., Feyera, F., & Ewunetu, T. (2015). Food insecurity and its associated factors among people living with HIV/AIDS receiving anti-retroviral therapy at Butajira Hospital, Southern Ethiopia. *Journal of Nutrition & Food Sciences*, *5*(2), 2-6.

Glendinning, E., Spiers, J., Smith, J. A., Anderson, J., Campbell, L. J., Cooper, V., & Horne, R. (2019). A qualitative study to identify perceptual barriers to Antiretroviral Therapy (ART) uptake and adherence in HIV positive people from UK Black African and Caribbean communities. *AIDS and Behavior*, *23*(9), 2514-2521 Gokarn, A., Narkhede, M. G., Pardeshi, G. S., & Doibale, M. K. (2012). Adherence to antiretroviral therapy. *Japi*, *60*, 17.

Goldberg GR, Black AE, Jebb SA & et al., 1991. Critical evaluation of energy intake data using fundamental principles of energy physiology: 1. Derivation of cut-off limits to identify underrecording. European Journal of Clinical Nutrition, 45(12), 569-581.

Golden SD, Earp JAL. Social ecological approaches to individuals and their contexts: twenty years of health education & behavior health promotion interventions. Health Education & Behavior. 2012;39(3):364–372

Goldenberg, S. M., Montaner, J., Duff, P., Nguyen, P., Dobrer, S., Guillemi, S., & Shannon, K. (2016). Structural barriers to antiretroviral therapy among sex workers living with HIV: findings of a longitudinal study in Vancouver, Canada. *AIDS and Behavior*, *20*(5), 977-986.

Gonzalez, J. S., Batchelder, A. W., Psaros, C., & Safren, S. A. (2011). Depression and HIV/AIDS treatment nonadherence: a review and meta-analysis. *Journal of acquired immune deficiency syndromes (1999)*, *58*(2).

Gonzalez, J. S., Psaros, C., Batchelder, A., Applebaum, A., Newville, H., & Safren, S. A. (2011). Clinician-assessed depression and HAART adherence in HIV-infected individuals in methadone maintenance treatment. *Annals of Behavioral Medicine*, *42*(1), 120-126.

Goudge, J., & Ngoma, B. (2011). Exploring antiretroviral treatment adherence in an urban setting in South Africa. *Journal of public health policy*, *32*(1), S52-S64.

Graham, J. W. (2009). Missing data analysis: Making it work in the real world. Annual review of psychology, 60, 549-576.

Grimsrud, A. T., Pike, C., & Bekker, L. G. (2020). The power of peers and community in the continuum of HIV care. *The Lancet Global Health*, *8*(2), e167-e168.

Guehi, C., Badjé, A., Gabillard, D., Ouattara, E., Koulé, S. O., Moh, R., ... & Danel, C. (2016). High prevalence of being Overweight and Obese HIV-infected persons, before and after 24 months on early ART in the ANRS 12136 Temprano Trial. *AIDS research and therapy*, *13*(1), 1-12.

Gugsa, S., Potter, K., Tweya, H., Phiri, S., Sande, O., Sikwese, P., ... & O'Malley, G. (2017). Exploring factors associated with ART adherence and retention in care under Option B+ strategy in Malawi: A qualitative study. *PloS one*, *12*(6), e0179838.

Hansana, V., Sanchaisuriya, P., Durham, J., Sychareun, V., Chaleunvong, K., Boonyaleepun, S., & Schelp, F. P. (2013). Adherence to antiretroviral therapy (ART) among people living with HIV (PLHIV): a cross-sectional survey to measure in Lao PDR. *BMC public health*, *13*(1), 1-11.

Harman, J. J., Amico, K. R., & Johnson, B. T. (2005). Standard of care: Promoting antiretroviral adherence in clinical care. Aids Care-Psychological And Socio-Medical Aspects Of Aids/Hiv, 17(2), 237-251.

Haskard Zolnierek KB, Dimatteo MR, Mondala MM, Zhang Z, Martin LR, Messiha AH. Development and Validation of the Physician-Patient Humor Rating Scale. J Health Psychol. 2009; https://doi.org/10.1177/1359105309342288

Havlir, D., & Beyrer, C. (2012). The beginning of the end of AIDS?. *New England Journal of Medicine*, *367*(8), 685-687.

Heestermans, T., Browne, J. L., Aitken, S. C., Vervoort, S. C., & Klipstein-Grobusch, K. (2016). Determinants of adherence to antiretroviral therapy among HIV-positive adults in sub-Saharan Africa: a systematic review. *BMJ global health*, *1*(4), e000125.

Hirvonen, T., Männistö, S., Roos, E., & Pietinen, P. (1997). Increasing prevalence of underreporting does not necessarily distort dietary surveys. European journal of clinical nutrition, 51(5), 297-301.

Hong, S. Y., Fanelli, T. J., Jonas, A., Gweshe, J., Tjituka, F., Sheehan, H. M., ... & Jordan, M. R. (2014). Household food insecurity associated with antiretroviral therapy adherence among HIV-infected patients in Windhoek, Namibia. *Journal of acquired immune deficiency syndromes (1999)*, *67*(4), e115.

Horizons/Population Council, International Centre for Reproductive Health and Coast Province General Hospital, Mombasa-Kenya. Adherence to Antiretroviral Therapy in Adults: A Guide for Trainers. Nairobi: Population Council. 2004. Available from: http://www.popcouncil.org/uploads/pdfs/horizons/mombasaarvtrainingguide.pdf . Accessed August 13, 2012.

Horne, R., Weinman, J., & Hankins, M. (1999). The beliefs about medicines questionnaire: the development and evaluation of a new method for assessing the cognitive representation of medication. *Psychology and health*, *14*(1), 1-24.

Huang, L., Li, L., Zhang, Y., Li, H., Li, X., & Wang, H. (2013). Self-efficacy, medication adherence, and quality of life among people living with HIV in Hunan Province of China: a questionnaire survey. *Journal of the Association of Nurses in AIDS Care*, *24*(2), 145-153.

Ibor, E. L., Pagán, E. M., Lapuerta, C. L., Laderas, L. B., Díaz, J. M., & Rodrigo, E. A. (2015). Es importante valorar los síntomas de Ansiedad y Depresión en población VIH. *Rev Multidiscip del Sida*, *1*(4), 52-5.

Ibrahim, K., Lindayani, L., Emaliyawati, E., Rahayu, U., & Nuraeni, A. Factors Associated with Adherence to Antiretroviral Therapy among People Living with HIV Infection in West Java Province, Indonesia.

Ickovics, J. R., & Meade, C. S. (2002). Adherence to HAART among patients with HIV: breakthroughs and barriers. Aids Care-Psychological And Socio-Medical Aspects Of Aids/Hiv, 14(3), 309-318.

Idigbe, E. O., Adewole, T. A., Eisen, G., Kanki, P., Odunukwe, N. N., Onwujekwe, D. I., ... & Musa, A. Z. (2005). Management of HIV-1 infection with a combination of nevirapine, stavudine, and lamivudine: a preliminary report on the Nigerian antiretroviral program. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, *40*(1), 65-69.

Idindili, B., Jullu, B., Mugusi, F., & Tanner, M. (2012). A case-control study of factors associated with non-adherent to antiretroviral therapy among HIV infected people in Pwani Region, eastern Tanzania. *Tanzania journal of health research*, *14*(3).

Igbende, Aumbur, D., Chinelo, H., Anhange, Terzungwe, S., & Aiingona, A.P. (2016). Belief in Spiritual Healing, Gender and Adherence to Medication among HIV/AIDS Patients in Benue State, Nigeria Igbende, Dorothy Aumbur, Dooior, Mkpelanga, Ogwuche, Helen Chinelo, Anhange.

Inzaule, S. C., Hamers, R. L., Kityo, C., Rinke de Wit, T. F., & Roura, M. (2016). Long-term antiretroviral treatment adherence in HIV-infected adolescents and adults in Uganda: a qualitative study. *PloS one*, *11*(11), e0167492.

Irunde, H., Temu, F., Maridadi, J., Nsimba, S., & Comoro, C. (2006). A study on antiretroviral adherence in Tanzania: a pre-intervention perspective, 2005. *From access to adherence: the challenges of antiretroviral treatment*, *164*.

Jamous, R. M., Sweileh, W. M., Taha, A. S. E. D. A., & Zyoud, S. E. H. (2014). Beliefs about medicines and self-reported adherence among patients with chronic illness: a study in Palestine. *Journal of family medicine and primary care*, *3*(3), 224.

Jayawardena, R., Byrne, N. M., Soares, M. J., Katulanda, P., Yadav, B., & Hills, A. P. (2013). High dietary diversity is associated with obesity in Sri Lankan adults: an evaluation of three dietary scores. *BMC public health*, *13*(1), 1-8.

Jones, D., Cook, R., Cecchini, D., Sued, O., Bofill, L., Weiss, S., ... & Spence, A. (2015). Examining adherence among challenging patients in public and private HIV care in Argentina. *AIDS and Behavior*, *19*(9), 1619-1629.

Jones, D., Cook, R., Spence, A., Weiss, S. M., & Chitalu, N. (2014). Antiretroviral therapy in Zambia: do partners on ART enhance adherence?. *Journal of the International Association of Providers of AIDS Care (JIAPAC)*, *13*(6), 497-500.

Joshi, B., Chauhan, S., Pasi, A., Kulkarni, R., Sunil, N., Bachani, D., ... & ART Adherence Study Group. (2014). Level of suboptimal adherence to first line antiretroviral treatment & its determinants among HIV positive people in India. *The Indian journal of medical research*, *140*(1), 84.

Kader, R., Govender, R., Seedat, S., Koch, J. R., & Parry, C. (2015). Understanding the impact of hazardous and harmful use of alcohol and/or other drugs on ARV adherence and disease progression. *PloS one*, *10*(5), e0125088.

Kalichman, S. C., Grebler, T., Amaral, C. M., McKerney, M., White, D., Kalichman, M. O., ... & Eaton, L. (2014). Food insecurity and antiretroviral adherence among HIV positive adults who drink alcohol. *Journal of behavioral medicine*, *37*(5), 1009-1018.

Kamaradova, D., Latalova, K., Prasko, J., Kubinek, R., Vrbova, K., Mainerova, B., ... & Tichackova, A. (2016). Connection between self-stigma, adherence to treatment, and discontinuation of medication. *Patient preference and adherence*, *10*, 1289.

Kang'ethe, S. M., & Nomngcoyiya, T. (2015). Exploring Underpinnings Weighing Down the Phenomenon of Adherence to Anti-Retroviral Drugs (ARVs) among the people living with HIV/AIDS (PLWHA) in South Africa and Botswana: a literature review. *Journal of Human Ecology*, *50*(3), 237-243.

Kasumu, L., & Balogun, M. (2014). Knowledge and attitude towards antiretroviral therapy and adherence pattern of HIV patients in southwest Nigeria. *International Journal of Infection Control*, *10*(3).

Katz, I. T., Ryu, A. E., Onuegbu, A. G., Psaros, C., Weiser, S. D., Bangsberg, D. R., & Tsai, A. C. (2013). Impact of HIV-related stigma on treatment adherence: systematic review and meta-synthesis. *Journal of the International AIDS Society*, *16*, 18640.

Kelly, J. D., Hartman, C., Graham, J., Kallen, M. A., & Giordano, T. P. (2014). Social support as a predictor of early diagnosis, linkage, retention, and adherence to HIV care: results from the steps study. *Journal of the Association of Nurses in AIDS Care*, *25*(5), 405-413.

Kessler, J., Nucifora, K., Li, L., Uhler, L., & Braithwaite, S. (2015). Impact and cost-effectiveness of hypothetical strategies to enhance retention in care within HIV treatment programs in East Africa. *Value in Health*, *18*(8), 946-955.

Kim, J., Lee, E., Park, BJ. *et al.* Adherence to antiretroviral therapy and factors affecting low medication adherence among incident HIV-infected individuals during 2009–2016: A nationwide study. *Sci Rep* 8, 3133 (2018). https://doi.org/10.1038/s41598-018-21081-x

Kim, M. H., Zhou, A., Mazenga, A., Ahmed, S., Markham, C., Zomba, G., ... & Abrams, E. J. (2016). Why did I stop? Barriers and facilitators to uptake and adherence to ART in Option B+ HIV care in Lilongwe, Malawi. *PloS one*, *11*(2), e0149527.

Kintu, A., Liu, E., Hertzmark, E., Spiegelman, D., Zack, R. M., Muya, A., ... & Fawzi, W. (2018). Incidence and risk factors for overweight and obesity after initiation of antiretroviral therapy in Dar es Salaam, Tanzania. *Journal of the International Association of Providers of AIDS Care (JIAPAC)*, *17*, 2325958218759759.

Kioko, M. T., & Pertet, A. M. (2017). Factors contributing to antiretroviral drug adherence among adults living with HIV or AIDS in a Kenyan rural community. *African journal of primary health care & family medicine*, *9*(1), 1-7.

Kitshoff, C., & Naidoo, S. S. (2012). The association between depression and adherence to antiretroviral therapy in HIV-positive patients, KwaZulu-Natal, South Africa. *South African Family Practice*, *54*(2).

Klis, S., Velding, K., Gidron, Y., & Peterson, K. (2011). Posttraumatic stress and depressive symptoms among people living with HIV in the Gambia. *Aids Care*, *23*(4), 426-434.

Koethe, J. R., Blevins, M., Bosire, C., Nyirenda, C., Kabagambe, E. K., Mwango, A., ... & Heimburger, D. C. (2013). Self-reported dietary intake and appetite predict early treatment outcome among low-BMI adults initiating HIV treatment in sub-Saharan Africa. *Public health nutrition*, *16*(3), 549-558.

Koethe, J. R., Jenkins, C. A., Lau, B., Shepherd, B. E., Justice, A. C., Tate, J. P., ... & North American AIDS Cohort Collaboration on Research and Design (NA-ACCORD). (2016). Rising obesity prevalence and weight gain among adults starting antiretroviral therapy in the United States and Canada. *AIDS research and human retroviruses*, *32*(1), 50-58.

Koole, O., Denison, J. A., Menten, J., Tsui, S., Wabwire-Mangen, F., Kwesigabo, G., ... & Colebunders, R. (2016). Reasons for missing antiretroviral therapy: results from a multi-country study in Tanzania, Uganda, and Zambia. *PloS one*, *11*(1), e0147309.

Kumar, N., Unnikrishnan, B., Thapar, R., Mithra, P., Kulkarni, V., Holla, R., ... & Mehta, I. (2014). Factors associated with adherence to antihypertensive treatment among patients attending a tertiary care hospital in Mangalore, South India. *Int J Curr Res Rev*, *6*(10), 77-85.

Lambo, E. (2006). Nigeria has established 74 ARV treatment centers nationwide. *HIV/AIDS News*, *15*.

Lancaster, K. E., Cernigliaro, D., Zulliger, R., & Fleming, P. F. (2016). HIV care and treatment experiences among female sex workers living with HIV in sub-Saharan Africa: A systematic review. African Journal of AIDS Research, 15(4), 377-386. https://dx.doi.org/10.2989%2F16085906.2016.1255652

Langebeek, N., Gisolf, E. H., Reiss, P., Vervoort, S. C., Hafsteinsdóttir, T. B., Richter, C., ... & Nieuwkerk, P. T. (2014). Predictors and correlates of adherence to combination antiretroviral therapy (ART) for chronic HIV infection: a meta-analysis. *BMC medicine*, *12*(1), 1-14.

Lencha, B., Hasen, K., Getachew, T., Abdi, M., & Habtamu, M. (2015). Adherence to antiretroviral therapy and associated factors among people living with HIV/AIDS at Gobba Hospital, Southeast Ethiopia: an institutional based study. *Qual Primary Care*, *23*, 336-341.

Lenzi, L., Tonin, F. S., Souza, V. R. D., & Pontarolo, R. (2018). Suporte social e HIV: relações entre características clínicas, sociodemográficas e adesão ao tratamento. *Psicologia: Teoria e Pesquisa*, *34*.

Letta, S., Demissie, A., Oljira, L., & Dessie, Y. (2015). Factors associated with adherence to Antiretroviral Therapy (ART) among adult people living with HIV and attending their clinical care, Eastern Ethiopia. *BMC International health and human rights*, *15*(1), 1-7.

Li JZ, G S R H, Heiseya A, Bangsbergd DR, Kuritzkesa DR. Incomplete adherence to antiretroviral therapy is associated with higher levels of residual HIV-1 viremia. AIDS. 2014;28(2):181–6. pmid:24361679

Loeliger, K. B., Niccolai, L. M., Mtungwa, L. N., Moll, A., & Shenoi, S. V. (2016). "I Have to Push Him with a Wheelbarrow to the Clinic": Community Health Workers' Roles, Needs, and Strategies to Improve HIV Care in Rural South Africa. *AIDS patient care and STDs*, *30*(8), 385-394.

Logie, C. H., Jenkinson, J. I., Earnshaw, V., Tharao, W., & Loutfy, M. R. (2016). A structural equation model of HIV-related stigma, racial discrimination, housing insecurity and wellbeing among African and Caribbean Black women living with HIV in Ontario, Canada. *PLoS One*, *11*(9), e0162826.

Lwanga, S. K., Lemeshow, S., & World Health Organization. (1991). *Sample size determination in health studies: a practical manual*. World Health Organization.

Lyimo, R. A., Stutterheim, S. E., Hospers, H. J., de Glee, T., van der Ven, A., & de Bruin, M. (2014). Stigma, disclosure, coping, and medication adherence among people living with HIV/AIDS in Northern Tanzania. *AIDS patient care and STDs*, *28*(2), 98-105.

Macallan, D. C. (1999). Nutrition and immune function in human immunodeficiency virus infection. *Proceedings of the Nutrition society*, *58*(3), 743-748.

Macdiarmid, J. I. & Blundell, J. E. (1997). Dietary under-reporting: what people say about recording their food intake. European Journal of Clinical Nutrition, 51(3), 199-200.

Machtinger, E. L., & Bangsberg, D. R. (2005). Adherence to HIV antiretroviral therapy. *HIV insite knowledge base chapter*.

Mahlangu, K., Modjadji, P., & Madiba, S. (2020, September). The Nutritional Status of Adult Antiretroviral Therapy Recipients with a Recent HIV Diagnosis; A Cross-Sectional Study in Primary Health Facilities in Gauteng, South Africa. In *Healthcare* (Vol. 8, No. 3, p. 290). Multidisciplinary Digital Publishing Institute.

Maixenchs, M., Boene, H., Anselmo, R., Mindu, C., Alonso, P., Menéndez, C., ... & Munguambe, K. (2015). Post-ART symptoms were not the problem: a qualitative study on adherence to ART in HIV-infected patients in a Mozambican rural hospital. *Plos one*, *10*(9), e0137336.

Mannheimer, S. B., Mukherjee, R., Hirschhorn, L. R., Dougherty, J., Celano, S. A., Ciccarone, D., ... & Finkelstein, R. (2006). The CASE adherence index: A novel method for measuring adherence to antiretroviral therapy. *AIDS care*, *18*(7), 853-861.

Mao, Y., Qiao, S., Li, X., Zhao, Q., Zhou, Y., & Shen, Z. (2019). Depression, social support, and adherence to antiretroviral therapy among people living with HIV in Guangxi, China: A longitudinal study. *AIDS Education and Prevention*, *31*(1), 38-50.

Markos, M., Lolaso, T., Mengistu, A., & Tariku, Z. (2020). Dietary Diversity and Associated Factors Among Adult HIV Positive Patients on Anti-Retroviral Therapy in Public Hospitals of Kembata Tembaro Zone, Southern Ethiopia. HIV/AIDS (Auckland, NZ), 12, 859.

Martiana, I., Waluyo, A., & Yona, S. (2019). Assessing the relationship between knowledge of antiretroviral therapy and stigma regarding adherence to ART among men who have sex with men. *Enfermeria clinica*, *29*, 321-325.

Martin, F., Kiwanuka, T., Kawuma, R., Zalwango, F., & Seeley, J. (2013). Tasks and strategies of self-management of living with antiretroviral therapy in Uganda. *AIDS patient care and STDs*, *27*(12), 697-706.

Martos-Méndez, M. J. (2015). Self-efficacy and adherence to treatment: the mediating effects of social support. *Journal of Behavior, Health & Social Issues*, *7*(2), 19-29.

Mashinya, F., Alberts, M., Colebunders, R., & Van Geertruyden, J. P. (2016). Weight status and associated factors among HIV-infected people on antiretroviral therapy in rural Dikgale, Limpopo, South Africa. *African journal of primary health care & family medicine*, *8*(1).

Mayer KH, Mugavero MJ, Amico KR, Horn T, Thompson MA. The state of engagement in HIV care in the United States: From cascade to continuum to control. Clinical Infectious Diseases. 2013. https://doi.org/10.1093/cid/cit420

Mbirimtengerenji, N. D., Jere, G., Lengu, S., & Maluwa, A. (2013). Factors that influence anti-retroviral therapy adherence among women in Lilongwe urban health centres, Malawi. *World Journal of AIDS*, *3*(01), 16.

McGuire, M., Munyenyembe, T., Szumilin, E., Heinzelmann, A., Le Paih, M., Bouithy, N., & Pujades-Rodríguez, M. (2010). Vital status of pre-ART and ART patients defaulting from care in rural Malawi. *Tropical Medicine & International Health*, *15*, 55-62.

Mchiza, Z. J., Parker, W. A., Makoae, M., Sewpaul, R., Kupamupindi, T., & Labadarios, D. (2015). Body image and weight control in South Africans 15 years or older: SANHANES-1. *BMC public health*, *15*(1), 1-11.

McPherson-Baker, S., Malow, R. M., Penedo, F., Jones, D. L., Schneiderman, N., & Klimas, N. G. (2000). Enhancing adherence to combination antiretroviral therapy in nonadherent HIV-positive men. AIDS Care, 12(4), 399-4

Mekuria, L. A., Sprangers, M. A., Prins, J. M., Yalew, A. W., & Nieuwkerk, P. T. (2015). Health-related quality of life of HIV-infected adults receiving combination antiretroviral therapy in Addis Ababa. *AIDS care*, *27*(8), 934-945.

Memiah, P., Shumba, C., Etienne-Mesubi, M., Agbor, S., Hossain, M. B., Komba, P., ... & Biadgilign, S. (2014). The effect of depressive symptoms and CD4 count on adherence to highly active antiretroviral therapy in sub-Saharan Africa. *Journal of the International Association of Providers of AIDS Care (JIAPAC)*, *13*(4), 346-352.

Mengesha, M. M., Ajema, D., Teshome, A., & Tura, A. K. (2020). The association between diagnosis disclosure and adherence to antiretroviral therapy among adolescents living with HIV in sub-Saharan Africa: a protocol for systematic review and meta-analysis. *Systematic reviews*, *9*(1), 1-5.

Mensa, M., & Belijo, Z. N. (2017). Levels and Predictors of Food Insecurity among HIV Positive Adult Patients Taking Highly Active Anti-Retroviral Therapy at Arba Minch General Hospital, Southern Ethiopia, 2016. *General Medicine: Open Access*, *5*(5).

Merten S, Kenter E, McKenzie O, Musheke M, Ntalasha H, Martin-Hilber A. Patient reported barriers and drivers of adherence to antiretrovirals in sub-Saharan Africa: A meta-ethnography. Trop Med Int Heal. 2010; https://doi.org/10.1111/j.1365-3156.2010.02510.x

Mills EJ, Nachega JB, Bangsberg DR, Singh S, Rachlis B, Wu P, et al. Adherence to HAART: A systematic review of developed and developing nation patient-reported barriers and facilitators. PLoS Medicine. 2006. https://doi.org/10.1371/journal.pmed.0030438

Mills, E. J., Nachega, J. B., Buchan, I., Orbinski, J., Attaran, A., Singh, S., ... & Bangsberg, D. R. (2006). Adherence to antiretroviral therapy in sub-Saharan Africa and North America: a meta-analysis. *Jama*, *296*(6), 679-690.

Mitiku, H., Abdosh, T., & Teklemariam, Z. (2013). Factors affecting adherence to antiretroviral treatment in harari national regional state, Eastern Ethiopia. *International Scholarly Research Notices*, *2013*.

Molassiotis, A., Nahas-Lopez, V., Chung, W. R., Lam, S. C., Li, C. P., & Lau, T. J. (2002). Factors associated with adherence to antiretroviral medication in HIV-infected patients. *International journal of STD & AIDS*, *13*(5), 301-310.

Molla AA, Gelagay AA, Mekonnen HS, Teshome DF. Adherence to antiretroviral therapy and associated factors among HIV positive adults attending care and treatment in University of Gondar Referral Hospital, Northwest Ethiopia. BMC Infectious Diseases (2018) 18:266 https://doi.org/10.1186/s12879-018-3176-8 pmid:29879913

Monteiro, J. P., Freimanis-Hance, L., Faria, L. B., Mussi-Pinhata, M. M., Korelitz, J., Vannucchi, H., ... & Hazra, R. (2009). Both human immunodeficiency virus–infected and human immunodeficiency virus–exposed, uninfected children living in Brazil, Argentina, and Mexico have similar rates of low concentrations of retinol, β-carotene, and vitamin E. *Nutrition research*, *29*(10), 716-722.

Morowatisharifabad, M. A., Movahed, E., Farokhzadian, J., Nikooie, R., Askarishahi, M., Bidaki, R., & Hosseinzadeh, M. (2019). Antiretroviral therapy adherence based on information, motivation, and behavioral skills model and its association with depression among HIV-positive patients: Health promotion strategy towards the 909090 target. *Journal of education and health promotion*, *8*.

Mugavero MJ. Elements of the HIV care continuum: Improving engagement and retention in care. Top Antivir Med. 2016;

Mukui, I. N., Ng'ang'a, L., Williamson, J., Wamicwe, J. N., Vakil, S., Katana, A., & Kim, A. A. (2016). Rates and predictors of non-adherence to antiretroviral therapy among HIV-positive individuals in Kenya: results from the second Kenya AIDS indicator survey, 2012. *PloS one*, *11*(12), e0167465.

Mukumbang, F. C., Mwale, J. C., & van Wyk, B. (2017). Conceptualising the factors affecting retention in care of patients on antiretroviral treatment in Kabwe District, Zambia, using the ecological framework. *AIDS research and treatment*, *2017*.

Mûnene, E., & Ekman, B. (2015). Association between patient engagement in HIV care and antiretroviral therapy medication adherence: cross-sectional evidence from a regional HIV care center in Kenya. *AIDS care*, *27*(3), 378-386.

Musumari, P. M., Wouters, E., Kayembe, P. K., Nzita, M. K., Mbikayi, S. M., Suguimoto, S. P., ... & Kihara, M. (2014). Food insecurity is associated with increased risk of non-adherence to antiretroviral therapy among HIV-infected adults in the Democratic Republic of Congo: a cross-sectional study. *PloS one*, *9*(1), e85327.

Mutevedzi, P. C., & Newell, M. L. (2014). The changing face of the HIV epidemic in sub-S aharan A frica. *Tropical Medicine & International Health*, *19*(9), 1015-1028.

NACA (2017) 'National Strategic Framework on HIV and AIDS: 2017-2021' [pdf]

Nachega, J. B., Uthman, O. A., Peltzer, K., Richardson, L. A., Mills, E. J., Amekudzi, K., & Ouédraogo, A. (2014). Association between antiretroviral therapy adherence and employment status: systematic review and meta-analysis. *Bulletin of the World Health Organization*, *93*, 29-41

Naidoo, P., Peltzer, K., Louw, J., Matseke, G., Mchunu, G., & Tutshana, B. (2013). Predictors of tuberculosis (TB) and antiretroviral (ARV) medication non-adherence in public primary care patients in South Africa: a cross sectional study. *BMC public health*, *13*(1), 1-10.

Najjar, A., Amro, Y., Kitaneh, I., Abu-Sharar, S., Sawalha, M., Jamous, A., ... & Amro, A. (2015). Knowledge and adherence to medications among Palestinian geriatrics living with chronic diseases in the West Bank and East Jerusalem. *PLoS One*, *10*(6), e0129240.

Nakimuli-Mpungu, E., Bass, J. K., Alexandre, P., Mills, E. J., Musisi, S., Ram, M., ... & Nachega, J. B. (2012). Depression, alcohol use and adherence to antiretroviral therapy in sub-Saharan Africa: a systematic review. *AIDS and Behavior*, *16*(8), 2101-2118.

Nakimuli-Mpungu, E., Mojtabai, R., Alexandre, P. K., Musisi, S., Katabira, E., Nachega, J. B., ... & Bass, J. K. (2013). Lifetime depressive disorders and adherence to anti-retroviral therapy in HIV-infected Ugandan adults: a case-control study. *Journal of affective disorders*, *145*(2), 221-226.

Naomi, W., Peter, G., Mbuthia, J., Joshua, M., & Ndwiga, T. (2018). Determinants of adherence to antiretroviral among HIV positive adolescents at Comprehensive Care Clinic, Gertrude's Children Hospital, Nairobi, Kenya. *Am J Nurs Sci*, *7*, 23.

Nasidi, A., & Harry, T. O. (2006). The epidemiology of HIV/AIDS in Nigeria. *AIDS in Nigeria: a nation on the threshold. Cambridge (Massachusetts): Harvard Center for Population and Development Studies*, 17-36.

National Agency for the Control of AIDS (NACA). NAIIS South-South Factsheet Vol 9 03/07/2019. Available from https://naca.gov.ng/wp-content/uploads/2019/03/NAIIS-SOUTH-SOUTH-ZONE-FACTSHEET_V0.9_030719-edits.pdf

National Agency for the Control of AIDS (NACA). Nigeria UNGASS Report In: Strategic planning and research, editor. Abuja: NACA; 2007. p. 20.

National Agency for the Control of AIDS. (2015). Available at http://www.naca.gov.ng/

National Population Census. Federal Republic of Nigeria. Population and housing census. Priority Table 111. Population Distribution by Sex, State, LGA and Senatorial Districts; 2006. Available:www.population.gov.ng/files/nationafinal.pdf In: Federal Republic of Nigeria. Global AIDS Response Country Progress Report, Nigeria; 201 Available:http://ghdx.healthdata.org/record/nigeria-global-aids-responce-country-progress-report-2012 (Date accessed: 24/7/2015)

Neupane, S., Dhungana, G. P., & Ghimire, H. C. (2019). Adherence to antiretroviral treatment and associated factors among people living with HIV and AIDS in CHITWAN, Nepal. *BMC public health*, *19*(1), 1-9.

Ngarina, M., Popenoe, R., Kilewo, C., Biberfeld, G., & Ekstrom, A. M. (2013). Reasons for poor adherence to antiretroviral therapy postnatally in HIV-1 infected women treated for their own health: experiences from the Mitra Plus study in Tanzania. *BMC public health*, *13*(1), 1-9.

Ngum, P. A., Fon, P. N., Ngu, R. C., Verla, V. S., & Luma, H. N. (2017). Depression among HIV/AIDS patients on highly active antiretroviral therapy in the southwest regional hospitals of Cameroon: a cross-sectional study. *Neurology and therapy*, *6*(1), 103-114.

Nigeria National Agency for the Control of AIDS (NACA), 2016.Nigeria National Agency for the Control of AIDS (NACA) Fact sheet: prevention of mother-to-child transmission of HIV (PMTCT) (2016)https://naca.gov.ng/fact-sheet-prevention-mother-child-transmission-pmtct-2016/. [Accessed 14 November 2018]

Nozaki, I., Kuriyama, M., Manyepa, P., Zyambo, M. K., Kakimoto, K., & Bärnighausen, T. (2013). False beliefs about ART effectiveness, side effects and the consequences of non-retention and non-adherence among ART patients in Livingstone, Zambia. *AIDS and Behavior*, *17*(1), 122-126.

Nsele, N. (2014). *The effect of seasonal food variety and dietary diversity on the nutritional status of a rural community in KZN* (Doctoral dissertation).

Nyambura, A.W. (2011). Factors that influence non-adherence to antiretroviral therapy among HIV and AIDs patients in central province, Kenya.

Obermeyer, C. M., Bott, S., Carrieri, P., Parsons, M., Pulerwitz, J., Rutenberg, N., & Sarna, A. (2009). HIV testing, treatment and prevention: generic tools for operational research.

Obirikorang C, Selleh PK, Abledu JK, Fofie CO. Predictors of Adherence to Antiretroviral Therapy among HIV/AIDS Patients in the Upper West Region of Ghana. ISRNAIDS Volume 2013, Article ID 873939,7pages http://dx.doi.org/10.1155/2013/873939

Odili, V. U., Obieche, A. O., & Amibor, K. C. (2017). Adherence to antiretroviral therapy and its determinants among HIV-infected patients in Nigeria. *Journal of pharmacy practice*, *30*(3), 291-295.

Okoronkwo, I., Okeke, U., Chinweuba, A., & Iheanacho, P. (2013). Nonadherence factors and sociodemographic characteristics of HIV-infected adults receiving antiretroviral therapy in Nnamdi Azikiwe University Teaching Hospital, Nnewi, Nigeria. *International Scholarly Research Notices*, *2013*.

Oku, A. O., Oku, O. O., Monjok, E., & Owoaje, E. T. (2014). Prevalence and determinants of adherence to highly active anti-retroviral therapy amongst people living with HIV/AIDS in a rural setting in South-South Nigeria. *African journal of reproductive health*, *18*(1), 133-144.

Oku, A. O., Owoaje, E. T., Oku, O. O., & Monjok, E. (2013). Prevalence and determinants of adherence to highly active antiretroviral therapy (HAART) amongst a cohort of HIV positive women accessing treatment in a tertiary health Facility in Southern Nigeria. *J HIV AIDS Infect Dis*, *1*, 1-8.

Okunola, O. A., Muoghalu, C. O., & Irinoye, A. I. Socio-Cultural Factors Influencing Adherence to Antiretroviral Therapy among People Living with HIV/AIDS in Obafemi Awolowo University Teaching Hospitals, Ile-Ife, Nigeria.

Oliveira, R. D. S., Primeira, M. R., Santos, W. M. D., Paula, C. C. D., & Padoin, S. M. D. M. (2020). Association between social support and adherence to anti-retroviral treatment in people living with HIV. *Revista Gaúcha de Enfermagem*, *41*.

Olowookere, S. A., Fatiregun, A. A., Ladipo, M. M. A., Abioye-Kuteyi, E. A., & Adewole, I. F. (2016). Effects of adherence to antiretroviral therapy on body mass index, immunological and virological status of Nigerians living with HIV/AIDS. *Alexandria Journal of Medicine*, *52*(1), 51-54.

Oluma, A., Abadiga, M., Mosisa, G., Etafa, W., & Fekadu, G. (2020). Food Insecurity among People Living with HIV/AIDS on ART Follower at Public Hospitals of Western Ethiopia. *International Journal of Food Science*, *2020*.

Olutayo, F.M., Lekhraj, R., Munn-Sann, L., Sherina, M.S., Norlijah, O., Zubairu, I., & Fatai, K.S. (2015). Knowledge and attitudes of adult HIV positive patients to HIV/AIDS in Yola, Nigeria. Journal of Public Health and Epidemiology, 7(7), 241-248

Omosanya, O. E., Elegbede, O. T., Agboola, S. M., Isinkaye, A. O., & Omopariola, O. A. (2014). Effects of stigmatization/discrimination on antiretroviral therapy adherence among HIV-infected patients in a rural tertiary medical center in Nigeria. *Journal of the International Association of Providers of AIDS Care (JIAPAC)*, *13*(3), 260-263.

Onyango, A. C., Walingo, M. K., Mbagaya, G., & Kakai, R. (2012). Assessing nutrient intake and nutrient status of HIV seropositive patients attending clinic at Chulaimbo Sub-District Hospital, Kenya. *Journal of nutrition and metabolism*, *2012*.

Onyeonoro, U. U., Ebenebe, U. E., Ibeh, C. C., Nwamoh, U. N., Ukegbu, A. U., & Emelumadu, O. F. (2013). Adherence to antiretroviral therapy among people living with human immunodeficiency virus/acquired immunodeficiency syndrome in a tertiary health facility in South Eastern Nigeria. *Journal of HIV and Human Reproduction*, *1*(2), 58.

Osterberg, L., & Blaschke, T. (2005). Adherence to medication. *New England journal of medicine*, *353*(5), 487-497.

Ostermann, J., Whetten, K., Reddy, E., Pence, B., Weinhold, A., Itemba, D., ... & CHAT Research Team. (2014). Treatment retention and care transitions during and after the scale-up of HIV care and treatment in Northern Tanzania. *AIDS care*, *26*(11), 1352-1358.

Paterson, D. L., Swindells, S., Mohr, J., Brester, M., Vergis, E. N., Squier, C., ... & Singh, N. (2000). Adherence to protease inhibitor therapy and outcomes in patients with HIV infection. *Annals of internal medicine*, *133*(1), 21-30.

Pedrosa, S. C., Fiuza, M. L. T., Cunha, G. H. D., Reis, R. K., Gir, E., Galvão, M. T. G., & Carvalho, A. F. (2016). Social support for people living with acquired immunodeficiency syndrome. *Texto & Contexto-Enfermagem*, *25*(4).

Pellecchia, U., Baert, S., Nundwe, S., Bwanali, A., Zamadenga, B., Metcalf, C. A., ... & Kanyimbo, K. (2017). "We are part of a family". Benefits and limitations of community ART groups (CAGs) in Thyolo, Malawi: a qualitative study. *Journal of the International AIDS Society*, *20*(1), 21374.

Pellowski, J. A., Kalichman, S. C., Cherry, S., Conway-Washington, C., Cherry, C., Grebler, T., & Krug, L. (2016). The daily relationship between aspects of food insecurity and medication adherence among people living with HIV with recent experiences of hunger. *Annals of Behavioral Medicine*, *50*(6), 844-853.

Peltzer, K., & Pengpid, S. (2013). Socioeconomic factors in adherence to HIV therapy in low-and middle-income countries. *Journal of health, population, and nutrition*, *31*(2), 150.

Pennap, G. R., Abdullahi, U., & Bako, I. A. (2013). Adherence to highly active antiretroviral therapy and its challenges in people living with human immunodeficiency virus (HIV) infection in Keffi, Nigeria. *Journal of AIDS and HIV Research*, *5*(2), 52-28.

Perneger TV, Courvoisier DS, Hudelson PM, Gayet-Ageron A. Sample size for pre-tests of questionnaires. Qual Life Res. 2015 Jan;24(1):147-51. doi: 10.1007/s11136-014-0752-2. Epub 2014 Jul 10. PMID: 25008261.

Poslusna, K., Ruprich, J., de Vries, J. H., Jakubikova, M., & van't Veer, P. (2009). Misreporting of energy and micronutrient intake estimated by food records and 24 hour recalls, control and adjustment methods in practice. British Journal of Nutrition, 101(S2), S73-S85.

Posse M, Meheus F, Van Asten H, Van Der Ven A, Baltussen R. Barriers to access to antiretroviral treatment in developing countries: A review. Tropical Medicine and International Health. 2008. https://doi.org/10.1111/j.1365-3156.2008.02091.x

Poudel, K. C., Buchanan, D. R., Amiya, R. M., & Poudel-Tandukar, K. (2015). Perceived family support and antiretroviral adherence in HIV-positive individuals: results from a community-based positive living with HIV study. *International quarterly of community health education*, *36*(1), 71-91.

Prah, J., Hayfron-Benjamin, A., Abdulai, M., Lasim, O., & Nartey, Y. (2018). Factors affecting adherence to antiretroviral therapy among HIV/AIDS patients in cape coast metropolis. *Ghana. J HIV AIDS*, *4*(1).

Raberahona, M., Lidamahasolo, Z., Andriamamonjisoa, J., Andriananja, V., Andrianasolo, R. L., Rakotoarivelo, R. A., & de Dieu Randria, M. J. (2019). Knowledge, attitudes, perception and practices regarding antiretroviral therapy among HIV-infected adults in Antananarivo, Madagascar: a cross-sectional survey. *BMC health services research*, *19*(1), 1-9.

Rackal, J. M., Tynan, A. M., Handford, C. D., Rzeznikiewiz, D., Agha, A., & Glazier, R. (2011). Provider training and experience for people living with HIV/AIDS. *Cochrane Database of Systematic Reviews*, (6).

Ramadhani, H. O., Muiruri, C., Maro, V. P., Omondi, M., Mushi, J. B., Lirhunde, E. S., & Bartlett, J. A. (2016). Association of knowledge on ART line of treatment, scarcity of treatment options and adherence. *BMC health services research*, *16*(1), 1-7.

Rasschaert, F., Philips, M., Van Leemput, L., Assefa, Y., Schouten, E., & Van Damme, W. (2011). Tackling health workforce shortages during antiretroviral treatment scale-up—experiences from Ethiopia and Malawi. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, *57*, S109-S112.

Rawat, R., Kadiyala, S., & McNamara, P. E. (2010). Research article The impact of food assistance on weight gain and disease progression among HIV-infected individuals accessing AIDS care and treatment services in Uganda.

Reda, A. A., & Biadgilign, S. (2012). Determinants of adherence to antiretroviral therapy among HIV-infected patients in Africa. *AIDS Research and treatment*, *2012*.

Remien, R. H., Hirky, A. E., Johnson, M. O., Weinhardt, L. S., Whittier, D., & Le, G. M. (2003). Adherence to medication treatment: A qualitative study of facilitators and barriers among a diverse sample of HIV+ men and women in four US cities. Aids And Behavior, 7(1), 61-72.

Reniers, G., & Armbruster, B. (2012). HIV status awareness, partnership dissolution and HIV transmission in generalized epidemics. *PLoS One*, *7*(12), e50669.

Reynolds, N. R. (2003). The problem of antiretroviral adherence: a self-regulatory model for intervention. Aids Care-Psychological And Socio-Medical Aspects Of Aids/Hiv, 15(1), 117-124

Reynolds, S. J., Shepherd, M. E., Risbud, A. R., Gangakhedkar, R. R., Brookmeyer, R. S., Divekar, A. D., ... & Bollinger, R. C. (2004). Male circumcision and risk of HIV-1 and other sexually transmitted infections in India. *The Lancet*, *363*(9414), 1039-1040.

RF, A. (2019). Household food security and associated factors among Adult people living with HIV/AIDS attending ART clinic in Hospitals of Hawassa Town, Southern Ethiopia 2017.

Ribeiro, Â., Ribeiro, J. P., & von Doellinger, O. (2017). Depression and psychodynamic psychotherapy. *Brazilian Journal of Psychiatry*, *40*, 105-109.

Risher, K., Mayer, K., & Beyrer, C. (2015). The HIV treatment cascade in men who have sex with men, people who inject drugs and sex workers. *Current Opinion in HIV and AIDS*, *10*(6), 420.

Rodger AJ, Cambiano V, Bruun T, et al.; PARTNER Study Group. Sexual activity without condoms and risk of HIV transmission in serodifferent couples when the HIV-positive partner is using suppressive antiretroviral therapy. JAMA 2016;316:171–81. PMID:27404185 https://doi. org/10.1001/jama.2016.5148

Rogers, A. S., Miller, S., Murphy, D. A., Tanney, M., & Fortune, T. (2001). The TREAT (Therapeutic Regimens Enhancing Adherence in Teens) program: theory and preliminary results. J Adolesc Health, 29(3 Suppl), 30-38.

Roux, P., Kouanfack, C., Cohen, J., Marcellin, F., Boyer, S., Delaporte, E., ... & Stratall ANRS 12110/ESTHER Study Group. (2011). Adherence to antiretroviral treatment in HIV-positive patients in the Cameroon context: promoting the use of medication reminder methods. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, *57*, S40-S43.

Rueda, S., Mitra, S., Chen, S., Gogolishvili, D., Globerman, J., Chambers, L., ... & Rourke, S. B. (2016). Examining the associations between HIV-related stigma and health outcomes in people living with HIV/AIDS: a series of meta-analyses. *BMJ open*, *6*(7), e011453.

Ruth et al. Knowledge and adherence to antiretroviral therapy among adult people living with HIV/AIDS at Tikur Anbessa Specialized Hospital, Ethiopia. International Journal of Basic & Clinical Pharmacology, [S.l.], v. 3, n. 2, p. 320-330, jan. 2017. ISSN 2279-0780. Available at: <https://www.ijbcp.com/index.php/ijbcp/article/view/429

Saberi, P., Neilands, T. B., Vittinghoff, E., Johnson, M. O., Chesney, M., & Cohn, S. E. (2015). Barriers to antiretroviral therapy adherence and plasma HIV RNA suppression among AIDS clinical trials group study participants. *AIDS patient care and STDs*, *29*(3), 111-116.

Safira, N., Lubis, R., & Fahdhy, M. (2018). Factors affecting adherence to antiretroviral therapy. KnE Life Sciences, 60-70.

Safren, S. A., Otto, M. W., Worth, J. L., Salomon, E., Johnson, W., Mayer, K., et al. (2001). Two strategies to increase adherence to HIV antiretroviral medication: life-steps and medication monitoring. Behav Res Ther, 39(10), 1151-1162.

Saha, R., Saha, I., Sarkar, A. P., Das, D. K., Misra, R., Bhattacharya, K., ... & Bhattacharya, A. (2014). Adherence to highly active antiretroviral therapy in a tertiary care hospital in West Bengal, India. *Singapore medical journal*, *55*(2), 92.

Sahay, S., Reddy, K. S., & Dhayarkar, S. (2011). Optimizing adherence to antiretroviral therapy. *The Indian journal of medical research*, *134*(6), 835.

Salami, A. K., Fadeyi, A., Ogunmodede, J. A., & Desalu, O. (2010). Factors influencing adherence to antiretroviral medication in Ilorin, Nigeria. *Journal of the International Association of Physicians in AIDS Care*, *9*(3), 191-195.

Sankar, A., Golin, C., Simoni, J. M., Luborsky, M., & Pearson, C. (2006). How qualitative methods contribute to understanding combination antiretroviral therapy adherence. J Acquir Immune Defic Syndr, 43 Suppl 1, S54-68.

Santos, V. D. F., Pedrosa, S. C., Aquino, P. D. S., Lima, I. C. V. D., Cunha, G. H. D., & Galvão, M. T. G. (2018). Social support of people with HIV/AIDS: the Social Determinants of Health Model. *Revista brasileira de enfermagem*, *71*, 625-630.

Sasaki, Y., Kakimoto, K., Dube, C., Sikazwe, I., Moyo, C., Syakantu, G., ... & Kai, I. (2012). Adherence to antiretroviral therapy (ART) during the early months of treatment in rural Zambia: influence of demographic characteristics and social surroundings of patients. *Annals of clinical microbiology and antimicrobials*, *11*(1), 1-11.

Schofield WN, 1985. Predicting basal metabolic rate, new standards and review of previous work. Human Nutrition. Clinical Nutrition, 39 Suppl 1, 5-41.

Scholl, I., Zill, J. M., Härter, M., & Dirmaier, J. (2014). An integrative model of patient-centeredness–a systematic review and concept analysis. *PloS one*, *9*(9), e107828.

Scott, K., Campbell, C., Madanhire, C., Skovdal, M., Nyamukapa, C., & Gregson, S. (2014). In what ways do communities support optimal antiretroviral treatment in Zimbabwe?. *Health promotion international*, *29*(4), 645-654.

Seeling, S., Mavhunga, F., Thomas, A., Adelberger, B., & Ulrichs, T. (2014). Barriers to access to antiretroviral treatment for HIV-positive tuberculosis patients in Windhoek, Namibia. *International journal of mycobacteriology*, *3*(4), 268-275.

Semvua SK, Orrell C, Mmbaga BT, Semvua HH, Bartlett JA, Boulle AA (2017) Predictors of non-adherence to antiretroviral therapy among HIV infected patients in northern Tanzania. PLoS ONE 12(12): e0189460. https://doi.org/10.1371/journal.pone.0189460 pmid:29252984

Senkomago, V., Guwatudde, D., Breda, M., & Khoshnood, K. (2011). Barriers to antiretroviral adherence in HIV-positive patients receiving free medication in Kayunga, Uganda. *AIDS care*, *23*(10), 1246-1253.

Shaibu, S. (2016). Caring for HIV-positive orphans in the context of HIV and AIDS: perspectives of Botswana grandmothers. *International journal of older people nursing*, *11*(4), 315-323.

Shigdel, R., Klouman, E., Bhandari, A., & Ahmed, L. A. (2014). Factors associated with adherence to antiretroviral therapy in HIV-infected patients in Kathmandu District, Nepal. *Hiv/aids (Auckland, NZ)*, *6*, 109.

Shittu, R. O., Issa, B. A., Olanrewaju, G. T., Odeigah, L. O., Sule, A. G., Sanni, M. A., & Aderibigbe, A. S. (2013). Adherence to Highly Active Antiretroviral Therapy. *Depressed Peoples Living with HIV/AIDS in Nigeria, West Africa. Journal of Antivirals & Antiretrovirals*, *6*, 6-12.

Shubber, Z., Mills, E. J., Nachega, J. B., Vreeman, R., Freitas, M., Bock, P., ... & Ford, N. (2016). Patient-reported barriers to adherence to antiretroviral therapy: a systematic review and meta-analysis. *PLoS medicine*, *13*(11), e1002183.

Shumba, C., Atuhaire, L., Imakit, R., Atukunda, R., & Memiah, P. (2013). Missed doses and missed appointments: adherence to ART among adult patients in Uganda. *International Scholarly Research Notices*, *2013*.

Sianturi, E. I., Perwitasari, D. A., Islam, M. A., & Taxis, K. (2019). The association between ethnicity, stigma, beliefs about medicines and adherence in people living with HIV in a rural area in Indonesia. *BMC public health*, *19*(1), 1-8.

Sicotte, M., Langlois, É. V., Aho, J., Ziegler, D., & Zunzunegui, M. V. (2014). Association between nutritional status and the immune response in HIV+ patients under HAART: protocol for a systematic review. *Systematic reviews*, *3*(1), 1-8.

Simoni JM, Amico KR, Pearson CR, Malow R. Strategies for promoting adherence to antiretroviral therapy: A review of the literature. Current Infectious Disease Reports. 32 2008. https://doi.org/10.1007/s11908-008-0083-y

Singer, A. W., Weiser, S. D., & McCoy, S. I. (2015). Does food insecurity undermine adherence to antiretroviral therapy? A systematic review. *AIDS and Behavior*, *19*(8), 1510-1526.

Skovdal, M., Campbell, C., Madanhire, C., Nyamukapa, C., & Gregson, S. (2011). Challenges faced by elderly guardians in sustaining the adherence to antiretroviral therapy in HIV-infected children in Zimbabwe. *AIDS care*, *23*(8), 957-964.

Smith, S. R., Rublein, J. C., Marcus, C., Brock, T. P., & Chesney, M. A. (2003). A medication self-management program to improve adherence to HIV therapy regimens. Patient Educ Couns, 50(2), 187-199.

Spencer, D. C., Harman, C., Botha, C., Rollins, N., Labadarios, D., & Visser, M. (2008). Nutrition and HIV/AIDS: nutritional guidelines for HIV-infected adults and children in Southern Africa: meeting the needs: guidelines. Southern African Journal of HIV Medicine, 2008(29), 34-59.

Ssewamala, F. M., Byansi, W., Bahar, O. S., Nabunya, P., Neilands, T. B., Mellins, C., ... & Nakigozi, G. (2019). Suubi+ Adherence study protocol: A family economic empowerment intervention addressing HIV treatment adherence for perinatally infected adolescents. *Contemporary clinical trials communications*, *16*, 100463.

Statista 2021, https://www.statista.com/statistics/1262130/deaths-due-to-aids-in-nigeria/

Steel, G., Nwokike, J., & Joshi, M. P. (2007). Development of a multi-method tool to measure ART adherence in resource-constrained settings: the South Africa experience. *RPM Plus*, *6*.

Suleiman, I. A., & Momo, A. (2016). Adherence to antiretroviral therapy and its determinants among persons living with HIV/AIDS in Bayelsa state, Nigeria. *Pharmacy Practice (Granada)*, *14*(1), 0-0.

Suryana, K., Suharsono, H., & Antara, I. G. P. J. (2019). Factors Associated With Adherence To Anti-Retroviral Therapy Among People Living With HIV/AIDS At Wangaya Hospital In Denpasar, Bali, Indonesia: A Cross-Sectional Study. *Hiv/aids (Auckland, NZ)*, *11*, 307.

Sweeney, S. M., & Vanable, P. A. (2016). The association of HIV-related stigma to HIV medication adherence: a systematic review and synthesis of the literature. *AIDS and Behavior*, *20*(1), 29-50.

Tadesse, S., Tadesse, A., & Wubshet, M. (2014). Adherence to antiretroviral treatment and associated factors among people living with HIV/AIDS in Northwest Ethiopia. *Journal of Tropical Diseases & Public Health*.

Tesfaw, A., Jara, D., & Temesgen, H. (2018). Dietary diversity and associated factors among HIV positive adult patients attending public health facilities in Motta Town, East Gojjam Zone, Northwest Ethiopia, 2017. Advances in Public Health, 2018.

Tesfaw, G., Ayano, G., Awoke, T., Assefa, D., Birhanu, Z., Miheretie, G., & Abebe, G. (2016). Prevalence and correlates of depression and anxiety among patients with HIV on-follow up at Alert Hospital, Addis Ababa, Ethiopia. *BMC psychiatry*, *16*(1), 1-7.

Than, P. Q. T., Tran, B. X., Nguyen, C. T., Truong, N. T., Thai, T. P. T., Latkin, C. A., ... & Ho, R. C. (2019). Stigma against patients with HIV/AIDS in the rapid expansion of antiretroviral treatment in large drug injection-driven HIV epidemics of Vietnam. *Harm reduction journal*, *16*(1), 1-10.

The impact of the US president's emergency plan for AIDS relief (PEPFAR) HIV and AIDS program on the Nigerian health system (2016). *The Pan African medical journal*, *25*.

The U.S. President's Emergency Plan for AIDS Relief (PEPFAR) 2019. Available from: https://www.state.gov/wp-content/uploads/2019/09/PEPFAR2019ARC.pdf

Thielman, N. M., Ostermann, J., Whetten, K., Whetten, R., Itemba, D., Maro, V., ... & Team, T. C. R. (2014). Reduced adherence to antiretroviral therapy among HIV-infected Tanzanians seeking cure from the Loliondo healer. *Journal of acquired immune deficiency syndromes (1999)*, *65*(3), e104.

Thupayagale-Tshweneagae, G., & Mgutshini, T. (2015). Disclosure of HIV status to sexual partners by people living with HIV.

Tiyou, A., Belachew, T., Alemseged, F., & Biadgilign, S. (2012). Food insecurity and associated factors among HIV-infected individuals receiving highly active antiretroviral therapy in Jimma zone Southwest Ethiopia. *Nutrition journal*, *11*(1), 1-8.

Tocco, J. U. (2017). The Islamification of antiretroviral therapy: Reconciling HIV treatment and religion in northern Nigeria. *Social Science & Medicine*, *190*, 75-82.

Tsega, B., Srikanth, B. A., & Shewamene, Z. (2015). Determinants of non-adherence to antiretroviral therapy in adult hospitalized patients, Northwest Ethiopia. *Patient preference and adherence*, *9*, 373.

Tshweneagae, G. T., Oss, V. M., & Mgutshini, T. (2015). Disclosure of HIV status to sexual partners by people living with HIV. *curationis*, *38*(1), 1-6.

Tuldra, A., Fumaz, C. R., Ferrer, M. J., Bayes, R., Arno, A., Balague, M., et al. (2000). Prospective randomized two-Arm controlled study to determine the efficacy of a specific intervention to improve long-term adherence to highly active antiretroviral therapy. J Acquir Immune Defic Syndr, 25(3), 221-228.

Turan, B., Hatcher, A. M., Weiser, S. D., Johnson, M. O., Rice, W. S., & Turan, J. M. (2017). Framing mechanisms linking HIV-related stigma, adherence to treatment, and health outcomes. *American journal of public health*, *107*(6), 863-869.

Turan, B., Rogers, A. J., Rice, W. S., Atkins, G. C., Cohen, M. H., Wilson, T. E., ... & Weiser, S. D. (2017). Association between perceived discrimination in healthcare settings and HIV medication adherence: mediating psychosocial mechanisms. *AIDS and Behavior*, *21*(12), 3431-3439.

Tymejczyk, O., Hoffman, S., Kulkarni, S. G., Gadisa, T., Lahuerta, M., Remien, R. H., ... & Nash, D. (2016). HIV care and treatment beliefs among patients initiating antiretroviral treatment (ART) in Oromia, Ethiopia. *AIDS and Behavior*, *20*(5), 998-1008.

Ukwe, C. V., Ekwunife, O. I., Udeogaranya, P. O., & Iwuamadi, U. I. (2010). Self-reported adherence to HAART in South-Eastern Nigeria is related to patients' use of pill box. *Sahara-J: Journal of Social Aspects of HIV/AIDS*, *7*(1), 10-15.

UNAIDS (2016) 'Prevention Gap Report' [pdf]. Retrieved from https://www.unaids.org/sites/default/files/media_asset/2016-prevention-gap-report_en.pdf

UNAIDS (2016). Global AIDS UP Date 2016. Joint United Nations Programme on HIV/AIDS (UNAIDS). Retrieved from https://www.unaids.org/en/resources/documents/2016/Global-AIDS-update-2016

UNAIDS (2017) 'West and Central Africa Catch up Plan'

UNAIDS . *Access to antiretroviral therapy in Africa: status report on progress towards the 2015 targets.* Geneva, Switzerland: UNAIDS; 2015

UNAIDS 'AIDSinfo' [Accessed October 2018] https://www.unaids.org/en/resources/documents/2018/unaids-data-2018

UNAIDs, U., & World Health Organization. (2011). Global HIV/AIDS response: epidemic update and health sector progress towards universal access: progress report 2011. *Global HIV/AIDS response: epidemic update and health sector progress towards universal access: progress report 2011*.

UNAIDS. (2019). Global AIDS update 2019—communities at the centre.

UNAIDS. 90-90-90. An ambitious treatment target to help end the AIDS epidemic 2014. Geneva: UNAIDS; 2014.

UNAIDS. World AIDS Day Report: Joint United Nations Programme on HIV/AIDS. 2011. Available from: http://www.unaids.org/en/media/unaids/contentassets/documents/unaidspublication/2011/JC2216_ WorldAIDSday_report_2011_en.pdf. Accessed September 13, 2012.

UNAIDS. *Access to antiretroviral therapy in Africa: status report on progress towards the 2015 targets.* Geneva, Switzerland: UNAIDS; 2015

Uthman, O. A., Magidson, J. F., Safren, S. A., & Nachega, J. B. (2014). Depression and adherence to antiretroviral therapy in low-, middle-and high-income countries: a systematic review and meta-analysis. *Current Hiv/aids Reports*, *11*(3), 291-307.

Vervoort, S. C., Borleffs, J. C., Hoepelman, A. I., & Grypdonck, M. H. (2007). Adherence in antiretroviral therapy: a review of qualitative studies. Aids, 21(3), 271-281.

Vincent, A., Grande, F., Compaoré, E., Amponsah Annor, G., Addy, P. A., Aburime, L. C., ... & Charrondière, U. R. (2020). FAO/INFOODS Food Composition Table for Western Africa (2019) User Guide & Condensed Food Composition Table. *FAO: Rome, Italy*.

Wafaie, F. (2003). Micronutrients and human immunodeficiency virus type 1 disease progression among adults and children. *Clinical Infectious Diseases*, *37*(Supplement_2), S112-S116.

Wagner, G. J., & Ryan, G. W. (2004). Relationship between routinization of daily behaviors and medication adherence in HIV-positive drug users. *AIDS Patient Care and STDs*, *18*(7), 385-393.

Wakibi, S. N., W Ng'ang'a, Z., & Mbugua, G. G. (2011). Factors associated with non-adherence to highly active antiretroviral therapy in Nairobi, Kenya. *AIDS Research and Therapy*, *8*(1), 1-8.

Walker, B. D., & Hirsch, M. S. (2013). Antiretroviral therapy in early HIV infection.

Wasti, S. P., Simkhada, P., Randall, J., Freeman, J. V., & Van Teijlingen, E. (2012). Factors influencing adherence to antiretroviral treatment in Nepal: a mixed-methods study. *PloS one*, *7*(5), e35547.

Wasti, S. P., Van Teijlingen, E., Simkhada, P., Randall, J., Baxter, S., Kirkpatrick, P., & Gc, V. S. (2012). Factors influencing adherence to antiretroviral treatment in Asian developing countries: a systematic review. *Tropical Medicine & International Health*, *17*(1), 71-81.

Weiser, S. D., Palar, K., Frongillo, E. A., Tsai, A. C., Kumbakumba, E., Depee, S., ... & Bangsberg, D. R. (2014). Longitudinal assessment of associations between food insecurity, antiretroviral adherence and HIV treatment outcomes in rural Uganda. *AIDS (London, England)*, *28*(1), 115.

Weiser, S. D., Tsai, A. C., Gupta, R., Frongillo, E. A., Kawuma, A., Senkungu, J., ... & Bangsberg, D. R. (2012). Food insecurity is associated with morbidity and patterns of healthcare utilization among HIV-infected individuals in a resource-poor setting. *AIDS (London, England)*, *26*(1), 67.

Weiser, S. D., Young, S. L., Cohen, C. R., Kushel, M. B., Tsai, A. C., Tien, P. C., ... & Bangsberg, D. R. (2011). Conceptual framework for understanding the bidirectional links between food insecurity and HIV/AIDS. *The American journal of clinical nutrition*, *94*(6), 1729S-1739S.

Weldegebreal, F., Digaffe, T., Mesfin, F., & Mitiku, H. (2018). Dietary diversity and associated factors among HIV positive adults attending antiretroviral therapy clinics at Hiwot Fana and Dilchora Hospitals, eastern Ethiopia. *Hiv/aids (Auckland, NZ)*, *10*, 63.

Weldehaweria, N. B., Abreha, E. H., Weldu, M. G., & Misgina, K. H. (2017). Psychosocial correlates of nutritional status among people living with HIV on antiretroviral therapy: A matched case-control study in Central zone of Tigray, Northern Ethiopia. *PloS one*, *12*(3), e0174082.

WHO, "Consultation on Nutrition and HIV/AIDS in Africa," Durban, South Africa, April 10th–13th, 2005

WHO,2018 https://www.who.int/gho/hiv/epidemic_response/ART/en/

WHO. (2016). Global health observatory data, health outcome in urban population.

WHO. World health statistics 2007. Geneva, Switzerland: World Health Organization; 2007

Widiyanti, M., Hadi, M. I., Kumalasari, M. L. F., Natalia, E. I., Purba, D. A., & Adiningsih, S. (2020). Body mass index increases CD4+ count in HIV/AIDS patients on first-line therapy. *Universa Medicina*, *39*(2), 121-127.

World Health Organization BMI classification. Global database on body mass index. Available at: http://apps.who.int/bmi/index.jsp?introPage=intro_3.html. Accessed 6 August 2010

World Health Organization, Adherence to Long-Term Therapies Evidence for Action World Health Organization; 2013; XII: 92–106.

World Health Organization, Khamarko, Kevin & Myers, Janet J. (2013). The influence of social support on the lives of HIV-infected individuals in low- and middle-income countries. World Health Organization. https://apps.who.int/iris/handle/10665/93529

World Health Organization. (2003). *Adherence to long-term therapies: evidence for action*. World Health Organization.

Wright, K., Naar-King, S., Lam, P., Templin, T., & Frey, M. (2007). Stigma scale revised: reliability and validity of a brief measure of stigma for HIV+ youth. *Journal of adolescent health*, *40*(1), 96-98.

Yaya I, Londoh DE, Saka B, Patchali PM, Wasswa P, Aboubakari AS, et al. Predictors of adherence to antiretroviral therapy among people living with HIV and AIDS at the regional hospital of Sokode, Togo. BMC Public Health 2014, 14:1308 http://www.biomedcentral.com/1471-2458/14/1308 pmid:25526773

Yaya, I., Saka, B., Landoh, D. E., Patassi, A. A., Aboubakari, A. S., Makawa, M. S., ... & Pitché, P. (2015). HIV status disclosure to sexual partners, among people living with HIV and AIDS on antiretroviral therapy at Sokodé regional hospital, Togo. *PloS one*, *10*(2), e0118157.

Yonah, G., Fredrick, F., & Leyna, G. (2014). HIV serostatus disclosure among people living with HIV/AIDS in Mwanza, Tanzania. *AIDS research and therapy*, *11*(1), 1-5.

Young, S., Wheeler, A. C., McCoy, S. I., & Weiser, S. D. (2014). A review of the role of food insecurity in adherence to care and treatment among adult and pediatric populations living with HIV and AIDS. *AIDS and Behavior*, *18*(5), 505-515.

Yu Y, Luo D, Chen X, Huang Z, Wang M, Xiao S. Medication adherence to antiretroviral therapy among newly treated people living with HIV. BMC Public Health (2018) 18:825 https://doi.org/10.1186/s12889-018-5731-z pmid:29973167

Zerihun, K. W., Muhammad, E. A., Biks, G. A., Belew, A. K., & Hunegnaw, M. T. (2020). Predictors of dietary diversity among adults on antiretroviral therapy in Debre Tabor Hospital, northwest Ethiopia: A cross-sectional study.

Zhang, F., Dou, Z., Ma, Y., Zhang, Y., Zhao, Y., Zhao, D., ... & Chen, R. Y. (2011). Effect of earlier initiation of antiretroviral treatment and increased treatment coverage on HIV-related mortality in China: a national observational cohort study. *The Lancet infectious diseases*, *11*(7), 516-524.

Zhang, J., Sun, W., Kong, Y., & Wang, C. (2012). Reliability and validity of the Center for Epidemiological Studies Depression Scale in 2 special adult samples from rural China. *Comprehensive psychiatry*, *53*(8), 1243-1251.