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**SCHOOL OF PUBLIC HEALTH
COLLEGE OF HEALTH SCIENCES
UNIVERSITY OF GHANA, LEGON**



**COMORBIDITIES AND ANTIRETROVIRAL THERAPY ADHERENCE AMONG
AGED HIV-POSITIVE CLIENTS IN WESTERN NORTH REGION, GHANA**

**BY
ALBERTA MALI WHAJAH**

(10447145)

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LEGON, IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD
OF MASTER OF PUBLIC HEALTH DEGREE**



JUNE, 2022

DECLARATION

I, Alberta Mali Whajah, declare that this thesis is my original work done under supervision. I further declare that except for references to other works which have been duly acknowledged, I affirm that this work has not been submitted for the award of any degree in this institution or other universities.

Alby

10/03/2022

Alberta Mali Whajah
(Student)

Date

Dr. Adom Manu

10th March, 2022

Dr. Adom Manu
(Supervisor)

Date



DEDICATION

I dedicate this work to my husband Mr. Constant Baku and my mother Susanna Whajah, who have been supportive throughout my academic journey.



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All thanks to the Almighty God for his strength and grace through the entire academic programme.

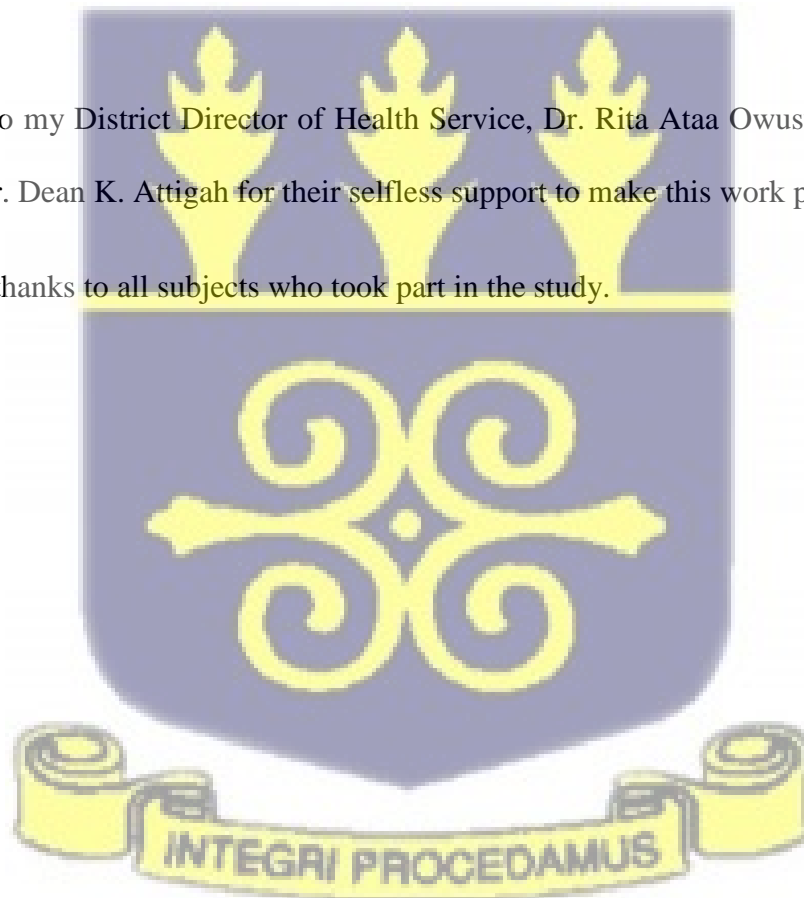
I wish to extend my profound appreciation to my supervisor, Dr. Adom Manu, for his guidance and tutelage at every step of the way in my academic journey.

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ABSTRACT

Background: Access to antiretroviral therapy in low-and middle-income countries has improved, leading to an increase in the number of the aged (≥ 50 years) living with HIV. Antiretroviral medication adherence has proven to increase longevity and the quality of life of people living with HIV. The age cut-off used to describe the elderly in HIV, is 50 years. Reports provide little information on over 50 years. Additionally, HIV interventions or programmes are mostly targeted at children, the youth or adults (15 – 49 years), and the general information on the aged (50 years and above) population is relatively poor.

Objective: The objective of the study was to examine the influence of comorbidities on ART adherence, and to assess the quality of life among aged HIV-positive clients.

Methods: A cross-sectional design that combined service records review and quantitative interviews was done. A total of 331 aged HIV positive patients on ART participated from the Aowin Municipality, Sefwi Wiawso Municipality and Suaman District of the Western North Region. The interviews were done using an electronic based data collection tool, KoBoCollect. Quantitative data analysis was done using Stata IC software version 16.

Results: The study observed a 28% comorbidity prevalence with 29% of them reporting a minimum of two comorbidities. Females were 57% of the total respondents. Adherence was high at about 83%. Reasons for non-adherence were found to be stigma [OR = 0.31(95% CI: 0.12, 0.80)], pill fatigue [OR = 0.37(95% CI: 0.16, 0.85)] and lack of support from family or significant others [OR= 0.33 (95% CI: 0.14, 0.78)] were found to negatively affect adherence. The overall quality of life was about 65% and this was evaluated from facet scores (1 = very poor and 5 = very good) using the WHO Quality of Life Instrument for HIV. The facets scores were added to get the domain scores (4 = very poor and 20 = very good QOL). The average

domain scores were calculated for the overall QOL of respondents.

Conclusion: Adherence among the aged HIV population is relatively high. However, stigma, pill fatigue and no support from family or significant others impact adherence to ART negatively. Notwithstanding, the overall quality of life was good among this group of PLHIV. Cardiovascular disease was prevalent among the aged PLHIV. Mental health disorders were the least among the aged HIV population. Further research to be done to assess the mental health status of aged HIV- positive clients in the region.



TABLE OF CONTENT

DECLARATION	i
DEDICATION	ii
ACKNOWLEDGEMENTS	iii
ABSTRACT.....	iv
TABLE OF CONTENT	vi
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF ABBREVIATIONS	xi
CHAPTER ONE	1
1.0 INTRODUCTION	1
1.1 Background to the study.....	1
1.2 Problem statement.....	3
1.3 Conceptual framework.....	4
1.4 Justification of the study	6
1.5 Research questions.....	6
1.6 Study objectives	7
CHAPTER TWO	8
2.0 LITERATURE REVIEW	8
2.1 Introduction.....	8
2.2 Epidemiology.....	8
2.3 Prevalence of comorbidities in older people living with HIV	9
2.4 Estimating antiretroviral therapy adherence	10
2.5 Factors associated with comorbidities	11
2.6 Factors related to medication adherence	13
2.7 Quality of life among aged HIV clients	15
2.8 Summary	16
CHAPTER THREE	18
3.0 METHODS	18
3.2 Study design.....	18
3.3 Study area.....	18

3.4	Study population	19
3.5	Inclusion and exclusion criteria	19
3.6	Sample size determination	19
3.6.1	Sample size adjustment	21
3.7	Sampling and recruitment method	21
3.8	Data collection instrument	21
3.9	Data collection technique	22
3.10	Variables	23
3.11	Quality assurance measures	24
3.12	Data processing and analysis	24
3.13	Ethical consideration	25
CHAPTER FOUR		29
4.0	RESULTS	29
4.1	Socio-demographic information of study participants	29
4.2	Prevalence of comorbidities	30
4.3	Level of antiretroviral therapy adherence	32
4.4	Factors associated with comorbidities	33
4.5	Factors associated with adherence to antiretroviral therapy	36
4.6	Influence of comorbidity on adherence	38
4.7	Quality of life	38
CHAPTER FIVE		40
5.0	DISCUSSIONS	40
5.1	Prevalence of comorbidities	40
5.2	Level of antiretroviral therapy adherence	40
5.3	Factors associated with comorbidities	41
5.4	Factors associated with adherence to antiretroviral therapy	42
5.5	Quality of life	43
5.6	Strengths and limitations of the study	43
CHAPTER SIX		45
6.0	CONCLUSIONS AND RECOMMENDATIONS	45
6.1	Conclusions	45
6.2	Recommendations	45
REFERENCES		46

APPENDICES	55
Appendix 1: Participant's information sheet.....	55
Appendix 2: Consent form.....	60
Appendix 3 Questionnaire	62
Appendix 4: Ethical clearance	68



LIST OF TABLES

Table 1	Variable description	23
Table 2	Socio-demographic characteristics	30
Table 3	Reported comorbidities among aged HIV population	32
Table 4	Level of ART adherence using PAD measure	32
Table 5	Bivariate analysis of factors associated with comorbidities	34
Table 6	Multivariate logistic regression analysis of factors associated with comorbidities	35
Table 7	Bivariate analysis of factors associated with adherence	36
Table 8	Multivariate logistic regression analysis of factors associated with adherence to antiretroviral therapy	37
Table 9	Test of association between comorbidity and ART adherence	38



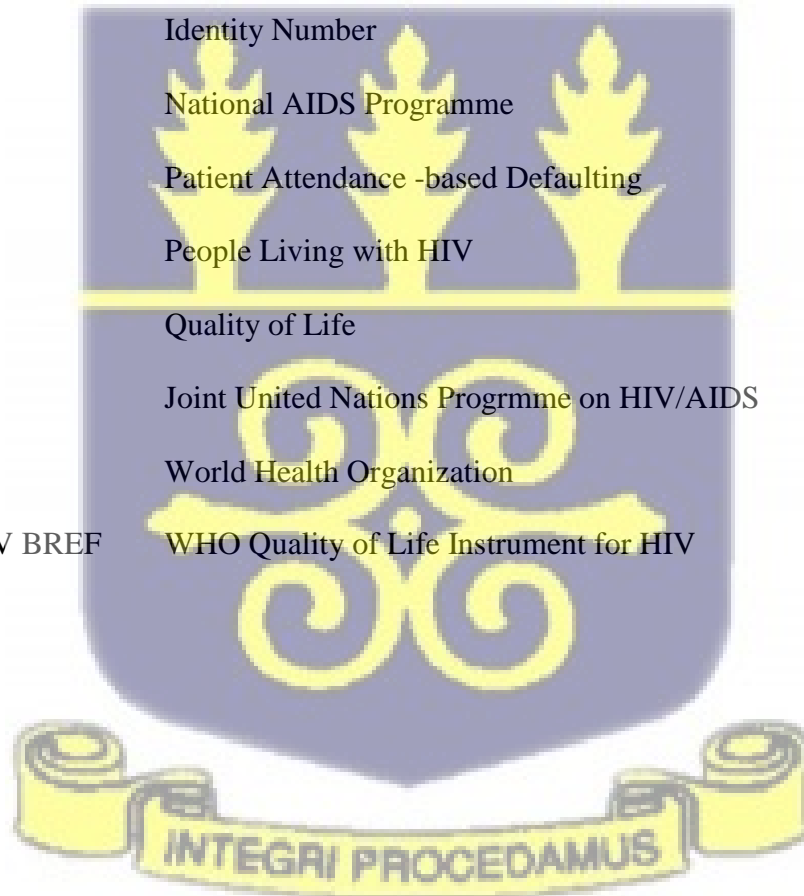
LIST OF FIGURES

Figure 1	Conceptual framework	4
Figure 2	Prevalence of comorbidity among aged HIV population	31
Figure 3	Adherence to ART among aged HIV population	33
Figure 4	Quality of life scores among aged HIV positive patients	39



LIST OF ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
ART	Antiretroviral Therapy
ARV	Antiretroviral
CI	Confidence interval
CD4	Cluster of differentiation 4
GHSERC	Ghana Health Service Ethics Review Committee
HAART	Highly Active Antiretroviral Therapy
HIV	Human Immunodeficiency Virus
ID	Identity Number
NACP	National AIDS Programme
PAD	Patient Attendance -based Defaulting
PLHIV	People Living with HIV
QOL	Quality of Life
UNAIDS	Joint United Nations Programme on HIV/AIDS
WHO	World Health Organization
WHOQOL-HIV BREF	WHO Quality of Life Instrument for HIV



CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the study

Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) are conditions of public health interest globally. HIV infection requires life-long medication therapy. The devastating effects affect the health of infected persons and their quality of life, including their social interactions (Basavaraj et al., 2010). In 2020, about 38 million people globally lived with HIV, comprising 36 million adults (15 years and above) and children (0–14 years) – 1.7 million, with 1.5 million new HIV infections, and about 680,000 people died from AIDS-related illnesses in 2020 (UNAIDS, 2021).

The age cut-off used for aged HIV populace is younger than what is frequently used for other backgrounds. The aged HIV population are described as those aged 50 years and above (Grabar et al., 2006). Approximately 7.5 million HIV-positive persons are aged 50 years and above, with over 4 million living in sub-Saharan Africa (UNAIDS, 2019b). Additionally, (Mahy et al., 2014; Autenrieth et al., 2018) estimate that 70% of people living with HIV (PLHIV) will be above the age of 50 years by 2030 due to the advent of life-prolonging antiretroviral therapy (ART). However, reports on HIV data have ended at age 49 years with relatively poor information on older PLHIV (Mahy et al., 2014). In Ghana, about 342,307 people had been infected with HIV as of 2019, with the highest prevalence among the adult population, 15 years and older (Ghana AIDS Commission, 2019; NACP, 2020).

Advancing age and increased susceptibility to chronic health problems are interrelated. Ageing heightens the risk of developing associated chronic illnesses and physiological limitations (Yancik et al., 2007). Other studies also stated that the presence of comorbidity is high. Among the aged

population, at least one or more chronic conditions exist (Caughey et al., 2008; Bahadir et al., 2016; Fan et al., 2021).

Comorbidities in aging patients with prolonged HIV infection are exceedingly predominant (Cuzin et al., 2017). Farahat et al. (2020) revealed that the problem of chronic comorbidities among the aged HIV diagnosed, is higher among older individuals. In South Africa, researchers revealed that positive HIV status and the lifelong dependence on ART also predisposes older PLHIV to comorbidities such as metabolic disorders, cardiovascular diseases, and osteoporosis (Levitt et al., 2011; Hopkins et al., 2021). Additionally, Ghosn et al. (2021) showed that symptomless atherosclerosis and multimorbidity were frequent in a cohort of HIV-positive people, attributable to traditional and HIV-specific factors.

Antiretroviral therapy remains the most effective measure against sustainable AIDS response (UNAIDS, 2019). In addition, there has been an increase in the life expectancy of PLHIV resulting from the use of antiretroviral medications (Mahy et al., 2014; Yoshimura, 2017; Autenrieth et al., 2018). This has resulted in an increase in the number of HIV and AIDS clients on ART worldwide. By June 2020, 26 million people worldwide had access to antiretroviral therapy (UNAIDS, 2020). In lower-middle-income countries, including sub-Saharan Africa (SSA), there is a significant decline in HIV and AIDS-related mortality rates among clients committed to ART regimens. The use of ART in PLHIV has also resulted in a reduction in HIV and AIDS-associated morbidities. (UNAIDS, 2019).

Despite the success of ART in reducing morbidity, mortality, and onward HIV transmission, including increased life expectancy among infected people, effective treatment outcomes depend on optimal adherence. Adherence refers to the ability of an individual to take medications at recommended times (Ammon et al., 2018).

Adherence to antiretroviral therapy is a positive factor in the quality of life of PLHIV because it improves immunity, suppresses viral load, and delays the disease progression (Tran, 2012; De Oliveira E Silva et al., 2014).

1.2 Problem statement

Adherence to ART is critical towards reducing the emergence and spread of drug-resistant viruses. However, medication adherence is a challenge in patients with chronic conditions. In addition, aged HIV-positive clients are likely to be less compliant to ART regimen than their younger counterparts despite the promising effects of ARTs on viral load (Fernandez-Lazaro et al., 2019).

As part of the measures to end the HIV/AIDS pandemic, WHO has introduced the 95-95-95 strategy, a fast-track action that aims to scale-up of the 90-90-90 targets to end the AIDS epidemic by 2030. The 95-95-95 strategy means that – 95% of people living with HIV know their HIV status; 95% know their status and are on treatment; and 95% of people on treatment with suppressed viral loads (UNAIDS, 2015). However, achieving 95% viral load suppression among all people receiving ART can only be possible with a strong emphasis on medication adherence.

In Ghana, the estimated prevalence of HIV among the 15-49 years' population is 1.7% (Ghana AIDS Commission, 2019b), with about 45% ART coverage of which 31% are achieving viral suppression as of 2019 (NACP, 2020). The Western North region has adult HIV prevalence of 1.85%, however, there is no reported medication adherence data.

Adherence in older adults is multifaceted and requires understanding the individual, interpersonal, community, and structural factors behind treatment adherence (Soomro et al., 2019). Prior researchers have identified some that affect medication adherence and quality of life include the

presence of other medical conditions, side effects of ART, stigma, pill fatigue, support system, forgetfulness, access to ART (Wasti et al., 2012; Obirikorang et al., 2013; Hodgson et al., 2014; Ammon et al., 2018; de Los Rios et al., 2021). In addition, demographic factors such as age, sex, marital status, education, and income have also been linked to medication adherence (Petse et al., 2018; Fernandez-Lazaro et al., 2019; Abadiga et al., 2020; Peña et al., 2021).

Suboptimal adherence to ART may result in treatment failure and the emergence of drug-resistant strains of HIV (UNAIDS, 2019b; NACP, 2020). Several studies have indicated a deficit in data relating to aged PLHIV (data on HIV surveillance end at age 49 years). The current study will thus look at comorbidities, ART adherence, and the quality of life among the aged HIV-positive clients to improve the focus given to this population in the Western North Region.

1.3 Conceptual framework

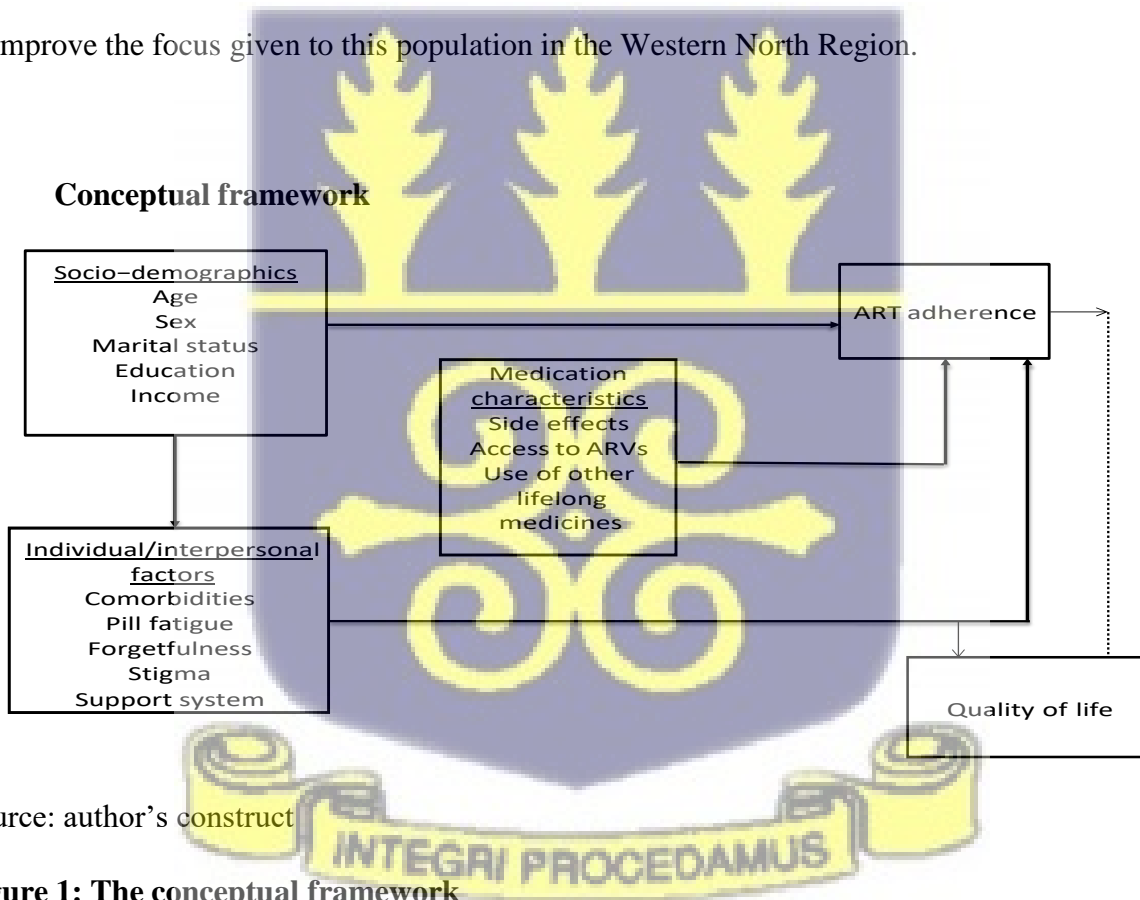


Figure 1: The conceptual framework

1.3.1 Narrative of the conceptual framework

As seen in Figure 1, the framework of this study is a conceptual framework that shows a graphic interpretation of factors associated with comorbidities, medication adherence, and quality of life. These factors have been grouped into demographic factors, individual/interpersonal, and medication characteristics.

Aging comes with a myriad of chronic conditions, decreased activity levels, neurocognitive impairment, etc., which could affect medication adherence and the quality of life (Erlandson & Karris, 2019). In addition, marital status with support from significant others has yielded excellent results in adherence and the superiority of life of individuals with lifelong ailments (Petse et al., 2018; Campbell et al., 2020). Also, formally educated people are more likely to adhere to prescriptions and indulge in activities that improve their quality of life (Monroe et al., 2013; Abadiga et al., 2020). Furthermore, people with high- and stable-income levels are more likely to adhere to medications and have a better quality of life than those without a steady income (Tegegne, 2021).

Comorbidities such as Tuberculosis, Diabetes, Hypertension, Cancers, and other chronic diseases threaten HIV medication and, consequently, the quality of life. In addition, the thoughts and stress of swallowing pills every day lead to pill fatigue resulting in missed doses or an abrupt end to taking lifelong medications (Okai et al., 2020). Also, the daily activities of making ends meet or postponing medication times could lead to forgetfulness (Obirikorang et al., 2013; Dzansi et al., 2020). Furthermore, stigma from partners, friends, family, etc., may prevent an infected person from disclosing their status and therefore will not want others to know of the medication they take (Katz et al., 2013). Stigma and self-isolation could lead to depression and neglect of drugs.

Each ARV has its side effects. For example, the drug regimen prescribed for the client may produce side effects that make them uncomfortable. As a result, they may discontinue the ARVs and possibly drop out of HIV care entirely (Okuku & Dan-Jumbo, 2021). Access to the medication itself could also affect adherence. For instance, clients not getting their drugs during clinic visits due to stock outs (Petse et al., 2018), or health service staff not being available could be possible reasons for nonadherence. The concomitant use of other medications could also reduce medication adherence (Back & Marzolini, 2020). People may find it daunting to swallow so many pills at a time.

1.4 Justification of the study

Some studies have been done in other regions in Ghana, including the Western part. However, the Western North is a new area and shares boundaries with higher HIV prevalent zones (Bono regions and Cote D'Ivoire). In the current situation where nothing is known about the adherence levels and quality of life of the aged HIV population and the factors underlying them in the region, the study's findings will help evaluate the management protocols regarding ART adherence. Additionally, it will inform the initiation of reporting on aged PLHIV. These and improve on the working towards achieving the 95% target of viral load suppression among those on ART.

1.5 Research questions

1. What is the prevalence of comorbidities among aged clients living with HIV/AIDS in the Western North Region?
2. What is the level of adherence to ART among aged clients living with HIV/AIDS in the Western North Region?
3. What are the factors associated with comorbidities and ART adherence among clients

living with in the Western North Region?

4. What is the quality of life among aged PLHIV in the Western North Region?

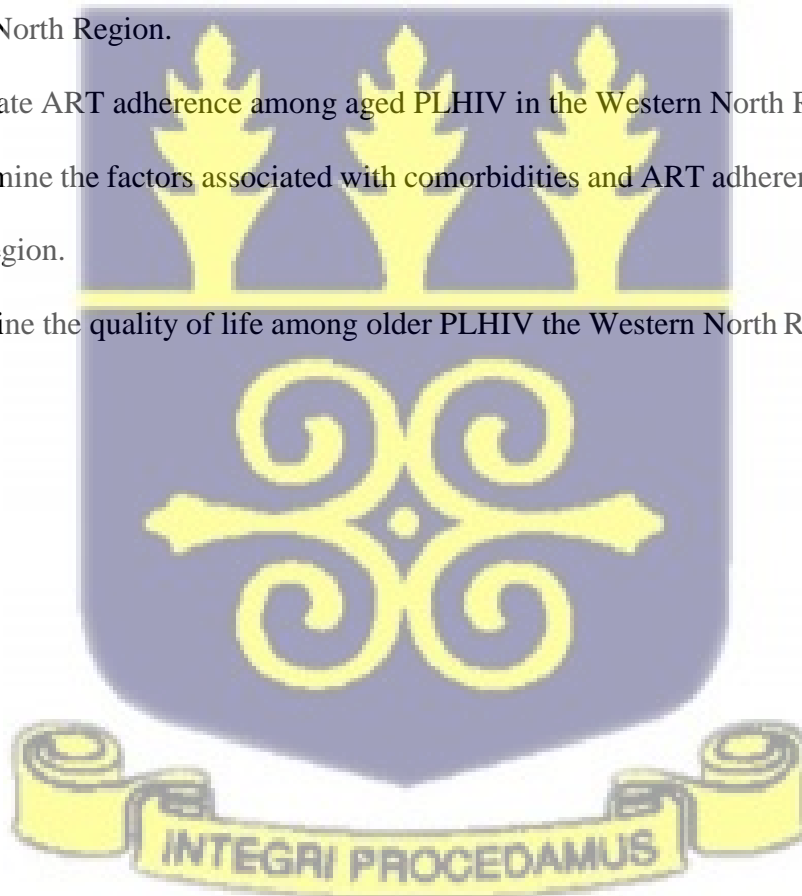
1.6 Study objectives

1.6.1 General objective

To examine comorbidities, ART adherence, and the quality of life among aged PLHIV in the Western North Region.

1.6.2 Specific objectives

1. To determine the prevalence of comorbidities among aged clients living with HIV in the Western North Region.
2. To estimate ART adherence among aged PLHIV in the Western North Region.
3. To determine the factors associated with comorbidities and ART adherence in the Western North Region.
4. To examine the quality of life among older PLHIV the Western North Region.



CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter reviews relevant literature on the subject under study in line with the objectives of the study by exploring books, reports, and journal articles.

2.2 Epidemiology

HIV/AIDS continues to be a pandemic of global concern since its discovery in 1981 in the United States of America, as it affects all categories of ages. Globally, 36 million adults aged 15 years and above, and 1.7 million of children aged 0–14 years were living with HIV. Of these 74% of adults (15 years and above) had access to ART. Six hundred and eighty thousand people died from AIDS-related deaths globally (UNAIDS, 2021). In Ghana, 316,352 adults aged 15 years and above are living with HIV with about 46% of them receiving medication (Ghana AIDS Commission, 2019b).

The age description for the elderly in HIV, is 50 years (Grabar et al., 2006). In industrialized countries, the HIV population is ageing as a result of effective antiretroviral medication and the rise in the number of diagnoses being made among this age group.

There has been an increasing trend in the growing number of people who are aged 50 years and older living with HIV. Despite this trend, few policies especially in low-and middle-income regions address this dimension of the HIV epidemic. Globally, an estimated 3.6 million people aged 50 years and more are living with HIV with the highest proportion among lower-middle-income regions where an estimated 100,000 people aged 50 years and above get infected with HIV every year, with three quarters in sub-Saharan Africa (UNAIDS, 2013; Wing, 2016). As countries continue to meet the UNAIDS treatment target, the number of aged PLHIV is

expected to increase due to the effects of ART on infected persons (Autenrieth et al., 2018).

There is the need and urgency for the aged HIV population to be given some attention with strategies specifically directed at them.

2.3 Prevalence of comorbidities in older people living with HIV

Different definitions have been suggested for comorbidity, as various conceptualizations (the nature of the disease, etc.) are taken into context. Despite the possible existence of conceptual and practical challenges in operationalizing, the concept needs to be defined (Nicholson et al., 2019).

The Oxford online languages define comorbidity as “*the presence of two or more diseases or medical conditions in a patient.*” or “*a disease or medical condition that is simultaneously present with another or others in a patient.*” These definitions will be adapted and used in this study.

The burden of comorbidities in aged HIV clients is increasing over time. A cross-sectional study conducted to investigate the prevalence of comorbidities among this study population in South Africa showed that 19.2% were HIV-positive. Hyperglycaemia was more significant among those who tested positive than those who had no HIV at the study time (16.1% and 9.6% respectively). In addition, the study also revealed that 21.7% of those on ART had hypercholesterolemia than those who were not on ART (Hopkins et al., 2021). Another study conducted in Western Saudi Arabia emphasized that although the prevalence of comorbidities was similar to that of the general population, the burden is higher among older-aged persons with the infection (Farahat et al., 2020).

Gallant et al. (2017), also revealed that comorbidities are easily found among ageing HIV populations with increasing trends. In a study conducted in Germany, findings showed that the increasing presence of comorbidities as well as the use of co-medications requires the need for appropriate selection of antiretrovirals for the aged HIV community (Funke et al., 2021). Similarly, another study in South Africa showed that older HIV infected adults had high rates of chronic

diseases (Negin et al., 2012). Grabar et al. (2006), also found that elderly patients are more susceptible to HIV disease progression due to they being diagnosed at a more progressive stage, their slower immune response to HAART and also because the combined effect of aging, HIV infection and use of ART.

Several works have also observed similar trends of increasing comorbidities and a rise in the number of comorbidities per patient (Guaraldi et al., 2011; Levitt et al., 2011; Cuzin et al., 2017; Fan et al., 2021; Ghosn et al., 2021). Due to this prevalence and increasing trends, Pourcher et al. (2020) have suggested the need to create awareness of comorbidities among aged HIV patients. Additionally, Erlandson & Karris (2019), recommended integrating screening for comorbidities in the management of aged PLHIV.

Despite studies that have been conducted to ascertain the prevalence of comorbidities in the general adult population (15-49) in Ghana, limited studies have been done among the older population. Nevertheless, the above review implies that comorbidities exist among older HIV clients with increasing trends.

2.4 Estimating antiretroviral therapy adherence

Medication adherence generally refers to the voluntary effort of an individual to take in medications as prescribed to achieve a therapeutic outcome. ART is the accepted medication in the management of HIV and AIDS. Measuring medication adherence among HIV clients is based on both individual and health system factors such as the ability of patients to recall intake of medication, use of laboratory tests, etc. ART adherence is needed to reach long-lasting viral suppression (Kabore et al., 2015).

Many studies have employed the use of self-reported adherence (SRA) to measure medication

adherence. (Kabore et al., 2015; Orrell et al., 2017; Gaifer & Boulassel, 2019; Oconnor et al., 2021). SRA involves the use of a questionnaire that rates responses. The measure of compliance is under two categories: good adherence ($\geq 95\%$) and poor adherence ($\leq 95\%$). Though there are biases of patients over reporting to their compliance, SRA helps further discussions on adherence between patients and caregivers. To achieve an undetectable viral load count, a client has to take a minimum of 95% of prescribed medications. In addition to SRA, some studies have reported ART adherence using different measures. The measures include plasma concentrations of ART, Pharmacy refills, Pill counts (clinic-based or client-based), provider reports, CD4 count levels, electronic monitoring systems clinic visits, and surrogate markers (Erlwanger et al., 2017; Iwuji et al., 2018; Tegegne et al., 2018; Wang et al., 2019; Abadiga et al., 2020; Benoit et al., 2020; Fatti et al., 2020). The authors mentioned that there is no set standard for measuring patient adherence to ART medication.

From the above, we can conclude that measuring adherence is both subjective and objective (e.g., client self-report and biochemical monitoring, respectively). In this regard, for pill counts, clinic-based pill counts give a more objective representation of adherence over client-based pill counts.

Although there is no set standard for measuring adherence, this study will use the current viral load levels of respondents in evaluating adherence, since to date, it is the most widely used approach (Orrell et al., 2017).

2.5 Factors associated with comorbidities

Aging has been attributed to the development of chronic diseases. Being an aged HIV patient, increases one's risk of further developing chronic illnesses due to immunosuppression. Chu et al. (2011), have attributed aging, HIV infection and prolonged use of ART to the development of

comorbidities. Similarly, older patients suffering HIV, are more susceptible to developing kidney complications resulting from the use of HIV medications (Wing, 2016).

In China for instance, in a study done among middle aged and the elderly, comorbidities were found to be predominant among the aged population, and authors further recommended the need for surveillance on comorbidities (Fan et al., 2021). Furthermore, the HIV infection also predisposes them faster to geriatric disorders and fragility including bone diseases and fracture, and unique psychological problems or chronic neurological difficulties (Wing, 2016).

In addition to aging, d'Arminio Monforte et al. (2020), have included that the immune response, the presence of the HIV virus and lifestyle patterns (e.g. diet, tobacco use, alcohol consumption, physical inactivity, risky behaviours, etc.) have a higher magnitude on the development of comorbidities among the aged population.

Furthermore, marital status such as a divorce, separation or the loss of a loved one, do have implications for health especially within the psychological health field (Ding et al., 2021). Also, in a similar study, disability assessment and depressive symptoms were higher among those who had transitioned to widowhood compared to those who were still married and lived together (Wójcik et al., 2021).

Socioeconomic status has also been known to have a relationship with the development of chronic diseases and related comorbidities. Comorbidities have been found to be higher or common among persons with high socioeconomic status (Biswas et al., 2019).

Additionally, the kind of occupation also puts one at a risk of developing occupational related comorbidities. The working conditions of an individual can affect the development of comorbidities and other related chronic infections (McNamara et al., 2021).

2.6 Factors related to medication adherence

2.6.1 Individual/ interpersonal (client-related factors)

Client-related factors such as pill fatigue, forgetfulness, comorbidities, stigma, and the presence of support systems contribute to medication adherence (Hodgson et al., 2014; Ammon et al., 2018). For example, in examining the correlations of barriers to ART adherence, 91% of respondents reported some fear of stigma relating to disclosing a positive HIV status from family and the community, and 284 of the 396 participants stated fear of stigma from work. In this study, stigma negatively affected medication adherence (Heylen et al., 2021). In a similar study, Katz et al. (2013) also saw stigma contributed to the failure in medication adherence. Also, some clients have attributed reasons for nonadherence to their ability to forget to take medications at the recommended time, especially when they have not eaten or travelled without their drugs. Others linked their forgetfulness to not setting reminders (Dzansi et al., 2020a). Forty-six percent of respondents mentioned forgetfulness as a cause for missing medication regimens (Obirikorang et al., 2013). In a study to determine adherence to household determinants, family support was positively related to medication adherence among PLHIV (Campbell et al., 2020).

The existence of comorbidities and other chronic infections is inevitable among HIV-infected people, especially the aged. For example, about 64% of samples taken from HIV-positive clients in a study conducted in California had at least one additional disease condition (Zingmond et al., 2017). Moreover, both physically and psychologically, the cost of dealing with these chronic illnesses negatively affects medication adherence (d'Arminio Monforte et al., 2020). Other studies have also mentioned food as a factor affecting medication compliance (Musumari et al., 2014; Dzansi et al., 2020; Liao et al., 2020). In addition, Pellowski & Kalichman (2016) concluded that diet significantly predicted adherence among people on ART.

From the results shared, client adherence to lifelong therapy depends not only on the efforts of the

infected individual but also on his immediate and external environments.

2.6.2 Medication-related factors

Given that ART is a lifelong therapy, it comes with side effects. Not being able to deal with the side effects poses a challenge to ART adherence. Self-motivation and other supporting factors are helpful to improve adherence (Chowdhury & Chakraborty, 2017). Furthermore, Okuku & Dan-Jumbo (2021) reported that poor adherence is precipitated by the uncomfortable side effects accompanying the intake of ARVs. In a study among HIV-positive pregnant women, medication side effects emerged more, contributing to nonadherence (Vitalis & Hill, 2017). These suggest that despite the knowledge of side effects regarding ART, side effects still threaten adherence, and so there is the need for more information on side effects since ART is a chronic medication.

The health facility also plays a role in ART adherence. For example, research shows that stock outs of ART medication contribute to missed doses (Petse et al., 2018). In addition, the availability of the drug forms part of the first steps to medication adherence (Tegegne et al., 2018). Therefore, health staff must know that stock out can be avoided through regular stock counts.

Chronic diseases are prominent PLHIV; therefore, the plausibility of being treated for more than just HIV is high (Cuzin et al., 2017). As a result, clients receive multiple medications for diagnosed conditions. Abada et al. (2019) also indicated that 58% of participants responded that poly-medication and complex dosing regimens had prevented them from adhering to medication at some point in their management. Some studies have suggested the need for support to reconsider the approach to treating comorbidities in the aged HIV population (Erlandson & Karris, 2019).

2.6.3 Socio-demographic factors

The level of income can be measured at the household or individual level. Tegegne (2021), in a

study on predictors of highly active antiretroviral therapy (HAART) he established that medication adherence was higher among patients with a high level of income than in those who had low- or poor-income levels. Also, some patients have to manage the cost implications of coexisting chronic ailments (Liao et al., 2020). This could reduce adherence, especially when clients may have no money to move to ART sites for medications.

Support is paramount in the management of HIV, especially among the aged population. In this regard, married HIV-infected patients during a study had a significant level of adherence due to support given by partners than those who were not married (Petse et al., 2018).

Formal education, health literacy, and health education have been mentioned by numerous researchers as good predictors of medication adherence. In various studies, educated persons are more likely to follow medication prescriptions than uneducated ones. In addition, formally educated people adhered more. Also, health literacy, and understanding of the medications' benefits, improved adherence among study populations (Monroe et al., 2013; Petse et al., 2018; Abadiga et al., 2020; Peña et al., 2021).

2.7 Quality of life among aged HIV clients

Quality of life (QOL) is defined by the WHO as, *“one’s perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations and concerns”* (WHO, 1998).

Quality of life is important in the management and care for PLHIV especially the aged. The quality of life in the HIV population is attributed to adherence to antiretroviral treatment (Peña et al., 2021). Conversely, those with a self-perception of good quality of life are more likely to adhere to medication (Fernandez-Lazaro et al., 2019). Additionally, Soomro et al. (2019) have mentioned that more research is required among aged PLHIV to help develop interventions that can improve

their clinical outcomes and quality of life. The daily dosing of pills is associated with nonadherence. HIV treatments could include long-acting and non-oral drug remains that can help clients overcome barriers, improve medication adherence, and thus, the quality of life. Family and community support has also improved the quality of life among aged HIV clients (de Los Rios et al., 2021).

Another study measured the quality of life among PLHIV using the WHO quality of life instrument for HIV (WHOQOL-HIV BREF). Again, among the predictors of quality of life, adherence to ART stood out. Therefore, the author recommended expanding ART services within the country of study (Tran, 2012).

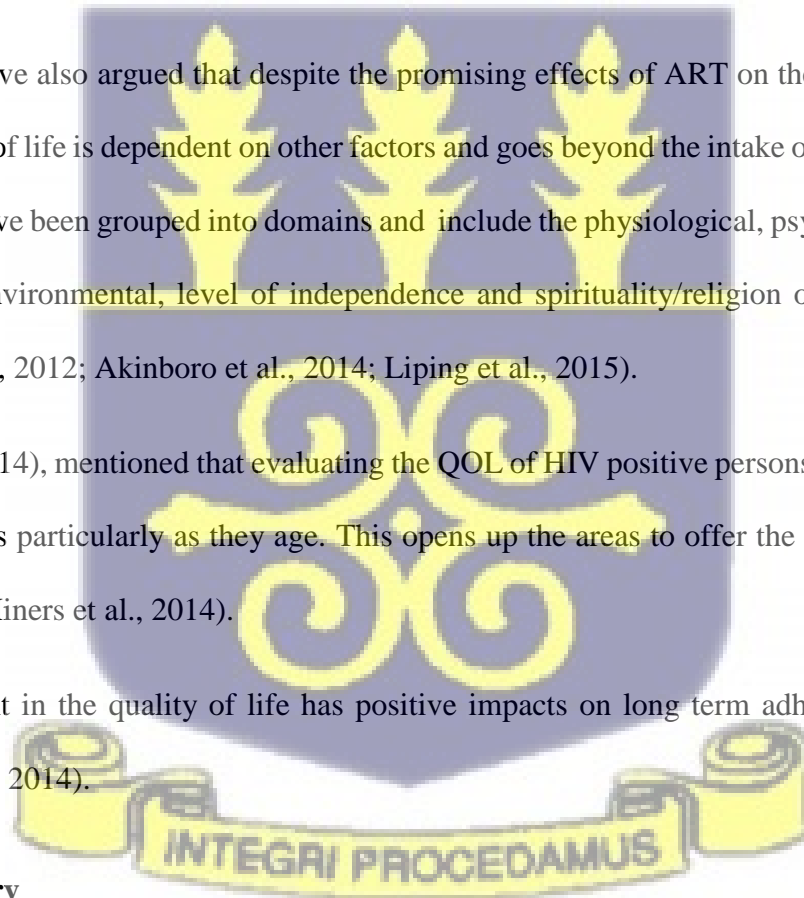
Other studies have also argued that despite the promising effects of ART on the quality of life of PLHIV, quality of life is dependent on other factors and goes beyond the intake of HIV medication. These factors have been grouped into domains and include the physiological, psychological, social relationships, environmental, level of independence and spirituality/religion or personal beliefs (Ntshakala et al., 2012; Akinboro et al., 2014; Liping et al., 2015).

Miners et al. (2014), mentioned that evaluating the QOL of HIV positive persons helps in knowing their experiences particularly as they age. This opens up the areas to offer the appropriate health interventions (Miners et al., 2014).

An improvement in the quality of life has positive impacts on long term adherence to therapy (Akinboro et al., 2014).

2.8 Summary

The reviews performed show that there are gaps regarding ART adherence measure. However, the methodologies employed by writers were transparent on adherence issues and the strategies to



adopt to improve patient adherence. The areas of concern that need further study include more research among the aged HIV population, innovative approaches to improve medication adherence, and standardized methods of estimating adherence.



CHAPTER THREE

3.0 METHODS

3.1 Introduction

This chapter describes the approaches used to answer the research questions. The subsections that will be discussed include the study design, study population, the inclusion and exclusion criteria, sampling techniques, methods and instruments used for data collection, data collection procedures, the data analysis, and ethical issues/ considerations.

3.2 Study design

The study utilized a cross-sectional design that combined records review and quantitative survey to examine comorbidities, antiretroviral therapy adherence, and the quality of life among aged HIV-positive clients.

3.3 Study area

The study was conducted in the Western North Region of Ghana. It was carved out of the existing Western Region in 2019, with the Constitutional Instrument 117. The Ivory Coast border bounds the part on the west, the Central region in the southeast, and the Ashanti, Ahafo, and areas of Bono in the north. It has a land size area of 8875 square kilometers. It has a population of about 949,094 (projected from the 2010 housing and population census).

Concerning health service delivery, the region has three hundred and thirty-five health (336) facilities comprising 16 hospitals, 26 health centers, 31 clinics, 238 community-based health planning services (CHPS) compounds, and 24 maternity homes. In addition, there are 10 ART sites (NACP, 2020).

Western North was chosen for this study because, as of 2019, about 11,331 people lived with HIV in the region (Ghana AIDS Commission, 2019a) and 3,130 among the adult (15 years +) population on ARTs (NACP, 2020). However, there is no data specifically on that of the aged (50 years +) population.

3.4 Study population

The study population comprised of HIV-positive clients aged 50 years and above and residing in the Western North Region.

3.5 Inclusion and exclusion criteria

3.5.1 Inclusion criteria

Participants met the following requirements to be included in the study

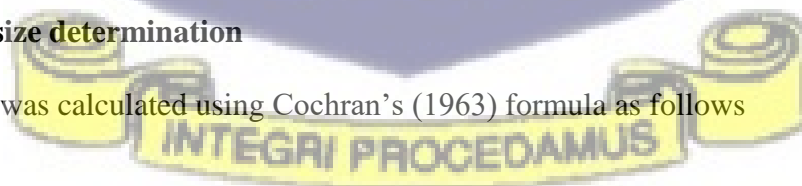
1. Participants were HIV-positive clients aged 50 years and above
2. Participants had been on ARVs for a minimum period of one year

3.5.2 Exclusion criteria

Subjects who met the inclusion criteria but had a language barrier (not speaking English, Sefwi, Brosa, Fante, Nzema, Twi) or hearing impairment, or those who were terminally ill at the time of the survey.

3.6 Sample size determination

The sample size was calculated using Cochran's (1963) formula as follows



$$n_0 = \frac{[Z^2 p (1-p)]}{e^2} \quad \text{Where; } n_0 = \text{minimum sample size required, } Z = \text{confidence interval}$$

(critical value 1.96), and p = estimated proportion or prevalence of adherence among aged HIV-positive clients and e is the margin of error.

A prevalence of 50% was used as no literature on prevalence of adherence among the study population in Ghana had not been reviewed at the time of the study. At a confidence interval of 95%, and a margin of error at $\pm 5\%$, the sample size was computed as follows

$$n_0 = \frac{[1.96^2 0.5 (1-0.5)]}{0.05^2} = \frac{[3.8416 * 0.25]}{0.0025} = 384.16 \approx 385 \text{ respondents}$$

3.6.1 Sample size adjustment

The sample size was adjusted using the finite population correction factor by Israel (1992) since the study did not involve the general population. This was computed as $n = \frac{n_0}{1 + \frac{(n_0-1)}{N}}$

where N = the population size of aged HIV-positive patients on ART in the selected districts. According to data from the District Health Information Management System (DHIMS 2) platform, a total of 2325 HIV-positive patients were aged and on ART in the selected districts.

$$n = \frac{385}{1 + \frac{(385-1)}{2325}} = \frac{385}{1.16516} = 330.42 = 331$$

The sample size = 331



3.7 Sampling and recruitment method

Three randomly selected ART sites out of 10, from three out of nine randomly selected districts within the region were used for this study. These facilities were Enchi Government Hospital (Aowin municipality), Wiawso Government Hospital (Sefwi Wiawso municipality) and Dadieso Government Hospital (Suaman district). Systematic sampling was used to sample the 331 respondents for this study. The folder numbers of aged HIV clients were obtained from the HIV units of the selected facilities and numbers assigned to them using Microsoft Excel spreadsheet Windows 10. The sampling interval ($k = N/n$) was calculated from the population. A random number between 1 and the sampling interval was chosen to serve as the starting point. The k^{th} number was repeatedly selected until the sample size was obtained. When a selected respondent was found to be ineligible, the nearest folder number was selected as a replacement.

3.8 Data collection instrument

Data was collected electronically using KoBoCollect. KoBoCollect is an android based data collection application that feeds data into ones KoBo toolbox account that is password protected. The electronic questionnaire was developed from the study objectives. This tool consisted predominantly of closed-ended questions and a few open-ended questions relating to socio-demographic characteristics, comorbidities, ART medication adherence and adherence measurements and quality of life. Additionally, service records were reviewed from the selected ART sites in the Western North Region to extract data on participants' current viral load levels, number of clinic visits and expected number of clinic visits.

Patient Attendance-based Defaulting (PAD) measure was assessed. The PAD measures the proportion of patients who miss appointment schedules and do not show up within 30 days. Such

clients are classified as treatment defaulters. Adherence will be categorized under optimal (95-100%), sub-optimal (80-94%) and poor (<80) using the PAD.

$$\text{PAD} = \frac{\text{Number of clinic visits attended}}{\text{Total expected clinic visits}} \times 100$$

For the purposes of this study, adherence was measured using viral load levels. According to the GHS/NACP reference, viral load levels >1000 copies/ml indicate treatment failure patients hence, non-adherents, and viral load levels <1000 copies/ml indicate adherents.

The WHO QOL scale for people living with HIV (WHOQOL-HIV BREF) questionnaire was adopted and used to assess the quality of life of the study population. The dimensions of the tool were measured by the using a Likert scale.

3.9 Data collection technique

Data collectors were trained to help the PI conduct interviews. The interviewer-administered questionnaire method using face-to-face interviews was used to collect data from respondents. Ethical issues regarding face-to-face interviews of HIV patients were addressed by involving the ART nurses seeking verbal permission from patients who expressed interest in participating. These patients were then scheduled for the interview and only those who gave informed consent were recruited as respondents. Patients were also assured of confidentiality and anonymization of data. A total of 331 respondents participated in the study. The interviews were conducted in an environment devoid of eavesdroppers and conducive for the participants. The interviews lasted an average of 20 minutes per respondent. Health records were reviewed and relevant data such as viral load and the number of ART clinic sessions respondents attended by end of the year 2021 were extracted. The session was conducted in both English and the local language that is more convenient to the client.

3.10 Variables

Table 1: Variables' description

Variable	Working description	Type
Independent variables		
Age	Age in completed years at the time of the study	Quantitative continuous
Sex	Sex of participant	Categorical
Marital status	Whether married or otherwise	Nominal
Educational status	Refers to the highest level of education attained	Categorical
Employment	whether employed or not	Categorical
Comorbidity	Any diagnosed acute or chronic disease client has. It could be one or more	Categorical
Other medications	Any other medication prescribed for chronic conditions	Categorical
Access to ARV	A client receiving ARVs from ART sites at all times	Categorical
Side effects	Any complaints from the respondent attributed to the ART	Binary
Support system	The presence of significant other(s) offering support	Categorical
Dependent variables		
ART Adherence	i. GHS expected viral load levels (viral load <1000 copies/ml - adherent)	Proportion
Quality of life	Meeting WHOQOL instrument domain classifications	Proportion

3.11 Quality assurance measures

The following measures were put in place to ensure quality and data integrity.

- The data collectors who helped collect data were trained on the use of the KoBo data collection application and also to understand the questionnaire and obtain the subjects' desired responses for data quality and analytical accuracy.
- The interview tool was pre-tested among ten aged HIV-positive clients. These people were not included in the main study. The pre-testing helped to determine respondents' reactions to sensitive questions and also to rephrase uncertain questions.
- Additionally, the PI was involved during the data gathering process to see to it that the trained data collectors asked the right questions.

3.12 Data processing and analysis

- The data was downloaded from the KoBo tool box and exported to Microsoft Excel spreadsheet Windows 10. The data was cleaned, coded, and imported into STATA software version 16 for analysis.
- Descriptive data analysis was done; categorical variables were expressed as frequencies and percentages. Continuous variables were presented as means and standard deviations. Graphs and tables were used in delivering the results.
- A bivariate analysis was conducted with adherence to medication as the dependent variable and all other variables as independent variables. A confidence interval of 95% and a p-value < 0.05 were considered statistically significant. Variables that showed significance were entered into a multiple logistic regression analysis to determine the strength of association among factors with comorbidities and ART adherence.

- Chi-square test was done to determine the relationship between comorbidities and adherence.
- QOL of respondents was evaluated using facet scores ranging from 1-5 (1 = very poor and 5 = very good). The facets scores were added to get the domain scores ranging from 4 being very poor QOL and 20 representing very good QOL. The average domain scores were calculated for the overall QOL of respondents

3.13 Ethical consideration

The following ethical principle were employed to safeguard the participants' safety and welfare during the study.

3.13.1 Ethical approval

Ethical clearance was sought from the Ghana Health Service Ethics Review Committee (GHSERC). Approval was given with ID; GHS-ERC: 046/12/21. Additionally, the researcher sought administrative permission from the Regional Health Directorate and the institutions that were involved in the study.

3.13.2 Informed consent

Written informed consent was obtained from subjects before they are interviewed. The informed consent form contained the name and telephone numbers of the Principal Investigator and the administrator of the GHSERC. The investigator reviewed the consent form with each respondent before start of the interview. Also, the rationale for the study and the risks and benefits were well explained to the participants in the languages they best understood. The voluntary participation of

subjects were confirmed through signing or thumb printing by participants. The participants were given a signed copy of the consent form was given to the participant and the other one kept by the lead investigator.

3.13.3 Confidentiality

Confidentiality of respondents was ensured as follows

- No names or personal identifiers of respondents was used throughout the study
- Patients were assured by word of mouth and made to understand that no information given by them will be disclosed to anyone
- All study records were restricted to only the investigator
- All computer and networking programmes identified participants with IDs only
- Separate rooms with locking doors within the ART units were used for the interviews and all information provided by respondents were not divulged to any other person including staff at the ART clinics.
- Entries made into the data collection App were in password protected storage server known to only the PI.

3.13.4 Privacy

The interviews were carried out in enclosed and separated rooms within the ART units of the institutions. Participants were alone with the investigator. This was to ensure the privacy of participants and to also prevent eavesdropping or unintentional divulging of information.

3.13.5 Potential risks

Participants were exposed to any physical risks since no biological samples were collected. However, some participants felt uncomfortable and were emotional while answering some of the questions with some sensitive questions. Respondents were not coerced to answer all questions.

Strict adherence to the national guidelines/protocols on reducing the risk of contracting COVID-19 infection was observed. Additionally, all procedures regarding participants' safety, rights, and welfare and the research team outlined by GHSERC were duly observed. This study included face-to-face interviews; therefore, the researcher provided participants with face masks and hand sanitizers (no cost to participant) and the one-meter physical distance was also observed.

3.13.6 Benefits

There were no direct benefits to participants; however, the study's findings could help improve the medication adherence among aged PLHIV with comorbidities.

3.13.7 Right to withdrawal

Participants were informed of their right not to participate in the study as they could to pull out at any time and also not answer some questions when asked. Participants were also told that declining to participate in the research had neither negative repercussions nor affect the quality of health care they will receive.

3.13.8 Data management and protection

Data was entered into password-protected databases with restricted access. Records reviewed were used for the intended purposes and anonymized. Only the PI, the supervisor and the Ghana Health Service Ethics Committee (if requested) will access the responses.

3.13.9 Compensation

Participation in this study was voluntary. The researcher did not give any monetary reward or gifts to participants for their acceptance to be part of this study.

3.13.10 Study funding information

The researcher fully funded this work.

3.13.11 Declaration of conflict of interests

The principal investigator (Ms. Alberta Mali Whajah) declared no conflict of interest in this work.

All others who were engaged to make up the research team also had no conflicts of interest.

Respondents were made aware that they could withdraw at any point of the study.



CHAPTER FOUR

4.0 RESULTS

Introduction

This chapter gives a description of the study findings.

4.1 Socio-demographic information of study participants

Table 2 describes the socio-demographic characteristics of the participants who enrolled in the study. It was revealed that from the 331 respondents, there were more females (57%) than males in the study. The mean age was about 58 ± 6.34 years, with most (36%) in the 55-59 years age group and the least (6%) in the 70-74 years age group. About four in ten (41%) of the participants had no formal education. Fifty-five per cent of the respondents were self-employed. Only 11% of the respondents were not married.

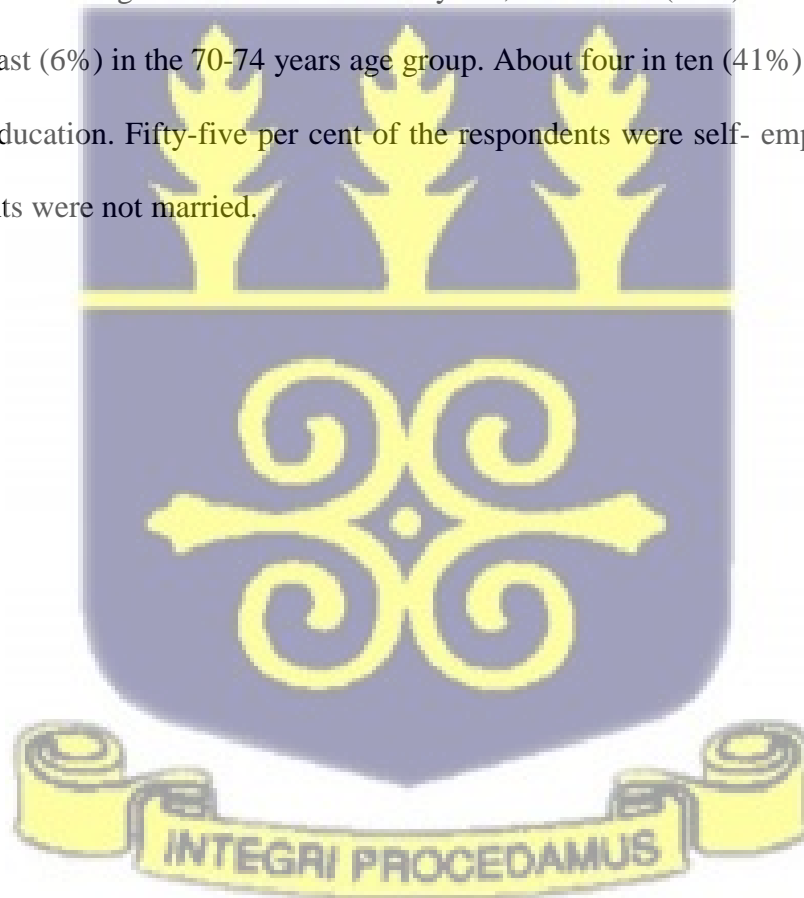


Table 2: Socio-demographic characteristics

Variable	Frequency	Percentage
n = 331		
Sex		
Male	142	42.9
Female	189	57.1
Age (mean) years 57.67 ± 6.34		
Age group		
50-54	110	33.23
55-59	119	35.95
60-64	41	12.39
65-69	42	12.69
70-74	19	5.74
Educational level		
No formal education	135	40.79
Junior high school	84	25.38
Senior high school/ vocational/technical	34	10.27
College/university	28	8.46
other*	50	15.11
Marital status		
Never married	37	11.18
Married/cohabiting	146	44.11
Separated /divorced/widowed	148	44.71
Employment status		
Employed (government or private)	46	13.9
Self-employed	181	54.68
Non-paid/pension	104	31.42

* Middle school leaver certificate and primary school

Source: from author's primary data collection

4.2 Prevalence of comorbidities

In addition to the existing HIV, participants were asked of the presence of any other disease they had been diagnosed. Figure 2 displays the proportion of respondents with comorbidities. A total of 93 respondents reported having comorbidities. Of these, 72% (67) reported having one

comorbidity and about 27% (25) mentioned having 2 comorbidities with one person reporting 3 comorbidities.

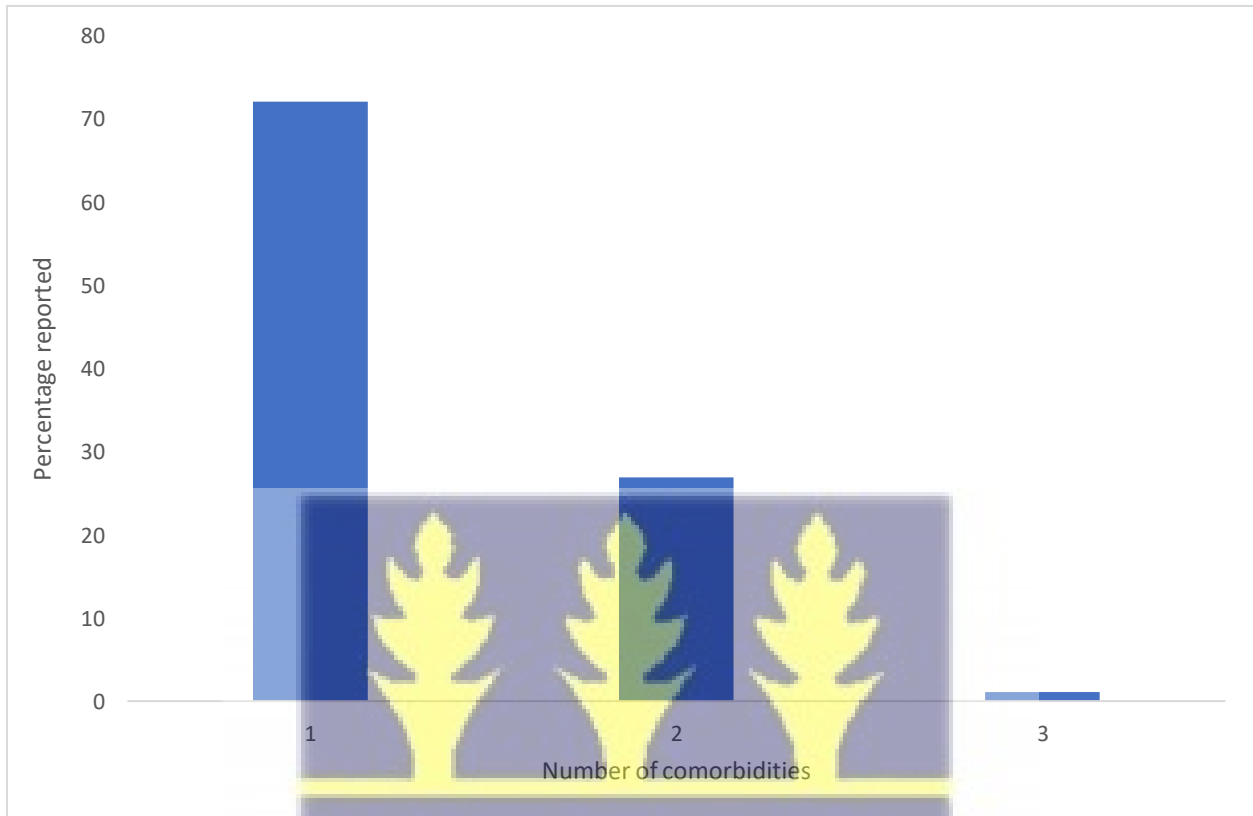


Figure 2 Prevalence of comorbidity among aged HIV population, Western North Region

All participants who reported having comorbidities were further asked to indicate the type of clinical conditions they had been diagnosed of. The reported comorbidities are illustrated in Table 3. Cardiovascular disease was the highest (72%) reported comorbidity, followed by diabetes mellitus (34.4%) with the least being mental health disorders (2%).

Table 3: Reported comorbidities among aged HIV population, Western North Region

Variable	Frequency	Percentage
Cardiovascular disease	67	72.04
Diabetes mellitus	32	34.41
Hepatitis (Hepatic disease)	12	12.9
Chronic respiratory disease	10	10.75
Mental health disorders	2	2.15

Source: from author's primary data collection

4.3 Level of antiretroviral therapy adherence

4.3.1 Level of ART adherence using Patient Attendance-based Defaulting (PAD) measure

Table 4 presents the level of adherence in three categories; optimal adherence, sub-optimal adherence and poor adherence. The study revealed that about 73% (240) of the respondents had optimal adherence to ART as they revisited the ART clinic on scheduled appointments for a refill of medication while about 15% (51) had poor adherence.

Table 4: Level of ART adherence using PAD measure

Level of adherence	Frequency	Percent
Optimal (95-100%)	240	72.51
Sub-optimal (80 - 94%)	40	12.08
Poor (< 80%)	51	15.41
Total	331	100

Source: from author's primary data collection

4.3.2 Level of ART adherence using viral load as a measure

For the purposes of this study viral load test was used as an objective measure to estimate the level of adherence. Viral load levels higher than 1000 copies/ml are classified as treatment failure patients hence, non-adherents, and viral load levels less than 1000 copies/ml are classified as adherents. Figure 3 shows the adherence to ART of the respondents using current viral load test results as a proxy to determine adherence to medication. About 83% (274) of the respondents had their current viral load test results below 1000 copies/ml, which signifies adherence to medication.

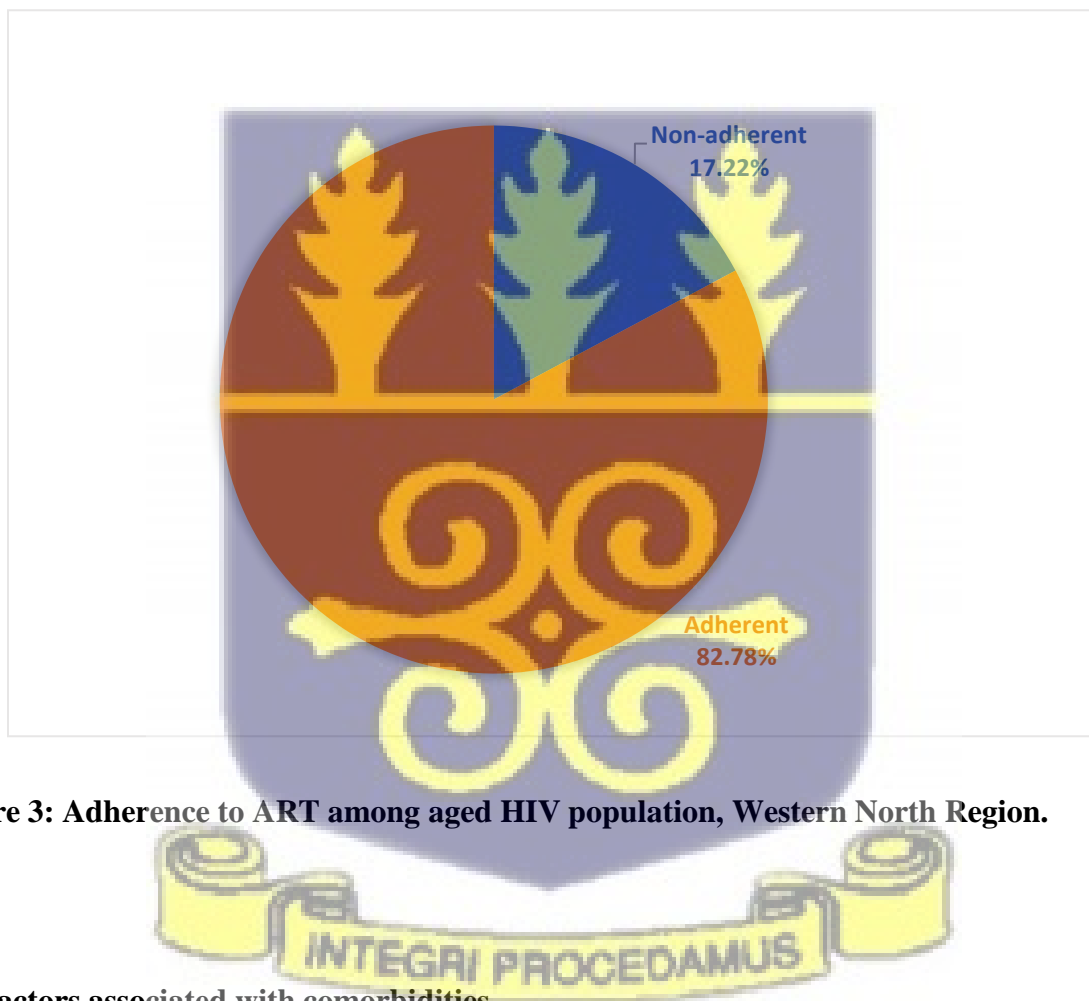


Figure 3: Adherence to ART among aged HIV population, Western North Region.

4.4 Factors associated with comorbidities

A bivariate analysis was conducted to determine the association of factors with comorbidities.

The factors in the study included age group, sex, marital status, employment and education. Of

these factors, age group [Pearson's χ^2 value = 49.646, P-value = 0.001], marital status [Pearson's χ^2 value = 21.716, P-value = 0.001], and employment [Pearson's χ^2 value = 24.644, P-value = 0.001], showed associations with comorbidities. See table 5.

Table 5: Bivariate analysis of factors associated with comorbidities

Independent variables	N (%)	Comorbidity N (%)	No comorbidity N (%)	χ^2	P-value
Age group				49.646	0.001*
50 - 54	110(33.23)	19 (20.43)	91 (38.24)		
55 - 59	119(35.95)	22 (23.66)	97 (40.76)		
60 - 64	41(12.39)	14 (15.05)	27 (11.34)		
65 - 69	42(12.69)	24 (25.81)	18 (7.56)		
70 - 74	19(5.74)	14 (15.05)	5 (2.10)		
Sex				0.22	0.639
Male	142 (42.90)	38 (40.86)	104 (43.70)		
Female	189 (57.10)	55 (59.14)	134 (56.30)		
Marital status				21.716	0.001*
Never married	37 (11.18)	4 (4.30)	33 (13.87)		
Married/ cohabiting	146 (44.11)	29 (31.18)	117 (49.16)		
Separated/ divorced /widowed	148 (44.71)	60 (64.52)	88 (36.97)		
Employment				24.644	0.001*
Employed (Government/ private)	46 (13.90)	8 (8.60)	38 (15.97)		
Self- employed	181 (54.68)	37 (39.79)	144 (60.50)		
Non-paid/ Pension	104 (31.42)	48 (51.61)	56 (23.53)		
Educational level				6.468	0.167
No formal education	135 (40.79)	46 (49.46)	89 (37.39)		
Junior high school	84 (25.38)	21 (22.58)	63 (26.47)		
Senior high school/vocational/technical	34 (10.27)	7 (7.53)	27 (11.34)		
College/university	28 (8.46)	4 (4.30)	24 (10.08)		
others	50 (15.11)	15(16.13)	35 (14.71)		

*p < 0.05 indicates significant determinants

Source: from author's primary data collection

A multivariate logistic analysis was done to determine the strength of association using significant factors from the bivariate analysis. The findings showed that as compared to age group 50 to 54 years, the odds of having comorbidities were 7 times more likely among those in age group 70 to 74 years, and 3 times more likely among those within the 65 to 69 age group categories. Additionally, the odds of developing comorbidities were 4 times more likely among those who had separated, had divorced or were widowed, compared to those who never married (see table 6).

Table 6: Multivariate logistic regression analysis of factors associated with comorbidities

Variables	N (%)	OR [95% CI]	P-value
Age group			
50 – 54	110 (33.23)	Reference	
55 – 59	119 (35.95)	0.89 [0.439, 1.799]	0.741
60 – 64	41 (12.39)	1.92 [0.816, 4.532]	0.135
65 – 69	42 (12.69)	3.67 [1.579, 8.536]	0.003*
70 – 74	19 (5.74)	7.13 [2.143, 23.692]	0.001*
Marital status			
Never married	37 (11.18)	Reference	
Married/ cohabiting	146 (44.11)	2.25 [0.699, 7.251]	0.174
Separated/ divorced /widowed	148 (44.71)	4.25 [1.340, 13.459]	0.014*
Employment			
Employed (Government/ private)	46 (13.90)	Reference	
Self- employed	181 (54.68)	0.88 [0.360, 2.133]	0.771
Non-paid/ Pension	104 (31.42)	1.77 [0.687, 4.566]	0.236

* Indicates significance at 95% CI

Source: from author's primary data collection

4.5 Factors associated with adherence to antiretroviral therapy

A bivariate analysis was conducted to determine the association of factors with comorbidities. The factors in this study were stigma, pill fatigue, forgetfulness, side effects of ART, no support from family or significant others, access to ART, poly-medication and financial reasons. Of these factors, stigma [Pearson's χ^2 value = 7.081, P-value = 0.008], pill fatigue [Pearson's χ^2 value = 7.467, P-value = 0.006], and no support from family or significant others [Pearson's χ^2 value = 6.791, P-value = 0.009], showed associations with adherence. See table 7.

Table 7: Bivariate analysis of factors associated with comorbidities

Independent variables	N (%)	Non-adherence N (%)	Adherence N (%)	χ^2	P-value
Stigma				7.081	0.008*
No	38 (30.16)	7 (18.42)	31 (81.58)		
Yes	88 (69.84)	38 (43.18)	50 (56.82)		
Pill fatigue				7.467	0.006*
No	51 (40.48)	11 (21.57)	40 (78.43)		
Yes	75 (59.52)	34 (45.33)	41 (54.67)		
Forgetfulness				0.264	0.608
No	33 (26.19)	13 (39.39)	20 (60.61)		
Yes	93 (73.81)	32 (34.41)	61 (65.59)		
Side effects				0.388	0.534
No	91 (72.22)	31 (34.07)	60 (65.93)		
Yes	35 (27.78)	14 (40)	21 (60)		
No family/ sig. other support				6.791	0.009*
No	50 (39.68)	11 (22)	39 (78)		
Yes	76 (60.32)	34 (44.74)	42 (55.26)		
Access to ART				0.026	0.873
No	110 (87.30)	39 (35.45)	71 (64.55)		
Yes	16 (12.70)	6 (37.5)	10 (62.5)		

Poly-medication				0.017	0.896
No	100 (79.37)	36 (36)	64 (64)		
Yes	26 (20.63)	9 (34.62)	17 (65.38)		
Financial				3.458	0.063
No	78 (61.90)	23 (29.49)	55 (70.51)		
Yes	48 (38.10)	22 (45.83)	26 (54.17)		

*p < 0.05 indicates significant determinants

Source: from author's primary data collection

Factors found with associations were put into a multivariate logistic analysis to determine the strength of association. In this study, as compared to those who do not experience external stigma, the odds of adhering to antiretroviral therapy was about 69% (0.31) less likely among those who experience external stigma. Additionally, those who had no support from family or significant others were 67% (0.33) less likely to adhere compared to those who had some support. Table 8 explains these findings.

Table 8: Multivariate logistic regression analysis of factors associated with adherence to ART

Variable	N (%)	OR [95% CI]	P-value
Stigma			
No	38 (30.16)	Reference	
Yes	88 (69.84)	0.31 [0.117, 0.802]	0.016*
Pill fatigue			
No	51 (40.48)	Reference	
Yes	75 (59.52)	0.37 [0.156, 0.852]	0.020*
No support from family/ significant others			
No	50 (39.68)	Reference	
Yes	76 (60.32)	0.33 [0.143, 0.781]	0.011*

* Indicates significance at 95% CI

Source: from author's primary data collection

4.6 Influence of comorbidity on adherence

This study revealed that adherence is not dependent comorbidity status. The Pearson's chi square test performed to determine the influence of comorbidities on antiretroviral medication adherence showed no statistically significant relationship between the two [Pearson's χ^2 value = 0.9347, P-value = 0.334]. See table 7.

Table 9: Test of association between comorbidity and ART adherence

Comorbidity Status	Adherence measure		Total
	Non-adherence N (%)	Adherence N (%)	
No comorbidity	38 (15.97)	200 (84)	238
Comorbidity	19 (20.43)	74 (79.57)	93

Pearson's χ^2 (1) = 0.9347 P- value = 0.334

Source: from author's primary data collection

4.7 Quality of life

Figure 4 gives a description of the QOL among the study population. The highest possible score is 20 for each domain and overall quality of life is 20. It was observed that the highest domain scores of 13.4, were in both the physical and level of independence domains, with the lowest score in the environmental domain. The physical domain measures how participants are able to deal with pain and discomfort, symptoms of HIV, how well they are able to rest and sleep as well as their energy and fatigue levels. The independence level measures their mobility, activities of daily

living, work capacity and how dependent they are on other medications. The overall quality of life score was about 13 (65%).

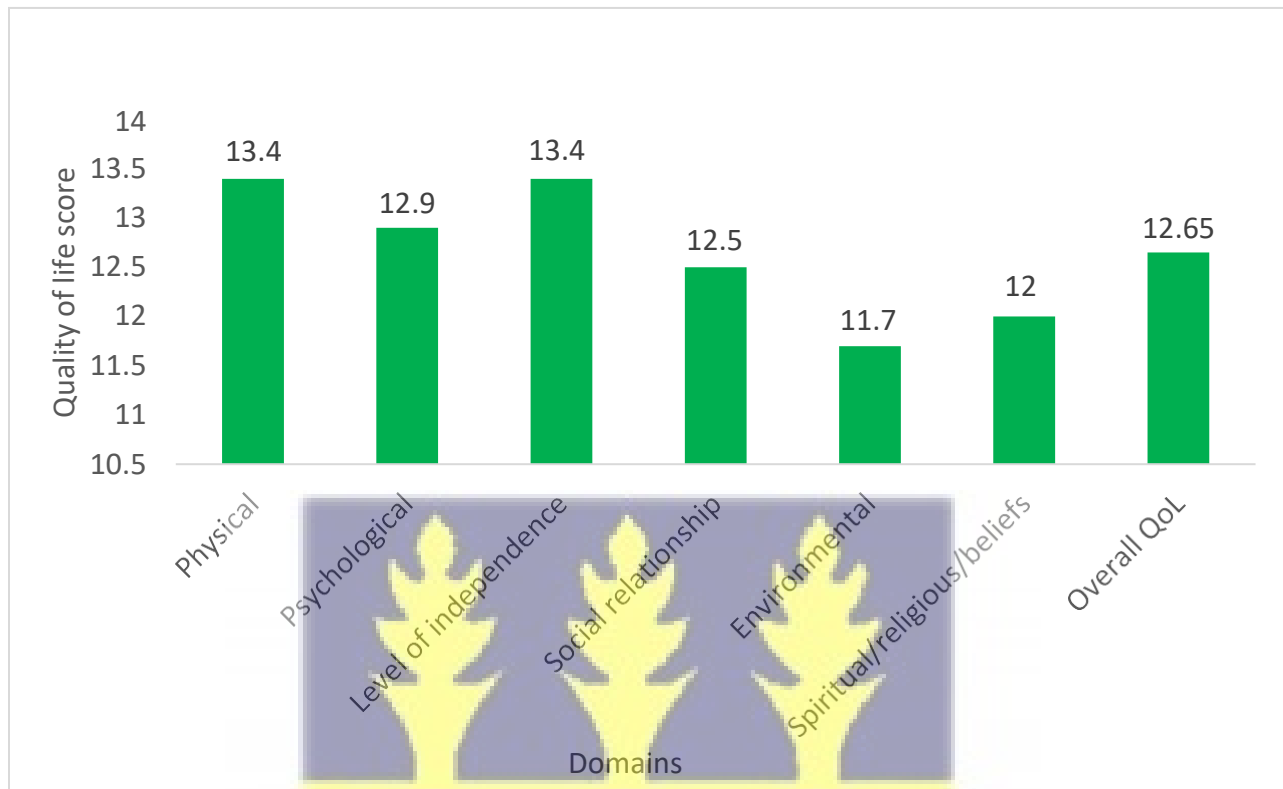


Figure 4: Quality of life scores among aged HIV positive patients, Western North Region



CHAPTER FIVE

5.0 DISCUSSIONS

5.1 Prevalence of comorbidities

Findings of this study showed that burden of comorbidities among the aged HIV population exists with increasing age. This is similar to findings of a study conducted in South Africa (Hopkins et al., 2021) and another in Western Saudi Arabia (Farahat et al., 2020). Nanditha et al. (2021), also realized similar results.

Additionally, this study found that there was more than one comorbidity per person. This finding is consistent with earlier findings (Re et al., 2014; Cuzin et al., 2017; Fan et al., 2021).

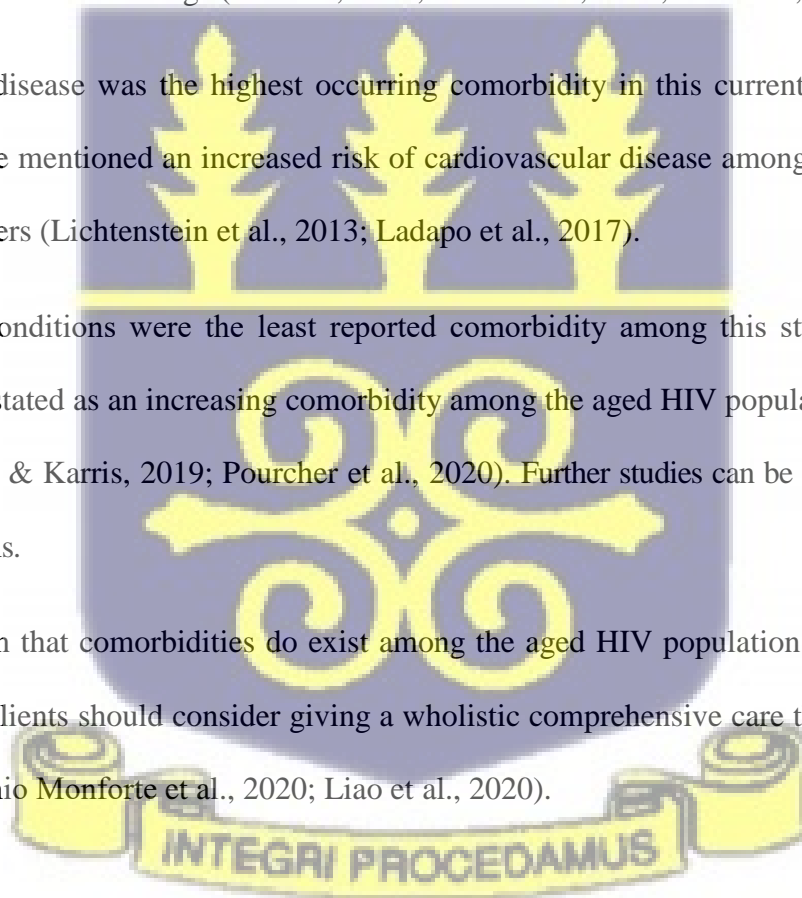
Cardiovascular disease was the highest occurring comorbidity in this current study. Similarly, other works have mentioned an increased risk of cardiovascular disease among people with HIV compared to others (Lichtenstein et al., 2013; Ladapo et al., 2017).

Mental health conditions were the least reported comorbidity among this study's participants despite it being stated as an increasing comorbidity among the aged HIV population (Cuzin et al., 2017; Erlandson & Karris, 2019; Pourcher et al., 2020). Further studies can be done to understand why the low levels.

The results mean that comorbidities do exist among the aged HIV population and as such, care givers for HIV clients should consider giving a wholistic comprehensive care than the usual way of care (d'Arminio Monforte et al., 2020; Liao et al., 2020).

5.2 Level of antiretroviral therapy adherence

In this study, adherence to ART among the aged HIV population was found to be significantly



high. This is consistent with similar studies conducted in Ghana, which showed high adherence to ART (Obirikorang et al., 2013; Alhassan et al., 2021). Also similar studies conducted among same age group revealed ART adherence to be about 88 to 94% (Ghidei et al., 2013; Karpiak, 2014). Additionally, Stoller & al. (2021), saw good adherence to ART among HIV patients who were 50 years and older.

This implies that if this level of adherence should continue among the aged population, over time viral suppression will be achieved. This could lead to the region achieving the third WHO '95' target, which states that 95% of people on treatment will achieve suppressed viral loads (UNAIDS, 2015).

5.3 Factors associated with comorbidities

Results of this research showed higher risk of having comorbidities with increasing age. This was evident among the age groups 65-69 years, and 70-74 years. Similarly, studies in South Africa, found high rates of comorbidities among older PLHIV and the general aged population (Negin et al., 2012; Gerber et al., 2016). In other studies, aging is proved to be one of the risk factors for developing comorbidities (Pourcher et al., 2020). Additionally, studies in China also linked aging to the development of comorbidities (Fan et al., 2021).

It was also evident from this study that those who had either separated from their partners, divorced or were widowed, also showed a strong association with the development of comorbidities. This finding is consistent with that of Stieglitz et al., (2022) who found higher prevalence of multi-morbidities among widows in Tanzania. Similarly, in a South African study, comorbidities were more prevalent in those who had been formerly married (Kushitor et al., 2021). Srivastava et al. (2021), in their study found that depression was higher among widowed adults in India. Additionally, other works have shared similar findings (Ding et al., 2021; Wójcik et al., 2021; Yu

et al., 2021).

In contrast to the findings of (Biswas et al., 2019; McNamara et al., 2021) that saw a linkage between employment and/or occupation and comorbidities, this current study, found no relationship between employment and the development of comorbidities. This could possibly be due to the kind of employment that this work's participants were involved in as majority of them were self-employed and hence their jobs probably did not influence their health.

5.4 Factors associated with adherence to antiretroviral therapy

Clearly, stigma (all forms), pill fatigue and no support from family or significant others had a negative bearing on adherence in this current study. These outcomes are similar to findings from similar studies on ART adherence among people living with HIV (Katz et al., 2013; Hodgson et al., 2014; Ammon et al., 2018; Petse et al., 2018; Campbell et al., 2020; Heylen et al., 2021; Oconnor et al., 2021).

Comorbidities accompanied with use of multiple medications have been noted as a reason for aged HIV patients not adhering to medication (Obirikorang et al., 2013; Cuzin et al., 2017). However, in this study, although some participants suffered comorbidities, it was not reason for them to have not adhered to their antiretroviral drug regimen. This could be due to the perceived benefits of the medication to their health, self-motivation, and also because they saw taking the medication as a part of their daily routine (Chowdhury & Chakraborty, 2017; Dzansi et al., 2020b).

These results imply that if more people continue to experience stigma of all forms (either perceived or discrimination experienced), get tired of taking their medication or are not assisted with the support needed from family or significant others, medication adherence could be affected negatively, which in turn will mar the benefits associated with adhering to ARVs. However, it is

quite satisfying to note that in the absence of these hindrances, the presence of comorbidity and the use of multiple medications is not a deterrent to medication adherence among the aged HIV population in the Western North Region.

5.5 Quality of life

From this study, the highest QOL scores were in the physical and level of independence domains. A similar study in Switzerland mentioned that participants mentioned these domains to be very important to their quality of lives (Ntshakala et al., 2012).

The least score was in the environmental domain which assessed their safety and security, home comfort, general home environment, transport and access to health information and health services. This result was no different from similar studies conducted in Nigeria and China (Akinboro et al., 2014; Liping et al., 2015). Additionally, majority of the respondents of this study were settlers and so did not really care about having well established permanent homes, could have also contributed to this low score in the environmental domain.

The overall quality of life score among study participants was good. This supports findings from studies that have linked good quality of life among PLHIV to positive adherence to ART regimen (Tran, 2012; Karkashadze et al., 2017; Peña et al., 2021).

5.6 Strengths and limitations of the study

The strength of the study lies in its ability to provide data on the aged HIV population within the region. However, the results of this study came from three districts within the region and may not be a true reflection of the entire region, thus the study cannot be generalized for the region. Nonetheless, the methods used for analysis were robust and statistically significant. Hence these

findings are still useful in informing policy and health practice concerning care given to aged HIV positive clients in the Western North Region of Ghana.



CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The following conclusions have been drawn based on the findings:

- Comorbidities exist among the aged HIV population in the Western North Region, with mental health recording the least and cardiovascular disease, the highest.
- Adherence among the aged HIV population in the Western North Region is relatively high.
- Factors that were found to be associated with comorbidities included increasing age and marital status (divorced, separated or widowed).

Stigma, pill fatigue and no support from family or significant others impact adherence to ART negatively.

- The overall quality of life was good among this group of PLHIV in the Western North Region.

6.2 Recommendations

Based on the findings of the study, the following recommendations are proposed:

1. There should be early diagnosis, appropriate management and prevention of comorbidities among the aged HIV-positive patients.
2. The health promotion units in various facilities within the region should come up with new sustainable and result oriented ways to help reduce the stigma attached to HIV clients.
3. Additionally, further studies can be done to investigate factors contributing to the low prevalence of mental health disorders among the aged HIV population in the region.

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APPENDICES

Appendix 1: Participant's information sheet

Title of study: Comorbidities and antiretroviral therapy adherence among aged HIV-positive clients in Western North Region.

Introduction

I am Alberta Mali Whajah (Principal Investigator), a Master of Public Health student, School of Public Health, University of Ghana. I am a Public Health Nurse working with the Ghana Health Service at the Aowin Municipal Health Directorate. I can be reached through mobile on 0208604151 and Email: amwhajah@st.ug.edu.gh

Background and Purpose of research

Access to antiretroviral therapy in low-and middle-income countries has improved over the years. This has led to an increase in the number of older adults (aged ≥ 50 years) living with HIV (Soomro et al., 2019). Global and National HIV reports have however ended at age 49, and interventions are mostly targeted at children, the youth or adults 15 – 49 years, and the general information on the aged population is relatively poor (Mahy et al., 2014). Old is generally associated with age-related problems and diseases, and the need for special care. Being aged and immunocompromised further increases the risk of developing other chronic illnesses, requiring lifelong medication in addition to ARTs. The complexities accompanied by aging has implications for medication adherence and on the quality of life. Adherence to ART, has been associated with increased longevity and improved quality of life among people living with HIV (Tran, 2012). This study seeks to examine the influence of comorbidities on ART adherence and the quality of life among aged HIV-positive clients.

Nature of research

The study is a cross-sectional quantitative study and will be conducted among 385 aged people living with HIV in the Western North Region. A structured questionnaire will be used to collect data from participants. The participants will be systematically sampled and study will be conducted in the language that is clearly understood by them. Participants will only be allowed to participate after they have given a voluntary consent to do so.

Participant's involvement

Duration / what is involved

Participants will be required to be HIV-positive patients who are 50 years and above and are on antiretroviral therapy. Your participation in the study will require that you answer questions on socio-demography (age, sex, marital status, educational level, and income status), medication taking and assessment of your personal life. This will take approximately 30 minutes of your time. Please note that a few of the questions may appear embarrassing or make you uncomfortable. Where needed, a local translator who is not a family member or known person will interact with you in the language that you best understand and can express yourself. Additionally, all COVID 19 protocols will be observed.

Potential Risks

Minimal risk is anticipated since some questions might be embarrassing. You may however choose not to answer questions that appear uncomfortable to you. Additionally, the risk of contracting covid 19 following contacts with contaminated surfaces and infected people exists. You will be given a surgical nose mask to wear. You will also be provided with alcohol hand sanitizer to disinfect your hands. The social distancing protocol will also

be strictly observed to further reduce your risks of infection.

Benefits

There is no direct benefit participating in this study. However, the study's findings could help improve the medication adherence among aged PLHIV with comorbidities and the attention that is given to this age category of PLHIV.

Costs

There will be no cost for participating in the study.

Compensation

There is no compensation for participation in this study. Participation is voluntary.

Confidentiality

Information about you will not be given to a third party. It shall be used for the sole purpose of this research work. Any information sheet that may bear direct identification to you will be kept away from a third party.

Voluntary participation/withdrawal

Your participation in this research is voluntary and you have the right to decline to participate and also withdraw from the study at any time without any penalties or having to explain yourself on your decision to withdraw. Additionally, you have the right to skip discomfoting questions during the interview.

Outcome and Feedback

Data collected will only be used for this study. No feedback on the data will be given to participants. However, the findings will be shared with the Western North Regional Health Directorate for dissemination and to also inform decision making on the study population. Also, the outcome of the study will be submitted to the School of Graduate Studies through the School of Public Health – University of Ghana.

Feedback to participant

There will be no direct feedback. The recommendations from the study findings however will be made available to the Western North Regional Health Directorate for adoption to improve services rendered to aged HIV-positive clients.

Funding information:

This study is funded by the principal investigator

Sharing of participants Information/Data

Data generated from the study will only be used for the purposes of this research. The Principal Investigator will own the data and only the team members of the research will have access to the data. No unauthorized person will have access to participants' information. Ethical clearance will be obtained from the Ethics Committee of the Ghana Health Service if the findings of the study would be published at any time.

Provision of Information and Consent for participants

A copy of the informed consent will be given to you to keep after you have signed or thumb printed. The information sheet will also be read to you.

Who to Contact for Further Clarification/Questions

If you have further questions or issues regarding this study, which require clarification, you may contact: **ALBERTA MALI WHAJAH (Principal Investigator) – 0208604151** or Email: amwhajah@st.ug.edu.gh



University of Ghana <http://ugspace.ug.edu.gh>

**Dr. ADOM MANU – Department of Population, Family and Reproductive Health,
University of Ghana (Academic Supervisor) – 0244236598** or email: amanu@ug.edu.gh

The Ghana Health Service Ethics Review Committee Administrator, **Nana Abena Apatu** may also be contacted on **0503539896**, or by email: ethics.reseach@ghsmail.org for further clarification on ethical issues and participant rights.



Appendix 2: Consent form

Title of the study: Comorbidities and antiretroviral therapy adherence among aged HIV positive clients in the Western North Region.

PARTICIPANTS' STATEMENT

I acknowledge that I have read or have had the purpose and contents of the participant's information sheet read and satisfactorily explained to me in a language (English /Sefwi /Twi /Brosa /Fante /Nzema) I understand. I fully understand the contents and any potential implications and my right to change my mind (i.e., withdraw from the research) even after I have signed this form.

I voluntarily agree to be part of this research.

Initials of Participant..... I.D. Code

Participants' Signature OR Thumb Print.....

INTERPRETERS' STATEMENT

I interpreted the purpose and contents of the Participants' Information Sheet to the afore named participant to the best of my ability in the (English /Sefwi /Twi /Brosa /Fante /Nzema) language to his proper understanding.

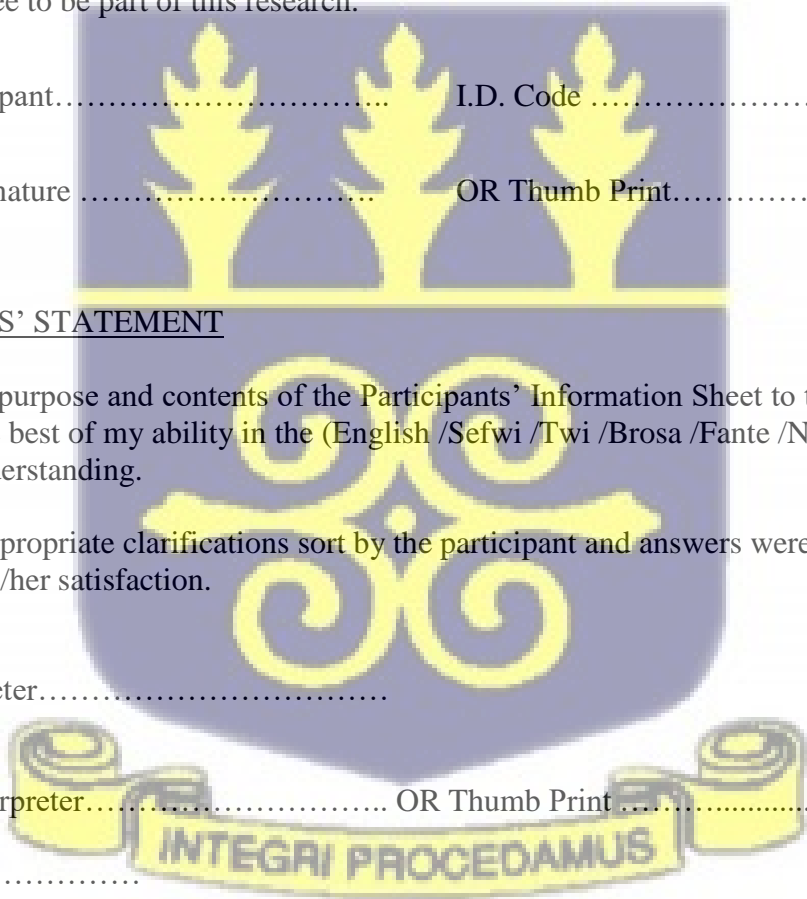
All questions, appropriate clarifications sort by the participant and answers were also duly interpreted to his/her satisfaction.

Name of Interpreter.....

Signature of Interpreter..... OR Thumb Print.....

Date:.....

Contact Details



STATEMENT OF WITNESS

I was present when the purpose and contents of the Participant Information Sheet was read and explained satisfactorily to the participant in the language he/she understood (English /Sefwi /Twi /Brosa /Fante /Nzema)

I confirm that he/she was given the opportunity to ask questions/seek clarifications and same were duly answered to his/her satisfaction before voluntarily agreeing to be part of the research.

Name:.....

Signature..... OR Thumb Print

Date:.....

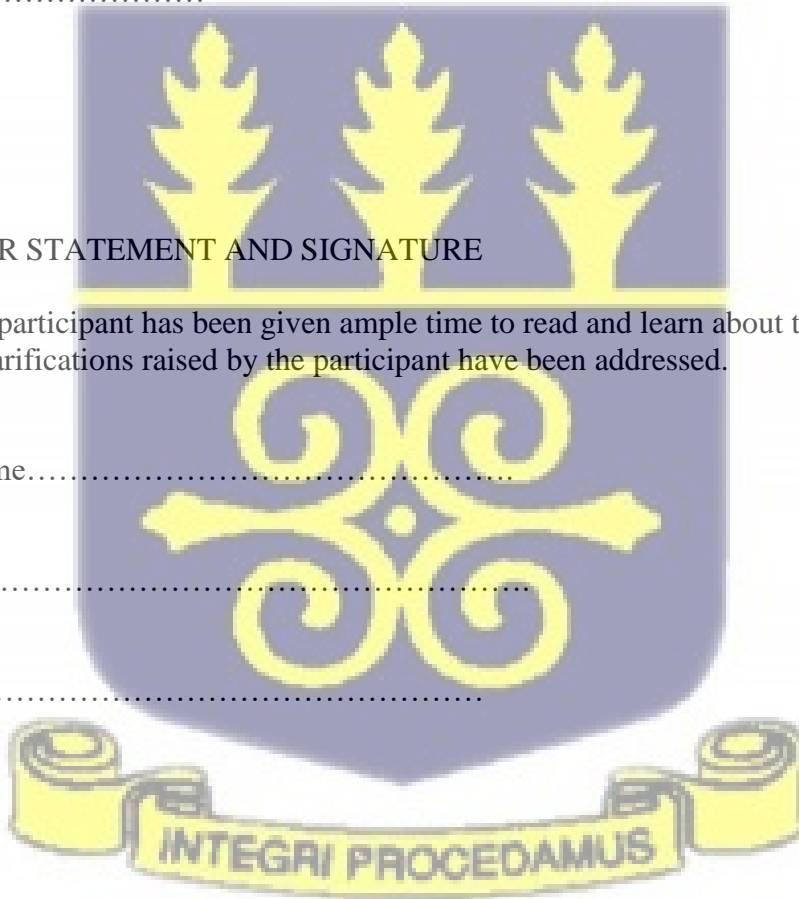
INVESTIGATOR STATEMENT AND SIGNATURE

I certify that the participant has been given ample time to read and learn about the study. All questions and clarifications raised by the participant have been addressed.

Researcher's name.....

Signature

Date.....



Appendix 3 Questionnaire

Participant ID		
Question No.	QUESTION	RESPONSE
1	Date of interview	dd ____ mm ____ yyyy ____
2	Contact phone number	
DEMOGRAPHIC INFORMATION <i>(please tick responses to questions with options)</i>		
3	Sex	1 Male 2 Female
4	Age	
5	What is the highest level of education completed	1 No formal education 2 Junior high school 3 Senior high school /Vocational /Technical 4 College/University 5 Others (specify) _____ 99 Refused
6	What is your current marital status	1 Never married 2 Married 3 Separated / Divorced 4 Widowed 5 Cohabiting 99 Refused
7	What is your current income status in relation to employment?	1 Employed (government/ private) 2 Self-employed 3 Non-paid 4 Pension 99 Refused
INFORMATION ON HIV, COMORBIDITIES AND ART STATUS		
8	How long have you been diagnosed with HIV?	1 Less than 1 year 2 1 - 2 years 3 3 - 4 years 4 5 or more years 99 Refused
9	How long have you been on ART?	1 6months - 1 year 2 1 -2 years 3 3 or more 99 Refused
10	Have you been diagnosed of any other chronic disease(s)?	1 Yes 2 No (If no, go to 15) 77 Don't know 99 Refused

11	How many of such conditions have you been diagnosed?	
Question No.	Question	Response
12	What is/are the name(s) of these conditions?	
13	Are you on medication for the condition(s) mentioned above?	1 Yes 2 No
14	How frequently are you to take this medication?	1 Daily 2 once per week 3 Other (specify) _____
INFORMATION ON ART ADHERENCE		
15	Have you ever missed taking your ART?	1 Yes 2 No (<i>If no, go to 19</i>) 77 Don't know 99 Refused
16	In the past month, how many times did you miss your prescribed dose?	1 Never 2 1-2 times 2 3-5 times 4 6-10 times 5 More than 10 times
17	In the past week, how many times did you miss your prescribed dose?	1 Never 2 1-2 times 2 3-5 times 4 6-10 times 5 More than 10 times
18	What are/were your reason(s) for missing the prescribed regimen? <i>(Move to 20 when you answer this)</i>	Please tick all that apply 1 Stigma 2 Pill fatigue (taking medication daily) 3 Forgetfulness 4 Side effect of drugs 5 No support from significant other(s) 6 Access to ART 7 Use of other lifelong medications (poly-medication) 8 Presence of other chronic diseases 9 Finance 10 Others (specify) _____
19	How are you able to stick to the prescribed regimen?	

Question No.	Questions	Response										
ADHERENCE MEASUREMENTS (To be obtained from client's folder)												
20	No. of clinic visits _____	No. of expected visits _____ Proportion of visits _____										
21	Current viral load _____											
INFORMATION ON QUALITY OF LIFE (Adapted from WHO) This section assesses your quality of life. Some of the questions may be a little uncomfortable.												
21	How is your health?	1 Very poor 2 Poor 3 Neither poor nor good 4 Good 5 Very good										
22	Do you consider yourself currently ill	1 Yes 2 No										
23	What is your HIV serostatus	1 HIV Positive – Asympomatic 2 HIV positive – sympomatic 3 AIDS (AIDS related illnesses) 4 HIV negative 77 Don't know 99 Refused										
24	In what year did you first test positive for HIV? (e.g. 1999)											
25	In what year do you think you were infected?											
26	How do you believe you were infected?	1 Sex with a man 2 Sex with a woman 3 Injecting drugs 4 Blood products 5 Other										
This section will assess your life in the past two weeks . If you are unsure about your response, choose one that best fits (usually what comes to mind first)												
Please, assess your feelings, and choose the number on the scale for each question that gives the best answer for you												
27 (G1)	How would you rate your quality of life?	<table border="1"> <tr> <td>Very poor</td> <td>Poor</td> <td>Neither poor nor good</td> <td>Good</td> <td>Very good</td> </tr> <tr> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> </table>	Very poor	Poor	Neither poor nor good	Good	Very good	1	2	3	4	5
Very poor	Poor	Neither poor nor good	Good	Very good								
1	2	3	4	5								
28 (G4)	How satisfied are you with your health?	<table border="1"> <tr> <td>Very dissatisfied</td> <td>dissatisfied</td> <td>Neither satisfied</td> <td>satisfied</td> <td>Very satisfied</td> </tr> </table>	Very dissatisfied	dissatisfied	Neither satisfied	satisfied	Very satisfied					
Very dissatisfied	dissatisfied	Neither satisfied	satisfied	Very satisfied								

		satisfied		nor dissatisfied		
		1	2	3	4	5

The following questions ask about how much you have experienced certain things in the last two weeks.

		Not at all	A little	A moderate amount	Very much	An extreme amount
29 (F1.4)	To what extent do you feel that physical pain prevents you from doing what you need to do?	1	2	3	4	5
30 (F50.1)	How much are you bothered by any physical problems related to your HIV infection?	1	2	3	4	5
31 (F11.3)	How much do you need any medical treatment to function in your daily life?	1	2	3	4	5
32 (F4.1)	How much do you enjoy life?	1	2	3	4	5
33 (F24.1)	To what extent do you feel your life to be meaningful?	1	2	3	4	5
34 (F52.2)	To what extent are you bothered by people blaming you for your HIV status?	1	2	3	4	5
35 (F53.4)	How much do you fear the future?	1	2	3	4	5
36 (F54.1)	How much do you worry about death?	1	2	3	4	5
37 (F5.3)	How well are you able to concentrate?	1	2	3	4	5
38 (F16.1)	How safe do you feel in your daily life?	1	2	3	4	5
39 (F22.1)	How healthy is your physical environment?	1	2	3	4	5

The following questions ask about how completely you experience or were able to do certain things in the last two weeks.

40 (F2.1)	Do you have enough energy for every day life?	Not at all	A little	moderately	mostly	completely
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						tel y
		1	2	3	4	5
41 (F7.1)	Are you able to accept your bodily appearance?	1	2	3	4	5
42 (F18.1)	Have you enough money to meet your needs?	1	2	3	4	5
43 (F51.1)	To what extent do you feel accepted by the people you know?	1	2	3	4	5
44 (F20.1)	How available to you is the information that you need in your day-to-day life?	1	2	3	4	5
45 (F21.1)	To what extent do you have the opportunity for leisure activities?	1	2	3	4	5
46 (F9.1)	How well are you able to get around?	Very poor	poor	Neither poor nor good	good	Very good
		1	2	3	4	5

The following questions ask you how good or satisfied you have felt about various aspects of your life over the last two weeks

47 (F3.3)	How satisfied are you with your sleep?	Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	satisfied	Very satisfied
		1	2	3	4	5
48 (F10.3)	How satisfied are you with your ability to perform your daily living activities?	1	2	3	4	5
49 (F12.4)	How satisfied are you with your capacity for work?	1	2	3	4	5
50 (F6.3)	How satisfied are you with yourself?	1	2	3	4	5
51 (F13.3)	How satisfied are you with your personal relationships?	1	2	3	4	5
52 (F15.3)	How satisfied are you with your sex life?	1	2	3	4	5
53 (F14.4)	How satisfied are you with the support you get from your friends?	1	2	3	4	5
54 (F17.3)	How satisfied are you with the conditions of your living place?	1	2	3	4	5

55 (F19.3)	How satisfied are you with your access to health services?	1	2	3	4	5
56(F23.3)	How satisfied are you with your transport?	1	2	3	4	5
The following question refers to how often you have felt or experienced certain things in the last two weeks.						
57 (F8.1)	How often do you have negative feelings such as blue mood, despair, anxiety, depression?	Never	Seldom	Quite often	Very often	A l w a y s



Appendix 4: Ethical clearance

In case of reply the number and date of this letter should be quoted.



GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
Digital Address: GA-050-3303
Mob: +233-50-3539896
Tel: +233-302-681109
Email: ethics.research@ghsmail.org
15th February 2022

My Ref: GHS/RDD/ERC:Admin App/22/645
Your Ref. No.

Alberta Mali Whajah
P. O. Box MC 2405
Market Circle, Takoradi

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	GHS-ERC: 046/12/21
Study Title	Comorbidities and Antiretroviral Therapy Adherence among Aged HIV Positive Clients in Western North Region
Approval Date	15 th February, 2022
Expiry Date	14 th February, 2023
GHS-ERC Decision	Approved

This approval requires the following from the Principal Investigator

- Submission of a yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months.
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report after completion of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

You are kindly advised to adhere to the national guidelines or protocols on the prevention of COVID -19

Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....
Dr. James Akazili
(Head, Ethics & Research Management Department)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra

