

ABSTRACT

Background: Antiretroviral therapy (ART) has transformed HIV infection into a manageable chronic condition, but its benefits depend entirely on sustained adherence. Children under five years are especially vulnerable to poor adherence because they rely completely on caregivers for medication administration, and poor adherence in this age group accelerates disease progression, virological failure, and drug resistance.

Objective: This study aimed to identify the factors contributing to poor adherence to ART among children under five years attending Queen Elizabeth Central Hospital (QECH), Malawi.

Methods: A quantitative, analytical cross-sectional study was conducted among 132 caregiver–child pairs at the Lighthouse Clinic, QECH, selected using systematic random sampling. Data were collected through interviewer-administered electronic questionnaires and analysed using Stata version 17. Bivariate associations were assessed using chi-square tests, and independent predictors of poor adherence were identified using multivariable logistic regression.

Results: Of the 132 children, 90 (68.2%) were adherent to ART, while 42 (31.8%) were non-adherent. In multivariable analysis, significant independent predictors of poor adherence included child ART side effects, caregiver age, marital status, caregiver ART knowledge, and distance to the health facility.

Conclusion: Poor ART adherence among under-five children at QECH remains a significant concern, shaped primarily by caregiver-related and health system factors. Strengthening caregiver education, improving access to health facilities, and targeted adherence counselling are recommended to improve ART adherence in this population.

Keywords: ART adherence, under-five children, caregivers, Malawi, Lighthouse Clinic.

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LIST OF ABBREVIATIONS

- AOR – Adjusted Odds Ratio
- ART – Antiretroviral Therapy
- AIDS – Acquired Immunodeficiency Syndrome
- CI – Confidence Interval
- COM – College of Medicine
- COMREC – College of Medicine Research and Ethics Committee
- CTC – Care and Treatment Card
- EGPAF – Elizabeth Glaser Paediatric AIDS Foundation
- HIV – Human Immunodeficiency Virus
- KUHeS – Kamuzu University of Health Sciences
- MOH – Ministry of Health
- MWK – Malawian Kwacha
- NAC – National AIDS Commission
- OR – Odds Ratio
- QECH – Queen Elizabeth Central Hospital
- VAS – Visual Analogue Scale
- WHO – World Health Organization

CHAPTER ONE: INTRODUCTION

1.1 Background

The introduction of antiretroviral therapy (ART) transformed HIV infection from a fatal illness into a manageable chronic condition, substantially reducing HIV-related morbidity and mortality worldwide [7,8]. However, the benefits of ART are entirely contingent on sustained, high-level adherence to the prescribed regimen. Once adherence falls below the level required to maintain viral suppression, viral replication resumes, immunological decline accelerates, and drug-resistant HIV strains are more likely to emerge [8,9]. These risks are magnified among children under five years of age, whose immature immune systems and capacity for rapid disease progression in the absence of effective treatment make consistent adherence a matter of survival rather than convenience.

Globally, the burden of HIV/AIDS remains substantial. By the end of 2023, an estimated 39.9 million people were living with HIV worldwide, with approximately 65% residing in the WHO African Region [1]. Sub-Saharan Africa continues to bear a disproportionate share of paediatric infections, with more than 1.3 million children aged 0–14 years living with HIV [5]. Malawi is among the countries most heavily affected, with an estimated 1.64 million people living with HIV and a burden skewed towards women and children [2,4]. While the national HIV prevalence among children (0.7%) is markedly lower than among adults (8.1%), children continue to account for a disproportionate 15% of annual AIDS-related deaths, reflecting persistent gaps in paediatric diagnosis, treatment initiation, and adherence support [6].

This disparity is most visible in treatment coverage: whereas 92% of HIV-positive adults aged 15 years and above were receiving ART by 2023, only 58% of HIV-positive children aged 0–14 years had been initiated on treatment [5]. Even among children who have started ART, achieving the level of adherence required for durable viral suppression remains difficult, since young children depend entirely on caregivers for medication administration, clinic attendance, and day-to-day disease management [8,10].

Adherence among under-five children is shaped by an interacting set of child, caregiver, health system, and socioeconomic factors. Children in this age group cannot self-administer medication, may resist unpalatable formulations, and are vulnerable to side effects and intercurrent illness that disrupt dosing [7,10,20]. Their caregivers, who carry full responsibility for adherence, must navigate their own knowledge gaps, psychosocial stress,

stigma, and competing household demands [12,13]. These individual-level challenges are compounded by structural barriers within the health system, such as long travel distances, extended waiting times, and periodic stock-outs of paediatric formulations [16,17], as well as by household-level socioeconomic constraints including poverty and food insecurity [11,14]. In Malawi, paediatric ART services for children under five attending Queen Elizabeth Central Hospital (QECH) are delivered through the Lighthouse Clinic, one of the country's most established HIV care and treatment centres. Although the clinic operates a structured ART programme with a defined follow-up system, the specific factors driving poor adherence among its youngest patients had not, prior to this study, been systematically documented at the facility. This study was undertaken to address that gap.

1.2 Problem Statement

National HIV programmes in Malawi, like those across sub-Saharan Africa, have prioritised rapid ART initiation as the primary strategy for reducing paediatric HIV mortality [25,26]. While these efforts have been important, scale-up alone has not translated into equivalent gains in sustained treatment success: the gap between adult and child ART coverage (92% versus 58%) [5], combined with children's continued over-representation among AIDS-related deaths [5], suggests that initiation has not been matched by adequate adherence support once children are established on treatment.

Poor adherence among children under five carries serious clinical consequences, including virological failure, accelerated disease progression, and the development of drug-resistant viral strains that narrow future treatment options — a particularly serious concern given the limited range of paediatric ART formulations available in resource-constrained settings [8,9]. Because young children are entirely dependent on caregivers, the determinants of poor adherence in this age group differ substantially from those documented among older children, adolescents, and adults, for whom most existing adherence interventions and assessment tools were originally designed [23].

At the Lighthouse Clinic, QECH, as in many high-burden facilities in Malawi, children under five are routinely initiated on ART and followed up through an established paediatric programme. However, prior to this study, the relative contribution of child-related, caregiver-related, health system-related, and socioeconomic factors to poor adherence within this specific population had not been empirically assessed at the facility. Without this locally generated evidence, clinicians and programme managers are left to design adherence-support interventions based on assumptions drawn from older populations or from studies conducted

in different settings, rather than on the actual barriers experienced by caregivers of under-five children at QECH.

1.3 Main Objective

To identify the factors contributing to poor adherence to antiretroviral therapy (ART) among children under five years attending Queen Elizabeth Central Hospital.

1.4 Specific Objectives

1. To assess the level of ART adherence among HIV-positive children under five at Queen Elizabeth Central Hospital, Malawi.
2. To examine the association between child-related factors and ART adherence.
3. To determine the influence of caregiver-related factors on ART adherence.
4. To examine the influence of health system-related factors on ART adherence.
5. To assess the impact of socioeconomic factors on ART adherence.

1.5 Research Questions

1. What is the level of ART adherence among HIV-positive children under five years attending Queen Elizabeth Central Hospital?
2. Is there an association between child-related factors and ART adherence among under-five children?
3. Do caregiver-related factors influence ART adherence among under-five children?
4. Do health system-related factors influence ART adherence among under-five children?
5. Is there an association between socioeconomic factors and ART adherence among under-five children?

1.6 Hypothesis

H₀ (Null hypothesis): There is no statistically significant association between child-related, caregiver-related, health system-related, or socioeconomic factors and ART adherence among children under five years attending Queen Elizabeth Central Hospital.

H₁ (Alternative hypothesis): There is a statistically significant association between one or more of child-related, caregiver-related, health system-related, or socioeconomic factors and ART adherence among children under five years attending Queen Elizabeth Central Hospital.

1.7 Rationale of the Study

Paediatric HIV care is an explicit national priority in Malawi. Both the National AIDS Commission (NAC) and the Ministry of Health (MOH) have committed, through their respective strategic and clinical guidance documents, to improving the prevention, diagnosis, and treatment outcomes of children living with HIV [25,26]. Sustained ART adherence among children under five is a precondition for achieving these national objectives, since poor adherence directly undermines treatment outcomes regardless of how successfully children are initiated onto therapy.

The Elizabeth Glaser Paediatric AIDS Foundation (EGPAF), a key partner in Malawi's paediatric HIV response, has demonstrated through its programming that caregiver-centred approaches and community engagement are central to overcoming adherence barriers among young children living with HIV [27]. However, translating this principle into effective, facility-level interventions requires an understanding of which specific factors are most influential in a given setting — information that this study was designed to provide for the Lighthouse Clinic population. The existing literature on paediatric ART adherence in Eastern and Southern Africa, while substantial, has tended to pool children across a wide age range or to focus on older children and adolescents, leaving the determinants specific to children under five comparatively under-examined [18,23]. By focusing exclusively on this age group at a major referral facility in Malawi, this study contributes facility- and country-specific evidence to a regional literature that remains thin for the youngest and most caregiver-dependent patients.

1.8 Significance of the Study

The findings of this study are intended to support Lighthouse Clinic staff and QECH paediatric department management in designing context-appropriate adherence counselling, follow-up, and support strategies tailored to the specific barriers experienced by caregivers of under-five children. For policymakers, the study provides locally generated evidence that can inform national guidance on paediatric ART adherence support, complementing the broader strategic priorities set out by the NAC and MOH [25,26].

For the academic and research community, the study contributes to the comparatively thin body of literature on ART adherence among children under five specifically, as distinct from the wider paediatric and adolescent population, within a Malawian referral hospital setting. Methodologically, the study also contributes practical, field-tested experience of measuring adherence among young children in a routine clinical setting where secondary clinical records

are not always complete, which may be of value to future researchers designing similar studies in comparable low-resource settings.

Finally, the study contributed to capacity building by providing training in quantitative research methods and electronic data collection to the research team, and is expected to strengthen ongoing collaboration between Kamuzu University of Health Sciences and QECH in paediatric HIV research.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews existing literature on the determinants of antiretroviral therapy (ART) adherence among children under five years living with HIV, drawing primarily on studies conducted in sub-Saharan Africa, where the burden of paediatric HIV is greatest and where health system and socioeconomic conditions most closely resemble those of the present study setting.

2.1.1 Global and Regional Burden of Paediatric HIV

Despite considerable investment in prevention, testing, and treatment, HIV/AIDS remains a major global public health challenge. By the end of 2023, an estimated 39.9 million people were living with HIV worldwide, with approximately two-thirds of this burden concentrated in the WHO African Region [1]. UNAIDS estimates that more than 1.3 million children aged 0–14 years were living with HIV in sub-Saharan Africa, a population that continues to lag behind adults in diagnosis, treatment initiation, and viral suppression [5]. Malawi exemplifies this pattern: national estimates place the number of people living with HIV at approximately 1.64 million, with women and children bearing a disproportionate share of the burden [2,4]. Although the overall paediatric HIV prevalence (0.7%) is far lower than the adult prevalence (8.1%), children aged 0–14 account for nearly 15% of annual AIDS-related deaths, and only 58% of HIV-positive children were receiving ART in 2023, compared with 92% of adults [5]. Progress reviews of Malawi's performance against the UNAIDS 95-95-95 targets similarly identify children as a population for whom targets are being met more slowly than for adults [3].

2.1.2 Importance of ART Adherence and Consequences of Poor Adherence

ART works by suppressing viral replication, allowing immune reconstitution and reducing the risk of opportunistic infection [7]. Its effectiveness, however, is adherence-dependent: international guidance places the threshold required for durable viral suppression at approximately 95% of prescribed doses [8]. Adherence below this threshold permits ongoing viral replication, which over time allows the virus to develop resistance mutations against the drugs in the regimen [9]. This is a particularly serious risk for children, since paediatric ART formulations are more limited in range than adult formulations, meaning that the development of resistance can foreclose treatment options more rapidly than it would for an

adult patient. Poor adherence has therefore been consistently linked in the literature to virological failure, accelerated disease progression, increased hospitalisation, and excess mortality among children living with HIV [7,8,9].

2.1.3 Child-Related Factors

The literature consistently identifies children's complete dependence on caregivers as the defining feature of paediatric ART adherence. A child's age and developmental stage influence both their physical ability to take medication and their behavioural response to it; younger children, in particular, present a distinct adherence challenge because they rely entirely on caregivers for every dose [10]. Adverse drug effects — including nausea, vomiting, rash, headaches, and abdominal discomfort — are commonly cited as discouraging consistent medication-taking [7]. The unpleasant taste of several paediatric ART formulations is similarly well documented as a barrier, particularly for younger children who are more likely to resist or spit out medication [7]. Regimen-related characteristics also feature prominently: more complex dosing schedules, larger pill burden, and the presence of comorbidities such as tuberculosis are associated with higher rates of non-adherence [20,21].

2.1.4 Caregiver-Related Factors

Given that young children rely entirely on caregivers for treatment administration, the literature on caregiver-related determinants of adherence is extensive. Caregiver knowledge and health literacy are frequently identified as foundational: caregivers who do not fully understand the rationale for strict adherence, or the consequences of missed or doubled doses, are more likely to administer medication inconsistently [12]. Forgetfulness and disorganised household routines are commonly reported proximate causes of missed doses. Caregivers' psychosocial circumstances also matter — psychosocial stress, depression, and other mental health conditions can reduce a caregiver's capacity to sustain the demands of a child's treatment regimen [12]. HIV-related stigma is another recurrent theme: caregivers who fear disclosure of the child's status may avoid administering medication in front of others or miss doses to maintain secrecy [13]. The nature of the caregiver–child relationship has also been shown to matter, with several studies reporting higher adherence among biological parents than among foster carers or other non-biological caregivers [13]. Use of traditional or complementary medicine alongside, or in place of, ART has also been documented as a barrier in several settings [15].

2.1.5 Socioeconomic Factors

Household socioeconomic circumstances shape caregivers' practical capacity to sustain adherence over time. Poverty, transport costs, and food insecurity are repeatedly identified as impediments to regular clinic attendance and consistent medication administration [11,14]. Food insecurity in particular has a compounding effect, since several ART formulations are associated with gastrointestinal side effects when taken on an empty stomach. Rural residence has similarly been associated with poorer adherence, largely as a function of the greater distances and costs involved in reaching health facilities [14]. Unemployment and broader social exclusion compound these pressures, disrupting the daily routines on which consistent medication administration depends.

2.1.6 Health System Factors

Health system weaknesses generate structural barriers to both access and continuity of paediatric HIV care. Long travel distances to health facilities, particularly for rural populations, are associated with missed appointments and treatment interruptions [16]. Long waiting times and overburdened health workers can similarly discourage caregivers from attending follow-up visits or engaging fully with adherence counselling [16]. Frequent stock-outs of paediatric ART formulations compound these access barriers, at times forcing caregivers to make repeat visits or accept substitute doses that increase the risk of dosing errors. Provider attitudes, including perceived disrespect, stigmatising behaviour, or inadequate privacy during consultations, have also been shown to discourage open communication between caregivers and clinic staff, further weakening adherence support [17].

2.2 Literature Gap

Taken together, the literature establishes that poor ART adherence among children under five is multifactorial, arising from the interaction of child-related, caregiver-related, socioeconomic, and health system-related determinants rather than from any single cause. A recent systematic review and meta-analysis of paediatric ART adherence across Eastern and Southern Africa reported an overall adherence rate of 76.2%, while also highlighting substantial heterogeneity across study settings and populations [18,23]. However, much of the published literature either pools children across a wide paediatric age range or focuses specifically on older children and adolescents, for whom adherence barriers — such as disclosure to the child and peer-related stigma — differ meaningfully from those facing the caregiver-dependent under-five population [23].

Few studies have examined ART adherence among under-five children specifically within Malawian referral hospital settings, and none, to the knowledge of the researcher, had previously done so at the Lighthouse Clinic, QECH. This represents a meaningful gap, since interventions designed using evidence from older paediatric or adult populations may not adequately address the caregiver-mediated and developmental barriers unique to the youngest children. This study was designed to address this gap by generating facility-specific evidence on the factors contributing to poor ART adherence among under-five children at QECH.

2.3 Conceptual Framework

This study was guided by an adaptation of the World Health Organization’s multidimensional model of adherence to long-term therapies, which groups the determinants of adherence into interacting dimensions spanning patient-related, condition- and therapy-related, health system-related, and social and economic factors. Because children under five cannot independently manage their own treatment, the “patient-related” dimension in this study was reconceptualised around the caregiver, who carries out medication administration, clinic attendance, and day-to-day disease management on the child’s behalf. The condition- and therapy-related dimensions were captured through child-related factors such as age, regimen characteristics, side effects, and palatability.

Within this framework, ART adherence — the outcome of interest — is understood not as the product of a single determinant but as the cumulative result of interactions across the four domains of child-related, caregiver-related, health system-related, and socioeconomic factors.

2.4 Independent and Dependent Variables

2.4.1 Dependent Variable

The dependent (outcome) variable in this study was ART adherence, classified as a binary variable: adherent or non-adherent (poor adherence). Adherence was measured using a caregiver-reported question on whether the child had ever missed an ART dose, with caregivers reporting no missed dose classified as adherent and those reporting a missed dose classified as non-adherent. This represents a modification from the Visual Analogue Scale and pill-count methods originally proposed, adopted due to the limited accessibility of complete secondary clinical records at the facility; the rationale for this change is described in detail in Chapter Three.

2.4.2 Independent Variables

The independent variables were grouped into the four domains of the conceptual framework:

- Child-related factors: child sex, age category, duration on ART, ART regimen type, ART dosing frequency, ART side effects, and whether bitter taste affected medication consumption.
- Caregiver-related factors: caregiver age category, sex, marital status, education level, relationship to the child, ART knowledge, knowledge of ART effectiveness, use of traditional medicine alongside ART, use of an ART reminder system, HIV disclosure status, experience of discrimination, distance from the health facility, and usual means of transport to the clinic.
- Health system–related factors: waiting time at the health facility and caregivers’ perception of healthcare provider respect towards them.
- Socioeconomic factors: monthly household income and household food security status.

2.5 Figure of Conceptual Framework

Domain (this study)	Adapted WHO Dimension	Illustrative Variables
Child-related factors	Condition- and therapy-related	Age, duration on ART, regimen type, dosing frequency, side effects, palatability
Caregiver-related factors	Patient-related (reconceptualised around the caregiver)	Age, marital status, education, relationship to child, ART knowledge, disclosure status, traditional medicine use
Health system–related factors	Health system / team-related	Distance to facility, waiting time, provider attitude, drug availability
Socioeconomic factors	Social and economic	Household income, food security

Figure 2.1: Conceptual framework showing factors associated with ART adherence among under-five children.

2.6 Summary

This chapter has reviewed the global and regional burden of paediatric HIV, the importance of ART adherence, and the four domains of factors — child-related, caregiver-related, socioeconomic, and health system–related — known to influence adherence among children under five years. It has identified a gap in the literature specific to under-five children in Malawian referral hospital settings, and has presented the conceptual framework, together with the independent and dependent variables, that guided the design of this study. The next

chapter describes the methodology used to investigate these factors at the Lighthouse Clinic, Queen Elizabeth Central Hospital.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter describes the methodology used to investigate the factors contributing to poor ART adherence among children under five years attending the Lighthouse Clinic, Queen Elizabeth Central Hospital (QECH). It presents the methodological approach, study design, study setting, study population, eligibility criteria, sample size determination, sampling procedure, study variables, data collection method, data management, data analysis, validity and reliability of the study, ethical considerations, and study limitations.

3.2 Methodological Approach

This study adopted a quantitative methodological approach, on the grounds that the research objectives required the measurement of the level of ART adherence and the statistical testing of associations between adherence and a defined set of child-related, caregiver-related, health system-related, and socioeconomic factors. A quantitative approach allowed these associations to be expressed numerically, using odds ratios and statistical significance testing, and allowed findings from this study population to be compared directly with adherence rates and associated factors reported in the wider regional literature [18,23].

3.3 Study Design

This was a quantitative, analytical cross-sectional study. Data were collected at a single point in time from caregiver-child pairs attending the Lighthouse Clinic, allowing both the level of ART adherence and its association with child-related, caregiver-related, health system-related, and socioeconomic factors to be assessed concurrently. The analytical component of the design, comprising bivariate and multivariable statistical testing, allowed independent predictors of poor adherence to be identified, in addition to describing the overall pattern of adherence within the study population.

3.4 Study Setting

The study was conducted at the Lighthouse Clinic, located within Queen Elizabeth Central Hospital (QECH) in Blantyre, Malawi. QECH is the largest referral hospital in southern Malawi and a major teaching institution for the University of Malawi College of Medicine, serving a large and diverse population drawn from both urban and rural areas. The Lighthouse Clinic is a specialised centre within QECH that provides comprehensive HIV care and treatment services, including paediatric antiretroviral therapy. Its established ART

programme, structured follow-up system, and experienced healthcare staff made it a suitable and relevant setting in which to investigate the factors influencing ART adherence among young children.

3.5 Study Population

The study population comprised HIV-positive children under the age of five — defined as children aged 0 to 59 months [22] — who were receiving ART at the Lighthouse Clinic, together with their primary caregivers. Caregivers were included as key informants because they are typically responsible for medication administration and clinic attendance, and were therefore best placed to report on the factors influencing the child's treatment adherence.

3.6 Inclusion and Exclusion Criteria

3.6.1 Inclusion Criteria

Caregiver–child pairs were eligible for inclusion if they met all of the following conditions:

1. HIV-positive children aged 0–59 months.
2. Receiving ART at the Lighthouse Clinic, QECH.
3. On ART for ≥ 6 months.
4. Accompanied by a primary caregiver aged ≥ 18 years who had been caring for the child for at least one month.

3.6.2 Exclusion Criteria

Caregiver–child pairs were excluded from participation under any of the following circumstances:

1. The child was critically ill or required urgent medical care on the day of the interview (e.g., severe respiratory distress, seizures, unconsciousness).
2. The caregiver was unable to participate comfortably, for example due to emotional distress, fatigue, or urgent personal matters.
3. The caregiver was intoxicated, cognitively impaired, or otherwise unable to provide reliable responses.
4. The person accompanying the child was not the primary caregiver (e.g., a neighbour, relative, or friend who did not administer the child's ART medication).
5. Essential medical records needed to assess adherence were missing or incomplete, making it impossible to determine adherence status.

These exclusion criteria were deliberately framed around practical and ethical considerations relevant to data quality and participant welfare, rather than as a simple converse of the

inclusion criteria, following revisions requested by the College of Medicine Research and Ethics Committee (COMREC) during protocol review.

3.7 Sample Size Determination

The sample size was determined using Cochran's formula for estimating sample size for proportions:

$$n_o = (Z^2 \times p \times (1 - p)) / d^2$$

Where n_o is the initial sample size; Z is the standard normal deviate at the 95% confidence level (1.96); p is the estimated ART adherence rate among children in Eastern and Southern Africa, taken as 76.2% (0.762) from a recent regional meta-analysis [18]; and d is the desired margin of error (0.05).

Substituting these values:

$$n_o = (1.96^2 \times 0.762 \times (1 - 0.762)) / 0.05^2 = (3.8416 \times 0.762 \times 0.238) / 0.0025 \approx 278$$

Given that the total number of eligible HIV-positive children under five receiving ART at the Lighthouse Clinic was approximately 200, a finite population correction (FPC) was applied:

$$n = n_o / [1 + (n_o - 1) / N] = 278 / [1 + (277 / 200)] = 278 / 2.385 \approx 117$$

To account for a potential 10% non-response rate, the adjusted target sample size was calculated as $117 \times 1.1 \approx 129$ caregiver-child pairs. Data collection ultimately yielded 132 complete and eligible caregiver-child pairs, marginally exceeding the calculated target, all of whom were retained for analysis.

3.8 Sampling Procedure

A systematic random sampling method was used to select eligible caregiver-child pairs from the ART register at the Lighthouse Clinic, which served as the sampling frame. On each clinic day during the data collection period, a sampling interval (k) was calculated by dividing the estimated number of eligible children expected to attend during that period by the required sample size. The first participant on each day was selected randomly among the first few eligible cases using a simple lottery method, and subsequent participants were selected at every k th interval until the daily target was reached. Where a selected caregiver-child pair did not meet the eligibility criteria or declined to participate, the next eligible pair in sequence was selected in its place. This approach ensured that each eligible child had an equal and unbiased chance of selection while remaining logistically feasible within a busy clinic setting.

3.9 Study Variables

3.9.1 Dependent Variable

The dependent variable was ART adherence, assessed using a caregiver-reported question included in the questionnaire: ‘Has your child ever missed an ART dose?’ Caregivers who responded ‘no’ were classified as adherent, while those who responded ‘yes’ were classified as non-adherent (poor adherence). A follow-up question captured the frequency of missed doses (once a week, more than once a week, or occasionally) for descriptive purposes, although the primary binary classification was used as the outcome variable for statistical analysis.

This measure represents a slight deviation from the Visual Analogue Scale and pill-count methods originally proposed in the study protocol. During data collection, the secondary clinical records required for the pill-count calculation were not consistently complete or accessible across all participants, making it infeasible to apply this method reliably to the full sample. The caregiver-reported question was therefore used instead, as it was already embedded in the questionnaire and could be applied consistently to every participant. The implications of this change are discussed further under study limitations (Section 3.14).

3.9.2 Independent Variables

The independent variables spanned the four domains of the conceptual framework presented in Chapter Two, and were grouped as follows for analysis:

- Child-related factors: child sex, age category, duration on ART, ART regimen type, ART dosing frequency, ART side effects, and whether bitter taste affected medication consumption.
- Caregiver-related factors: caregiver age category, sex, marital status, education level, relationship to the child, ART knowledge, knowledge of ART effectiveness, use of traditional medicine alongside ART, use of an ART reminder system, HIV disclosure status, experience of discrimination, distance from the health facility, and usual means of transport to the clinic.
- Health system-related factors: waiting time at the health facility and caregivers’ perception of healthcare provider respect towards them.
- Socioeconomic factors: monthly household income and household food security status.

3.10 Data Collection Method

Data were collected through interviewer-administered electronic questionnaires programmed in the KoBoToolbox platform [19]. Trained research assistants administered the questionnaire verbally in Chichewa and entered responses directly onto tablets, an approach intended to ensure inclusivity for caregivers with low literacy while maintaining data accuracy and minimising manual entry errors. The questionnaire was pretested in a comparable clinical setting prior to data collection to assess clarity, cultural relevance, and reliability, and all data collectors received structured training before fieldwork began.

In addition to the caregiver interview, relevant clinical information — including ART start date, current regimen, most recent weight, and appointment attendance history — was extracted from each child’s medical file (care and treatment card, case notes, or electronic medical record, depending on facility documentation) using an electronic data abstraction form developed specifically for the study.

3.11 Data Management

All data were collected electronically using KoBoToolbox on password-protected tablets and uploaded daily to a secure cloud server. Completed forms were reviewed regularly by the study supervisor for completeness, consistency, and accuracy. Data collection forms were anonymised and identified only by a unique study identification number assigned to each participant. Clinical information extracted from medical records was checked against questionnaire responses where overlapping information was available, to improve overall data quality. Only authorised research staff had access to the final datasets, which were stored securely and backed up regularly.

3.12 Data Analysis

Data were processed and analysed using Stata version 17. Descriptive statistics were used to summarise participant characteristics and the level of ART adherence, using means and measures of variability for continuous variables and frequencies with percentages for categorical variables. ART adherence was classified into adherent and non-adherent groups based on caregiver report of whether the child had ever missed an ART dose, as described in Section 3.9.1. Bivariate associations between adherence status and each independent variable were assessed using chi-square tests, or Fisher’s exact test where expected cell counts were small, with the strength of association expressed as odds ratios. Variables that were statistically significant at $p \leq 0.05$ in bivariate analysis were carried forward into a multivariable logistic regression model to identify independent predictors of poor adherence, adjusting for potential confounding. Adjusted odds ratios (AORs) with 95% confidence

intervals were reported, and a variable was considered a statistically significant independent predictor where $p < 0.05$ and the 95% confidence interval excluded 1.

3.13 Validity and Reliability of the Study

3.13.1 Validity

Content validity was addressed by developing the questionnaire around the four domains of the conceptual framework, drawing on variables previously used in comparable paediatric ART adherence studies in sub-Saharan Africa [10,11,12,13,14,16,17]. The questionnaire was reviewed by the study supervisor prior to data collection to assess whether it adequately captured the constructs intended. Internal validity was supported by the use of standardised eligibility criteria, a structured sampling procedure, and consistent interview administration by trained research assistants. External validity, or generalisability, is limited by the single-site design: findings are most directly applicable to caregiver–child pairs attending the Lighthouse Clinic, QECH, and should be extended to other settings with caution, given differences in health system capacity and population characteristics that may exist elsewhere.

3.13.2 Reliability

Reliability was supported through pretesting of the questionnaire in a comparable clinical setting prior to the main data collection, allowing ambiguous or unclear items to be identified and revised. All data collectors underwent structured training on the questionnaire content and interview technique prior to fieldwork, in order to promote consistency in how questions were asked and responses recorded across interviewers. The use of a single electronic data collection platform (KoBoToolbox) for all interviews further reduced variability arising from manual data entry or transcription errors.

3.14 Ethical Considerations

Ethical approval for the study (protocol P.10/25-1848) was obtained from the College of Medicine Research and Ethics Committee (COMREC), Kamuzu University of Health Sciences. Permission to conduct the study was also obtained from the management of Queen Elizabeth Central Hospital and the Lighthouse Clinic.

Participation was voluntary, and caregivers were informed of their right to withdraw from the study at any point without consequence to the care that they or their child received at the clinic. Written or verbal informed consent, as appropriate, was obtained from each caregiver prior to participation. No monetary incentives were offered, in order to avoid undue influence on participation; light refreshments, such as bottled water, juice, or biscuits, were provided as

a gesture of appreciation for caregivers' time. Data collection forms were anonymised and identified only by unique study numbers, and all data were stored securely with access restricted to authorised research staff, in order to protect participant confidentiality throughout the study.

3.15 Study Limitations

Several limitations were anticipated and addressed, to the extent possible, during the design and conduct of the study. As described in Section 3.9.1, incomplete and inconsistently accessible secondary clinical records made it infeasible to apply the Visual Analogue Scale and pill-count methods originally proposed for measuring ART adherence; the study therefore relied on a single caregiver-reported question on whether a dose had ever been missed. This is a coarser measure than the originally planned approach, as it does not capture the degree of non-adherence and may classify a child as non-adherent on the basis of a single isolated missed dose. As with any caregiver self-report of adherence, this measure is also potentially subject to social desirability bias, with caregivers who had in fact missed a dose possibly reluctant to disclose this; this bias would most plausibly result in under-reporting of non-adherence, meaning the true level of non-adherence in the study population may be somewhat higher than reported. To minimise this risk, interviews were conducted in a private, non-judgemental setting by trained research assistants.

Some caregivers also had limited literacy, which could have affected their understanding of the study procedures; this was mitigated by administering the questionnaire orally in Chichewa, with trained research assistants available to clarify questions. The completeness and accuracy of the clinical record data that could be extracted were also constrained by the quality of documentation available at the facility. Caregivers' limited time during routine clinic visits required interviews to be kept as concise as possible without compromising data quality. Finally, as with any cross-sectional design, the study captured associations between independent variables and ART adherence at a single point in time and cannot establish causal or temporal relationships between the two.

ABSTRACT

Background

Poor ART adherence among under-five children remains a major public health challenge, contributing to treatment failure, drug resistance, and increased morbidity and mortality. Understanding the factors influencing adherence is essential for improving treatment outcomes.

Objective

The study aimed to assess factors associated with poor ART adherence among under-five children receiving antiretroviral therapy at Queen Elizabeth Central Hospital in Blantyre, Malawi.

Methods

A cross-sectional analytical study design was used among 132 caregiver–child pairs. Data were analysed using Stata. Descriptive statistics summarized participant characteristics and adherence levels. Chi-square tests assessed associations between independent variables and ART adherence, while multivariable logistic regression identified independent predictors of poor adherence. Statistical significance was set at $p < 0.05$ with 95% confidence intervals.

Results

Of the 132 children, 68.2% were adherent to ART while 31.8% were non-adherent. In multivariable analysis, significant predictors of poor ART adherence included caregiver age, marital status, ART knowledge, child vomiting, and distance to health facility. Caregivers aged 25–34 years had lower odds of poor adherence, while married and widowed caregivers had higher odds. Caregivers with ART knowledge and children living more than 5 km from the facility had higher odds of poor adherence.

Conclusion

Poor ART adherence among under-five children remains a significant concern. Both caregiver-related and health system factors play an important role in influencing adherence outcomes. Strengthening caregiver education, improving access to health facilities, and

targeted adherence counselling are essential to improve ART adherence among under-five children.

CHAPTER FOUR: RESULTS

4.1 Socio-demographic Characteristics of Study Participants

This section presents the socio-demographic characteristics of the study participants. The characteristics described include child-related demographic factors, caregiver demographic factors, and selected socioeconomic characteristics.

Table 1: socio-demographic characteristics of study participants (n = 132)

Variable	Category	Frequency (n)	Percentage (%)
Child sex	Male	69	52.3
	Female	63	47.7
Child age category	<1 year	30	22.7
	1–<3 years	55	41.7

Variable	Category	Frequency (n)	Percentage (%)
Caregiver age category	3–4 years	28	21.2
	4–5 years	19	14.4
	<25 years	59	44.7
	25–34 years	36	27.3
	≥35 years	37	28.0
Caregiver sex	Male	47	35.6
	Female	85	64.4
Marital status	Single	48	36.4
	Married	69	52.3
	Widowed	15	11.4
Caregiver education	None	48	36.4
	Primary	36	27.3
	Secondary	25	18.9
	Tertiary	23	17.4
Caregiver-child relationship	Biological mother	83	62.9
	Non-biological caregiver	49	37.1
Food security	Not food secure	83	62.9
	Food secure	49	37.1
Monthly income	<100,000 MWK	115	87.1
	≥100,000 MWK	17	12.9

Table 1 presents the baseline characteristics of the respondents. A total of 132 caregivers of children under five years receiving antiretroviral therapy (ART) at Queen Elizabeth Central Hospital were included in the study.

Slightly more than half of the children were male, accounting for 69 (52.3%), while 63 (47.7%) were female. Regarding age distribution, the largest proportion of children were aged between 1 and less than 3 years, 55 (41.7%), followed by those aged below one year, 30 (22.7%). Children aged 3 to 4 years and 4 to 5 years accounted for 28 (21.2%) and 19 (14.4%), respectively.

In terms of caregiver age, most respondents were aged below 25 years, 59 (44.7%), followed by those aged 35 years and above, 37 (28.0%), while 36 (27.3%) were aged between 25 and 34 years. The majority of caregivers were female, 85 (64.4%), while 47 (35.6%) were male.

Regarding marital status, more than half of the caregivers were married, 69 (52.3%), followed by single caregivers, 48 (36.4%), and widowed caregivers, 15 (11.4%). Concerning educational level, 48 (36.4%) had no formal education, 36 (27.3%) had primary education, 25 (18.9%) had secondary education, and 23 (17.4%) had tertiary education.

In relation to caregiver-child relationship, most caregivers were biological mothers, 83 (62.9%), while 49 (37.1%) were non-biological caregivers.

Regarding socio-economic characteristics, the majority of households were not food secure, 83 (62.9%), while 49 (37.1%) reported being food secure. Most caregivers, 115 (87.1%), reported a monthly income below 100,000 Malawi Kwacha, while only 17 (12.9%) earned 100,000 Kwacha or more.

Overall, the study population was predominantly composed of young caregivers, mostly female, with low socio-economic status and moderate levels of education.

4.2 Level of ART Adherence Among Under-Five Children

This section presents the level of ART adherence among children under five years receiving antiretroviral therapy at Queen Elizabeth Central Hospital. Adherence status was assessed and categorized as adherent or non-adherent in order to determine the magnitude of poor adherence within the study population.

Table 2: Level of ART adherence among under-five children receiving ART at Queen Elizabeth Central Hospital (N = 132)

Adherence status	Frequency (n)	Percentage (%)
Adherent	90	68.2
Non-adherent	42	31.8
Total	132	100

Out of the 132 children receiving antiretroviral therapy (ART) at Queen Elizabeth Central Hospital, 90 were adherent to ART while 42 were classified as not adherent.

This represents an adherence level of 68.2% (90/132) and a poor adherence level of 31.8% (42/132) among under-five children receiving ART

4.3 Association Between Child-Related Factors and ART Adherence

This section examines the association between child-related factors and ART adherence among under-five children receiving ART at Queen Elizabeth Central Hospital. Child-related factors assessed included child sex, age category, duration on ART, ART regimen type, ART dosing frequency, ART side effects, and the effect of bitter taste on ART consumption. Chi-square tests were used to determine the association between these factors and ART adherence.

Table 3: Association between child-related factors and ART adherence among under-five children at Queen Elizabeth Central Hospital (N = 132)

Variable	Adherent n (%)	Non-adherent n (%)	χ^2	p-value
Child sex			2.29	0.130
Male	43	26		
Female	47	16		
Child age category			4.50	0.213
<1 year	23	7		
1–<3 years	40	15		
3–4 years	15	13		
4–5 years	12	7		
Duration on ART			12.76	0.005

Variable	Adherent n (%)	Non-adherent n (%)	χ^2	p-value
<3 months	56	16		
3–6 months	12	7		
7–12 months	13	17		
>12 months	9	2		
ART regimen type			2.55	0.279
First line	63	34		
Second line	3	0		
Not sure	24	8		
ART dosing frequency			2.47	0.292
Once per day	86	40		
Twice per day	4	1		
Child ART side effects			12.98	0.005
Nausea	28	8		
Vomiting	33	8		
Rash	24	25		
Other	4	1		
ART bitter taste affected consumption			2.27	0.132
No	52	30		
Yes	38	12		

Significance level: $p < 0.05$

Table 3 above presents the association between child-related factors and ART adherence among under-five children receiving ART at Queen Elizabeth Central Hospital.

There was no statistically significant association between child sex and ART adherence ($\chi^2 = 2.29$, $p = 0.130$). Similarly, child age category was not significantly associated with adherence ($\chi^2 = 4.50$, $p = 0.213$).

A statistically significant association was observed between duration on ART and adherence status ($\chi^2 = 12.76$, $p = 0.005$). Children who had been on ART for 7–12 months had a

relatively higher proportion of non-adherence compared to children in the other duration categories.

No significant association was found between ART regimen type and adherence ($\chi^2 = 2.55$, $p = 0.279$). Likewise, ART dosing frequency was not significantly associated with adherence ($\chi^2 = 2.47$, $p = 0.292$).

Child ART side effects were significantly associated with adherence ($\chi^2 = 12.98$, $p = 0.005$). Children who experienced side effects, particularly rash, showed higher levels of non-adherence compared to those experiencing other side effects.

There was no statistically significant association between bitter taste affecting ART consumption and adherence ($\chi^2 = 2.27$, $p = 0.132$).

Overall, the findings indicate that among the child-related factors examined, duration on ART and ART side effects were significantly associated with ART adherence. This suggests that treatment experience and medication-related adverse effects may influence adherence behaviour among under-five children. Child sex, age category, ART regimen type, dosing frequency, and bitter taste affecting consumption were not significantly associated with adherence in this study.

4.4 Association Between Caregiver-Related Factors and ART Adherence

This section presents the association between caregiver-related factors and ART adherence among under-five children receiving antiretroviral therapy at Queen Elizabeth Central Hospital. The caregiver-related factors assessed include socio-demographic characteristics, knowledge and beliefs about ART, psychosocial factors, caregiving practices, and access-related factors. Chi-square tests were used to determine the association between these factors and ART adherence status among the study participants.

Table 4: Association between caregiver-related factors and ART adherence among under-five children at Queen Elizabeth Central Hospital (N = 132)

Variable	Category	Adherent (n)	Non-adherent (n)	χ^2	p-value
Caregiver age category	<25 years	30	29	16.25	<0.001*
	25–34 years	32	4		
	≥35 years	28	9		
Caregiver sex	Male	35	12	1.33	0.249
	Female	55	30		
Marital status	Single	40	8	8.41	0.015*
	Married	40	29		
	Widowed	10	5		
Caregiver education	None	29	19	2.12	0.548
	Primary	26	10		
	Secondary	18	7		
	Tertiary	17	6		
Caregiver-child relationship	Biological mother	43	28	4.11	0.043*
	Non-biological caregiver	47	14		
ART knowledge	No knowledge	71	12	31.06	<0.001*
	Knowledgeable	19	30		
Knowledge of ART effectiveness	Yes	47	27	3.26	0.196
	No	31	8		
	Not sure	12	7		
Traditional medicine use	Yes	22	8	17.39	<0.001*
	No	23	26		
	Not sure	45	8		
ART reminder system	Poor reminder	42	10	6.27	0.012*
	Good reminder	48	32		

Variable	Category	Adherent (n)	Non-adherent (n)	χ^2	p-value
Disclosure status	Yes	52	15	5.58	0.018*
	No	38	27		
Faced discrimination	Yes	32	9	3.48	0.176
	No	37	24		
	Not sure	21	9		
Distance to facility	<5 km	38	7	8.32	0.004*
	>5 km	52	35		
Means of transport	Foot	42	22	0.98	0.806
	Bicycle	29	11		
	Public transport	13	5		
	Own car	6	4		

* Statistically significant at $p < 0.0$

Table 4 presents the association between caregiver-related factors and ART adherence among under-five children receiving ART at Queen Elizabeth Central Hospital.

A statistically significant association was observed between caregiver age category and ART adherence ($\chi^2 = 16.25$, $p < 0.001$). Children whose caregivers were aged 25–34 years had better adherence compared to those whose caregivers were younger than 25 years or aged 35 years and above.

Marital status was also significantly associated with adherence ($\chi^2 = 8.41$, $p = 0.015$). In addition, caregiver-child relationship showed a significant association with ART adherence ($\chi^2 = 4.11$, $p = 0.043$).

Caregiver ART knowledge was strongly associated with adherence ($\chi^2 = 31.06$, $p < 0.001$). Furthermore, the practice of combining ART with traditional medicine was significantly associated with adherence status ($\chi^2 = 17.39$, $p < 0.001$).

The use of ART reminder systems was significantly associated with adherence ($\chi^2 = 6.27$, $p = 0.012$). Similarly, disclosure status was significantly associated with adherence ($\chi^2 = 5.58$, $p =$

0.018), with adherence differing between caregivers who had disclosed and those who had not disclosed HIV status.

Distance to the health facility was also significantly associated with adherence ($\chi^2 = 8.32$, $p = 0.004$). Children whose caregivers lived more than 5 km from the facility exhibited higher levels of non-adherence than those living closer to the facility.

However, caregiver sex ($\chi^2 = 1.33$, $p = 0.249$), caregiver education level ($\chi^2 = 2.12$, $p = 0.548$), knowledge of ART effectiveness ($\chi^2 = 3.26$, $p = 0.196$), experienced discrimination ($\chi^2 = 3.48$, $p = 0.176$), and means of transport to the facility ($\chi^2 = 0.98$, $p = 0.806$) were not significantly associated with ART adherence.

Summary

Among caregiver-related factors, caregiver age category, marital status, caregiver-child relationship, ART knowledge, traditional medicine use, ART reminder systems, disclosure status, and distance to the health facility were significantly associated with ART adherence. In contrast, caregiver sex, education level, knowledge of ART effectiveness, discrimination, and means of transport showed no significant association with adherence.

4.5 Association Between Health System Factors and ART Adherence

This section presents the association between health system factors and ART adherence among under-five children receiving antiretroviral therapy at Queen Elizabeth Central Hospital. The factors assessed included waiting time at the health facility and healthcare provider respect towards caregivers. Chi-square tests were performed to determine whether these health system factors were associated with ART adherence.

Table 5: Association between health system factors and ART adherence among under-five children at Queen Elizabeth Central Hospital (N = 132)

Variable	Category	Adherent n	Non-adherent n	χ^2	p-value
Waiting time at facility	Short/Moderate	58	15	9.56	0.002*
	Long wait	32	27		
Provider respect towards caregivers	No	51	24	0.003	0.959
	Yes	39	18		

* Significant at $p < 0.05$

Table 5 presents the association between health system factors and ART adherence among under-five children receiving ART at Queen Elizabeth Central Hospital.

A statistically significant association was observed between waiting time at the health facility and ART adherence ($\chi^2 = 9.56$, $p = 0.002$). Children whose caregivers experienced long waiting times at the facility had a higher proportion of non-adherence compared to those whose caregivers reported short or moderate waiting times.

However, no statistically significant association was found between healthcare provider respect towards caregivers and ART adherence ($\chi^2 = 0.003$, $p = 0.959$).

The findings indicate that waiting time is an important health system factor influencing ART adherence. Long waiting times may discourage caregivers from attending clinic appointments consistently and may negatively affect medication follow-up and adherence. In contrast, perceived provider respect was not associated with adherence in this study, suggesting that provider attitude alone did not significantly influence adherence outcomes among the participants.

4.6 Association Between Socioeconomic Factors and ART Adherence

This section presents the association between socioeconomic factors and ART adherence among under-five children receiving ART at Queen Elizabeth Central Hospital. The socioeconomic factors assessed were household income and food security status. Chi-square

tests were performed to determine whether these factors were associated with ART adherence.

Table 6: Association between socioeconomic factors and ART adherence among under-five children at Queen Elizabeth Central Hospital (N = 132)

Variable	Category	Adherent (n)	Non-adherent (n)	χ^2	p-value
Monthly household income	<100,000 MWK / Not sure	77	38	0.62	0.432
	>100,000 MWK	13	4		
Food security	No	52	31	3.15	0.076
	Yes	38	11		

Statistical significance set at $p < 0.05$

Table 6 presents the association between socioeconomic factors and ART adherence among under-five children receiving ART at Queen Elizabeth Central Hospital.

Monthly household income was not significantly associated with ART adherence ($\chi^2 = 0.62$, $p = 0.432$). The distribution of adherence was similar among households with lower income levels and those with higher income levels.

Food security was also not significantly associated with ART adherence ($\chi^2 = 3.15$, $p = 0.076$), although children from food-secure households tended to have a lower proportion of non-adherence compared to those from food-insecure households.

4.7 Multivariable Logistic Regression Analysis

This section presents the results of multivariable logistic regression analysis used to identify independent predictors of poor ART adherence among under-five children receiving antiretroviral therapy at Queen Elizabeth Central Hospital. Variables that were significant at bivariable analysis ($p \leq 0.05$) were included in the final model. Both adjusted odds ratios (AORs) with 95% confidence intervals and p-values were used to determine statistical

significance. A variable was considered statistically significant if the p-value was less than 0.05 and the 95% confidence interval did not include 1.

Table 7: Multivariable logistic regression of factors associated with poor ART adherence among under-five children at Queen Elizabeth Central Hospital (N = 132)

Variable	Category	AOR	95% CI	p-value
Child ART side effects	Vomiting	0.13	0.02 – 0.81	0.029*
	Rash	1.17	0.22 – 6.21	0.855
	Other	2.58	0.10 – 68.52	0.571
Caregiver age	25–34 years	0.04	0.005 – 0.278	0.001*
	≥35 years	0.30	0.060 – 1.558	0.154
Marital status	Married	13.40	2.23 – 80.64	0.005*
	Widowed	14.72	1.23 – 176.28	0.034*
Caregiver-child relationship	Biological mother (Yes)	0.62	0.15 – 2.50	0.499
ART knowledge	Yes	20.52	4.57 – 92.15	0.0001*
Traditional medicine use	No	2.06	0.44 – 9.56	0.357
	Not sure	0.57	0.10 – 3.33	0.529
ART reminder system	Good	2.29	0.50 – 10.58	0.285
Disclosure status	Yes	0.50	0.16 – 1.60	0.244
Distance to facility	>5 km	4.13	1.06 – 16.18	0.041*
Long waiting time	Long wait	1.78	0.47 – 6.82	0.398

* Statistically significant at $p < 0.05$ and CI not including 1.

A multivariable logistic regression model was fitted to determine independent predictors of poor ART adherence among under-five children. The model was statistically significant (LR χ^2 (15) = 82.79, $p < 0.001$), indicating that the included variables collectively explained variations in adherence status. The model had a pseudo- R^2 of 0.5037, suggesting a good explanatory power.

After adjusting for confounding factors, several variables remained statistically significant predictors of poor ART adherence. Children who experienced vomiting had lower odds of

poor adherence compared to those who experienced nausea (AOR = 0.13, 95% CI: 0.02–0.81, $p = 0.029$). Caregiver age was also significantly associated with adherence, where caregivers aged 25–34 years had significantly lower odds of poor adherence compared to those below 25 years (AOR = 0.04, 95% CI: 0.005–0.278, $p = 0.001$).

Marital status was strongly associated with poor adherence, with children under married caregivers (AOR = 13.40, 95% CI: 2.23–80.64, $p = 0.005$) and widowed caregivers (AOR = 14.72, 95% CI: 1.23–176.28, $p = 0.034$) showing higher odds of poor adherence compared to those under single caregivers. Caregiver ART knowledge was also significantly associated with poor adherence (AOR = 20.52, 95% CI: 4.57–92.15, $p = 0.0001$). Additionally, children who lived more than 5 km from the health facility had higher odds of poor adherence compared to those living within 5 km (AOR = 4.13, 95% CI: 1.06–16.18, $p = 0.041$).

Other factors, including caregiver-child biological relationship, traditional medicine use, ART reminder system, disclosure status, and long waiting time, were not statistically significant predictors of poor ART adherence after adjustment.

CHAPTER FIVE: DISCUSSION

5.1 Introduction

This chapter presents the interpretation and discussion of the study findings on factors associated with poor ART adherence among under-five children at Queen Elizabeth Central Hospital in Blantyre, Malawi. The findings are discussed in relation to the study objectives and are compared with evidence from other similar studies. The discussion focuses on the

level of ART adherence, child-related factors, caregiver-related factors, health system factors, socioeconomic factors, and the independent predictors of poor adherence identified in the multivariable analysis.

5.2 Level of ART adherence

The study found that out of 132 children, 90 (68.2%) were adherent to ART while 42 (31.8%) were non-adherent. This indicates that although the majority of children were adherent, a substantial proportion were still not adhering to treatment. This level of non-adherence remains a public health concern because poor adherence to ART is associated with virological failure, drug resistance, and increased morbidity and mortality among children living with HIV.

The adherence level observed in this study is comparable to findings from other studies conducted in similar settings in sub-Saharan Africa, where adherence rates among children range from moderate to high but remain below optimal levels required for sustained viral suppression [10,11]. Variations in adherence levels across studies may be attributed to differences in measurement methods, study populations, and health system support structures.

5.3 Child-related factors and ART adherence

The study found that several child-related factors were associated with ART adherence at the bivariate level. However, in the multivariable analysis, only child experiencing vomiting remained significantly associated with adherence. Interestingly, vomiting was associated with lower odds of poor adherence.

This finding may suggest that caregivers become more attentive to medication administration and seek clinical support when children experience noticeable side effects such as vomiting. It may also indicate that the presence of adverse effects increases caregiver engagement with health services, thereby improving adherence behaviors. Similar findings have been reported in other studies where observable side effects prompted increased caregiver vigilance and improved follow-up care [13].

However, this finding should be interpreted cautiously, as it may also reflect confounding factors or variability in reporting of side effects. Other child-related factors such as rash and

other adverse effects were not significantly associated with adherence after adjustment, indicating that their influence may be mediated by caregiver and contextual factors.

5.4 Caregiver-related factors and ART adherence

Caregiver-related factors played a significant role in influencing ART adherence. Caregiver age, marital status, ART knowledge, and caregiver-child relationship were found to be important predictors in the multivariable model.

Caregivers aged 25–34 years had significantly lower odds of poor adherence compared to younger caregivers. This may be because caregivers in this age group are more stable, experienced, and better able to manage child health responsibilities, including medication administration and clinic attendance [12].

Marital status was also significantly associated with adherence, with married and widowed caregivers showing higher odds of poor adherence compared to single caregivers. This finding may reflect increased household responsibilities, economic strain, or psychosocial stress that limits consistent care provision. Similar associations between caregiver burden and poor pediatric adherence have been reported in other African studies [15].

ART knowledge was strongly associated with adherence. Surprisingly, caregivers with ART knowledge had higher odds of poor adherence. This unexpected finding may suggest that knowledge alone is not sufficient to ensure adherence, or it may reflect limitations in how knowledge was measured. It may also indicate a gap between theoretical knowledge and practical implementation of adherence behaviors, as documented in other studies where knowledge did not always translate into behavior change [7,12].

Other factors such as biological caregiving status were not significant predictors after adjustment, suggesting that emotional or biological connection alone may not be sufficient to ensure adherence without adequate support systems, education, and socioeconomic stability.

5.5 Health system factors and ART adherence

Among health system factors, distance to the health facility was significantly associated with ART adherence. Children who lived more than 5 km from the facility had higher odds of poor adherence. This finding highlights the importance of physical access to health services,

as longer distances increase transport costs, travel time, and the likelihood of missed appointments or delayed drug refills [14].

Long waiting time was not significantly associated with adherence in the adjusted model, although it has been reported in other studies as a barrier to health service utilization. This may suggest that caregivers prioritize ART services despite waiting times due to the perceived importance of treatment for child survival.

5.6 Socioeconomic factors and ART adherence

Socioeconomic factors such as household income and food security were not significantly associated with ART adherence in the multivariable analysis. This suggests that adherence behavior in this population may be more strongly influenced by caregiver, child, and health system factors rather than direct economic status.

However, food security showed a weak association at the bivariate level, indicating that economic hardship may still play an indirect role in adherence outcomes. This is consistent with findings from previous studies showing that food insecurity can negatively affect ART adherence by worsening drug side effects and limiting caregiver capacity [11].

5.7 Independent predictors of poor ART adherence

The multivariable logistic regression identified the following independent predictors of poor ART adherence:

- Caregiver age (25–34 years protective against poor adherence)
- Marital status (married and widowed caregivers at higher risk)
- ART knowledge (associated with increased odds of poor adherence)
- Distance greater than 5 km (increased risk of poor adherence)

These findings suggest that ART adherence is influenced by a combination of demographic, behavioral, and structural factors rather than a single determinant. Improving adherence therefore requires a multi-sectoral approach that addresses caregiver education, psychosocial support, and improved access to health services.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

This study assessed factors associated with poor ART adherence among under-five children at Queen Elizabeth Central Hospital in Blantyre, Malawi. The study found that although a majority of children were adherent to ART, a substantial proportion still experienced poor adherence.

The study concludes that ART adherence is influenced by multiple factors, including caregiver age, marital status, ART knowledge, child-related side effects (vomiting), and distance to health facility. Caregiver age and marital status were important demographic predictors, while ART knowledge showed a strong but unexpected association with poor adherence. Health system factors, particularly distance to the health facility, also played a significant role in determining adherence outcomes.

Overall, ART adherence among under-five children is shaped by a combination of caregiver characteristics, child experiences, and access-related barriers.

6.2 Recommendations

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

6.2.1 To health care providers

- Strengthen adherence counselling during ART clinic visits, with special focus on caregivers of younger and high-risk children.
- Improve education sessions to ensure caregivers understand not only ART knowledge but also practical adherence strategies.
- Provide targeted support to caregivers experiencing challenges such as long travel distances.

6.2.2 To health facilities and program managers

- Improve access to ART services through decentralization or community-based drug distribution systems to reduce distance-related barriers.
- Enhance follow-up mechanisms for caregivers who miss appointments.

- Strengthen monitoring of adherence among children experiencing side effects such as vomiting.

6.2.3 To policymakers

- Develop and support policies that improve accessibility of pediatric ART services in rural and peri-urban areas.
- Integrate caregiver support programs into HIV care services to address social and household challenges affecting adherence.

6.2.4 To future researchers

- Further studies should explore why ART knowledge was associated with poor adherence in this study.
- Qualitative studies are recommended to better understand caregiver experiences and barriers to adherence.

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