College Of Medicine

Assessing Effectiveness of teen clubs in improving ART outcomes among HIV infected adolescents: A case of Zingwangwa Health Centre

By

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(BSoc. Economics)

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DECLARATION

I, Lucia Davie Mbulaje, hereby declare that this thesis is my original work and has not been presented for any other awards at this University or any other university.

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CERTIFICATE OF APPROVAL

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ABSTRACT

Adolescents and young adults present a growing share of people getting newly infected or living with HIV. Globally, 40% of all new infections occur in adolescents (10-19 years) and young adults (20-24 years). Compared to their adult counterparts, about half of HIV infected adolescents who are on ART are reported to be non-adherent to ART. Further evidence available also suggests that there is little specialized care for adolescents living with HIV as opposed to their adult counterparts. Other studies conducted to measure ART outcomes among adolescents in urban clinics in Zimbabwe showed that adolescents and young adults had high loss to follow up, unlike adults in the same set up

HIV positive adolescents on ART have usually lower viral suppression rates when compared to adults and children, meaning their viral load remains relatively high even though they are on ART. According to spectrum data for 2018, viral load suppression in all ART clients in Malawi was at 89%. A further analysis also indicated that the viral load suppression was different across different age and sex groups. Where as in adults the suppression rates were at above 82%, viral load suppression in children 0 -14 years was at 58%. Additionally, a 2019 study by Umar et al in selected six districts of the southern region of Malawi showed that viral load suppression among adolescents aged 13 – 24 was at 61% Interventions aimed at improving optimal ART uptake among adolescents would therefore go a long way in improving ART outcomes among the

adolescents, and one such intervention is teen clubs, implemented in selected health facilities in the country.

The main objective of the study is to assess whether teen clubs as a model of care for HIV and AIDS can improve ART outcomes among infected adolescents.

Using a retrospective analytical cross sectional design, the study assessed ART outcomes among adolescents aged 10 – 24 years attending teen club and those not enrolled in any teen club program, but were enrolled in ART program at Zingwangwa Health Centre. The study employed quantitative data collection and analysis methods. Sample size for study participants was 225 and it was nearly evenly matched for cases (113) and controls (112). This number represented all adolescents aged 10-24 years and on ART at the facility. Patient level data was collected from all the 113 adolescents belonging to the teen club, as well as the 112 adolescents not enrolled in any teen club program but on ART at the health facility. The data was abstracted from patient records such as attendance registers, ART, Defaulter, Viral Load and High Viral Load registers. In addition to the facility registers, viral load results were accessed from Lab Management Information System (LIMS) database for all the adolescents registered at the health center.

Out of the total 225 adolescents enrolled in the study, results showed that 79 adolescents had high viral load (HVL), representing 35% of total adolescents while 146 had low detectable levels (LDL) of viral load (<1000 copies). For the 112 adolescents not enrolled in any teen club program, 44 had high viral load levels (>1000 copies), thus representing about 39% of the total non-teen club adolescents, while 68 had low detectable levels for viral load, which is about 61% of adolescents on ART but not in

any teen club program. On the other hand, out of the 113 adolescents enrolled in teen club program at the health center, 35 adolescents had high viral load level, representing about 31% of total adolescents in the program, while a total of 78 adolescent teen club members, representing about 69% had a low detectable viral load level.

Despite results of the study showing that more adolescents enrolled in the teen club reporting to have low viral load levels than their counterparts, calculated p-value of 0.192 and Pearson Chi^2 value of 1.7058 suggest there is no strong statistical evidence to suggest an association between viral load level and belonging to a teen club program or not.

In terms of adherence to ART, results show that there was no statistical significant difference in adherence between youths in teen clubs and those not in teen clubs evidenced by p-value being greater than 0.05. (p-value = 0.0814). However, adherence level for youth in the teen club was higher (89.7%) when to compared to that of the youth not belonging to teen club (86.7%)

Results of the study show teen club program is effective in ART care of HIV infected adolescents, demonstrated by better ART outcomes among adolescents that are exposed to teen club program when compared with adolescents not enrolled in teen club program

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CHAPTER 1. INTRODUCTION

1.1 Introduction

This chapter presents the main context of the study. It highlights literature on HIV/AIDS and ART program, it discusses existing challenges for care of adolescents who are HIV positive and the existing models of care for this group. The chapter also discusses the key framework used in assessment of adolescent ART model of care and the rationale for the study

1.2 Background and Problem Statement

The World Health Organization (WHO) defines an adolescent as any person who is aged between 10 – 19 years (1). The majority of adolescents (including those enrolled in teen clubs) therefore fall within the category of a "child" as defined by the *Convention on the Rights of a Child* as a person under the age of 18 years (2). This age range also falls within the category of young people as defined by the WHO, which is between the ages 10 – 24 years. Globally, about a fifth of the population is made up of adolescents. In sub-Sahara Africa, including Malawi, a third of the population is composed of adolescents (3).

Adolescence is a stage in life characterized by rapid physical, psychological and biological growth and marks as a transitional phase from childhood to adulthood. The physical growth and development often leads to sexual maturation, and most often leads

to intimate relationships (4). At this stage of development, availability of proper supportive skills and structures often times leads to increased independence and development of positive and healthy behaviors. However, without these, adolescence can be a period of great risk. In terms of physiological, psychological and social development, there are a numbers of stages, each with special characteristics. For example, physical changes at the onset of puberty such as increased sexual feelings, increased importance of peer groups and risk taking (4).

In 2016, there were 2.1 million adolescents aged 10 – 19 years living with HIV and about 260,000 became newly infected with the virus that causes AIDS (5). The majority, about 1.7 million of these infected adolescents live in sub-Sahara Africa [5]. However, in the same period, about 5 million young people globally were also living with HIV (6,1). In Malawi, with a population of over 17 million people, HIV prevalence is at 8.8%, and approximately 10% of those living with HIV are children and young adults (7). Some of these infected adolescents acquire HIV perinatally, i.e. through their infected mothers, while some acquire it during adolescence and it is mostly through sex (3).

Additionally, Malawi has a significant youth and adolescent population, with nearly two-thirds of the country's estimated 17.2 million people under the age of 24 (8) Youth and adolescents, aged 10-24, account for about 50% of new HIV infections in Malawi, with prevalence higher among 15-17 year olds. Five percent of young women and 1.1% of young men aged 15-24 are living with HIV in the country, compared to a regional prevalence of 3.4% and 1.6% in East and Southern Africa, respectively (9,10)

There are a number of factors that put adolescents at risk of contracting HIV, and some of them include (7):

- Low rates of condom use. The burden of HIV is high in sub-Sahara Africa where poverty levels are high, and most often sexual relationships occur with older men as means of economic survival, and as result reduces negotiating powers for safe sex especially in adolescent girls.
- High rates of sexually transmitted diseases among adolescents, and STIs increases the risk of HIV infection. WHO estimates that each year, 4 million adolescents are diagnosed with STIs, and this includes chlamydia, gonorrhea, herpes and the HIV.
- Social economic factors such as gender imbalances, poverty, illiteracy all combine to reduce ability of adolescent girls to negotiate for safe sex, thus risking contracting HIV

HIV and AIDS is the second leading cause of adolescent morbidity and mortality worldwide and the leading cause in Africa. While AIDS related deaths declined by 30% globally between 2005 and 2012, AIDS related deaths among adolescents aged 10 – 19 years old grew by 50% in the same period (4).

According to the global agenda on development as enshrined in Sustainable Development Goals (SDG), SDG number 3 states that all countries will by 2030 ensure healthy lives and promoting wellbeing for all at all ages. Within this goal, under target 3.3, all countries commit to end HIV by the year 2030. To attain this goal, various strategies will have to be employed by different nations, targeting different geographical locations, and age and sex groups. One such intervention is improving linkage to

antiretroviral therapy among HIV infected individuals. The use of HIV medicines, commonly called anti-retroviral drugs is recommended for all HIV infected individuals, regardless of stage of infection.

The efficacy of ARVs in fighting against HIV depends on other factors too, such as adherence, which refers to taking HIV medicine every day and exactly as prescribed by a qualified provider. However, ART does not cure HIV, but helps people with HIV live longer, healthier and if properly adhered to, reduces the risk of transmission to an uninfected sexual partner. The main goal of ART is to reduce viral load to undetectable levels, meaning that the volume of HIV in the blood of an infected partner is so low that it cannot be detected by a viral load test (13). Thus, an effective ART program is key to preventing transmission of HIV among infected partners.

The numbers of HIV positive individuals receiving HIV treatment has significantly increased over the years. In 2017, 79% of HIV positive adults were on ART program, representing a dramatic increase from 2014 when only 41% of infected adults and 32% of infected children were receiving ART [12]. In other studies, UNAIDS estimated that as of 2012, only 27% of HIV infected individuals were on ART in sub-Sahara Africa (13). However, countries adopted UNAIDS set ambitious targets of 90:90:90 to be achieved by 2020. This means 90% of people with HIV should know their HIV status, 90% of HIV positive individuals should be on ART and 90% of individuals on ART should achieve viral suppression.

Malawi adopted the ambitious 90:90:90 UNAIDS targets in 2014, and remains on course to achieve ambitious targets of ending AIDS by 2030 as set in SDGs. According to data from the Department of HIV and AIDS (DHA), the number of HIV positive

individuals on ART program in Malawi has also been increasing significantly. The number of clients on ART as of June 2014 was at about 500, 000, out of the estimated One million HIV positive individuals, thus giving a coverage of 50%. However, a DHA report for October to December 2018 indicates that 805,232 clients out of 1,064, 676 HIV positive clients were on ART, giving ART coverage of 76%. The same report however, indicates that ART coverage for adults was higher, at 76%, unlike in children at 68%.

Despite the progress Malawi has made in putting HIV positive people on ART, challenges remain about care of infected children and adolescents. Among others, lower ART coverage means many infected children and adolescents are not on treatment. Nonetheless, for the adolescents who start or continue ART, there are reported adherence problems as opposed in adults (14). The importance of adherence to ART cannot be over emphasized. It is an important factor in achieving optimal ART outcomes, measured by high virologic suppression. On the other hand, poor adherence to ART is associated with less effective viral suppression, and this pauses great risk on the health of patients, but also can create permanent resistance to that particular treatment.

Apart from poor adherence to ART among adolescents, studies comparing treatment outcomes in adolescents and young adults to older adults have shown poorer outcomes in terms of virologic failure and retention in care (15). There are a number of factors to explain poor adherence as well as low retention in care for adolescents living with HIV. HIV infected adolescents, who are also responsible for their own health, food security, livelihood and shelter often compromise ART adherence. Stigma around HIV from

peers at school or in their community may also compromise ART adherence, as ALHIV without peer support can feel isolated (16). Disclosing HIV status may be difficult, creating a barrier to developing supportive friendships and peer relationships. Additionally, ALHIV have poor mental health outcomes such as depression, which in itself is associated with poor adherence (17).

Malawi adopted test and treat policy in April 2016, but implementation started in July 2016. As expected, implementation of Test and Treat Policy saw increasing number of HIV positive clients starting ART. This however, meant introduction or intensification of tailor made programs to provide care for ALHIV. However, studies show that there is no single most effective differentiated service delivery model of care for this special population. Nonetheless, systematic reviews which examined service delivery interventions aimed at improving retention in care and adherence to ART for ALHIV, concluded from a limited number of studies that peer counselling and support, as well as improved accessibility to clinics for ALHIV and availability of youth-friendly services were promising strategies that warranted further investigation (18)

One such differentiated service delivery model for care of ALHIV is teen clubs. Initially introduced in Malawi in 2007 by Baylor College, the model initially targeted perinatally infected adolescents; but currently membership is also open to adolescents who acquire HIV horizontally (19). This model of care is implemented in selected health facilities in the country, depending on availability of an implementing partner in that particular district and facility. This is an adopted model of care by the Ministry of Health, with partners supporting it. The teen clubs are ran on monthly basis, on Saturday or Sunday, outside normal clinic hours and are attended by adolescents only. The clubs are held on

Saturdays or Sundays on purpose, to ensure that school going adolescents do not miss classes.

Zingwangwa Health Centre runs such a clinic, and according to available records at the health centre, it has been operational since 2015. During clinic days, a designated provider, either a nurse or clinician facilitates sessions. Considering that HIV care is more than provision of ART, other services such as psychosocial support, adherence counselling, viral load testing and sexual and reproductive health services especially for older adolescents are provided. To make the clubs more exciting, other activities such as sports do take place at this designated site.

The teen club model of care for ALHIV was introduced taking into consideration the factors below that affect provision of care among ALHIV in various hospitals in the country (7)

- Overcrowding in ART clinics
- Lack of provision of integrated HIV/AIDS services targeting adolescents
- Few sites offering youth friendly health services
- HIV/AIDS support programs targeting mainly adults and pediatrics
- Lack of accurate data on ALHIV in the country
- Health care perceptions towards adolescents
- High risk of stigma and discrimination for HIV infected adolescents especially from fellow adolescents. There is also high likelihood of adolescents not enrolling in care, or for those that do so, dropping out of care

Literature available from other parts of the world where the teen club model is also implemented emphasize the point that teen clubs are important in that they ensure health interaction of the teens. Studies show that the teen clubs provide unique developmental benefits for adolescents and children. The clubs empower members to share information with each other, apart from aiming to provide a safe, fun, and productive place where teens engage, connect, and discover their true potential (20).

Eligibility criteria for enrollment in the teen clubs includes the following

- Aged 10 – 19 years
- HIV positive, enrolled on ART at the same clinic
- Must have disclosed and accepted their HIV status
- Not pregnant or married

There have been other studies conducted to assess role of teen clubs in improving ART outcomes among teen club members. However, these have been limited by the fact that they were not holistic in assessment of the outcomes. A study conducted at Tisungane clinic at Zomba Central Hospital concluded that teen clubs played an important role in improving retention in care for ALHIV (7), but fell short of linking other important outcomes such viral suppression among teen clubs members and non-teen club members. In terms of service provision, the report does not indicate whether a review was conducted in terms of service provision and link it to specific outcomes of interest

The teen club model has also been implemented in other countries, such as Botswana, Tanzania and Namibia. In a report from where Intra Health Namibia, a PEPFAR funded agency implemented this differentiated service delivery model at Andara District

Hospital, a remote area in the country. However, the report does not explain that there was a systematic review of the teen club model to assess whether it was associated with improved ART outcomes among members attending the teen clubs versus those that did not attend the teen club at the hospital

1.3 Key Framework

Models, theories and frameworks all fit into theoretical approaches. In implementation science they serve three functions. Firstly, theoretical approaches help describe or guide translation of research into practice, secondly, they explain or help to understand what influences implementation outcomes and lastly, support evaluating implementation. A framework is a strategic or action planning model that provides a systematic way to develop, manage and evaluate interventions. (21). A framework identifies set of variables and relationships that should be examined in order to explain a phenomenon. There are a number of theoretic approaches that can be employed in studies, and examples include Precede – Proceed Model, i-PARIHS, Interactive Systems Framework, RE-AIM framework etc.

This study employed RE-AIM framework, which is consistent with overall objective of the study on evaluating impact of teen club model of care on ART outcomes among adolescents at a selected facility (Zingwangwa Health Centre) in Blantyre. The RE-AIM dimensions include reach (R), effectiveness (E), and maintenance (M)–which operate at the individual level (i.e., those who are intended to benefit), and adoption (A), implementation (I), and maintenance (M), which focus on the staff and setting levels (22)

The figure below is an illustration of the framework employed in the study

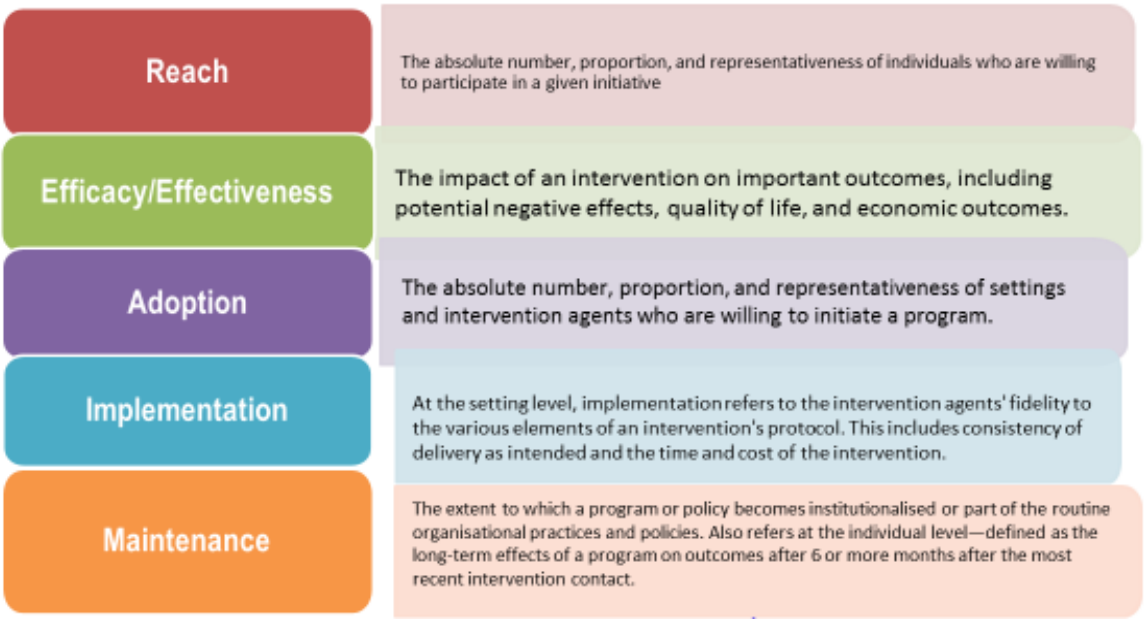

Figure 1: The RE-AIM Framework. Adapted from the "RE-AIM: Extended Consort Diagram"; and elements from PRISM; with contributions from members of the RE-AIM workgroup.

1.4. Justification for the study

There have been remarkable achievements in global HIV response, however, the progress in HIV prevention, care, and treatment among adolescents aged 10–24 years, more especially adolescents aged 10-19, is lagging behind other age groups (13). While mortality among people living with HIV in all other age groups is decreasing, that of adolescents living with HIV is increasing. Reasons for poor HIV outcomes in adolescents have included poor long-term immunologic recovery (23), poor adherence to ART due to treatment fatigue and marginalization, delayed diagnosis stigma difficulties with disclosure, among others. According to Malawi AIDS response report

of 2015, health providers interviewed conceded to lacking motivation for provision of youth friendly health services in their places of work, as this was not considered as part of their routine work (11). Even in terms of ART service provision in the clinics, focus is more on adults and pediatric services, thus leaving adolescents in the mix of service provision

Conceived to bridge the gap of providing improved ART services among ALHIV, teen clubs, differentiated services delivery model is implemented in selected health facilities in the country. This study therefore aims at assessing whether this model of care impacts on ART outcomes among adolescents, and whether it should be adopted on large scale for caring of adolescents living with HIV care.

Objectives of the Study

1.5. 1 Broad Objective

The broad objective of the study is to assess the role of teen clubs in improving ART outcomes among adolescents at Zingwangwa health centre in Blantyre district.

1.5.2 Specific Objectives

Specifically, the study aimed at assessing the following objectives

1. Compare viral load suppression levels among adolescents attending the teen club and those not attending teen club at the same health facility
2. Assess ART adherence among adolescents attending teen club and those not attending teen club at the facility

Research hypothesis

The study aims to assess the two hypotheses below

1. More adolescents attending teen club at the health facility will be virally suppressed compared with adolescents on ART at the same facility but not belonging to any teen club
2. Relatively more adolescents who are teen club members at the facility will be more adherent to ART compared with their counterparts who are not teen club members

CHAPTER 2: METHODOLOGY

2.1 Type of research study

The study employed a retrospective analytical cross sectional study design, aimed at assessing ART outcomes among adolescents aged 10 – 19 attending teen club at Zingwangwa Health Centre, compared against the same group of adolescents who do not belong to the teen club at the same facility, and by extension at any other health facility.

2.2 Study Place

The study was conducted at Zingwangwa Health Centre, a primary health care institution operating under Blantyre District Health Office. At 17.2 % (6), Blantyre city has the highest HIV prevalence among all other cities in Malawi. It is located approximately 5 km southwest of Blantyre City. According to the 2018 national population census, the facility has a catchment area of 150, 820 people and is one of the high HIV burden facilities providing ART services to 3,910 patients. Operating on an outpatient basis, the facility offers services such as Family Planning (FP), Maternal Child Health (MCH), Antiretroviral Therapy (ART), Early Infant HIV Diagnosis (EID), Nutrition and Rehabilitation, Laboratory Services, Antenatal Care, HIV Testing Services, Tuberculosis Screening, and Dental Therapy Services. The facility is supported by 36 trained medical personnel of various cadres and 73 support staff. They include 1 Medical Officer, 2 Clinical Officers, 24 Nurses, 9 Medical Assistants, 1 Environmental Health Officer, 47 Health Surveillance Assistants (HSAs), 7 HIV

Diagnostic Assistants (HDAs), 2 Laboratory Technicians, and 11 Support Staff (Clerks, Patient Attendants, Cleaners).

2.3 Study Population

For this study, we selected both young and old adolescents, aged 10 - 24 years attending the teen club at the health facility, and the comparator group was HIV positive adolescents who, during the entire duration of the study were on ART at the same health facility but did not belong to any teen club. These were identified by simply using available registers, which are ART and Viral Load, as well as MasterCards, and verified whether they within the category of adolescents as defined in this study. Various models of teen club admit adolescents who are outside the age bracket of 10-19 years, and some adolescents enrolled in the program are mothers. However, this study, excluded all adolescents falling outside the defined age bracket of 10 - 24. Additionally, all adolescent teen mothers in both the study and comparator groups were also excluded because they could have been on different ART regimen than adolescents who are not mothers. Furthermore, all adolescents who default, stop and die within the defined period of June 2019 to May 2020 shall be excluded from the study.

Considering the defined age bracket of the adolescents to be enrolled in the study, most of adolescents weighing less than 25kg are expected to be on 2A, with those weighing more than 25kg expected to be on 2P, except in cases of contraindications, and if weighing more than 30kg, they are expected to be on 5A. The two ART regimens of 2P and 2A essentially contains the same combination of Lamivudine (3TC), Zidovudine (AZT) and Nevirapine (NVP), with weight the only determining factor for administration

2.4 Study Period

The study was planned to take place for a period of 15 months, i.e. from April 2019 to July 2020. This included period for proposal preparation and submission, data collection, analysis and reporting and dissemination. However due to reasons beyond the control of the principle investigator, study period was extend up to September 2020.

2.5 Sample Size

According to the Department of HIV and AIDS, as of March 2020, total number of clients alive on ART at Zingwangwa Health Centre was 3,318. Average registration for teen club at the facility was at 132. While data for actual number of adolescents currently on ART at the facility could not be adequately verified, spectrum data calculations indicated that as of March 2020, there were 421 ALHIV alive on ART at the facility. This meant approximately, about 289 ALHIV at the facility did not belong to the teen club run at the facility. It could therefore be concluded that this group did not belong to any other teen club considering that the nearest health facilities to Zingwangwa health Centre are not offering teen club services. For the adolescents not members of the teen club, we shall employ paired samples method to get 132 adolescents as controls in the study

In terms of sample size, for the two specific objectives, all enrolled ALHIV on ART for both teen club and non-teen club members were assessed for their outcomes in the year 2020 (From June 2019 to May 2020). This may be the case because of small sample size for both intervention and control groups

2.6 Data collection

A number of parameters were collected from the study. These included age and sex of the respondents, their history of medication such as number of years on ART, adherence patterns; history for viral load, such as, whether they have had a viral load test done within a specified time frame and if they had results for the test disaggregated by result type.

We extracted data from medical records for all adolescents enrolled in the study. Such records included ART, adherence and viral load registers, attendance registers from the teen club at the facility. Data from Lab Management Information System (LIMS) was also extracted to complement and triangulate viral load data obtained from viral load registers. In all the data collection, excel sheets were designed and used for data collection from the sources as defined above, such as ART and Viral Load registers.

Throughout the duration of the study, the Principle Investigator worked closely with ART providers at the facility as well as providers of teen club services during data collection. An ART data clerk was also trained in abstraction of data for all the parameters in question.

2.7 Data Management and Analysis

The study utilized quantitative collection and analysis methods. All data were extracted from existing medical records at the study site as explained in the preceding section. An excel database was created and used for data storage as well as analysis. Other statistical packages such as STATA version 13 was used to analyze data imported from

excel. As already explained, this data primarily came from already existing registers such as Viral Load, ART, Adherence registers. For objective 1, we made use of the data collection tool attached as an annex at the end of this report, which mirrors the Lab Management Information System (LIMS) reporting window for measuring Viral Load levels among HIV infected individuals, with viral load level of more than 1000 copies being classified as High Viral Load (HVL) while levels of less than 1000 being classified as Low Detectable Levels (LDL). For Objective 2, the same data collection tool was modified and used to capture variables such as defaulters, stopped, deaths and adherence patterns for both sets of adolescents in the specified time frame of June 2019 – May 2020. These data were extracted from the Viral and High Viral Load registers, ART registers, ART master cards, Appointment registers, Defaulter Tracing Registers.

Statistical analysis such as standard t tests, Pearson's chi square were used to assess ART outcomes between the two study groups of adolescents.

2.8 Ethical consideration

Prior to commencement of the study, approval to conduct the study was obtained from the College of Medicine Research and Ethics Committee (COMREC). The Principle Investigator also sought permission from the Director of Health and Social Services for Blantyre, The District Health Research Committee as well as the Facility In charge for Zingwangwa Health Centre, to allow the study be done at the health Centre. To ensure confidentiality of data which has identifiers such as names, all files we mainly concealed names of the participants enrolled in the study, instead we used ART numbers and linked them to ART outcomes of interest.

2.9 Study Limitations/Constraints

There were a number of limitations/constraints that affected the study. Initially, data were expected to be collected for one calendar year of January to December 2018 for easy tracking. Secondly, most literature reviewed categorize adolescents as those aged 10-19 years, however say some literature also break adolescent categorization in two, namely younger adolescents (aged 10-19) and older adolescents (aged 20-24). The study period was however changed from Jan-Dec 2018 to June 2019 – May 2020. The main reason was unavailability of data for specific objective 1, which is about viral load outcomes. It was learnt during the data collection exercise that the Ministry of Health, with support from different partners made significant progress in testing of viral load has only been more prominent beginning the year 2019, which thus explained for unavailability of data prior to that period outcomes of interest. The study also belatedly included both younger and old adolescents because data were scanty for younger adolescents only.

Another limitation of the study is on lack of generalizability of study findings. The study was conducted at one site only and with limited sample size, which may be difficult to generalize study findings to other facilities that are also offering teen club services. Program reporting in the Ministry of Health does not have finer disaggregates for age and sex and this paused a challenge during analysis of data, especially to identify which age brackets were associated with issues like drug non adherent, viral load suppression or not. .

To address these challenges, with approval from COMREC, the study period was changed from January – December 2018 to June 2019 – May 2020, changed age bracket

of adolescents to include those aged 10 – 24 years. Additionally, the study enrolled all adolescents at the teen club, as well as all adolescents that are not teen clubs members at the facility for quantitative data collection on ART outcomes.

CHAPTER 3. STUDY FINDINGS

The chapter presents findings from analysis of secondary data that was collected from existing medical records at Zingwangwa health center, and relate directly to the main and specific objectives of the study

The study enrolled a total of 225 adolescents aged 10-24, who are on ART program at the health center. Out of this number, 143 were female adolescents while 82 were male adolescents. From the total sample size of 225, a total of 113 were attending teen club program (67 Female and 46 Male) while 112 (76 Females and 36 Males) adolescents not enrolled had not been exposed to any teen club program, but were on ART at the facility.

Table 1: Viral Load Analysis by Teen Club

teen	HVL	LDL	Total
No	44	68	112
	39.29	60.71	100.00
	55.70	46.58	49.78
Yes	35	78	113
	30.97	69.03	100.00
	44.30	53.42	50.22
Total	79	146	225
	35.11	64.89	100.00
	100.00	100.00	100.00

Pearson chi2(1) = 1.7058 Pr = 0.192

Our sample size in the study was 225 for both adolescents enrolled in teen club program and those not enrolled in teen club program, but on ART at the health facility. From the table above, results of data analysis showed more adolescents not enrolled in teen club had high viral load levels, when compared with adolescents not enrolled in teen clubs. On a different note, more adolescents enrolled in teen club were virally suppressed. The figure below further presents this information on viral load.

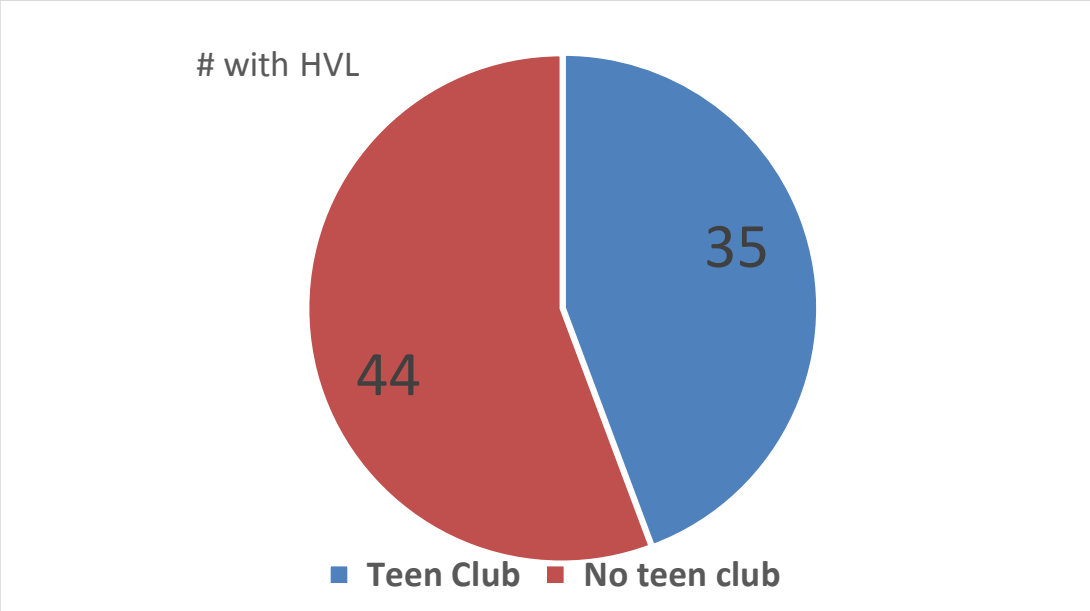

Figure 2: Number of adolescents with High Viral Load

Considering that we had paired samples for both cases and controls, Figure 2 above shows that more adolescents (44) who were not on any teen club program reported to have high viral load counts when compared with adolescents (35) who were on the teen club program at Zingwangwa Health center

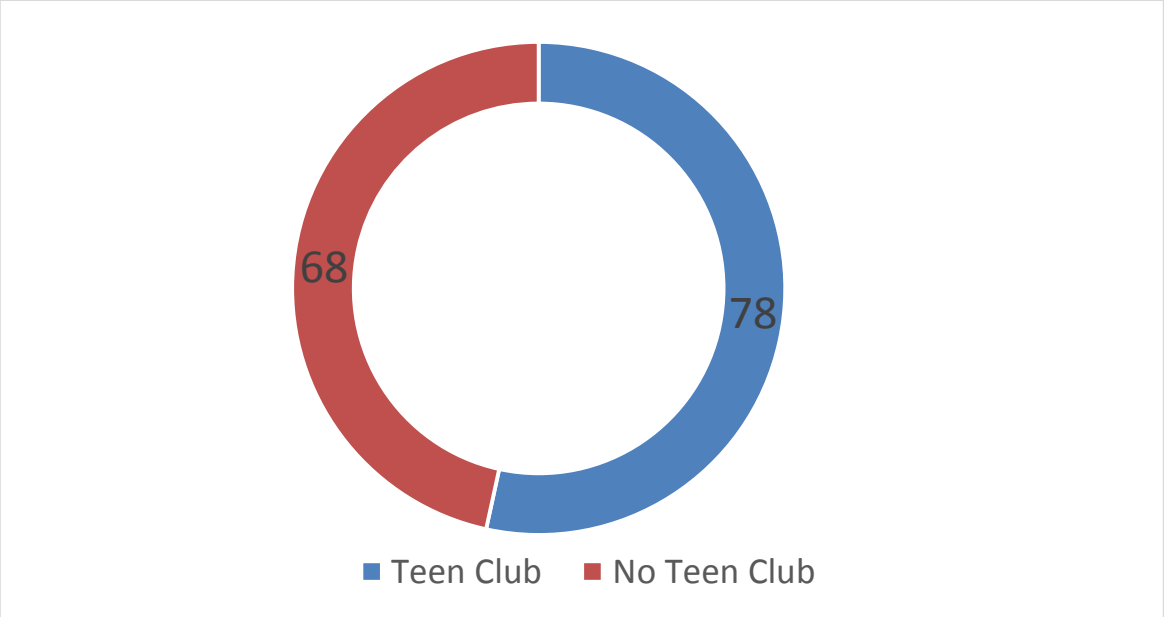

Figure 3: Viral Load suppression levels

The study also looked at viral load suppression levels for adolescents enrolled in teen clubs versus those not enrolled in teen clubs at the same health facility. 61% (68 out of 112) of adolescents not enrolled in teen club program had LDL, while 70% (78 out of 113) of adolescents enrolled in the teen club program reported LDL

Table 2: Adverse Outcomes

Teen Club	**outcome**		
	alive	**defaulted**	**Total**
No	107	5	112
	95.54	4.46	100.00
Yes	112	1	113
	99.12	0.88	100.00
Total	219	6	225
	97.33	2.67	100.00

Pearson chi2(1) = 2.7764 Pr = 0.096

We also assessed adverse ART outcomes among adolescents enrolled in teen club versus those not enrolled in teen club, but on ART at Zingwangwa Health center. The outcomes are not cumulative, but rather reported during the period of June 2019 – May 2020. It was reported that 5 out of the 112 adolescents not enrolled in teen club program but on ART at the facility had defaulted from ART program and couldn't be traced, which meant 107 of these adolescents were still alive on ART. For the adolescents enrolled in Teen club program at the facility, only one reported to have defaulted from ART program while 112 adolescents were still alive on ART at the end of data collection period for the study

Adherence Percentage

Table 3: T-Test for Adherence Percentage

Two-sample t test with unequal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
No	107	86.6729	1.314822	13.60062	84.06614	89.27966
Yes	112	89.69643	1.119532	11.84802	87.478	91.91486
combined	219	88.21918	.8646091	12.79505	86.51512	89.92324
diff		-3.023531	1.726878		-6.427769	.3807061

diff = mean(No) - mean(Yes) t = -1.7509

Ho: diff = 0 Satterthwaite's degrees of freedom = 210.005

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.0407 Pr(|T| > |t|) = 0.0814 Pr(T > t) = 0.9593

The study compared adherence level between adolescents exposed to teen club at the health centre against adolescents not exposed to the program, but were on conventional ART program at the same facility. Adherence levels were found to be higher, at about 90% compared with 87% for adolescents not exposed to teen club program.

3.1 OTHER RELEVANT FINDINGS

The results below focus on other findings from the data analysis which are not directly related to key objectives of the study, but may inform decision making regarding teen club programming versus adolescent care

Table 4: Sex by belonging to Teen Club or not

teen	sex F	M	Total
No	76	36	112
	67.86	32.14	100.00
	53.15	43.90	49.78
Yes	67	46	113
	59.29	40.71	100.00
	46.85	56.10	50.22
Total	143	82	225
	63.56	36.44	100.00
	100.00	100.00	100.00

Pearson chi2(1) = 1.7815 Pr = 0.182

The study enrolled a total of 225 adolescents aged 10 – 24 years old. Out of this number, 143 were adolescent females, representing about 64% of the total adolescents on ART at the health center while 82 were males, which is about 36% of all adolescents on ART at the facility. In terms of categorization, a total of 112 adolescents were attending teen club at the health center during the entire study period, and out of these adolescents, 76 were female, representing 68% of the total and the remaining 36 were males, thus representing 32% of total teen club members at the health facility. On the other hand, a total of 113 adolescents were alive on treatment at the facility, but did not belong to the teen club at the health facility nor at any other health facility. Distribution by sex shows that 67 were females, while 46 were males, representing about 59% and 41% respectively of the total adolescents alive on treatment, but not belonging to any teen club.

Results from data above shows that in both sets of adolescents, more adolescent females were on ART when compared to adolescent males. However, analysis of data for adolescents enrolled in teen clubs shows that sex does not significantly influence attendance in teen club or not, as shown by the *p-value* of 0.182.

Table 5: Age Distribution by Teen Club or Not

5a -> teen = No

age

Percentiles		**Smallest**		
1%	9	9		
5%	10	9		
10%	12	10	Obs	112
25%	17	10	Sum of Wgt.	112
50%	21		**Mean**	19.54464
	Largest		**Std. Dev.**	4.398789
75%	23	24		
90%	24	24	Variance	19.34934
95%	24	24	Skewness	-.9337679
99%	24	24	Kurtosis	2.673697

5b -> teen = Yes

age

Percentiles		**Smallest**		
1%	10	10		
5%	11	10		
10%	11	10	Obs	113
25%	13	10	Sum of Wgt.	113
50%	15		**Mean**	15.10619
	Largest		**Std. Dev**.	2.974183
75%	18	21		
90%	20	21	Variance	8.845765
95%	20	21	Skewness	.2298373
99%	21	21	Kurtosis	2.130576

Data collected from the study was analyzed to further understand age distribution for all the adolescents enrolled in ART program at the health facility, those attending teen club as well as those not attending teen club. For adolescents not attending teen club, median age was 21, while the mean age was about 19.5 years and standard deviation of 4. The youngest adolescent enrolled in ART program but not a teen club member was aged 9 years, with the oldest aged 24 years. For adolescents enrolled in teen club program at the facility, age range was between 10 and 21 years. Median age was 15 years, with a mean age also of 15, and a standard deviation for age of about 3. Age comparison for enrollment shows that younger adolescents on ART program were enrolled in the teen club program when compared to adolescents who were not in teen club (Refer to tables 5a and 5b above)

Table 6: Viral Load by Teen Club by Sex

6a. teen = No

sex	vl: HVL	vl: LDL	Total
F	34	42	76
	44.74	55.26	100.00
	77.27	61.76	67.86
M	10	26	36
	27.78	72.22	100.00
	22.73	38.24	32.14
Total	44	68	112
	39.29	60.71	100.00
	100.00	100.00	100.00

Pearson chi2(1) = 2.9456 Pr = 0.086

6b teen = Yes

sex	vl: HVL	vl: LDL	Total
F	25	42	67
	37.31	62.69	100.00
	71.43	53.85	59.29
M	10	36	46
	21.74	78.26	100.00
	28.57	46.15	40.71
Total	35	78	113
	30.97	69.03	100.00
	100.00	100.00	100.00

Pearson chi2(1) = 3.0943 Pr = 0.079

Tables 6a and 6b above further provides analysis of data for viral load suppression levels for adolescents enrolled in teen club program and those not enrolled in the teen club program, but based on sex. In both cases, it is evidently clear that more adolescent

females reported to have HVL when compared to adolescent males. In the first scenario, 45% of adolescent females not enrolled in any teen club program reported HVL as compared to 28% of their male counterparts. On the other hand, 37% of adolescent females enrolled in teen club program reported HVL compared with 22% of adolescent females. Conversely, more adolescent males reported LDL when compared with adolescent females. In the first case, 72% of male adolescent males not enrolled in teen club program reported LDL as opposed to 55% of adolescent females, while 78% of male adolescent enrolled in teen club program had LDL, compared with 63% of female adolescents. A test for statistical significance in adolescents not on teen club program and those enrolled in teen club program shows *p-values* of 0.086 and 0.079 respectively, suggesting there is no indication to suggest sex is associated with levels of viral load for the two sets of adolescents. However, the p-values in both cases which are closer to p-values of 0.05 show that increasing sample sizes could increase statistical significance of the findings

Adherence

Table 7: Age at initiation to ART

7a. Non Teen Club

initiation_age

Percentiles		**Smallest**		
1%	5	3		
5%	6	5		
10%	8	5	Obs	112
25%	11	6	Sum of Wgt.	112
50%	17		Mean	15.19643
	Largest		Std. Dev.	5.167186
75%	19.5	21		
90%	21	22	Variance	26.69981
95%	21	22	Skewness	-.6495946
99%	22	22	Kurtosis	2.070854

7b Teen Club

initiation_age

Percentiles		**Smallest**		
1%	3	3		
5%	4	3		
10%	4	3	Obs	113
25%	9	3	Sum of Wgt.	113
50%	10		Mean	10.09735
	Largest		Std. Dev.	3.497358
75%	12	16		
90%	16	16	Variance	12.23151
95%	16	16	Skewness	-.0312737
99%	16	16	Kurtosis	2.543782

Tables 8a and 8b presents results of age of ART initiation for the two sets of adolescents at the health centre. For adolescents not enrolled in teen club program, age

of ART initiation shows that the youngest adolescent was enrolled on ART program at the age of 3, with the oldest enrolled at age 22. Median and Mean age of ART enrollment for non-teen club adolescents were 17 and 15 years respectively, with a standard deviation of 5 years. For adolescents who were enrolled in teen club program at the facility, enrollment age in ART program was at 3 years, and the oldest adolescent was enrolled at age 16 years. The median and mean age for ART initiation for adolescents in ART program was 10 years respectively, with a standard deviation of 3.5years.

CHAPTER 4: DISCUSSION

The section below presents further discussion mainly relating to literature review for teen club model of care as well as result findings of the study in relation to the main and specific objectives of the study, as well as suggesting policy direction in implementation of the teen club model of ART care for adolescents

4.1 Viral Load

One of the main objectives of setting up teen club program as a model of care for adolescents is to attain improved ART outcomes, one of which is to improve viral load suppression levels. The study compared ART viral load suppression levels for 225 adolescents, 113 adolescents enrolled in teen club program at the facility while an equal number of adolescents, 112 were listed to have been on ART program at the facility, but did not belong to any teen club program. Out of the total 225 adolescents enrolled in the study, results showed that 79 adolescents had high viral load (HVL), representing 35% of total adolescents while 146 had low detectable levels (LDL) for viral load. For 112 adolescents not enrolled in any teen club program, 44 had high viral load levels, thus representing about 39% of the total non-teen club adolescents, while 68 had low detectable levels for viral load, which is about 61% of adolescents on ART but not in any teen club program

On the other hand, out of the 113 adolescents enrolled in teen club program at the health center, 35 adolescents had high viral load level, representing about 31% of total

adolescents in the program, while a total of 78 adolescent teen club members, representing about 69% had a low detectable viral load level.

From the analysis above in Table 3, results show that more adolescents enrolled in teen club at the health centre had low detectable levels of viral load. A total of 78 adolescents, representing 69% of the total adolescents in teen club program, reported to have low detectable levels of viral load, compared with 68 adolescents which was 60% of total adolescents not enrolled in any form of teen club program. Conversely, 39% of adolescents not enrolled in any teen club program reported to have high viral load levels, while 30% of adolescents belonging to the teen club at the facility had high viral load level.

However, despite the results showing that more adolescents enrolled in teen club program reported to have low detectable levels of viral load, while more adolescents in the study who didn't enroll in any teen club program had high viral load levels, a *p-value* of 0.192 and Pearson Chi^2 value of 1.7058 suggest there is no strong statistical evidence to suggest an association between viral load level and belonging to a teen club program or not.

The findings of the study regarding viral load suppression levels for adolescents attending teen club versus those not attending teen club are consistent with finding of similar studies conducted locally or abroad. An impact evaluation of teen club program in Eswatini (20) established that teen club program was effective in improving viral load suppression among adolescents attending teen club when compared with adolescents not attending teen program. The evaluation found that viral load suppression was higher among Teen Club members compared to non-members with

Teen Club members achieving 90.3 per cent against 88.60 per cent for non-members (22). There could have been a number or reasons responsible for better viral load outcomes among adolescents attending teen club program, and these included promotion of positive living resulting from ability to fight stigma, build self-confidence, self-esteem and self-efficacy.

4.2 Adherence Patterns

Poor retention in HIV care is a major public health challenge, and interventions to ensure persistent engagement in care are essential for sustaining substantial public health and individual benefits (26). Health care providers are faced with challenges emanating from high rates of non-retention among adolescents. Teen Club intervention was introduced at a tertiary HIV clinic in Malawi to provide ALHIV on ART with dedicated clinic time, peer mentorship, SRH education, ART refill, and support for positive living and treatment adherence. An evaluation of the teen club program in Malawi by Mackenzie R.K, et al found that the program adolescents not attending teen club program were less likely to be retained in care than those exposed to teen club program (16). Apart from reducing new HIV infections, adherence to ART as well as retention in care are determining factors for health outcomes among people who are infected with HIV. Retention in care is crucial for ART receipt and management of comorbid conditions; while ART adherence is necessary for viral suppression and prevention of HIV resistance and transmission (27- 29).

The study also assessed adverse outcomes for the adolescents enrolled in teen club program and those not enrolled in teen club program at Zingwangwa health center. The main outcome of interest in both cases was number of adolescents defaulting from the

ART program during the study period. Results from the study show that there were very few adolescents to have defaulted from ART program during the study program or number of adolescents retained in care during the period of the study, which was June 2019 to May 2020. For adolescents not enrolled in teen club program, a total of 5 out of 112 adolescents defaulted from ART program during the study period, representing 4% default rate while the default rate for adolescents attending teen club was 0.88%, as only one adolescent out of the enrolled 113 in the teen club program reported to have defaulted in ART program

Additionally, adherence to ART is a measure of a patient taking medication correctly, in the right doses, right frequency and right time. The patient is involved in deciding whether to take the medication as prescribed by health personnel or not. In this study, we assessed adherence patterns for adolescents enrolled in teen club program at the health facility, as well as adolescents not enrolled in teen club program at the same health facility. The results show that there was no statistical significant difference in adherence between youths in teen clubs and those not in teen clubs evidenced by p-value being greater than 0.05. (p-value = 0.0814). However, adherence level for youth in the teen club was higher (89.7%) when to compared to that of the youth not belonging to teen club (86.7%).

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

Literature reviewed indicates current models of care for HIV infected people are more tailored towards infants and adults, with little provided for adolescent care. Young people are often forgotten in national HIV and AIDS plans which typically focus on adults and children. Consequently, there are a lack of youth-friendly health services [30]. Despite availability of effective HIV treatment, adolescent-specific services are rarely available and often healthcare providers have little experience of providing services for young people. They may not understand the needs of adolescents living with HIV and may have judgmental attitudes towards those who are sexually active.

Studies done both locally and abroad indicate the important role teen clubs play in improving ART outcomes among adolescents living with HIV. For example, studies done in 160 clinics in Tanzania, Kenya, Mozambique and Rwanda indicated that adolescents who attended teen club programs were more likely to remain in care than those not enrolled in any teen club or youth friendly clinics that provided sexual and reproductive health including adolescent support groups [28]. Locally, a 2017 local study by Dignitas International on impact of teen clubs on retention at Tisungane Clinic at Zomba Central Hospital (ZCH), further showed that adolescents exposed to teen clubs were more likely to stay on treatment than those not exposed to ART treatment [31]. Adherence to ART is a key determinant of viral load suppression, hence more adolescents attending teen club program are also more likely to be virally suppressed.

Results from the findings of this study done at Zingwangwa Health Centre support findings from the studies done in other facilities in the country as well as outside the country. Adolescents attending teen club program at the health had higher viral load suppression levels than their counterparts not attending teen club program at the health center or any other facility. Similarly, adherence to ART for adolescents attending teen clubs at Zingwangwa Health center was higher than adherence pattern for adolescents on ART but not enrolled in any teen club program

In terms of policy direction, there is need for deliberate efforts to be put in place for ensuring conducive environment for providing care for HIV care for infected adolescents. There is growing need to include adolescent package in national policies and strategies for HIV care. We cannot talk about ending AIDS without talking about adolescent care. Other than overly relying on donor support, there should be deliberate efforts from the Ministry of health to support HIV care for adolescents. This could be inform of training more health care workers to better support the adolescents, ensuring such programs are adequately funded at every level of program implementation (at facility, district and national level), as well as continued collaboration with other key stakeholders to pool resources for HIV management in adolescents

To further improve management of the program, the study makes the following recommendations

- Consistent with the conceptual framework (RE-AIM) used in the study, there is need to put in place proper sustainability of the program. At the facility where

the study was conducted, the program was largely supported by a Non-Governmental Organization (NGO), EGPAF, with the Ministry of Health staff members availability for service provision dependent on payment of allowances. Furthermore, Dignitas International provided transport reimbursement and food rations to members of teen clubs at Tisungane clinic. Without such support, it is highly likely the program may discontinue once these programs phased out. This could be included as routine activities during formulation of Annual District Implementation plans

- There is also need to provide in house training or refresher courses for providers of the services. ART guidelines keep being revised but not all providers are trained in the revised guidelines. Facility in charges to prioritise these providers should there be a training opportunity. The DHO, through the ART coordinator can champion this
- There should be proper transitioning process from adolescent to adult care. If this process is not well managed, adolescents transitioning to adult care are highly likely to default from ART program because of lack of mental preparation to be enrolled in adult care

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APPENDICES

Appendix 1:VL data abstraction Tool

Facility Name	Region	Zone	District	Sex	DOB	Age (Yrs)	ART Start Date	Collection Date	Reason for Test	Date of Receiving Results	Date of Testing	Date Result Printed	Viral Load (LDL or HVL)	Result Given to clients or not

Appendix 2: Tools for Tracking Attrition/Adherence

ART #	Registration Date	Name	Current Age	Age at initiation	Visit Date	Number of Days missed	Pill Count	Doses Missed	Adverse Outcomes (Died, Stopped, Trans Out, Defaulted)	Outcome Date	Next Appointment

Appendix 3: Manuscript

Assessing the role of teen clubs in improving viral load outcomes among adolescents: A case of Zingwangwa Health Centre

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Abstract

Background

Achieving viral load suppression in Human Immune Deficiency Virus (HIV) infected patients is very key in reducing HIV transmission to sexual partners, HIV related illnesses and related deaths. Above all, is key in ending Acquired Immune Deficiency Syndrome (AIDS). Adolescents living with HIV/AIDS have lower viral load suppression levels compared to adults. Here, we report on effectiveness of teen clubs as a model of HIV care in viral load outcomes among adolescents enrolled in teen club program versus those not enrolled in teen club program at Zingwangwa Health Centre in Blantyre

Objectives

The main objective of the study was to determine the effectiveness of the teen clubs in improving viral load outcomes among the adolescents at Zingwangwa Health Centre

Methodology

A retrospective analytical cross sectional study design, among adolescents attending teen club program and those not attending teen club programs at Zingwangwa Health Centre. Data collected from 225 adolescents aged 10-24 years attending Anti-retroviral therapy (ART) Clinic, and belonging to teen club or not. Viral load results collected for period May 2019 to June 2020

Results

Relatively more adolescents (78), which was 69% attending teen clubs had low viral load levels than adolescents (68) not attending teen clubs, which was 60% of the total adolescents

in teen club program. More adolescents not attending teen clubs (44) had high viral load levels when compared with adolescents enrolled in teen club program at the facility (35). However, p- values of 0.192 and Pearson Chi^2 value of 1.7058 suggest there is no strong statistical evidence to suggest an association between viral load level and belonging to a teen club program or not

Conclusion

Teen club program has potential to improve ART outcomes among adolescents, considered as a key population in HIV programming. The program helps improve adherence and retention of adolescents in ART program, key in viral load status for patients enrolled in the program

Key Words: Adolescents, ART, Viral Load Levels

Introduction

Adolescents and young people represent a growing share of people living with HIV worldwide. In 2020 alone, about 410,000 young people between the ages of 10 to 24 were newly infected with HIV, of whom about 150,000 were adolescents between the ages of 10 and 19[1.]. Cumulatively in the same year, about 1.75 million adolescents between the ages of 10 and 19 were living with HIV worldwide. Adolescents account for about 5 per cent of all people living with HIV and about 11 per cent of new adult HIV infections. Out of these HIV infected adolescents, about 1.5 million, (88 per cent) live in sub-Saharan Africa. Outside of sub-Saharan Africa, the highest numbers of HIV-positive adolescents are in Asia and Latin America[2]

According the Malawi Demographic Health Survey (MDHS) of 2015-16, HIV prevalence for adolescents in Malawi was at 2.1%, with the prevalence rate being higher in adolescent girls (3.3%) than in boys (1%) and several reasons explain why girls are more vulnerable than boys, including biology, poverty and sexual abuse[3]

Despite many decades of continuous fight, Human immunodeficiency virus (HIV) is still one of the major global health issue, having claimed more than 35 million lives so far, with the WHO African Region in particular being the most affected with 25.7 million people living

with HIV in 2017[4,5]. Of the estimated 2.1 million adolescents aged 10 – 24 years living with HIV, 85% reside in sub-Saharan Africa[6]. However. The expansion of access to antiretroviral therapy (ART) has enabled more children vertically infected with HIV to survive into adolescence. Concern about the growing population of adolescents requiring lifelong ART has drawn increasing global attention on the need to better monitor this key population and to tailor treatment services

Previous studies have demonstrated that, even on treatment, adolescents exhibit the worst health outcomes compared to all other age groups[7]. In South Africa, which houses the world's largest ART programme, adolescents have repeatedly demonstrated the lowest rates of retention in care and viral suppression compared to other age groups[8]. In 2015, HIV was the second leading cause of mortality amongst adolescents globally and the leading cause of mortality in sub-Saharan Africa[9]. Poor adherence to ART is one of the most significant challenges in ensuring patients achieve and maintain viral load suppression[10]. For adolescents, the transitional life period is characterized by physiological, psychological and intellectual development, which poses very unique challenges to ART adherence. The management of adolescents on ART, therefore, has to take cognizance of the complexity of biological and psychosocial changes, which take place in the life of adolescents and its effects on adherence[11, 12]

Recognizing that adolescents living with HIV have worse adherence to ART, low retention in care, lower viral load suppression and high mortality rates, teen club program is one of the many differentiated service delivery models aimed at improving ART outcomes among adolescents enrolled in the program. Teen clubs provide comprehensive ART care in a confidential forum that reduces barriers to HIV care for adolescents. Services offered include ART refills, laboratory collection (Viral Load), psychosocial counselling, sexual reproductive health (SRH). Trained health providers in selected health facilities offer the services.

Zingwangwa Health Centre is among the facilities in Blantyre which provide teen club program

Methodology

Study Design

This is a retrospective analytical cross sectional study, aimed at assessing effectiveness of teen club program in improving viral load suppression levels among adolescents

Study Place

The study was conducted at Zingwangwa Health Centre, a primary health care institution operating under Blantyre District Health Office. At 17.2 % [6], Blantyre city has the highest HIV prevalence among all other cities in Malawi. It is located approximately 5 km southwest of Blantyre City. According to the 2018 national population census, the facility has a catchment area of 150, 820 people and is one of the high HIV burden facilities providing ART services to 3,910 patients. Operating on an outpatient basis, the facility offers services such as Family Planning (FP), Maternal Child Health (MCH), Antiretroviral Therapy (ART), Early Infant HIV Diagnosis (EID), Nutrition and Rehabilitation, Laboratory Services, Antenatal Care, HIV Testing Services, Tuberculosis Screening, and Dental Therapy Services. The facility is supported by 36 trained medical personnel of various cadres and 73 support staff. They include 1 Medical Officer, 2 Clinical Officers, 24 Nurses, 9 Medical Assistants, 1 Environmental Health Officer, 47 Health Surveillance Assistants (HSAs), 7 HIV Diagnostic Assistants (HDAs), 2 Laboratory Technicians, and 11 Support Staff (Clerks, Patient Attendants, Cleaners).

2.3 Study Population

The study selected both young and old adolescents, aged 10 - 24 years attending the teen club at the health facility, and the comparator group was HIV positive adolescents who, during the entire duration of the study were on ART at the same health facility but did not belong to any teen club. Recruitment of subjects enrolled in the study was done by using ART and Viral

Load registers as well as Master Cards, and triangulating the same data in Lab Management Information System (LIMS)

Study Period

The study was planned to take place for a period of 15 months, i.e. from April 2019 to July 2020. This included period for proposal preparation and submission, data collection, analysis and reporting and dissemination. However due to reasons beyond the control of the principle investigator, study period was extend up to September 2020.

Sampling and Data Collection

The study enrolled all adolescents, attending teen club and those not enrolled in teen club program, who were on ART at the health facility during the study period. This was because of small numbers of adolescents in that age group who were alive on ART at the health facility. According to records at the health facility, average registration for teen club at the facility was at 113. While data for actual number of adolescents alive on ART at the facility could not be adequately verified, spectrum data calculations indicated that as of March 2020, there were 321 Adolescents Living with HIV (ALHIV) alive on ART at the facility. This meant approximately, about 208 ALHIV at the facility did not belong to the teen club run at the facility. However, existing medical records at the facility showed in total, 225 adolescents were in ART program. For the adolescents not members of the teen club, we employed paired samples method to get 132 adolescents as controls in the study

Parameters collected from the study included age and sex of the respondents, their history of medication such as number of years on ART, adherence patterns; history for viral load, such as, whether they have had a viral load test done within a specified time frame and if they had results for the test disaggregated by result type.

Data was extracted data from medical records for all adolescents enrolled in the study. Such records included ART, adherence and viral load registers, attendance registers from the teen club at the facility.

Data Management and Analysis

The study utilized quantitative collection and analysis methods. All data were extracted from existing medical records at the study site. An excel database was created and used for data storage as well as analysis. Other statistical packages such as STATA version 13 was used to analyze data imported from excel. Statistical analysis such as standard t tests, Pearson's chi square were used to assess viral load suppression levels between the two study groups of adolescents at the health center.

Ethical consideration

College of Medicine Research and Ethics Committee (COMREC) approved this study. Additionally, permission was sought from the Director of Health and Social Services for Blantyre, The District Health Research Committee as well as the Facility In charge for Zingwangwa Health Centre, to allow the study be done at the health Centre.

Results

Out of the 225 adolescents aged 10-24 enrolled in the study, and on ART program at the health center, 143 were females while 82 were males. A total of 113 were attending teen club program (67 Female and 46 Male) while 112 (76 Females and 36 Males) adolescents not enrolled had not been exposed to any teen club program, but were on ART at the facility

Table 1. VL by Teen Club

teen	HVL	LDL	Total

```
          No |         44          68 |        112
             |      39.29       60.71 |     100.00
             |      55.70       46.58 |      49.78
-----------+----------------------+----------
         Yes |         35          78 |        113
             |      30.97       69.03 |     100.00
             |      44.30       53.42 |      50.22
-----------+----------------------+----------
       Total |         79         146 |        225
             |      35.11       64.89 |     100.00
             |     100.00      100.00 |     100.00

          Pearson chi2(1) =   1.7058   Pr = 0.192
```

Out of the total 225 adolescents enrolled in the study, results showed that 79 adolescents had high viral load (HVL), representing 35% of total adolescents while 146 had low detectable levels (LDL) for viral load. For 112 adolescents not enrolled in any teen club program, 44 had high viral load levels, thus representing about 39% of the total non-teen club adolescents, while 68 had low detectable levels for viral load, which is about 61% of adolescents on ART but not in any teen club program

On the other hand, out of the 113 adolescents enrolled in teen club program at the health center, 35 adolescents had high viral load level, representing about 31% of total adolescents in the program, while a total of 78 adolescent teen club members, representing about 69% had a low detectable viral load level.

From the analysis above in Table 3, results show that more adolescents enrolled in teen club had low detectable levels of viral load. A total of 78 adolescents, representing 69% of the total adolescents in teen club program, reported to have low detectable levels of viral load, compared with 68 adolescents, which was 60% of total adolescents not enrolled in any form of teen club program. Conversely, 39% of adolescents not enrolled in any teen club program reported to have high viral load levels, while 30% of adolescents belonging to the teen club at the facility had high viral load level

However, despite the results showing that more adolescents enrolled in teen club program reported to have low detectable levels of viral load, a *p-value* of 0.192 and Pearson Chi^2 value of 1.7058 suggest there is no strong statistical evidence to suggest an association between viral load level and belonging to a teen club program or not.

Table 2 Viral Load by Teen Club by Sex

2a. teen = No

sex	vl: HVL	LDL	Total
F	34	42	76
	44.74	55.26	100.00
	77.27	61.76	67.86
M	10	26	36
	27.78	72.22	100.00
	22.73	38.24	32.14
Total	44	68	112
	39.29	60.71	100.00
	100.00	100.00	100.00

Pearson chi2(1) = 2.9456 Pr = 0.086

2b teen = Yes

sex	vl: HVL	LDL	Total
F	25	42	67
	37.31	62.69	100.00
	71.43	53.85	59.29
M	10	36	46
	21.74	78.26	100.00
	28.57	46.15	40.71
Total	35	78	113
	30.97	69.03	100.00
	100.00	100.00	100.00

Pearson chi2(1) = 3.0943 Pr = 0.079

Tables 4a and 4b above further provides analysis of data for viral load suppression levels for adolescents enrolled in teen club program and those not enrolled in the teen club program, but based on sex. In both cases, it is evidently clear that more adolescent females reported to have HVL when compared to adolescent males. In the first scenario, 45% of adolescent females not enrolled in any teen club program reported HVL as compared to 28% of their male

counterparts. On the other hand, 37% of adolescent females enrolled in teen club program reported HVL compared with 22% of adolescent females. Conversely, more adolescent males reported LDL when compared with adolescent females. In the first case, 72% of male adolescent males not enrolled in teen club program reported LDL as opposed to 55% of adolescent females, while 78% of male adolescent enrolled in teen club program had LDL, compared with 63% of female adolescents. A test for statistical significance in adolescents not on teen club program and those enrolled in teen club program shows *p-values* of 0.086 and 0.079 respectively, suggesting there is no indication to suggest sex is associated with levels of viral load for the two sets of adolescents. However, the p-values in both cases which are closer to p-values of 0.05 show that increasing sample sizes could increase statistical significance of the findings

Discussion

Malawi has a significant youth and adolescent population, with nearly two-thirds of the country's estimated 19.1 million people under the age of 24[13]. Youth and adolescents, aged 10-24, account for about 50% of new HIV infections in Malawi, with prevalence higher among 15-17 year olds. Five percent of young women and 1.1% of young men aged 15-24 are living with HIV in the country, compared to a regional prevalence of 3.4% and 1.6% in East and Southern Africa, respectively[14, 15]

Adolescents represent an important target population to prevent new HIV infections and end AIDS. However, when compared to other age groups, adolescent living with HIV tend to be less adherent to ART as well as have lower viral load suppression levels. Many factors contribute to such pattern, and these include stress due to loss of parents and family members, stigma and discrimination.

Teen club model is aimed at providing dedicated care to HIV infected adolescents aged 10-24 years, by among other ways, build supportive environment, build self-esteem, develop, and reinforce good habits among the adolescents. Participants receive counselling and clinical,

psychosocial support as well as linked to other services such as sexual reproductive health, which mainly targets older adolescents.

Results from the adolescents enrolled in teen club at Zingwangwa Health Centre showed both improved ART adherence as well as viral load suppression among the adolescents attending the teen club program at the health facility when compared against the adolescents who were not attending the teen club program at the health center or anywhere else.

The study compared ART viral load suppression levels for 225 adolescents, 113 adolescents enrolled in teen club program at the facility while an equal number of adolescents, 112 were listed to have been on ART program at the facility, but did not belong to any teen club program. Out of the total 225 adolescents enrolled in the study, results showed that 79 adolescents had high viral load (HVL), representing 35% of total adolescents while 146 had low detectable levels (LDL) for viral load. For 112 adolescents not enrolled in any teen club program, 44 had high viral load levels, thus representing about 39% of the total non-teen club adolescents, while 68 had low detectable levels for viral load, which is about 61% of adolescents on ART but not in any teen club program

On the other hand, out of the 113 adolescents enrolled in teen club program at the health center, 35 adolescents had high viral load level, representing about 31% of total adolescents in the program, while a total of 78 adolescent teen club members, representing about 69% had a low detectable viral load level.

From the analysis above in Table 3, results show that more adolescents enrolled in teen club at the health centre had low detectable levels of viral load. A total of 78 adolescents, representing 69% of the total adolescents in teen club program, reported to have low detectable levels of viral load, compared with 68 adolescents which was 60% of total adolescents not enrolled in any form of teen club program. Conversely, 39% of adolescents

not enrolled in any teen club program reported to have high viral load levels, while 30% of adolescents belonging to the teen club at the facility had high viral load level

Limitations

There are several limitations in the study. The biggest limitation is the small sample size for study participants, which may affect generalizability of study findings especially on all adolescents who are enrolled on ART program across various health centres in Malawi. There could also be some variables such as education background, which may affect ART outcomes among adolescents, but data was not available in all the data sources used during the study

Conclusion and Recommendations

Teen club model has demonstrated that it appeals to adolescents living with HIV/AIDS and are enrolled in ART program. This is more relevant to a country like Malawi where adolescents lag behind in terms of accessing HIV testing and treatment. Results from the study at Zingwangwa shows that teen club program has the potential to improve adherence to ART as well as retention, which are important elements in achieving viral load suppression levels.

To further improve the program, the concept of teen club program should be embraced as a program within District Implementation Plans (DIP) and funded by the same resource basket received within directorate of Health Services at district level. Additionally, rolling out the program to more health facilities would greatly improve adherence and retention of adolescents in ART program, which would contribute to ending AIDS by ensuring more adolescents on ART are virally suppressed. A study that may include more health facilities that offer teen club program would also help generate generalizable results

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