OUTCOMES OF LATE INITIATION OF ANTIRETROVIRAL THERAPY IN UGANDAN HIV-INFECTED CHILDREN TREATED AT MILDMAY JAJJA HOME

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**OUTCOMES OF LATE INITIATION OF ANTIRETROVIRAL THERAPY IN UGANDAN HIV-INFECTED CHILDREN TREATED AT MILDMAY JAJJA HOME**

by

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RESEARCH DISSERTATION

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Table of Contents

[DEDICATION 2](#_Toc290909368)

[DECLARATION 2](#_Toc290909369)

[ACKNOWLEDGEMENT 2](#_Toc290909370)

[LIST OF TABLES 2](#_Toc290909371)

[LIST OF FIGURES 2](#_Toc290909372)

[LIST OF ACRONYMS AND ABBREVIATIONS 2](#_Toc290909373)

[SUMMARY 2](#_Toc290909374)

[CHAPTER 1: INTRODUCTION 2](#_Toc290909375)

[1.0 BACKGROUND 2](#_Toc290909376)

[1.1 PROBLEM STATEMENT AND RESEARCH QUESTIONS 2](#_Toc290909377)

[1.2 PURPOSE OF THE STUDY 2](#_Toc290909378)

[1.3. SPECIFIC OBJECTIVES OF THE STUDY WERE TO 2](#_Toc290909379)

[1.4 JUSTIFICATION OF THE STUDY 2](#_Toc290909380)

[CHAPTER 2: LITERATURE REVIEW 2](#_Toc290909381)

[2.0 INTRODUCTION 2](#_Toc290909382)

[2.1 BENEFITS OF ANTIRETROVIRAL TREATMENT (ART) 2](#_Toc290909383)

[2.2 GUIDELINES ON THE INITIATION OF ART IN CHILDREN 2](#_Toc290909384)

[2.3 BARRIERS TO TIMELY ACCESS OF ART IN CHILDREN 2](#_Toc290909385)

[2.4. CONCLUDING REMARKS 2](#_Toc290909386)

[CHAPTER 3: METHODOLOGY 2](#_Toc290909387)

[3.0 INTRODUCTION 2](#_Toc290909388)

[3.1 STUDY DESIGN 2](#_Toc290909389)

[3.2 STUDY SITE 2](#_Toc290909390)

[3.3 STUDY POPULATION 2](#_Toc290909391)

[3.4 SAMPLING AND SAMPLE SIZE 2](#_Toc290909392)

[3.5 DATA COLLECTION AND ANALYSIS 2](#_Toc290909393)

[3.5.1. Data collected 2](#_Toc290909394)

[3.5.2. Data analysis 2](#_Toc290909395)

[3.5. ETHICAL ISSUES 2](#_Toc290909396)

[CHAPTER 4: RESULTS 2](#_Toc290909397)

[4.0 INTRODUCTION 2](#_Toc290909398)

[4.1 SAMPLE CHARACTERISTICS 2](#_Toc290909399)

[4.1.1. Demographic characteristics of children on treatment 2](#_Toc290909400)

[4.1.2. Sociodemographic characteristics of care providers 2](#_Toc290909401)

[4.2. CLINICAL CHARACTERISTICS 2](#_Toc290909402)

[4.2.1. Bodyweights parameters 2](#_Toc290909403)

[4.2.2. CD4 Counts parameters 2](#_Toc290909404)

[4.2.3. Initiation of ART based on CD4 Count progression 2](#_Toc290909405)

[4.3. OUTCOMES MEASURED 2](#_Toc290909406)

[4.4. FACTORS ASSOCIATED WITH LATE INITIATION 2](#_Toc290909408)

[4.4.1. Children factors 2](#_Toc290909409)

[4.4.2. Care provider factors 2](#_Toc290909410)

[4.5. FACTORS ASSOCIATED WITH OUTCOMES OF LATE INITIATION 2](#_Toc290909411)

[CHAPTER 5: DISCUSSION OF RESULTS, CONCLUSIONS AND RECOMMENDATIONS 2](#_Toc290909412)

[5.0 Introduction 2](#_Toc290909413)

[5.1 Demographic profile of children on treatment and their care providers 2](#_Toc290909414)

[5.2 Outcomes of antiretroviral treatment in children on treatment 2](#_Toc290909415)

[5.3 Timing and factors associated with outcomes of late initiation of treatment 2](#_Toc290909416)

[5.4 Limitations of the study 2](#_Toc290909417)

[5.5 Conclusions 2](#_Toc290909418)

[5.6 Recommendations 2](#_Toc290909419)

[REFERENCES 2](#_Toc290909420)

[APPENDICES 2](#_Toc290909422)

# DEDICATION

This study is dedicated to: Jehovah El- Gibbor (the most high God), my loving husband Dr Freddie Ssengooba, and my beloved mother Mrs Felly Kisamba, whose tireless physical, emotional and spiritual support has enabled me to reach this far in my education.

To my lovely children Samuel- Jeff and Samuela- Freda Ssengooba for their sacrifice.

# DECLARATION

I, Jennifer Nabukenya Ssengooba, declare that the mini-dissertation hereby submitted to the University of Limpopo, for the degree of Master of Public Health, has not previously been submitted by me for a degree at this or any other university; that it is my work in design and execution, and that all material contained herein has been duly acknowledged.

……………………………

Signature

……………………………

Date

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All children’s care providers who participated in this study are sincerely appreciated for their voluntary participation.

**LIST OF TABLES**

|  |  |
| --- | --- |
| **Table** | **Page Number** |
| Table 1: Sociodemographic data of care providers | 25 |
| Table 2: Paired T-test for children baseline bodyweights and at 12th month | 26 |
| Table 3: Paired T-test for children bodyweights from 12th to 18th month | 26 |
| Table 4: Paired T for CD4 counts of children at 12th month - CD4 at baseline | 27 |
| Table 5: Paired T for CD4 counts of children at 18th month - CD4 at 12th month | 27 |
| Table 6: Outcomes of treatment assessed | 29 |
| Table 7: Percentage of adherence level | 30 |
| Table 8: Late and timely initiation by sex and age category | 30 |
| Table 9: Age and sex characteristics of those initiated late | 31 |
| Table 10: Characteristics of care providers by initiation of treatment | 31 |
| Table 11: Outcomes by initiation of treatment | 32 |
| Table 12: Child and care providers factors associated with adherence | 33 |
| Table 13: Child and care providers factors associated with hospitalisation | 34 |
| Table 14: Child and care providers factors associated with death by 12th month | 35 |
| Table 15: Child and care providers factors associated with death by 18th month | 36 |

**LIST OF FIGURES**

|  |  |
| --- | --- |
| Figures | Page No |
| Fig.1: Age parameters of children in the sample | 23 |
| Fig.2: Distribution of children by gender and age category | 24 |
| Fig.3: Age parameters of care providers | 24 |
| Fig.4: Distribution of children by time of initiation of treatment | 28 |
| Fig.5: Time of initiation by age category | 28 |

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# LIST OF ACRONYMS AND ABBREVIATIONS

|  |  |
| --- | --- |
| Acronyms | Meaning |
| AIDS | Acquired Immune Deficiency Syndrome |
| ARV | Antiretroviral drugs |
| ART | Antiretroviral therapy |
| MoH | Ministry of Health of Uganda |
| WHO | World Health organization |

# 

# SUMMARY

INTRODUCTION: Antiretroviral therapy (ART) has been proven to significantly improve the quality and quantity of lives of patients infected with HIV. However, several barriers exist that prevent children from being initiated on treatment on time. Studies in adults have shown that the timing of treatment influence outcomes of ART; but little is known about this in children. Hence, the need for this study.

The purpose of this study was to characterize the outcomes of late initiation of ART in HIV- positive children seen at the Mildmay Jajja Home center.

METHODOLOGY: The study was a cross-sectional survey involving all children who were initiated at the Mildmay Jajja Home in 2005 and had had been on ART for at least 18 months. Two sets of data were collected, for the children on ART: their age and sex were recorded. In addition, based on the Ugandan clinical guidelines for ART, children were grouped into two groups; those 6 six years and below; and those above 6 years. Clinical variables recorded were baseline and repeated measurements of bodyweights, and CD4 counts; weight and CD4 counts at the time of initiation of ART, at 12 months and at 18 months. For the care providers: their age, gender, education level, relationship to the child was recorded. Three outcomes of treatment were assessed, adherence level by the 12th month on treatment; hospitalisation by the 12th month (during the first 12 months of treatment); and survival or death at by the 12th and 18th month on treatment.

RESULTS: In total, 114 children were included in the sample. Among them, 54.4% of children were initiated late. Based on age, children 6 years old and younger were more likely and significantly initiated late as compared to those over 6 years old as about 70% of them were actually initiated late. Based on sex, female children older than 6 years were significantly initiated late as compared to boys. The characteristics of care providers that were associated with children being initiated late were being male, less than 40 years old, with a primary school level of education, and not knowing their own HIV status.

With regard to outcomes of the treatment, adherence, hospitalisation, and survival were assessed. Overall, 59.4% of children achieved an adherence level of 90% or more; 17.3% of children had been hospitalised at least once; and the mortality was 17.5% during the 2 year period covered by the study. Adherence was influenced slightly by the timing of the start of the treatment since less than half (46.34%) of those initiated late achieved an adherence level of 90% or more as compared to over 53% among those initiated timely. Though there was not statistically significant difference, adherence was slightly better in children whose care providers were biological parents, whose HIV status was known as positive, and female. With regard to hospitalisation, children less than 6 years were significantly more hospitalised than the older ones; their care providers were relatives, not educated, and of unknown HIV status. Those initiated late were significantly more hospitalised than those initiated timely (63.15% versus 36.84%, p=0.03).

With regard to survival, the majority of children who died were over 6 years old, and female. The majority of their care providers were female, under 40 years old, and known HIV-positive. In children initiated late, the mortality was 50% (n=14) and 83.3% (n=6) respectively by the 12th and 18th month of treatment as compared to those initiated timely.

In conclusion, 54.4% of children were initiated late. Late initiation was associated with negative outcomes such as low adherence to treatment as less than half of them achieved a adherence level of 90% or more; hospitalisation as those initiated late were significantly more hospitalised than those initiated timely; and high mortality since among those who died, 50% and 83.3% of deaths occurred respectively by the 12th and 18th month of treatment among those initiated late. In order to minimize the probability that the majority of children are initiated late, a general awareness campaign should be directed at the general public so that they can be sensitized to the need to bring children to medical attention as soon as possible.

# CHAPTER 1: INTRODUCTION

## 1.0 BACKGROUND

Uganda is a landlocked country, one of the 3 that make up that make up East Africa. With a population of 31 Million, it is estimated that there are 2 million children who are orphans as a result of HIV/AIDS. Although HIV/AIDS is the 5th leading cause of morbidity and mortality in children under 5 years in Uganda, it is known that, of the 30,000 children in need of ART, only about 9,800 received it by the end of the year 2006 (Uganda MOH, 2007). This study focuses on antiretroviral treatment outcomes in children.

## 1.1 PROBLEM STATEMENT AND RESEARCH QUESTIONS

Although it is known that antiretroviral treatment improves clinical outcomes in both adults and children, little is known about the impact of late initiation of ART in Ugandan children. From the studies conducted in Europe and Canada among adults, there are reports that late initiation is associated with negative outcomes such as the emergence of opportunistic infections, poor prognosis, and death (Philipps et al., 2001; Hoggs et al., 2001). This study aims to assess the outcomes of ART in children who were initiated later than the disease stage recommended in the national guidelines. Therefore, this study purports to answer the following questions:

* How does the late initiation of antiretroviral treatment affect its outcomes in children?
* What are the factors associated with these outcomes?

## 1.2 PURPOSE OF THE STUDY

To characterize the outcomes of late initiation of ART in HIV- positive children seen at the Mildmay Jaja Pediatric Home Center

## 1.3. SPECIFIC OBJECTIVES OF THE STUDY WERE TO

1. Establish the proportion of children who were initiated on ART later than they were supposed to, according to the official recommended Ugandan guidelines based on the CD4 counts measurements
2. Determine and compare the outcomes (adherence, hospitalisation, and survival) between those initiated timely and those initiated late
3. Assess the relationship between time of initiation of ART and socio-demographic factors of care providers
4. Determine factors associated with late initiation and outcomes

## 1.4 JUSTIFICATION OF THE STUDY

An understanding of how the late initiation of ART in HIV infected children impacts on outcomes is necessary in order to formulate recommendations for ART programs implementers. Based on the findings, it seems that it is important to motivate ART program implementers to recruit more children onto ART early enough so as to increase the benefits from the antiretroviral therapy.

# CHAPTER 2: LITERATURE REVIEW

## 

## 2.0 INTRODUCTION

The HIV pandemic is said to be the worst disaster that has ever affected mankind. Since its recognition in the early 1980s it has claimed millions of lives, disrupted several people’s health and livelihood and caused extensive social and economic damage to many countries. About 4 million people were living with HIV by the end of the year 2006 and 2.9 million people of whom 380,000 were children under the age of 15 years lost their lives due to the virus in the same year. With an estimated 4.1 million new infections occurring in the same year (UNAIDS, 2006).

## 2.1 BENEFITS OF ANTIRETROVIRAL TREATMENT (ART)

Regarding highly active antiretroviral therapy (HAART), which is the standard of care for people infected with HIV and which has also been proved to significantly improve the quality and quantity of lives of patients as well as reduce the transmission rate of the virus, the intervention only became widely available in the region in 2004. Prior to this, the drug- costs were too high for the Governments in this region to afford; a month’s supply of the drugs cost about USD 500 against a GDP of USD 320 in Uganda at that time, for example (USAID, 2001). The breakthrough came in with the provision of pre-paid ART services courtesy of mainly the Global Fund and PEPFAR initiatives and a general reduction in the drug- costs by many manufacturing pharmaceutical companies.

Soon after the launch of PEPFAR’s ‘3 by 5’ initiative in which the main objective was to reach 3 million people with ARVs by the end of the year 2005, several sites from low and middle- income countries reported survival rates of up to 95% and 85% in the 1st and 2nd years after initiation of ART, respectively. Other benefits included a general reduction in inpatient costs and duration of stay (Viani, 2004). However, these benefits can only accrue to those who have access.

## 2.2 GUIDELINES ON THE INITIATION OF ART IN CHILDREN

Whereas there was a significant improvement in ART- access in adults with the number of those receiving the therapy doubling from around 700,000 to around 1.3 million, that of children did not follow the same trend. Of the 2.3 million children aged 0−14 years living with HIV in 2006, almost 90% of whom live in sub-Saharan Africa, about 115,500 children had access to treatment by the end of 2006, representing a coverage of only about 15%. Compared to the estimates of 2005 in which about 75,000 children were receiving treatment, there was a 50% increase but this was against a very low baseline. 780,000 children worldwide are estimated to be in need of antiretroviral therapy representing 11% of the total need for antiretroviral therapy (UNAIDS, 2006)

Many impediments prevent children from accessing ART. These range from individual physical factors such as concomitant infections such as Tuberculosis whose therapy counteracts the effects of ARVS, to complex psychosocial issues and global ones such as economic and political instability, over which individuals have no control over. Many of the infected HIV children are also orphans with no adequate social support required in the day- to- day living of a child which is needed in the successful administration of ART (UNICEF, 2006).

## 2.3 BARRIERS TO TIMELY ACCESS OF ART IN CHILDREN

In order for the goals of ART to be achieved, guidelines on the use of the drugs involved have to be observed. These include issues like initiating the therapy at the recommended time, observing high levels of adherence- over 95%, avoidance of co- administration of drugs, foods or substances that may negatively interfere with the ARVS’ bioavailability among other restrictions. Regarding the point at which ART should be initiated, the decision is made based on both clinical and immunological criteria, of which the latter is the most important. The CD4- cell count is the most ideal immunological indicator of one’s state of immunity; hence the initiation of antiretroviral treatment is based on the level of CD4 counts. In resource- limited settings the recommended CD4 level for initiation is also < 200 cells/ mm³ for adults. The immunological criteria considered for infants and children differ from that of adults because of the rapid progress of the disease even at higher CD4- cell counts. In resource- limited settings (the category in which Uganda falls), ART should be initiated, based on WHO guidelines of 2006 as follows: a CD4 level of below 25% of the total lymphocyte- cell count, for infants (i.e. children below or equal to 11months of age), below 20% for children aged 12 to 35 months, below 15% for children aged 3 to 6 years and an absolute count below 200cells/mm³ for those aged 6 years and above. It has however been observed that infants below the age 6 months have a tendency of progressing to severe disease and death despite having a CD4- cell count of 25%, (the threshold for severe immunosuppression) for this age group; for this reason some authors recommended that ART be initiated earlier than the threshold for severe immunosuppression in this age- group. The shortcoming with the guidelines used in resource- limited settings is that they were derived from experiences and evidence obtained during the rolling- out of ART in high- income countries (WHO, 2006), and they are therefore not representative of patients in low and middle- income countries.

Regarding ‘late’ initiation of ART, using the immunological criteria, in particular the CD4- cell threshold values for severe immunosuppression, several studies have shown that this is associated with poor outcome in terms of recovery of the immune system, suppression of viral replication, and prevention of development of AIDS- defining illnesses and death after some time when a positive change would be expected (Hogg et al., 2001; Sterling et al., 2003; Ormaasen et al., 2003; Garcia et al., 2004; and Torti et al.,2007; Makadzange et al., 2010). In conclusion several studies have been done to try and determine various prognostic outcomes for different levels of baseline CD4- cell counts including the more generally recommended threshold levels for severe immunosuppression and for levels above and below it. Most of these studies have been carried out in resource- rich countries where higher baseline CD4- cell counts have been generally the norm than what is seen in resource- limited countries. There is therefore an urgent need to carry out studies in children in resource-limited settings to establish various outcomes at different baselines in order to develop appropriate guidelines for regarding the use of ART for effective control of the HIV epidemic in this age- group in this part of the world.

## 2.4. CONCLUDING REMARKS

Some studies have reported on the issue of late initiation of antiretroviral treatment; however few studies were found about late initiation of ART into children particularly in Uganda. The criteria for defining when initiation of ART can be classified as “early or timely” versus “late” are well presented and discussed in the literature. This study will build on this and provide data on the outcomes of ART depending on whether the initiation it was timely or late.

# CHAPTER 3: METHODOLOGY

## 

## 3.0 INTRODUCTION

This chapter describes the processes and techniques used in the implementation of this study. It starts by describing the design of the study, and ends by outlining how ethical issues were handled.

## 3.1 STUDY DESIGN

This is a cross sectional study based on the review of patient’s records. The design was chosen because of its simplicity and its ability to aid in a rapid collection of data. Furthermore, it is easier to compare data among the two groups, those who were initiated early or in time and those were initiated late on ART as their data can be collected at the same time in this design. In this study *late initiation means that the patient was initiated onto ART at a CD4 level of below 250cells/mm³ for those children aged above 6 years of age; below 15% of the total lymphocyte count for children aged from 3 years to 6 years; below 20% for children aged from 35months to 12months, and below 25% for children aged 11months and below*. Early or recommended official level is 250cells/mm³ or above for those children aged above 6 years of age, 15% or above of the total lymphocyte count for children aged from 3years to 6 years, 20% or above, for those aged 35months to 12months of age.

## 3.2 STUDY SITE

Mildmay Jaja Home is a center that treats children (aged 0 to 18yrs) infected and affected with HIV/ AIDS as well training of others in the care thereof. A holistic approach of care including medical management of opportunistic infections and conditions such as cancers, nutritional and psycho- social rehabilitation is employed. ART is also included wherever possible. The care is carried out in various settings including an inpatient unit which has a bed capacity of 34, a daycare unit that cares for over slightly 60 children per day, rural community outreach unit which takes care of approximately 1,600 per fortnight and, an emergency outreach unit that runs a clinic among the internally displaced people (IDP). All the treatment costs for the children is free to the users due to the support and sponsorship from the Global Fund, the US Center for Diseases Control and other private sponsors.

## 3.3 STUDY POPULATION

All children who were initiated on ART between 1st January 2005 and 31st December 2006 at Mildmay Jajja’s Home. The participants were identified from the patients’ registers.

## 3.4 SAMPLING AND SAMPLE SIZE

The study was a census in which, the records of all patients meeting the inclusion criteria were included in the study. The inclusion criteria were that the patient should have been

* 0 to 18years
* Initiated and on ART between 1st January 2005 to 31st December 2006
* Having been on treatment for at least 12 months

It was expected that at least 100 records would meet the criteria to be included in the study.

## 3.5 DATA COLLECTION AND ANALYSIS

A team made of the investigator and two assistants (one a data specialist at the center and another, a student nurse) collected the data. The two assistants were trained by the investigator on the use of the data collection form. Data were collected between March to June 2009. Using a pre-designed and pre-tested data extraction form (see Appendix 2), the records were examined in order to extract the data described below.

### 3.5.1. Data collected

1. Sociodemographic variables: two sets of data were collected:
   * For the children on ART: their age and sex were recorded. In addition, based on the Ugandan clinical guidelines for ART, children were grouped into two groups; those 6 six years and below; and those above 6 years. This grouping was based on the normative criterion used for determining when to initiate ART based on the results of CD4 measurements as explained above. Sex was recorded as male and female.
   * For the care providers: their age, gender, education level, relationship to the child were recorded. Sex was recorded as above; based on their age, they were grouped into two age categories, those 40 years old and below versus those over 40 years old. Their education level was recorded from not educated, to primary, high school, to tertiary level of education. Their relationship to the child as dichotomized into, firstly, biological parents; secondly, relatives (uncles, aunts, …etc).
2. Clinical variables recorded were
   * For children: baseline and repeated measurements of bodyweights, and CD4 counts; weight and CD4 counts at the time of initiation of ART, at 12 months and at 18 months.
3. Outcomes: three outcomes were assessed:
   * adherence level by the 12th month on treatment; this was taken as recorded in the files
   * hospitalisation by the 12th month (during the first 12 months of treatment)
   * survival or death at by the 12th and 18th month on treatment

### 3.5.2. Data analysis

Data was checked, cleaned and entered into Excel before subjecting it to statistical analysis using Epi-Info. Descriptive statistics were calculated based on the types of data. Proportions and percentages were calculated for categorical data; while the mean and other measures of dispersion were determined for discrete and continuous variables. A two by two table was used to assess the relationship between dichotomous variables and a Chi-square test was performed when one variable had more than two categories. In particular, the association between the children and care providers ’characteristics and outcomes of interest, namely, adherence, hospitalisation and mortality were assessed in this fashion. The level of statistical significance was set at p<0.05.

## 3.5. ETHICAL ISSUES

The design of the study took into consideration the principles of distributive justice, autonomy and anonymity. Hence, patients were not identifiable by name but by a numerical identification number (patient file and study number) was used. Furthermore, information and patients’ files were available only to the study team and all documents were locked away when not in use.

Ethical clearance of the proposal was obtained from the MEDUNSA Campus Research and Ethics Committee. Written permission to carry out this study was sought and obtained from Data Management Team and the management of the Mildmay Centre as they also manage the Mildmay Jajja Home.

## 

# CHAPTER 4: RESULTS

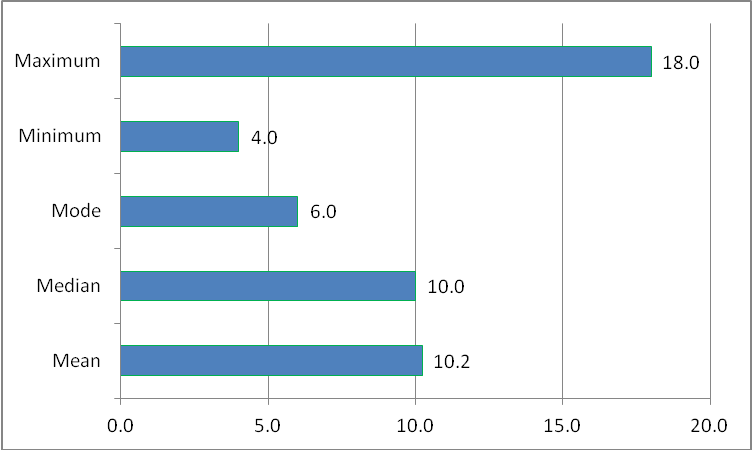
## 4.0 INTRODUCTION

This chapter gives a summary of results of the study. The data is presented in the form of narration, tables, graphs and figures.

## 4.1 SAMPLE CHARACTERISTICS

### 4.1.1. Demographic characteristics of children on treatment

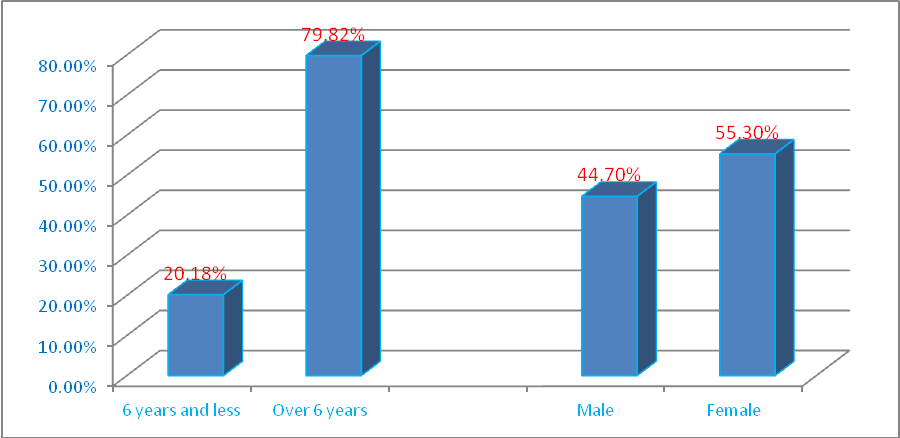
**4.1.1.1. Age parameters**



**Fig.1: Age parameters of children in the sample (n=114)**

The ages of children ranged from 4 to18 years, the mean age was 10.2±3.7; the median age was 10 years.

**4.1.1.2. Sex and age category distribution**

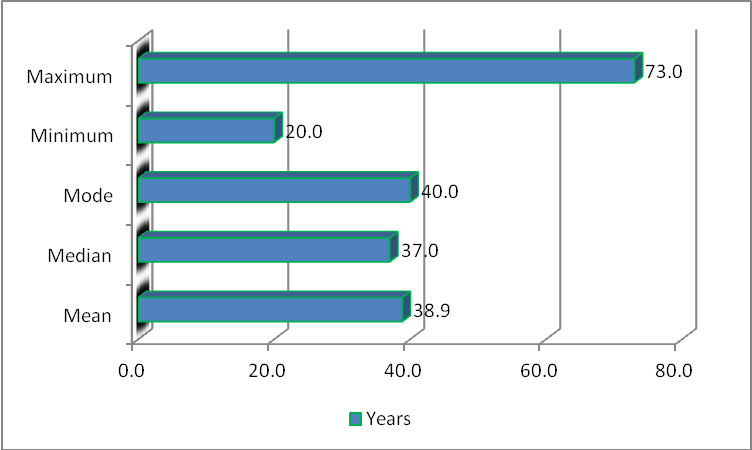


**Fig.2: Distribution of children by gender and age category (n=114)**

This figure shows that the majority of children were 6 years old, and female.

### 4.1.2. Sociodemographic characteristics of care providers

**4.1.2.1. Age parameters**



**Fig.3: Age parameters of care providers (n=102)**

The age of care providers ranged from 20 to 73 years; with a mean of 38.9±10.49 years, and a median age of 37 years.

**4.1.2.2. Other characteristics of care providers**

**Table 1: Sociodemographic data of care providers (n=102)**

|  |  |  |
| --- | --- | --- |
| **Variables** | **Frequency** | **Percent** |
| **Age category** |  |  |
| 40 years and over | 59 | 57.80% |
| Under 40 years old | 43 | 42.20% |
| Total | 102 | 100.00% |
| **Education level** |  |  |
| Not educated | 10 | 10.20% |
| Primary | 19 | 19.40% |
| High School | 40 | 40.80% |
| Tertiary | 29 | 29.60% |
| Total | 98 | 100.00% |
| **Sex** |  |  |
| Male | 19 | 18.80% |
| Female | 82 | 81.20% |
| Total | 101 | 100.00% |
| **HIV status** |  |  |
| Unknown | 20 | 19.60% |
| Positive | 46 | 45.10% |
| Negative | 36 | 35.30% |
| Total | 102 | 100.00% |
| **Relationship with child** |  |  |
| Biological parents | 45 | 44.60% |
| Relatives | 56 | 55.40% |
| Total | 101 | 100.00% |

The majoritycare providers were female, aged 40 years or less; most of them knew their HIV status, which was positive. The majority of them had a high school level of education, and were relative rather than biological parents to the child they tended to. There was a statistical significant difference among care providers based on their HIV status and level of education (Chi-square =17.3, DF=6, p=0.008); 40% of those with unknown HIV status were uneducated (8 out of 20), while 51.2% of those who knew their HIV status as being positive had a high school level of education (22 out of 39); and the majority (44.1%) whose HIV status was negative had a tertiary level of education (15 out of 34).

## 4.2. CLINICAL CHARACTERISTICS

### 4.2.1. Bodyweights parameters

The mean bodyweight at baseline was 19.07 ±7.97 kg as shown in table below.

**Table 2: Paired T-test for children baseline bodyweights and at 12th month**

n Mean StDev SE Mean

Weights by 12th month 102 23.080 9.030 0.894

Weights at baseline 102 19.074 7.971 0.789

Difference 102 4.007 2.368 0.234

95% CI for mean difference: (3.542, 4.472)

T-Test of mean difference = 0 (vs not = 0): T-Value = 17.09 P-Value = 0.000

There was an increase in the bodyweights from baseline. An additional 4.01 kg of bodyweights were gained by patients, a significant difference (p=0.0001).

Similarly, the mean bodyweight by the 12th month of treatment was 23.08 ±9.03 kg as shown in table below.

**Table 3: Paired T-test for children bodyweights from 12th to 18th month**

n Mean StDev SE Mean

Weights at 12th month 102 24.625 9.492 0.940

Weights at 18th month 102 23.080 9.030 0.894

Difference 102 1.544 1.272 0.126

95% CI for mean difference: (1.294, 1.794)

T-Test of mean difference = 0 (vs not = 0): T-Value = 12.26 P-Value = 0.000

There was an increase in the bodyweights from the 12th to the 18th month. An additional 1.54 kg of bodyweights were gained by patients, a significant difference (p=0.0001).

### 

### 4.2.2. CD4 Counts parameters

**Table 4: Paired T for CD4 counts of children at 12th month - CD4 at baseline**

n Mean StDev SE Mean

CD4 by 12th 108 659.1 391.2 37.6

CD4 at baseline 108 373.5 403.1 38.8

Difference 108 285.6 382.8 36.8

95% CI for mean difference: (212.6, 358.7)

T-Test of mean difference = 0 (vs not = 0): T-Value = 7.75 P-Value = 0.000

There was a significant increase in CD4 counts values from baseline to the 12th month (p=0.0001).

**Table 5: Paired T for CD4 counts of children at 18th month - CD4 at 12th month**

n Mean StDev SE Mean

CD4 at 18th 93 831.6 470.4 48.8

CD4 at 12th  93 662.1 391.6 40.6

Difference 93 169.5 379.1 39.3

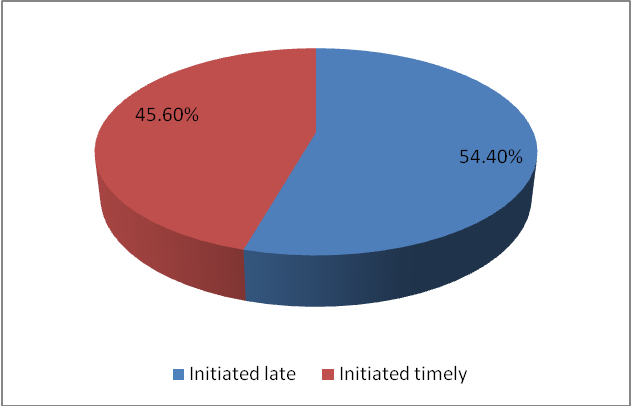
95% CI for mean difference: (91.5, 247.6)

T-Test of mean difference = 0 (vs not = 0): T-Value = 4.31 P-Value = 0.000

There was a significant increase in CD4 counts values from the 12th to the 18th month (p=0.0001).

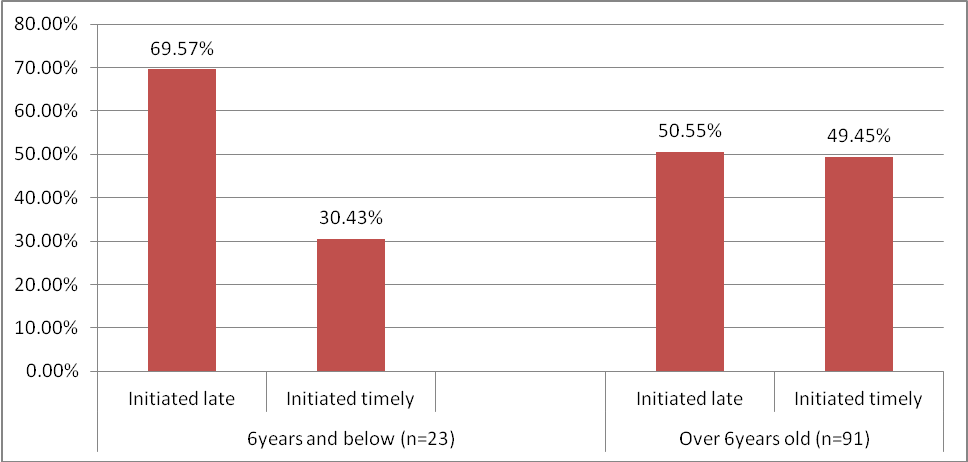
### 

### 4.2.3. Initiation of ART based on CD4 Count progression



**Fig.4: Distribution of children by time of initiation of treatment (n=114)**

The majority of patients were initiated late. The situation was different based on the age of the patients as shown in the following figure.



**Fig.5: Time of initiation by age category (n=114)**

In children younger than 6 years, the majority of them were significantly initiated late (p=0.001).

## 4.3. OUTCOMES MEASURED

**Table 6: Outcomes of treatment assessed (n=114)**

|  |  |  |
| --- | --- | --- |
| **Outcomes** | **Frequency** | **Percent** |
| **Adherence by 12 months** |  |  |
| Adherence level of 90% or more | 41 | 59.40% |
| Adherence level of less than 90% | 28 | 40.60% |
| Total | 69 | 100.00% |
| **Hospitalisation by 12 months** |  |  |
| Yes | 19 | 17.30% |
| No | 91 | 82.70% |
| Total | 110 | 100.00% |
| **Survival by 12 months** |  |  |
| Alive | 100 | 87.70% |
| Dead | 14 | 12.30% |
| Total | 114 | 100.00% |
| **Survival by 18 months** |  |  |
| Alive | 94 | 94.00% |
| Dead | 6 | 6.00% |
| Total | 100 | 100.00% |

With regard to hospitalisation, 17.3% had been hospitalised due to various illnesses. These included respiratory tract infections (119 episodes), skin conditions (108 episodes), malaria (55 episodes), gastro-intestinal disturbances (45), tuberculosis (18 episodes), and anemia (13 episodes). The most common conditions were pneumonia for respiratory tract infections; skin rashes for skin conditions; nausea and vomiting for gastro-intestinal disturbances.

The overall mortality was 17.5% (20 out of 114); it was 12.3% by the 12th month on treatment, and 6% by the 18th month.

Moreover, the above table shows that about 60% of children had achieved a high level of adherence of at least 90%. A further analysis on adherence data showed that it ranged from as low as 40% to as high as 98% as shown in the following table.

**Table 7: Percentage of adherence level (n=69)**

|  |  |  |
| --- | --- | --- |
| **Adherence level** | **Frequency** | **Percent** |
| 40 | 1 | 1.45 |
| 50 | 1 | 1.45 |
| 60 | 4 | 5.8 |
| 65 | 1 | 1.45 |
| 70 | 5 | 7.25 |
| 75 | 1 | 1.45 |
| 80 | 4 | 5.8 |
| 85 | 12 | 17.39 |
| 89 | 1 | 1.45 |
| 90 | 20 | 28.99 |
| 91 | 1 | 1.45 |
| 92 | 1 | 1.45 |
| 94 | 3 | 4.35 |
| 95 | 12 | 17.39 |
| 98 | 2 | 2.9 |

## This table shows that the majority of children (20 out of 69), whose adherence was documented, achieved an adherence level of 90%. A further 12 children had achieved an adherence level of 85%; while another group of 12 children had done better by achieving 95% level of adherence.

## 4.4. FACTORS ASSOCIATED WITH LATE INITIATION

## 4.4.1. Children factors

**Table 8: Late and timely initiation by sex and age category**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **Initiated late** | | **Initiated timely** | | **Total** | |
| **Sex** | **Frequency** | **Percent** | **Frequency** | **Percent** | **Frequency** | **Percent** |
| Male | 23 | 45.10% | 28 | **54.90%** | 51.00 | 100.00% |
| Female | 35 | **55.56%** | 28 | 44.44% | 63.00 | 100.00% |
| **Age category** |  |  |  |  |  |  |
| 6years and below | 16 | 69.57% | 7 | **30.43%\*** | 23.00 | 100.00% |
| Over 6years old | 46 | 50.55% | 45 | 49.45% | 91.00 | 100.00% |

\*p=<0.05

This table indicates that the majority of HIV-positive children on ART that were initiated late were female; with regard to age, children below 6 years were significantly initiated late as compared to those over 6 years old and adults (69.57% versus 30.43%; p=0.034)

**Table 9: Age and sex characteristics of those initiated late**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Age category** | **Male** | | **Female** | | **Total** | |
|  | Frequency | Percent | Frequency | Percent | Frequency | Percent |
| 6years and below | 8 | 50.00% | 8 | 50.00% | 16.00 | 100% |
| Over 6years old | 17 | 36.96% | 29 | **63.04%\*** | 46.00 | 100% |

\*p=<0.05

This table shows that female children that were over 6 years old were significantly initiated late as compared to those below 6 years and male children (p=0.02). A stratified analysis based on the initial CD4% and bodyweights did not show any significant difference between the groups.

## 4.4.2. Care provider factors

**Table 10: Characteristics of care providers by initiation of treatment**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **Initiated late** | | **Initiated timely** | | **Total** | |
| **Age category** | **Frequency** | **Percent** | **Frequency** | **Percent** | **Frequency** | **Percent** |
| 40 years and over | 28 | 47.46% | 31 | **52.54%** | 59.00 | 100.00% |
| Under 40 years old | 26 | **60.47%** | 17 | 39.53% | 43.00 | 100.00% |
| **Sex** |  |  |  |  |  |  |
| Male | 13 | **68.42%** | 6 | 31.58% | 19.00 | 100.00% |
| Female | 41 | 50.00% | 41 | 50.00% | 82.00 | 100.00% |
| **HIV status** |  |  |  |  |  |  |
| Unknown | 14 | **70.00%** | 6 | 30.00% | 20.00 | 100.00% |
| Positive | 20 | 43.48% | 26 | **56.52%** | 46.00 | 100.00% |
| Negative | 19 | 52.78% | 17 | 47.22% | 36.00 | 100.00% |
| **Education level** |  |  |  |  |  |  |
| Not educated | 6 | 60.00% | 4 | 40.00% | 10.00 | 100.00% |
| Primary | 14 | **73.68%** | 5 | 26.32% | 19.00 | 100.00% |
| High School | 17 | 42.50% | 23 | **57.50%** | 40.00 | 100.00% |
| Tertiary | 16 | 55.17% | 13 | 44.83% | 29.00 | 100.00% |
| **Relationship with child** |  |  |  |  |  |  |
| Biological parents | 21 | 46.67% | 24 | **53.33%** | 45.00 | 100.00% |
| Relatives | 32 | **57.14%** | 24 | 42.86% | 56.00 | 100.00% |

This table indicates that care providers who looked after children who were initiated late were likely to be under 40 years old, males, of unknown HIV status, with primary level of education and relatives to the child. However, there was no statistically significant difference between children looked after by biological parents and those looked after by relatives. On the contrary, there was a statistically significant difference among children looked after parents of unknown HIV status; 70% of these children were initiated late (p=0.04). This was also the case for children looked after by male care providers.

***4.4.3. Outcomes factors***

**Table 11: Outcomes by initiation of treatment**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Outcomes** | **Initiated late** | | **Initiated timely** | | **Total** | |
| **Adherence by 12 months** | **Frequency** | **Percent** | **Frequency** | **Percent** | **Frequency** | **Percent** |
| Adherence level of 90% or more | 19 | 46.34% | 22 | **53.66%** | 41.00 | 100.00% |
| Adherence level of less than 90% | 15 | 53.57% | 13 | 46.43% | 28.00 | 100.00% |
| **Hospitalisation by 12 months** |  |  |  |  |  |  |
| Yes | 12 | **63.16%** | 7 | 36.84% | 19.00 | 100.00% |
| No | 43 | 47.25% | 48 | 52.75% | 91.00 | 100.00% |
| **Survival by 12 months** |  |  |  |  |  |  |
| Alive | 51 | 51.00% | 49 | 49.00% | 100.00 | 100.00% |
| Dead | 7 | 50.00% | 7 | 50.00% | 14.00 | 100.00% |
| **Survival by 18 months** |  |  |  |  |  |  |
| Alive | 46 | 48.94% | 48 | 51.06% | 94.00 | 100.00% |
| Dead | 5 | **83.33%** | 1 | 16.67% | 6.00 | 100.00% |

This table shows that many children initiated timely achieved good level adherence as compared to those initiated late but the difference was not statistically significant (p>0.05). With regard to hospitalisation, those initiated late were significantly more hospitalised than those initiated timely (63.15% versus 36.84%, p=0.03). With regard to survival, at 12 months, the number of deaths was similar in the two groups; but by the 18th month, deaths occurred predominantly in those initiated late but the observed difference was not significantly significant.

## 

## 4.5. FACTORS ASSOCIATED WITH OUTCOMES OF LATE INITIATION

**4.5.1. Adherence**

**Table 12: Child and care providers factors associated with adherence**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **Adherence of 90% or more** | | **Adherence <90%** | | **Total** | |
|  | Frequency | Percent | Frequency | Percent | Frequency | Percent |
| Children Factors |  |  |  |  |  |  |
| **Age category** |  |  |  |  |  |  |
| 6years or less | 1 | 100.00% | 0 | 0.00% | 1 | 100.00% |
| Over 6 years | 39 | 57.35% | 29 | 42.65% | 68 | 100.00% |
| **Gender** |  |  |  |  |  |  |
| Male | 19 | **59.38%** | 13 | 40.63% | 32 | 100.00% |
| Female | 21 | 56.76% | 16 | 43.24% | 37 | 100.00% |
| Care provider factors |  |  |  |  |  |  |
| **Age category** |  |  |  |  |  |  |
| Under 40 years old | 21 | 56.76% | 16 | 43.24% | 37 | 100.00% |
| 40 years and over | 17 | **65.38%** | 9 | 34.62% | 26 | 100.00% |
| **Sex** |  |  |  |  |  |  |
| Male | 7 | 53.85% | 6 | 46.15% | 13 | 100.00% |
| Female | 31 | **63.27%** | 18 | 36.73% | 49 | 100.00% |
| **HIV status** |  |  |  |  |  |  |
| Unknown | 5 | 33.33% | 10 | 66.67% | 15 | 100.00% |
| Positive | 19 | **73.08%** | 7 | 26.92% | 26 | 100.00% |
| Negative | 13 | 61.90% | 8 | 38.10% | 21 | 100.00% |
| **Education level** |  |  |  |  |  |  |
| Not educated | 2 | 25.00% | 6 | 75.00% | 8 | 100.00% |
| Primary | 8 | 88.89% | 1 | 11.11% | 9 | 100.00% |
| High School | 15 | 62.50% | 9 | 37.50% | 24 | 100.00% |
| Tertiary | 10 | 52.63% | 9 | 47.37% | 19 | 100.00% |
| **Relationship with child** |  |  |  |  |  |  |
| Biological parents | 19 | **73.08%** | 7 | 26.92% | 26 | 100.00% |
| Relatives | 18 | 50.00% | 18 | 50.00% | 36 | 100.00% |

This table shows that though adherence was not reported in more than one patient aged 6years or less, 57.4% of children over 6 years achieved a high level of adherence. There was no statistically significant difference based on the sex of the children.

Care providers that were female, aged over 40 years old, HIV-positive, and biological parents constituted the majority of those whose children achieved good adherence of 90% or more.

**4.5.2. Hospitalisation**

**Table 13: Child and care providers factors associated with hospitalisation by 12th month**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **Was hospitalised by**  **12th month** | | **Not hospitalised** | | **Total** | |
|  | Frequency | Percent | Frequency | Percent | Frequency | Percent |
| Children Factors |  |  |  |  |  |  |
| **Age category** |  |  |  |  |  |  |
| 6 years or less | 7 | **30.43%** | 16 | 69.57% | 23 | 100.00% |
| Over 6 years | 12 | 13.79% | 75 | 86.21% | 87 | 100.00% |
| **Gender** |  |  |  |  |  |  |
| Male | 9 | 18.37% | 40 | 81.63% | 49 | 100.00% |
| Female | 10 | 16.39% | 51 | 83.61% | 61 | 100.00% |
| Care provider factors |  |  |  |  |  |  |
| **Age category** |  |  |  |  |  |  |
| Under 40 years old | 8 | 14.55% | 47 | 85.45% | 55 | 100.00% |
| 40 years and over | 9 | **20.93%** | 34 | 79.07% | 43 | 100.00% |
| **Sex** |  |  |  |  |  |  |
| Male | 4 | **22.22%** | 14 | 77.78% | 18 | 100.00% |
| Female | 13 | 16.46% | 66 | 83.54% | 79 | 100.00% |
| **HIV status** |  |  |  |  |  |  |
| Unknown | 4 | **22.22%** | 14 | 77.78% | 18 | 100.00% |
| Positive | 6 | 13.64% | 38 | 86.36% | 44 | 100.00% |
| Negative | 7 | 19.44% | 29 | 80.56% | 36 | 100.00% |
| **Education level** |  |  |  |  |  |  |
| Not educated | 3 | **30.00%** | 7 | 70.00% | 10 | 100.00% |
| Primary | 3 | 16.67% | 15 | 83.33% | 18 | 100.00% |
| High School | 7 | 17.95% | 32 | 82.05% | 39 | 100.00% |
| Tertiary | 4 | 14.81% | 23 | 85.19% | 27 | 100.00% |
| **Relationship with child** |  |  |  |  |  |  |
| Biological parents | 6 | 13.95% | 37 | 86.05% | 43 | 100.00% |
| Relatives | 12 | **22.22%** | 42 | 77.78% | 54 | 100.00% |

This table shows that children under 6 years were significantly more hospitalised than the older ones (30.43% versus 13.79%; p=0.04); the majority of them being female (10 out of 19).

The care providers of the majority of children that had been hospitalised by the 12th month were relatives to the child, aged under 40 years old, female, HIV-negative, with a primary level of education.**4.5.3. Survival**

**Table 14: Child and care providers factors associated with death by 12th month**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **Died by 12th month** | | **Survived by 12th month** | | **Total** | |
|  | Frequency | Percent | Frequency | Percent | Frequency | Percent |
| Children Factors |  |  |  |  |  |  |
| **Age category** |  |  |  |  |  |  |
| 6years or less | 2 | 8.70% | 21 | 91.30% | 23 | 100.00% |
| Over 6 years | 12 | **13.19%** | 79 | 86.81% | 91 | 100.00% |
| **Gender** |  |  |  |  |  |  |
| Male | 6 | 11.76% | 45 | 88.24% | 51 | 100.00% |
| Female | 8 | **12.70%** | 55 | 87.30% | 63 | 100.00% |
| Care provider factors |  |  |  |  |  |  |
| **Age category** |  |  |  |  |  |  |
| Under 40 years old | 9 | **13.56%** | 52 | 86.44% | 61 | 100.00% |
| 40 years and over | 5 | 11.63% | 38 | 88.37% | 43 | 100.00% |
| **Sex** |  |  |  |  |  |  |
| Male | 2 | 10.53% | 17 | 89.47% | 19 | 100.00% |
| Female | 12 | **13.41%** | 72 | 86.59% | 82 | 100.00% |
| **HIV status** |  |  |  |  |  |  |
| Unknown | 4 | **22.22%** | 14 | 77.78% | 18 | 100.00% |
| Positive | 6 | 13.64% | 38 | 86.36% | 44 | 100.00% |
| Negative | 4 | 19.44% | 29 | 80.56% | 33 | 100.00% |
| **Education level** |  |  |  |  |  |  |
| Not educated | 3 | **30.00%** | 7 | 70.00% | 10 | 100.00% |
| Primary | 0 | 0.00% | 19 | 100.00% | 19 | 100.00% |
| High School | 5 | 12.50% | 35 | 87.50% | 40 | 100.00% |
| Tertiary | 3 | 10.34% | 26 | 89.66% | 29 | 100.00% |
| **Relationship with child** |  |  |  |  |  |  |
| Biological parents | 5 | 11.11% | 40 | 88.89% | 45 | 100.00% |
| Relatives | 8 | **14.29%** | 48 | 85.71% | 56 | 100.00% |

This table shows that the majority of children that died by the 12th month were female (8 out of 14), and over 6 years old (12 out of 14).

The care providers of the majority of children that died by the 12th month were relatives to the child, aged under 40 years old, female, HIV-positive, with a primary level of education.**Table 15: Child and care providers factors associated with death by 18th month**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **Died by 18th month** | | **Survived by 18th month** | | **Total** | |
|  | Frequency | Percent | Frequency | Percent | Frequency | Percent |
| Children Factors |  |  |  |  |  |  |
| **Age category** |  |  |  |  |  |  |
| 6years or less | 1 | 4.35% | 22 | 95.65% | 23 | 100.00% |
| Over 6 years | 5 | **5.49%** | 86 | 94.51% | 91 | 100.00% |
| **Gender** |  |  |  |  |  |  |
| Male | 3 | 5.88% | 48 | 94.12% | 51 | 100.00% |
| Female | 3 | 4.76% | 60 | 95.24% | 63 | 100.00% |
| Care provider factors |  |  |  |  |  |  |
| **Age category** |  |  |  |  |  |  |
| Under 40 years old | 5 | **8.47%** | 54 | 91.53% | 59 | 100.00% |
| 40 years and over | 1 | 2.33% | 42 | 97.67% | 43 | 100.00% |
| **Sex** |  |  |  |  |  |  |
| Male | 1 | 5.26% | 18 | 94.74% | 19 | 100.00% |
| Female | 5 | **6.10%** | 77 | 93.90% | 82 | 100.00% |
| **HIV status** |  |  |  |  |  |  |
| Unknown | 0 | 0.00% | 20 | 100.00% | 20 | 100.00% |
| Positive | 4 | **8.70%** | 42 | 91.30% | 46 | 100.00% |
| Negative | 2 | 5.56% | 34 | 94.44% | 36 | 100.00% |
| **Education level** |  |  |  |  |  |  |
| Not educated | 0 | 0.00% | 10 | 100.00% | 10 | 100.00% |
| Primary | 3 | **15.79%** | 16 | 84.21% | 19 | 100.00% |
| High School | 2 | 5.00% | 38 | 95.00% | 40 | 100.00% |
| Tertiary | 1 | 3.45% | 28 | 96.55% | 29 | 100.00% |
| **Relationship with child** |  |  |  |  |  |  |
| Biological parents | 3 | **6.67%** | 42 | 93.33% | 45 | 100.00% |
| Relatives | 2 | 3.57% | 54 | 96.43% | 56 | 100.00% |

This table shows that, though male and female children died in equal numbers, the majority of children that died by the 18th month were over 6 years old (5 out of 6).

The care providers of the majority of children that died by the 18th month were biological parents to the child, aged under 40 years old, female, HIV-positive, with a primary level of education.

A multivariate analysis of the above factors as predictors, and death as outcome at 12th and 18th month, did not show any factor that was significantly associated with the outcome.

# CHAPTER 5: DISCUSSION OF RESULTS, CONCLUSIONS AND RECOMMENDATIONS

## 5.0 Introduction

This chapter presents the discussions on the findings from the study, the conclusions and recommendations made based on these findings.

## 5.1 Demographic profile of children on treatment and their care providers

The majority of children of children were over 6 years old. This pattern has been consistently reported in many studies from Uganda. However the fact that the majority of children in this sample were female seems in contrast with reports from Malangu and Karamagi (2010) who reported that the majority of children enrolled into the ART were male. Overall, the immune status of children in this sample improved significantly from baseline to 12 months and even to 18 months as demonstrated by the increase in their CD4 counts. Clinically, their bodyweights also increased significantly from baseline to 12 and 18th month. These findings concur with results from Ethiopian and South African children (Memirie, 2009; Reddi et al., 2007)

With regard to care providers, they differed significantly based on their level of education and HIV status; in particular, the majority of them knew their status. Those with tertiary education were likely to be HIV-negative as compares to those with high school level of education. Among those whose HIV was known, the majority were HIV-positive. This is very encouraging as it shows that the efforts into implementing HIV Testing and Counseling seem to bear fruits. Moreover, knowing the HIV status of the care providers provides a unique opportunity to compare whether this has any influence on the outcomes of treatment of children they looked after. In this study, the majority of care providers were relatives; this may suggest that either the biological parents of the children had died, or were too sick to tend to their children, or had been not able to do so; but this was not investigated in this study.

## 5.2 Outcomes of antiretroviral treatment in children on treatment

Of the three outcomes measured, adherence was low as 60% of children had achieved a high level of adherence of at least 90%. However, it is comparable to figures previously by other investigators in Uganda (Musoke et al., 2006; Luyirika et al., 2006). This finding suggests that despite many years of experience with antiretroviral treatment, the issue of adherence is still not adequately addressed as it is still to find at least 80% or 90% of patients on ART adhering to treatment. This finding is consistent with reports from other settings (Glass et al., 2008; Talam et al., 2008; Do et al., 2010; Potchoo et al., 2010).

With regard to hospitalisation, the finding from this study shows that 17.3% of children were hospitalised. This figure is lower than reported by Puthanakit and colleagues (2007) in Thai children. This finding support the assertion that HIV is one the leading causes for hospitalisation in many countries. With regard to the survival of children on treatment, the overall mortality was 17.5%. This figure is higher than what was reported by Asfawesen et al. (2011) in a group of Ethiopian children as well as by Carter et al (2007) on a review or mortality data from many countries. He calculated an average of 9%. However, the figure reported from this study concurs with reports by [Wamalwa et al. (2010) who reported a figure of 13.4% in Kenyan children; and](http://www.ncbi.nlm.nih.gov/pubmed?term=%22Wamalwa%20DC%22%5BAuthor%5D) by Malangu and Karamagi (2010) who reported that annual mortality rates in Ugandan children on ART ranged from 9 to 25%. These findings support the view that antiretroviral treatment does save lives particularly in children since without it, it is estimated that 80% of HIV-Infected children would have died before their fifth anniversary (Penda et al, 2009).

## 5.3 Timing and factors associated with outcomes of late initiation of treatment

Many factors may contribute to late initiation of antiretroviral treatment in children. These include children or patient-related factors, health system factors, and care providers’ characteristics. Overall, 54.5% of children had been initiated late. The children factors associated with late initiation of ART were the female sex, and the old age of children. This study found that the majority (63%) of those initiated late were female children aged over 6 years. This finding suggests the need for qualitative studies to establish the reasons for this state of affairs. Data from this study suggest that initial CD4% and subsequent improvements did not show any difference between those who were initiated late taking into account the gender, and age of patients. With regard to care providers’ factors, this study found that care providers who looked after children who were initiated late were likely to be under 40 years old, males, with primary level of education, relatives to the child, and of unknown HIV status. However, there was no statistically significant difference between children looked after by biological parents and those looked after by relatives. On the contrary, there was a statistically significant difference among children looked after by care providers of unknown HIV status; 70% of these children were initiated late (p=0.04). This was also the case for children looked after by male care providers. The above findings concur with findings by other investigators as explained below. In Zambian children, Bolton-Moore and co-workers (2007) reported also that mortality was associated with young age; while Fleishman et al (2010) reported a figure of 43.1% of patients as being initiated late. Moreover, Sterne et al. (2009) reported that mortality was high among those initiated late.

The overall mortality of 17.3% reported in this study falls within the rage as calculated by Brinkhof and colleagues (2009) who reported that, in African programmes, the mortality ranges from 12 to 87%. The finding of this study suggests that early initiation is associated with better long-term survival as 83.3% of deaths by the 18th month were among those initiated late. This finding concurs with report by Severe et al (2010). Moreover, this study has shown that mortality by the 12th month was influenced more likely but not significantly by the education level of the care providers, as 30% of deaths occurred in children looked after by uneducated care providers. Deaths by 18th month occurred more in children whose care providers were HIV positive, with primary level of education and who biological parents to the child were. The above shows that data from this study did not provide enough evidence to identify risk factors associated with mortality in children on antiretroviral treatment but pointed out to the need to increase advocacy and general awareness among communities about the importance of bringing children to medical attention as soon as they are unwell.

The findings from this study did not show a statistically significant difference with regard to age and gender of the children who died; though there were slightly more female and those aged over 6 years who died. On the contrary, May et al (2010) reported that in Sub-Saharan Africa, early mortality in patients on ART include increasing age and male sex; while Lawn and co-workers (2008) suggested that mortality is strongly associated with the baseline CD4 counts of less than 50 cells/mul.

With regard to hospitalisation, this study showed that age and gender of the children on treatment had some influence as younger children (6 years and less) were significantly hospitalised than the older ones. It is also interesting to note that those who were initiated late were more likely and significantly to have been hospitalised and the majority of deaths by 18th month were among them. The care providers’ characteristics that influenced hospitalisation were their HIV status and their relationship to the child. Children cared for by relatives and uneducated care providers were more likely to be hospitalised although the difference was not statistically significant. Moreover, in line with reports from other investigators, pneumonia was one the most common reasons for hospitalisation (McNally et al., 2007). Additionally, the range of diseases reported among Ugandan children in this study is similar to what was reported by Schoeman and Pather (2009) in South African children. Given the wide range of diseases and infections that may affect children on ART, these findings suggest that a holistic approach to care is required.

With regard to adherence, although there was no statistically significant difference, only less than half of children initiated late achieved adherence level of 90% or more. There was no difference with regard to the age, and gender of children but children whose care providers were over 40 years old, female, HIV-positive and biological parents were more likely to have achieved high level of adherence. The findings from this study concur with reports from Togo where poor adherence in children on ART were associated with care providers of unknown HIV status, not biological parents, and living in individual setting (Polisset et al., 2009). Moreover, though the reasons for non-adherence were not investigated in this study, it is known that forgetfulness, travelling, cost of treatment, and adverse effects are the common reasons cited for not adhering to the treatment (Malangu, 2009; Potchoo et al., 2010). Further studies are needed in Ugandan children to establish the reasons for low adherence particularly in those who were initiated late.

## 5.4 Limitations of the study

Given the design of the study, some limitations were experienced such as missing data. Hence it was not possible to report on causes of deaths as this information was not found in the majority of files, some laboratory tests reports for CD4 counts and hemoglobin results. Moreover, other outcomes such as HIV or AIDS-defining illnesses and adverse effects were not assessed. It was not possible to ascertain whether the files of patients retrieved included also those who had been lost to follow-up.

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## 5.5 Conclusions

The purpose of this study was to characterize the outcomes of late initiation of ART in HIV- positive children seen at the Mildmay Jajja Home center. In doing so, this study established that 54.4% of children were initiated late. Among them children 6 years old and younger were more likely and significantly initiated late as compared to those over 6 years old as about 70% of them were actually initiated late. Based on sex, female children older than 6 years were significantly initiated late as compared to boys. The characteristics of care providers that were associated with children being initiated late were being male, less than 40 years old, with a primary school level of education, and not knowing their own HIV status.

With regard to outcomes of the treatment, adherence, hospitalisation, and survival were assessed. Overall, 59.4% of children achieved an adherence level of 90% or more; 17.3% of children had been hospitalised at least once; and the mortality was 17.5% during the 2 year period covered by the study. Adherence was influenced slightly by the timing of the start of the treatment since less than half (46.34%) of those initiated late achieved an adherence level of 90% or more as compared to over 53% among those initiated timely. Though there was not statistically significant difference, adherence was slightly better in children whose care providers were biological parents, whose HIV status was known as positive, and female. With regard to hospitalisation, children less than 6 years were significantly more hospitalised than the older ones; their care providers were relatives, not educated, and of unknown HIV status. Those initiated late were significantly more hospitalised than those initiated timely (63.15% versus 36.84%, p=0.03).

With regard to survival, the majority of children who died were over 6 years old, and female. The majority of their care providers were female, under 40 years old, and known HIV-positive. In children initiated late, the mortality was 50% (n=14) and 83.3% (n=6) respectively by the 12th and 18th month of treatment as compared to those initiated timely.

In conclusion, 54.4% of children were initiated late. Late initiation was associated with negative outcomes such as low adherence to treatment as less than half of them achieved a adherence level of 90% or more; hospitalisation as those initiated late were significantly more hospitalised than those initiated timely; and high mortality since among those who died, 50% and 83.3% of deaths occurred respectively by the 12th and 18th month of treatment among those initiated late.

## 5.6 Recommendations

1. Because it was not possible to establish in this study why the majority of those initiated late were female children aged over 6 years, there is a need for further studies to establish the reasons for this state of affairs;
2. Since the majority of children who died were looked after by care provider who were female, under 40 years old and HIV-positive, it is necessary that more material and psychological support should be provided to this group of care providers;
3. In order to minimize the probability that the majority of children are initiated late, a general awareness campaign should be directed at the general public so that they can be sensitized to the need to bring children to medical attention as soon as possible;
4. Given the overall low level of adherence, more research is needed to establish the reasons, obstacles, and facilitators of adherence in children based on the characteristics of their care providers.

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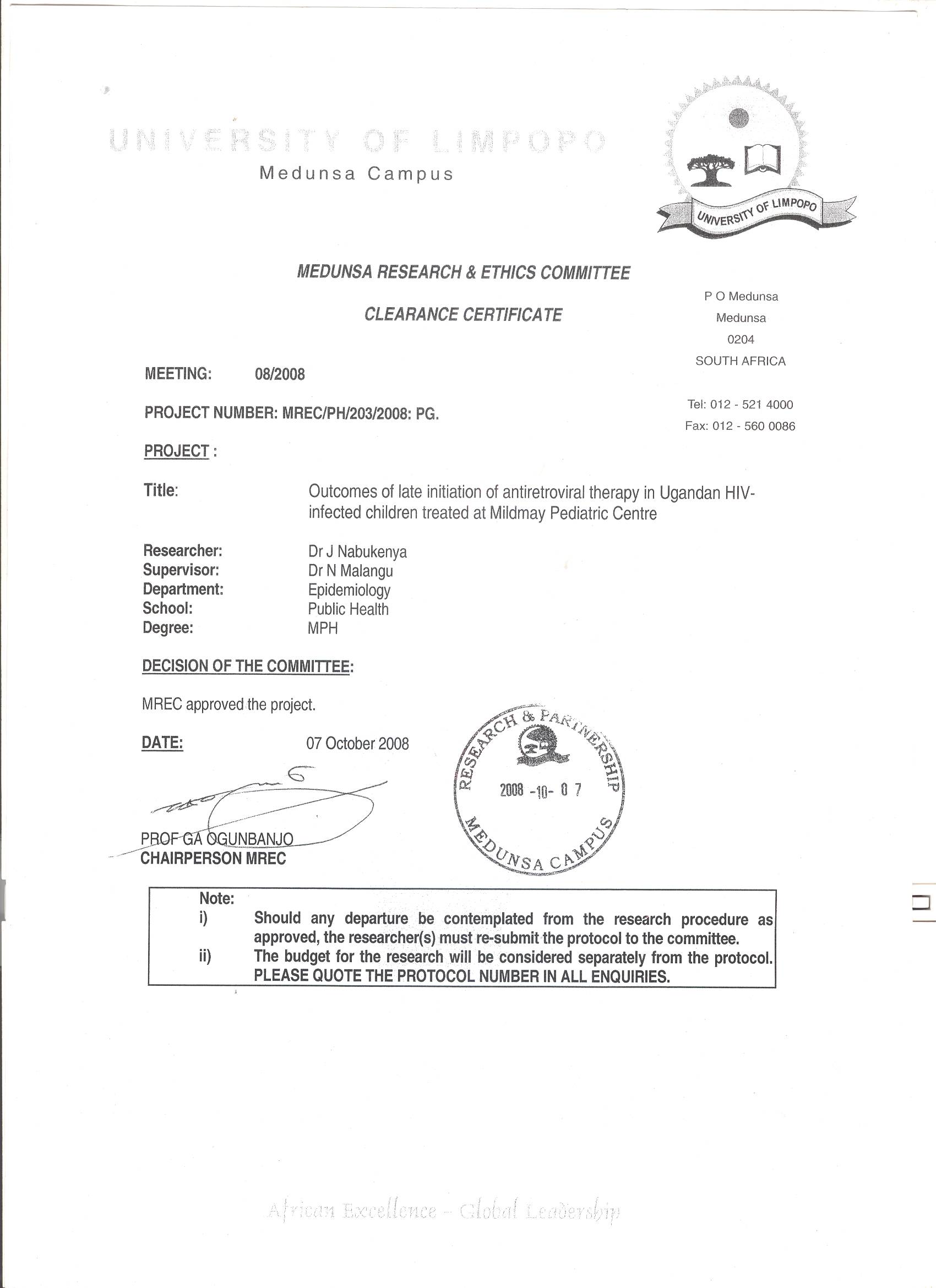
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# APPENDICES

Appendix 1: MREC ETHICS APPROVAL LETTER



Appendix 2: MILDMAY PERMISSION LETTER TO CARRY OUT STUDY

