Operational aspects of diagnosing and treating tuberculosis and HIV infection in Ugandan urban areas
Sendagire, I.

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Chapter 7

Ibrahim Sendagire, Frank Cobelens, Andrew Kambugu, Joseph Konde-Lule, Maarten Schim Van der Loeff

Adherence to combination anti-retroviral therapy in the first 12 months of therapy among urban patients in Kampala, Uganda
Adherence to combination anti-retroviral therapy in the first 12 months of therapy among urban patients in Kampala, Uganda

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*Corresponding author
Abstract

Background:
A high level of adherence to combination anti-retroviral therapy (cART) is critical for achieving viral suppression and good clinical outcomes. We assessed the levels of and factors associated with adherence in an urban cART programme setting.

Methods:
An observational study among adult (age ≥18 years) cART-naive patients initiating cART at three urban public primary care centres in Kampala, Uganda. We assessed adherence using a pretested questionnaire measuring 7-day self-reported adherence. The questionnaire was administered at unannounced home visits every three months for the first 12 months of therapy. Poor adherence was defined as having taken <90% of the dosages of cART. We assessed baseline factors associated with poor adherence through multivariable logistic regression, adjusting for confounders.

Results:
Between May 2008 and August 2010, we assessed adherence for 294 patients. The median age was 35 years (inter-quartile range (IQR: 30 to 40); 200 (68%) were female. The median CD4 count was 138 cells/μL (IQR: 67 to 188); 103 (35%) patients had CD4 count <100 cells/μL. Poor adherence was recorded for 22 patients (7%). Being in the lower wealth tertile was significantly associated with poor adherence, adjusted odds ratio (aOR): 2.8; 95% CI 1.1-7.1 as was receiving healthcare from one of the health centres that was located in a slum area (aOR: 3.8; 95% CI 1.4-9.9) and heavy alcohol consumption (aOR 3.2, 95% CI 1.1-9.2).

Conclusions:
Few patients show poor adherence to cART. Poverty and heavy alcohol consumption at baseline predict poor adherence, as do provider-specific factors and/or social conditions of a slum area. Assessing patients’ socio-economic circumstances before initiating cART should signal the need for enhanced patient-centred adherence counseling, adherence support and contact tracing in these patient populations.
Background

Combination anti-retroviral therapy (cART) is now widely available to many HIV patients worldwide after global campaigns for universal access to the life saving drugs.\textsuperscript{1,2} The goal of cART is to suppress plasma viral load to undetectable levels.\textsuperscript{3} Early cART reduces progression to AIDS and death.\textsuperscript{4,5} Good adherence to cART is critical in achieving virologic suppression.\textsuperscript{6,7,8,9} A detectable viral load during follow-up is an independent risk factor for death.\textsuperscript{3} Good adherence is also important in preventing the development of drug resistant HIV strains.\textsuperscript{10}

Barriers to adherence have changed during the course of time. In the era of limited cART coverage, cost, substance and alcohol abuse and treatment-related factors were the main barriers of adherence to cART.\textsuperscript{11,12,13} In the era of expanded access to cART, factors associated with adherence are varied and include: regular follow-up attendance,\textsuperscript{14} family support,\textsuperscript{15,16} type of regimen,\textsuperscript{17} medication adverse effects,\textsuperscript{18} education level,\textsuperscript{19,20} and self-efficacy.\textsuperscript{21,22,23} High levels of adherence to cART (>90\%) have been reported in both sub-Saharan Africa and Asia.\textsuperscript{24,25,26,27}

The World Health Organization (WHO) issues guidelines on eligibility for and use of cART which often form the basis for national guidelines.\textsuperscript{28,29} Uganda adopted these guidelines in 2003 and revised and updated them twice.\textsuperscript{30,31,32,33} Current evidence has resulted in recommendations for use of cART in several situations, including prevention of mother to child transmission of HIV.\textsuperscript{34,35} The implication of implementing these guidelines is that the number of patients eligible for ART will most likely double.\textsuperscript{36} The Ugandan Government is committed to enrolling an additional 100,000 people infected with HIV on ART in the year 2012/2013.\textsuperscript{37}

Recent studies have shown risky sexual practices among patients on cART;\textsuperscript{38,39,40} calling for greater need for higher adherence levels in order to avoid transmission of HIV to partners.\textsuperscript{41} Maintaining adequate levels of adherence to antiretroviral medications has proved challenging for many persons living with HIV.\textsuperscript{42} It is unclear what the adherence levels and the predictors of adherence are in urban primary care clinics where the bulk of patients is or will be cared for. We assessed the levels of adherence to cART and the
associated factors under routine conditions in urban public care centers in Kampala, Uganda.

**Methods**

*Study setting:*
We conducted an observational study in three urban primary care health centres in Kampala, Uganda, operated by Kampala Capital City Authority offering free outpatient services including comprehensive HIV care. The health centres were purposively selected considering geographical representation: Kiruddu is located in a semi-rural area, Kisenyi in an urban slum area while Kiswa is located in a semi-industrial, semi-residential area. Patients attending the health centres are self-referred or down-referred from the tertiary-care hospital in Kampala for continuation of care and treatment. HIV services at these health centres include HIV testing and counseling, basic health care, prevention and treatment; the centres follow a public health approach and receive clinical support from the Infectious Diseases Institute of the Makerere University College of Health Sciences. HIV-infected patients were started on ART according to the Ministry of Health ART treatment guidelines; criteria to start included WHO clinical stage 4 or CD4 count $\leq 200$ cells/$\mu$L. The treatment guidelines were revised twice during the course of the study, first in 2008 to remove stavudine as one of the drugs in a first line regimen; secondly in 2009 to increase the CD4 count cut-off for ART eligibility to $\leq 250$ cells/$\mu$L.

*Study design:*
We consecutively recruited adult ($\geq 18$ years) ART-naive HIV patients starting cART. Patients residing outside Kampala city or beyond a 16 km-radius from the city center were excluded from the study. A pre-tested semi-structured enrolment questionnaire was administered at baseline and a home visit adherence questionnaire was administered during unannounced quarterly visits, both by trained research assistants. Socio-economic and demographic data were collected at baseline. The questions in the quarterly interviews included frequency of medication, missed doses and reasons for missing the doses in the past seven days and detailed data on the patients’ circumstances in the past 48 hours. CD4 counts, type of regimen and dosing were extracted from the clinic records.
Patients who missed their clinic appointments were actively searched for in order to establish their vital status.

Data handling and statistical analysis:
All questionnaires and forms were checked once weekly for completeness and errors by one of the investigators (IS). Data were double entered into OpenClinica software (Akaza Research, Waltham, MA, USA) and checked for inconsistencies. Statistical analyses were carried out using Stata v10 (StataCorp, College Station, TX, USA).

Body Mass Index (BMI) (kg/m\(^2\)) was categorized according to the WHO International Classification of Adult BMI.\(^{43}\) Household wealth was derived from asset scores as based on the 2006 Uganda Demographic Health Survey and categorized into tertiles.\(^{44}\) The four question items from the “CAGE” questionnaire standard for screening alcohol dependence were used to assess alcohol consumption.\(^{45}\) Two positive responses were considered a positive test for heavy alcohol consumption. Functional performance was assessed using the Working, Ambulatory and Bedridden (WAB) scoring system.\(^{46}\)

The outcome of interest was poor adherence defined by taking fewer than 90% of the doses over the cumulative period over which patients were interviewed: recent studies have shown adherence levels to cART of lower than 95% are still sufficient to achieve virologic suppression.\(^{47,48}\) Association between poor adherence and exposure variables were assessed using cross tabulations, chi-squared tests and logistic regression. For multivariable analysis we entered into the model demographic, socio-economic and other variables that showed an association with poor adherence in the univariable analysis at \(p<0.25\), and kept them in the final model if they contributed to the model likelihood at \(p<0.05\), or confounded the association between the outcome and any of the other variables in the model.

Written informed consent before recruitment into the study was obtained from all study participants. The study received ethical approval from ethics review committees at the Makerere University School of Public Health and the Academic Medical Center, Amsterdam.
Results

Study population
Between May 15, 2008 and August 31, 2010, 407 ART-naive patients starting treatment were screened; 33 patients declined consent, 4 patients visited outside study days while another 4 patients had a language barrier (Figure 1). Of the 366 patients enrolled into the study, 328 initiated cART. The socio-demographic and baseline characteristics of the patients initiated and those not initiated on cART were previously published.49

Of the 328 patients initiated on cART, 34 were transferred out, died or were lost to follow-up before the first scheduled adherence measurement; in 294 patients (90%) adherence was assessed at least once. The median age was 35 years (inter-quartile range, IQR: 30,40); 200 (68%) were female. Two hundred-nine (71%) patients were employed, 125 (43%) were either married or cohabiting; and 94 (32%) had above primary level education. The median CD4 count was 138 cells/μL (IQR: 67,188); 103 (35%) had a CD4 count <100 cells/μL while 134 (46%) had CD4 count between 100 and 200 cells/μL. Hundred fifty patients (52%) had WHO clinical stage 2 disease; 25 (9%) had WHO clinical stage 4. Two hundred sixty-eight patients (92%) reported being able to perform their usual work normally. Almost all patients (281; 96%) took zidovudine-based regimens.

Adherence
Of 294 patients, adherence was assessed once only in 12, twice in 10, thrice in 41, and four times in 231. Mean adherence was calculated from all the available adherence data for each individual in the first 12 months of treatment; this was 97% (standard deviation 11%). Poor adherence was recorded for 22 patients (7%) as having taken their medicines less than 90% of the time during at least one of the adherence measurements, while good adherence (patients took at least 90% of the dosages at all available measurements) for 272 (93%). When we considered a cut-off level of 95%, 30 patients (10%) had poor adherence.

In univariable analysis poor adherence was significantly more frequent among patients who scored positive for alcohol dependence compared to those who did not (OR: 3.6; 95%CI: 1.4-9.2, Table 1) and among patients visiting Kisenyi health centre compared to
those who visited any of the other two health centres (OR: 3.1; 95%CI: 1.2-7.5). Having a
treatment supporter showed perfect prediction. Age, sex or other programme factors such
as duration of oral prophylaxis, living distance from the health facility, having disclosed
one’s HIV status and type of regimen were all not significantly associated with poor
adherence (Table 1).

Age, sex, household wealth, CD4 group, alcohol consumption and location of health
centre were considered for multivariable analysis (Table 1). Patients in the lower wealth
tertile were more likely to have poor adherence compared to patients in the middle and
upper tertile (adjusted OR (aOR): 2.8; 95% CI 1.1-7.1) as were patients visiting Kisenyi
health (aOR: 3.8; 95% CI 1.4-9.9) and heavy alcohol consumption (aOR: 3.2; 95% CI
1.1-9.2).

**Discussion**

The mean adherence during the first year of therapy in our study among urban Ugandan
HIV patients initiating cART was 97%. This finding is comparable to an earlier study by
Oyugi et al., carried out among urban patients in Kampala that found a mean adherence
level of 93%.10 The 7% of patients with poor adherence was lower than the 22% observed
by Abaasa et al. in a study carried out among patients receiving care in a large HIV care
centre in Kampala.50 Even when using the adherence level cut-off of 95% to distinguish
between poor and good adherence, the difference still remained, with 10% of patients in
our study having poor adherence. The observed difference between the two studies could
possibly be due to the different study designs employed by the studies. Abaasa et al.
reviewed medical records and used multiple imputations to cater for missing data while
our study used data prospectively collected with minimal data losses.

Our study findings showed that poverty was associated with adherence. Being in the
lowest tertile of wealth was significantly associated with poor adherence to cART. An
earlier study carried out in Kampala, also among urban HIV-positive patients reported
similar findings.51 Kisenyi health centre had clearly lower adherence levels compared to
any of the other two health centres. We hypothesized that this had something to do with
the health centre’s location in a slum area, while the other two were located in semi-rural,
semi-residential areas. We speculate that whereas the difference could be due to differing levels of clinical care, quality of service, unfavorable opening hours, inadequate human resources or health care worker behaviour, the difference could also be related to situational conditions in the slum area that are independent of poverty. This could well be true since asset scores may have limited power for detecting socio-economic differences as these are likely to give relatively homogeneous results within urban populations. It may be possible that patients in the slum areas have unstable housing (change residence a lot), to face a high opportunity cost of attending clinics, multiple childcare responsibilities, lack social support, face stigma or social isolation a lot. All these factors influence adherence negatively and more research into the role of these conditions in cART adherence is needed.

Heavy alcohol consumption was found to have a significant association with adherence at both univariable analysis and multivariable analysis. Other studies yielded similar findings in Uganda and elsewhere.\textsuperscript{52,53} It is possible that while under the influence of alcohol patients may miss taking their medications or lose the pills in case of having moved with the medicine. This may result in treatment interruptions. Patients who drink heavily may not feel confident to return to the health facility to ask for a refill. Such patients may also lack the much needed social support from the family and community members especially if the drinking has already been judged to be a nuisance to patient’s community. Living alone was shown to be associated with poor adherence in an earlier study in Kampala.\textsuperscript{54}

We did not find a significant association between adherence to cART and other socio-demographic and other programme factors as has been reported by other studies such as education level, marital status, family support, and cART regimen.\textsuperscript{12,56} The majority of patients were taking similar drug combinations, which were fixed dose combinations with simple dosing schedule. This possibly explains why the cART regimen was not associated with adherence in our study. Secondly the toxicity profile of the newer cART regimens is less than earlier regimens. Earlier cART regimens were complex and entailed taking different single formulation drugs, with frequent dosing which possibly affected adherence as observed in earlier studies.\textsuperscript{12,13}
Our study had limitations. We measured adherence using self-report method as opposed to objective measures of adherence. Recall bias could have been a possibility in this study. However, the method of assessing adherence we employed (self-report) was validated in patients taking cART in an earlier study in Kampala, and was found to be highly correlated with the objective measures of adherence.\textsuperscript{24} Possibly adherence to cART was over-reported because of the study setting (Hawthorne effect).\textsuperscript{57} Finally, our study only assessed baseline factors for their prediction of adherence with cART. Adherence is however, a complex phenomenon that may change over time, and for which determinants may be time-dependent as well. An analysis of adherence for individual observation periods that takes into account time-varying variables may yield additional risk factors for poor adherence or show these to explain the observed associations with poverty, clinic and alcohol consumption.

**Conclusion**

During the first year of antiretroviral therapy of urban Ugandan HIV patients, few patients showed poor adherence to cART. Poverty and heavy alcohol consumption at baseline predict poor adherence, as do provider-specific factors and/or social conditions of a slum area. Assessing patients’ socio-economic circumstances before initiating cART should signal the need for enhanced patient-centred adherence counseling, adherence support, social support and contact tracing as the need arises in these patient populations.

**Acknowledgements**

The authors acknowledge the contribution of Nadine Pakker (AMC-CPCD Foundation, Kampala) and Dr. Mesach Mubiru (Kampala City Council).
Figure 1 - Flow chart showing the patients included in the adherence to combination anti-retroviral therapy study, Kampala, Uganda 2008-2010.

Legend

cART = combination anti-retroviral therapy
Table 1. Associations of baseline socio-demographic, clinical and programme characteristics with adherence to combination antiretroviral therapy of 294 HIV-1 infected patients at three urban clinics, in adherence study, Kampala, Uganda 2008-2010

<table>
<thead>
<tr>
<th>Variable</th>
<th>Totals N (%)</th>
<th>Poor adherence</th>
<th>Univariable analysis</th>
<th>Multivariable analysis</th>
</tr>
</thead>
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<tr>
<td></td>
<td></td>
<td>Yes (%)</td>
<td>No (%)</td>
<td>unadjusted Odds ratio</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor adherence</td>
<td>Yes (%)</td>
<td>No (%)</td>
<td>95% CI</td>
</tr>
<tr>
<td>Age, years</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>18 – 29</td>
<td>73 (24.8)</td>
<td>7 (9.6)</td>
<td>66 (90.4)</td>
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</tr>
<tr>
<td>30-39</td>
<td>147 (50.0)</td>
<td>7 (4.8)</td>
<td>140 (95.2)</td>
<td>0.5</td>
</tr>
<tr>
<td>≥ 40</td>
<td>74 (25.2)</td>
<td>8 (10.8)</td>
<td>66 (89.2)</td>
<td>1.1</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>200 (68.0)</td>
<td>14 (7.0)</td>
<td>186 (93.0)</td>
<td>1</td>
</tr>
<tr>
<td>Male</td>
<td>94 (32.0)</td>
<td>8 (8.5)</td>
<td>86 (91.5)</td>
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<tr>
<td>Marital status</td>
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<td></td>
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<tr>
<td>Single</td>
<td>42 (14.3)</td>
<td>1 (2.4)</td>
<td>41 (97.6)</td>
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<tr>
<td>Married/cohabiting</td>
<td>125 (42.5)</td>
<td>8 (6.4)</td>
<td>117 (93.6)</td>
<td>2.8</td>
</tr>
<tr>
<td>Divorced/separated</td>
<td>127 (43.2)</td>
<td>13 (10.2)</td>
<td>114 (89.8)</td>
<td>4.7</td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (up to primary 7)</td>
<td>200 (68.0)</td>
<td>17 (8.5)</td>
<td>183 (91.5)</td>
<td>1</td>
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<tr>
<td>High (above primary 7)</td>
<td>94 (32.0)</td>
<td>5 (5.3)</td>
<td>89 (94.7)</td>
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<td>Household wealth</td>
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<td></td>
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<td></td>
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<tr>
<td>Middle and upper tertiles</td>
<td>188 (64%)</td>
<td>10(5.3)</td>
<td>178(94.7)</td>
<td>1</td>
</tr>
<tr>
<td>Lowest tertile</td>
<td>106 (36%)</td>
<td>12 (11.3)</td>
<td>94 (88.7)</td>
<td>2.3</td>
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<td>CD4 group, cells/μL (N=291)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>&lt; 100</td>
<td>103 (35.4)</td>
<td>5 (4.9)</td>
<td>98 (95.1)</td>
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- 86 -
<table>
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<th>WHO clinical stage (n=291)</th>
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<th></th>
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<td>Stage 1</td>
<td>32 (11.0)</td>
<td>2 (6.3)</td>
<td>30 (93.7)</td>
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<td>Stage 2</td>
<td>150 (51.5)</td>
<td>12 (8.0)</td>
<td>138 (92.0)</td>
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<td>0.3 – 6.1</td>
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<tr>
<td>Stage 3</td>
<td>84 (28.9)</td>
<td>6 (7.1)</td>
<td>78 (92.9)</td>
<td>1.2</td>
<td>0.2 – 6.0</td>
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<tr>
<td>Stage 4</td>
<td>25 (8.6)</td>
<td>2 (8.0)</td>
<td>23 (92.0)</td>
<td>1.3</td>
<td>0.2 – 10.0</td>
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<th>Duration of oral prophylaxis (n=291)</th>
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<tr>
<td>&lt; 1 month</td>
<td>23 (7.9)</td>
<td>2 (8.7)</td>
<td>21 (91.3)</td>
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<tr>
<td>≥1 to &lt;6 months</td>
<td>155 (53.3)</td>
<td>10 (6.5)</td>
<td>145 (93.6)</td>
<td>0.7</td>
<td>0.1 – 3.5</td>
</tr>
<tr>
<td>≥6 to &lt;12 months</td>
<td>56 (19.2)</td>
<td>7 (12.5)</td>
<td>49 (87.5)</td>
<td>1.5</td>
<td>0.3 – 7.8</td>
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<tr>
<td>≥12 months</td>
<td>57 (19.6)</td>
<td>3 (5.3)</td>
<td>54 (94.7)</td>
<td>0.6</td>
<td>0.1 – 3.7</td>
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<th>Signs of alcohol dependence</th>
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<th>Yes</th>
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<tr>
<td>No</td>
<td>249 (84.7)</td>
<td>14 (5.6)</td>
</tr>
<tr>
<td>Yes</td>
<td>45 (15.3)</td>
<td>8 (17.8)</td>
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<th>HIV disclosure (n=290)</th>
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<tr>
<td>No</td>
<td>16 (5.5)</td>
<td>2 (12.5)</td>
</tr>
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<td>Not known</td>
<td>4 (1.4)</td>
<td>0 (0.0)</td>
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<tr>
<th>Regimen type (n=290)</th>
<th>ZDV-EFV-3TC</th>
<th>ZDV-NVP-3TC</th>
<th>Non ZDV-based regimen</th>
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<tr>
<td></td>
<td>137 (47.2)</td>
<td>14 (10.2)</td>
<td>123 (89.8)</td>
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<tr>
<td></td>
<td>144 (49.7)</td>
<td>7 (4.9)</td>
<td>137 (95.1)</td>
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<td>9 (3.1)</td>
<td>1 (11.1)</td>
<td>8 (88.9)</td>
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<th>Distance to health centre</th>
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<tr>
<td></td>
<td>175</td>
<td>15</td>
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- 87 -
<table>
<thead>
<tr>
<th>Location of health centre</th>
<th>&gt;5km</th>
<th>Non-slum</th>
<th>Slum area</th>
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<tr>
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<tr>
<td></td>
<td>119</td>
<td>181</td>
<td>113</td>
</tr>
<tr>
<td></td>
<td>(40.5)</td>
<td>(61.6)</td>
<td>(38.4)</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>(5.9)</td>
<td>(4.4)</td>
<td>(12.4)</td>
</tr>
<tr>
<td></td>
<td>112</td>
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<td></td>
<td>(94.1)</td>
<td>(95.6)</td>
<td>(87.6)</td>
</tr>
<tr>
<td></td>
<td>0.7</td>
<td>1</td>
<td>3.1</td>
</tr>
<tr>
<td></td>
<td>0.3 – 1.7</td>
<td>1.2 – 7.5</td>
<td>1.2 – 7.5</td>
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<td></td>
<td>-</td>
<td>3.8</td>
<td>3.8</td>
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<tr>
<td></td>
<td>-</td>
<td>1.4 – 9.9</td>
<td>1.4 – 9.9</td>
</tr>
</tbody>
</table>

**Legend**

CI=confidence interval;
HIV=human immunodeficiency virus;
3TC=lamivudine;
ZDV=zidovudine;
EFV=efavirenz;
NVP=nevirapine.
## Supplementary table: Socio-demographic and baseline characteristics of 366 HIV-1 infected patients presenting at three urban clinics, Kampala, Uganda 2008-2010

<table>
<thead>
<tr>
<th></th>
<th>Initiated ART N (%)</th>
<th>Did not initiate ART N (%)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age in years</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median age (IQR)</td>
<td>34 (29-39)</td>
<td>37 (29-39)</td>
<td>0.550</td>
</tr>
<tr>
<td><strong>Age group</strong></td>
<td></td>
<td></td>
<td>0.870</td>
</tr>
<tr>
<td>18 - 29 years</td>
<td>85 (25.9)</td>
<td>11 (29.0)</td>
<td>-</td>
</tr>
<tr>
<td>30 - 39 years</td>
<td>163 (49.7)</td>
<td>19 (50.0)</td>
<td>-</td>
</tr>
<tr>
<td>≥ 40 years</td>
<td>80 (24.4)</td>
<td>8 (21.0)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td>0.419</td>
</tr>
<tr>
<td>Female</td>
<td>220 (67.1)</td>
<td>23 (60.5)</td>
<td>-</td>
</tr>
<tr>
<td>Male</td>
<td>108 (32.9)</td>
<td>15 (39.5)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Education level</strong></td>
<td></td>
<td></td>
<td>0.156</td>
</tr>
<tr>
<td>Primary 7 or less</td>
<td>222 (67.7)</td>
<td>30 (79.0)</td>
<td>-</td>
</tr>
<tr>
<td>Above primary 7</td>
<td>106 (32.3)</td>
<td>8 (21.0)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
<td>0.555</td>
</tr>
<tr>
<td>Single</td>
<td>49 (14.9)</td>
<td>4 (10.5)</td>
<td>-</td>
</tr>
<tr>
<td>Married/cohabiting</td>
<td>136 (41.5)</td>
<td>19 (50.0)</td>
<td>-</td>
</tr>
<tr>
<td>Divorced/Separated/widowed</td>
<td>143 (43.6)</td>
<td>15 (39.5)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Employment status</strong></td>
<td></td>
<td></td>
<td>0.013</td>
</tr>
<tr>
<td>Employed</td>
<td>226 (68.9)</td>
<td>18 (48.7)</td>
<td>-</td>
</tr>
<tr>
<td>Unemployed</td>
<td>102 (31.1)</td>
<td>19 (51.3)</td>
<td>-</td>
</tr>
<tr>
<td>Variable</td>
<td>Value 1</td>
<td>Value 2</td>
<td>p-value</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>----------------------</td>
<td>----------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Household wealth</td>
<td></td>
<td></td>
<td>0.830</td>
</tr>
<tr>
<td>Lowest tertile</td>
<td>120 (36.6)</td>
<td>12 (31.6)</td>
<td>-</td>
</tr>
<tr>
<td>Middle tertile</td>
<td>129 (39.3)</td>
<td>16 (42.1)</td>
<td>-</td>
</tr>
<tr>
<td>Highest tertile</td>
<td>79 (24.1)</td>
<td>10 (26.3)</td>
<td>-</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td></td>
<td></td>
<td>0.447</td>
</tr>
<tr>
<td>Median BMI (IQR)</td>
<td>20.7 (18.8 - 23.3)</td>
<td>20.1 (18.8 - 22.9)</td>
<td>-</td>
</tr>
<tr>
<td>BMI class</td>
<td></td>
<td></td>
<td>0.840</td>
</tr>
<tr>
<td>&lt; 18.5 kg/m²</td>
<td>71 (21.7)</td>
<td>7 (18.4)</td>
<td>-</td>
</tr>
<tr>
<td>≥ 18.5 - &lt; 23.0 kg/m²</td>
<td>167 (50.9)</td>
<td>22 (57.9)</td>
<td>-</td>
</tr>
<tr>
<td>≥ 23.0 - &lt; 25.0 kg/m²</td>
<td>47 (14.3)</td>
<td>4 (10.5)</td>
<td>-</td>
</tr>
<tr>
<td>≥ 25 kg/m²</td>
<td>43 (13.1)</td>
<td>5 (13.2)</td>
<td>-</td>
</tr>
<tr>
<td>Karnofsky’s score²</td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Median score (IQR)</td>
<td>90 (90 -90)</td>
<td>80 (80-90)</td>
<td>-</td>
</tr>
<tr>
<td>WHO clinical staging³</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage 1</td>
<td>36 (11.0)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Stage 2</td>
<td>156 (47.9)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Stage 3</td>
<td>103 (31.6)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Stage 4</td>
<td>31 (9.5)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>CD4 count in cells/μl¹</td>
<td></td>
<td></td>
<td>0.016</td>
</tr>
<tr>
<td>Median CD4 count (IQR)</td>
<td>132 (63 - 187)</td>
<td>151 (106 - 231)</td>
<td>-</td>
</tr>
<tr>
<td>CD4 group⁴</td>
<td></td>
<td></td>
<td>0.016</td>
</tr>
<tr>
<td>&lt; 100 cells/μl</td>
<td>124 (37.7)</td>
<td>6 (17.7)</td>
<td>-</td>
</tr>
<tr>
<td>100 - 199 cells/μl</td>
<td>147 (44.7)</td>
<td>15 (44.1)</td>
<td>-</td>
</tr>
<tr>
<td>200 - 349 cells/μl</td>
<td>51 (15.5)</td>
<td>11 (32.3)</td>
<td>-</td>
</tr>
<tr>
<td>≥ 350 cells/μl</td>
<td>7 (2.1)</td>
<td>2 (5.9)</td>
<td>-</td>
</tr>
<tr>
<td>City clinic offering ART</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Kiruddu</td>
<td>91 (27.7)</td>
<td>11 (28.9)</td>
<td></td>
</tr>
<tr>
<td>Kisenyi</td>
<td>123 (37.5)</td>
<td>18 (47.4)</td>
<td></td>
</tr>
<tr>
<td>Kiswa</td>
<td>114 (34.8)</td>
<td>9 (23.7)</td>
<td></td>
</tr>
</tbody>
</table>

**Legend**

ART=antiretroviral therapy  
BMI=Body Mass Index  
HIV=human immunodeficiency virus  
IQR=inter quartile range  
WAB=Working Ambulatory Bedridden  
WHO=World Health Organization

**Key**

1=missing employment status for 1 patient; 2=missing Karnofsky value for 15 patients; 3=data not available for the group that was not yet initiated on ART; 4=missing for 4 patients
References


