Original Research Article

Factors Associated with Adherence to Antiretroviral Drugs among HIV Positive Patients Attending Selected Comprehensive Care Centers in Semi-Urban, Kenya

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ABSTRACT

Management of Human Immunodeficiency Virus (HIV) is multipronged but its nerve centre is lifelong adequate and consistent use of antiretroviral drugs (ARVs). The overall objective of this study was to determine the factors associated with adherence to antiretroviral drugs among HIV positive patients attending selected Comprehensive Care Centres (CCC) in Kibwezi West Sub-county, Makueni County, Kenya. 385 respondents were recruited by systematic random sampling and interviewed. Three Focused Group Discussions (FGD) and two Key Informant Interviews (KII) were also conducted. Majority 364(94.5%) of the respondents were adherent to ARVs. There was a significant association between adherence to ARVs and gender {$\chi^2 (1) = 4.636$, $p<0.05$} with males likely to have poor adherence {OR 0.174 (95%CI 0.130, 0.233)}. Age was significantly associated with adherence {Likelihood Ratio $G^2 (4) = 10.693$, $p<0.05$} with older ages (above 65 years) likely to adhere. Living in the same house with someone on ARVs was significantly associated with adherence to ARVs {$\chi^2 (1) = 3.997$ $p=<0.05$} with respondents living in the same house with someone on ARVs likely to adhere {OR 0.144 (95%CI 0.103, 0.200)}. Majority of the respondents had adequate knowledge and positive attitude towards adherence to ARVs. FGDs and KIIs identified fear, stigma, not believing in oneself, participating in activities that hamper adherence such as drinking alcohol, ignorance, denial, lack of social support, busy work schedule poor attitude by health service providers, drug stock outs, distance and long waiting time as contributing to poor adherence to ARVs. In conclusion, constant education and awareness creation on importance of adherence to ARVs should be strengthened particularly during clinic appointments to maintain knowledge and enhance positive attitude towards adherence. Measures to improve adherence among the male and younger population should be strengthened.

Key Words: adherence, antiretrovirals age, gender, knowledge, attitude

INTRODUCTION

Management of Human Immunodeficiency Virus (HIV) is multipronged but the nerve centre of it is lifelong adequate and consistent use of antiretroviral drugs (ARVs). Poor adherence to ARVs is a significant public health concern in the control of (HIV) infection.

Understanding factors contributing to good adherence to ARVs is crucial in strengthening methods to improve adherence. Research shows that adherence to ARVs increases longevity and maintains an individual's optimal functionality in ways comparable to a healthier counterpart. [1] Heestermans *et al* posits that the success

of HIV treatment includes both access and adherence to ARVs by individuals enrolled into care. [2] In order to achieve optimum treatment outcomes, an adherence rate of 95% is required. [3] There have been great inroads by governments and international organizations such as the World Health Organization (WHO) in ensuring access to ARVs and free HIV treatment; however, drug adherence remains a significant challenge.

The general objective of the study was to determine the factors associated with adherence to antiretroviral drugs among HIV positive patients aged 15 years and above attending selected CCCs in Kibwezi West sub-county, Makueni County, Kenya. The specific objectives were: to determine the prevalence of adherence to ARVs; to determine socio-demographic and socioeconomic factors associated with adherence to ARVs; to determine behavioural factors associated with adherence to ARVs and to determine clinical and facility level factors associated with adherence to ARVs among HIV positive patients attending selected CCCs in

Kibwezi West sub-county, Makueni County, Kenya.

Counties in Kenya have varying levels of adherence rates among HIV infected adult population on ARVs. Makueni County houses the longest stretch of the busy Mombasa-Nairobi Highway. Kibwezi West sub-county has major administrative and commercial towns along the Mombasa-Nairobi highway that contribute significantly to the national burden of HIV/AIDS. The towns are also stop-overs for long-distance truck drivers; a key population in contributing significantly to high HIV prevalence along the transport corridor. Kenya's Vision 2030 describes HIV as one of the greatest threats to achieving socio-economic development. [4] Poor adherence to ARVs further makes socioeconomic development a mirage as it is associated with worse health outcomes. Notably, HIV/AIDS accounted for the sixth top ten causes of death by the year 2014. [5] Poor adherence accelerates progression to AIDS; thus, undermining United Nations' Sustainable Development Goal (SDG) 3.3 that aims at ending AIDS epidemics by 2030. [6]

Table 1: Literature review findings

Author(s)	Title	Type of article	Journal	Level of Evidence	Relevant Findings
Heestermans et al., 2016	Determinants of adherence to antiretroviral therapy among HIV-positive adults in sub-Saharan Africa: a systematic review.	Systematic Review and Meta-analysis	BMJ Global Health	Level V	Study shows an adherence estimate of 72.9%%. [2]
Soomro et al., 2019	Comparison of Antiretroviral Therapy Adherence Among HIV-Infected Older Adults with Younger Adults in Africa: Systematic Review and Meta-analysis	Systematic Review and Meta-analysis	AIDS and Behaviour	Level V	Older adults were more likely to adhere to ARVs than younger adults. [7]
Ammon et al., 2018	Factors impacting antiretroviral therapy adherence among human immunodeficiency virus-positive adolescents in Sub-Saharan Africa: a systematic review	Systematic Review	Public Health	Level V	Barriers to optimal adherence to ARVs were stigma, ARV side effects, forgetfulness and lack of assistance. Facilitators of optimal adherence were knowledge of HIV status, peer support and caregiver support. [8]
Croome et al., 2017	Patient-reported barriers and facilitators to antiretroviral adherence in sub-Saharan Africa	Systematic Review	AIDS	Level V	Barriers to optimal adherence to ARVs were forgetfulness, lack of access to adequate food, travelling, being outside the house, side effects, stigma and discrimination. Facilitators of optimal adherence were social support, disclosing one's HIV status, feeling healthier after taking ARVs, good relationship with health care provider, reminders and social support. [9]

Table 1 Continued...				
Mengesha *et al.,* 2020	The association between diagnosis disclosure and adherence to antiretroviral therapy among adolescents living with HIV in sub-Saharan Africa: a protocol for systematic review and meta-analysis	Systematic Review and Meta-analysis	*Sytematic Reviews*	Level V	Adherence to ARVs differs with knowledge of one's own HIV status and self-disclosure.[10]
Bijker *et al.,* 2017	Adherence to antiretroviral therapy for HIV in sub-Saharan Africa and Asia: a comparative analysis of two regional cohorts	Cohort Prospective Research	*Journal of International AIDS Society*	Level II	Sub-optimal adherence to ARVs was greater in the African cohort. In the African cohort predictors of sub-optimal adherence were male sex, younger age, use of concomitant medication and attending public facility. Patient-reported barriers to adherence to ARVs in the African Cohort were forgetfulness, scheduling demands, drug stock outs, stigma, depression, pill burden, regimen complexity, sickness or adverse events.[11]
Chirambo et al., 2019	Factors influencing adherence to antiretroviral treatment among adults accessing care from private health facilities in Malawi	Cross-sectional Qualitative Study	*BMC Public Health*	Level III	Patient factors as barriers to optimal adherence were forgetfulness, better perception of one's health, denial of one's HIV status, fear of disclosure on one's status, ARV side effects and ARV fatigue. Health system level factors contributing to suboptimal adherence include poor relationship between healthcare providers and clients, shortage of trained health care workers in ART, lack of finances and long distance to the facilities. Predictors of good adherence were psychological support, follow up visits after missed opportunities, positive relationship with health care providers, education, adequate information and counselling.[12]
Mukui *et al.,* 2016	Rates and Predictors of Non-Adherence to Antiretroviral Therapy among HIV-Positive Individuals in Kenya: Results from the Second Kenya AIDS Indicator Survey, 2012.	Cross-sectional Quantitative Study	*PLoS ONE*	Level III	Less than 10% of Kenyans in Nairobi County, Kenya's capital city were not adhering to ARVs reflecting a significant success in retention to care and treatment response.[13]
Rouhani *et al.,*2017	The role of social support on HIV testing and treatment adherence: A qualitative study of HIV-infected refugees in south-western Uganda.	Cross-sectional Qualitative Study	*Global Public Health*	Level III	Individuals with higher social support had better adherence.[14]
Agbaji *et al.,* 2015	Treatment Discontinuation in Adult HIV-Infected Patients on First-Line Antiretroviral Therapy in Nigeria.	Cross-sectional Quantitative Study	*Current HIV research*	Level III	Positive association between younger age and poor adherence.[15]
Semvua *et al.,* 2017	Predictors of non-adherence to antiretroviral therapy among HIV infected patients in northern Tanzania.	Cross-sectional Study	*PLoS One*	Level III	Poor adherence was associated with unemployment.[16]
Kim *et al.,* 2017	High self-reported non-adherence to antiretroviral therapy amongst adolescents living with HIV in Malawi: barriers and associated factors		*Journal of the International AIDS Society*		There was no association between sex and age and adherence.[17]
Adejumo *et al.,* 2015	Contemporary issues on the epidemiology and antiretroviral adherence of HIV-infected adolescents in sub-Saharan Africa: a narrative review.	Meta-analysis	*Journal of the International AIDS Society*	Level V	Older adolescents were more likely to have poor adherence than other age groups. lack of food, transportation costs, unaffordable treatment fees, low family purchasing power were associated with poor adherence.[18]

			Table 1 Continued...		
Mukui *et al.,* 2016	Rates and Predictors of Non-Adherence to Antiretroviral Therapy among HIV-Positive Individuals in Kenya: Results from the Second Kenya AIDS Indicator Survey, 2012.	Cross-sectional Quantitative Study	*PLoS ONE*	Level III	Younger age was positively associated with poor adherence. Non-adherence was noted to be higher among rural population compared to the urban population as well as those involved in recreational drug use.[13]
Mûnene & Ekman, 2016	Socioeconomic and clinical factors explaining the risk of unstructured antiretroviral therapy interruptions among Kenyan adult patients	Cross-sectional Study	*AIDS Care*	Level III	ARV treatment interruption was likely to be more prevalent in individuals who have been on treatment longer.[19]
Tiruneh *et al.,* 2016	Retention in Care among HIV-Infected Adults in Ethiopia, 2005- 2011: A Mixed-Methods Study.	Mixed-Methods Study	*PLoS One*	Level III	Economic constraints negatively affect retention to care; consequently poor adherence to ARVs.[20]
Yotebieng *et al.,* 2016	Conditional Cash Transfers to Increase Retention in PMTCT Care, Antiretroviral Adherence, and Postpartum Virological Suppression: A Randomized Controlled Trial.	Interventional Study	*Journal of Acquired Immune Deficiency Syndromes*	Level I	Incentives did not significantly affect adherence to ARVs.[21]
Tweya *et al.,* 2018	Understanding factors, outcomes and reasons for loss to follow-up among women in Option B+ PMTCT programme in Lilongwe, Malawi.	Cohort Study	*Tropical Medicine & International Health*	Level II	Most studies have not related WHO clinical staging at enrolment and adherence to ARVs. In this Malawian study, WHO clinical stage 3and 4 were associated with an increased risk to loss to follow up (LTFU).[22]
Costenaro *et al.,* 2015	Predictors of Treatment Failure in HIV-Positive Children Receiving Combination Antiretroviral Therapy: Cohort Data From Mozambique and Uganda.	Cohort Study	*Journal of the Paediatric Infectious Diseases Society*	Level II	WHO clinical stage 4 was associated with a higher rate of treatment failure in Uganda and Mozambique.[23]
Gesesew *et al.,*2018	Early mortality among children and adults in antiretroviral therapy programs in Southwest Ethiopia	Cross-sectional Study	*PLoS One*	Level III	WHO stage 3 and 4 was associated with a higher mortality rate compared to WHO stage 1 and 2.[24]
Ssebunya *et al.,* 2017	Antiretroviral therapy initiation within seven days of enrolment: outcomes and time to undetectable viral load among children at an urban HIV clinic in Uganda.		*BMC Infectious Diseases*		Adherence to ARVs and baseline WHO clinical stage 1 and 2 were associated with viral suppression.[25]
Dos & Wolvaardt 2016	Integrated intervention for mental health co-morbidity in HIV-positive individuals: A public health assessment		*African Journal of AIDS Research (AJAR)*		Psychological disorder was associated with poor adherence to ARVs.[26]
Mangesho, *et al.,* 2014	"Every drug goes to treat its own disease…" - a qualitative study of perceptions and experiences of taking anti-retrovirals concomitantly with anti-malarials among those affected by HIV and malaria in Tanzania.	Cross-sectional Qualitative Study	*Malaria Journal*	Level III	Treatment with anti-malarial in HIV infected patients did not affect adherence to ARVs.[27]
Ammon *et al.,* 2018	Factors impacting antiretroviral therapy adherence among human immunodeficiency virus-positive adolescents in Sub-Saharan Africa: a systematic review.	Systematic Review and Meta-analysis	*Public Health*	Level V	Knowledge about HIV status was associated with better adherence.[8]

Table 1 Continued...				
Eshun-Wilson *et al.,* 2019	Being HIV positive and staying on antiretroviral therapy in Africa: A qualitative systematic review and theoretical model.	Systematic Review and Meta-analysis	*PLoS One*	Level V	Punitive and uninviting perception of hospitals makes patients have a bad attitude towards ARV adherence.[28]
Dowse *et al.,* 2014	Simple, illustrated medicines information improves ARV knowledge and patient self-efficacy in limited literacy South African HIV patients.	Cohort Study	*AIDS Care*	Level II	Positive association between adherence to ARVs and knowledge on HIV and ARV.[29]
Okawa *et al.,* 2018	Psychological well-being and adherence to antiretroviral therapy among adolescents living with HIV in Zambia		*AIDSCare*		Lack of basic knowledge about HIV was associated with poor adherence to ARV.[30]
Mprah, 2016	Knowledge, opinions, and experiences of stigma as a barrier to antiretroviral therapy adherence among HIV community volunteers and health care givers in an urban slum, in Uganda.		*Annals of Tropical Medicine & Public Health*		Knowledge about stigma in itself does not improve adherence to ARVs.[31]
Ramadhani *et al.,* 2016	Association of knowledge on ART line of treatment, scarcity of treatment options and adherence.		*BMC Health Services Research*		Patient's knowledge of their antiretroviral line of treatment and limited future treatment options were more likely to adhere.[32]

The variability of these findings points to the need of contextualizing determinants of poor adherence to population-specific studies.

MATERIALS AND METHOD

We conducted a cross-sectional study in selected comprehensive care centres in Kibwezi west sub-county, Makueni County, Kenya between the months of September 2019 to December 2019.The study population was HIV positive patients aged 15 years and above who met our inclusion criteria.

Sample size of 385 was determined by the Cochran formula [33] with a significance level of 0.05), estimated prevalence rate from previous studies (average of 50%) and a precision level of 0.05. Two CCC centres: Makindu Sub-County hospital and Emali model health centre were purposively sampled. Makindu town is majorly an administrative town while Emali town is majorly a commercial town thus provided a better and diverse picture in the study. Number of respondents in each CCC was proportionately determined and respondents attending the CCC clinics on their appointed dates were sampled by systematic random sampling.

Data was collected by interviewer administered Centre for Adherence Support Evaluation (CASE) questionnaire on adherence level confirmed by pill count and the last viral load. It assesses adherence level using a Likert-scale like questions where a score of >10 denotes adherent while <10 denotes non-adherent. Adherence in this study was defined as how one correctly takes medication or interventions as prescribed by a health care provider. [34] There are a variety of methods for measuring adherence. They include direct methods such body fluid assays, and biologic markers or indirect methods such as viral load monitoring, interview, self-report, pharmacy records and pill counts. Whereas a combination of these methods may be used, self-report is the most widely employed [35] due to its ease of implementation and studies show that it correlates well with both viral load and clinical picture. [36, 37]

The questionnaire was adapted from previous studies.[38] Part A of the second questionnaire collected data on socio-demographic and socio-economic characteristics of study while part B collected data on knowledge and attitude of the study participants. A data abstraction

sheet was used to collected specific data from patient's sick sheet. Focused Group Discussions (FGD) and Key Informant Interviews (KII) guides were used to collect qualitative data. Audio-taping was done using a phone recorder. Data collection tools were pretested by piloting 10% of the questions to 38 respondents drawn from a CCC different from the selected. The CASE Adherence Index questionnaire is known to have strong validity and reliability levels.[38]

Three FGDs were constituted classified into male, female and adolescents. Each FGD consisted of 8 participants recruited by convenience sampling technique; thus forming a total of 24 participants. Qualitative data was obtained guided by data saturation. Discussions were held in Kiswahili with translations into Kiswahili where necessary and transcribed verbatim into English.

Statistical analysis

Data was cleaned and checked for consistencies and completeness.

Data was analysed by Statistical Package for Social Sciences (SPSS) version 20. We examined the associations of the dependent and independent variables using Pearson's Chi-square statistics and logistic regression with level of significance set at $p<0.05$.

Each response on knowledge was assigned a similar score (1) and calculated

as: Poor <25% - (no correct answer); moderately low (25-49%) - 1 correct answer out of the three questions; moderately high (50 - 74%) - 2 correct answers out of the three questions; excellent (75-100%)- all correct answers. A respondent scoring above 50% and above was considered to have adequate knowledge on adherence to ARVS.

Each response on attitude was assigned a similar score (1) and calculated as: Poor/Good (25 - <75%) - (no or 1 correct answer out of the two questions); Excellent (75 - 100%)-all correct answers out of the two questions. A respondent scoring above 75% and above was considered to have positive attitude towards adherence to ARVS.

Qualitative data from was analysed by Computer-assisted qualitative data analysis software (CAQDAS) software based on thematic and core codes and conclusions drawn.

Only study subjects who had been adequately informed and voluntarily consented to participate were recruited. The study involved participants less than 18 years; thus an assent form was provided to these participants. Ethical clearance was obtained from Kenyatta National Hospital Ethics and Review Committee before implementation (Ref: KNH-ERC/A/322).

RESULT

Table 2. Socio-demographic and socio-economic characteristics of study respondents.

Characteristic	Category		Frequency(n=385)	Percentage (%)
Gender	Male		105	27.3
	Female		280	72.7
Age (years)				
	Mean		43 (SD=14)	
	Median		44	
	Mode		41	
Age distribution of respondents	15-17 years		15	3.9
	18-24 years		28	7.3
	25-49 years		218	56.6
	50-64 years		104	27.0
	65 years and above		20	5.2
Person living with respondents aged 15-17 years	Orphaned		2	15.4
	Living with one parent/guardian		11	84.6
Residence of respondents	Majority were living in	Emali	53	13.8
		Makindu	51	13.2
Living with someone on ARVs in the same house	Yes		158	41
	No		227	59

Table 2 Continued...			
Marital status	Single	92	23.9
	Cohabiting	22	5.7
	Married to one partner	148	38.4
	Married to more than one partner	2	0.5
	Divorced or separated	47	12.2
	Widow or widower	69	17.9
	Not applicable	5	1.3
Highest level of Education	Never been to school	64	16.6
	Primary	212	55.1
	Secondary	84	21.8
	Tertiary (college, university)	25	6.5
Occupation	Government employee	11	2.9
	Unemployed	126	32.7
	Business/Self employed	167	43.4
	Casual labourer	81	21
Monthly income	<ksh1000	6	1.6
	ksh.1001-5000	31	8.1
	ksh5001-10000	20	5.2
	>ksh 10000	25	6.5
	Not willing to disclose	147	38.2
	Not sure	50	13
	Not applicable	106	27.5

Table 3. Knowledge on adherence to ARVs of the respondents.

Knowledge Variables	Category	Frequency(n=385)	Percentage(%)
Adherence to ARVs reduces progression towards AIDS	Strongly agree	344	89
	Agree	39	10.1
	Disagree	1	0.3
	Strongly disagree	1	0.3
Adherence to ARVs reduces chances of dying from HIV and its related complications	Strongly agree	321	83.4
	Agree	62	16.1
	Disagree	0	0
	Strongly disagree	2	0.5
Frequency of taking ARVs	Once and that's all	2	0.5
	Daily	383	99.5
	Once in a week	0	0
	Occasionally when one feels like	0	0
% Overall score on knowledge on adherence to ARVs	Poor (<25%)	2	0.4
	Moderately low (25 – 49%)	0	0.1
	Moderately high (50 - 74%)	34	8.7
	Excellent (75 - 100%)	349	90.6
Overall score on knowledge on adherence to ARVs	Adequate (Moderately high+ Excellent)	383	99.3
	Inadequate (Poor + Moderately low)	2	0.5

Table 4. Attitude towards adherence to ARVs of the respondents.

Attitude Variables	Category	Frequency (n=385)	Percentage (%)
ARVs are the mainstay in keeping individuals living with HIV free from frequent attacks of diseases	Strongly agree	304	79
	Agree	78	20.3
	Disagree	2	0.5
	Strongly disagree	1	0.3
One does not need to take ARVs as long as he/she eats well	Strongly agree	25	6.5
	Agree	1	0.3
	Disagree	70	17.9
	Strongly disagree	289	74.8
% Overall score on attitude towards adherence to ARVs	Poor/Good (25 - <75%)	24	6.2
	Excellent (75 - 100%)	361	93.8
Overall assessment on attitude towards adherence to ARVs	Positive	361	93.8
	Negative	24	6.2

Figure 1. Distribution of respondents by duration on ARVs.

Figure 2. Distribution of respondent's WHO clinical stage at initiation into ARV treatment.
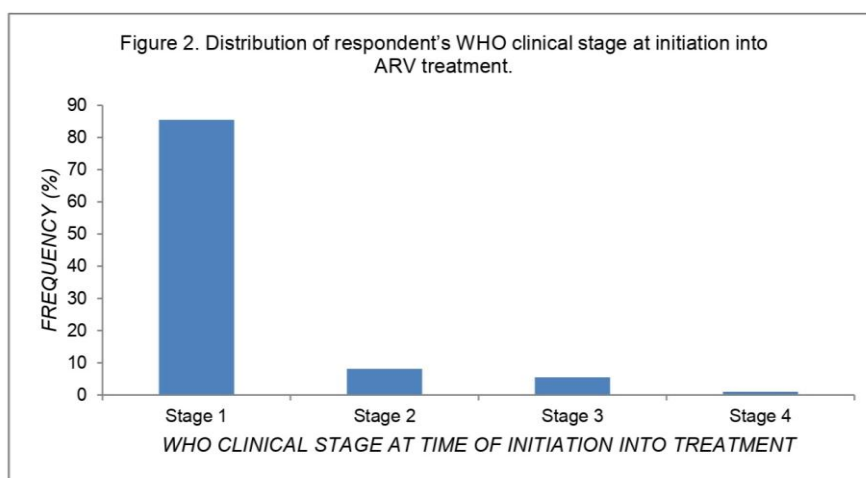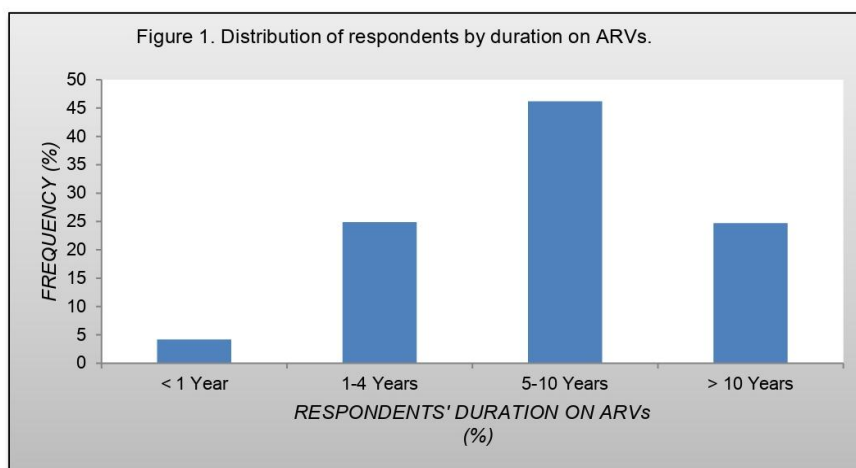
Table 5. Distribution of respondents by WHO clinical stage at initiation into ARV treatment.

Variable	Category	WHO clinical stage at time of initiation into ARV				Total n(%)
		Stage 1	Stage 2	Stage 3	Stage 4	
		Frequency n (%)				
Gender	Male	89(27.1)	7(22.6)	8(38.1)	1(25)	105(27.3)
	Female	**240(72.9)**	24(77.4)	13(61.9)	3(75)	280(72.7)
Age	15-17 years	12(3.6)	3(9.7)	0(0)	0(0)	15(3.9)
	18-24 years	24(7.3)	3(9.7)	1(4.8)	0(0)	28(7.3)
	25-49 years	**187(56.8)**	17(54.8)	11(52.4)	3(75)	218(56.6)
	50-64 years	87(26.4)	7(22.6)	9(42.9)	1(25)	104(27)
	65 years and above	19(5.8)	1(3.2)	0(0)	0(0)	20(5.2)
15-17 years	Orphaned	2(18.2)	0(0)	0(0)	0(0)	2(15.4)
	Living with one parent/ guardian	**9(81.8)**	2(100)	0(0)	0(0)	11(84.6)
Living with someone on ARVs in the same house	Yes	140(42.6)	13(41.9)	4(19.0)	1(25)	158(41)
	No	**189(57.4)**	18(58.1)	17(81.0)	3(75)	227(59)
Marital status	Single	71(21.6)	16(51.6)	4(19)	1(25)	92(23.9)
	Cohabiting	21(6.4)	0(0)	0(0)	1(25)	22(5.7)
	Married to one partner	**133(40.4)**	9(29)	6(28.6)	0(0)	148(38.4)
	Married to more than one partner	2(0.6)	0(0)	0(0)	0(0)	2(0.5)
	Divorced or separated	34(10.3)	3(9.7)	8(38.1)	2(50)	47(12.2)
	Widow or widower	63(19.1)	3(9.7)	3(14.3)	0(0)	69(17.9)
	Not applicable	5(1.5)	0(0)	0(0)	0(0)	5(1.3)
Highest Level of Education	Never been to school	54(16.4)	7(22.6)	2(9.5)	1(25)	64(16.6)
	Primary	**180(54.7)**	15(48.4)	14(66.7)	3(75)	212(55.1)
	Secondary	72(21.9)	8(25.8)	4(19)	0(0)	84(21.8)
	Tertiary (college, university)	23(7)	1(3.2)	1(4.8)	0(0)	25(6.5)
Occupation	Government employee	11(3.3)	0(0)	0(0)	0(0)	11(2.9)
	Unemployed	109(33.1)	11(35.5)	5(23.8)	1(25)	126(32.7)
	Business/Self employed	**144(43.8)**	11(35.5)	11(52.4)	1(25)	167(43.4)
	Casual labourer	65(19.8)	9(29)	5(23.8)	2(50)	81(21)

Table 5 Continued…						
Monthly income	<ksh1000	5(1.5)	1(3.2)	0(0)	0(0)	6(1.6)
	ksh.1001-5000	28(8.5)	3(9.7)	0(0)	0(0)	31(8.1)
	ksh5001-10000	19(5.8)	1(3.2)	0(0)	0(0)	20(5.2)
	>ksh 10000	24(7.3)	1(3.2)	0(0)	0(0)	25(6.5)
	Not willing to disclose	**114(34.7)**	14(45.2)	17(81)	2(50)	147(38.2)
	Not sure	46(14)	2(6.5)	1(4.8)	1(25)	50(13)
	Not applicable	93(28.3)	9(29)	3(14.3)	1(25)	106(27.5)

Figure 3. Distribution of respondents' current chronic medical comorbidities.

Figure 4. Respondents' adherence to ARVs

■ Good Adherence (94.5%)
■ Poor Adherence (5.5%)
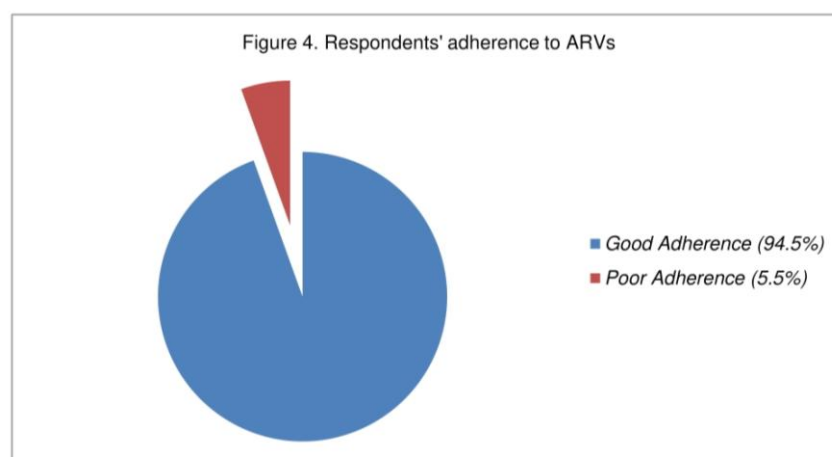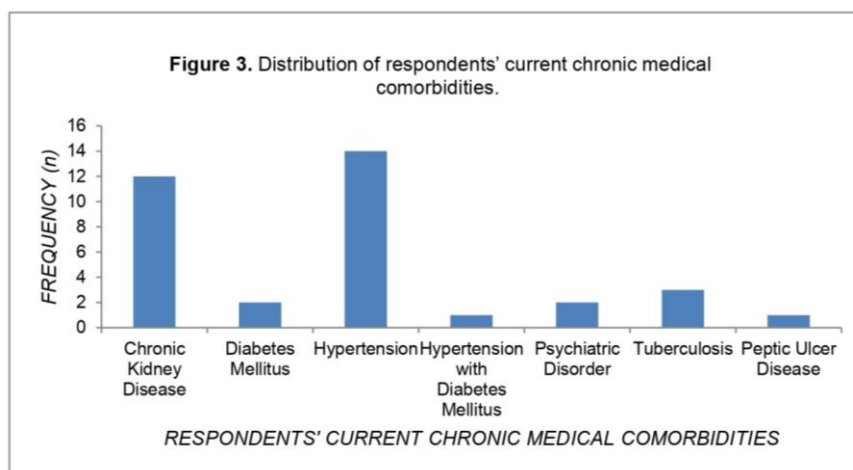
Table 6. Prevalence of adherence to ARVs adherence to ARVs against socio-economic characteristics among HIV positive patients attending selected CCCs in Kibwezi West sub-county, Makueni County, Kenya.

Variable	Category	Adherent (n=364) Frequency n (%)	Non-adherent (n=21) Frequency n (%)
Gender	Male	95(26.1)	10(47.6)
	Female	269(73.9)	11(52.4)
Age	15-17 years	12(3.3)	3(14.3)
	18-24 years	24(6.6)	4(19)
	25-49 years	207(56.9)	11(52.4)
	50-64 years	101(27.7)	3(14.3)
	65 years and above	20(5.5)	0(0)
15-17 years	Orphaned	1(10)	1(33.3)
	Living with one parent/guardian	9(90)	2(66.7)
Living with someone on ARVs in the same house	Yes	145(39.8)	13(61.9)
	No	219(60.2)	8(38.1)
Marital status	Single	87(23.9)	5(23.8)
	Cohabiting	19(5.2)	3(14.3)
	Married to one partner	141(38.7)	7(33.3)
	Married to more than one partner	1(0.3)	1(4.8)
	Divorced or separated	44(12.1)	3(14.3)
	Widow or widower	68(18.7)	1(4.8)
	Not applicable	4(1.1)	1(4.8)

Table 6 Continued...			
Highest Level of Education	Never been to school	60(16.5)	4(19)
	Primary	201(55.2)	11(52.4)
	Secondary	78(21.4)	6(28.6)
	Tertiary (college, university)	25(6.9)	0(0)
Occupation	Government employee	11(3)	0(0)
	Unemployed	116(31.9)	10(47.6)
	Business/Self employed	160(44)	7(33.3)
	Casual labourer	77(21.2)	4(19)
Monthly income	<ksh1000	6(1.6)	0(0)
	ksh.1001-5000	30(8.2)	1(4.8)
	ksh5001-10000	20(5.5)	0(0)
	>ksh 10000	24(6.6)	1(4.8)
	Not willing to disclose	140(38.5)	7(33.3)
	Not sure	47(12.9)	3(14.3)
	Not applicable	97(26.6)	9(42.9)
Total for each variable		364(100)	21(100)

There was a significant association between adherence to ARVs and gender $\{\chi^2 (1) =4.636, p<0.05\}$; however, the strength of association was low (Cramer's' V 0.110). The odds of poor adherence among males was 0.174 against females (95%CI 0.130, 0.233). Thus, female gender was likely to adhere to ARVs than the male gender (Table 7).

Table 7. Binary logistic regression analysis of association between gender and adherence to ARVs.

Variables in the Equation									
		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	Gender	-1.749	.149	138.201	1	.000	.174	.130	.233
a. Variable(s) entered on step 1: Gender.									

Age was significantly associated with adherence $\{$Likelihood Ratio $G^2 (4) =10.693, p<0.05\}$ with a low strength of association (Cramer's' V 0.183). The odds of poor adherence among respondents aged 65 years and above was 0.30, the least among the age categories (95%CI 0.09, 0.094); thus more likely to adhere to ARVs (Table 8).

Table 8. Binary logistic regression analysis of association age and adherence to ARVs.

Variables in the Equation									
		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	Age			141.611	4	.000			
	Age(1)	-1.386	.645	4.612	1	.032	.250	.071	.886
	Age(2)	-1.792	.540	11.007	1	.001	.167	.058	.480
	Age(3)	-2.935	.309	89.964	1	.000	.053	.029	.097
	Age(4)	-3.517	.586	36.027	1	.000	.030	.009	.094
a. Variable(s) entered on step 1: Age.									

Living in the same house with someone on ARVs was significantly associated with adherence to ARVs $\{\chi^2 (1) =3.997$ p=$<0.05\}$ with a low strength of association (Cramer's' V 0.102). The odds of poor adherence among respondents living in the same house with someone on ARVs was 0.144 compared to those living without (95%CI 0.103, 0.200); thus, more likely to adhere to ARVs (Table 9).

Table 9. Binary logistic regression analysis of association between living with someone on ARVs in the same house and adherence to ARVs.

Variables in the Equation									
		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	Living with someone on ARVs in the same house	-1.941	.168	133.028	1	.000	.144	.103	.200
Variable(s) entered on step 1: Living with someone on ARVs in the same house.									

Table 10. Socio-demographic and economic factors associated with adherence to ARVs among HIV positive patients attending selected CCCs in Kibwezi West sub-county, Makueni County, Kenya.

Socio-demographic and economic characteristic	Category	Adherence level (n=385)		Chi Square test of significance Level of significance =p<0.05
Gender		Adherent n=364	Not adherent n=21	
	Male	95(26.1 %)	10(47.6%)	χ^2 (1) =4.636
	Female	269(73.9%)	11(54.6%)	P=0.031
Age	15-17 years	12(3.3%)	3(14.8%)	G^2 (4) =10.693
	18-24 years	24(6.6%)	4(19%)	P=0.030
	25-49 years	207(56.9%)	11(52.4%)	
	50-64 years	101(27.7%)	3(14.3%)	
	65 years and above	20(5.5%)	0(0%)	
Ages 15-17 years		Adherent n=10	Not adherent n=3	
	Orphaned	1(10%)	1(33.3%)	G^2 (1) =0.842
	Living with one parent/guardian	9(90%)	2(66.7%)	P=0.359
Living with someone on ARVs in the same house		Adherent n=364	Not adherent n=21	
	Yes	145(39.8%)	13(61.9%)	χ^2 (1) =3.997
	No	219(60.2%)	8(38.1%)	P=0.046
Marital status		Adherent n=364	Not adherent n=21	
	Single	87(23.9%)	5(23.8%)	G^2 (6)=9.702
	Cohabiting	19(5.2%)	3(14.3%)	P=0.138
	Married to one partner	141(38.7%)	7(33.3%)	
	Married to more than one partner	1(0.3%)	1(4.8%)	
	Divorced or separated	44(12.1%)	3(14.3%)	
	Widow or widower	68(18.7%)	1(4.8%)	
	Not applicable	4(1.1%)	1(4.8%)	
Highest education level		Adherent n=364	Not adherent n=21	G^2 (3) =3.334 P=0.343
	Never been to school	60(16.5%)	4(19%)	
	Primary	201(55.2%)	11(52.4%)	
	Secondary	78(21.4%)	6(28.6%)	
	Tertiary (college, university)	25(6.9%)	0(0.0%)	
Occupation		Adherent n=364	Not adherent n=21	G^2 (3)=3.165 P=0.367
	Government employee	11(3.0%)	0(0.0%)	
	Unemployed	116(31.9%)	10(47.6%)	
	Business/Self employed	160(44%)	7(33.3%)	
	Casual labourer	77(21.2%)	4(19%)	
Monthly income		Adherent n=364	Not adherent n=21	G^2 (6)=5.180 P=0.521
	<ksh1000	6(1.6%)	0(0.0%)	
	ksh.1001-5000	30(8.2%)	1(4.8%)	
	ksh5001-10000	20(5.5%)	0(0.0%)	
	>ksh 10000	24(6.6%)	1(4.8%)	
	Not willing to disclose	140(38.5%)	7(33.3%)	
	Not sure	47(12.9%)	3(14.3%)	
	Not applicable	97(26.6%)	9(42.9%)	

Table 11. Behavioural factors associated with adherence to ARVs among HIV positive patients attending selected CCCs in Kibwezi West sub-county, Makueni County, Kenya.

Behavioural factors	Category	Adherence level (n=385)		Chi Square test of significance Level of significance =p<0.05
Knowledge on adherence to ARVs		Adherent n=364	Not adherent n=21	
	Adequate	362(99.5 %)	21(100%)	G^2 (1) =0.225, P=0.635
	Inadequate	2(0.5%)	0(0%)	
Attitude towards adherence to ARVs	Positive	340(93.4%)	21(100%)	G^2 (1) =2.782, P=0.095
	Negative	24(6.6%)	0(0%)	

The quantitative results were collaboration by FGD results in which the Male focus group discussion identified fear, stigma, not believing in oneself, participating in activities that hamper adherence such as drinking alcohol and denial as the main causes of poor adherence to ARVs. *Discussant number 3 observed,*

'The first thing contributing to not taking these drugs is hiding. Second is fear". The discussion also identified increase in frequency and severity of opportunistic diseases, increased viral load, reduced immunity, family-social consequences and ultimately death as consequences of poor adherence to ARVs. *Discussant number 5 said, "Most of the diseases would just find it very to come to your body and they make you very weak and even you can…can lead to death"* Nevertheless, the group identified one-on-one educational counselling sessions, seeking advice, group education with similar infected people and social support as means to improve adherence to ARVs. *Discussant number 8 suggested, "It is through ways of counselling through doctors or group counselling."*

The Female focus group discussion identified religious beliefs, denial and lack of self-love as the main reasons of poor adherence to ARVs. *Discussant number 2 averred, "One must accept oneself and love self to be able to take drugs well."* The group also identified increase in severity of opportunistic infections and frequent hospitalisation as the main consequences of poor adherence to ARVs. *Discussant number 4 posited, "If you fail to take the drugs because it is your responsibility, you*

will keep visiting the hospital with pain here, pain there." Nonetheless, it identified adherence counselling support by health workers, acceptance of one's status, social and family support as means to improve adherence to ARVs. *Participant number 9 suggested, "To improve adherence, one must accept of the eternity of ARVs early enough until God's appointed time."* Adolescent focus group discussion identified defiance, stigma, and ignorance on reasons for medication, fear and denial as reasons for poor adherence to ARVs. *Discussant number 4 noted, "One may have not been told why they are taking the drugs."* The group also identified increased frequency of diseases, hospitalisations, morbidity and death as the consequences of poor adherence to ARVs. *Participant number 5 observed, "When you fail to take medications well, viral load goes up."* However, the group noted that knowing one's status, acceptance, personal discipline on adherence and reminders such clock alarms or a trusted person are ways to improve adherence to ARVs. *Discussant number 8 suggested "You have to understand that life does not end with getting HIV/AIDS, so you have to continue taking medications well not to get diseases frequently."*

Table 12. Clinical factors associated with Adherence to ARVs among HIV positive patients attending selected CCCs in Kibwezi West sub-county, Makueni County, Kenya.

Clinical parameter	Category	Adherence level (n=385)		Chi Square test of significance Level of significance =p<0.05
WHO Clinical Stage at the Time of Initiation into Treatment		**Adherent n=364**	**Not adherent n=21**	
	Stage 1	314(86.3%)	15(71.4%)	G^2 (3) =3.364 P=0.304
	Stage 2	28(7.7%)	3(14.3%)	
	Stage 3	19(5.2%)	3(9.5%)	
	Stage 4	3(0.8%)	1(4.8%)	
Current chronic medical co-morbidities		**Adherent n=364**	**Not adherent n=21**	
	Chronic Kidney Disease	12(3.3%)	0(0.0%)	G^2 (7) =4.122 P=0.766
	Diabetes Mellitus	2(0.5%)	0(0.0%)	
	Hypertension	14(3.8%)	0(0.0%)	
	Hypertension with Diabetes Mellitus	1(0.3%)	0(0.0%)	
	None	329(90.4%)	21(100%)	
	Psychiatric Disorder	2(0.5%)	0(0.0%)	
	Tuberculosis	3(0.8%)	0(0.0%)	
	Peptic Ulcer Disease	1(0.3%)	0(0.0%)	
Duration on ARVs		**Adherent n=364**	**Not adherent n=21**	G^2 (3) =0.194 P=0.978
	< 1 year	15(4.1%)	1(4.8%)	
	1-4 years	90(24.7%)	6(28.6%)	
	5-10 years	169(46.4%)	9(42.9%)	
	>10 years	90(24.7%)	5(23.8%)	

Two key informants (the in-charges involved in primary care of HIV positive patients) from respective CCCs were interviewed. They identified stigma, ignorance, lack of social support and busy work schedule as patient level factors that would hamper adherence to ARVs. KIIs identified poor attitude by health service providers, drug stock outs, distance, and long waiting time contributing to poor adherence to ARVs. On how to improve adherence to ARVs, they identified community dispensing, health talks with mentors, support groups, drug availability, outreach, psychosocial support, distribution of patients to nearest satellite clinics, encourage disclosure and directly observed therapy (DOT) by a trusted relative. KI number 1 suggested, "I think the major thing is stigma. If stigma was done away with, then everything will run off smooth."

DISCUSSION

Approximately ninety five percent (94.5%) of the respondents were adherent to ARVs. This portends good progress in reaching the target UNAIDS goal of 90-90-90 by 2020,[39] Makueni County Strategic Direction 4.4.2 in the Makueni County HIV, Aids, and Tb Strategic Plan 2015/16-2018/19 [40] as well as Kenya Aids Strategic Framework (KASF) priority intervention areas.[41] This could be attributed to the 'test-and-treat all' approachn Africa. The findings contrast with a systematic review in Sub-Sahara Africa that shows an adherence estimate of 72.9%% to ARVs. [2] The results; however, concur with a recently conducted laboratory-based study on Kenyans aged 18-64 years that indicate less than 10% of Kenyans are not adhering to ARVs.[13] In as much as the results are not generalizable as the study was conducted in Kenya's capital city, the concurrence is worth appreciating. The high prevalence of good adherence in key population areas serves as a control point in halting the spread of the virus.

Gender was significantly associated with adherence to ARVs. Majority of those

adherents were females 269(73.9%) showing that females were more likely to adhere to ARVs than their male counterparts. This differs from a recent study done in Sub-Saharan Africa that show females were more likely to have poor adherence to ARVs than males.[11] It also differs with a recent Malawian study that did not find any assocaition between gender and adherence to ARVs.[17] Females have better health-seeking behaviour thus are more likely to adhere to their medication. Besides, more women are infected thus conversely more are enrolled into care and treatment therefore more numbers of adherents.

Age was significantly associated with adherence in the sense that older age (above 65 years) was more likely to adhere to ARVs. This concurs with most studies in sub-Saharan Africa that shows poor adherence among the younger ages. [7, 15, 16, 18] This is presumed to be due to better understanding of the importance of drug adherence in prolonging life to meet their family and societal obligations. Younger population who is the country's economic driver is at an increased risk of poor adherence.

Among respondents aged 15-17 years, being orphaned or living with one parent/guardian did not have a significant association with adherence to ARVs. This differs from studies that show good adherence among persons with social support systems. [9,12,14] Similarly, marital status did not have a statistically significant association with adherence to ARVs; differing with studies that show good adherence among individuals with social capital.[9,14] Marriage in itself is not a predictor of better adherence to medication but perhaps mutual support and understanding within a marriage setup would improve adherence to ARVs.

Living in the same house with someone on ARVs was significantly associated with adherence to ARVs. This concurs with studies that show good adherence among individuals with social

capital. [9,12,14] Social support in high stigma related HIV environment is important in enhancing adherence to ARVs. Education level and occupation did not have a statistically significant association with adherence to ARVs. This differs with a recent Tanzanian study that shows poor adherence rates among individuals who are unemployed and who attained tertiary education. [16] Education level and type of occupation may not have much bearing on adherence to medication if it does not influence attitude. There is a difference between attaining an education and being educated to influence behaviour change. Results from the study shows no significant association between monthly income and adherence to ARVs which differs from other studies that show association between high asset index and adherence to ARVs. [18,20] However, the finding is in concordance with a recent Congo study that shows no association between adherence and incentives. [21] In as much as money is necessary in meeting basic needs and to some extend make access and consequently adherence to medication easier, it may also overshadow behaviour change towards adherence.

There was no significant association between neither knowledge nor attitude towards adherence to ARVs and adherence to ARVs. Findings from the study differ with a systematic review of Sub-Saharan Africa that knowledge about HIV status was associated with better adherence. [8] Other studies conducted in South Africa, Zambia, Uganda and Tanzania avers that there was a positive association between adherence to ARVs and knowledge on HIV and ARV in contrast to findings from the study. [29-32] Knowledge and attitude are abstract. Adherence to medication is practical. Thus, one may have the correct knowledge and the right attitude towards adhering to ARVs but fails to take the initiative to actually adhere to the medications probably influenced by other factors.

There was no statistically significant association between duration on ARVs and adherence to ARVs. It differs from a Kenyan study done in Nyeri that showed interruption of treatment among individuals who had been on ARVs for longer duration. [19] This could be attributed to treatment fatigue and other compounding factors.

There was no statistically significant association between WHO clinical stage at the time of initiation into treatment and adherence to ARVs. Most studies have not related WHO clinical stage at ART initiation and adherence; however, a recent study in Uganda indicates that baseline WHO clinical stage 1 and 2 were associated with viral suppression, [25] a proxy indicator of adherence. However, adherence to ARVs is measured on a long term basis and given the life-time nature of ARV treatment, WHO clinical stage at time of entry into care may not impact adherence thereafter.

There was no statistically significant association between current chronic medical co-morbidities and adherence to ARVs. The findings differ with recent African studies that show poor adherence and treatment failure among patients on treatment for psychological disorder, [26] and tuberculosis [23] respectively.

KIIs identified stigma, busy work schedule, poor attitude by health service providers, drug stock outs, distance and long waiting time as facility level factors contributing to poor adherence to ARVs. This compares to two studies in Sub-Saharan Africa that identified HIV-related stigma, work-related demand, drug-related side effects and human resource-related factors hampering adherence to ARVs. [9, 11, 12] Stigma is mostly associated with HIV being a 'behavioural' problem thus people are presumed to be responsible for their HIV status. Kibwezi West Sub-County being a semi-arid area, most residents are busy in various economic activities to sustain themselves or their dependants thus may miss out on their clinic appointments.

Limitation

It was a planting season, thus the turnout was poor. K[th] value had to be

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statistically adjusted based on the average turnout per day. Only 3 FGDs- male, female and adolescents were conducted. Stratification based on education level was not possible as it was a planting season thus most prioritized farming citing no time thus no quorum.

CONCLUSION

The near optimal adherence level to ARVs in Kibwezi-West Sub County is comparable with the WHO recommended level of 95%. This portends good progress in the fight against the HIV scourge. Majority of respondents had adequate knowledge and positive attitude towards adherence to ARVs. Being of female gender, older age (above 65 years) and sharing a roof with someone on ARVs predicted better adherence.

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