

ORIGINAL ARTICLE

POOR ADHERENCE TO ANTIRETROVIRAL THERAPY AND ASSOCIATED FACTORS AMONG PEOPLE LIVING WITH HIV IN OMDURMAN CITY, SUDAN

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ABSTRACT

Adherence to antiretroviral therapy (ART) plays an important role in the treatment outcomes of human immunodeficiency virus (HIV) infection. Poor adherence would result in failure to prevent viral replication as well as an increased risk of developing drug resistance. Adherence to a life long treatment such as antiretroviral therapy is usually a complicated issue that requires careful and continuous collaboration of patient, family and healthcare provider. The objective of this study was to assess adherence to antiretroviral therapy and its associated factors among people living with HIV. This is a health facility-based cross sectional study conducted among adults' people living with HIV in Omdurman HIV/AIDS centre, Sudan. Data was collected through direct interview using semi-structured questionnaire. There were only 144/846 (17.02%) who adhered to antiretroviral therapy as prescribed by their doctors. The remaining 51.18% were taking the therapy but not regularly, 31.21% were taking it but currently not and 0.59% stated that they have never taken any antiretroviral therapy. Factors associated with poor adherence that have been identified include female gender (*Adj. OR* = 3.46 (95%CI: 1.46-8.21), *P* = 0.005), younger age (*Adj. OR* = 1.14 (95%CI: 1.02-1.28), *P* = 0.022), being unemployed (*Adj. OR* = 5.94 (95%CI: 1.51-23.40), *P* = 0.011), those who were divorced, separated or widowed (*Adj. OR* = 11.35 (95%CI: 1.74-73.96), *P* = 0.011) and respondents who perceived that their health status is poor (*Adj. OR* = 5.21 (95%CI: 1.44-18.81), *P* = 0.012) or very poor (*Adj. OR* = 4.04 (95%CI: 1.27-12.81), *P* = 0.018). Educational level and social support against HIV-related stigma and discrimination were not significantly associated with adherence. Adherence to antiretroviral therapy among the respondents is very poor. Urgent interventions based on modifiable factors and mainly targeting females and younger age group are needed to improve adherence to antiretroviral therapy among people living with HIV.

Keywords: People with HIV, adherence, antiretroviral therapy, Omdurman, Sudan.

INTRODUCTION

The access and regular adherence to antiretroviral therapy is crucial for reducing morbidity, hospitalization and mortality in addition to improving and prolonging life of people living with HIV^{1, 2, 3, 4, 5, 6, 7}. Although there are many issues attributed to the reduction of the benefits obtained by using antiretroviral therapy, adherence emerged and remains as the central factor to the therapeutic positive outcome among those who are infected with human immunodeficiency virus (HIV)⁸.

Researches showed that poor adherence to antiretroviral therapies could have serious consequences for individuals who are infected with HIV including failure of prevention of viral replication, an increased possibility of developing viral resistance, the progression of the disease to stage of clinical complications, and reduction of survival^{9, 10, 11}. Friedland and Williams showed

that intermediate levels of antiretroviral drug (HAART) adherence increases the risk of resistance whereas complete adherence and total none adherence are associated with low probabilities of resistance¹².

Numerous studies have shown that the level of adherence to antiretroviral therapy that is needed for long duration suppression of HIV and successful management of HIV infection is nearly about $\geq 95\%$ ^{9, 10, 11}. A study conducted by Gifford et al. (2000) showed that among the total number of 133 HIV-infected persons, 28% reported less than 80% adherence which is classified as poor adherence, 23% reported from 80%-99% adherence which is classified as fair, and 50% reported 100% adherence which is excellent adherence¹⁰.

In the United States it has been found that adherence to antiretroviral therapy range between 26% (95%CI: 25% - 27%) in study conducted by Becker et al. (2002)

to 86% (95%CI: 81% - 90%) in study conducted by Cook et al. (2001)^{13, 14}. In African countries studies showed variable levels of adherence to antiretroviral therapy that ranges from as low as 30% to almost 100% adherence^{15, 16, 17, 18, 19}. Wakibi found in a study conducted in Kenya that 18% of respondents were non-adherent to therapy by self report²⁰. A meta-analysis of 21 studies carried out in African (2006) showed that 77% of 12116 respondents living with HIV had adherence rates of 95% to ART²¹.

Different reasons have been given to justify missing doses. In a study conducted in Tanzania Watt et al. (2009) found that adherence is related to the degree of level of trust between the patients and their health care provider²². Gifford et al. (2000) found that organizational factors such being too busy, forgetfulness, away from home, change in routine and some emotional issues were the most common reasons given for missing of antiretroviral agent doses¹⁰. Wenger et al. (1999) found that younger people living with HIV, women, minority ethnic groups, and patients without health insurance were less likely to be associated with good antiretroviral therapy adherence²³.

Other studies have also reported similar findings. Younger age, female sex, African-American descent, those with drinking problem, and intravenous drug users were found to be associated with lower levels of adherence treatment^{10, 24, 25}. However Nokes et al. (1998) found in a large study similar level of antiretroviral adherence between men women²⁶. Paterson et al. (2000) found that adherence was significantly associated with age, education, but not with sex, employment and income²⁷. Weiser et al. (2003) showed that cost, lower level of education, side effects and disclosure are significant predictors to adherence to antiretroviral therapy²⁸.

Sudan National AIDS Control Programme (SNAP) stated that the estimated number of people who are in need of ART is 20,282 for adults, 6,144 for children and 5,095 for mothers for prevention of mother-to-child-transmission (PMTCT)²⁹. Sudanese are like other Middle Eastern countries are conservative communities and it was found that HIV-related stigma is highly prevalent (77%) and therefore the access to and use of ART might be avoided to prevent unnecessary disclosure of status³⁰.

The aim of this study was to assess the prevalence of adherence to antiretroviral therapy and its associated factors among people living with HIV in Omdurman HIV/AIDS centre in Sudan.

METHODS

A health facility-based cross sectional study was conducted among people living with HIV in Omdurman HIV/AIDS centre in Khartoum State, Sudan. The data of this paper is part of a big study conducted to assess HIV-related stigma. People living with HIV who attended the center during the study period (August 2011 to February 2012) were recruited in a consecutive alternative manner until the total number of sample size achieved. Sample size was calculated based on a 2-sided hypothesis tests using Fleiss (1981) formula with 80% power, 95% confidence level, 5% precision and having added additional 10% to account for non-response.

The study was conducted under voluntary condition and confidentiality was secured. Information about the purpose of the study, tool used to collect data and the role of the respondent were explained then consent of agreement to participation was obtained from each respondent. Ethical approvals were obtained from Universiti Kebangsaan Malaysia (Code) and from Sudan authorities.

Adherence was assessed using respondents' self-reports assessment method through direct face-to-face interview. Respondents were categorized into four groups. Those who never used the therapy, those who were using it but currently not, those who used the therapy but not regularly as prescribed by their doctors, and finally those who are using antiretroviral therapy regularly as prescribed by their doctors. A semi-structured questionnaire was administered by trained team to collect data through direct interview.

Factors associated with poor adherence to antiretroviral therapy among people living with HIV were assessed using binary logistic regression analysis. Simple logistic regression was conducted first and crude result was obtained then followed by multiple logistic regression analysis to obtain the independent adjusted association between the outcome variable and its associated factors.

In multiple logistic regression analysis independent variables were selected using Backward: LR method. The classification accuracy rate of the model is more than the proportional by chance accuracy rate by more than 25% and therefore the model was considered to be useful in predicting respondents who were non-adherent to their antiretroviral therapy using the factors under study. Hosmer-Lemeshow tests for goodness-of-fit in this study was ($\chi^2 = 7.29$, $df = 8$ and $P = 0.506$) showing that the data fit to model. The model chi-square of Omnibus Test was ($\chi^2 = 278.87$, $df = 11$ and $P < 0.001$). This indicates the presence of statistically significant relationship between the independent variables and the dependent variable. Therefore the overall independent variables in this study significantly contributed to the logistic regression model.

Based on table of Model if Term Removed it was obvious that all the independent variables that were finally

found to have statistical significant association with the outcome variable in multiple logistic regression analysis significantly contributed to the model. The overall accuracy of the multiple logistic regressions' model to predict poor adherence to antiretroviral therapy among people living with HIV (with a predicted probability of 0.50 or greater) was 90.79%. The independent variables used in the final model in multiple logistic regressions analysis explain 55.34% of the variation in the dependent variable - poor adherence to antiretroviral therapy among people living with HIV (Nagelkerke R Square = 0.553).

RESULT

Data analysis

Data was described and prevalence of adherence was measured first then simple logistic regressions analysis followed by binary multiple logistic regression analysis were used to assess the predictors for poor adherence among respondents. The dependent variable of this study is poor adherence to antiretroviral therapy among people living with HIV. The independent variables used to predict the outcome of this study were divided into eight groups.

They include socio-demographic factors (residence, gender, age, employment, marriage, education, religion, and owning house); family factors (stay with family, family type, children, partner with HIV, family member with HIV, and breadwinning status); HIV-testing factors (method of HIV discovery, perceived mode of infection, and presence and types of services provided during HIV-testing); health status factors (perceived health status and symptoms); social factors (disclosure issues and social support); knowledge factors (health education and knowledge of HIV-related laws and policies); access to services factors (access to information and hospitals); and stigma and discrimination

issues. Data was analyzed using Statistical Package for Social Science software (SPSS Inc., Chicago, IL, USA, version 20.0).

Respondents' characteristics

A total number of 852 respondents participated in this study giving a response rate of 96.05%. Male and female were equally represented. The

mean age was 32.67±8.03 years, 79.83% are unemployed, and 86.07% moved to Khartoum from other state when they discovered that they were infected with HIV. There were no significant differences between respondents and those who have not responded. Table 1 shows the distribution of respondent characteristics.

Table 1 Distribution of respondents' characteristics (n =852)

Factors	N	%
Residence (original state)		
Khartoum	118	13.93
Other state	729	86.07
Residence (city)		
Omdurman	242	28.57
Khartoum	497	58.68
Khartoum Bahri	108	12.75
Gender		
Male	426	50.0
Female	426	50.0
Age in years Mean ± SD	= 32.67±8.03	
Employment status		
Unemployed	677	79.83
Employed	171	20.17
Income (in SP)		
None	677	79.83
Yes (17 - 250)	171	20.17
Marital status		
Single	211	24.91
Married	16	1.89
DSW	620	73.20
Level of education		
None	260	30.66
Primary	312	36.79
Secondary	118	13.92
Tertiary	158	18.63
Religion		
None Muslim	79	9.33
Muslim	768	90.67
Own house		
No	705	83.14
Yes	143	16.86

DSW: Divorced, separated or widowed, SP: Sudanese pound.

Descriptive analysis

Bases on an open ended question to respondents it was found that worry of HIV status disclosure and its consequences of stigma and

discrimination, money and transportation issues, too many medications, dose frequencies, life long

duration of therapy and doubt of effectiveness in addition to depression and waiting for life to end as stated by respondents are among the reasons

behind poor adherence to antiretroviral therapy. Table 2 shows the distribution of the study outcome variable.

Table 2 Distribution of adherence to antiretroviral therapy (n =846)

Adherence to antiretroviral therapy	Frequency	Percentage
	N	(%)
Adherent regularly	144	17.02
Adherent but not regularly	433	51.18
Was adherent but currently not	264	31.21
Never taken any	5	0.59

Factors associated with adherence

The adjusted independent non-confounded relationship between the independent variables under study and the dependent outcome variable using multiple logistic regression analysis showed that there is statistically significant relationship between poor adherence to antiretroviral therapy and factors such as gender, age, state of employment, marital status and perceived health status.

level and social support against HIV-related stigma and discrimination have not shown any significant association with adherence to antiretroviral therapy in this study. Table 3 shows the adjusted association between adherence to antiretroviral therapy and the factors under study using multiple logistic regressions analysis with Odds ratio and its 95% confidence interval, Wald statistic with its degree of freedom, and probability value.

Female respondents (Adj. OR = 3.46 (95%CI: 1.46-8.21), P = 0.005), younger age group (Adj. OR = 1.14 (95%CI: 1.02-1.28), P = 0.022), unemployed (Adj. OR = 5.94 (95%CI: 1.51-23.40), P = 0.011), those who are divorced, separated or widowed (Adj. OR = 11.35 (95%CI: 1.74-73.96), P = 0.011), and those who perceived that their health status is poor (Adj. OR = 5.21 (95%CI: 1.44-18.81), P = 0.012) or very poor (Adj. OR = 4.04 (95%CI: 1.27-12.81), P = 0.018) are more likely to be associated with poor adherence to antiretroviral therapy as prescribed by their doctors. Education

Table 3 Multiple logistic regressions analysis of poor adherence to antiretroviral therapy and associated factors (n =684)*

Factors		Adj. OR	(95%CI of OR)	Wald (df)	P-value
Gender	Male	1.00			
	Female	3.46	(1.46 - 8.21)	7.91 (1)	0.005
Age (younger)		1.14	(1.02 - 1.28)	5.26 (1)	0.022
Employment	Yes	1.00			
	No	5.94	(1.51 - 23.40)	6.47 (1)	0.011
Marital status	Single	1.00		6.52 (2)	0.038
	Married	6.50	(0.39 - 108.95)	1.69 (1)	0.193
	DSW	11.35	(1.74 - 73.96)	6.46 (1)	0.011
Education	Illiterate	1.00		5.43 (3)	0.143
	Basic	0.78	(0.32 - 1.91)	0.29 (1)	0.589
	Secondary	0.89	(0.31 - 2.58)	0.05 (1)	0.824
	≥University	3.11	(0.80 - 12.04)	2.70 (1)	0.101
Health status	Good	1.00		9.08 (3)	0.028
	In-between	0.55	(0.15 - 2.0)	0.82 (1)	0.366
	Poor	5.21	(1.44 - 18.81)	6.34(1)	0.012
	Very poor	4.04	(1.27 - 12.81)	5.62 (1)	0.018
Social support	No	1.00			
	Yes	0.50	(0.24 - 1.05)	3.33 (1)	0.068

DSW: divorced, separated or widowed, * the model predicted respondents who were non-adherent to antiretroviral therapy

DISCUSSION

Tools for the measurement adherence

Numerous studies have shown that adherence to antiretroviral therapy is a critical predictor of successful HIV treatment. Conventionally, an acceptable level of adherence to treatment in chronic illness is the consumption of at least 80% or more of the prescribed doses^{31, 32, 33, 34}. The level of adherence needed to successfully manage HIV infection is nearly appears to be about 100%. It was found that adherence measured by different approaches is significantly associated with viral load.

Despite the absence of gold standard for the assessment of adherence, there are

many validated tools and strategies to measure adherence³⁵. Adherence to

antiretroviral therapy can be measured by using different tools such as information obtained directly from people living with HIV, data from health services providers, bottles pill count, using records from pharmacy, the use of electronic devices, biochemical assays technique, or combinations of some or all these sources. Although patient self-report of adherence may overestimate the prediction of adherence it is still appropriate for measuring the association between adherence and viral load responses. Patient's report of suboptimal adherence is a strong indicator of non-adherence and therefore should be taken seriously^{9, 36}. Despite its limitations it has been shown in different studies that self-report

assessments method for adherence to a combination therapy is significantly related to HIV viral load and hence failure of treatment.

Prevalence of adherence

Although antiretroviral therapy is provided for free in HIV/AIDS centres in Sudan, the findings of this study showed the level of adherence to antiretroviral therapy is very low. The prevalence of the self-reported adherence in this study is the lowest compared to neighboring and other African countries. This might be attributed to the different tools used to assess adherence through self-report method. This study used stringent method by taking only those who adhered to their antiretroviral therapy as prescribed by their doctors from the date of first prescription. Although studies in some African countries like Burkina Faso, Cote D'Ivoire and Mali showed low level of adherence^{15, 16, 17}. Other studies showed high level of adherence that reached up to 100% such as in Rwanda and Democratic Republic of Congo^{18, 19}.

Factors associated with adherence

Predictors of poor adherence based on the findings of this study include gender, age, employment, marital status, and health status. Educational level and social support against HIV-related stigma and discrimination were found to be non-significant predictor to poor adherence to antiretroviral therapy. Factors associated with and predicting poor adherence to antiretroviral therapy reported in literature differ according to the countries and studied populations.

The finding of this study showed that females were more likely to be associated with poor adherence to antiretroviral therapy although several studies found that gender is not generally associated with adherence^{10, 32, 37, 38, 39, 40, 41, 42, 43}. Several studies supported the finding of this study that younger people are more likely to be associated with poor adherence and that

older people are associated with better adherence^{24, 27, 38, 42, 44, 45}. A study conducted by Stone et al. (2001) showed that younger persons might skip some doses⁴⁶. This study showed that those who were unemployed are more likely to be associated with poor adherence to their antiretroviral therapy. Other studies found that employment alone is not a predictor for poor adherence^{27, 35, 42, 45, 48, 49}.

With regard to educational attainment, the finding of this study showed that educational level is not a significant predictor for adherence to antiretroviral therapy. This finding is also supported by several studies which found that education level of a person have nothing to do with the prediction of adherence to antiretroviral therapy^{32, 37, 38, 39, 41, 42, 45, 46, 48, 49}. Although the presence and severity of symptoms was found to be consistently associated with poor adherence^{38, 40, 43, 44}, health-related quality of life was not consistently associated^{10, 27, 40, 43, 45, 49}. This study showed that poor perception of health status is associated with poor adherence to antiretroviral therapy. It has been assumed that the presence of tangible and emotional support can increase motivation and reduce barriers to adherence. Despite the finding that social support was not associated with adherence, studies showed that lack of support from either the family or community is an important risk factor for poor adherence to antiretroviral therapy^{8, 10, 24, 37, 38, 43, 49}.

The limitations of this study include the use of cross sectional study design which although it could determine the prevalence it lacks the temporality to assess associated factors. Since this is a health facility-based study which only included people living with HIV who attended the Omdurman HIV/AIDS centre during the period of study, the result cannot be generalized to all people living with HIV in Sudan.

CONCLUSION

This study showed that although antiretroviral therapy is provided free of charge, the prevalence of regular adherence to antiretroviral therapy among people living with HIV is very low. There are many modifiable factors that have been identified and can be used to improve adherence such as providing employment opportunities and improving health status for people living with HIV. Females, younger age, divorced, separated and widowed people living with HIV need to be given a priority in any intervention provided. Further studies are needed to examine the

adherence to antiretroviral therapy among a more representative sample.

Conflict of interest

The authors declared that there is no conflict of interest related to this study.

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