

# The Influence of HIV-Status Disclosure on Adherence, Immunological and Virological Outcomes among HIV-Infected Patients Started on Antiretroviral Therapy in Dar-es-Salaam, Tanzania

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Received date: 07 Sept 2015; Accepted date: 13 October 2015; Published date: 19 October 2015.

Citation: Buma D, Bakari M, Fawzi W, Mugusi F (2015) The Influence of HIV-Status Disclosure on Adherence, Immunological and Virological Outcomes among HIV-Infected Patients Started on Antiretroviral Therapy in Dar-es-Salaam, Tanzania. J HIV AIDS 1(3): <http://dx.doi.org/10.16966/2380-5536.111>

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## Abstract

**Background:** Disclosure of HIV status pose a great challenge in many societies due to associated stigma. We prospectively investigated whether or not HIV-status disclosure before commencement of antiretroviral therapy (ART) has influence on adherence, immunological response and viral load suppression (VLS) in HIV-infected patients.

**Methods:** Using systematic sampling, 520 HIV-infected patients were selected prior to initiation of ART from 4 HIV care and treatment clinics (CTC) in Dar-es-Salaam. Data on HIV status disclosure and adherence were collected using a structured questionnaire, while viral load and CD4+ T-cell counts were determined through laboratory investigations. Patients were followed up for one year. We performed logistic regression to determine the association between HIV status disclosure and the outcomes.

**Results:** Four hundred and sixty two patients were analyzed, of whom 136 (29.4%) were males. Sixty (13%) and 310 (67.1%) of the study patients disclosed their HIV-status early and late respectively, while 92 (19.9%) did not disclose their HIV-status. Between males and females in each category, male had low number of HIV-status disclosure,  $p < 0.05$ . The proportion adhering to therapy of 96.7% was higher in patients who disclosed their HIV-status before ART initiation compared to that of 85.4% among those who disclosed later on,  $p = 0.0109$ . There was a statistically significant difference in terms of CD4+ T-cell counts recovery between patients who disclosed earlier and those who disclosed later on,  $p = 0.0341$ . A statistically significant difference in terms of viral load suppression was also noted between early and later HIV status disclosure,  $p = 0.0036$ .

**Conclusion:** Disclosure of HIV-status before initiation of ART improves patients' adherence, and has a positive influence on CD4+ T-cell counts recovery as well as viral load suppression.

**Keywords:** Early HIV-status disclosure; Adherence; CD4+T-cell counts recovery; Viral load suppression

## Background

Human immunodeficiency virus (HIV) infection brings about fear and worries to patients who contract it [1,2]. Experiences from Kenya show that patients who disclosed their HIV status were stigmatized [2-4]. As a result of the stigma attached to HIV status, some patients elect not to disclose their status to others [4,5]. This is because stigma is known to drive away HIV-infected patients' from social support, family gathering and even spiritual support [5-8]. On the other hand, it is known that social, family and or spiritual support are of paramount importance in influencing treatment outcomes among HIV infected individuals [3,7].

Adherence to antiretroviral therapy (ART) has been associated with better prognosis. HIV-infected patients who take their medication at regular intervals improve their health significantly [3,9]. A study conducted by Ekam et al. [10] on the pattern and determinants of antiretroviral drug adherence revealed that patients who disclosed their HIV status had better adherence to therapy as well as receiving support from the family members [3,10-12]. Additionally, many studies have reported that disclosure of HIV status was linked to better adherence,

with the ultimate better viral load suppression (VLS) and immunological improvement [10,13,14]. When patients take medicines without having the fear of being stigmatized it means that the medications can indeed be taken even at their work places, as well as in front of their relatives and other family members including their sexual partners [14]. In so doing patient's confidence is increased and hence better health outcomes [10,12-14].

To our knowledge, the information about patients' HIV status disclosure before or after initiation of antiretroviral medicines has not been documented in Tanzania. The current findings are limited to inform just disclosure or non-disclosure of serostatus among HIV-infected patients with their associated outcomes. We investigated whether or not HIV status disclosure before ART initiation has influence on the adherence to therapy; CD4+ T cell counts levels, and viral load levels.

## Materials and Methods

### Study design

This was a prospective cohort study among ART naïve HIV/AIDS infected patients who visited CTC's in Dar-es-Salaam, Tanzania.

## Study settings and population

HIV-infected subjects (aged  $\geq 18$  years) were recruited from CTC's supported by the Management and Development for Health (MDH) program in Dar es Salaam region. The MDH program is supported by the US President's Emergency Plan for AIDS Relief (PEPFAR) to support HIV clinics within Dar es Salaam city. The clinics are located within hospitals or health centers, and include Muhimbili National Hospital (MNH); Temeke, Amana, and Mwananyamala hospitals; Infectious Disease clinic (IDC); and Mbagala, Sinza, Mnazi Mmoja, Buguruni and Tabata health centers. The clinics have enrolled about 70,000 patients and about two-thirds of them are women. Among these patients, about 7,000 were on care and monitoring at Mwananyamala, Amana, IDC and Temeke hospitals as they were not eligible for antiretroviral therapy. About 40 patients were identified on a daily basis as eligible and thus initiated on antiretroviral therapy. The study participants were recruited from 4 CTC's which were at the IDC, Amana, Temeke and Mwananyamala hospitals. Selection of the study sites was based on the high enrolment and antiretroviral therapy initiation rates of eligible HIV infected patients. Inclusion criteria required that patients be HIV-infected as confirmed by positive HIV antibody test, able to give informed consent, and eligible for initiation of antiretroviral therapy and naïve to antiretroviral medicines as determined by self-reporting. Exclusion criteria included patients who lived outside Dar es Salaam region that could not keep their appointment due to distance and patients with a mental disorder.

## Sample size and study procedures

Using systematic sampling, 520 HIV-infected patients were selected prior to initiation of ART from the 4 CTC in Dar-es-Salaam. The sample size was calculated based on 90% power, at significance level of 5%, assuming 5% differences between hypothetical and postulated proportion of patients adhering to therapy. Patients visited the clinic on a monthly basis with a total follow up period of one year. Patients were asked to remain in Dar-es-Salaam for the entire study period. Dar es Salaam is one of the big cities in Tanzania located in the East part of the country boarded by Indian Ocean with the total population of about 4.4 million people.

Disclosure of HIV status was assessed at the first initiation of antiretroviral therapy using a structured questionnaire. Patients were asked whether they have disclosed their HIV status or not to any of the family members, once they became aware of being HIV infected. Medicines were provided on a monthly basis and pill count (PC) and self-reporting (SR) were used to assess adherence at three, six, nine and twelve months. The dispensing personnel counted the remaining tablets before dispensing medicines for the following month. Also the dispensing personnel asked patients whether or not they had missed doses for the past thirty days. Adherence was expressed as a percentage based on the number of pills taken out of the monthly supply, as well as from deducting the number of missed days from the total number of days a patient was supposed to take the medicines. If the patient was taking twice-a-day dosing, each dosing was considered as half a day dosing.

Viral load was measured at baseline and six months by COBAS AmpliPrep/COBAS TaqMan HIV-1 Test, version 2.0 (Roche, Switzerland). CD4+ T cell counts were measured at baseline, three, six, nine and twelve months by FacsCalibur (BD Biosciences serial number E9750071, USA) at Immunology Laboratory, Muhimbili National Hospital.

## Study endpoints

The primary outcomes were; the proportion of patients who adhered to therapy, the average increase in CD4+ T cell counts at twelve months from baseline, and the viral load suppression to  $<400$  copies/mL at six months.

## Data and statistical methods

Data were double entered into a secure Microsoft Access database. For statistical analyses Stata for windows software (version IC/12.1; 4905; Stata corp; College Station, Texas 77845 USA) was used. Patients' baseline characteristics were compared and statistical tests were performed using Chi-square and t-tests for categorical and continuous variables respectively. We performed logistic regression to determine the association between HIV status disclosure and the outcomes. All tests were 2-sided and were tested at 5% level of significance.

We classified HIV status disclosure as "early" if patients disclosed before initiation of ART, while disclosure after initiation of therapy was regarded as "late". We considered "non-disclosure" of HIV status if patients did not disclose their status during the entire study period. We classified adherence to antiretroviral therapy as good or bad, if patients took their prescribed medicines  $\geq 95\%$  and less than 95% respectively. We classified CD4+ T cell count recovery as "no recovery" if there was a decrease or no increase of average CD4+ T cell counts from baseline to the average of CD4+ T cell counts at three, six, nine and twelve months of follow up. On the other hand "recovery" was considered if there was an increase in the average CD4+ T cell counts at the 4 time points from baseline. We classified viral load suppression if patients had HIV-1 RNA less than 400 copies/mL at six months. We classified age groups as below 30, 31-40 years and  $>40$  years. Marital status was classified as single, married and widowed if patients were unmarried, on the other hand, patients were considered married, if were married or co-habiting while widowed were considered if patients were living alone due to partner's death. We considered family member if the patients' relationship with the other persons were in the category of being a wife, husband, mother, child, cousin, brother, sister, father, uncle, grandfather or grandmother. We defined a partner as a husband, wife or two persons of opposite sex having a sexual relationship.

## Ethical issues

The institutional review board (IRB) of Muhimbili University of Health and Allied Sciences (MUHAS) approved the study. The respective Municipal authorities granted permission where the facilities were located.

## Results

Between November 7th 2011 and February 28th 2013, a total of 462 (88.8%) of the 520 enrollees completed the study, of whom 136 (29.4%) were males. Of those who did not complete the study, there were 10 (1.9%) transfers, 9 (1.7%) deaths, 33 (6.3%) lost to follow up, and 6 (1.2%) withdrawal of consents (Figure 1). The overall mean (standard deviation [SD]) age was 39 (8.8) years, while it was 41 (9) and 38 (9) years for males and females respectively (Table 1).

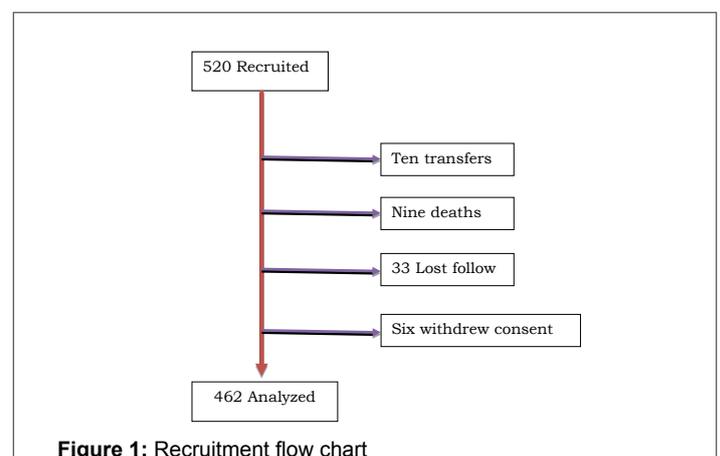


Figure 1: Recruitment flow chart

Variable	Disclosure status				P value
	Total n(%)	Early n(%)	Late n(%)	None n(%)	
<b>Sex</b>					
Male	136 (29.4)	9 (15.0)	97 (31.3)	34 (37.0)	<0.05
Female	326 (70.6)	51 (75.0)	213 (68.7)	58 (63.0)	
<b>Age</b>					
≤ 30 years	68 (14.7)	11 (18.3)	48 (15.5)	9 (9.8)	0.416
31-40 years	218 (47.2)	31 (51.7)	142 (45.8)	45 (48.9)	
>40 years	176 (38.1)	18 (30.0)	120 (38.7)	38 (41.3)	
<b>WHO</b>					
Stage 1	43 (9.3)	5 (8.3)	35 (11.3)	3 (3.3)	0.109
Stage 2	148 (32.0)	23 (38.3)	97 (31.3)	28 (30.4)	
Stage 3/4	271 (58.7)	32 (53.3)	178 (57.4)	61 (66.3)	
<b>Education</b>					
Primary	391 (84.6)	49 (81.7)	266 (85.8)	76 (82.6)	0.581
Secondary	63 (13.7)	10 (16.7)	40 (12.9)	13 (14.1)	
College	8 (1.7)	1 (1.6)	4 (1.3)	3 (3.3)	
<b>Marital</b>					
Single	72 (15.6)	6 (10.0)	54 (17.4)	12 (13.0)	0.086
Married	248 (53.7)	42 (70.0)	157 (50.7)	49 (53.3)	
Widowed	142 (30.7)	12 (20.0)	99 (31.9)	31 (33.7)	
<b>CD4 count</b>					
<350 cells/mm <sup>3</sup>	406 (87.9)	49 (81.7)	276 (89.0)	81 (88.0)	0.278
≥ 350 cells/mm <sup>3</sup>	56 (12.1)	11 (18.3)	34 (11.0)	11 (12.0)	
<b>Viral load</b>					
<400 particles/mL	0	0	0	0	1
≥ 400 particles/mL	462 (100)	60 (100)	310 (100)	92 (100)	

**Table 1:** Baseline demographic information

### Disclosure and adherence

Of the 462 patients, 60 (13%) and 310 (67.1%) disclosed their HIV-status before and after ART initiation respectively. Ninety two (19.9%) did not disclose their HIV-status. Compared to females, males were significantly fewer in all the three categories. There were 9 (15%) males who disclosed their status before initiation of ART, 97 (31.3%) who disclosed later on, and 34 (37%) who did not disclose their HIV-status ( $p < 0.05$ ).

Overall, there were statistically significant differences between patients who disclosed their HIV-status and those who did not, in terms of adherence to therapy, with a risk ratio (95% CI) being 2.722 (2.073, 3.574);  $p < 0.0001$ . The proportion adhering to therapy of 96.7% (58/60) was higher in patients who disclosed their HIV-status before ART initiation compared to that of 85.8% (266/310) among those who disclosed later on,  $p = 0.0218$ . However, when adherence was determined at different time points, we noted a decrease in the proportion of patients adhering to therapy with time (Figure 2).

Among patients who disclosed their HIV-status, the proportion adhering to therapy was 89% (310) among females, while it was 81.1% (114) among males,  $p = 0.0327$ . There was no statistically significant difference noted between the age group in terms of disclosure of HIV-status, with a risk ratio (95% CI) being 1.10 (0.879, 1.378). We also found that couples were more likely to disclose their HIV-status before initiation of ART by 46.5% compared to patients who were living alone, with a risk ratio (95% CI) being 0.535 (0.328, 0.873;  $p = 0.0100$ ). Patients living as couples had significantly better adherence to therapy 84.7% (210) compared to those who were living alone 75.2% (161),  $p = 0.0219$ .

### Disclosure and CD4+T-cell counts

The overall mean (SD) CD4+ T-cell counts recovery was 207 (154) cells/mm<sup>3</sup>. The figures were 322 (134), and 229 (138) among patients who disclosed “early” and “late” respectively. Patients with “non-disclosure”

had a mean (SD) recovery of 62 (113) cells/mm<sup>3</sup>. These differences were statistically significant,  $p = 0.0341$ . The probability of CD4+ T-cell counts recovery was twice as much among patients who adhered to therapy compared to that among non-adherent patients, with the risk ratio (95% CI) being 2.031 (1.252, 3.295). Furthermore, there was a statistically significant difference in terms of mean (SD) CD4+ T-cell counts recovery between males and females, 176 (140) and 225 (162) respectively,  $p = 0.002$  in favor of females. Additionally, patients with age below 40 years were about 82% more likely to recover their CD4+ T-cell counts compared to those with age above 40 years, with a risk ratio (95% CI) being 1.82 (1.618, 2.048).

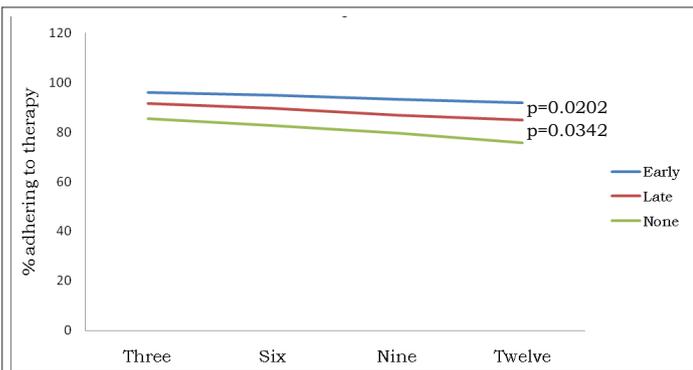
### Disclosure and viral load suppression

The proportions of patients who achieved VLS were 80.1% and 19.9% among patients who disclosed their HIV-status and those who did not respectively,  $p < 0.0001$ . Furthermore, the proportions of patients who achieved VLS were 96.7% (58/60) and 80.6% (250/310) among those who disclosed early and late respectively,  $p = 0.0028$ .

Compared to non-adherent patients the proportion achieving better viral load suppression was 17.6% among those who adhered to therapy, with a risk ratio (95% CI) being 1.176 (1.060, 1.305;  $p = 0.0038$ ). Similarly, the proportion who had better CD4+T-cell counts recovery of 94% among those with better VLS was higher than that of 85% among those with poor viral load suppression,  $p = 0.034$ .

### Discussion

Disclosure of HIV status poses significant challenges to patients. Consequent stigma and other social segregation ramifications compel some patients to hesitate revealing their status to family members and other associates. To our knowledge, this is the first study in Tanzania to confirm that disclosure of HIV status before or after initiation of ART impacts on adherence, restoration of immunity and viral load suppression.



**Figure 2:** Proportion of patients adhering to therapy at different time periods

However, our findings indicate that 67.1% patients reveal their HIV status after initiation of therapy. This is probably due to the need to have financial or moral support from either relatives or other family members as reported before [4,15]. Also the fact that side effects experienced from use of antiretroviral drugs in most cases are unlikely to be hidden for long may drive patients to reveal their status. The hesitancy to disclose HIV status before initiation of ART on the other hand may be due to the fear of being stigmatized at very early stage of infection as symptoms may appear later on from time of infection [15-17]. It has been reported that relatives and or sexual partners might discriminate against patients who have revealed their HIV status; therefore patients may fear to lose their social status that has been built for a long time [15].

Our findings indicated that patients who disclosed their HIV status before initiation of ART had better adherence, immunity and viral load suppression outcomes. This is likely due to the fact that early disclosure brings about courage for one to strive against the disease than looking for solution when it is late. Furthermore, if it so happens that a patient gets stigmatized at the point of revealing the status, the early disclosure would have wiped off all bad experiences encountered during disclosure allowing the patient to focus on addressing the infection as previously reported [17]. The psychological torture that is known to occur [18] would have been healed, hence once the patient starts therapy, he/she would be having nothing to fear and is more likely to observe a higher adherence than would those who disclose later on or do not disclose at all [17]. Our findings indicate that patients with better adherence have better immunological recovery and viral load suppression [19]. This is because patients who adhere to therapy have good maintenance of drug therapeutic concentrations that halt viral replications with the ultimate good immune recovery [19].

It was found in this study that males were less likely to reveal their HIV status compared to females. This is probably due to the fact that males are known to have poor health seeking behavior [20-23]. Females on the other hand are known to be more likely attending medical services more frequently than men, especially during pregnancy, when taking their children for medical services and or when attending for gynecological problems [22]. Indeed these services might be the entry points for HIV testing among females, hence knowing their serostatus earlier than males. Once patients know their HIV status, they are more likely to seek for medical attention than those who do not. The act of seeking medical attention is reportedly associated with seeking for financial, social and moral support [23]. Therefore it is easier for females to share their status to individuals whom they trust; who might also solve their distressing conditions with the ultimate support in therapy.

Among patients who disclosed their HIV status, our findings showed that females adhere to therapy more compared to males This could be

due to the fact that females are known to be more responsible in the daily living chores of their children. They are therefore more eager to have good health so as to ensure that their children and other family members get their support [24]. Indeed in many societies, females are the pivotal figures and symbols of a united and stable family. Knowing this responsibility, females will ensure by all means that they have good health by adhering to therapy [23,25].

Our findings also indicate that couples were more likely to disclose their HIV status earlier compared to those living alone. This implies that once a person discovers that he/she is HIV infected the immediate partner is the one more likely to be informed, likely for the sake of getting support from her or him [18,24]. In our settings it is difficult for one to attend a medical facility while the other partner is completely unaware. It is therefore plausible that the one who seeks for medical attention reports back on what has transpired following a hospital visit. In the event that there are misunderstandings, they are likely to be resolved earlier before therapy is initiated [18,24]. In this context a partner who is on therapy is likely to take his/her medications without fear of being seen by his/her partner, and hence to be more adherent to therapy than when a patient lives alone [18].

This study revealed that a few patients do not reveal their HIV status at all [18,26]. The reason for not disclosing might be due to personal stigma, fear of losing friends, marriage and social status [18,24,26]. To these patients, friends, marriage, society are more important than their personal health [26]. Adherence to therapy is more likely to be interrupted because patients take their prescribed medicines at private or secluded places [4]. In the event of social or family gathering, patients are more likely not to take medicines, hence are likely to have poor immune recovery and poor viral load suppression than those who disclose their HIV status [27].

Our findings indicate that HIV status disclosure was associated with good adherence. Many studies report that adherence is associated with improved immunity hence better viral load suppression [3,27,28]. Our findings are in keeping with those from studies conducted by Ekama et al. [10] and Ramadhani et al. [28] who reported that patients who adhered to therapy were more likely to have improved immunity and viral load suppression.

In conclusion, disclosure of HIV status before initiation of ART is important to have excellent adherence to therapy, immune restoration and viral load suppression. This needs to be emphasized in our health care and other settings. Additionally more studies are recommended to assess the motivation for HIV-infected patients to reveal their status before initiation of therapy.

## Acknowledgements

The investigators are grateful to study participants who were bold enough to have a high clinic attendance for the study period of six months. We also acknowledge the health staff team who participated in data collection. The study was funded by Fogarty International Centre (FIC) of the National Institute of Health (NIH) through International Clinical Operations Health Research in Tanzania (ICOHRTA) a collaborative project between MUHAS (Tanzania) and the Harvard School of Public Health (USA).

## Conflicts of Interest

There were no potential conflicts of interest disclosed.

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