Original article

Adherence to Highly Active Antiretroviral Therapy in People Living with HIV/AIDS

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Abstract

Background: Maintaining adherence to HIV/AIDS treatment is essential to delay or prevent drug resistance and ensure the long-term effectiveness of first-line antiretroviral therapy. *Objectives:* This study aimed to assess the level of adherence to Highly Active Anti-Retroviral Therapy (HAART) and identify factors influencing adherence among individuals living with HIV/AIDS. *Methodology:* A cross-sectional study was carried out at Ashar Alo Society in Mohammadpur, Dhaka, from July 2013 to June 2014. Data were gathered from 193 participants through face-to-face interviews using a semi-structured questionnaire based on the Center for Adherence Support and Evaluation Adherence Index and a checklist for document review. *Result:* In the study, 53.9% of respondents were male, 43.0% female, and the rest were transgender, with a mean age of 36.8 years. Most had completed secondary school (46.6%), 29.5% were businessmen, 58.5% came from nuclear families, the average family size was 4.7, and 69.4% were married. A total of 97.4% of participants adhered to Highly Active Antiretroviral Therapy (HAART) based on Pill count and the Center for Adherence Support and Evaluation Index. Most respondents had been diagnosed with HIV for over 730 days (64.8%) and on HAART for the same period (49.7%). More than half (59.6%) took a single daily dose, with a mean of 2.75 tablets per day. Adherence was significantly higher in males (p = 0.005) and married individuals (p = 0.027). Full adherence was observed in participants with primary or higher education, age 41+, family support, recent HIV detection (68-365 days), shorter HAART duration (59-365 days), single daily dose, and baseline CD4 count ≥ 300. Non-adherence was mainly due to negligence (40%), being away from home, frustration, and being busy (20% each). *Conclusion:* To improve HAART adherence, continuous counseling for both patients and their families is recommended.

Keywords: HAART, HIV/AIDS, Antiretroviral Therapy, Treatment Adherence

Introduction:

Adherence to Highly Active Antiretroviral Therapy (HAART) is essential for successful HIV treatment, requiring 95% adherence to ensure optimal virological, immunological, and clinical outcomes. This prevents drug resistance and maintains the long-term effectiveness of therapy. HAART, the gold standard in HIV/AIDS management, should be offered comprehensively, including adherence counseling, regular lab tests, management of opportunistic infections, and continuous treatment

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monitoring.[1]

Virological response to Highly Active Antiretroviral Therapy: Usually by week 24 following initiation of treatment, patient's viral load should be at the least <400 copies /ml.[2]

The introduction of highly active antiretroviral therapy (HAART) in 1996 significantly improved the management of HIV, reducing morbidity and mortality. However, since HIV is a chronic disease requiring long-term treatment, patients often face challenges with adherence to their medication regimens. Non-adherence has been identified as a major reason for treatment failure, leading to increased morbidity and mortality. Effective antiretroviral therapy is heavily dependent on patient adherence.[3]

The introduction of highly active antiretroviral therapy (HAART) in the treatment of HIV has shown dramatic results, leading to the reduction of mortality and the improvement of the quality of life of People Living with HIV/AIDS.[4]

The emergence of drug-resistant viral strains linked to suboptimal adherence in resource-poor settings poses challenges for the effectiveness of Highly Active Antiretroviral Therapy (HAART) in HIV/AIDS treatment. High patient motivation and adherence are crucial to prevent resistant strains. A 10% increase in adherence could lead to a 21% reduction in disease progression, highlighting that nonadherence increases the risk of therapy failure and drug resistance.[5,6]

Optimal adherence to antiretroviral regimens is closely associated with achieving and maintaining HIV viral suppression and preventing the development of drug-resistant virus. Missed antiretroviral doses, interruptions in therapy and improper dosing can all lead to HIV drug resistance. Adherence measures were significantly associated with VL, with 42% of suboptimally adherent patients compared with only 19% of optimally adherent patients showing virological failure (P < 0.001).[7]

The present significant challenges to both patients and health-care providers with respect to adherence. Without adequate adherence, antiretroviral agents are not maintained at sufficient concentrations to suppress HIV replication in infected cells and to lower the plasma viral load. In addition to being associated with poor short-term virological response, poor adherence to antiviral medication accelerates development of drug-resistant HIV.[8]

Antiretroviral adherence is the second strongest predictor of progression to AIDS and death, after CD4 count. Incomplete adherence to Antiretroviral Therapy, however, is common in all groups of treated individuals. The average rate of adherence to Antiretroviral Therapy is approximately 70%, despite the fact that long-term viral suppression requires near-perfect adherence.[9]

The main goal of Antiretroviral Therapy (ART) is to reduce HIV-related illness and death, with an initial focus on achieving sustained viral suppression. Near-perfect adherence (over 95%) to ART is crucial for this suppression. Nonadherence can lead to decreased immunological benefits and increased rates of morbidity, mortality, and hospitalization. A study involving 1,095 patients showed a clear correlation between adherence levels and CD4 count increases at 12 months, with higher adherence linked to greater CD4 cell gains.[10]

Bangladesh is a low-level epidemic but high risk country. Prevalence of Most at Risk People (MARP) {FSW, MSM, Hijra, and Transgender} and in general population is less than one percent. According to 9th round of serological surveillance (2011) the overall prevalence of HIV is 0.7%. Highest rate of HIV is among People Who Inject Drug (PWID). But the prevalence has declined to 5.3% from 7%.[11]

The introduction of HAART in 1996 changed the clinical course of HIV, with a significant decline in morbidity and mortality. Evidence suggests that HIV-positive patients have problems taking antiretroviral medication correctly and non-adherence has been recognized as one of the main causes of treatment failure.[3]

Materials and methods

This cross-sectional study aimed to determine the extent and factors affecting adherence to HAART. Both qualitative and quantitative data were gathered through interviews with respondents at Ashar Alo Society, Mohammadpur, Dhaka, a community-based NGO working with people living with HIV/AIDS (PLHIV). The study was conducted from July 2013 to June 2014.

Adults (18+), male, female, and transgender, diagnosed with HIV/AIDS, receiving HAART, and willing to participate were included in the study. Ashar Alo Society was selected purposively for collecting samples, as it provides HIV/AIDS treatment. For data collection, a semi-structured questionnaire was used, including socio-demographic data, adherence factors, the CASE Adherence Index, and reasons for non-adherence. Adherence was assessed by pill count and using the following formula:

Adherence (%) = (Total pills taken×100) ÷ (Total pills prescribed)

Ethical approval was obtained from NIPSOM and Ashar Alo Society. Informed consent was secured, and confidentiality maintained. The cross-sectional design limited causal inferences. The study was restricted to one center, had a low educational level among respondents, and few non-adherent participants, affecting the conclusions.

Result:

A total of 193 respondents were enrolled in this study. Collected data on adherence to HAART were organized into four different categories:

a) Socio-demographic and economic characteristics

b) Extent of treatment adherence to Highly Active Antiretroviral Therapy

c) Factors associated with adherence to Highly Active Antiretroviral Therapy

d) Reasons behind non-adherence to Highly Active Antiretroviral Therapy

a) Socio-economic characteristics

The study involved 193 respondents, with 53.9% male, 43.0% female, and 3.1% transgender. The mean age was 36.88 years, with the majority (28.5%) aged up to 30 years. Most respondents were Muslims (91.7%) and married (69.4%). Living arrangements included 57.5% in rural areas. Occupationally, 29.5% were businessmen and 28.5% housewives. Education levels showed 46.6% completed secondary school, while the average family income was Tk. 11,248. Less than half were the primary income source, with most residing in tin shed houses (54.9%). Family sizes averaged 4.7 members, with 59.1% having 4 to 6 members.

b) Extent of treatment adherence

Using the Center for Adherence Support and Evaluation (CASE) Adherence Index Questionnaire, where the total score ranges from 3 to 16 (with scores >10 indicating good adherence and scores ≤10 indicating poor adherence), the majority of respondents (50.3%) obtained a score of 13. One-fifth of respondents (20.2%) received a score of 11, and only 6.7% of participants achieved the maximum score of 16. A score of ≤10 was observed in only 2.5% of respondents. The mean score was 12.5 (±1.5). Based on adherence assessed via pill count, 74.1% of respondents achieved a score of 100. Only 2.6% had a score below 95, while 17.9% received a score between 97 and 99. The mean pill count score was 99.3 (±1.5). In this study, 97.4% of participants were adherent to HAART based on both the pill count and the CASE Adherence Index Questionnaire, while only 2.6% were classified as non-adherent.

c) Factors associated with adherence to HAART

Among the 193 respondents, the majority (93.8%) lived with their family, while 5.7% lived alone, and only one person (0.5%) lived with a friend. In this study, 85.5% of participants disclosed their HIV status, while 14.5% chose to keep it confidential.

Of the respondents, 67.9% managed their daily medication reminders themselves, while 32.1% were reminded by family members. The majority (86%) attended physician visits alone, 13.5% were accompanied by family, and only one person (0.5%) attended with a friend.

All participants (100%) expressed satisfaction with their healthcare provider. Most respondents (97.4%) received counseling at every follow-up visit, with only 2.6% reporting they did not. Similarly, 97.4% were satisfied with the time spent on counseling, and only 2.6% reported insufficient counseling time.

A majority of respondents (63.2%) felt comfortable taking antiretroviral drugs in the presence of others, while 36.8% did not. Additionally, 96.9% of respondents reported no history of alcohol or substance use, while 3.1% had a history of such usage.

Regarding antiretroviral drug side effects, 63.2% of respondents reported none. Itching was experienced by 12.4%, while nausea and/or vomiting, anorexia, fever, and skin pigmentation were reported by 5.7%, 4.7%, 4.1%, and 4.1%, respectively. Diarrhea and paresthesia/neuropathy were each reported by 2.1%, and 1.6% experienced skin rashes.

The majority of respondents (64.8%) had been diagnosed with HIV for more than 730 days, with 19.2% diagnosed between 366 to 730 days, and 7.8% diagnosed within 180 days. The mean duration of HIV detection was 1,306 (±993) days.

Nearly half of respondents (49.7%) had been on HAART for more than 730 days, 22.3% had been on HAART for 366 to 730 days, 15.5% for ≤180 days, and 12.4% for 181 to 365 days. The mean duration of HAART was 866 (±725) days.

A majority of respondents (90.7%) had no history of opportunistic infections, while 9.3% reported such infections. Among the respondents, 96.4% acquired HIV through sexual transmission, 3.1% through blood transfusions, and one person (0.5%) via intravenous drug use.

Most respondents (91.2%) did not require a change in drug regimens, while 8.8% reported changes. Nearly half of the respondents (43%) were on the antiretroviral regimen of TDF+FTC+EFV. A similar proportion (26.9%) were on TDF+3TC+EFV, and 26.4% were on a double combination that included EFV. Smaller proportions were on LPV/r-based regimens: 2.6% on LPV/r, TDF, and 3TC, and 1% on a double combination with LPV/r.

Of the 193 respondents, 59.6% were prescribed a double daily dose, while 40.4% were on a single daily dose. The majority (26.9%) took four tablets per day, followed by three tablets per day (24.9%), two tablets (23.8%), and one tablet (20.7%). Only 2.6% took seven tablets per day. The mean number of tablets per day was 2.75 (±1.33).

At the time of HAART enrollment, 34.7% of respondents had a CD4 cell count between 100 and 199, followed by 28.5% with counts between 200 and 299. A CD4 cell count below 100 was recorded for 26.4% of participants, while only 5.7% had counts above 350. The mean CD4 cell count was 176 (±106.8).

The study found no significant association between participants' age and adherence to HAART. In the age group of 41 years and above, adherence was 100%, followed by the 36 to 40 age group with 97.4% adherence. The lowest adher-

ence (94.5%) was observed among participants aged 18 to 30. Although five cells (50.0%) had an expected count of less than five, Fisher's Exact Test was conducted, revealing no significant association between age and adherence to HAART (p = 0.69).

In contrast, the study identified a significant association between gender and adherence to HAART. Male participants demonstrated a higher adherence rate (99.0%) compared to female respondents (97.6%), with the lowest adherence observed among transgender individuals (66.7%). Despite three cells (50.0%) having an expected count of less than five, Fisher's Exact Test was applied, and the association between adherence and gender was found to be statistically significant (p = 0.005).

Table-1: Association between Gender of the respondents and Adherence to HAART

Gender	Adherence to HAART				Total	
	Non-adherent		Adherent			
	frequency	percentage	frequency	percentage	frequency	percentage
Male	1	1.0%	103	99.0%	104	100.0%
Female	2	2.4%	81	97.6%	83	100.0%
Transgender	2	33.3%	4	66.7%	6	100.0%
Total	5	2.6%	188	97.4%	193	100.0%
Significance	Fisher's Exact Test p = .005					

The study found no significant association between respondents' religion and adherence to HAART. Among Muslim participants, 97.2% were adherent, while 100% of Hindu respondents demonstrated adherence. Although two cells (50.0%) had an expected count of less than five, Fisher's Exact Test was conducted, revealing no significant association between religion and adherence to HAART (p = 1.000).

In contrast, the study identified a significant association between marital status and adherence to HAART. Married respondents exhibited the highest adherence rate (99.3%), compared to 88.9% among single participants and 93.8% among widowed individuals. Divorced respondents showed 100% adherence. Despite four cells (50.0%) having an expected count of less than five, Fisher's Exact Test was applied, and the association between marital status and adherence was found to be statistically significant (p = 0.027).

The study found no significant association between the monthly family income of respondents and adherence to HAART. Participants with a monthly family income between 9,000 and 18,000 had 100% adherence, while the lowest adherence (94.3%) was observed among those with a monthly family income of up to 8,000. Although four cells (50.0%) had an expected count of less than five, Fisher's

Table-2: Association between Marital status of the respondents and Adherence to HAART

Marital status	Adherence CASE				Total	
	Non-adherent		Adherent			
	frequency	percentage	frequency	percentage	frequency	percentage
Single	2	11.1%	16	88.9%	18	100.0%
Married	1	.7%	133	99.3%	134	100.0%
Divorced	0	0%	9	100.0%	9	100.0%
Widowed	2	6.3%	30	93.8%	32	100.0%
Total	5	2.6%	188	97.4%	193	100.0%
Significance	Fisher's Exact Test, p = .027					

Exact Test was applied, showing no significant association between monthly family income and adherence to HAART (p = 0.103).

Similarly, no significant association was found between the educational qualification of respondents and adherence to HAART. Participants with primary, higher secondary, and above qualifications exhibited 100% adherence, while the lowest adherence (91.9%) was found among illiterate participants. Despite four cells (50.0%) having an expected count of less than five, Fisher's Exact Test was conducted, revealing no significant association between educational qualification and adherence to HAART (p = 0.121).

The study also found no significant association between the reminder assistance for medication doses and adherence to HAART. Participants who were reminded by family members had 100% adherence, compared to 96.2% adherence among those who did not receive family support. Although two cells (50.0%) had an expected count of less than five, Fisher's Exact Test indicated no significant association between reminder assistance and adherence to HAART (p = 0.178).

Regarding accompaniment during physician visits, the study found no significant association with adherence to HAART. Participants who were accompanied by family or friends had 100% adherence, while those who attended physician visits alone had 97% adherence. Despite four cells (66.7%) having an expected count of less than five, Fisher's Exact Test revealed no significant association between accompaniment and adherence to HAART (p = 1.00).

The study also found no significant association between the duration since HIV detection and adherence to HAART. Participants who had been diagnosed with HIV within 68 to 365 days exhibited 100% adherence, while the lowest adherence (96.8%) was observed among those diagnosed for more than 730 days. Although four cells (50.0%) had an

expected count of less than five, Fisher's Exact Test found no significant association between the duration since HIV detection and adherence to HAART (p = 1.00).

Similarly, no significant association was observed between the duration of HAART and adherence. Participants who had been on HAART for 59 to 365 days had 100% adherence, while the lowest adherence (95.8%) was found among those on HAART for more than 730 days. Despite four cells (50.0%) having an expected count of less than five, Fisher's Exact Test revealed no significant association between the duration of HAART and adherence (p = 0.84).

The study also found no significant association between the number of daily doses and adherence to HAART. Participants who received a single daily dose exhibited 100% adherence, while those on a double daily dose had an adherence rate of 95.7%. Although two cells (50.0%) had an expected count of less than five, Fisher's Exact Test found no significant association between the number of daily doses and adherence to HAART (p = 0.082).

Lastly, the study found no significant association between CD4 count at HAART enrollment and adherence to treatment. Participants with a baseline CD4 count of ≥300 exhibited 100% adherence, while the lowest adherence (96.4%) was found among those with a CD4 count between 200 and 299, followed by those with a count between 100 and 199 (97%). Although four cells (50.0%) had an expected count of less than five, Fisher's Exact Test indicated no significant association between baseline CD4 count and adherence to HAART (p = 1.00).

d) Reasons behind non-adherence

Negligence was the main reason (40%) behind non-adherence to HAART. Away from home (20%), Frustration (20%), Busy with other things (20%) was the other reasons behind non-adherence to HAART.

Table-3: Distribution of respondents by Reasons behind non-adherence to HAART

Reasons behind non-adherence	Frequency	Percent
Away from home	1	20.0%
Frustration	1	20.0%
Busy with other things	1	20.0%
Negligence	2	40.0%
Total	5	100.0%

Discussion:

The article presents an analysis of several factors influencing adherence to Highly Active Antiretroviral Therapy (HAART) in individuals with HIV/AIDS across various countries, including Brazil, India, Ethiopia, South Africa, and Nigeria. The findings reveal that gender, age, marital status, education, and occupation significantly affect HAART adherence. Notably, most participants were male, middle-aged, and had completed secondary education. In Nigeria and Ethiopia, the majority were married, with businesspeople and civil servants being prominent occupation groups.

Adherence rates varied, with higher rates observed in India (87.6%) and lower rates in South Africa (63%). Key factors associated with better adherence included older age, higher education, male gender, family support, and higher baseline CD4 counts. Common reasons for non-adherence were forgetfulness, being away from home, and busyness. Despite relatively high adherence overall, barriers such as negligence and frustration remained prevalent.

Several studies have explored gender, age, marital status, education, and adherence to Highly Active Antiretroviral Therapy (HAART) across various countries. For instance, gender distribution in studies from Brazil, India, and France showed male predominance.[7, 12, 13] Age-related patterns in Nigeria, South Africa, and Ethiopia revealed mean ages of 39.1, 34.1, and 35.3 years, respectively.[14, 15, 16] Marital status data from Ethiopia and Nigeria indicated the majority were married, with 44.4% and 66.7% respectively.[14, 16]

Occupation profiles varied, with businesspeople and civil servants forming the majority in Nigeria[14] and similar patterns seen in Ethiopia.[16] Education levels showed that most participants in studies from Nigeria and Ethiopia had completed secondary school[l,14, 16] while a South African study reported a higher proportion with secondary or higher education.[17] Adherence rates to HAART varied: 87.6% in West Bengal, India, 75.7% in India, and 63% in South Africa.[7, 18, 19] Significant associations were found between adherence and factors such as age, education, sex, and baseline CD4 count.[17, 18, 19] Reasons for non-adherence included forgetfulness, being away from home, and busyness, which were reported across studies.[14, 18, 20]

These findings highlight the multifaceted factors influencing adherence and the importance of addressing them through targeted interventions.

Conclusion:

Most participants were young, economically disadvantaged, and had completed primary or secondary education. The majority demonstrated adherence to HAART, as assessed through pill counts and the CASE Adherence Index Questionnaire. There were significant associations between adherence and various factors, including gender, marital status, age, educational level, family support, once-daily dosing, and higher baseline CD4 counts. Common reasons for non-adherence included forgetfulness, being away from home, frustration, and being preoccupied.

These findings emphasize the importance of targeted interventions, such as counseling, family involvement, and community support, to address these barriers. Enhancing adherence could slow HIV progression and reduce the likelihood of developing drug resistance, thereby improving patient outcomes. Despite high overall adherence, addressing these influencing factors through effective interventions could further optimize adherence and treatment success.

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