Original Article

Proportion and Determinants of Adherence to Antiretroviral Therapy among HIV Positive People Registered Under ART Center in South India

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Abstract

Background: Antiretroviral therapy (ART) significantly delays the progression from HIV to AIDS. Adherence to ART is the second strongest predictor of progression to AIDS and death, after CD4 count. A very high level of adherence (≥95%) is required for ART to be effective on a long term and to prevent the emergence of resistant viral strains and prevent comorbidities. **Methods:** A case series study was undertaken at an ART center for a period of 6 months. Non-probability purposive sampling was adapted to select HIV-positive subjects aged >15 years on ART for more than 6 months. A predesigned semi-structured questionnaire was used to obtain the data. Treatment compliance was assessed by self-reported 1-week recall method. **Results:** A total of 536 HIV-positive people were interviewed, among which 315 (58.8%) of them were males and 214 (39.9%) were females. Nearly two third of the participants (359, 67.0%) reported ≥95% adherence to treatment. Personal commitments (51, 28.8%) and working time inconvenience (42, 23.7%) were the common reasons for less adherence. On bivariate analysis, married people (OR: 1.586, CI: 1.097-2.292), participants residing in rural area (OR: 1.628, CI: 1.130-2.345), participants not having side effects of drugs (OR: 5.324, CI: 3.491-8.181), participants equipped with better knowledge about ART (OR: 2.019, CI: 1.377-2.961), and participants having support of friends and family members (OR: 1.612, CI: 1.019-2.540) showed a higher level of adherence to ART. **Conclusions:** Demographic factors such as marital status, residing in rural area, and other personal factors like having good knowledge about ART, without side effects to drugs, and having support of friends and family members were found to show a high level of adherence to ART.

Keywords: *Acquired immunodeficiency syndrome, adherence, antiretroviral therapy, human immunodeficiency virus*

Introduction

India has the third highest adult-HIV burden with a prevalence of 0.26%.[1] Advent of antiretroviral drugs for HIV has been an important milestone in the history of HIV/AIDS and not only has changed the way of life for people living with HIV (PLHIV) by adding duration of survival but also has improved quality of life. Antiretroviral therapy (ART) has consistently helped in the prevention of opportunistic infections, hence progression from HIV to AIDS. These drugs have been available in the developed countries since 1990, unfortunately as in many resource-poor areas; access to this treatment was limited in India. However, in India, free ART was started in the year 2004, by adopting technical guidelines from the World Health Organization.[2] Since 2007, there is a consistent decline in AIDS-related mortality by 54% annually; this coincides with rapid access to ART.[1]

Among PLHIV on antiretroviral drugs, adherence to treatment is the second strongest predictor of progression to AIDS and death, after CD4 count.[3] Adherence is the term used to describe the patient's behavior of taking drugs correctly in the right dose, with the right frequency, and at the right time.[2]

A very high level of adherence is also an important determinant of virologic and immunologic outcome, AIDS-related morbidity, mortality, hospitalizations, and to be effective on a long term to prevent the emergence of resistant viral strains.[3-7] The goal of the National AIDS Control Programme is to attain ≥95% individual drug adherence rate.[8] So, the success of the program depends on the sustainable high rates of adherence to medication regimen. Non-adherence risks the development of drug resistance and failure of therapy.

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In India, even though there is free availability of ART, individual's perspective toward treatment, their immediate surroundings, and sociocultural factors plays a major role in compliance to therapy. Hence, this study was started with the objective to know the adherence level to ART and to find out its determining factors.

Methods

A case series study was undertaken at an ART center attached to a medical college from June 1, 2012, to May 31, 2013. The study was approved by the ethical review committee of the institute. A written informed consent was taken from all study participants and confidentiality was maintained throughout the study.

HIV-positive people aged >15 years and who are on ART for minimum period of 6 months were included. A non-probability purposive sampling was adopted to select the study participants and a predesigned semi-structured questionnaire was used to obtain data after explaining the purpose of the study and obtaining written informed consent.

A total of 536 participants were interviewed during the study period. Relevant data on sociodemographic profile were collected by interviewing the participants and clinical profile was noted from the respective ART register. An arbitrary scoring method was adopted to assess the knowledge and attitude toward ART, where a person answering three questions correctly out of five questions with respect to both knowledge and attitude separately was considered to have adequate knowledge or positive attitude.

The treatment adherence level was assessed by 1-week recall method:[9]

$$\text{Adherence level over 7 days} = \frac{\text{Expected no. of doses to be taken} - \text{No. of missed doses} \times 100}{\text{Expected no. of doses to be taken}}$$

A database was created in MS Excel and analysis was done using SPSS version. 20, IBM, New York, USA. Descriptive statistics such as proportion and percentage were used to analyze the findings and to draw the inferences. Chi-square was used to test for statistical significance; a *P* value of <0.05 was considered as statistically significant. Bivariate analysis was performed, and variables found to be statistically significant on bivariate analysis were included in multiple logistic regression analysis.

Results

A total of 536 HIV-positive people were included in this study, out of which 58.8% of them were males, 42.9% were from the 25 to 34 year age group, and 32.8% were between 35 and 44 years. Majority of the study participants (79.1%) were Hindu; 62.7% were married, 60% had studied up to high school, and 57.1% were unskilled laborers. More than one third of the study participants were from upper lower class (39.6%) followed by 31.0% from the lower middle class. A higher proportion of the study participants (59.9%) lived in urban areas while 40.1% were from rural areas [Table 1].

Among 536 participants, majority were on ZLN (zidovudine/lamivudine/nevirapine) regimen (76.7%) followed by 14.8% on SLN (stavudine/lamivudine/nevirapine) regimen and 4.1% on ZLE (zidovudine, lamivudine, efavirenz) regimen. Nearly two third of

Table 1: Association between socio-demographic profile and ART adherence

Socio-demographic profile	Adherence to ART		*P*
	High ≥95% *n* (%)	Low <95% *n* (%)	
1.Age in years			
15 to 24	21 (55.3)	17 (44.7)	0.272
25 to 34	163 (70.9)	67 (29.1)	
35 to 44	117 (66.5)	59 (33.5)	
45 to 54	44 (61.1)	28 (38.9)	
>55	14 (70.0)	6 (30.0)	
2.Gender			
Male	209 (66.3)	106 (33.7)	0.336
Female	147 (68.7)	67 (31.3)	
Transgender	3 (42.9)	4 (57.1)	
3.Religion			
Hindu	290 (68.4)	134 (31.6)	0.353
Muslim	54 (62.8)	32 (37.2)	
Others	15 (57.7)	11 (42.3)	
4.Mariatal status			
Married	238 (70.8)	98 (29.2)	**0.009**
Not married	33 (51.6)	31 (48.4)	
Separated/Widowed	88 (66.7)	48 (33.3)	
5.Education			
Illiterate	27 (69.2)	12 (30.8)	**0.016**
Primary School	35 (52.2)	32 (47.8)	
High School	217 (66.4)	110 (33.0)	
Preuniversity	70 (76.9)	21 (23.1)	
Graduation	10 (83.3)	2 (16.7)	
6.Occupation			
Unemployed	106 (70.7)	44 (29.3)	0.607
Unskilled	197 (64.4)	109 (35.6)	
Semiskilled	44 (68.8)	20 (31.2)	
Skilled	4 (66.7)	2 (33.3)	
Professional	8 (80.0)	2 (20.0)	
7.Socio-conomic status			
Upper	10 (83.3)	2 (16.7)	0.098
Upper middle	72 (66.5)	38 (34.5)	
Lower middle	103 (62.0)	63 (38.0)	
Upper lower	144 (67.9)	68 (32.1)	
Lower	30 (83.3)	6 (16.7)	
8.Area of residence			
Rural	229 (71.3)	92 (28.7)	**0.009**
Urban	130 (60.5)	85 (39.5)	

the participants (67.0%) reported ≥95% adherence to treatment and remaining 33.0% of the study participants reported <95% adherence. Personal work such as attending family functions (28.8%), working time inconvenience to come to the ART center for collection of drugs (23.7%), and difficulty to remember the treatment (23.5%) were the commonest reasons for less adherence.

Married participants showed a higher level of adherence to ART (70.8%) than single (51.6%) and separated or widowed participants (66.7%, $P = 0.009$). Participants who had studied up to graduation (83.3%) and pre-university (76.9%) were better adherent to treatment compared with illiterates (69.2%, $P = 0.016$). A higher proportion of participants residing in rural areas (71.3%) were better adherent than from urban areas (60.5%, $P = 0.009$) [Table 1].

It was evident that the participants who did not have the habit of tobacco usage (71.7%) were better adherent to treatment than the participants with the habit of using tobacco (60.4%) ($P = 0.008$). Participants who had friends and family members who were supporting them personally and helping them to take care of themselves by reminding about the drugs were better adherent to treatment (68.9%) compared with others who were not having support of friends and family members (57.9%) ($P = 0.039$). Not having any of the side effects such as uneasiness, vomiting, and so on to ART drugs showed a high level of adherence (76.3%) compared with participants having any one of the side effects to drugs (37.5%) ($P < 0.005$), and having good knowledge about ART showed better adherence (71.8%) than having poor knowledge about ART (55.8%) ($P < 0.005$) [Table 2].

On bivariate analysis, married participants (OR: 1.586, CI: 1.097–2.292) and participants residing in rural areas (OR: 1.628, CI: 1.130–2.345) were better adherent to treatment compared with unmarried, widowed, and participants from urban area, respectively. A higher level of adherence was also seen among participants with support of friends and family members (OR: 1.612, CI: 1.019–2.540) and without tobacco consumption (OR: 0.611, CI: 0.424–0.879) compared with participants without anybody's support and having a habit of tobacco consumption, respectively [Table 3].

After logistic regression, the determining factors for adherence to ART were being married (AOR: 1.695, CI: 1.113–2.579), residing in rural area (AOR: 1.863, CI: 1.225–2.834), not consuming tobacco (AOR: 0.529, CI: 0.351–0.798), having no side effects to drugs (OR: 11.843, CI: 6.212–22.579), having support of friends and family members (AOR: 2.805, CI: 1.385–5.682), and having good knowledge regarding ART (AOR: 2.437, CI: 1.582–3.753) [Table 4].

Table 2: Association between personal and ART profile with adherence to ART

I-Personl profile	Adherance to ART		*p*
	High ≥95% *n* (%)	Low <95% *n* (%)	
1.Tobacco consumption			
Yes	139 (60.7)	90 (39.3)	**0.008**
No	220 (71.7)	87 (22.3)	
2.Alcohol consumption			
Yes	97 (61.4)	61 (38.6)	0.076
No	262 (69.3)	116 (30.7)	
3.Support of family and friends			
Present	304 (68.9)	137 (31.1)	**0.039**
Absent	55 (57.9)	40 (42.1)	
II-ART profile			
4.Side effects to ART drugs			
Absent	311 (76.2)	97 (23.8)	**<0.005**
Present	48 (37.5)	80 (62.5)	
5.Knowledge regarding ART			
Better knowledge	268 (71.8)	105 (28.2)	**<0.005**
Poor knowledge	91 (55.8)	72 (44.2)	
6.Attitude towards ART			
Positive attitude	318 (68.1)	149 (31.9)	0.154
Negative attitude	41 (59.4)	28 (40.6)	

Discussion

Among HIV-positive people, ART can significantly delay the progression from HIV to AIDS and has transferred the miserable lives of HIV-positive people to chronic manageable disease. A very high level of adherence (≥95%) is required for ART to be effective on long term and to prevent the emergence of resistant viral strains and prevent comorbidities like opportunistic infections.

A self-reported adherence level by 1-week recall method was adopted, which has shown high sensitivity.[3] A high level of adherence (≥95%) to treatment was seen among 67.0% of study participants and 33.0% showed lower level of adherence. Similar cutoff level of >95% adherence was considered in the studies done by Achappa *et al*.[10], Shah *et al*.,[11] and Bello[12] that reported a level of adherence of 63.7%, 73%, and 73.3%, respectively. A little higher level of adherence observed in other studies may be because of the methodology adopted of self-reporting by 4-day recall method, random self-reporting, geographical difference leading to cultural differences, and taboo associated with HIV in study population. A cutoff level of adherence was varying; studies with a higher cutoff level showed lower level of adherence and consequently studies with lower cutoff levels showed a higher level of adherence. In studies done by Naik *et al.*[13] and Sharma *et al.*[14] with absolute 100% cutoff level, 57% and 59% of people were adherent to therapy, respectively, and in a study done Sarna *et al.*[15]

Table 3: Association between socio-demographic, personal and ART profile and adherence to ART among PLHIV by bivariate analysis

Variables		ART Adherence		Odds Ratio	95% CI	*P*
		≥95%	≤ 95%			
Age	<45 years	184 (68.4%)	85 (31.6%)	1.138	0.794-1.632	0.482
	>45 years	175 (65.5%)	92 (34.5%)			
Gender	Males	209 (66.3%)	106 (33.7%)	1.366	0949-1.966	0.093
	Others (Females & Transgender)	147 (68.7%)	67 (31.3%)			
Religion	Hindus	290 (68.4%)	134 (31.6%)	1.348	0.810-2.075	0.174
	Others	069 (61.6%)	043 (38.4%)			
Marital status	Married	238 (70.8%)	98 (29.2%)	1.586	1.097-2.292	0.014
	Others	121 (60.5%)	79 (39.5%)			
Education	Illiterate	27 (69.2%)	12 (30.8%)	1.118	0.552-2.263	0.756
	Literate	332 (66.8%)	165 (33.2%)			
Occupation	Unemployed	106 (70.6%)	44 (29.4%)	1.266	0.842-1.918	0.258
	Employed	253 (65.5%)	133 (34.5%)			
Monthly family income	<5000	194 (66.0%)	100 (34.0%)	0.905	0.630-1.3011	0.591
	>5000	165 (68.2%)	77 (31.8%)			
Area of residence	Rural	229 (71.3%)	92 (28.7%)	1.628	1.130-2.345	**0.009**
	Urban	130 (60.5%)	85 (39.5%)			
Tobacco	Users	139 (60.7%)	90 (39.3%)	0.611	0.424-0.879	**0.008**
	Non users	220 (71.7%)	87 (28.3%)			
Alcohol	Users	97 (61.4%)	61 (38.6%)	0.704	0.478-1.038	0.076
	Non users	262 (69.3%)	116 (30.7%)			
Support of friends & family	Present	304 (68.9%)	137 (31.1%)	1.612	1.019-2.540	**0.04**
	Absent	55 (57.9%)	40 (42.1%)			
Side effects to ARTdrugs	No	311 (76.2%)	97 (23.8%)	5.324	3.491-8.181	**<0.005**
	Yes	48 (37.5%)	80 (62.5%)			
Knowledge regarding ART	Good	268 (71.8%)	105 (28.2%)	2.019	1.377-2.961	**<0.005**
	Poor	91 (55.8%)	72 (44.2%)			
Attitude towards ART	Positive	318 (68.1%)	149 (31.9%)	1.458	0.868-2.448	0.154
	Negative	41 (59.4%)	28 (40.6%)			

Table 4: Determining factors of ART adherence among PLHIV by multiple logistic regression

Variables		ART Adherence		Odds Ratio	95% CI	*P*
		>95%	≤ 95%			
Marital status	Married	238 (70.8%)	98 (29.2%)	1.695	1.113-2.579	**0.014**
	Others	121 (60.5%)	79 (39.5%)			
Area of residence	Rural	229 (71.3%)	92 (28.7%)	1.863	1.225-2.834	**0.004**
	Urban	130 (60.5%)	85 (39.5%)			
Tobacco	Users	139 (60.7%)	90 (39.3%)	0.529	0.351-0.798	**0.002**
	Non users	220 (71.7%)	87 (28.3%)			
Support of friends & family	Present	311 (76.2%)	97 (23.8%)	2.805	1.385-5.682	**0.004**
	Absent	48 (37.5%)	80 (62.5%)			
Side effects to ART drugs	No	311 (68.7%)	142 (31.3%)	11.843	6.212-22.579	**<0.005**
	Yes	48 (57.8%)	35 (42.2%)			
Knowledge regarding ART	Good	268 (71.8%)	105 (28.2%)	2.437	1.582-3.753	**<0.005**
	Poor	91 (55.8%)	72 (44.2%)			

with lower cutoff level of 90%, a higher proportion of 94% people were adherent to treatment. A meta-analysis showed a adherence level of 77% in Africa and 55% in North America with a cutoff level of 95%,[16] whereas in India, adherence level was 70% with different definitions of adherence.[17]

The most common reasons for non-adherence among the less adherent group were personal work (28.8%), that is, being away from home for attending wedding, funerals, religious places, and not able to carry drugs with them because of stigma attached to HIV; difficult to remember (23.7%); and work time inconvenient

especially because of night shifts (23.5%). Similar reasons were found by Achappa *et al*.[10] and Bello.[12] The cost of the treatment was the main barrier to adherence in some of the studies done such as Achappa *et al*.[10] and Kumarsamy *et al*.[18] However, a study done by Sarna *et al*.[15] reported that people paying out of their pockets showed a higher level of adherence compared with free ART. As our study was done in a government hospital with the availability of free investigations, ART, and travel allowance to patients, we did not consider cost as a factor for lower adherence.

It was evident from this study that there was no much difference among different age groups and adherence to therapy, and similar results were observed by studies Achappa *et al.*,[10] Cauldbeck *et al.*,[19] and Olowookere *et al*.[20] However, a study done by Wasti *et al*.[21] revealed that participants older than 35 years were more adherent to treatment (90.3%); this difference may be attributed to strict adherence counselling sessions conducted pre and post ART. Some studies[22-24] have reported that men were more likely to adhere to ART than women. However, in this study, there was no much difference in adherence levels between males and females. One very important finding was that transgender group was very poor in adherence levels. Married participants were better adherent to treatment (70.8%) may be because of the support they receive from their spouses. A contrasting finding was showed by Olowookere *et al*.[20] in which married participants showed a lowest level of adherence compared with others which may be because of the difference in the sociocultural factors.

Education does play an important role in participants being adherent to treatment: by facilitating a better communication between participants and health care provider, increasing understanding, retention of information provided by health workers, and, thereby, enhancing adherence to ART medication. In this study, participants who studied more than pre-university or graduation showed a higher level of adherence and this association was statistically significant. A similar finding was observed in study done by Wasti *et al*.[21] which may be attributed to similar a geographical and sociocultural background. However, on bivariate analysis, illiterates were better adherent to therapy compared with literates which was statistically not significant, likewise in some studies,[10,19,20] illiterates were better adherent. There was no much difference between employed and unemployed in being adherent to treatment, which is similar to the study done by Wasti *et al*.[21] However, one of the reason for missing drugs was inconvenience caused because of work time and night shifts. Socioeconomic status was not associated with ART adherence, but in a study done by Cauldbeck *et al.*,[19] higher level of adherence was seen among people from low income family groups when compared with people from high income family groups in which the study was done in private sector where people had paid for their medication. Participants living in rural areas were showing better adherence levels; similar results were observed by Cauldbeck *et al*.[19] This may be because participants from rural area followed instructions given by health care providers correctly.

Participants with better knowledge about ART showed a higher level of adherence. Similar results were shown by Olowookere *et al*.[20] There was no association between attitude toward ART and adherence to treatment but having no side effects to drugs was not associated with a higher level of ART adherence, and contrasting results were observed by Wasti *et al*.[21] Participants not having the habit of tobacco consumption showed a better level of adherence, and alcohol consumption was not associated with lower level of adherence. However, in a study done by Wasti *et al.*,[21] alcoholics showed lower level of adherence. There was association between having support of friends and family members and high level of adherence which may be in the form of reminding the drugs to be taken or accompanying them to the ART center.

Recommendations

An extra effort should be put to counsel about benefits gained from adhering to ART to participants who are transgender, single, illiterate, less educated, and residing in urban areas. During every visit, attention should be paid to the side effects of drugs and family members should be counseled about helping by reminding about drugs and accompanying them to the ART centers.

Limitations

A self-reported adherence was collected which may not give a clear picture of level of adherence, but, however, it is a better available method in resource limited settings. Non-probability sampling method was adopted in this study, which may not have provided an equal chance of selection of study participants.

Conclusions

In this study, 67.0% of the participants showed ≥95% adherence to ART. Sociodemographic factors such as education, marital status, hailing from rural area, not consuming tobacco, not having side effects to ART drugs, and other personal factors such as having support of friends and family members and having good knowledge about ART were associated with high level of adherence to ART.

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Conflicts of interest

There are no conflicts of interest.

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