



Barriers to Adherence to Antiretroviral Treatment Among Inmates of a Prison in Tehran, Iran: A Qualitative Study

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Abstract

Background: People with chronic illnesses such as HIV infection face many health status outcomes in the correctional settings. The current study aimed at investigating multiple determinants of HIV medication adherence among patients with HIV.

Methods: Focus group discussion (FGD) was conducted on inmates of Ghezel-hesar Prison in Karaj, Alborz province, Iran, to investigate the barriers and facilitators of adherence to antiretroviral therapy (ART) in January 2015. The purposive sampling method was employed to recruit seven male prisoners with HIV infection.

Results: Participants reported illegal drug use, poor education in HIV treatment, side-effects of antiretroviral drugs, treatment interruption, drug interferences, fear of hangover, poor diet, poor socioeconomic background, hopelessness, depression, not believing in the treatment, rejection and lack of social support, stigma, compulsory rest in the yard, lack of tendency toward visiting psychiatrists, lack of familial support, forgetfulness, and not receiving complementary drugs as the barriers to adherence to ART. In addition, the facilitators were physician-patient good relationship, physician's compassion, counseling services for the patients, education of patients regarding HIV treatment necessities, peer education, informing patients about their CD4 levels, education of correctional staff to show courtesy in the treatment of patients, timely methadone therapy, and improved diet.

Conclusions: Providing welfare programs and education of inmates with HIV infection regarding the adherence to ART may play a prominent role in the treatment of such patients. Training correctional staff regarding the significance of HIV treatment and adherence to ART can also be effective in the treatment of prisoners with HIV infection.

Keywords: HIV, Adherence, Barriers, Facilitators, Antiretroviral Treatment, Prison

1. Background

Correctional facilities fail to provide adequate health-care services for inmates; and those with chronic illnesses such as HIV infection face many health status outcomes in correctional settings. Optimal adherence to medication regimen is a crucial factor to obtain desirable clinical outcomes in patients with HIV (1, 2), while suboptimal adherence results in poor clinical outcomes (3, 4), poor quality of life (5, 6), and mortality (7).

A variety of factors was reported regarding non-adherence to medication in patients with HIV such as substance abuse (8-12), health beliefs (13-15), psychiatric status (12, 16-21), demographic characteristics (10, 20), social factors (22), familial factors (23-25), medication side effects (17, 26), and cognitive functioning (10, 14, 26). Although the

previous studies drawn a comprehensive picture of barriers and facilitators of adherence to medication among patients with HIV, such studies mostly relied on the quantitative designs that fail to adequately explain the ecological factors influencing the adherence. Furthermore, there is a paucity of research on the barriers to medication adherence inside the correctional facilities.

The current study aimed at investigating multiple determinants of HIV medication adherence in inmates with HIV. The study conducted an in-depth focus group discussion (FGD) to investigate barriers and facilitators of HIV medication adherence among inmates with HIV in Ghezel-hesar Prison in Karaj, Alborz province, Iran. The current study with a qualitative design investigated the barriers to medication adherence from the viewpoint of inmates with HIV infection.

2. Methods

FGD was conducted on seven male inmates at Ghezel-hesar Prison to investigate the research question in January 2015. Since FGD benefits from a qualitative approach, a purposive sampling method was applied to recruit participants with enough related experiences.

In the beginning of the interview, the participants were asked to complete a demographic questionnaire. During the interview, the first author, with the help of a trained facilitator, checked the accuracy of the participants' interpretations in some questions. In addition, the author carefully monitored non-verbal communications such as body language and facial expressions during the interview. Participants were asked to clarify their remarks with examples, if necessary. The author recorded all the interviews and discussions with prior permission; the interviews were then transcribed accordingly.

The main criteria for a qualitative research are credibility, dependency, conformability, and transferability. To increase credibility of the study, seven inmates with HIV were selected as the FGD participants. In order to minimize dependency and prevent biases, more than one analyst encoded each transcript. In addition, the accuracy of the coded statements was evaluated, and confirmed by the participants. Conformability was increased by providing a clear description about the research path, allocating enough time to complete each step, using multiple data sources for better understanding of participants' statements, discussing the controversial data to reach a consensus, and asking the opinion of other experts. Transferability refers to the degree of which the results can be generalized to other contexts or settings; such interviews are analyzed by the content analysis.

3. Results

Table 1 briefly describes the main results.

3.1. Medical Factors

3.1.1. Side Effects of Antiretroviral Drugs

Most of the participants believed that efavirenz had adverse effects and caused some problems in the adherence to antiretroviral therapy (ART) regimen. The side effects were nightmares, and hallucination and hangovers in the beginning of the use (the first two or three months), which intensified not adjusting methadone dose appropriately. Lethargy, loss of appetite, anemia, and dizziness were the remarkable side effects of other drugs such as zidovudine, mentioned by the participants. One of the participants declared:

Table 1. Barriers to ART Adherence in Inmates with HIV in Ghezel-hesar Prison Based on FGD Results

Factors	
Medical Factors	- Side effects of antiretroviral drugs
	- Treatment interruption
	- Methadone maintenance treatment (MMT) program
	- The role of physical conditions and CD4 level
Social Factors	- Accessibility of complementary medicines
	- Stigma
Psychological Factors	- The role of patient-physician relationship
	- Depression, anxiety, and disappointment
Others	- Prison conditions
	- Education
	- Neurocognitive factors
	- Substance-use-related factors

“It's the fear of hangover! After using efavirenz I feel that the drug is washing inside of my body! Due to lack of methadone and the terrible hangover causes by efavirenz, the patients refuse to use it and believe the other drugs may also have same complications.”

3.1.2. Treatment Interruption

One of the participants who had HIV and HCV (hepatitis C virus) coinfection, but not used any drugs, believed that the coinfection was not a barrier to adhere HIV medication. Some patients who received anti-tuberculosis (TB) drugs stated that the concurrent use of these medicines with antiretroviral drugs exacerbated their hangovers and lethargy, but the physician may solve their problem by adjusting the dosage of the methadone.

3.1.3. Methadone Maintenance Treatment Program

All of the participants had the history of illegal drug use and underwent methadone maintenance treatment (MMT). Participants noted that they stopped using HIV medication to prevent efavirenz-related hangovers, caused in the absence of an exact MMT program. In other words, timely receive of methadone with appropriate dosage adjustment may result in adherence to treatment.

“During the weekends we receive methadone too late at almost 2:00 pm, while in the working days we receive it just after the breakfast. The patients do not take HIV drugs such as zidovudine and lamivudine before taking methadone, because of the fear of hangover. In fact, a long interval between taking methadone and HIV medication is the reason for hangovers”.

3.1.4. The Role of Physical Conditions and CD4 Level

Physical weakness, weight-loss, and reduced CD4 count are the crucial clinical signs and laboratory finding for the need to receive HIV regimen in patients with non-adherence to medication

“Once my CD4 count dropped to 100 and the doctor warned me about the potential consequences of the infection! I took medications timely and after six months, my CD4 increased to 270. The doctor asked have you ever used methamphetamine? I said “yes”. He let me know about the outcomes of using methamphetamine once again. Now my CD4 count is 400.”

3.1.5. Accessibility of Complementary Medicines

The participants declared that they had free access to antiretroviral drugs, but despite the physician’s prescription for complementary medicines (e.g., vitamins and cyproheptadine), sometimes they did not receive it.

3.2. Social Factors

3.2.1. Stigma

Participants noted that the stigma in patients with HIV let them to be abused by the correctional staff, healthcare staff, and other inmates. They called them by their illness in a ridiculous way. Verbal abuse of inmates with HIV infection evoked feeling of shame and self-hatred that resulted in confidential use of medication and missing some doses of antiretroviral drugs.

“I’m the only person with HIV in our cell. The others do not know that I am HIV-positive and when the correctional staff calls me, I tell the cellmates it is because of my kidney problems! If the others know that someone is HIV-positive, they wear mask and treat badly! This illness is highly stigmatized and makes us reluctant to take the drugs. My family knows nothing about my illness; there is long-time since I’ve left home because of the illegal drug use!”

3.2.2. The Role of Patient-Physician Relationship

The participants declared that friendly patient-physician relationships and physician recommendations for medication adherence can improve morale and hope in the patients. They also believed that providing consulting services and education regarding the barriers to HIV treatment for the patients could be helpful in adherence to HIV treatment. They added that physician’s insistence on medication adherence helps the patients to trust them, which in turn, leads to higher medication adherence.

“We all owe the doctor and should be ashamed of ourselves if do not use the drugs! Friendly relationship and excellent manner of the doctor extremely affects our treatment. He listens to our words and pay attention to us! He is an angel.”

3.3. Psychological Factors

Participants noted depression as well as lack of social and familial support as barriers to medication adherence.

“We are sad and have no hope for the treatment. Sometimes we think about death. We are hopeless, because of the setting of the prison and ineffectiveness of the drugs.”

3.4. Prison Conditions

Compulsory rest in the prison yard sometimes cause difficulties for patients. Correctional services officials do not consider such issues, despite warnings the attending physicians to consider potential adverse health consequences of compulsory rest in prison yard for vulnerable inmates. In addition, inmates’ poor diet and the high cost of purchasing meal from restaurant cause malnutrition, weakness of immune system, and consequently non-adherence to treatment.

“We don’t need compulsory rest. We wrote a letter to the correctional officials. All of the patients signed the letter and the doctor even signed it. Nevertheless, some correctional officials may ignore the letter! We are also deprived of much useful nutrition such as vegetables and dairy products.”

3.5. Education

Some of the patients believed that they do not have enough knowledge about the importance of adherence to therapeutic regimen and may misinterpret the outcomes of low adherence. Since the patients had a somewhat similar background, peer education could be more helpful than the individual education by the physicians.

“The physicians have not explained well the patients about the illness. Some of the patients even do not know the name of the pills. Training patients could be beneficial, especially when one patient educates the other. For example, I can explain the other patients my terrible condition. I could not even go to the toilet! But now, I’ve got better by being adherent to the medication.”

3.6. Neurocognitive Factors

Participants believed that they rarely forget taking drugs, but if their daily program changes, they are more likely to forget it.

“We rarely forget taking HIV medication. When about two or three hours have passed and we have forgotten taking drugs timely, we have not eat the pills. Forgetting the medicines is not intentional and is because of unexpected events such as going to court.”

3.7. Substance-Use-Related Factors

The injection drug use was the HIV transmission route in all of the study participants. One of the participants noted that if the drug abuse is the main priority in someone's life, he cannot expect to have adherence to medication. They believed that methamphetamine has a more devastating effect on the medication adherence than heroin.

"Those who drug abuse is their main priority in life..., may not adhere to the treatment. I lost my family because of using illegal drugs!"

Participants believed that good physician-patient relationship, physician's compassion, providing counseling services for the patients, education of patients regarding HIV treatment effects, peer education, informing patients about their CD4 levels, education of correctional staff to show courtesy in the treatment of patients, providing methadone timely, and improving patients' diet significantly affect medication adherence in the inmates infected with HIV.

4. Discussion

The present study revealed barriers and facilitators of HIV medication adherence among inmates with HIV. Result of the study indicated that substance use plays a crucial role in non-adherence to medication among the inmates with HIV. Hangover caused by delay in receiving methadone and its appropriate dose adjustment in patients undergoing MMT program prevented taking antiretroviral drugs in them. This finding was consistent with that of the other study (27), which found that inappropriate methadone coverage is an important barrier to medication adherence. In contrast to the findings of the mentioned study, which focused mainly on increasing methadone use to improve medication adherence, the current study revealed that timely receive of methadone facilitates adherence.

The current study found that adverse side effects of antiretroviral drugs such as efavirenz and zidovudine were another barrier to treatment adherence. Such side effects were intensified if the patients did not timely use methadone or appropriate methadone dose adjustment. This finding was consistent with those of other studies on the role of side effects in non-adherence to HIV medication (28, 29).

Cognitive impairment was considered as a significant barrier to adhere to HIV treatment in some studies (10, 26); on the other hand, forgetfulness was the main aspect of cognitive impairment. In the current study, inmates declared that they rarely forgot taking medications, except

when their daily program changed. Although forgetfulness is a barrier to take medications in patients infected with HIV, it apparently does not play a major role in this study; the reason can be attributed to low involvement of the inmates with daily living activities (10, 26).

The study suggests that concomitant treatment with anti-TB medications might interfere with taking HIV drugs. This issue is possibly due to the tight schedule necessary to take antiretroviral and anti-TB medications concurrently, which leads to more errors in memory and timing. Another potential reason for non-adherence is the added side effect of treatment of two diseases and also increased hangovers due to interaction of rifampin with methadone.

The current study also found that stigma was a significant barrier to ART in the correctional facilities. HIV is highly stigmatized in Iran (30) and many inmates living with HIV do not disclose their illness for the fear of rejection and discrimination. These behaviors force the infected prisoners to keep their illness confidential and take their medication secretly which, in turn, may result in missing some doses. Some of the prisoners with HIV infection may avoid taking HIV medication because they afraid the drug's side effects reveal their illness. The current study findings are consistent with those of a prior study, which revealed that patients with HIV stigma were three times more likely to have no adherence to therapeutic regimen than those with no stigma. The studies also showed that revealing HIV status was a significant predictor for HIV adherence (31).

Previous study revealed that nutritional support and food security have important implications for antiretroviral adherence (32). Consistent with this research, the present study found that poor diets of HIV-positive prisoners might result in non-adherence to medication. Accessibility of complementary drugs is also required for adherence to HIV treatment regimens, and correctional officials should pay specific attention to the problem.

The results of the present study indicated that the patient-physician relationship was another factor that influences medication adherence among prisoners with HIV. It was found that patient-physician relationships can play role as the barrier or facilitator in medication adherence. Palepu et al. (9) reported that physicians with higher HIV-related experiences more contributed to medication non-adherence in HIV-positive prisoners. The findings were consistent with those of Palepu et al. (9), but inconsistent with those reported by Barfod et al. (33), who showed that patient-physician relationships were often awkward and superficial, while some of the patient-physician relationships were strong and realistic and could significantly affect the medication adherence in HIV-positive prisoners.

The findings were consistent with a research reported

that patients' knowledge regarding the level of CD4 was contributed to medication adherence (32). Patients who had lower levels of CD4 perceived a serious threat when received feedback; hence, they were more likely to show adherence.

Psychological complications such as depression have a direct impact on medication adherence; it is reported in prior studies (19, 34-37). Accordingly, the current study found depression as a significant barrier to adherence. Patients with depression were not hopeful about the future and treatment implications, and consequently showed no adherence to medication.

In the study by Goujard et al. (38), the effect of patient education programs on adherence to HIV medication were evaluated. They found that education of patients in medication adherence had lasting effects. In agreement with the results of their research, the current study showed that education of patients in HIV medication adherence may facilitate adherence to HIV medication, especially when a patient educates the others.

As with qualitative studies, several limitations were observed in the current research. Although adherence is a dynamic process, the authors examined it at a static point in time. The research not included females, while barriers and facilitators of adherence may be different between males and females in the correctional facilities. For example, child-care issues maybe a crucial factor in medication adherence, which is only experienced by mothers. Nevertheless, the present research shed light on many aspects of medication adherence in the correctional facilities and revealed new barriers and facilitators of medication adherence.

5. Conclusions

The current study results showed that psychological symptoms, forgetfulness, poor physical condition, unpleasant prison setting, social stigma, lack of family support, substance abuse, and poor adjustment of methadone dosage were the potential barriers to medication adherence, whilst social and familial support, patient-physician relationship, complementary medicines and healthy diet for HIV-positive prisoners, education of prisoners with HIV especially with their peer, and patient's knowledge about CD4 level were the potential facilitators for adherence to medication among HIV-positive prisoners.

In this regard, training correctional staff in the importance of HIV treatment as well as providing HIV-positive prisoners with a more comprehensive and detailed education in medication adherence, appropriate methadone dosage adjustment and meticulous management of antiretroviral drugs adverse reactions may have many posi-

tive implications for the treatment. In addition, provision of more welfare services for the prisoners with HIV infection can affect their treatment.

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Footnote

Conflict of Interests: The authors declared no conflict of interest.

References

- Osterberg L, Blaschke T. Adherence to medication. *N Engl J Med*. 2005;**353**(5):487-97. doi: [10.1056/NEJMra050100](https://doi.org/10.1056/NEJMra050100). [PubMed: [16079372](https://pubmed.ncbi.nlm.nih.gov/16079372/)].
- Wood E, Hogg RS, Yip B, Harrigan PR, O'Shaughnessy MV, Montaner JS. The impact of adherence on CD4 cell count responses among HIV-infected patients. *J Acquir Immune Defic Syndr*. 2004;**35**(3):261-8. [PubMed: [15076240](https://pubmed.ncbi.nlm.nih.gov/15076240/)].
- Bangsberg DR, Hecht FM, Charlebois ED, Zolopa AR, Holodniy M, Sheiner L, et al. Adherence to protease inhibitors, HIV-1 viral load, and development of drug resistance in an indigent population. *AIDS*. 2000;**14**(4):357-66. [PubMed: [10770537](https://pubmed.ncbi.nlm.nih.gov/10770537/)].
- Hogg RS, Heath K, Bangsberg D, Yip B, Press N, O'Shaughnessy MV, et al. Intermittent use of triple-combination therapy is predictive of mortality at baseline and after 1 year of follow-up. *AIDS*. 2002;**16**(7):1051-8. [PubMed: [11953472](https://pubmed.ncbi.nlm.nih.gov/11953472/)].
- Carballo E, Cadarso-Suarez C, Carrera I, Fraga J, de la Fuente J, Ocampo A, et al. Assessing relationships between health-related quality of life and adherence to antiretroviral therapy. *Qual Life Res*. 2004;**13**(3):587-99. doi: [10.1023/B:QURE.0000021315.93360.8b](https://doi.org/10.1023/B:QURE.0000021315.93360.8b). [PubMed: [15130023](https://pubmed.ncbi.nlm.nih.gov/15130023/)].
- Mannheimer SB, Matts J, Telzak E, Chesney M, Child C, Wu AW, et al. Quality of life in HIV-infected individuals receiving antiretroviral therapy is related to adherence. *AIDS Care*. 2005;**17**(1):10-22. [PubMed: [15832830](https://pubmed.ncbi.nlm.nih.gov/15832830/)].
- Lima VD, Geller J, Bangsberg DR, Patterson TL, Daniel M, Kerr T, et al. The effect of adherence on the association between depressive symptoms and mortality among HIV-infected individuals first initiating HAART. *AIDS*. 2007;**21**(9):1175-83. doi: [10.1097/QAD.0b013e3281ebf57](https://doi.org/10.1097/QAD.0b013e3281ebf57). [PubMed: [17502728](https://pubmed.ncbi.nlm.nih.gov/17502728/)].
- Lucas GM, Cheever LW, Chaisson RE, Moore RD. Detrimental effects of continued illicit drug use on the treatment of HIV-1 infection. *J Acquir Immune Defic Syndr*. 2001;**27**(3):251-9. [PubMed: [11464144](https://pubmed.ncbi.nlm.nih.gov/11464144/)].
- Palepu A, Tyndall MW, Chan K, Wood E, Montaner JS, Hogg RS. Initiating highly active antiretroviral therapy and continuity of HIV care: the impact of incarceration and prison release on adherence and HIV treatment outcomes. *Antivir Ther*. 2004;**9**(5):713-9. [PubMed: [15535408](https://pubmed.ncbi.nlm.nih.gov/15535408/)].
- Hinkin CH, Hardy DJ, Mason KI, Castellon SA, Durvasula RS, Lam MN, et al. Medication adherence in HIV-infected adults: effect of patient age, cognitive status, and substance abuse. *AIDS*. 2004;**18** Suppl 1:S19-25. [PubMed: [15075494](https://pubmed.ncbi.nlm.nih.gov/15075494/)]. [PubMed Central: [PMC2886736](https://pubmed.ncbi.nlm.nih.gov/PMC2886736/)].
- Hinkin CH, Barclay TR, Castellon SA, Levine AJ, Durvasula RS, Marion SD, et al. Drug use and medication adherence among HIV-1 infected individuals. *AIDS Behav*. 2007;**11**(2):185-94. doi: [10.1007/s10461-006-9152-0](https://doi.org/10.1007/s10461-006-9152-0). [PubMed: [16897351](https://pubmed.ncbi.nlm.nih.gov/16897351/)]. [PubMed Central: [PMC2867605](https://pubmed.ncbi.nlm.nih.gov/PMC2867605/)].

12. Ingersoll K. The impact of psychiatric symptoms, drug use, and medication regimen on non-adherence to HIV treatment. *AIDS Care*. 2004;**16**(2):199-211. doi: [10.1080/09540120410001641048](https://doi.org/10.1080/09540120410001641048). [PubMed: [14676026](https://pubmed.ncbi.nlm.nih.gov/14676026/)].
13. Gifford AL, Bormann JE, Shively MJ, Wright BC, Richman DD, Bozzette SA. Predictors of self-reported adherence and plasma HIV concentrations in patients on multidrug antiretroviral regimens. *J Acquir Immune Defic Syndr*. 2000;**23**(5):386-95. [PubMed: [10866231](https://pubmed.ncbi.nlm.nih.gov/10866231/)].
14. Barclay TR, Hinkin CH, Castellon SA, Mason KI, Reinhard MJ, Marion SD, et al. Age-associated predictors of medication adherence in HIV-positive adults: health beliefs, self-efficacy, and neurocognitive status. *Health Psychol*. 2007;**26**(1):40-9. doi: [10.1037/0278-6133.26.1.40](https://doi.org/10.1037/0278-6133.26.1.40). [PubMed: [17209696](https://pubmed.ncbi.nlm.nih.gov/17209696/)]. [PubMed Central: [PMC2863998](https://pubmed.ncbi.nlm.nih.gov/PMC2863998/)].
15. Gao X, Nau DP, Rosenbluth SA, Scott V, Woodward C. The relationship of disease severity, health beliefs and medication adherence among HIV patients. *AIDS Care*. 2000;**12**(4):387-98. doi: [10.1080/09540120050123783](https://doi.org/10.1080/09540120050123783). [PubMed: [11091771](https://pubmed.ncbi.nlm.nih.gov/11091771/)].
16. Palmer NB, Salcedo J, Miller AL, Winiarski M, Arno P. Psychiatric and social barriers to HIV medication adherence in a triply diagnosed methadone population. *AIDS Patient Care STDS*. 2003;**17**(12):635-44. doi: [10.1089/108729103771928690](https://doi.org/10.1089/108729103771928690). [PubMed: [14746657](https://pubmed.ncbi.nlm.nih.gov/14746657/)].
17. Catz SL, Kelly JA, Bogart LM, Benotsch EG, McAuliffe TL. Patterns, correlates, and barriers to medication adherence among persons prescribed new treatments for HIV disease. *Health Psychol*. 2000;**19**(2):124-33. [PubMed: [10762096](https://pubmed.ncbi.nlm.nih.gov/10762096/)].
18. Mellins CA, Kang E, Leu CS, Havens JF, Chesney MA. Longitudinal study of mental health and psychosocial predictors of medical treatment adherence in mothers living with HIV disease. *AIDS Patient Care STDS*. 2003;**17**(8):407-16. doi: [10.1089/108729103322277420](https://doi.org/10.1089/108729103322277420). [PubMed: [13678542](https://pubmed.ncbi.nlm.nih.gov/13678542/)].
19. Vranceanu AM, Safren SA, Lu M, Coody WM, Skolnik PR, Rogers WH, et al. The relationship of post-traumatic stress disorder and depression to antiretroviral medication adherence in persons with HIV. *AIDS Patient Care STDS*. 2008;**22**(4):313-21. doi: [10.1089/apc.2007.0069](https://doi.org/10.1089/apc.2007.0069). [PubMed: [18338960](https://pubmed.ncbi.nlm.nih.gov/18338960/)].
20. Turner BJ, Laine C, Cosler L, Hauck WW. Relationship of gender, depression, and health care delivery with antiretroviral adherence in HIV-infected drug users. *J Gen Intern Med*. 2003;**18**(4):248-57. [PubMed: [12709091](https://pubmed.ncbi.nlm.nih.gov/12709091/)]. [PubMed Central: [PMC1494846](https://pubmed.ncbi.nlm.nih.gov/PMC1494846/)].
21. Simoni JM, Pantalone DW, Plummer MD, Huang B. A randomized controlled trial of a peer support intervention targeting antiretroviral medication adherence and depressive symptomatology in HIV-positive men and women. *Health Psychol*. 2007;**26**(4):488-95. doi: [10.1037/0278-6133.26.4.488](https://doi.org/10.1037/0278-6133.26.4.488). [PubMed: [17605569](https://pubmed.ncbi.nlm.nih.gov/17605569/)]. [PubMed Central: [PMC4044097](https://pubmed.ncbi.nlm.nih.gov/PMC4044097/)].
22. Rao D, Kekwaletswe TC, Hosek S, Martinez J, Rodriguez F. Stigma and social barriers to medication adherence with urban youth living with HIV. *AIDS Care*. 2007;**19**(1):28-33. doi: [10.1080/09540120600652303](https://doi.org/10.1080/09540120600652303). [PubMed: [17129855](https://pubmed.ncbi.nlm.nih.gov/17129855/)].
23. Mellins CA, Brackis-Cott E, Dolezal C, Abrams EJ. The role of psychosocial and family factors in adherence to antiretroviral treatment in human immunodeficiency virus-infected children. *Pediatr Infect Dis J*. 2004;**23**(11):1035-41. [PubMed: [15545859](https://pubmed.ncbi.nlm.nih.gov/15545859/)].
24. Beals KP, Wight RG, Aneshensel CS, Murphy DA, Miller-Martinez D. The role of family caregivers in HIV medication adherence. *AIDS Care*. 2006;**18**(6):589-96. doi: [10.1080/09540120500275627](https://doi.org/10.1080/09540120500275627). [PubMed: [16831787](https://pubmed.ncbi.nlm.nih.gov/16831787/)].
25. Khalilili H, Rohani R, Seyedalinaghi S, Hajiabdolbaghi M, Dashti-Khavidaki S, Talasaz AH. Adherence to antiretroviral therapy among Iranian HIV/AIDS patients. *Curr Clin Pharmacol*. 2012;**7**(2):111-5. [PubMed: [22432842](https://pubmed.ncbi.nlm.nih.gov/22432842/)].
26. Hinkin CH, Castellon SA, Durvasula RS, Hardy DJ, Lam MN, Mason KI, et al. Medication adherence among HIV+ adults: effects of cognitive dysfunction and regimen complexity. *Neurology*. 2002;**59**(12):1944-50. [PubMed: [12499488](https://pubmed.ncbi.nlm.nih.gov/12499488/)]. [PubMed Central: [PMC2871670](https://pubmed.ncbi.nlm.nih.gov/PMC2871670/)].
27. Soto Blanco JM, Perez IR, March JC. Adherence to antiretroviral therapy among HIV-infected prison inmates (Spain). *Int J STD AIDS*. 2005;**16**(2):133-8. doi: [10.1258/0956462053057503](https://doi.org/10.1258/0956462053057503). [PubMed: [15807941](https://pubmed.ncbi.nlm.nih.gov/15807941/)].
28. Ammassari A, Murri R, Pezzotti P, Trotta MP, Ravasio L, De Longis P, et al. Self-reported symptoms and medication side effects influence adherence to highly active antiretroviral therapy in persons with HIV infection. *J Acquir Immune Defic Syndr*. 2001;**28**(5):445-9. [PubMed: [11744832](https://pubmed.ncbi.nlm.nih.gov/11744832/)].
29. Emamzadeh-Fard S, Fard SE, SeyedAlinaghi S, Paydary K. Adherence to anti-retroviral therapy and its determinants in HIV/AIDS patients: a review. *Infect Disord Drug Targets*. 2012;**12**(5):346-56. [PubMed: [23017163](https://pubmed.ncbi.nlm.nih.gov/23017163/)].
30. SeyedAlinaghi SA, Paydary K, Afsar Kazerooni P, Hosseini M, Sedaghat A, Emamzadeh-Fard S, et al. Evaluation of Stigma Index Among People Living With HIV/AIDS (PLWHA) in Six Cities in Iran. *Thrita J Med Sci*. 2013;**2**(2):69-75. doi: [10.5812/thrita.11801](https://doi.org/10.5812/thrita.11801).
31. Rintamaki LS, Davis TC, Skripkauskas S, Bennett CL, Wolf MS. Social stigma concerns and HIV medication adherence. *AIDS Patient Care STDS*. 2006;**20**(5):359-68. doi: [10.1089/apc.2006.20.359](https://doi.org/10.1089/apc.2006.20.359). [PubMed: [16706710](https://pubmed.ncbi.nlm.nih.gov/16706710/)].
32. Biadgillign S, Deribew A, Amberbir A, Deribe K. Barriers and facilitators to antiretroviral medication adherence among HIV-infected paediatric patients in Ethiopia: A qualitative study. *SAHARA J*. 2009;**6**(4):148-54. [PubMed: [20485854](https://pubmed.ncbi.nlm.nih.gov/20485854/)].
33. Barfod TS, Hecht FM, Rubow C, Gerstoft J. Physicians' communication with patients about adherence to HIV medication in San Francisco and Copenhagen: a qualitative study using Grounded Theory. *BMC Health Serv Res*. 2006;**6**:154. doi: [10.1186/1472-6963-6-154](https://doi.org/10.1186/1472-6963-6-154). [PubMed: [17144910](https://pubmed.ncbi.nlm.nih.gov/17144910/)]. [PubMed Central: [PMC1702356](https://pubmed.ncbi.nlm.nih.gov/PMC1702356/)].
34. Boarts JM, Sledjeski EM, Bogart LM, Delahanty DL. The differential impact of PTSD and depression on HIV disease markers and adherence to HAART in people living with HIV. *AIDS Behav*. 2006;**10**(3):253-61. doi: [10.1007/s10461-006-9069-7](https://doi.org/10.1007/s10461-006-9069-7). [PubMed: [16482405](https://pubmed.ncbi.nlm.nih.gov/16482405/)].
35. Carney RM, Freedland KE, Eisen SA, Rich MW, Jaffe AS. Major depression and medication adherence in elderly patients with coronary artery disease. *Health Psychol*. 1995;**14**(1):88-90. [PubMed: [7737079](https://pubmed.ncbi.nlm.nih.gov/7737079/)].
36. Delahanty DL, Bogart LM, Figler JL. Posttraumatic stress disorder symptoms, salivary cortisol, medication adherence, and CD4 levels in HIV-positive individuals. *AIDS Care*. 2004;**16**(2):247-60. doi: [10.1080/09540120410001641084](https://doi.org/10.1080/09540120410001641084). [PubMed: [14676029](https://pubmed.ncbi.nlm.nih.gov/14676029/)].
37. Paydary K, Ekhtiari H, Noori M, Rad MV, Hajiabdolbaghi M, SeyedAlinaghi S. Evaluation of the association between Addiction Severity Index and depression with adherence to anti-retroviral therapy among HIV infected patients. *Infect Disord Drug Targets*. 2015;**15**(3):177-83. [PubMed: [26411558](https://pubmed.ncbi.nlm.nih.gov/26411558/)].
38. Goujard C, Bernard N, Sohier N, Peyramond D, Lancon F, Chwalow J, et al. Impact of a patient education program on adherence to HIV medication: a randomized clinical trial. *J Acquir Immune Defic Syndr*. 2003;**34**(2):191-4. [PubMed: [14526208](https://pubmed.ncbi.nlm.nih.gov/14526208/)].