

The Prevalence of Behavioral Risk Factors in People with HIV/AIDS and Its Effect on Adherence to Treatment

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Abstract

Background: Behavioral risk factors, in addition to increasing the risk of HIV/AIDS transmission, can affect the antiretroviral therapy (ART) pattern of people with the condition. The aim of this study was to determine the prevalence of behavioral risk factors and its effect on adherence to antiretroviral drugs (ARV) treatment in patients with HIV/AIDS in western Iran.

Methods: This study was performed on all patients who were diagnosed with HIV/AIDS in Kermanshah province during the years 1995-2019 (25 years). Adherence to treatment in these patients was divided into three categories according to the WHO definition: Non-adherence, cessation and adherence to treatment. Using single-variable and multi-variable logistic regression, the effect of important variables in four models was modified and the effect of each of the behavioral risk factors was studied in patients who had non-adherence or experienced cessation compared to those who adhered to ARV.

Results: Of the 2,867 patients with HIV/AIDS, 2,449 (85.42%) were men. The mean age of HIV infection was 33.36 ± 11.8 years. In 1995, less than 10 percent of people received treatment, which in 2019 it reached to more than 67 percent. All behavioral risk factors increased the non-adherence to medication and cessation of ARV. In general, after controlling confounding variables except needle sharing, all behavioral variables affected ARV treatment; The greatest impact on non-adherence to medication was History of drug abuse, History of the prison, History of injection drug use and Sex with non-spouse with a chance of 10.87 (7.21-16.39), 3.94 (2.84-5.46), 3.86 (2.47-6.03) and 3.38(2.19-5.23) times more than patients without these risk factors, respectively.

Conclusion: Although the process of receiving treatment has been increasing since 2005, the non-adherence to medication is still high in high-risk groups, so it is important to focus more on reducing non-adherence and eventually cessation of treatment. In particular, more focus is necessary for health education and raising the level of awareness of these groups.

Background

HIV/AIDS is one of the most serious challenges to global health and development. According to WHO's report, at the end of 2018, nearly 37.9 million people were living with HIV worldwide, with only 23.3 million people receiving antiretroviral treatment and 770,000 people died from HIV/AIDS. In Iran, of the 61,000 people living with HIV, only 20% of people aged 15 and more were treated and 2,600 had HIV/AIDS-related deaths (1, 2).

Antiretroviral treatment aims to slow the progression of HIV-related diseases, improve the quality of life of patients by suppressing the proliferation of the virus in the body and maintaining the function of the immune system (3, 4). Antiretroviral treatment can be delayed until the CD4 count is less than 200 cells per microliter; In other words, early treatment cannot prevent the destructive effects of non-adherence to it, but unfortunately, since poor adherence to treatment and treatment interruptions are common, this is exacerbated by increasing HIV symptoms, incomplete viral inhibition, disease progression, and high

mortality, even patients with CD4 350 cells per microliter or more begin antiretroviral treatment (5-7). ARV poisoning, pill tolerance, and a complex diet can lead to problems such as undesirable effect of antiretroviral drugs, poor treatment, cessation of treatment, and eventual failure of treatment. More than 78% of all cessation of treatments have resulted in treatment failure (8).

Drug injections are the most important cause of this epidemic disease in Iran. People who use drugs, especially those who inject drugs with shared needles or have unprotected sex, play a significant role in the higher prevalence of HIV/AIDS. Drug use and related disorders are prominent barriers to adherence to ARV use in people with the disease (9).

In general, there has been a significant reduction in the incidence of disease and mortality associated with HIV after the introduction of antiretroviral treatment, although this has not been successful among some high-risk groups, such as injecting drug users, due to less adherence to medications (10).

Given the commitment to treatment to increase virus suppression, reducing HIV transmission is also important in reducing the effects of disease, especially in people with high-risk behaviors. Therefore, this study was conducted to investigate the effect of behavioral risk factors on adherence to antiretroviral treatment in patients with HIV/AIDS during the years 1995-2019 (25 years) in western Iran.

Methods

The Study Population:

The present study is a cross-sectional study that examined the data of all AIDS/HIV⁺ patients in Kermanshah province during the years 1995-2019 (25 years). Kermanshah province is the largest province in western Iran, with a population of nearly two million people, and shares a border with Iraq.

Data collection and measurements

In Iran, after being identified by all relevant institutions including the counseling centers of the University of Medical Sciences, prison counseling centers, hospitals, blood transfusion centers, and rehabilitation organization's counseling centers, the affected people are referred to the health deputy of the relevant province. In the Deputy Minister of Health, patients are treated based on the treatment model of the World Health Organization (11, 12). In addition to demographic characteristics, behavioral risk factors and the status of tuberculosis and hepatitis B and C are recorded in the collected information and the health status of the individual is followed up to the stage of death. According to the World Health Organization's standard definitions, as well as the national guidelines: HIV⁺ refers to a person who has antibodies in his or her body and has been diagnosed with two positive tests and a positive Western-blot test (13). Also, according to the WHO definition, adherence to treatment is "The extent to which the patient follows medical instructions" (14). Adherence to ARV is defined as the patient's ability to follow a treatment plan, take medication at specific times and frequencies, and follow restrictions on food and other medications.

In patients with HIV infection, CD4 T-cell counting is considered as an appropriate laboratory indicator for determining the progression of the disease, in which values below 200 per microliter of blood in absolute counting are considered as the scope of the disease crisis leading to AIDS symptoms. In this study, those who had passed 6 months of their first VL test were measured according to the start date of the first VL level ARV treatment.

Inclusion and Exclusion Criteria

For the present study, all AIDS/HIV⁺ patients who had at least one year of residency in the province were included, and criteria for leaving the study were non-native and people who had only come to the province for testing or continued treatment in other follow-up provinces.

Analysis

In this study, in addition to describing the data using descriptive indicators such as mean SD for quantitative data and ratio and percentage for qualitative data, the effect of each of the behavioral risk factors in patients adherence, non-adherence and with cessation of treatment compared to those receiving treatment was studied using single-variable and multivariate logistic regression, in which the effect of important variables in four models was modified. In these four models, which were examined based on a concept model shown in Figure 1, the base model was the same as the Crude logistic regression value. The first model involved modifying demographic variables (gender, age, marital status, occupation, and level of education). The second model, in addition to the first model, modified co-infections of HIV/AIDS (concomitant HBV, HCV, and TB infections). Finally, the third model, in addition to the mentioned variables, included clinical variables, i.e. HIV disease stage and CD4 number. In this study, the significance level was considered to be less than 0.05. Less than 5% of the data contained MISSNGs that were excluded from the study. Data analysis was performed using STATA v14 software.

Ethical consideration

The present study was conducted according to the Helsinki Declaration (15). The study was approved by the ethics committee of the vice chancellery of research and technology, Kermanshah University of Medical Sciences (KUMS.REC.1394.315) and the written informed consent was obtained from each participant.

Results

During the years 1995 to 2019 (25 years), 2867 patients were infected with HIV/AIDS, of which 2449 (85.42%) were male. The average age of the study population was 33.47 (95% CI: 33.92-34.02), which was almost the same for men and women. The mean age of HIV/AIDS in women was 33.94 (95% CI: 32.70-35.17) per year and in men was 33.36 (95% CI: 32.66-34.06) per year.

The mean duration of HIV/AIDS in women was 11.54 years (95% CI: 10.76-12.32) and in men was 11.89 (95% CI: 11.44-12.35). According to the WHO classification, 185 patients (6.45%) were identified in stage 4 (AIDS). During the study period, 1591 patients died, the most important causes of death being AIDS,

suicide and substance abuse, respectively, and AIDS-related infections were 354 (36.9%), 178 (18.5%) and 110 (11.4%), respectively. Of the 1,276 living patients in this study, 773 (60.58%) patients are currently receiving ARV treatment.

Among patients with HIV/AIDS, 98 (3.42%), 394 (13.74%) and 776 (27.07%) had HBV, HCV, and TB infections, respectively. Among the risk factors for HIV/AIDS are 2143 (74.75%) History of drug abuse, 1967 (68.61%) History of injection drug, 1693 (59.05%) history of the prison, 1584 (55.25%) needle sharing, 1336 (46.60%) unsafe sexual behavior and 716 (24.97%) sex with non-spouse (Table 1).

In terms of treatment status, 1817 people with HIV/AIDS (63.38%) were non-adherence to medication and 783 (27.31%) were adherence to ARV, and the rest had cessation of ARV. As Table 1 shows, adherence to ARV increased in women, married people, and with age and education. Also, those who did not have needle sharing, history of drug abuse, history of injection drug use, history of the prison, sex with non-spouse, and unsafe sexual behavior had a higher percentage of adherence to treatment than those who had these behavioral risk factors (Table 1).

Table 1: Demographic characteristics and behavioral risk factors of people with HIV/AIDS according to the status of antiretroviral treatment pattern.

| P value | Cessation of ARV | Adherence to ARV | Non-adherence to ARV | Total (%) | Characteristics/Infection status | |
|----------------|-------------------------|-------------------------|-----------------------------|------------------|---|----------------------------------|
| | 267(9.31) | 783(27.31) | 1817(63.38) | 2867(100) | Total (%) | |
| <0.001 | 39(9.33) | 254(60.77) | 125(29.90) | 418(14.58) | Female | Gender |
| | 228(9.31) | 529(21.60) | 1692(69.09) | 2449(85.42) | Male | |
| 0.054 | 33(7.10) | 121(26.02) | 311(66.88) | 465(16.22) | <18 | Age |
| | 127(9.61) | 346(26.17) | 849(64.22) | 1322(46.11) | 19-29 | |
| | 74(9.28) | 223(27.98) | 500(62.74) | 797(27.80) | 30-40 | |
| | 33(11.66) | 93(32.86) | 157(55.48) | 283(9.87) | >41 | |
| <0.001 | 147(10.78) | 456(33.43) | 761(55.79) | 1364(47.58) | Unemployed | Job |
| | 120(7.98) | 327(21.76) | 1056(70.26) | 1503(52.42) | employed | |
| <0.001 | 26(9.39) | 57(20.58) | 194(70.04) | 277(9.66) | illiterate | Educational |
| | 59(8.43) | 200(28.57) | 441(63.00) | 700(24.42) | Elementary | |
| | 109(11.61) | 270(28.75) | 560(59.64) | 939(32.75) | guidance | |
| | 55(9.84) | 250(44.72) | 254(45.44) | 559(19.50) | High school and above | |
| | 18(4.59) | 6(1.53) | 368(93.88) | 392(13.67) | Unknown | |
| <0.001 | 112(8.75) | 257(20.08) | 911(71.17) | 1280(44.65) | Single | Marital status |
| | 83(9.64) | 355(41.23) | 423(49.13) | 861(30.03) | Married | |
| | 62(11.33) | 147(26.87) | 338(61.97) | 547(19.08) | Widow /divorce | |
| | 10(5.59) | 24(13.41) | 145(81.01) | 179(6.24) | Unknown | |
| <0.001 | 130(8.60) | 264(17.47) | 1117(73.92) | 1511(52.70) | ≤200 | CD4 cell count (cells/μl) |
| | 137(10.10) | 519(38.27) | 700(51.62) | 1356(47.30) | >200 | |
| <0.001 | 122(8.13) | 174(11.60) | 545(42.95) | 1269(44.26) | No | HBV* |
| | 10(10.20) | 20(20.41) | 68(69.39) | 98(3.42) | Yes | |
| | 135(10.64) | 589(46.41) | 1204(80.27) | 1500(52.32) | Unknown | |
| <0.001 | 135(10.75) | 535(42.60) | 586(46.66) | 1256(43.81) | No | HCV* |
| | 64(16.24) | 146(37.06) | 184(46.70) | 394(13.74) | Yes | |
| | 68(5.59) | 102(8.38) | 1047(86.03) | 1217(42.45) | Unknown | |
| <0.001 | 205(9.80) | 639(30.56) | 1247(59.64) | 2091(72.93) | No | TB* |

| | | | | | | |
|--------|-----------|------------|-------------|-------------|-------------------------------|---|
| | 62(7.99) | 144(18.56) | 570(73.45) | 776(27.07) | Yes | |
| <0.001 | 149(9.41) | 317(20.01) | 1118(70.58) | 1584(55.25) | Yes | Needle sharing |
| | 10(12.05) | 28(33.73) | 45(54.22) | 83(2.90) | No | |
| | 108(9.41) | 438(36.50) | 654(54.50) | 1200(41.86) | Unknown | |
| <0.001 | 208(9.71) | 449(20.95) | 1486(69.34) | 2143(74.75) | Yes | History of drug abuse |
| | 35(7.83) | 325(72.71) | 87(19.46) | 447(15.59) | No | |
| | 24(8.66) | 9(3.25) | 244(88.09) | 277(9.66) | Unknown | |
| <0.001 | 182(9.25) | 352(17.90) | 1433(72.85) | 1967(68.61) | Yes | History of injection drug use |
| | 25(14.20) | 82(46.59) | 69(39.20) | 176(6.14) | No | |
| | 60(8.29) | 349(48.20) | 315(43.51) | 724(25.25) | Unknown | |
| <0.001 | 164(9.69) | 409(24.16) | 1120(66.15) | 1693(59.05) | Yes | History of the prison |
| | 50(8.40) | 364(61.18) | 181(30.42) | 595(20.75) | No | |
| | 53(9.15) | 10(1.73) | 516(89.12) | 579(20.20) | Unknown | |
| <0.001 | 71(9.92) | 257(35.89) | 388(54.19) | 716(24.97) | Yes | sex with non-spouse |
| | 28(9.69) | 213(73.70) | 48(16.61) | 289(10.08) | No | |
| | 168(9.02) | 313(16.81) | 1381(74.17) | 1862(64.95) | Unknown | |
| <0.001 | 132(9.88) | 479(35.85) | 725(54.27) | 1336(46.60) | Yes | Unsafe sexual behavior |
| | 72(9.63) | 286(38.24) | 390(52.14) | 748(26.09) | No | |
| | 63(8.05) | 18(2.30) | 702(89.38) | 783(27.31) | Unknown | |
| <0.001 | 24(5.37) | 156(34.90) | 267(59.73) | 447(15.59) | Stage 1 (asymptomatic) | WHO Clinical Staging of HIV/AIDS |
| | 68(10.43) | 409(62.73) | 175(26.84) | 652(22.74) | Stage 2 | |
| | 77(16.14) | 134(28.09) | 266(55.77) | 477(16.64) | Stage 3 | |
| | 48(25.95) | 67(36.22) | 70(37.84) | 185(6.45) | Stage 4 (AIDS) | |
| | 50(4.52) | 17(1.54) | 1039(93.94) | 1106(38.58) | Unknown | |
| | | | | | | |

* Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Tuberculosis (TB).

The HIV/AIDS treatment trend shows that in 1995, more than 90 percent of people were non-adherent to treatment, while in 2019, more than 67 percent of those studied were adherence to treatment, the treatment process has been on the rise since 2005, the trend of cessation of treatment between 1995 and 2019 was almost constant and close to 8%. (Figure 2).

All behavioral risk factors increased non-adherence to treatment. In general, after controlling the confounding variables except needle sharing, all behavioral variables affected adherence; The greatest impact was on non-adherence with treatment in History of drug abuse, History of the prison, History of injection drug use and Sex with non-spouse with a chance of 10.87 (7.21-16.39), 3.94 (2.84-5.46), 3.86 (2.47-6.03) and 3.38 (2.19-5.23) times more than patients without this risk factors to follow the treatment (Table 2).

Although the effect of behavioral risk factors on cessation of treatment was not as significant as non-adherence to treatment, after controlling the variables of the disorder, the most important factors in cessation of treatment were observed in patients with a history of drug use and history of the prison. The chances of cessation of treatment in patients with a history of drug use and history of the prison were 4.15 (2.37-7.25) and 2.21 (1.35-3.61) times higher than in patients without these risk factors in adherence to ARV, respectively (Table 2).

Table 2. Results of the crude and adjusted multivariate logistic regression analysis of non-adherence and cessation compared to adherence to antiretroviral therapy.

| Model 3 OR(95%CI) | Model 2 OR(95%CI) | Model 1 OR(95%CI) | Model 0 OR(95%CI) | Behavioral Risk factors | | |
|----------------------|----------------------|----------------------|----------------------|-------------------------|-------------------------------|--|
| 1 | 1 | 1 | 1 | No | History of drug abuse | Non-adherence to ARV compared to adherence to antiretroviral therapy |
| 10.87(7.21-16.39) | 9.38(6.42-13.72) | 9.75 (6.99-13.60) | 12.36(9.54-16.02) | Yes | | |
| 72.04(32.12-161.57) | 75.34(34.95-162.42) | 79.78(38.29-166.21) | 101.27(49.99-205.19) | Unknown | | |
| 1 | 1 | 1 | 1 | No | Needle sharing | |
| 1.40(0.80-2.47) | 1.58(0.91-2.74) | 2.15(1.31-3.53) | 2.19(1.35-3.57) | Yes | | |
| 0.99(0.55-1.79) | 1.27(0.72-2.22) | 1.55(1.-1.06) | 0.93(0.57-1.51) | Unknown | | |
| 1 | 1 | 1 | 1 | No | History of injection drug use | |
| 3.86(2.47-6.03) | 3.42(2.28-5.14) | 3.53(2.46-5.05) | 4.84(3.44-6.80) | Yes | | |
| 1.02(0.64-1.63) | 1.22(0.80-1.87) | 1.25(0.86-1.82) | 1.07(0.75-1.52) | Unknown | | |
| 1 | 1 | 1 | 1 | No | History of the prison | |
| 3.94(2.84-5.46) | 3.27(2.42-4.42) | 3.47(2.68-4.51) | 5.51(4.46-6.80) | Yes | | |
| 60.67(29.82-123.48) | 67.84(34.13-134.85) | 68.80(35.39-133.75) | 103.77(54.14-198.91) | Unknown | | |
| 1 | 1 | 1 | 1 | No | sex with non-spouse | |
| 3.38(2.19-5.23) | 3.87(2.55-5.89) | 3.81(2.61-5.57) | 6.70(4.72-9.51) | Yes | | |
| 8.27(5.47-12.50) | 10.53(7.08-15.66) | 11.59(8.09-16.61) | 19.58(13.99-27.41) | Unknown | | |
| 1 | 1 | 1 | 1 | No | Unsafe sexual behavior | |
| 1.53(1.19-1.96) | 1.35(1.07-1.70) | 1.19(0.97-1.46) | 1.11(0.92-1.34) | Yes | | |
| 27.23(15.93-46.55) | 25.48(15.21-42.67) | 24.22(14.70-39.90) | 28.6(17.48-46.78) | Unknown | | |
| 1 | 1 | 1 | 1 | No | History of drug abuse | Cessation of ARV compared to Adherence to antiretroviral therapy |
| 4.15(2.37-7.25) | 3.83(2.22-6.59) | 3.93(2.34-6.59) | 4.30(2.92-6.32) | Yes | | |
| 0.63(0.34-1.17) | 24.01(9.76-59.53) | 26.19(1.87-63.08) | 24.76(10.67-57.45) | Unknown | | |

| | | | | | |
|-------------------|--------------------|--------------------|--------------------|---------|-------------------------------|
| 1 | 1 | 1 | 1 | No | Needle sharing |
| 1.15(0.50-2.62) | 1.21(0.56-2.63) | 1.28(0.61-2.73) | 1.32(0.62-2.78) | Yes | |
| 0.82(0.35-1.94) | 1.05(0.47-2.34) | 1.01(0.47-2.21) | 0.69(0.32-1.46) | Unknown | |
| 1 | 1 | 1 | 1 | No | History of injection drug use |
| 1.64(0.95-2.84) | 1.43(0.86-2.40) | 1.63(1.00-2.67) | 1.69(1.04-2.75) | Yes | |
| 0.63(0.34-1.17) | 0.67(0.37-1.20) | 0.71(0.40-1.25) | 0.56(0.33-0.95) | Unknown | |
| 1 | 1 | 1 | 1 | No | History of the prison |
| 2.21(1.35-3.61) | 1.98(1.24-3.17) | 2.22(1.41-3.51) | 2.91(2.06-4.13) | Yes | |
| 21.54(9.42-49.24) | 31.21(14.26-68.34) | 34.17(15.82-73.80) | 38.58(18.45-80.67) | Unknown | |
| 1 | 1 | 1 | 1 | No | sex with non-spouse |
| 1.53(0.89-2.62) | 1.59(0.94-2.69) | 1.45(0.86-2.42) | 2.10(1.31-3.37) | Yes | |
| 2.51(1.52-4.12) | 3.13(1.94-5.06) | 3.13(1.96-4.99) | 4.08(.64-6.32) | Unknown | |
| 1 | 1 | 1 | 1 | No | Unsafe sexual behavior |
| 1.37(0.95-1.96) | 1.24(0.88-1.74) | 1.18(0.85-1.65) | 1.09(0.79-1.51) | Yes | |
| 11.09(5.5-21.37) | 13.85(7.48-25.67) | 14.52(7.94-26.54) | 13.90(7.75-24.93) | Unknown | |

OR, odds ratio; CI, confidence interval.

Model 0 the crude odds ratio with 95% confidence interval of risk factors.

Model 1, adjusted for gender, age, job, educational, marital status.

Model 2, adjusted for model 1, HBV, HCV, TB.

Model 3, adjusted for model 2, CD4, WHO stages.

In general, Viral Load level varied in different behavioral risk factors in individuals who cessation of treatment or non-adherence to ARV ($P < 0.001$), so that the VL level was lower significantly among patients who had cessation or non-adherence to ARV. But it was almost the same in the people who were adherence to treatment ARV ($P = 0.19$). The highest VL level in patients who were non-adherent to treatment is related

to individuals who had sex with non-spouse. Moreover, the highest VL level in patients who had cessation of treatment is for the history of injection drug use (Figure 3).

Discussion

HIV/AIDS has become a major obstacle to the development of human societies and a major concern for people around the world. HIV in all countries of the world, rich and poor, is not only a health problem but also a socio-cultural and economic problem for human societies.

In this study, 85.42% of all people living with HIV were men. According to the World Health Organization in 2018, of the 37.9 million people living with HIV, 18.8 million were women and 17.4 million were men (1). In a study of nine US patients, nearly a quarter of women were ill (16). The most important reason for the difference in the sex ratio of patients with HIV/AIDS in different countries is the way the disease is transmitted. In Iran, due to the fact that injecting drug use is the most common way of transmission, more than 80% of diseases are observed in men, but in recent years, with the change in the cause of infection and the increase in sexually transmitted diseases, the prevalence of HIV/AIDS in women is increasing quickly (9).

In this study, there was a significant relationship between gender and treatment status. Thus, receiving treatment and adhering to treatment was higher in women than men. The results of a study in the United States showed that women were less likely to receive treatment (17). In our study, the cessation of ARV in both sexes was consistent with the findings of similar studies (18-20). These gender differences are largely explained by social and behavioral factors. In addition to the regularity and high commitment of women versus men in adherence to treatment, antiretroviral treatment can be provided to prevent the transmission of HIV from mother to infant, which has been included in the national guidelines for care and treatment since 2016 (21).

There is a statistically significant relationship between education and treatment. As the rate of education increased, the treatment increased and the non-adherence to medication decreased, which was consistent with the results of the study (22). One of the reasons for non-adherence in illiterate people is not using daily calendars, reminder notes, diet instructions, and devices such as timers and alarms, which require minimal level of literacy.

In the study of marital status, there was a statistically significant relationship between marital status and adherence to treatment, so that adherence was higher in married people, which matched with the results of a similar study (23). Couples support may have increased the use of treatment after disclosure of the disease. This form of support may not exist in single people.

In this study, 59.05% had a history of imprisonment, of which 66.15% did not adhere to treatment. After controlling the confounding variables, the chance of cessation of treatment in patients with a history of the prison of 2.21 (1.35-3.61) was equal to that of patients without a history of the prison in compliance with treatment. In prisons, people are kept in a closed environment for a long time, and with conditions such as

overcrowding, poor nutrition, lack of medical care and sexual contact with homosexuals, violence, rape, and tattooing with contaminated equipment, these people are prone to infection. They become infected with a variety of diseases and, after being released, they are distributed in the community and can spread these diseases in the community. To reduce the risk of transmitting the disease to prisoners, it has been suggested that measures such as informing and raising prisoners' levels of information, screening, providing sterile condoms and syringes, treating patients, and vaccinating individuals can reduce the risk of transmission. In two prisons in Germany, in addition to training and raising public awareness, sterile injections were also required, which reduced both the percentage of injecting drug use and the use of the shared needle and ultimately the chances of HIV, Hepatitis B and C transmission (24). Therefore, programs that ensure the continued care of HIV-positive patients after release, as well as awareness of the negative consequences of the cessation of ARV, require further development and evaluation.

After controlling the confounding variables of the drug, the chance of cessation of treatment in patients with a history of drug use 4.15 (2.37-7.25) was higher than without a history of drug abuse patients. The results of similar studies showed that drug use was associated with less adherence to antiviral treatment and accelerated the progression of HIV (25-27). For people who are taking drugs, special considerations such as the impact of their unstable lifestyles, problems with adherence to treatment, and the effect of methadone maintenance treatment on antiretroviral treatment are factors that should be considered. Also, although alcohol and non-injectable drugs do not expose a person to direct contact with other people's blood, they can impair their ability to think and reason and lead to dangerous behaviors (especially during sexual intercourse) that they do not perform under normal circumstances.

In the present study, 46.60% had unprotected sex. Due to the fact that one of the ways of HIV transition is through sexual contact, the correct use of condoms and the avoidance of multiple sexual partners are always recommended.

The results of multivariate logistic regression analysis showed a statistically significant relationship between non-adherence to ARV and unsafe sexual behavior, so that the chance of non-adherence to treatment in patients with unsafe sexual behavior was 1.53 times more than patients without unsafe sexual behavior. According to a study in Cameroon, patients who did not receive treatment reported unsafe sexual behavior from one and a half to three times more than their treated counterparts (28). Interventions can maintain the health of the individual and society by emphasizing commitment to treatment, and by knowing that antiretroviral treatment can significantly reduce the likelihood of HIV transmission through sexual behaviors (29).

The HIV/AIDS treatment diagram shows that the trend of receiving treatment has been on a rising steeply since 2005. With the introduction of the HIV epidemic in 1996 in some Iranian prisons, the number of identified cases suddenly increased dramatically, and this trend continued until 2004 when the total number of identified cases reached a maximum in one year (30-32).

VL levels was higher in patients at risk without ARV treatment than in patients at risk. When patients adhere to treatment properly, the immunodeficiency virus changes from a potentially deadly condition to a

potentially controllable chronic disease (33). Therefore, creating a context for receiving treatment in patients with risk factors seems necessary.

Limitations And Strengths

The most important strength of this study is the high dimension of the sample and its population-based nature and the study of a long-term period, the collection of information by trained individuals and its accurate recording. The study was limited in that about 21% of patients who adhere to treatment have a history of drug use and are currently being treated with methadone or are currently taking drugs, so there is a need to accurately record drug abuse information. We didn't ask participants about rape, forced sex, pressing, and tattooing as risk factors for HIV transmission. These factors were important in assessing the risk of HIV infection, or even for reasons such as the accusing and discrimination against people living with the disease, concomitant infections such as tuberculosis, sexually transmitted infections and hepatitis, the patients did not tend to laboratory tests and antiretroviral treatments; so they remained unknown.

Conclusion

Although the process of receiving treatment has been on the rise since 2005, there is still a non-adherence to medication in high-risk groups such as people with a history of drug abuse and needle sharing, people with a history of the prison and individuals with unsafe sexual behavior. Since non-adherence to treatment in these groups is an important factor in increasing the level of VL, HIV transmission and prevalence, it is necessary to focus more on health education and increasing the awareness to reduce non-adherence and eventually cessation of treatment, increasing the level of awareness of these groups, the continuity of care for HIV-infected patients, as well as the emergence of non-governmental organizations to provide harm reduction programs for patients.

Declarations

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Availability of data and materials

Total data set supporting the conclusions of this study are available from the corresponding author and can be accessed against the sensible demand.

Authors' contributions

MS, AM, ES and MM participated in the study design and data collection and analysis and to the writing of the manuscript. Participated in the study design and helped in drafting article preparation for publication.

All authors have read and approved the final manuscript.

Consent for publication

This study has not been published elsewhere and is not under. All authors have accepted the final manuscript and agreed for its publication.

Competing interests

The authors declare that they have no competing interests.

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Figures

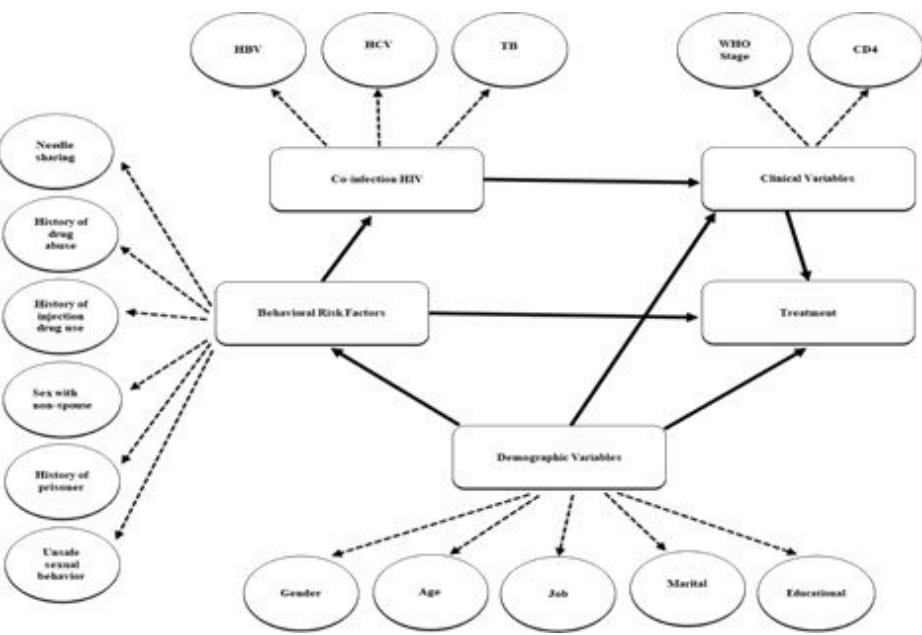


Figure 1

Conceptual model for modifying confounding factors on the effect of each behavioral risk factor on treatment pattern.

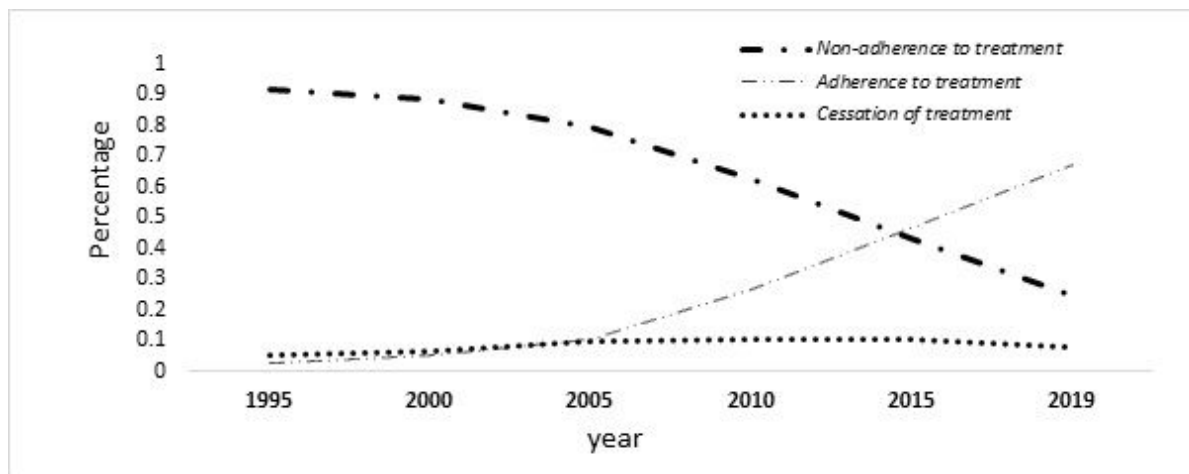


Figure 2

Treatment trend of people with HIV/AIDS based on treatment pattern.

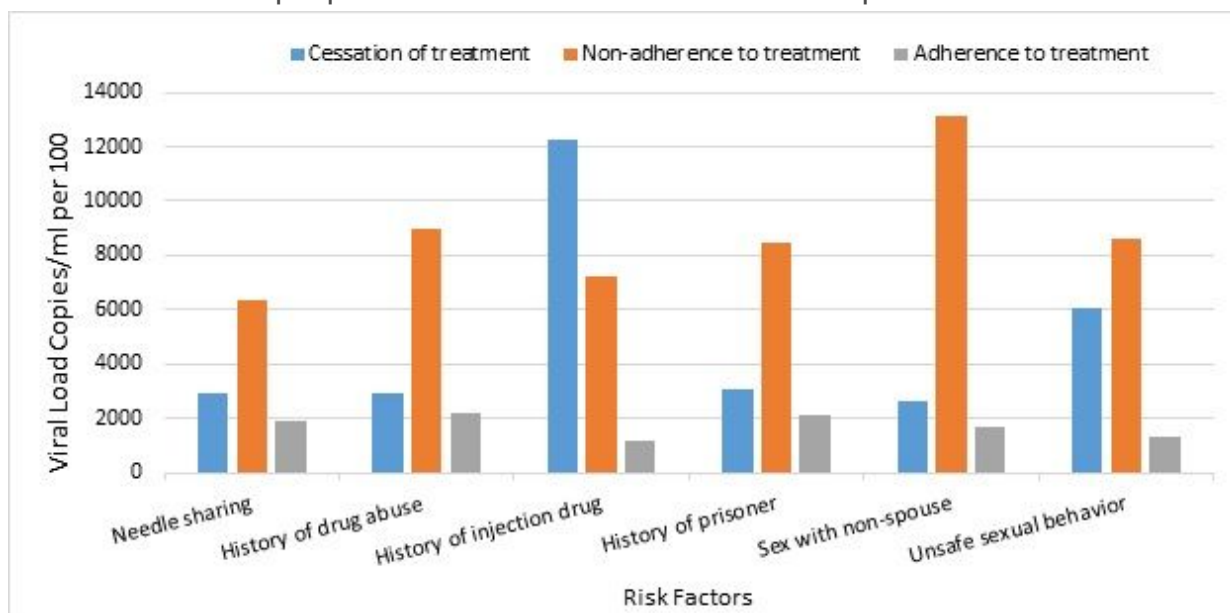


Figure 3

Viral Load measure in risk factors of HIV infection transmission based on the treatment to ARV status.