**ORIGINAL RESEARCH**

# Being young with HIV is a higher risk for non-adherence to ART in Chihuahua, Mexico

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**Abstract**

**Introduction.** Mortality due to HIV/AIDS in Mexico is 3.62 per 100,000 inhabitants. Most research on ART adherence in the Mexican population has considered only people with HIV/AIDS living in Mexico City. Due to the different social characteristics (e.g. conservatism) in other states of the Mexican Republic, it is to be expected that there are different factors related to ART adherence. **Objective.** To analyze the association of individual characteristics, health care institutions, and antiretroviral treatment with adherence in people with HIV residing in Chihuahua. **Results.** The sample population (n=211) had a mean age of 37.6 years (±10.3 SD), with a minimum of 18 years and a maximum of 67 years. The first multivariate analysis showed that the younger the age, the greater the risk of nonadherence. The second multivariate analysis showed the same pattern according to the age of the participants; in addition, those who noted increased body fat had a higher risk of nonadherence to ART. **Conclusion.** Health professionals treating people living with HIV should pay special attention to young people and those with increased body fat to reduce the risk of low adherence. **Key words:** Adherence, ART, HIV.

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## *Introduction*

The human immunodeficiency virus (HIV) is a retrovirus that affects and alters the cells of the immune system, mainly T CD4-positive cells and macrophages. The infection results in the weakening of the immune system and with it the inability to fight infections and diseases.1 Antiretroviral treatment is known as ART whose function is to reduce the replication and spread of the virus. Treatment includes a combination of four groups of drugs, which are: nucleoside reverse transcriptase inhibitors, non-nucleoside reverse transcriptase inhibitors, protease inhibitors, and integrase inhibitors. [1]

In Mexico, according to INEGI figures, reported cases of HIV according to year of diagnosis (2020) and sex, were 1,901 cases, or 17.4% (1,633 or 15% men and 268 or 2.4% women), 1.3% lower than in 2019, in which the percentage was 18.7%.(1). Mortality due to HIV/AIDS in the country is 3.62 per 100,000 inhabitants; the rate rising to 6.19 amongst men.

In the Chihuahua Health Services, from 1984 to 2020, 9,886 people with HIV were registered and 5,763 cases developed AIDS; in 2020 there were 4,123 HIV-positive people in the

state (2). In the last 36 years, 2,317 deaths have been registered in the state due to this cause, resulting in a mortality rate of 1.4 per 100,000 inhabitants, which is below the national average of 4 per 100,000 inhabitants. The proportion of men to women is 4 to 1, with men being the most affected group (79%), and the most frequent age group is between 25 and 44 years of age (65%) (2). There is no governmental information on ART adherence.

The 90-90-90 objective of the UNAIDS (Joint United Nations Program on HIV/AIDS) Political Declaration set as a goal that by 2020 at least 90% of people receiving ART should have viral suppression (3). In Mexico, since the 1990's, there have been programs to provide ART to people living with HIV. In 2003, according to the Federal Government, universal access to ART for people with HIV/AIDS had been achieved (4).

People with HIV who are adherent (≥95% of the prescribed dose) are more likely to achieve an optimal virological response, an increase in the CD4 lymphocyte count, a lower probability of opportunistic infections and hospitalization; in addition to extending survival expectancy and even achieving a life expectancy similar to that of seronegative people (5, 6). Therefore, it is necessary to study the factors related to ART adherence.

Most of the research on ART adherence in the Mexican population has only considered people with HIV/AIDS living in Mexico City. Information on the situations of people with HIV/AIDS in other states of the Mexican Republic is scarce. In regions other than Mexico City and the Metropolitan area, it is to be expected that there will be greater prejudice towards people with HIV and that the quality of medical care they receive will be different. Therefore, what is observed with respect to the factors involved in adherence to ART in people residing in CDMX may not be extrapolated, in this case, to people residing in the state of Chihuahua.

Conservatism, lack of sex education, poor protection of sexual and reproductive rights, church intervention, and sociocultural homophobia are more prevalent in other states than in Mexico City (7). In the literature review, there are several articles related to homophobia and discrimination in Mexico, especially in the northern states of Mexico such as Jalisco, Guanajuato, Sinaloa, Sonora, Baja California and Chihuahua (8). Considering that in other states of the Mexican Republic are still lingering behind the CDMX in terms of social justice, the factors mentioned at the beginning of this paragraph could be present with greater force and affect the population with HIV – especially sexual minorities - in terms of adherence to ART.

***General Objective***

To analyze the association between individual characteristics, health care institutions, and antiretroviral treatment with adherence to ART in people with HIV residing in Chihuahua.

***Material and Methods***

A cross-sectional survey was conducted among people with HIV who received attention through public health services in the state of Chihuahua. The information was obtained with a questionnaire applied through an Internet platform (Alchemer). The questionnaire was promoted in the social networks of the project and SISEX A.C. In addition, it was applied in its digital and printed version in the waiting rooms of different CAPASITS of Chihuahua, in order to obtain variation in the profiles of people with HIV.

Informed consent was requested from all participants. Participation was anonymous, confidential and voluntary. This research is part of project Proy-2018-0141 funded by CENSIDA. 500 records were obtained during the period June-December 2018. Of these, 42.2% were considered for analysis, using as criteria that the surveys had been completed and that the place of residence was in the state of Chihuahua (n=211).

Socioeconomic data was collected, as well as data on the individuals themselves (age, sexual orientation, schooling, distress, mistreatment in health services, openness about their illness, concealment of their illness and discrimination due to HIV); data related to the institution (treatment by staff, satisfaction with medical care, satisfaction with other services, shortage of medications, hours of care, trust in the institution) and antiretroviral treatment (time on ART and presence of side effects). The analysis of ease carried out by the platform indicates that the average time for filling out the form was 15

minutes, the fatigue score was low and the level of accessibility was high.

Three groups were formed according to sex-gender and sexual orientation. To identify sexual orientation, the sex of the persons with whom they had had sexual intercourse was asked. All cis women were kept within the same group regardless of their sexual orientation. In the case of men, they were divided into heterosexuals (they had only had sex with women) and homo-bisexuals (they had had sex with men or with both women and men). Because of their small number, trans women and trans men were also included in this group called "sexual minorities".

The 8 mental health questions of the SF-36 questionnaire, which has been validated in the Mexican population (9), were applied; it has Likert-type response options ranging from "never" (score 1) to "always" (score 6). Exploratory factor analysis was performed and the questions were grouped into a single set. The scores of the 8 items were summed to obtain the overall distress score. Items with positive feelings were recoded to obtain an inverse score (1 for "always" and 6 points for "never"). Individuals were classified into tertile categories.

Regarding HIV stigma, 11 items were grouped and 3 factors emerged from the factor analysis. One of them was openness, i.e., it was considered whether family and friends know about their serostatus and whether they can talk to their relatives about the disease or its treatment. The second factor was called concealment, asking if you are ashamed to talk about your disease, if you don't want others to know that you are taking ART, or if you are afraid of people knowing that you are living with HIV. Each question had a yes or no option, the experiences of the 3 questions included in each variable were summed and 3 groups were created: none, partial (1 or 2 experiences) and complete (3 or more). The third factor was HIV discrimination, which was integrated with 5 items ("you have been disrespected or made to feel less because you live with HIV", "someone has avoided contact with you because you have HIV", "someone has spoken badly about you or gossiped about you because you have HIV", "a family member or friend stopped talking to you because you have HIV", "someone has not wanted to use things that you used for fear of acquiring HIV"). Affirmative responses scored 1 point, negative responses scored none. The scores of the 5 items were then summed to give an overall score, which was divided into 3 groups: those who had no experiences were termed none, those who experienced 1 or 2 experiences were termed moderate, and 3 or more experiences, severe discrimination (See Table 1).

The existence of mistreatment in health services was evaluated using 5 items in which they were asked to indicate whether they had experienced any of the following situations by the institution's personnel: emotional and/or psychological mistreatment, impunity, rude/dissatisfied attitude, arrogance or lack of respect for their privacy. The number of experiences was summed and 3 groups were created: none, 1 or 2 experiences and 3 or more.

One specific question was treated individually ("In general, the treatment you received from the staff where you receive your medical care was:") because it involved the treating institution as a unit. The response options were in Likert format ranging from "very bad" (score 0) to "very good" (score 5), also included was the option "don't know". Three categories were formed: very bad to fair, good and very good.

Regarding the doctor-patient relationship, 6 items were used to ask about the treatment received from the medical staff ("How much did the doctor allow you to talk about your health condition", "How much did the doctor explain about your health condition? "How much did the doctor explain the treatment to be followed?", "How much did the doctor explain the care you should follow?", "How clear was the information the doctor gave you?", "How much did they solve the health problem for which you came to the facility?"). Satisfaction with other services in the institution (surveillance, social work, clinical records, nursing, laboratories, x-rays, and pharmacy) was evaluated with a scale previously used in persons with HIV/AIDS in Mexico City (10); in both cases, the responses were grouped and 3 categories were formed according to tertiles. Another specific question was related to trust in the institution that attended by the person ("In general, do you trust this institution for your health care"). The response options were in Likert format with the numerical option of rating 1 as no trust

and 7 as totally trustworthy. Three categories were formed according to tertiles. They were asked how many antiretroviral drugs they had to take in the morning and at night. The number of pills they should have taken was calculated. The number of pills not taken was divided by the total number of pills they should have taken. Adherence to ART was considered low when it was less than 95%.

For data analysis, a database was prepared and analyzed using the StataSE Version 15 statistical program. A descriptive analysis of the socio-demographic variables was performed; in addition, to determine which characteristics of the individual, the institution, and the treatment influenced adherence to ART, bivariate analysis was performed, estimating prevalence ratios based on Poisson models. Differences were considered statistically significant if the 95% confidence interval (95%CI) did not contain the null value (1.00). estimating odds ratios (OR) from logistic regression models. Differences were considered statistically significant if $p \leq 0.050$.

Subsequently, a multivariate model was performed, including the variables that in the bivariate analysis had a p value of less than 0.250 ($p<0.250$); the second multivariate model included the variables that had this same p in the first model.

In relation to the side effects of ART, 5 questions were asked, of which 2 questions were discarded ("When starting ART, the side effects were explained to you" and "the type of medication you take has been changed"). Factor analysis of the remaining 3 items yielded 2 factors that were identified as acute effects and chronic effects.

**Results**

The sample population (n=211) had a mean age of 37.6 years (±10.3 SD), with a minimum of 18 years and a maximum of 67 years. Three quarters belonged to sexual minorities and just over a tenth were heterosexual men or women (Table 1). Half of the persons were not completely open about their disease, and only one third did not hide their disease. Two-thirds had experienced discrimination for having HIV. Younger people had a higher risk of non-adherence to antiretroviral treatment compared to older ones (OR=3.35 for those 18 to 34 years old, see Table 1). Non-adherence was not related to other characteristics of the people.

Younger people had a higher risk of non-adherence compared to older people (Table 1). Non-adherence was not related to other characteristics of the individuals. It is worth mentioning that of the 67 respondents whose treatment schedule indicated taking medication in the morning, 22.4% (n=15) skipped between 1 and 3 doses and 4.5% (n=3) did not take the treatment at all in the week prior to the survey, while of the 176 respondents whose treatment schedule indicated taking medication in the evening, 19.3% (n=34) skipped between 1 and 4 doses and 0.57% did not take the treatment on any day in the week prior to the survey. Regarding ART adherence, 19.4% (n=41) of participants did not adhere.

In the institution where they receive treatment, most of them go to CAPASITS or Seguro popular (Table 2). Half of the people had some experience of mistreatment in the health service and almost a quarter considered the treatment by the staff to be very bad to fair. One-fifth strongly disagreed with the hours of service. Regarding ART and the supply of medicines in the institution that cares for them, a third part has experienced a shortage of medicines at least once; and most had been on antiretroviral treatment for 3 to 5 years (Table 2). When considering the relationship of adherence with variables concerning the institution or the treatment itself, it was found that those who have had drug shortages 2 or more times had a higher risk of not adhering to ART (RM=3.84).

Regarding ART and the supply of drugs in the institution providing care, one third had experienced a shortage at least once; the majority had been in antiretroviral treatment for 3 to 5 years (Table 2). When considering the relationship between adherence and variables concerning the institution or the treatment itself, it was found that those who had experienced drug shortages two or more times were at greater risk of not adhering to ART (RM=3.84)

A quarter were never told about the possible side effects of ART; in addition, half of them noticed an increase in abdominal fat (which was related to non-adherence to ART), as well as elevated blood cholesterol levels, and a quarter noticed a decrease in the volume of their cheeks.

The first multivariate analysis showed that the younger the age, and the increase in fat, the higher the risk of non-adherence. The second multivariate analysis showed the same pattern according to the age of the participants, and those who noted increased body fat had a higher risk of nonadherence to ART, also those who experience lack of access to proper drugs as a result of its shortage.

**Table 1. Descriptive and bivariate analysis of sociodemographic variables.**

| | Sample distribution | | Bivariate analysis | | |
|---|---|---|---|---|---|
| **Variable** | **n** | **%** | **OR** | | ***p*** |
| **Age** | | | | | |
| 18-34 | 89 | 42.2 | 3.35 | | 0.022 |
| 35-44 | 66 | 31.3 | 2.75 | | 0.070 |
| 45-67 | 56 | 26.5 | | | |
| **Sexual Orientation** | | | | | |
| Sexual minority | 160 | 76.2 | | | |
| Heterosexual male | 24 | 11.4 | 0.80 | | 0.731 |
| Women | 26 | 12.4 | 0.95 | | 0.935 |
| **Education** | | | | | |
| High school or less | 72 | 34.1 | | | |
| College | 83 | 39.3 | 1.35 | | 0.510 |
| Professional or more | 56 | 26.6 | 0.87 | | 0.788 |
| **Distress** | | | | | |
| Tertile 1 | 59 | 28.0 | | | |
| Tertile 2 | 79 | 37.4 | 2.35 | | 0.110* |
| Tertile 3 | 73 | 34.6 | 1.92 | | 0.230* |
| **Openness** | | | | | |
| None | 26 | 12.3 | | | |
| Partial | 82 | 38.9 | 1.58 | | 0.538 |
| Complete | 103 | 48.8 | 2.33 | | 0.251 |
| **Concealment** | | | | | |
| None | 65 | 30.8 | 1.00 | | |
| Partial | 76 | 36.0 | 0.80 | | 0.539 |
| Complete | 70 | 33.2 | 0.58 | | 0.177* |
| **Discrimination due to HIV** | | | | | |
| None | 94 | 44.6 | | | |
| Moderate | 62 | 29.4 | 1.68 | | 0.254 |
| Severe | 55 | 26.07 | 1.32 | | 0.569 |

Source: Study data, 2021

**Table 2. Descriptive and bivariate analysis of institution-related and ART-related**

| | Sample distribution | | Bivariate Analysis | | |
|---|---|---|---|---|---|
| **Variable** | **n** | **%** | **OR** | | ***p*** |
| **Institution** | | | | | |
| IMSS/ISSSTE | 80 | 38.1 | | | |
| CAPASITS/Seguro popular | 130 | 61.9 | 0.84 | | 0.657 |
| **Mistreatment in health services** | | | * | | |
| None | 102 | 48.3 | | | |
| 1 or 2 experiences | 62 | 29.4 | | | 0.400 |
| 3 or more experiences | 47 | 22.3 | 1.46 | | 0.540 |
| **Personnel treatment** | | | 1.35 | | |
| Very bad or regular | 47 | 22.3 | | | |
| Good | 63 | 29.8 | | | 0.956 |
| Very good | 101 | 47.9 | 1.03 | | 0.550 |
| **Satisfaction with medical personnel** | | | 1.36 | | |
| Tertile 1 | 57 | 27.0 | | | |
| Tertile 2 | 86 | 40.8 | | | 0.673 |
| Tertile 3 | 68 | 32.2 | 0.81 | | 0.613 |
| **Satisfaction with other services** | | | 1.29 | | |
| Tertile 1 | 63 | 29.9 | | | |
| Tertile 2 | 78 | 37.0 | | | 0.463 |
| Tertile 3 | 70 | 33.1 | 0.70 | | 0.784 |
| **Adequate attention hours** | | | 1.14 | | |
| Strongly disagree (1-3) | 42 | 19.9 | | | |
| Neither agree nor disagree (4-6) | 75 | 35.6 | | | 0.353 |
| Strongly agree (7) | 94 | 44.5 | 0.61 | | 0.675 |
| **Trust in the institution** | | | 0.81 | | |
| Tertile 1 | 40 | 19.0 | | | |
| Tertile 2 | 68 | 32.2 | | | 0.759 |
| Tertile 3 | 103 | 48.8 | 0.85 | | 0.238* |
| **Drug shortage** | | | 0.55 | | |
| 0 times | 139 | 65.9 | | | |
| 1 time | 41 | 19.4 | | | 0.865 |
| 2 o more times | 31 | 14.7 | 0.91 | | 0.005* |
| **Years taking ART** | | | 3.84 | | |
| Less than a year | 53 | 25.1 | | | |
| 3 to 5 years | 73 | 34.6 | | | 0.342 |
| 6 to 10 years | 47 | 22.3 | 0.61 | | 0.483 |
| 11 or more years | 38 | 18.0 | 1.46 | | 0.805 |
| **Explanation of side effects** | | | 0.86 | | |
| No | 56 | 26.5 | | | |
| Yes | 155 | 73.5 | | | 0.693 |
| **Acute side effects** | | | 0.84 | | |
| Tertile 1 | 75 | 35.6 | | | |
| Tertile 2 | 56 | 26.5 | | | 0.623 |
| Tertile 3 | 80 | 37.9 | 1.28 | | 0.360 |
| **Chronic Side Effects** | | | 1.52 | | |
| **Increase in body fat** | | | | | |
| No | 101 | 47.9 | | | |
| Yes | 110 | 52.1 | | | 0.009* |
| **Diminished cheeks** | | | 3.07 | | |
| No | 160 | 75.8 | | | |
| Yes | 51 | 24.2 | | | 0.447 |
| **Change in ART** | | | 1.39 | | |
| No | 131 | 62.1 | | | |
| Yes | 80 | 37.9 | 1.75 | | 0.155* |

Source: Study data, 2021. OR (odds ratio).

* Not estimable for being a single person

**Table 3.** Multivariate logistic regression models in which the dependent variable is adherence to ART.

| | Model 1 | | Model 2 | |
|---|---|---|---|---|
| **Variable** | **OR** | **p** | **OR** | **P** |
| **Age** | | | | |
| 18-34 | 4.10 | 0.015 | 4.02 | 0.012 |
| 35-44 | 2.18 | 0.197 | 2.14 | 0.192 |
| 45-67 | | | | |
| Sexual orientation | | | | |
| Heterosexual men | 0.74 | 0.659 | | |
| Women | 0.80 | 0.719 | | |
| **Distress** | | | | |
| Tertile 1 | | | | |
| Tertile 2 | 1.77 | 0.293 | | |
| Tertile 3 | 1.68 | 0.373 | | |
| **Ocultamiento** | | | | |
| Ninguno | | | | |
| Parcial | 0.66 | 0.375 | 0.74 | 0.503 |
| Completo | 0.46 | 0.142 | 0.52 | 0.191 |
| Discriminación por VIH | | | | |
| Ninguna | | | | |
| Moderada | 1.27 | 0.611 | | |
| **Confianza en institución** | | | | |
| Tercil 1 | | | | |
| Tercil 2 | **1.00** | **0.999** | | |
| Tercil 3 | **0.76** | **0.637** | | |
| **Drug shortage** | | | | |
| 0 times | | | | |
| 1 time | 0.82 | 0.739 | 0.90 | 0.840 |
| 2 or more times | 2.64 | 0.064 | 3.39 | 0.012 |
| **Change in ART** | | | | |
| No | | | | |
| Yes | | | | |
| **Increase in body fat** | | | | |
| No | | | | |
| Yes | | | | |
| **Trust in the institution** | | | | |
| Tertile 1 | | | | |
| Tertile 2 | | | | |
| Tertile 3 | | | | |
| **Change of ART** | | | | |
| No | | | | |
| Yes | 1.57 | 0.302 | | |
| **Increase in fat** | | | | |
| No | | | | |
| YES | 2.50 | 0.047 | 3.04 | 0.009 |

Source: Study data, 2021

***Discussion***

In the population with HIV in CDMX, low adherence to ART was 5.9% (11); however, in the population surveyed in the state of Chihuahua, low adherence to ART was 19.4%. No significant relationships were found between low adherence to ART and the quality of care in the institution in general, despite the fact that half of the people had some experience of mistreatment in the health service and almost a quarter considered the treatment of the staff to be very poor to fair, and a fifth strongly disagreed with the hours of care.

The difference in the prevalence of adherence can probably be explained by the fact that the institutions in Mexico City have a better quality in general and that for the population of Chihuahua, poor care is a normalized situation. Therefore, if mistreatment is normalized in the health services, it does not affect adherence; whereas when the normal situation is to receive good treatment, if violence or mistreatment is perceived, it is related to adherence to ART.

In addition, it was observed that younger people, between 18 and 34 years of age, had a higher risk of nonadherence to ART compared to older people. Adolescents and young people may present internal conflicts regarding the recognition and acceptance of their sexual identity, especially those who live in unfavorable economic contexts and heteronormative cultures.

In this sense, conservatism in Chihuahua is part of the culture of the north of the country, in which virility is very important; sexual minorities (trans men and women, men who have sex with men), feel shame that leads to silence - the silences that allow other people to believe that we really approve of the things that are done in our culture to women, minorities, gays and lesbians. Silence when we do not confront injustices such as discrimination, homophobia, and violence in any form in our own daily lives encourages young people not to adhere to antiretroviral treatment (12).

The conflict with sexual identity has a strong relationship with social beliefs, prejudices and stigmas related to homosexuality and homophobia, which generates great anguish among young people who are in the process of defining and accepting their sexual identity (12).

The adolescent or young person who lives under social rejection tends to feel alone, without support, exhibiting reduced communication and social interaction, guilt, rejection of their own identity, as well as a tendency towards isolation and an avoidance of health professionals, thus increasing the probability of incurring in risk behaviors; in the case of people with HIV/AIDS, it also increases the risk of low adherence to ART.

On the other hand, in a population of people with HIV in Mexico City, the most frequent chronic effect was lipodystrophy, which was associated with low adherence to ART (13). In our study, lipodystrophy was not related to low adherence, but the perception of increased body fat was.

This relationship could be explained by the fact that young people, who are in the process of defining and accepting their sexual identity and for whom their body image is important, perceiving fat gain after starting ART may affect adherence; in addition, as was identified in a population in Mexico City, there is a lack of information on the possible side effects of ART (10).

Although the Government of Mexico officially declared in 2003 the provision of ART to the population with HIV/AIDS (4), we found a relationship between low adherence to ART and the shortage of antiretroviral drugs; those who had suffered shortages two or more times were at greater risk of nonadherence. If the HIV-positive population does not have free access to ART, it probably has an impact on adherence due to the high cost of the drugs. In the study conducted with the HIV-positive population of the CDMX, no relationship was found between drug shortages and adherence to ART (14).

In this study, non-adherence was not related to other characteristics of the individuals, neither socioeconomic nor negative affect. Regarding the association between the patient-physician relationship and adherence, no association was found in our study. In contrast, studies conducted in Mexico City and in a systematic review, the doctor-patient relationship is strongly related to adherence to ART (10, 13, 15). As previously mentioned, this is probably due to the fact that in Chihuahua poor care is a normalized situation.

It is worth mentioning that our HIV research began several years ago in the population of Mexico City; currently, we are exploring

whether the variables identified in the center of the country have the same impact in other states of the Mexican Republic. In this regard, we can conclude that not all data from Mexico City can be extrapolated to HIV/AIDS populations in the rest of the country.

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