An Alarming Shift of HIV Infection from Injection Drug to Sexual Transmission in Mashhad, Iran, 1989-2014

Habibollah Esmaily, PhD¹, Rasoul Alimi, PhD², Zahra Meshkat, PhD³, Ali Mohammad Hoseinpour, MD⁴, Omid Kiani, MSc⁵, Fatemeh Khorashadizadeh, PhD⁶

¹Department of Epidemiology and Biostatistics, School of Health, Mashhad University of Medical Sciences, Mashhad, Iran.
²Department of Public Health, School of Health, Torbat Heydariyeh University of Medical Sciences, Torbat Heydariyeh, Iran.
³Department of Microbiology and Virology, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.
⁴General Practitioner, Mashhad University of Medical Sciences, Mashhad, Iran.
⁵Clinical Research Development Unit of Imam Reza Hospital, Birjand University of Medical Sciences, Birjand, Iran.
⁶Department of Epidemiology and Biostatistics, Neyshabur University of Medical Sciences, Neyshabur, Iran.

Introduction: Iran is facing to a rapid change in the epidemiological pattern of HIV. The trend of annual number of new HIV infections and factors associated with the development of HIV over the last two decades in Iran, were examined.

Methods: The data were retrospectively collected from patients who attended the Behavior Diseases Consultation Center of Mashhad University of Medical Sciences in Iran. Individuals were contributed if they were HIV-positive. Baseline factors including demographic, behavioral and clinical characteristics for all participants were examined. Changes in population characteristics were assessed using chi-square test or the Fisher’s exact test.

Results: From 1989 to 2014, 584 individuals were eligible for present analysis according to the inclusion criteria. Most patients were men (87%) with most being 36–52 years old, unemployed (58%), married (39.3%), less educated (47.7%) and had a history of imprisonment (83%). The most common modes of HIV transmission were injection drug use (IDU) (51.4%) and IDU along with the sexual relationship (26.5%). These transmission modes varied significantly according to gender (p-value<0.001). Similarly, IDU and sexual relationship were most important transmission modes in males and females, respectively. The number of new HIV infections through sexual-related modes has risen sharply in recent years.

Conclusion: In Iran, the pattern of HIV transmission is shifting from unsafe injection drug to unsafe sexual contact for forthcoming years. Also, increasing trend of HIV incidence in women is remarkable. Accordingly, HIV-prevention strategies need to be changed.
Introduction

The HIV pandemic is steadily increasing worldwide in the last four decade. Although the annual number of AIDS-related deaths are decreasing in many countries, the danger for the Middle East and North Africa (MENA) is serious.\(^1\)

The Joint United Nations Program on HIV/AIDS (UNAIDS) estimated that 38 million (31.6-44.5 million) people were living with HIV at the end of 2019. Of these people, 240000 (170000–400000) were living in MENA. In recent years, global efforts to strengthen HIV prevention and treatment programs are reducing the rate of HIV transmission, AIDS-related deaths, and new HIV infections. Meanwhile, new infections in 2019 increased by 22% compared to 2010, but, AIDS-related death only 2% decrease in MENA.\(^2\)

According to WHO estimation, number of people living with HIV in Iran (a country in the Middle East) until 2019 was 59000(33000-130000).\(^3\) In Iran the HIV burden is concentrated among people who inject drugs (PWID) and is quite low in the general population.\(^4\)\(^-\)\(^7\) However, the number of people living with HIV and new HIV infections have been growing. In 2005, the prevalence in the general population for the age ranged 15-49, was 0.1% while it is expected to rise to 0.16% by 2020.\(^8\) The first case of HIV/AIDS in Iran was observed in a six-year-old child with hemophilia through contaminated blood products in 1986. These imported blood products caused large numbers of hemophiliacs to become infected with HIV. It was the first wave of the epidemic of the country.\(^9\)\(^,\)\(^10\) The second wave of this disease occurred with the outbreak of the epidemic of 1996 in some of Iran’s penitentiaries among PWID because of insecure use of intravenous drugs. The number of new HIV infections suddenly increased considerably and this trend continued and reached a peak by 2004.\(^5\)\(^,\)\(^8\) Although the prevalence of HIV among PWID has been declining, it remains one of the most important factors fueling the epidemic in Iran.\(^4\) Alongside with decrement, the third wave of the epidemic can be attributed to sexual transmission of HIV. The number of recorded cases through sexual relationship is gradually increasing.\(^11\) Evidence shows that the increase in the number of new cases of pregnant women living with HIV has increased the birth rate of children with this disease.\(^8\)\(^,\)\(^10\) This phenomenon may be called the beginning of the fourth wave of HIV outbreaks.

Generally, the HIV transmission routes among all registered cases from 1986 to 2014 were shared equipment in injecting drug users (67.2%), sexual relationships (13.9%), blood products (0.9%), mother-to-child (1.3%) and unknown (16.7%).\(^8\) Nowadays the rate of HIV transmission through sexual relations is rising. It is a big warning that the transmission trend is shifting from injecting drug users to sexual relationships.\(^12\)\(^,\)\(^13\) It is also worth noting that alongside an increase in the sexual transmission rate, the number of infected women is also rising in recent years. More than 35% of newly diagnosed cases are women.\(^8\)\(^,\)\(^14\)

Given the importance of the incremental growth of HIV and a limited number of studies in the northeast of Iran; the present paper examines trend, new infections, epidemiological findings and factors associated with HIV prevalence in these patients between 1989 and 2014 in the northeast of Iran, Razavi Khorasan Province.
Materials and Methods

Ethics Statement

The study was approved by the ethical committee of Mashhad University of Medical sciences in Iran (IR.MUMS.REG.1392.807).

Study design and participants

This study was a retrospective study among HIV-positive cases diagnosed during the period 1989-2014 and referred to the Behavioral Diseases Consultation Center (BDCC) of Mashhad University of Medical Sciences in the Razavi Khorasan province, Iran. Participants included in the study consisted of 1) volunteers who attend after a high-risk behavior; 2) referrals of new HIV cases come from various organizations such as Mashhad prisons, blood transfusion organization, hospitals, and clinics and so on.

HIV Testing

HIV testing can be conducted for surveillance, diagnosis or blood screening purposes.\(^{15}\) In the case of voluntary individuals, a blood specimen was collected after pretest counseling and was later tested for free HIV testing. Initially, a rapid test was performed as a screening. Then, if the result of the rapid test was positive, ELISA and Western Blot testing was done as the confirmatory test in accordance with the national HIV testing algorithm.\(^{16}\) These people receive post-test counseling by on-site counselors and are monitored for HIV care at the center. All tests were performed at the center’s Laboratory so that the results could quickly be returned to the participants. Patient’s information was strictly confidential. In the case of referrals, the diagnostic documents of the HIV testing were taken from individuals. All subjects completed a structured questionnaire programmed into the interviewers in face-to-face interview. The registry also tracks patient vital status, including date of death, the cause of death (when available), and place of death. Individuals return almost every 1 month to assess their physical health, mental, medical treatment and some laboratory testing (eg.CD4 counts).

Study eligibility

Subjects were excluded if the results of the confirmatory HIV testing were negative for them. Also, non-Iranian people from the study were exclude.

Statistical analysis

Demographic characteristics (age, date of birth, sex, marital status, employment status, educational status and prison record) and clinical characteristics (HIV diagnosis date, routes of HIV transmission, and ART treatment history) have been collected for each subject. We categorized the age HIV diagnosis into groups (≤14 years, 15–24 years, 25–49 years and ≥50 years).

At first, data were entered and cleaned. For continuous variables, median and interquartile range (or mean and standard deviation) were calculated. Categorical factors associated with HIV infection were summarized using frequency and percentage stratified by the gender. Then, were tested using the chi-square test or the Fisher’s exact test. Time trend for HIV transmission by gender and risk factor using linear charts was examined. Non-missing data in the included/relevant variable(s) were
Results

Demographic and Clinical Characteristics

Among the 606 individuals recorded in the study, 22 were excluded from the present analysis for the following reasons: Eighteen patients were non-Iranian in nationally and four individuals were diagnosed HIV-negative in later confirmatory testing. The final analysis population consisted of 584 individuals that met the eligibility criteria. The median age of patients was 44 years (IQR: 36-52). The most of patients were male (87%), and for them, median age was 45 years (IQR: 37–52). In terms of job status, 58% of the participants self-identified as unemployed. Housewives and students were also considered unemployed. More than half of these patients (54.1%) had completed only primary-level education and 39.7% were currently married. Eighty-three percent of the patients had a history of imprisonment. For 22.6% of patients, treatment was started. At the end of the study, 173 patients were alive (29.6%) and 176 patients (30.1%) dead. There was no information available on the status of other patients. This lack of information is due to the fact that 30.8% of patients came from other Iranian provinces to the center and returned to their city after treatment or diagnosis. A number of patients were also homeless people who did not have a stable place to live. The median age of the HIV diagnosis was 35 years (IQR: 28-40). The HIV prevalence was highest in the age group of 25-49 years, which is 83.6% of the study population.

Baseline CD4 cell counts (1st available count after HIV diagnosis) were available for 277 individuals (47%); the median CD4 cell count was 382 cells/mm$^3$ (IQR: 213.5–585). The demographic and clinical characteristics were not statistically significant by the gender except for educational status and CD4 level (Table1).

Relationship between Mode of HIV transition and Gender

Table 2 presents the modes of HIV transition. The most important transmission modes were IDU (51.4%) and unsafe sexual contact along with IDU (26.5%). The history of imprisonment was high among PWID (91.7%) but lower in those infected through sexual relationships (28.6%). There was a statistically significant association between the gender and mode of HIV transition (P<0.001). In other words, the most frequent mode of HIV transition in male and female was IDU and through a spouse, respectively.

Time Trends in new HIV infections by gender and modes of transmission

Table 3 describes the number of new HIV infections by the modes of HIV transition between 1989 and 2014. It was observed that in the early years (1989-1993), the infected blood product was the most important factor in the spread of the disease. Also, transmission of disease from these people to their spouse has led to the further spread of the disease.

In 1996, HIV transmission risk among IDUs suddenly increased and reached 22 cases (95.7%) of the total number of cases in that year. Following the trend of the disease, since 2003, the rate of incidence steadily has grown.
Table 1. Demographic and Clinical Characteristics of HIV/AIDS patients by sex, Mashhad, 1989-2014

| Marital status        | Male n (%) | Female n (%) | Total n (%) | P value<sup>a</sup> |
|-----------------------|------------|--------------|-------------|----------------------|
| Married               | 185(39.3)  | 28(43.1)     | 213(39.7)   | <0.001               |
| Single                | 161(34.2)  | 7(10.8)      | 168(31.3)   |                      |
| Divorced              | 120(25.5)  | 17(26.2)     | 137(25.6)   |                      |
| Widow                 | 5(1.1)     | 13(20.0)     | 18(3.4)     |                      |

| Job status            | Male n (%) | Female n (%) | Total n (%) | P value<sup>a</sup> |
|-----------------------|------------|--------------|-------------|----------------------|
| Unemployed            | 153(52.9)  | 46(82.1)     | 199(57.7)   | <0.001               |
| Employed              | 136(47.1)  | 10(17.9)     | 146(42.3)   |                      |

| Educational status    | Male n (%) | Female n (%) | Total n (%) | P value<sup>a</sup> |
|-----------------------|------------|--------------|-------------|----------------------|
| Illiterate or Elementary | 215(55.6) | 21(42.9)     | 236(54.1)   |                      |
| Intermediate          | 91(23.5)   | 15(30.6)     | 106(24.3)   |                      |
| High school or Diploma | 69(17.8)  | 12(24.5)     | 81(18.6)    |                      |
| Higher than diploma   | 12(3.1)    | 1(2.0)       | 13(3.0)     |                      |

| History of imprisonment | Male n (%) | Female n (%) | Total n (%) | P value<sup>a</sup> |
|-------------------------|------------|--------------|-------------|----------------------|
| Yes                     | 430(91.3)  | 12(19.4)     | 442(82.9)   | <0.001               |
| No                      | 41(8.7)    | 50(80.6)     | 91(17.1)    |                      |

| ART | Male n (%) | Female n (%) | Total n (%) | P value<sup>a</sup> |
|-----|------------|--------------|-------------|----------------------|
| Yes | 103(20.3)  | 28(38.9)     | 131(22.6)   | <0.001               |
| No  | 405(79.7)  | 44(61.1)     | 449(77.4)   |                      |

| Age of HIV diagnosis | Male n (%) | Female n (%) | Total n (%) | P value<sup>a</sup> |
|----------------------|------------|--------------|-------------|----------------------|
| ≤14                  | 5(1.1)     | 3(4.5)       | 8(1.5)      |                      |
| 15-24                | 40(8.5)    | 12(17.9)     | 52(9.7)     |                      |
| ≥50                  | 398(84.7)  | 51(76.1)     | 449(83.6)   |                      |

| CD4 Level | Male n (%) | Female n (%) | Total n (%) | P value<sup>a</sup> |
|-----------|------------|--------------|-------------|----------------------|
| ≤200      | 54(23.8)   | 12(24.0)     | 66(23.8)    |                      |
| 201-349   | 51(22.5)   | 10(20.0)     | 61(22.0)    |                      |
| 350-500   | 57(25.1)   | 7(14.0)      | 64(23.1)    |                      |
| ≥501      | 65(28.6)   | 21(42.0)     | 86(31.0)    |                      |

<sup>a</sup>P value from Chi-square test

Table 2. Distribution of transmission routes of HIV by sex, Mashhad, 1989-2014

| Transmission routes of HIV | Male N=510 n (%) | Female N=74 n (%) | Total N=584 n (%) | P value<sup>b</sup> |
|----------------------------|------------------|-------------------|-------------------|----------------------|
| IDU<sup>a</sup>           | 291(57.1)        | 9(12.2)           | 300(51.4)         |                      |
| Unsafe sexual contac & IDU | 13(2.5)          | 8(10.8)           | 21(3.6)           |                      |
| Unsafe sexual contact      | 151(29.6)        | 4(5.4)            | 155(26.5)         |                      |
| Blood products             | 9(1.8)           | 0(0)              | 9(1.5)            | <0.001               |
| Mother to child            | 3(0.6)           | 5(6.8)            | 8(1.4)            |                      |
| through a spouse           | 3(0.6)           | 36(48.6)          | 39(6.7)           |                      |
| Unknown                    | 13(2.5)          | 5(6.8)            | 18(3.1)           |                      |
| Other                      | 27(5.3)          | 7(9.5)            | 34(5.8)           |                      |

<sup>a</sup>Injection drug use

<sup>b</sup>Fisher's exact test for (r × c) table
through the unsafe sexual relationship that most of them occurred along with IDU. The proportion of sex-related factors increased from 21.1% to 53.7% in 2013, whereas the proportion of IDUs decreased from 63.2% to 19.5%. Also, as a new factor, several cases mother-to-child transmission has been seen in recent years (2008, 2010, 2013 and 2014). As shown in Fig.1, the newly identified HIV infections of the disease between 1988 and 2014 varies by the IDU, sexual relationship and blood products. In the case of contaminated blood products, except for the early years, in the following years, the trend has been close to zero.

Table 3. Distribution of new HIV infections by year of diagnosis, Mashhad, 1989-2014

| Transmission modes       | 1989 | 1990 | 1991 | 1992 | 1993 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | Total |
|--------------------------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Injection drug use       | 0(0) | 0(0) | 0(0) | 1(20)| 0(0) | 22(95.7)| 22(81.5)| 9(94.8)| 12(75)| 3(37.5)| 7(53.8)| 8(53.3)|       |
| Unsafe sexual contact    | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) | 2(2.1)| 0(0) | 0(0) | 0(0) | 3(20)|       |
| Injection drug use &     | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) | 1(4.3) | 5(18.5)| 1(1) | 0(0) | 0(0) | 2(15.4)| 4(26.7)|       |
| Unsafe sexual contact    |      |      |      |      |      |      |      |      |      |      |      |      |       |
| Blood products           | 3(100)| 1(50)| 1(100)| 3(60)| 1(50)| 0(0) | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) |       |
| Mother to child          | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) | 1(6.3)| 0(0) | 0(0) | 0(0) |       |
| Through a spouse         | 0(0) | 1(50)| 0(0) | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) | 3(18.7)| 0(0) | 0(0) | 0(0) |       |
| Unknown                  | 0(0) | 0(0) | 0(0) | 1(20)| 1(50)| 0(0) | 0(0) | 1(1) | 0(0) | 5(62.5)| 4(30.8)| 0(0) |       |
| Other                    | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) | 0(0) | 1(1) | 0(0) | 0(0) | 0(0) | 0(0) |       |

Table 3. (continued) Distribution of new HIV infections by year of diagnosis, Mashhad, 1989-2014

| Transmission modes                  | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | Total |
|-------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Total                               | 19(1)| 21(1)| 33(1)| 41(1)| 38(1)| 37(1)| 24(1)| 31(1)| 24(1)| 46(1)| 41(1)| a(1) |       |
| Injection drug use                  |      |      |      |      |      |      |      |      |      |      |      |      | 12(63.1)|      |
| & Unsafe sexual contact             |      |      |      |      |      |      |      |      |      |      |      |      | 4(21.1)|      |
| Blood products                      |      |      |      |      |      |      |      |      |      |      |      |      | 0(0) | 0(0) |
| Mother to child                     |      |      |      |      |      |      |      |      |      |      |      |      | 0(0) | 0(0) |
| Through a spouse                    |      |      |      |      |      |      |      |      |      |      |      |      | 3(15.8)| 0(0) |
| Unknown                             |      |      |      |      |      |      |      |      |      |      |      |      | 0(0) | 0(0) |

a, The end of the study was August 21, 2014. So, the statistics for 2014 was not complete.
An Alarming Shift of HIV Infection from Injection Drug to Sexual ...

Figure 1. Trend of change in transmission routes of HIV from 1989 to 2014

Figure 2. Trends of registered cases from 1989 to 2014 disaggregated by sex

and completely inhibited. HIV transmission through IDU hit a peak in 1998, possibly due to the HIV epidemic among PWIDs, especially in prisons in that year. Notably, since 2007, the trajectory of transmission due to IDU along with sexual relationship had a higher rate of injecting drug alone. Attention to the gender-specific trends shows that proportion of men with this disease is still higher than women over time. However, the upward trend in the number of HIV-infected women in recent years is quite evident (Fig.2). Unfortunately, the records of
patients diagnosed in 1994 and 1995 were lost and not included in the analysis.

Discussion

Iran has previously been considered protected from HIV due to strong moral views. However, more recent evidence shows that Iran is facing a rapid change in the epidemiological pattern of HIV. Although the most important mode of HIV transmission has been injection drug use over the years, sexually transmitted spread of HIV seems to be catching up.

According to the results of current study, most of patients were male, which is in line with national and global statistics. The reason for this may be having the higher level of sexual immorality, multiple sexual partners, travel to foreign countries, and more drug use in men. However, it must be noted that this phenomenon may be due to less attending women to centers, especially since it is very difficult and sometimes impossible to reach high-risk groups such as female sex workers to counsel and encourage them to undertake HIV testing.

We found that most of the HIV-positive patients were infected in 25-49 age range. Compared with a recent study, the median age of HIV diagnosis in males was significantly higher than females (35 vs. 29 yrs). A review of the studies conducted in this area shows that in most cases, HIV disease has been acquired during youth years. The youths as an active age group and in the age of marriage and work are more likely to experience risky behaviors; hence, preventing these behaviors may reduce the prevalence of HIV remarkably in this group. Furthermore, the conflict with this disease affects the country’s employment system and family life of these people. As a result, management of high-risk behaviors related to HIV in young people is one of the priorities of public health.

As evidence show, more than half of the patients were unemployed. Of course, it's important to note that even patients who have been registered as being employed are mostly seasonal and part-time workers, have not had much job stability, or have been nominated by their former job position. Previous studies have indicated that the incidence of this disease can affect the financial and occupational status of individuals and create instability. On the other hand, poverty and wealth inequality is a significant factor to explain the risk of developing HIV in the community. Therefore, considering the employment status on the community level can be important in preventing the disease.

Overall, level of education in this study is low in line with other studies. It can be the indicator of low awareness of these people about their disease. Research shows that educated patients had a better quality of life because of the better job and financial conditions; higher levels of culture and better adaptation to disease.

In our findings, HIV is most commonly transmitted among PWIDs. Most of the research done so far has reported the results consistent with this result. Because of the neighborhood of Afghanistan and the fact that an important transit route for smuggling opiates pass through Iran, this country has the highest numbers of PWIDs among all countries in the MENA. Also, after the prevalence of HIV in 1996 among PWIDs in prisons, the rate of disease increased considerably. The HIV prevalence in these people has reached to 13.8% in 2014. On the other hand, sexual transmission of HIV in Iran has been steadily growing in recent years (32). Many studies have ranked sexual
transmission as the second transition mode of HIV.\textsuperscript{10,18,20,27} Evidence shows that, the use of amphetamine-type stimulants is rising that may be associated with high-risk sexual behaviors.\textsuperscript{33,34}

Also, the prevalence of HIV among FSWs has reached 4.5\% and was more than three times among FSWs who had a history of IDU (comparable to HIV prevalence among PWID in Iran).\textsuperscript{32} As a result, it is reasonable to assume that great proportion of HIV infections among FSWs were acquired through IDU rather than unprotected sex. Thereafter, potentially, the risk of disease transmission of these people to their clients is high.

Our study indicated that in 26.9\% of cases, patients have experienced high-risk sexual behavior in addition to IDU. We found that IDU was the most common transmission cause in males and sexual contact was the most common in females. So, a significant relationship was found between gender and transmission mode. These findings are similar to other reported results.\textsuperscript{10,20,35}

Based on results of this study, although the infection rate in men is higher than women, the proportion of female cases is increasing alongside the increase in the proportion of those infected by sexual route in recent years. This is compatible with previous studies.\textsuperscript{4,11,36}

We found that most women are married and major transmission mode of HIV in them has been through their husbands, who were mostly PWID (48.6\%) in consist with Nasirian et al.\textsuperscript{37} Moreover prevalence of HIV among FSWs has led to an increase in the number of affected women.\textsuperscript{11}

As the number of women living with HIV grows, so does mother-to-child transmission, in the absence of adequate preventive measures. Although the rates of HIV transmission from mothers to infants have decreased worldwide, MENA has had the least amount of progress in this field. In this region, nearly one-third of women living with HIV pass the virus on to their children.\textsuperscript{7} Our data show that rate of mother-to-child transmission is 1.4\%. Similar researches certify this finding.\textsuperscript{20,31} Screening pregnant women for HIV lead to early detection of HIV infection and can reduce the risk of mother to child transmission.\textsuperscript{38} In addition, use of antiretroviral medicines during the pregnancy and breastfeeding among women living with HIV prevents onward transmission of HIV.\textsuperscript{7} This is vital regard to the high-risk groups such as PWIDs and FSWs.

We found that 1.5\% of our participants got the disease through blood products. It seems that activities to control HIV transmission through contaminated blood or blood products have been appropriate and approximately the number of cases of this way has dropped to zero.\textsuperscript{8}

Based on our results and mentioned discussion above, it is apparent that the transmission pattern of HIV/AIDS is changing in Iran. Although previously IDU accounted for the major transmission route, this proportion will reduce in coming years and the third wave of infection through sexual contact may possibly be replaced by it.

During these years many policies have been implemented in relation to HIV. At first, the separation of HIV-infected prisoners with others caused to the stigma and discrimination of HIV-infected people. Later, Iran started harm reduction programs among high-risk groups (IDUs, prisoners, and more recently, FSWs) in 2001.\textsuperscript{39} These programs include: needle, syringe, and condoms distribution program, provision of the condom to prevent unusual sex relationships, Methadone Maintenance Treatment (MMT) for IDUs and Voluntary
counseling and Testing Centers (VCT). FSWs, men who have sex with other men (MSMs) and their clients may play the role of a bridge across populations in transferring an HIV epidemic from high-risk groups to the general population. This fact should be considered by the main health policymakers in the country. Due to the lack of valid information regarding this group, and as they are one of the most hidden populations, epidemic of HIV in this group is uncertain but implementing serious harm reduction programs for them is important.

In Iran, due to strong moral views, HIV was assumed to be less prevalent. Therefore, negative attitudes about appertain of disease to particular groups, guilty sufferers, being in the lower social level of infected people (IDUs, FSWs), pre/extramarital sex, homosexuality and like these led to HIV-related stigma. Stigmatized attitudes are serious obstacles to testing HIV, prevention, treatment, and support. It creates a hidden population that is extremely difficult to reach may restrict access to HIV-related data in conducting HIV researches in the region.39–41

Conclusion

It is recommended that, in the case of Iran, HIV prevention and treatment strategies should be integrated within the existing religious, cultural and social context. Ignorance of the disease can lead to an HIV epidemic, which can affect people not associated with illicit sexual relations or drug use.

Limitations

There are some limitations to present study. First, it should be noted that HIV-positive people referring to other centers in other provinces were not included in this study due to lack of availability. Then the results may not be generalized to all Iranian HIV/AIDS patients. Second, because of the stigma attributed to this disease and nature of interviewer-administered surveys, sensitive questions about personal sexual behaviors prevalence may underestimate the true values of these sexual behaviors.

In addition, since a large proportion of those present in the study have referred voluntarily, selection bias should also be considered as a possible limitation in the study. Despite these limitations, this retrospective study was the first of its kind in Iran that investigated trends in HIV prevalence since the disease emergence so far on a provincial level. Moreover, the sample size of our study is relatively large.

Acknowledgments

We would like to thank the staff as well as the team of BDCC of Mashhad University of Medical Sciences and HIV-patients who participated in this study.

References

1. World Health Organization. Number of deaths due to HIV/AIDS Estimates by country. Last updated: 2020-07-09. https://apps.who.int/gho/data/view.main.22600?lang=en.

2. Joint United Nations Programme on HIV/AIDS (UNAIDS). UNAIDS DATA 2020. (n.d.). Retrieved July 6, 2020, from https://www.unaids.org/en/resources/documents/2020/unaids-data.

3. World Health Organization. Number of people (all ages) living with HIV Estimates by
4. Haghdooşt A, Moštäfavi E, Mirzazadeh A, Sajadi L, Navadeh S, Feizzadeh A, et al. Modelling of HIV/AIDS in Iran up to 2014. J AIDS HIV Res Vol. 2011 Jan 1;3:231–9.

5. Gökengin D, Doroudi F, Tohme J, Collins B, Madani N. HIV/AIDS: trends in the Middle East and North Africa region. Int J Infect Dis IJID Off Publ Int Soc Infect Dis. 2016 Mar;44:66–73.

6. Mumtaz GR, Weiss HA, Thomas SL, Riome S, Setayesh H, Riedner G, et al. HIV among people who inject drugs in the Middle East and North Africa: systematic review and data synthesis. PLoS Med. 2014 Jun;11(6):e1001663.

7. Joint United Nations Programme on HIV/AIDS (UNAIDS).The Gap Report. (2014). Retrieved August 16, 2014, from http://www.unaids.org/en/resources/documents/2014/20140716_UNAIDS_gap_report.

8. Joint United Nations Programme on HIV/AIDS (UNAIDS).Islamic Republic of Iran AIDS Progress Report. (2015). Geneva, Switzerland. Retrieved March 1, 2015, from http://www.unaids.org/sites/default/files/country/documents/IRN_narrative_report_2015.pdf.

9. Center for Disease Management, Ministry of Health and Medical Education: HIV=AIDS Surveillance Report. Tehran, Iran, 2004.

10. Alimohamadi Y, Tabatabaee H, AfsarKazerooni P, Vahedi S, Enaami M, Teimourizad A. Epidemiologic characteristics of HIV-positive patients referring to behavioral diseases consultation center in Shiraz, Iran. Med J Islam Repub Iran. 2014;28:147.

11. Leylabadlo HE, Baghi HB, Fallahi L, Kafil HS. From sharing needles to unprotected sex: a new wave of HIV infections in Iran? Vol. 3, The lancet. HIV. Netherlands; 2016. p. e461-2.

12. Moradi G, Piroozi B, Alinia C, Akbarpour S, Gouya M, Saadi S, et al. Incidence, Mortality, and Burden of HIV/AIDS and Its Geographical Distribution in Iran during 2008-2016. Iran J Public Health. 2019 Mar 1;48:1–9.

13. Danial Z, Moayed M, Kalantar Motamedi MH, Mirhashemi S, Zamanian H. New Wave of Sexually-Transmitted HIV in Iran. Hosp Pract Res [Internet]. 2017;2(1):25–6. Available from: http://www.jhpr.ir/article_43769.html

14. Choi K-H, Hoff C, Gregorich SE, Grinstead O, Gomez C, Hussey W. The efficacy of female condom skills training in HIV risk reduction among women: a randomized controlled trial. Am J Public Health. 2008 Oct;98(10):1841–8.

15. UNAIDS/WHO. UNAIDS/WHO recommendations. The importance of simple/rapid tests in HIV testing. Weekly Epidemiological Record. (1998), 73, 321–328.

16. Guidelines for Using HIV Testing Technologies in Surveillance: Selection,
Evaluation and Implementation: 2009 Update.
Geneva: World Health Organization; 2009. Available from: https://www.ncbi.nlm.nih.gov/books/NBK305270/.

17. Fallahzadeh H, Morowatisharifabadi M, Ehrampooosh MH. HIV/AIDS epidemic features and trends in Iran, 1986-2006. AIDS Behav. 2009 Apr;13(2):297–302.

18. Bakhshaee M, Sarvghad MR, Khazaeni K, Movahed R, Hoseinpour AM. HIV: An Epidemiologic study on Head and Neck Involvement in 50 Patients. Iran J Otorhinolaryngol. 2014 Apr;26(75):97–104.

19. Sabouri S, Delavar A, Jabbari H. Quality of life among human immunodeficiency virus-1 infected and human immunodeficiency virus-1/ hepatitis C virus co-infected individuals in Iranian patients. Niger Med J. 2016;57(1):49–53.

20. Rimaz S, Nikooseresht Z, Vesali S, Nedjat S, Asadi-Lari M. A study on factors that drive variation in the levels of social capital among people living with HIV/AIDS in Iran. Glob J Health Sci. 2015 Mar;7(3):351–7.

21. Noar S, Anderman E, Zimmerman R, Cupp P. Fostering Achievement Motivation in Health Education. J Psychol Human Sex. 2004 Jan 1;16:59–76.

22. Pronyk PM, Harpham T, Morison LA, Hargreaves JR, Kim JC, Phetla G, et al. Is social capital associated with HIV risk in rural South Africa? Soc Sci Med. 2008 May;66(9):1999–2010.

23. Muriisa RK, Jamil I. Addressing HIV/AIDS challenges in Uganda: does social capital generation by NGOs matter? SAHARA J J Soc Asp HIV/AIDS Res Alliance. 2011;8(1):2–12.

24. Webel A, Phillips JC, Rose CD, Holzemer WL, Chen W-T, Tyer-Viola L, et al. A cross-sectional description of social capital in an international sample of persons living with HIV/AIDS (PLWH). BMC Public Health. 2012 Mar;12:188.

25. Nojoomi, M., & Anbari, K. (2008). A Comparison of the Quality of Life in HIV/AIDS Patients and Control Group, 15(58), 169–176. Retrieved from [text in persian].

26. Bozicevic I, Riedner G, Haghdoost A. HIV case reporting in the countries of North Africa and the Middle East. J Int AIDS Soc. 2014;17(1):18962.

27. Rabirad N, Mohammad Nejad E, Hadizadeh MR, Begjan J, Ehsani SR. The Prevalence of Tb in HIV Patients and Risk Factor With Frequent Referral (Iran, 2009-10). Iran Red Crescent Med J [Internet]. 2013/01/05. 2013 Jan;15(1):58–61. Available from: https://pubmed.ncbi.nlm.nih.gov/23487151

28. SeyedAlinaghi S, Zadeh AOT, Zaresefat H, Hajjizadeh M, Mohamadi SN, Paydary K, et al. Prevalence of HIV infection and the correlates among beggars in Tehran, Iran. Asian Pacific J Trop Dis [Internet]. 2013 Feb;3(1):76–8. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4027254/

29. Moradi AR, Emdadi A, Soori B, Mostafavi E. Prevalence of Human Immunodeficiency Virus Infection among
Injection Drug Users Released from Jail. Addict Heal. 2012;4(3–4):151–5.

30. Rahimi-Movaghar A, Amin-Esmaeili M, Haghdoot A-A, Sadeghirad B, Mohraz M. HIV prevalence amongst injecting drug users in Iran: a systematic review of studies conducted during the decade 1998-2007. Int J Drug Policy. 2012 Jul;23(4):271–8.

31. Ghannad MS, Arab SM, Mirzaei M, Moinipur A. Epidemiologic study of human immunodeficiency virus (HIV) Infection in the patients referred to health centers in Hamadan province, Iran. AIDS Res Hum Retroviruses. 2009 Mar;25(3):277–83.

32. Sajadi L, Mirzazadeh A, Navadeh S, Osooli M, Khajehkazemi R, Gouya MM, et al. HIV prevalence and related risk behaviours among female sex workers in Iran: results of the national biobehavioural survey, 2010. Sex Transm Infect. 2013 Nov;89 Suppl 3(Suppl 3):iii37-40.

33. Volkmann T, Wagner KD, Strathdee SA, Semple SJ, Ompad DC, Chavarin C V, et al. Correlates of self-efficacy for condom use among male clients of female sex workers in Tijuana, Mexico. Arch Sex Behav. 2014 May;43(4):719–27.

34. Wright PB, Stewart KE, Curran GM, Booth BM. A Qualitative Study of Barriers to the Utilization of HIV Testing Services Among Rural African American Cocaine Users. J Drug Issues. 2013 Jul;43(3):314–34.

35. Mohammad K, Farahani FKA, Mohammadi MR, Alikhani S, Zare M, Tehrani FR, et al. Sexual risk-taking behaviors among boys aged 15-18 years in Tehran. J Adolesc Heal Off Publ Soc Adolesc Med. 2007 Oct;41(4):407–14.

36. Jamshidimanesh M, Khoie EM, Mousavi SA, Keramat A, Emamian MH. Perceptions of Iranian Female Drug Users Toward HIV Testing: A Qualitative Content Analysis. J Int Assoc Provid AIDS Care. 2017;16(6):555–61.

37. Nasirian M, Doroudi F, Gooya MM, Sedaghat A, Haghdoot AA. Modeling of human immunodeficiency virus modes of transmission in Iran. J Res Health Sci. 2012 Dec;12(2):81–7.

38. Khazaie S, Rezaeian S. Increasing Rate of Mortality Due to HIV/AIDS in Iranian Children: An Alarm for Health Policymakers. Iran J Public Health [Internet]. 2017 Jul;46(7):1001–2. Available from: https://pubmed.ncbi.nlm.nih.gov/28845417

39. Khodayari-Zarnaq R, Ravaghi H, Mohammad Mosaddeghrad A, Sedaghat A, Mohraz M. HIV/AIDS policy agenda setting in Iran. Med J Islam Repub Iran [Internet]. 2016 Jul 3;30:392. Available from: https://pubmed.ncbi.nlm.nih.gov/27579283

40. Brener L, von Hippel W, von Hippel C, Resnick I, Treloar C. Perceptions of discriminatory treatment by staff as predictors of drug treatment completion: utility of a mixed methods approach. Drug Alcohol Rev. 2010 Sep;29(5):491–7.

41. Rahmati-Najarkolaei F, Niknami S, Aminshokravi F, Bazargan M, Ahmadi F, Hadjizadeh E, et al. Experiences of stigma
in healthcare settings among adults living with HIV in the Islamic Republic of Iran. J Int AIDS Soc [Internet]. 2010 Jul 22;13:27. Available from: https://pubmed.ncbi.nlm.nih.gov/20649967