Survival Rate of Patients With HIV/AIDS and Related Factors in Tehran, Iran

Ali Moradi [1], Seyed Saeed Hashemi Nazari [2], Farnaz Zandvakili [3], Pegah Ameri [4], Ali Nikfarjam [5], Sonia Darvishi [6], Mehdi Noroozi [7] and Khaled Rahmani [8, *]

[1] Occupational Health and Safety Research Center, Hamadan University of Medical Sciences, Hamadan, Iran
[2] Department of Epidemiology, Safety Promotion and Injury Prevention Research Center, School of Public Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[3] Department of Obstetrics and Gynecology, Kurdistan University of Medical Sciences, Sanandaj, Iran
[4] Clinical Research Development Unit, Besat Hospital, Hamadan University of Medical Sciences, Hamadan, Iran
[5] Tehran University of Medical Sciences, Tehran, Iran
[6] Social Determinants of Health Research Center, Research Institute for Health Development, Kurdistan University of Medical Sciences, Sanandaj, Iran
[7] Psychosis Research Center, University of Social Welfare and Rehabilitation Sciences, Teharan, Iran
[8] Liver and Digestive Research Center, Research Institute for Health Development, Kurdistan University of Medical Sciences, Sanandaj, Iran

Corresponding author: Liver and Digestive Research Center, Research Institute for Health Development, Kurdistan University of Medical Sciences, Sanandaj, Iran. Email: khaledrahmani111@yahoo.com

Abstract

Background: Human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) is a major public health problem in Iran. It imposes heavy costs on governments and affected people. Determining the survival duration of patients and recognizing the related factors can help the disease surveillance system.

Objectives: The current study aimed at determining the survival rate and the related factors concerning patients with HIV/AIDS identified in Tehran, Iran.

Methods: The study population of the current retrospective cohort consisted of patients with HIV/AIDS covered by the Health Center of Southern Tehran. The data were obtained by referring to the HIV/AIDS care centers and reviewing the patients' records. Survival rates of the study subjects during 10 years follow-up were calculated. The Cox proportional-hazards model was used to determine the relationship between independent variables and survival of patients with HIV/AIDS.

Results: A total of 487 patients were investigated in the current study. Four-hundred thirty-three subjects (88.9%) were male, and 54 (11.1%) female. The mean ± standard deviation of the participants' age was 44.08 ± 9.00 years. According to univariate analyses, the variables of gender, marital status, education level, occupational status, transmission way, infection with hepatitis C or tuberculosis, and history of antiretroviral treatment were significantly associated with the survival time of patients with AIDS. In the final model, a significant relationship was found between the variables of treatment, coinfection with tuberculosis, occupational status, education level, marital status, and mortality.

Conclusions: The current study was one of the few research that examined the survival rate of HIV-infected patients in Iran. Considering the expansion of AIDS epidemic in Iran, it is necessary to take appropriate measures to prevent the spread of the epidemic and decrease the mortality rate of infected patients through early detection and timely treatment of HIV-positive people coinfected with tuberculosis, creation of employment opportunities for patients and addicted individuals, controlling substance abuse, and paying more attention to harm reduction programs in individuals that have unsafe sex as one of the most important high-risk groups to increase their survival time.

Keywords: HIV/AIDS, Survival, Risk Factor

1. Background

HIV infection is associated with various diseases and high mortality rate. It imposes heavy costs on governments and affected people (1). It is over 30 years since the AIDS pandemic in the world, which killed many people in most countries (2). Worldwide, the main concern is now about HIV transmission in the Middle East and North Africa. Iran is one of the most populous Middle East countries, with many concerns about HIV incidence (3).

According to the latest statistics, more than 35 million patients died from AIDS so far in the world, and about 30 million are currently living with the disease (2). In Iran, according to the latest statistics by the Ministry of Health and Medical Education, about 28,921 people are diagnosed with

HIV (4).

One of the common concerns of patients and health system authorities is the death from the disease, which usually occurs on average within 5 to 20 years after the infection (5). In recent years, the extensive use of antiretroviral drugs and free treatment increased the prognosis of the disease and patients' longevity. Since 2004, with the advent of the ART (antiretroviral therapy), both the transmission and mortality rates of the disease decreased significantly. However, many factors can contribute to the mortality of such patients; in other words, the survival of patients depends on a variety of factors. In general, determining the duration of patients' survival and recognizing the effective factors can help the HIV/AIDS surveillance system (6).

There are different methods to calculate survival indicators. The semi-parametric Cox proportional-hazards (PH) model is one of the widely used methods in survival analysis. It is used in almost all studies conducted on survival (7). In Iran, not many studies are conducted so far on the survival of patients with HIV/AIDS, nor much evidence is published. On this basis, it seems that the conduction of such studies to examine patients' survival using a good modeling method can provide desired results for the care system of this disease.

2. Objectives

Therefore, in line with the objectives of the AIDS care system, the present study aimed at determining the survival time and factors affecting survival and mortality of patients with HIV/AIDS identified by counseling centers for behavioral diseases which deliver health services to HIV patients Tehran University of Medical Sciences.

3. Methods

The current retrospective cohort study was conducted on all patients with HIV/AIDS in the population covered by the Health Center of Southern Tehran. The study inclusion criteria were: having HIV/AIDS, Iranian nationality, and being diagnosed before 21 March 2006. The exclusion criteria were: being an Afghan refugee patient and not being covered by the Health Center of Southern Tehran due to the place of residence. Exposure included receiving treatment for tuberculosis, hepatitis, or similar diseases. The outcome included the interval between the definitive diagnosis of HIV infection and AIDS and mortality due to HIV/AIDS. The following measures were taken to deal with self-censorship: Using appropriate methods to obtain information about the selected samples and using relevant models such as age-based ones in data analysis.

The current study was conducted on a census basis. All patients registered as HIV-positive in 2005 and earlier at the Behavioral Diseases Counseling Unit of the Health Center of Southern Tehran, consisting of 490 people, were included in the study. An expert was theoretically and practically trained on how to extract the necessary information. Under the supervision of one of the project supervisors, the information was extracted from medical files of patients with HIV/AIDS and recorded in the data collection forms. The collected data were analyzed in Stata software version 14. The analysis was carried out both descriptively and analytically. Descriptive analysis was used for quantitative variables based on the mean and standard deviation and for ordinal and categorical data based on absolute and relative frequency. In the analytical analysis, the Cox PH model was used to determine the relationship between independent and dependent variables (survival time of patients with HIV/AIDS).

It should be noted that before the modeling, the association between survival time of the studied subjects and each of the independent variables were assessed by univariate analysis. Then, variables with P values ≤ 0.2 were entered into the model. Before fitting the models, the proportionality assumption was checked for each variable using the log(-log(survival)) curves and observed versus expected survival curves. A likelihood test was used to gain the fitted model.

4. Results

A total of 487 individuals infected with HIV were investigated in the current study. In terms of frequency, 433 subjects (88.9%) were male, and 54 (11.1%) female. The mean ± standard deviation of the participants' age was 44.08 ± 9.00 years. The mean, median, standard deviation, mode, and minimum and maximum values of quantitative variables in the studied subjects are summarized in Table 1.

The way of HIV transmission in 67.8% of the patients was injecting drug use and sharing the injection equipment, such as syringes and needles; other demographic and clinical characteristics of the study subjects are detailed in Table 2.

Table 3 shows the survival rates of 1 to 10 years in patients. Based on the data presented in this table, 1-, 5-, and 10-year survival rates were 94%, 78%, and 58%, respectively.

According to Table 4, after adjusting for potential confounding variables by the Cox PH modeling, the relationship between the way of infection transmission, place of

Table 1. Mean, Median, Standard Deviation, Mode, Minimum and Maximum of Quantitative Variables of Studied Subjects

Variable	Mean	Median	SD	Mode	Minimum	Maximum
Current age, y	44	43	9	44	11	76
Age at diagnosis, y	33.7	33	9	34	1	64
Age when entering the phase of AIDS or progressed HIV/CD4 < 350	40.4	40.1	10.2	44	2	77
Age at death, y	37.4	36.1	9.3	34	2	61
First CD4 count	361.6	312	275.6	400	3	1663
Last CD4 count	429.6	314	1242.5	11	9	19744

residence, education level, occupational status, coinfection with tuberculosis, treatment, and the risk ratio after HIV infection was statistically significant.

As shown in Table 4, hazard ratio (HR) of death was higher in isolated or divorced subjects (HR: 2.70, P = 0.01), patients with illiterate or elementary education level (HR: 2.61, P = 0.01), unemployed ones (HR: 1.99, P = 0.02), patients not under ART (HR: 2.01, P = 0.03), cases with coinfection of HIV and tuberculosis (HR: 6.39, P < 0.001).

5. Discussion

The current study results showed that the survival rate of the studied patients was 92%, 74%, and 50% in 1-, 5-, and 10-year survival after diagnosis, respectively. These results were consistent with those of Mirzaei et al. (8), in Hamedan showing the 1-, 5-, and 10-year survival rates after definitive diagnosis of HIV as 87%, 67%, and 40%, respectively. The results indicated that the survival rates of the current study patients at different intervals from the time of definitive diagnosis were higher than those of the ones studied in Hamadan. These differences can be due to the demographic differences between patients in the two provinces or the better coverage and quality of care provided by the Tehran University of Medical Sciences.

The current study results showed that the survival of patients infected with HIV was lower in unemployed, widower, male patients aged above 40, with secondary education, hepatitis B, hepatitis C, or *Mycobacterium tuberculosis* coinfection, a history of substance abuse, and not receiving ART. However, according to the univariate analyses, the variables of gender, marital status, education level, occupational status, HIV transmission way, hepatitis C or tuberculosis coinfection, and treatment were significantly associated with the survival time of patients with AIDS. In the final model, only the relationship between the variables of treatment, coinfection with tuberculosis, occupational status, education level, marital status, and the risk ratio was significant.

The final model showed a significantly higher HR as 6.39 in HIV-positive patients co-infected with tuberculosis. The study by Mirzaei et al. (8), in Hamedan also had similar results: The highest HR belonged to HIV-positive patients coinfected with tuberculosis. However, in that study, the HR (2.01) was much lower than that of the current study (8). As the estimates suggest, a significant proportion of new tuberculosis cases in the world are coinfected with HIV (e.g., in 2012, more than 13% of the newly diagnosed cases of tuberculosis were coinfected with HIV) (9). Therefore, it is necessary to treat patients coinfected with HIV and tuberculosis without considering the CD4 count marker, according to the WHO guidelines.

The HR (1.47) in patients coinfected with HIV/AIDS and hepatitis C was higher than the HIV-positive ones not infected with the hepatitis C virus. However, the trend was inverse in HIV-positive patients coinfected with hepatitis B (HR = 0.65). Previous studies in other parts of the world reported controversial results about the survival of patients with HIV and hepatitis C coinfection. A study by El-Serag et al. (10), in the USA, reported a reverse relationship; that is coinfection with hepatitis C reduced HR. In contrast, a cohort study by Greub et al. (11), in Switzerland, found that the coinfection of hepatitis C and HIV can increase the risk of death. Furthermore, some studies, including the study by Rancinan et al. (12), in France, suggested that the coinfection of hepatitis C and HIV does not positively or negatively affect mortality. Therefore, it can be argued that the mechanism of the relationship between HIV and hepatitis C infection is still unclear and needs further studies.

The final model in the current study showed that one of the variables that had a significant relationship with the survival of patients with HIV/AIDS was the way of infection transmission. Patients infected with the virus through substance abuse, needle sharing in injecting drug users (IDUs), were at the highest risk of mortality. Although the use of narcotics through injection is a new phenomenon in Iran, the country has a long history of drug abuse because of a long border with Afghanistan; hence, easy access to heroin

Table 2. Demographic and Clinical Characteristics of the Study Subjects[a]

Variable	Values
Marital status	
Married	145 (29.8)
Single	208 (42.7)
Divorced	46 (9.4)
Widower	16 (3.3)
Isolated	34 (7)
Unknown	38 (7.8)
Level of Education	
Illiterate	10 (2.1)
Elementary	104 (21.4)
Tips	164 (33.7)
High school	126 (25.9)
University	35 (7.2)
Unknown	48 (9.9)
Occupational status	
Student	7 (1.4)
Housewife	43 (8.8)
Military member	2 (0.4)
Manual worker	53 (10.9)
Driver	28 (5.7)
Unemployed	205 (42.1)
Others	115 (23.6)
Unknown	34 (7)
Place of residence	
Tehran	326 (66.9)
Others	161 (33.1)
Way of transmission	
Drug abuse	329 (67.6)
Sexual contact	111 (22.8)
Blood and blood product	39 (8)
Mother to fetus	8 (1.6)
Currently under treatment	
Yes	147 (30.2)
No	340 (69.8)
Coinfection with tuberculosis	
No	191 (39.2)
Yes	87 (19.1)
Unknown	209 (42.9)
Coinfection with hepatitis B	
No	291 (59.8)
Yes	41 (8.4)
Unknown	155 (31.8)
Coinfection with hepatitis C	
No	80 (16.4)
Yes	288 (59.1)
Unknown	119 (24.4)
Entering the phase of AIDS	
No	229 (47)
Yes	258 (53)

[a] Values are expressed as No. (%).

Table 3. Survival Rates of the Study Subjects During Ten Years of Follow-Up

Year	Survival Rate	Standard Error	95% Confidence Interval	
			Lower	Upper
1	0.94	0.89	0.01	0.92
2	0.88	0.81	0.01	0.85
3	0.84	0.76	0.02	0.8
4	0.82	0.73	0.02	0.78
5	0.78	0.68	0.02	0.74
6	0.74	0.64	0.02	0.7
7	0.7	0.59	0.02	0.65
8	0.67	0.55	0.03	0.61
9	0.65	0.51	0.03	0.58
10	0.58	0.41	0.04	0.5

and fluctuations in the prices increased the tendency toward heroin. In turn, it leads to an increase in the tendency towards drug injection in Iran; therefore, most of the HIV-positive cases in Iran are IDUs that acquired the infection through needle sharing (13). Also, the decrease in the age of substance use initiation and the prevalence of drug injection make addiction a contributor to the social harm in Iran. Continued drug use, especially heroin, among youth is more likely to lead to drug injection (14). This form of drug use, injecting, grew dramatically over the past two decades due to its ease of use, lack of an apparent sign, and low price. In the study on the rapid assessment of the state of drug use in Iran, 18.1% of drug users reported injection as the dominant method of drug use, and 26% reported a history of drug injection in the past year of the previous years (15). In order to reduce the impact of this phenomenon on the survival rate of patients infected with HIV, it is necessary to promote harm reduction programs for drug abuse. According to UNAIDS (the Joint United Nations Programme on HIV/AIDS) guidelines, the minimum target coverage of syringe programs should be 60% to be effective. But the coverage level in Iran is much lower than the above figure (16).

In conclusion, it can be said that the current study was one of the few studies that examined the survival rate of patients infected with HIV in Iran. According to the expansion of AIDS epidemic in Iran, it is necessary to take appropriate measures to prevent the spread of the epidemic by reducing the incidence of tuberculosis and HIV coinfection, training patients, creating employment opportunities for patients, not isolating HIV-positive and addicted individuals, controlling substance abuse, and paying more attention to harm reduction programs in those that have

Table 4. Results of the Cox Proportional-Hazard Modeling to Evaluate Factors Related to Survival of HIV Patients

Variable	Hazard Ratio	Standard Error	P Value	95% Confidence Interval	
				Lower	Higher
Gender					
Male/Female ratio	0.80	0.72	0.81	0.13	4.65
Marital status					
Married	1	-	-	-	-
Never married	1.97	0.82	0.10	0.87	4.46
Isolated or divorced	2.70	1.14	0.01	1.18	6.18
Education level	1	-	-	-	-
Diploma and academic	1	-	-	-	-
Guidance school (under diploma)	2.19	0.84	0.04	1.03	4.65
Illiterate or elementary	2.61	0.99	0.01	1.23	5.52
Occupational status					
Unemployed/employed ratio	1.99	0.62	0.02	1.08	3.66
Location					
Other cities/Tehran ratio	1.85	0.65	0.08	0.92	3.71
Under retroviral treatment					
No/yes ratio	2.01	0.65	0.03	1.06	3.81
The way of transmission	1	-	-	-	-
Blood and blood products	1	-	-	-	-
Sexual contact	1.59	1.20	0.53	0.36	7.00
Substance abuse (needle sharing)	1.69	1.13	0.43	0.45	6.31
Coinfection with hepatitis B	0.65	0.29	0.34	0.27	1.57
Coinfection with hepatitis C	1.47	0.91	0.53	0.43	4.98
Coinfection with tuberculosis	6.39	2.08	<0.001	3.38	12.10

unsafe sex as a high-risk group to increase the patients' survival time.

Footnotes

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