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HIV therapy adherence and outcomes in Peruvian military personnel over a 30-year period

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ARTICLE INFO	ABSTRACT
	Objectives: We aimed to describe the sociodemographic, clinical, and therapeutic characteristics of Peruvian military personnel diagnosed with HIV. Furthermore, we determined the frequency of highly active antiretroviral therapy (HAART) adherence, the complications and mortality. **Methods:** We retrospectively reviewed the medical records of patients diagnosed with HIV, confirmed by Western blot at a single institution from 1989-2020. Descriptive analyses were performed for all the variables using mean and standard deviation (SD) in the case of quantitative variables, and frequency and percentage for qualitative variables. **Results:** Of the 161 patients included, 95.7% were males and the mean age was 39.59 years (SD= 16.45 years). Most had college or higher education (67.7%) and were on active duty at diagnosis (77%). 35.4% had AIDS at diagnosis; 28.6% opportunistic infections; and 8.1% tuberculosis. The median follow-up was five years. 94.4% of the patients received HAART as the principal treatment; of these, 88.8% was adherent to treatment, and death was reported in 6.8%. There were no factors associated with adherence. **Conclusions:** Although the sociodemographic characteristics of Peruvian military personnel are similar to those of other countries, our findings suggest that Peruvian military personnel present higher adherence to HAART compared to previous studies in other military populations from South American countries. Further studies are recommended to assess specific factors attributed to these successful outcomes in the military personnel that can be applied in other hospitals. **Keywords:** human immunodeficiency virus, HIV, communicable diseases, Peru

INTRODUCTION

Long-term adherence to human immunodeficiency virus (HIV) treatment is essential to reduce morbidity and mortality. However, maintenance of therapy is difficult to achieve. Indeed, factors that decrease adherence to treatment include adverse drug effects, poor access to health care, and forgetting to take the medications, among others [1-3]. Optimal treatment consists of adherence of at least 95% [1], and a previous meta-analysis reported that 62% of people on highly active antiretroviral therapy (HAART) were more than 90% adherent [5]. Military personnel are at high risk of HIV transmission due to social norms and occupational exposure [6]. Therefore, it is necessary to implement successful HIV treatment programs [7].

In Peru, the average adherence to treatment has been reported to be 52%-64% in the "Hospital Nacional Arzobispo Loayza" public hospital. On the other hand, the average adherence in other countries has been described as 47% in Venezuela, 80% in Brazil, and 70% in Korea and the United States [8-13]. In the latter country, the adherence rate has increased to more than 90% in the last 10 years, due to the programs dedicated to this objective [14]. Private insurance companies in Peru, especially those of the armed forces, have a comprehensive approach with continuous follow-up of patients with HIV, being a crucial factor to enhance adherence [15, 16]. Therefore, our hypothesis was that military personnel in Peru have better adherence and outcomes compared to other countries of Latin America due to the integral treatment of our patients.

Currently, literature on adherence to HAART among military personnel in developing countries is scarce, although it has been demonstrated in the USA that comprehensive programs are very successful and effective in military personnel [3, 17]. The main objective of this study was to describe the sociodemographic, clinical, and therapeutic characteristics of military personnel diagnosed with HIV at the "Hospital Militar Central (HMC) Coronel Luis Arias Schreiber" between 1989 and 2020. Also, we determined the frequency of adherence, complications, and mortality in this population.

MATERIALS AND METHODS

Type of Study and Population

Military personnel diagnosed with HIV between 1989 and 2020 were included in this retrospective cohort study. Medical records were reviewed between December 2019 and March 2020, and the last follow-up date was January 2020. Patients younger than 18 years, those diagnosed prior to 1989, and individuals with incomplete medical records were excluded. Patients were diagnosed by screening performed by enzyme-linked immunosorbent assay and subsequently confirmed by Western blot at any of the military bases in Peru.

All patients were transferred to Lima for confirmation of the diagnosis and evaluation by internal medicine, infectious diseases, and psychology, in order to determine the physical and psychological condition of the individuals, investigate associated infectious diseases (confirmed by laboratory tests) and the sexual behavior of each patient. Likewise, all the patients received psychological therapy, counseling, and preventive health strategies to avoid infecting people around them. After completing the global approach to the patient, HAART was started. The patients then returned to their military base to continue with their activities.

Patients who did not pick up their drug therapy were called by the nursing staff and if this was unsuccessful after several attempts, they were visited to continue motivating them to comply with HAART. Patients in the acquired immunodeficiency syndrome (AIDS) stage did not return to their military base until recovery. Pharmacological and psychological therapy were also administered in addition to constant referral activities by nursing staff. Patients were followed until total loss of contact, transfer to another health insurance or death.

Variables

The variables included in the study were age, sex, marital status, military rank, origin, education level, military activity, sexual orientation, alcohol tobacco and drug use, comorbidities, number of sexual partners, sexual protection, associated sexually transmitted infections (STIs), AIDS stage, initial CD4+ cell count, initial viral load, opportunistic diseases, type of HAART received, and death. Adherence to HIV treatment was defined as the ability of patients to follow a treatment, take medication at a set time, and follow restrictions of food and other drug intake [18]. Moreover, adherence was also assessed by the medication dispensing record or by the following criteria: number of drugs taken, not forgetting to take the medication, continuously taking the drugs at the prescribed time, not interrupting the drugs in case of general malaise, not interrupting the medication during the weekend, not taking six or more doses in one week, or not interrupting the medication for more than two full days since the last visit. All data were obtained by reviewing medical records of HIV patients treated at the HMC.

Statistical Analysis

The data were entered into the Microsoft Excel program and subsequently coded for subsequent analysis in the statistical package for the social sciences (SPSS version 24). For the description of the sociodemographic, clinical and therapeutic characteristics of the patients, descriptive statistics were used for quantitative variables such as mean and standard deviation (SD), while frequency and percentage were used for qualitative variables. In the bivariate analysis, chi-square was used for qualitative variables and the student's t-test and Mann Whitney's U were used for quantitative variables, after assessing normality. Finally, logistic regression was performed to evaluate the strength of association of the factors with nonadherence to treatment. Results with a p-value <0.05 were considered statistically significant.

RESULTS

A total of 161 military patients were included with a mean age of 39.59 years (SD=16.45), and the majority were male (95.7%). In addition, 47.2% and 41.6% were single and married at diagnosis, respectively. With respect to military rank, 32.3% were voluntary military service troops, 51% were supervisors, technicians and non-commissioned officers, and 26.7% were officers of the Peruvian army. In addition, most were from Lima and Callao (56.5%), 67.7% had technical or higher education and 77% were still active. The majority reported being heterosexual (63.4%), while 33.5% did not report their sexual orientation. The sociodemographic characteristics of the military personnel included in the study are shown in **Table 1**.

Of all military personnel diagnosed with HIV, 35.4% had AIDS at diagnosis, 28.6% had opportunistic infections, 8.1% had tuberculosis and 16.1% had STIs. It was found that while 94.4% received HAART, 88.8% were adherent to this treatment. Non administration of HAART in the first months after diagnosis was due to personal decision, renal dysfunction requiring dialysis, or active treatment for tuberculosis. The median follow-up was five years, and 6.8% of the patients died. The clinicopathologic and therapeutic characteristics of the patients are shown in **Table 2**.

In addition, no association of any variable to non-adherence to treatment was found in bivariate analysis or in logistic regression. However, it was observed that of the 161 patients included, 12 were diagnosed with AIDS and at the same time were non-adherent to treatment. Of these, five (41.7%) died, all were males (100%), and nine (75%) were in active status. In addition, three (25%) had opportunistic diseases, 8 (66.7%) had technical or higher education, and four (33.3%) had secondary education. Of the 57 patients who were diagnosed with AIDS, 50 (87.7%) recovered from the AIDS stage.

DISCUSSION

The present study characterizes the sociodemographic, clinical pathological, therapeutic and outcome profile of military patients of the Peruvian Army diagnosed with HIV over a period of 30 years. Most of the population was middle-aged,

Table 1. Sociodemographic characteristics of Peruvian military patients diagnosed with HIV

Variables	n=161	%
Age (years)–mean (standard deviation)	39.59 (±16.45)	
Sex		
Female	7	4.4
Male	154	95.7
Date of diagnosis (years)–median (range)	2014 (1989-2020)	
Marital Status		
Single	76	47.2
Married	67	41.6
Separated	9	5.6
Cohabitant	9	5.6
Range		
Voluntary military service troops		
Private	41	25.5
Corporal	2	1.2
Sergeant	9	5.6
Supervisors, technicians, & NCOs personnel		
Non-commissioned officer	29	18.0
Technician	37	23.0
Officers		
Lieutenant	8	5.0
Captain	4	2.5
Major	11	6.8
Colonel	20	12.4
Origin		
Lima & Callao	91	56.5
Other departments	70	43.5
Education		
None	1	0.6
Primary	5	3.1
Secondary	46	28.6
Technical-higher	109	67.7
Military status		
Active	124	77.0
Retired	37	23.0
Sexual orientation		
Heterosexual	102	63.4
Homosexual	4	2.5
Bisexual	1	0.6
Do not report	54	33.5

Table 2. Clinical pathologic & therapeutic characteristics of Peruvian military patients diagnosed with HIV

Variables	n=161	%
AIDS stage at diagnosis	57	35.4
Initial CD4 (cells/mm3)- mean (SD)	326.56 (±241.06)	
Viral load-mean (SD)	212, 954 (±518, 060)	
Opportunistic infections	46	28.6
Tuberculosis	13	8.1
HAART	152	94.4
Adherence to HAART	135	88.8
Alcohol	58	36.0
Tobacco	41	25.5
Drugs	10	6.2
Comorbidities	14	8.7
Number of sexual partners-mean (SD)	6.05 (±6.46)	
Use of sexual protection	36	22.4
Sexually transmitted infections	26	16.1
Death	11	6.8
Follow-up (years)-median (range)	5 (0-31)	

The level of education is an important factor regarding knowledge of HIV infection and its risk factors [23, 24]. Nonetheless, one of the most important findings in our study was that 67.7% of the military personnel diagnosed with HIV had a high technical education. The findings regarding the level of education and HIV infection are contradictory. While in the USA military it was shown that there was no significant difference between the level of education and HIV infection [25], in the Nigerian military, a high level of education was associated with a low perceived risk of contracting HIV (odds ratio [OR]: 0.7, 95% confidence interval [CI]: 0.56-0.88) [26]. Therefore, future studies on the knowledge of HIV and its risk factors may help to elucidate the reasons for these different results, which may be due to other external factors [27].

One of the most common manifestations in HIV patients are opportunistic infections that occur due to low immunity in the most advanced stages. In our study we found that 46 military (28.6%) had opportunistic infections, likewise in Cameroon 521 (32.2%) military also suffered from these infections. Among the latter, 104 (20%) had pulmonary tuberculosis compared to only 13 military patients (8.1%) in our study. One possible explanation for these discordant findings is the incidence of tuberculosis in both countries. The incidence of tuberculosis in Africa is 276 cases per 100,000 inhabitants, while in Peru 119 cases per 100,000 inhabitants have been reported [28].

In addition, our study showed that 22.4% of the soldiers used condoms. Similar results were found by Villaran et al. who reported that 24.8% of military personnel used condoms in their last sexual intercourse [29]. On the other hand, it was reported that the frequency of condom use during sexual relations among young men in the armed forces school was intermediate, both in those entering through voluntary military service and in civilians, with 47.6% and 38.9%, respectively. However, their use increased among sex workers, with 100% and 91.7%, respectively. Some of the factors that increased the use of condoms were correct use and knowledge of HIV transmission routes [30], which could be disseminated in military schools through educational programs, and thus, reduce risk behaviors [29].

In a Peruvian study, adherence to HIV treatment was found to be 51.9% in a public hospital in Lima-Peru [9]. Although this percentage is similar to that of other countries in the region, with 31.9% in Colombia [31], 47.5% in Venezuela [12], 79.7% in

male, and included supervisors, technicians, and non-commissioned officers, in addition to having a technical or higher education and active status. The percentage of adherence and recovery from the AIDS stage was higher than in other South American countries and other non-military hospitals in Peru [9, 11-13].

In our study, of the total number of military patients with HIV, the highest percentage were male (95.7%). This result is similar to the study by Peppe et al. who concluded that among Uruguayan military members of peacekeeping missions, 92% of HIV cases corresponded to male personnel [19]. Similar results were reported by Hakre et al. who found that 97.9% of the USA Air Force military personnel with HIV infection were male [20]. However, Rimoin et al. reported that in the army of the Republic of Congo in Africa, the prevalence of HIV infection was higher in women than in men (8% vs. 3.8%, respectively) [21]. These results can be explained by the majority of army personnel being male. However, when this is analyzed on a sex-by-sex prevalence basis, the results are different, as seen in the Republic of Congo. Similarly, the military personnel at higher risk are usually young men, who by being away from home and having greater access to sexual partners are at higher risk of infection [22].

Brazil [13], and 55% in Spain [5], our study showed that 88.8% of military personnel demonstrated good adherence to HAART. There are several limitations of health care in our country, especially in the public sector, including poor doctor-patient relationships, effective communication, division of responsibilities and a comprehensive approach that includes the psychosocial environment of each patient [32]. Thus, this high percentage of adherence and recovery in the military population is attributed to continuous follow-up of the nursing staff and the psychological approach to each patient [33].

In 2020, 680,000 HIV/AIDS-related deaths were reported worldwide [34]. One of the most fatal events is the death of patients with HIV, since the available treatment offers the same survival as patients without HIV infection, and there is a rising number of deaths in developing countries [35, 36]. Our study found a low mortality rate with 6.8% (11 individuals) of military personnel dying from HIV-related infection and comorbidities. In comparison, in South Africa, 17.2% of deaths were reported from a total of 7,114 military patients with HIV [37]. In the USA, it was reported similar results to ours, with 5.4% of deaths in patients diagnosed from 1996 to 2005 and 0.4% deaths in those diagnosed from 2006 to 2015 [38]. Although the mortality in our study was lower than other previously mentioned studies, future prospective studies are needed to identify weaknesses in our system in order to continue improving these results.

Despite the high adherence to treatment compared to other South American countries [12, 13, 31], several of our patients died due to the high percentage of AIDS stage at diagnosis and subsequent complications. It was reported that survival rates in patients with HIV/AIDS receiving HAART were 97%, 86%, 78%, and 61% at 2, 4, 6, and 10 years, respectively, while those in patients not receiving HAART were 48%, 26% and 18% at 2, 4, and 6 years, respectively [39]. While military patients benefit from the comprehensive approach provided, the importance of the rate of adherence to treatment is highly reflected by the outcomes.

Our study has several strengths. To our knowledge, this is the first study in Peruvian army patients diagnosed with HIV, which includes the entire population diagnosed and treated in a national referral hospital for military personnel throughout the country. Also, the sociodemographic, clinicopathological, therapeutic and outcome characteristics of all patients were evaluated. In addition, most of the patients treated were followed for several years, visited, and recalled for continued treatment by the nursing staff. On the other hand, a limitation of the study is its retrospective design. Some patients were lost to follow-up and were withdrawn from the study. Moreover, this is the experience of a single center, and, therefore, our results should be carefully interpreted or extrapolated, although they may be useful for Peruvian or South American populations. Future prospective and randomized studies analyzing specific factors attributing to the success of the results in patients are recommended for application in other hospitals in developing countries.

In conclusion, our study showed that military patients from the Peruvian Army diagnosed with HIV present 88.8% of adherence to HAART, which is higher than other reports from South America. In addition, among those with AIDS at diagnosis, 87.7% recovered. Therefore, it is essential to have a global approach to the patients, including follow-up, psychotherapy and instruction by nursing and psychology staff to obtain beneficial results and avoid non-adherence to treatment of HIV patients.

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