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SOCIODEMOGRAPHIC FACTORS ASSOCIATED WITH GREATER IMMUNE RECOVERY IN PEOPLE LIVING WITH HIV/AIDS IN THE COMPREHENSIVE CARE UNIT OF ROOSEVELT HOSPITAL, GUATEMALA

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Abstract: This retrospective cross-sectional study evaluated the immune recovery of people living with HIV/AIDS (PLWHA) who attended the "Dr. Carlos Rodolfo Mejía Villatorio" Comprehensive Care Unit and were diagnosed between 2017 and 2021. Carlos Rodolfo Mejía Villatoro", and who were diagnosed between the years 2017 and 2021; in order to identify the sociodemographic factors associated with this recovery, through the evaluation of the database collected within the unit and statistical association tests in the Jamovi software. The results showed that 34% of the individuals included in the study achieved immune recovery; however, only a statistically significant association was observed in the variables of age and occupation; thus concluding that the patients most likely to recover are those aged between 31 and 56 years, and the unemployed. In addition, the importance of creating awareness campaigns to encourage the general public to undergo screening tests and follow up with health care if positive diagnoses are obtained is demonstrated.
Keywords: HIV/AIDS, immune recovery, viral load, CD4+ T lymphocytes, Guatemala

INTRODUCTION

According to the World Health Organization [WHO] (2022), for the year 2021 there were a total of 38.4 million people around the world living with the human immunodeficiency virus (HIV) or acquired immunodeficiency syndrome (AIDS), corresponding to 44% of cases in men, 51% of cases in women and 5% of cases in children under 15; with 650,000 people deceased; and more than 36 million deaths since the beginning of the epidemic. By 2021, the incidence of the disease was expected to be 1.5 million and 28.7 million people living with HIV/AIDS on antiretroviral therapy [ART] (Minority HIV/AIDS Fund [MHAF], 2021).

Antiretroviral therapy (ART) has been a determining factor in treatment for people living with HIV/AIDS (PLWHA); when there is optimal adherence to treatment, it is possible to manage the condition and avoid progression to a chronic disease (Altice et al., 2019). The return of CD4 cells^{+} after effective ART is a determining factor in HIV-associated and non-IV-associated morbidity and mortality (Fiseha, Ebrahim, Ebrahim & Gebreweld, 2022; Ford et al., 2017).

Haider et al. (2019) found that factors such as age, sex, educational level and amount of income are associated with viral suppression, indicative of immune recovery; short age, female sex, low educational levels and monthly economic income are factors negatively associated with recovery. Observations in migrants have also indicated that age and sex are associated with viral suppression (Sarcino, Lorenzini, Lo Caputo, Girardi, Castelli et al., 2016). Labisi et al. (2022) in their literature review evaluated immune recovery, associated with viral suppression, in women; they confirm that females have a lower probability of viral suppression, with an association also with age, ethnicity and place of residence.

Studies in Sudafrica, on the other hand, found that females are more likely to achieve viral suppression because they tend to have greater interaction with the health system, usually due to macho notions (Chinogurei, Manne-Goehler, Khan, Kabudula, Cornell, & Rohr, 2024). There were similar findings in Tanzania, with viral suppression in 79.4% of women, compared to 69.9% in men (Kilapilo, Mosha, Bwire, Sambayi, Sangeda & Kilewo, 2023).

Studies conducted in Ethiopia have shown that factors such as age, gender, nutritional status, adherence to treatment and initial CD4 count^{+} influence the effectiveness of treatment, and therefore the immune recovery of patients (Fiseha et al., 2022; Barasa-Gelba et al., 2020).

On the other hand, studies conducted in the United States have shown that ethnicity is one of the determining factors in immune recovery by observing a lower percentage of viral suppression in black people compared to other ethnic groups, reflecting a significant difference in this factor compared to others such as age and gender; as result of health care disparities associated with racism (Crepaz, Dong, Wang, Hernandez & Hall, 2018). Xia et al. (2018) concluded that both black and Hispanic people living in New York, United States are less likely to achieve viral suppression.

In Guatemala, all people living with HIV should be started on ART, regardless of their clinical stage and any CD4 count^{+} (MSPAS, 2019). Sociodemographic factors can have a negative and unequal impact on patients' quality of life in the context of the country, at a family and individual level, which can lead to risky practices and increase comorbidities.

For this reason, knowing the sociodemographic factors associated with immune recovery can be a starting point for developing strategies to reduce the inequality gap and highlight the importance of comprehensive care and an inter-institutional approach to improve the associated factors that will consequently improve adherence, immunological recovery and with it the patient's quality of life at an individual level, and at a population level the suppression of viral load reduces the risk of transmission. The aim of this study was to determine the sociodemographic factors associated with greater immune recovery in people living with HIV/AIDS one year after diagnosis, who attended the Comprehensive Care Unit (UAI) for HIV and Chronic Infections "Dr. Carlos Rodolfo Mejía Villatoro" at Roosevelt Hospital during the years 2017-2021.

METHODOLOGY

METHODOLOGICAL DESIGN

Analytical, paired, longitudinal, retrospective observational study.

POPULATION AND SAMPLE

The universe consisted of the 2,291 patients diagnosed with HIV at the Unit between the years 2017 and 2021; for the sample, a random, simple, stratified (by years) sampling was carried out with proportional allocation for the selection of 200 patients.

INCLUSION CRITERIA

The sample included people: (1) over 18 years old, (2) who received a positive diagnosis at the Unit during 2017 and 2021, (3) 9 to 15 months between the initial measurement and the follow-up measurement of CD4 T lymphocytes^{+} and viral load, and (4) with active treatment.

IMMUNE RECOVERY

Patients who achieved CD4 lymphocyte counts^{+} greater than 200 cells/μL and achieved viral suppression in the second measurement were categorized as those who achieved immune recovery.

DATA COLLECTION INSTRUMENT

The information obtained from the original database of the Unit's Monitoring and Evaluation department in an electronic Excel spreadsheet was filtered according to the inclusion criteria, and after the random selection of patients, the data was transcribed to an electronic Google Sheets spreadsheet for the operation of variables; including gender, age, ethnicity, occupation, sexual orientation, vulnerability group, marital status and educational level. In addition, the number of CD4 T cells^{+} and the viral load of the patients were taken into account to determine immune recovery.

STATISTICAL ANALYSIS

The data collected was analyzed using Jamovi 2.4.14 software, and consisted of calculating frequencies and percentages for categorical variables, measures of central tendency and standard deviation for numerical variables, binomial logistic regression and odds ratio to determine the degree of association; taking into account statistical significance at an alpha level of 0.05.

ETHICAL ASPECTS

During the research, the basic principles of ethics were taken into account: respect for people, beneficence, non-maleficence and justice. The confidentiality of the data was preserved, with no names or codes assigned to the patients that could expose their identity. The research protocol was submitted to the Department of Teaching and Research of Roosevelt Hospital, and was approved in Minutes No. 709, Point No. 3ero with a closing date of March 31, 2023.

RESULTS

Factor	n (%)
Sex	
Female	29 (15.0)
Male	171 (85.0)
Age (in years)	
Media	33
Median	30
Fashion	23
Standard deviation	11.5
Ethnicity	
Ladino	186 (93.0)
Maya	14 (7.0)
Sexual orientation	
Bisexual	28 (14.0)
Heterosexual	71 (36.0)
Homosexual	101 (50.0)

Table 1. Characterization of the sample for non-modifiable sociodemographic factors

Table 1 shows the non-modifiable sociodemographic factors of the patients included in the sample, showing the absolute frequencies and percentages for each subgroup of each categorical variable, and measures of central tendency and dispersion for the age variable.

In the sample, there was a higher prevalence of males (85.0%), Ladino ethnicity (93.0%), self-identified as homosexuals (50.0%). With an average age of 33 years.

Factor	n (%)
Occupation	
Estudiante	8 (4.0)
Depleted	45 (23.0)
Fixed-term work	104 (52.0)
Informal economy	26 (13.0)
Nanny from home	16 (8.0)
Vulnerability group	
General population (PG)	68 (34.0)
Men who have sex with men (MSM)	129 (64.5)
Person deprived of liberty (PPL)	2 (1.0)
Women who are pregnant (ME)	1 (0.5)
Marital status	
Soltero	147 (73.5)
Married	21 (10.5)
Free union	27 (13.5)
Viudo	5 (2.5)
Educational level	
Illiterate	7 (3.5)
Primary	54 (27.0)
Basic	16 (8.0)
Diversified	98 (49.0)
University	25 (12.5)

Table 2. Characterization of the sample for modifiable sociodemographic factors

Table 2 shows the modifiable sociodemographic factors of the patients included in the sample; the absolute frequencies and percentages imply a higher prevalence of individuals with a steady job (52.0%), belonging to the vulnerability group of men who have sex with men (64.5%), in a single marital status (73.5%) and with studies at a diversified level (49.0%).

Sociodemographic factor	Immune recovery	
	Si [n (%)]	No [n (%)]
Sex		
Female	8 (4.0)	21 (10.5)
Male	59 (29.5)	112 (56.0)
Age group		
(1) 18 - 30	44 (22.0)	63 (31.5)
(2) 31 - 43	17 (8.5)	37 (18.5)
(3) 44 - 56	5 (2.5)	24 (12.0)
(4) 57 - 69	1 (0.5)	8 (4.0)
(5) 70	0 (0.0)	1 (0.5)
Ethnicity		
Ladino	65 (32.5)	121 (60.5)
Maya	2 (1.0)	12 (6.0)
Sexual orientation		
Bisexual	10 (5)	18 (9)
Heterosexual	20 (10)	51 (25.5)
Homosexual	37 (18.5)	64 (32)
TOTAL	67 (33.5)	133 (66.5)

Table 3. Immune recovery as a function of non-modifiable sociodemographic factors.

Table 3 shows the frequency of immune recovery for each category, corresponding to the non-modifiable sociodemographic factors.

The highest proportion of immune recovery was observed in male patients (29.5%), aged between 18 and 30 years (22.0%), of Ladino ethnicity (32.5%), and self-identified as homosexual (18.5%).

Sociodemographic factor	Immune recovery	
	Si [n (%)]	No [n (%)]
Occupation		
Estudiante	3 (1.5)	5 (2.5)
Depleted	13 (6.5)	32 (16)
Fixed-term work	36 (18.0)	69 (34.5)
Informal economy	9 (4.5)	17 (8.5)
Nanny from home	5 (2.5)	11 (5.5)
Vulnerability group		
General population (PG)	19 (9.5)	49 (24.5)
Men who have sex with men (MSM)	46 (23.0)	83 (41.5)
Person deprived of liberty (PPL)	1 (0.5)	1 (0.5)
Women who are pregnant (ME)	1 (0.5)	0 (0.0)

Marital status		
Soltero	50 (25.0)	97 (48.5)
Married	5 (2.5)	16 (8.0)
Free union	12 (6.0)	15 (7.5)
Viudo	0 (0.0)	5 (2.5)
Educational level		
Illiterate	0 (0.0)	7 (3.5)
Primary	16 (8.0)	38 (19.0)
Basic	4 (2.0)	12 (6.0)
Diversified	34 (17.0)	64 (32.0)
University	13 (6.5)	12 (6.0)
TOTAL	67 (33.5)	133 (66.5)

Table 4: Immune recovery as a function of modifiable sociodemographic factors.

For modifiable sociodemographic factors, a higher proportion of immune recovery was observed in patients with a fixed job (18.0%), belonging to the vulnerability group of men who have sex with men (23.0%), in a single marital status (25.0%) and with studies up to a diversified level (17.0%).

It is clear that the proportion of immune recovery in the sample coincides with the general distribution of the sample in terms of the prevalence of each sociodemographic factor.

Sociodemographic factor	p-value	Odds ratio	95% CI
Age group			
2 (31-43) - 1 (18-30)	0.021	0.339	0.136 - 0.848
3 (44-56) - 1 (18-30)	0.007	0.142	0.035 - 0.584
4 (57-69) - 1 (18-30)	0.141	0.163	0.015 - 1.822
5 (70) - 1 (18-30)	0.996	1.82e-8	0.0000 - Inf
Occupation			
Unemployed - Nanny	0.041	0.064	0.004 - 0.889
Informal economy - Nanny	0.303	0.259	0.020 - 3.371
Estudiante - Ama de casa	0.106	0.095	0.005 - 1.645
Retired - Nanny at home	0.996	3.11e8	0.0000 - Inf
Fixed-term work - Nanny at home	0.057	0.086	0.006 - 1.081

Table 5 Sociodemographic factors associated with immune recovery

Table 5 shows the binomial logistic regression to demonstrate the association between sociodemographic factors and the immune recovery of patients recently diagnosed at the UAI. It can be seen that age groups 2 (31 - 43) and 3 (44-56) are positively associated with immune recovery, compared to age group 1 (18 - 30). On the other hand, unemployed people are more likely to achieve recovery than house mothers.

Factors such as gender, ethnicity, sexual orientation, vulnerability group, marital status and educational level showed no significant association with immune recovery.

DISCUSSION

This analysis included 200 patients with a recent diagnosis between 2017 and 2021. There was a higher prevalence of males (85%) with an average age of 33 years. 93% of the patients identified themselves as Ladino, 52% had a steady job. Fifty percent recognized themselves as homosexual, 36% as heterosexual and the remaining 14% as bisexual; the most prevalent vulnerability group (64.5%) being men who have sex with men (MSM). 73.5% of the sample was single and 49% had completed high school (diversified).

Aksak-Was et al. (2022) in their study of factors influencing the immune restoration of people living with HIV/AIDS also found in their study population, a higher prevalence (72.3%) of males, an average age of 33 years, and 42.3% of individuals categorized within the group of men who have sex with men. African studies, on the other hand, found a higher prevalence of females (50.6%), an average age of 64 years, 34.6% with secondary education, and 56.3% living with a partner (Tegegne, 2021).

Tables 3 and 4 show the proportions of immune recovery for each category of non-modifiable and modifiable sociodemographic factors, respectively; both tables show the total number of patients who achieved and did not achieve immune recovery, regardless of the classification of sociodemographic factors. For the purposes of the study, immune recovery was defined as an improvement in the patient's immune status evidenced by an increase in lymphocyte count (>200 cells/μL), and the subsequent decrease in viral load to undetectable values. A higher number of recovered patients was observed in 29.5% of male patients, 22.0% of the age group between 18 and 30 years old, 32.5% of Ladino ethnicity, 18.0% of people with a fixed job, 18.5% of homosexuals, 23.0% of the vulnerability group of men who have sex with men, 25.0% of single men and women, and 17.0% of people who had completed their studies as diversified students.

Table 5 shows that there is only a statistically significant association between the variables of age and occupation, with age being a non-modifiable factor and occupation a modifiable factor.

In terms of age, age groups 2 (31-43) and 3 (44-56) were found to be protective factors compared to group 1; therefore, people aged 18-30 are less likely to achieve immune recovery. Studies conducted by the Centers for Disease Control and Prevention (CDC) found that young people between 13 and 24 years of age make up 22% of incident HIV cases, and that they are the age group least likely to be linked to health care because of the stigma attached to the disease (Centers of Disease Control and Prevention [CDC], 2017; CDC, 2024). Chakraborty et al. (2015) point out that due to screening and late diagnosis, young adults tend to have higher baseline viral loads compared to other age groups, and therefore greater difficulty in reaching undetectable values. Finally, a study conducted by Crepaz (2018) emphasizes that the high prevalence of substantial viral loads increases the potential for transmission, which results in a threat to this age group with prominent risk behaviors (Haider et al., 2019).

In relation to occupation, the data show that a jobless person is more likely to achieve immune recovery than a housekeeper; This is a contradiction to the literature so far available, as it has been observed that unemployment is associated with a double adjusted risk of virological failure, generally due to the lack of income needed to access medical care (Saracino et al., 2016; Xia et al., 2017). Taking into account the Guatemalan reality, it can be hypothesized that a nanny at home has a greater number of barriers to accessing care; among them, the management of childcare, transportation, and macho notions that could limit the possibilities of seeking health care. Whereas for a jobless person, considering that the UAI programs at Roosevelt Hospital are subsidized by the government, the biggest expense is transportation.

One of the limitations of the study is the failure to include the initial CD4 T-lymphocyte count^{+} in order to carry out the analysis of immune recovery, considering that the higher the CD4 T-lymphocyte count^{+} the better the likelihood of achieving normal values for this lymphocyte count. Bombon-Pozo et al. (2024). found in their bibliographic review of "Viral and immune response after the start of antiretroviral treatment in HIV patients" that those patients with initial levels > 300 cells/μL are more likely to reach normal levels (approx. 500 cells/μL) than those with levels < 200 cells/μL. Likewise, considering the initial viral load will make it possible to highlight the difference in this parameter between the measurements, and the possible effect of therapy in relation to it.

The findings of this analysis show the importance of close follow-up for those patients who, due to different characteristics, may experience unequal conditions in the health care they receive; highlighting the value of close follow-up for young patients aged between 18 and 30 and those who are housewives attending the Unit. But more than that, developing tools to link these groups of people through programs that facilitate diagnosis and access to quality care according to their needs and abilities.

On the other hand, there is a need for awareness campaigns aimed at the general public to minimize the stigma surrounding the infection; to counteract the lack of screening and diagnosis, and to promote the integration of HIV-positive patients into the country's comprehensive care units. The aim is to achieve the PAHO/WHO-UNAIDS targets. Within these campaigns, it is highly relevant to include sexual education topics and risk behaviors that can increase the risk of transmitting sexually transmitted infections.

Finally, with regard to future interventions to increase the immune recovery of HIV patients in Guatemala, interventions should be strengthened to improve the timely access of HIV-positive patients to quality treatment, in line with international guidelines. Taking into account the variety of unequal barriers that can exist during health care.

CONCLUSION

The sociodemographic factors associated with greater immune recovery in people living with HIV/AIDS one year after diagnosis were age and occupation. Both age groups 2 (31-43) and 3 (44-56), as well as unemployed people are more likely to achieve immune recovery, compared to other groups of this factor. It is therefore recommended to monitor incident cases with sociodemographic factors associated with a lower likelihood of immune recovery.

FINAL CONSIDERATIONS

The content of this article corresponds to the partial results of a postgraduate thesis report from the Faculty of Chemical Sciences and Pharmacy at the University of San Carlos de Guatemala.

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