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SPATIAL DISTRIBUTION AND PREVALENCE OF HIV BEFORE AND DURING THE COVID-19 PANDEMIC IN SERGIPE, BRAZIL

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ORIGINAL STUDY

RESUMO

Objetivo: Este trabalho teve por objetivo determinar a ocorrência do HIV no estado de Sergipe durante os períodos pré-pandêmico e pandêmico, 2017-2019 a 2020-2022 da COVID-19. **Métodos:** Realizou-se um estudo ecológico e analítico utilizando dados do SINAN (2017-2022). As variáveis sociodemográficas foram analisadas com base em frequências, teste qui-quadrado e V de Cramér. Calculou-se a taxa de prevalência por 100.000 habitantes e as razões de prevalência com IC de 95%. A análise espacial utilizou métodos como K-means, suavização bayesiana, índices de Moran, LISA e varredura espacial. Os dados foram organizados no Excel e analisados no software R (v4.4.2), adotando-se 5% de significância. **Resultados:** Entre 2020 e 2022, durante a pandemia da COVID-19, houve redução geral nas taxas de HIV em comparação a 2017- 2019, especialmente entre pessoas de 20 a 39 anos, de ambos os sexos, com maior queda entre brancos/amarelos. Alterações por escolaridade e gestação foram mínimas. No período pré-pandêmico, os municípios com maior concentração de casos foram Aracaju, Nossa Senhora do Socorro e São Cristóvão. A análise espacial revelou um cluster de risco de contrair HIV envolvendo Aracaju, Barra dos Coqueiros, Socorro e São Cristóvão, nos períodos pré-pandêmico e pandêmico. **Conclusão:** Apesar da estabilidade nos números, o HIV ainda não está controlado, com muitos casos sem diagnóstico e tratamento. Esses dados fornecem insights sobre fatores que influenciam a disseminação da doença em diferentes regiões de Sergipe.

Palavras-chave: HIV; COVID-19; Análise espacial; Epidemiologia.

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ABSTRACT

Objective: This study aimed to determine the occurrence of - HIV in the state of Sergipe, Brazil during the pre-pandemic and pandemic periods of COVID-19, from 2017–2019 to 2020–2022. **Methods:** An ecological, analytical study was conducted using data from the Notifiable Diseases Information System (SINAN) of the Sergipe Stat Health Department (2017–2022). Sociodemographic variables were analyzed based on frequencies, chi-square tests, and Cramér's V. HIV prevalence rates per 100,000 inhabitants and prevalence ratios with 95% confidence intervals were calculated. Spatial analysis employed methods such as K-means clustering, Bayesian smoothing, Moran's I, LISA, and spatial scan statistics. Data were organized in Excel and analyzed using R software (v4.4.2), with a 5% significance level. **Results:** Between 2020 and 2022, during the COVID-19 pandemic, there was a general reduction in HIV rates compared to 2017–2019, especially among individuals aged 20 to 39, of both sexes, with the sharpest reductions among White and/Asian populations. Changes related to education level and pregnancy status were minimal. In the pre-pandemic period, the municipalities with the highest concentration of cases were Aracaju, Nossa Senhora do Socorro, and São Cristóvão. Spatial analysis identified a high-risk cluster for HIV infection involving Aracaju, Barra dos Coqueiros, Socorro, and São Cristóvão, present in both study periods. **Conclusion:** Despite numerical stability, HIV remains insufficiently controlled, with many undiagnosed and untreated cases. These findings provide insights into the sociodemographic and spatial factors influencing the spread of the disease in Sergipe.

Keywords: HIV, COVID-19, spatial analysis, epidemiology.

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INTRODUCTION

Human immunodeficiency virus (HIV), the causative agent of acquired immunodeficiency syndrome (AIDS), was first identified in the 1980s in Africa following the detection of pneumocystosis cases[1]. It is a retrovirus belonging to the lentivirus family, which destroys defense cells, specifically CD4+ T lymphocytes, leading to immunodeficiency. This syndrome is classified as a sexually transmitted infection (STI), and viral transmission occurs through bodily secretions, including semen, breast milk, vaginal secretions, and blood. It can also result from sharps injuries involving contaminated materials, organ transplantation, and vertical transmission[2]. Globally, the highest concentration of cases is found in sub-Saharan Africa, the region where the pandemic began in the 20th century. In Brazil, the largest number of cases is concentrated in the Southeast region, followed by the Northeast. In the state of Sergipe, cases remain largely concentrated in the capital, Aracaju[3,4].

As an STI, its prevention is achieved through condom use and, since 2018, with the implementation of pre-exposure prophylaxis (PrEP), targeted at groups with greater vulnerability to infection, such as men who have sex with men (MSM), sex workers, drug users, and partners of people living with HIV (PLWHA)[5,6]. With the introduction of antiretroviral therapy (ART) in Brazil in 1996, the quality of life of PLWHA improved, with many achieving undetectable viral loads and increased longevity, although challenges such as poor treatment adherence and limited access to healthcare services still compromise prognosis[7,8].

These difficulties became more pronounced during the COVID-19 pandemic, when disruptions in healthcare provision, contributed to treatment discontinuation, particularly due to reduced access to medical consultations and pharmacies for medication acquisition[9,10]. Despite this Joint United Nations Programme on HIV/AIDS (UNAIDS) reported a decline in, the number of reported cases between 2019 and 2020, a finding likely explained by fewer diagnoses resulting from a lack of testing and underreporting during the pandemic. From 2020 to 2022, however, there was a 17.2% increase in reported cases nationwide, concentrated in the North and Northeast regions[4,11]. In Sergipe, thise epidemiological pattern has persisted, with a rising number

of cases. Most cases occurred among men, as well as among individuals with incomplete secondary education, those of mixed-race, and predominantly heterosexual exposure[12].

Brazil has adopted the 95-95-95 target, implemented by the Ministry of Health in 2021, which aims for 95% of people living with HIV to be diagnosed, 95% to be in treatment, and 95% to achieve viral suppression by 2030. Currently, 96% are diagnosed, 81% are on ART, and 95% have suppressed viral load. Despite these advances, further efforts are needed to provide greater healthcare support for HIV prevention and the care of PLWHA[4,13].

This study aimed to determine, during the pre-pandemic (2017–2019) and pandemic (2020–2022) periods: the distribution of HIV notifications and their sociodemographic characteristics; prevalence rates (PR) and prevalence rate ratios (PRR) between these periods; and the spatial distribution of HIV incidence rates in the state of Sergipe.

METHODOLOGY

Study Design

This is an ecological analytical study, based on secondary data from reported HIV cases that occurred in the state of Sergipe during the pre-pandemic (2017–2019) and pandemic (2020–2022) periods of COVID-19. Data were obtained from SINAN (The Notifiable Diseases Information System) of the Sergipe State Health Department.

Study Area

The study area was the state of Sergipe, one of the 27 federative units of Brazil, located in the Northeast region, bordered by the Atlantic Ocean to the east, the state of Bahia to the west and south, and the state of Alagoas to the north. It is the smallest Brazilian state, with 75 municipalities and a total area of 21,915.116 km², an estimated population of 2,338,474 inhabitants, and a population density of 94.36 inhabitants/km² (IBGE, 2010). In 2016, the per capita income was 878 Brazilian reais, and the Human

Development Index (HDI) was 0.665 (IBGE, 2016).

Data Collection and Case Selection

This study included all individuals aged 13 years or older reported in the National Notifiable Diseases Information System (*Sistema de Informação de Agravos de Notificação – SINAN*), with HIV in the state of Sergipe between 2017 and 2022. Microdata were obtained from the database of the national Brazilian public health system (*DATASUS*). For the analysis, sociodemographic variables were used (age, sex, race/skin color, pregnancy status, education, and municipality of residence). For the calculation of incidence, municipal population projections from the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística – IBGE*) were used, available at TABNET/DATASUS (health-specific tabulations). For prevalence estimates, population data by education, race, and age group were used, available at SIDRA/IBGE (the broader national demographic and socioeconomic statistics platform). For estimating the number of pregnant women, the number of live births during the study periods was considered, available at TABNET/DATASUS.

Statistical Analysis

Initially, absolute and relative frequency tables were constructed to characterize the reported HIV cases according to sociodemographic variables. These results were subsequently stratified into two periods: pre-pandemic (2017–2019) and pandemic (2020–2022). To assess potential differences in distributions between periods, the chi-square test of independence was applied. As a measure of effect size for the chi-square test, Cramér's V was used, which expresses the magnitude of the association between categorical variables. The values were interpreted according to the following criteria: negligible effect (<0.10), small (0.10–0.30), moderate (0.30–0.50), and strong (>0.-50)[14]. Next, prevalence rates per 100,000 inhabitants were calculated for each

sociodemographic category in both periods. The prevalence ratio (PR) was defined as the ratio between the prevalence rate in the pandemic period and the pre-pandemic period. For each PR, the 95% confidence interval (95% CI) was estimated based on the log-normal distribution. Prevalence ratios with 95% CI not including the value 1 were considered statistically significant.

We mapped the detection rate of new cases per 100,000 inhabitants using the cartographic base of Sergipe, divided by municipalities, available from the IBGE website. The K-means clustering technique[14], with the Hartigan-Wong algorithm, was applied for municipal stratification. Crude rates were smoothed using the local empirical bayesian estimator[15] to minimize instability caused by random fluctuations. For both, the global Moran's index[16] was calculated to identify spatial autocorrelations, and when identified, the local indicators of spatial association (LISA)[14,15] were applied, generating Moran's scatter plots to identify critical or transitional areas. The quadrants were interpreted as follows: Q1 – High/high (positive values and positive means); Q2 – Low/low (negative values and negative means); Q3 – High/low (positive values and negative means); Q4 – Low/high (negative values and positive means). Cluster formation, as well as the relative risk of infection within each cluster, was assessed using the spatial scan statistic technique[15,17]. Data were organized in Microsoft Excel, and all statistical analyses were performed using R software, version 4.4.2[18]. A significance level of 5% was adopted.

Ethical Considerations

This research did not require ethical approval as it used publicly available data. This is supported by Law No. 12,527, of November 18, 2011, known as the Access to Information Law and Transparency Law, which guarantees the fundamental right of access to information, as established in item XXXIII of Article 5, item II of §3 of Article 37, and §2 of Article 216 of the Federal Constitution of Brazil.

RESULTS

Table 1 shows the distribution of HIV notifications among patients aged over 13 years in the state of Sergipe between 2017 and 2022, according to sociodemographic

characteristics. Regarding age group (n = 2156), most cases occurred among individuals aged 20–39 years, 66.3%. Followed by those aged 40–59 years (24.7%); 13–19 years (6.0%); and 60 years and older 2.8%. With respect to sex (n = 2164), men accounted for 71.7% of notifications, while women represented 28.2%. Among women (n = 611), 22.7% of notifications were from pregnant women.

Regarding race/skin color (n = 2115), most notifications were among individuals who self-identified as Black, Brown, or Indigenous (85.4%), while White or Asian individuals accounted for 14.5% of cases. Concerning education level (n = 1946), the highest proportion of cases was found among individuals with complete or incomplete secondary education (38.8%), followed by those with elementary education (37.4%), higher education (20.5%), and, lastly, illiterate individuals (3.1%). These findings revealed an epidemiological profile characterized by young Black/Brown/Indigenous adults with low educational attainment.

Table 1. HIV notifications among patients aged 13 years and older, according to sociodemographic characteristics, in the state of Sergipe, Brazil, 2017–2022 (n = 2164).

Variable/Category	Frequency	Percentage
Age group (n = 2156)		
13–19 years	131	6.08
20–39 years	1430	66.33
40–59 years	533	24.72
≥ 60 years	62	2.88
Sex (n = 2164)		
Female	611	28.23
Male	1553	71.77
Pregnant (n = 611)		
No	472	77.25
Yes	139	22.75
Race/Color (n = 2115)		
White/Asian	307	14.52
Black/Brown/Indigenous	1808	85.48
Education (n = 1946)		
Illiterate	62	3.19

Elementary school	729	37.46
High school	755	38.80
Higher education	400	20.55

Table 2 compares HIV notifications between the pre-pandemic (2017–2019) and pandemic (2020–2022) periods according to sociodemographic variables. Regarding age group, no statistically significant differences were observed in the distribution of cases between the analyzed periods (p = 0.105), with an effect size considered negligible (Cramér's V = 0.05). The highest proportion of cases in both periods was concentrated among individuals aged 20–39 years (66.1% pre-pandemic and 66.7% during the pandemic). With respect to sex, no significant differences were observed between the periods (p = 0.807), with a predominance of cases among men in both intervals (71.5% and 72.1%, respectively), and a Cramér's V of only 0.01, indicating no relevant effect. In the group of pregnant women, the proportion of reported cases remained stable between the two periods (p = 0.934), with 23.0% of cases in the pre-pandemic and 22.4% during the pandemic. The effect size was minimal (Cramér's V = 0.01).

The race/skin color variable showed a statistically significant difference (p = 0.012), although with a small effect size (Cramér's V = 0.06). A reduction was observed in the proportion of White/Asian individuals (from 16.1% to 12.0%) and a proportional increase among Black/Brown/Indigenous individuals (from 83.9% to 88.0%) during the pandemic period. Regarding education level, although the difference was not statistically significant (p = 0.141), it is noteworthy that there was a proportional increase in cases among individuals with secondary education (from 37.5% to 41.0%) and elementary education (from 37.1% to 38.0%), while the proportion of individuals with higher education decreased (from 21.8% to 18.5%). The Cramér's V (0.05) indicates a weak effect.

Table 2. Comparison of HIV notifications among patients aged 13 years and older, according to sociodemographic characteristics, between the pre-pandemic (2017–2019) and pandemic (2020–2022) periods, Sergipe, Brazil.

Variable/Category	Period		p-value	Cramér's V
	2017 - 2019 (%)	2020 - 2022 (%)		
Age group				
13–19 years	83 (6.3)	48 (5.7)	0.105	0.05
20–39 years	866 (66.1)	564 (66.7)		
40–59 years	333 (25.4)	200 (23.7)		
≥ 60 years	29 (2.2)	33 (3.9)		
Sex				
Female	374 (28.5)	237 (27.9)	0.807	0.01
Male	940 (71.5)	613 (72.1)		
Pregnant (n = 611)				
No	288 (77.0)	184 (77.6)	0.934	0.01
Yes	86 (23.0)	53 (22.4)		
Race/Color				
White/Asian	208 (16.1)	99 (12.0)	0.012	0.06
Black/Brown/Indigenous	1085 (83.9)	723 (88.0)		
Education				
Illiterate	43 (3.6)	19 (2.6)	0.141	0.05
Elementary school	449 (37.1)	280 (38.0)		
High school	453 (37.5)	302 (41.0)		
Higher education	264 (21.8)	136 (18.5)		

Table 3 presents the prevalence rates (PR) and prevalence rate ratios (PRR) between the pre-pandemic (2017–2019) and pandemic (2020–2022) periods of HIV notifications among patients aged 13 years and older in the state of Sergipe, according to sociodemographic variables. A general downward trend in rates was observed during the pandemic period, with statistically significant reductions in several population subgroups. Regarding age group, the most marked and statistically significant reductions occurred among individuals aged 20–39 years (PRR = 0.65; 95% CI: 0.75–0.92) and 40–59 years (PRR = 0.60; 95% CI: 0.67–0.96). Among adolescents aged 13–19 years and adults aged 60 years or older variations in prevalence rates did not reach statistical significance, suggesting relative stability in these groups.

Table 3. Prevalence rate and prevalence ratio between the pandemic and pre-pandemic periods, according to sociodemographic characteristics of HIV notifications among patients aged 13 years and older, Sergipe, Brazil.

Variable/Category	2017 - 2019		2020 - 2022		PR	95% CI
	n	TR	n	TR		
Age group						
13 - 19 years	83	11.53	48	6.67	0.58	0.55; 1.12
20 - 39 years	866	41.17	564	26.81	0.65	0.75; 0.92
40 - 59 years	333	19.40	200	11.65	0.60	0.67; 0.96
≥ 60 years	29	3.28	33	3.73	1.14	0.64; 1.74
Sex						
Female	374	10.82	237	6.86	0.63	0.70; 0.97
Male	940	29.62	613	19.32	0.65	0.75; 0.92
Pregnant (n = 611)						
No	288	8.54	184	5.46	0.64	0.68; 0.99
Yes	86	100.50	53	61.94	0.62	0.58; 1.14
Race/Color						
White/Asian	208	12.38	99	5.89	0.48	0.57; 0.92
Black/Brown/Indigenous	1,085	21.92	723	14.61	0.67	0.76; 0.92
Education						
Illiterate	43	10.30	19	4.55	0.44	0.41; 1.20
Elementary school	449	19.76	280	12.32	0.62	0.70; 0.95
High school	453	24.07	302	16.05	0.67	0.72; 0.97
Higher education	264	31.20	136	16.07	0.52	0.61; 0.92

Considering sex, there was a significant decrease in prevalence rates among both men (from 29.62 to 19.32 per 100,000; PRR = 0.65; 95% CI: 0.75–0.92) and women (from 10.82 to 6.86 per 100,000; PRR = 0.63; 95% CI: 0.70–0.97). These findings indicate that the reduction in notifications during the pandemic was proportionally similar in both sexes, although rates remained higher among men. Among pregnant women, the prevalence rate remained relatively stable, with a nonsignificant reduction (PRR = 0.62;

95% CI: 0.58–1.14). However, among non-pregnant women, a statistically significant decline was observed (PRR = 0.64; 95% CI: 0.68–0.99), suggesting a possible impact of the pandemic on case detection outside the prenatal care setting.

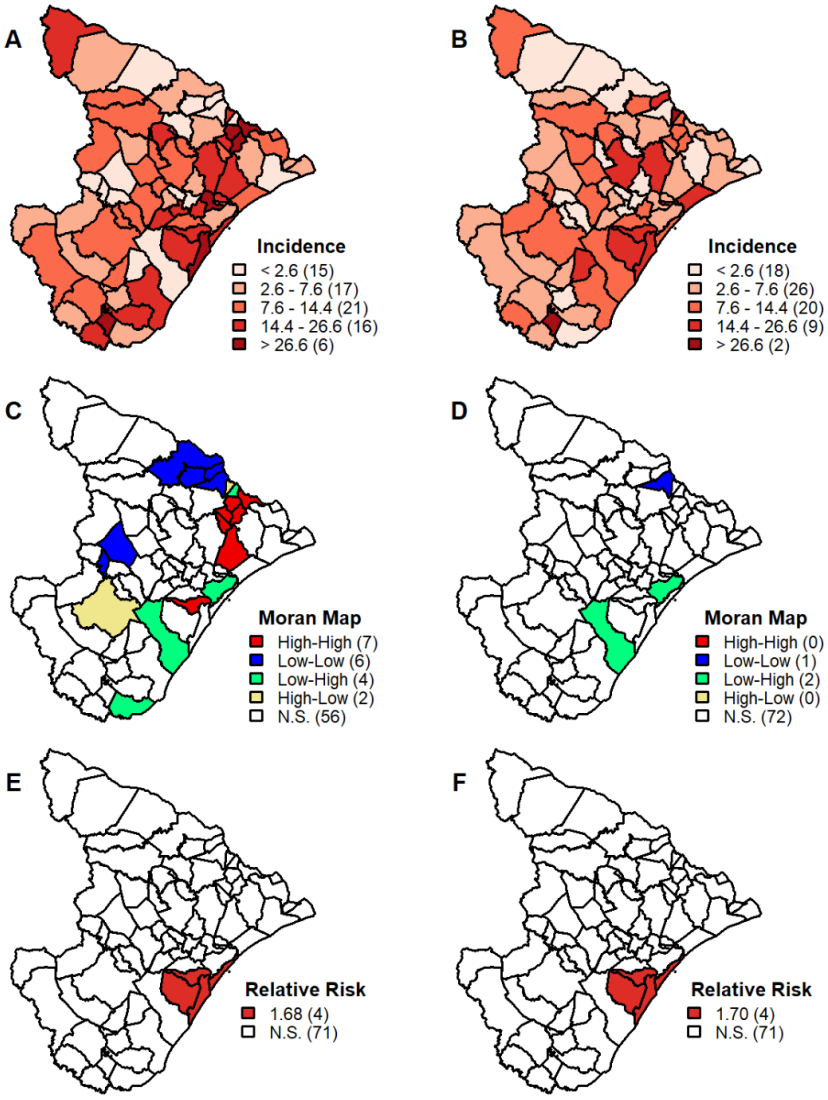
The analysis by race/skin color showed a significant reduction in prevalence rates among both White/Asian individuals (PRR = 0.48; 95% CI: 0.57–0.92) and Black/Brown/Indigenous individuals (PRR = 0.67; 95% CI: 0.76–0.92), with a proportionally greater reduction in the former group. Regarding education level, significant reductions in prevalence rates were observed among individuals with elementary education (PRR = 0.62; 95% CI: 0.50–0.95), secondary education (PRR = 0.67; 95% CI: 0.72–0.97), and higher education (PRR = 0.52; 95% CI: 0.61–0.92). Among illiterate individuals, although a decline in prevalence rate was observed (from 10.30 to 4.55 per 100,000), the difference did not reach statistical significance (PRR = 0.44; 95% CI: 0.41–1.20), possibly due to the small absolute number of cases in this group.

The spatial analysis of HIV incidence rates in the state of Sergipe revealed important spatial and temporal variations between the analyzed periods (2017–2019 and 2020–2022), as shown in Figure 1. During 2017–2019 (Figure 1A), a widespread distribution of municipalities with high incidence rates was observed, especially along the coast and central regions of the state. Six municipalities presented rates above 26.6 cases per 100,000 inhabitants, while another 16 municipalities fell within the range of 14.4 to 26.6. In the pandemic period (2020–2022, Figure 1B), incidence magnitude declined in several municipalities: only two had rates above 26.6, while most were concentrated in intermediate (7.6–14.4, with 20 municipalities) and low categories (<7.6, with 44 municipalities). The global spatial autocorrelation statistic, represented by Moran's index, showed a significant pattern only in the pre-pandemic period. Between 2017 and 2019, Moran's Index was 0.24 ($p < 0.001$), indicating positive spatial autocorrelation and suggesting that municipalities with high incidence rates tended to cluster geographically. In the subsequent period (2020–2022), Moran's index was -0.02 ($p = 0.533$), with no statistical significance, indicating the absence of spatial autocorrelation and, therefore, a random spatial pattern of incidence rates during this interval.

Figure 1C (Moran Map for 2017–2019) confirms this spatial pattern, identifying seven municipalities classified as "high-high," i.e., high incidence rates surrounded by

municipalities also with high rates. In addition, other municipalities were classified as “low-low” (n = 6), “low-high” (n = 4), and “high-low” (n = 2), showing different types of spatial association. In the pandemic period (Figure 1D), the absence of “high-high” clusters reinforced the disruption of the previously observed spatial pattern, leaving only one “low-low” and two “low-high” municipalities. The relative risk (RR) analysis, presented in Figures 1E and 1F, revealed that in the pre-pandemic period, four municipalities had an elevated risk of HIV (RR = 1.68) compared to the state average risk. During the pandemic, four municipalities continued to present elevated relative risk (RR = 1.70), concentrated in the same region of the state (metropolitan area and surroundings), suggesting the persistence of risk hotspots despite the attenuated spatial dispersion.

Figure 1. Spatial distribution of HIV incidence in Sergipe, Brazil. (A) Map of HIV incidence rates for the period 2017–2019. (B) Map of incidence rates for the period 2020–2022. (C) Local spatial autocorrelation map (LISA – Moran Map) for the period 2017–2019. (D) Moran Map for the pandemic period (2020–2022). (E) Relative risk map for the period 2017–2019. (F) Relative risk map for the pandemic period (2020–2022).



DISCUSSION

The findings of this study are consistent with those reported by the Municipal Health Department of Aracaju (2021)[11] for the period from 2017 to 2020, which also showed a predominance of HIV cases among men compared with women[19]. Although there was a proportional reduction in prevalence rates among both sexes during the pandemic period (2020–2022), men continued to show a higher burden of the disease. This reduction may reflect underreporting, that is consistent with national trends, and represents a limitation in HIV studies according to UNAIDS (2024)[4]. Such underreporting results from the lack of testing, which in turn may be driven by stigma, limited access to health services among populations living in peripheral areas, incomplete or inconsistent data notification, delays in reporting by health professionals, or other bureaucratic processes that interfere with case notification [20,21].

The higher prevalence rates observed among individuals aged 20 to 39 years are in line with national data from the Health Surveillance Secretariat (2020), which indicated that HIV cases were concentrated in the 25–39-year age group in 2019[22]. Despite the significant reduction in disease prevalence, the pandemic did not alter this pattern.

In 2021, 60.6% of HIV cases were reported to the Notifiable Diseases Information System (SINAN). Regarding race, Black populations have accounted for more than half of HIV infections worldwide since 2016 according to UNAIDS[12]. A reflection of this global scenario was observed in the present findings: in Sergipe, between 2017 and 2022, 85.48% of reported cases occurred among Black individuals a proportion that increased during the pandemic, accompanied by a reduction among White/Asian individuals.

Regarding educational level, an increase in cases was observed among individuals with primary and secondary education, while a reduction was found among those with higher education. These findings align with age distribution patterns and corroborate previous studies conducted in Aracaju[21], which consider education a protective fator [6,22].

According to the Municipal Health Department of Aracaju (2021)[19], the prevalence of pregnant women with HIV in Brazil has shown an increasing trend in recent years. However, the present findings for the 2020–2022 period revealed stability,

with only a negligible reduction compared to the pre-pandemic period, underscoring the need for special attention to the prevention of vertical transmission in this group.

Overall, the demographic characteristics observed in this study were similar, in percentage, to global patterns. Evidence shows that HIV tends to be distributed in a similar manner regardless of location[1].

In Brazil, there has been a downward trend in HIV prevalence over the past two decades, particularly in the South, Southeast, and Central-West regions. The regions with the smallest decreases were the Northeast and North. Sergipe, located in the Northeast, showed a similar trend, with little variation in prevalence rates despite the COVID-19 pandemic [23,24].

The Northeast region ranks second in the number of HIV cases in Brazil, which, in turn, is the country with the highest number of cases in Latin America [4,24,25]. In the state of Sergipe, HIV has been spreading to smaller municipalities[26]. The cluster of high-risk municipalities identified—comprising Aracaju, Barra dos Coqueiros, Nossa Senhora do Socorro, and São Cristóvão—demonstrates that nearby regions tend to cluster and disseminate the disease, a fact that may be attributed to population mobility and social connections [27,28].

AIDS continues to be an incurable condition prevention is paramount. Measures such as condom use, antiretroviral therapy (for patients living with HIV), and maintaining undetectable viral load are crucial to preventing transmission[29]. The implementation of socio-educational measures is essential to promote treatment adherence[30,31]. Unfortunately, in Sergipe, particularly in smaller municipalities, there is still a lack of health education initiatives, which contributes to the emergence of new cases in these areas, once again highlighting the importance of such strategies [26,32].

In addition to these existing challenges, the COVID-19 pandemic brought new obstacles to the care of people living with HIV, impairing disease control even among patients who had been regularly followed before this period[33]. In healthcare units where patients had poor disease control and high viral load, mortality increased by 10% among those who lost follow-up during the pandemic. However, new strategies for patient management also emerged, including the incorporation of digital technologies, teleconsultations, the implementation of new protocols, and improved access to antiretroviral therapy and laboratory tests[34,35].

Taken together, the findings of the present study highlight the need for continued epidemiological research on HIV, both at the national level and, particularly, in the state of Sergipe. These results provide important insights into the determinants of HIV transmission across different regions of the state. Understanding these social factors in Sergipe can guide policies such as expanding testing in vulnerable regions, encouraging PrEP and PEP use among individuals at higher risk, improving the training of healthcare professionals who to serve this population, offering psychosocial support, and implementing health education initiatives to increase diagnosis and treatment adherence. Although prevalence has not changed significantly, the definitive control of HIV has not yet been achieved Many individuals remain undiagnosed and, therefore, untreated. While underreporting in health databases continues to compromise the quality of epidemiological surveillance. Improving notification systems is, therefore, essential to advance both would knowledge and effective HIV control strategies.

CONCLUSION

Despite numerical stability, HIV remains insufficiently controlled, with many undiagnosed and untreated cases. These findings provide insights into the sociodemographic and spatial factors influencing the spread of the disease in Sergipe.

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