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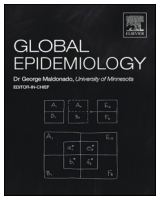

Original Research

Mpox: Characterization and clinical outcomes of patients in Colombian healthcare institutions

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A R T I C L E I N F O

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A B S T R A C T

Introduction: In 2022, the world experienced a monkeypox outbreak caused by the Clade IIb strain of the virus. While this outbreak had widespread effects, more information is needed on mpox's specific impact in Colombia, particularly regarding how it is managed, its burden, and its epidemiology. This research seeks to examine the medical context, clinical presentation, and health outcomes of individuals diagnosed with mpox infection, with a particular focus on those with HIV in Colombia.

Methods: This retrospective study was conducted in fourteen Health institutions in Colombia based on computerized clinical records from Jan 2022 to Dec 2023. Clinical and epidemiological characteristics were collected from diagnosis until discharge (or death). Participants in the study were diagnosed through molecular methods (PCR) and their clinical evolution was tracked through hospital and/or outpatient medical records. Registered variables were based on the mpox 2023 Case Report Form (2023 - CRF) proposed by the World Health Organization.

Results: One thousand four hundred thirteen (1413, 97.2 % male) individuals, including 2.6 % identified as healthcare workers, were included in this study. The majority (54 %, 764/1413 individuals) were persons living with HIV (PWH) and almost one-third of them (30.1 %, $n = 284$) of participants had concomitant sexually transmitted diseases and HIV, with syphilis being the most prevalent (20.4 %), followed by *Neisseria gonorrhoeae* (16.4 %). Complications were infrequent, with cellulitis being the most common, and no individuals received mpox-specific treatment or vaccination. Although all individuals had skin lesions distributed across various body

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regions, differences were noted in lesion distribution among women. Those living with HIV showed higher emergency department attendance and reported having known mpox contacts. While complications were rare, with cellulitis being the most common, women living with HIV showed a higher rate of emergency room visits and known mpox contacts. Although not statistically significant, gastrointestinal, musculoskeletal, psychological, respiratory, and STI symptoms, including syphilis and urethritis, were more common in the virologically non-suppressed HIV group. At the same time, proctitis was more prevalent in the suppressed group. No significant differences were found based on CD4 count, using 200 cells/mm^3 in PWH.

Conclusion: Over half of the participants were people living with HIV (PWH), with a significant presence of STIs like syphilis. While skin lesions and complications varied, no significant differences were linked to CD4 count or viral load suppression. Mpox symptomatology was not significantly associated with unsuppressed viral loads or low CD4 levels, highlighting the need for further research.

Introduction

Mpox (formerly known as monkeypox) is a viral disease caused by the human monkeypox virus (hMPXV), a zoonotic virus belonging to the Orthopoxvirus genus of the Poxviridae family [1]. The first human case was reported in 1970 in the Democratic Republic of Congo [2–4]. Until 2022, most reported cases were described in Africa and caused by Clades I and IIa [5,6,7].

In 2022, the largest and most extensive outbreak of mpox was documented, attributed to clade IIb [5]. According to the World Health Organization (WHO), a cumulative total of 99,176 laboratory-confirmed cases of mpox, including 208 deaths, have been reported to the World Health Organization (WHO) from 116 countries between January 1, 2022, through June 30, 2024 [8]. This new outbreak differs from what was observed in Africa regarding how the virus spreads, some of the symptoms it presents (for example, amount of genital lesions), the affected population, lethality, among other factors [3,4,6,9–12]. However, it is worth noting that the growth in the last year of individuals diagnosed with mpox is also due to the increase in cases in Africa by clades Ia and Ib [10–12].

Mpox has significantly impacted Latin America, with countries like Brazil, Mexico, and Colombia reporting high numbers of cases and associated deaths. Between 2022 and 2023, Argentina, Brazil, Chile, Colombia, Mexico, and Peru collectively reported 25,503 individuals diagnosed with mpox and 71 deaths. Notably, the majority of cases (91.8 %–98.5 %) occurred among men, with a mean age ranging from 32 to 35 years. In Colombia specifically, the maximum R(t) value reached 3.15 (95 % CI: 2.07 to 4.44), indicating a significant transmission rate [13].

The intersection of Mpox and HIV has been a critical area of study: a Brazilian cohort analysis revealed that individuals with HIV, particularly those with advanced immunosuppression, are at an increased risk of severe Mpox outcomes and hospitalization. [14] Additionally, the first reported case of concurrent acute HIV infection and Mpox in Latin America underscores the importance of vigilant monitoring and early intervention in co-infected individuals [8].

According to published data and recent meta-analysis, there is evidence that people with HIV (PWH), especially those with low CD4 cell counts or who are not virologically suppressed, although, with similar hospitalization, this type of individuals are more likely to experience critical outcomes such as death if they contract mpox [15]. Although the number of individuals diagnosed with mpox has decreased significantly since the peak of the epidemic [16,17], it remains to be evaluated whether the severe necrotizing form of mpox can be considered an opportunistic infection in people with uncontrolled HIV. Considering that Colombia is the sixth country in the world with the highest number of reported cases of mpox and that the hMPXV continues to circulate in various regions of the world and, with the emergence of new clades with new clinical manifestations and lethality [12], this research aims to gather information on the clinical characteristics of mpox caused by IIb clade from health-providing institutions in Colombia between 2022 and 2023.

Methods

This retrospective study was conducted in fourteen health institutions in Colombia through PAHO/WHO and National University calls to participate in a clinical registry network. The institutions that shared clinical data were Clínica Universitaria Colombia, Clínica Reina Sofía, Clínica Iberoamérica, Clínica Sebastián de Belalcázar, Clínica Santa María del Lago, Clínica la Inmaculada, Infectoclínicos, Corporación de la Lucha contra el SIDA, Virrey Solís IPS, Hospital de la Sabana, Hospital Universitario del Valle, Hospital Alma Mater, Hospital La María, centros médicos Sanitas Teusaquillo; the study analyzed computerized clinical records covering the period of 2022 to 2023.

Procedures

This study included all individuals diagnosed with mpox in the participating institutions between January 2022 and December 2023. All individuals had a confirmed mpox diagnosis by PCR perfomed at the National Institute of Health of Colombia and were followed using hospital and/or outpatient medical records. The main hospitalization criteria, demographic information, clinical characteristics, and outcome values were based on the Case Report Forms (CRF) proposed by the WHO [13], specifically the WHO's CRF for Mpox version 2023. Data registered in the Clinical Research Form (CRF) were manually introduced by the researchers while reading the clinical records. CRF data collected from the medical records was reviewed to ensure accuracy, completeness, and consistency. A data cleaning process to ensure uniformity over the data collected through the CRF was carried out, when unconformities were found, collectors double checked the data in the medical records.

No direct contact was made with the individuals, as this was the case no systematic test was performed on the person (for example, testing for other STIs) and only routine data was collected.

Definitions

Specific groups were created regarding the approach and presentation of composite variables, such as body mass index (BMI), CD4 lymphocyte count, and viral load. For BMI, the WHO proposed categories were used (Underweight <20, Normal 20–24.9, Overweight 25–29.9, Obese 30–34.9, and Extremely Obese >35). For viral suppression, a viral load threshold of 200 viral particles per milliliter of blood was established (≤ 200 suppressed and > 200 not suppressed). For CD4 count, the threshold for AIDS was used (<200 and ≥ 200 cell/uL). Additionally, the following age groups were analyzed: 0 to 4 years old, 5 to 14 years old, 15 to 44 years old, 45 to 64 years old, and over 64 years old. Other Sexually Transmitted Infections are every other single pathogen reported routinely in the medical records, no systematic testing was carried out.

Statistical analysis

Normality was check visually by Q-Q plot, log transformation and sqrt transformation as appropriate. Data missingness was also checked

to aid in the data cleaning and processing. Univariate descriptive analysis was conducted for all variables, and the report was tailored to the nature of the variables. After a Principal Component Analysis and a Multiple Correspondence Analysis multivariate analysis using a General Linear Model (GLM) and a logistic regression were performed. Quantitative variables are presented as measures of central tendency and dispersion. For qualitative variables, the description utilized absolute and cumulative frequencies. To compare PWH and people without HIV (PWoH), a Welch Two Sample *t*-test was carried out using a Standardized Mean Difference with a 2-sample test for equality of proportions without continuity correction and two sample tests for equality of proportions. A logistic regression analysis was conducted to evaluate the association between clinical and demographic factors and HIV infection. The dependent variable in all models was HIV status (binary: 1 = HIV positive, 0 = HIV negative). Independent variables included age (continuous and categorical), BMI categories, syphilis status, and other sexually transmitted infections (STIs). We constructed two models: Model 1 (hiv_model): included continuous age, BMI categories, syphilis, and STIs. Model 2 (hiv_model2): replaced continuous age with categorical age groups. Logistic regression was used given the binary nature of the dependent variable. The significance level was set at $p < 0.05$, and 95 % confidence intervals (CI) were reported. Additionally, a multinomial logistic regression was performed to examine the factors associated with BMI categories, with normal BMI as the reference group. Statistical processing was conducted using R Software® (version 4.3.0).

Ethics statement

This study adhered to the principles outlined in the Helsinki Declaration, including its subsequent amendments, and followed comparable ethical standards. The research protocol received approval from the Ethical Committee of Clinica Colsanitas and Unisanitas (CEIFUS 2495–22) and the necessary approvals from other collaborating institutions involved in the project, as this study was based on medical records no direct contact with the individuals was carried out. The need for informed consent was waived by the Ethical Committees. The commitment to ethical guidelines and the rigorous review process ensures the protection of participants' rights and the integrity of the study following established ethical norms.

Results

Population characteristics

One thousand three hundred ninety two individuals were enrolled in the study (Table 1), comprising predominantly males ($n = 1353$, 97.2 % of the cohort, with only 39 females). The average age of the enrolled individuals was 33 years (standard deviation [SD] 7.8), 91.1 % of the men were under 45, and no people over 65 were reported. In females, 89.7 % were under 45 years of age, and only one person over 65 years of age was reported. The number of unresolved lesions was higher in males than in females (6–100 lesions vs. 1–25, respectively). Additionally, the number of lesions in each body region was higher in males than in females (1–16 vs. 1–2). Notably, 47 individuals reported international travel three weeks before symptoms, covering destinations such as Brazil, Mexico, Argentina, Panama, Ecuador, Peru, the Netherlands, the United States, and the United Arab Emirates. None of the 39 females included in this study were pregnant; 36 individuals (2.6 %) were health

Table 1
Demographic and Clinical Characteristics in Colombian confirmed individuals diagnosed with mpox by sex.

Characteristic	Male, $N = 1353$	95 % CI[2]	Female, $N = 39$	95 % CI [2]	Missing, N = 1	95 % CI [2]	*p*-value [3]	q-value [4]
Age[1]	32 (28, 37)		28 (24, 36)		25 (25, 25)		0.023	0.069
Age groups							0.040	0.10
15 to 44 years old	1232 (91 %)	89 %, 92 %	35 (90 %)	75 %, 97 %	1 (100 %)	5.5 %, 100 %		
45 to 64 years old	121 (8.9 %)	7.5 %, 11 %	3 (7.7 %)	2.0 %, 22 %	0 (0 %)	0.00 %, 95 %		
older than 65 years old	0 (0 %)	0.00 %, 0.35 %	1 (2.6 %)	0.13 %, 15 %	0 (0 %)	0.00 %, 95 %		
Lymphadenopathy	1353 (100 %)	100 %, 100 %	39 (100 %)	89 %, 100 %	1 (100 %)	5.5 %, 100 %		
Syphillis	58 (4.3 %)	3.3 %, 5.5 %	0 (0 %)	0.00 %, 11 %	0 (0 %)	0.00 %, 95 %	0.4	0.7
Other STIs	280 (21 %)	19 %, 23 %	4 (10 %)	3.3 %, 25 %	0 (0 %)	0.00 %, 95 %	0.3	0.6
HIV Status							<0.001	<0.001
PWoH	605 (45 %)	42 %, 47 %	34 (87 %)	72 %, 95 %	0 (0 %)	0.00 %, 95 %		
PWH	748 (55 %)	53 %, 58 %	5 (13 %)	4.8 %, 28 %	1 (100 %)	5.5 %, 100 %		
Missing	0 (0 %)	0.00 %, 0.35 %	0 (0 %)	0.00 %, 11 %	0 (0 %)	0.00 %, 95 %		
Proctitis symptomatology	113 (8.4 %)	7.0 %, 10 %	0 (0 %)	0.00 %, 11 %	0 (0 %)	0.00 %, 95 %	0.14	0.3
Urethritis symptomatology	23 (1.7 %)	1.1 %, 2.6 %	1 (2.6 %)	0.13 %, 15 %	0 (0 %)	0.00 %, 95 %	0.5	0.7
Sore throat symptomatology	1353 (100 %)	100 %, 100 %	39 (100 %)	89 %, 100 %	1 (100 %)	5.5 %, 100 %		
Psychological disturbances	8 (0.6 %)	0.28 %, 1.2 %	0 (0 %)	0.00 %, 11 %	0 (0 %)	0.00 %, 95 %	>0.9	>0.9
Skin lesions	1353 (100 %)	100 %, 100 %	39 (100 %)	89 %, 100 %	1 (100 %)	5.5 %, 100 %		
Respiratory symptoms	310 (23 %)	21 %, 25 %	9 (23 %)	12 %, 40 %	0 (0 %)	0.00 %, 95 %	>0.9	>0.9
Musculoskeletal symptoms	390 (29 %)	26 %, 31 %	9 (23 %)	12 %, 40 %	0 (0 %)	0.00 %, 95 %	0.6	0.8
Gastrointestinal symptoms	70 (5.2 %)	4.1 %, 6.5 %	1 (2.6 %)	0.13 %, 15 %	0 (0 %)	0.00 %, 95 %	0.7	0.9
Antibiotics	60 (4.4 %)	3.4 %, 5.7 %	0 (0 %)	0.00 %, 11 %	0 (0 %)	0.00 %, 95 %	0.4	0.7
Antifungal	2 (0.1 %)	0.03 %, 0.59 %	0 (0 %)	0.00 %, 11 %	0 (0 %)	0.00 %, 95 %	>0.9	>0.9
Antiviral [5]	521 (39 %)	36 %, 41 %	2 (5.1 %)	0.89 %, 19 %	1 (100 %)	5.5 %, 100 %	<0.001	<0.001
BMI Groups[6]							0.3	0.5
Normal	7 (0.5 %)	0.23 %, 1.1 %	1 (2.6 %)	0.13 %, 15 %	0 (0 %)	0.00 %, 95 %		
Underweight	299 (22 %)	20 %, 24 %	11 (28 %)	16 %, 45 %	0 (0 %)	0.00 %, 95 %		
Overweight	19 (1.4 %)	0.87 %, 2.2 %	1 (2.6 %)	0.13 %, 15 %	0 (0 %)	0.00 %, 95 %		
Obese	153 (11 %)	9.7 %, 13 %	1 (2.6 %)	0.13 %, 15 %	0 (0 %)	0.00 %, 95 %		
Extremely obese	19 (1.4 %)	0.87 %, 2.2 %	0 (0 %)	0.00 %, 11 %	0 (0 %)	0.00 %, 95 %		
Unknown	856 (63 %)	61 %, 66 %	25 (64 %)	47 %, 78 %	1 (100 %)	5.5 %, 100 %		

PWH = people with HIV.
[1] Median (IQR); n (%).
[2] CI = Confidence Interval.
[3] Welch Two Sample *t*-test; Standardized Mean Difference; 2-sample test for equality of proportions without continuity correction; Two sample test for equality of proportions.
[4] False discovery rate correction for multiple testing.
[6] Body Mass Index (BMI. Underweight <20, Normal 20–24.9, Overweight 25–29.9, Obese 30–34.9, and Extremely Obese >35).

workers with work-related mpox exposure; 16 % of the individuals were aware of having a sexual partner or contact with mpox. None of the individuals in this case series received mpox-specific treatment nor had access to previous mpox vaccinations.

Antiretrovirals

Complications were infrequent, with cellulitis being the most common, reported in only five individuals. Other complications included shock, acute respiratory distress syndrome, necrotizing cellulitis, abscesses, and bleeding disorders. Two people died; the first was a 29-year-old man, recently diagnosed with HIV, CD4 cell count 33/mm3, and an HIV viral load of 32000copies/ml (Log 4.5). He did not begin antiretroviral treatment and did not have other opportunistic infections reported. His cause of death was described as septic shock. The second person was a 28-year-old man. One week before his death, he had his first positive HIV test. He had no analysis of CD4 cell count nor HIV viral load. He had lesions in the genital area, with necrotizing fasciitis that was reported as the cause of death.

Skin lesions and lymphadenopathy were ubiquitous among all individuals (Fig. 1A); within the extremities, the arms were affected in 273 (20.2 %) of cases, and the genitals were the most frequently affected anatomic site (524, 37 %). Other areas reported as affected in a few individuals included the scalp, neck, and wrists, contributing to the diverse distribution of lesions throughout the body. The diversity of lesion types was notable, encompassing macules 167 (12.4 %), abscess 347 (25.7 %), early vesicles 269 (19.9 %), small pustules 189 (13.9 %), umbilicated pustules 63 (4.7 %), ulcerated lesions 82 (6.1 %), crusting of mature lesions 113 (8.4 %), and partially removed scabs (4.9 %). Proportionally, females reported significantly more lesions (active or otherwise) in the legs (43.6 % vs 27.8 %), arms (31.6 % vs 48.7 %) and oral mucosa (12.3 % vs 30.8 %), whereas males presented more in soles of feet (2.7 % vs. 0.0 %), genitals (39.3 % vs. 17.9 %) and perianal (16.8 % vs 2.6 %) (Fig. 1B). but not in other regions. No differences were found between the type, number of lesions, location, and severity. (See Fig. 2.)

Comparing variables and characteristics by BMI groups

As obesity has been identified as a risk factor for developing more severe disease in certain conditions, we performed an analysis by BMI groups. Regarding this characteristic, 60.3 % had a normal BMI, 30.3 % were overweight, 3.5 % were underweight, 3.9 % were obese, and 1.8 % were extremely obese. Most females (37 individuals) had a normal body weight (78.6 %). No differences by BMI were found regarding antibiotic, antifungal or antiviral use, psychological symptoms, respiratory symptoms, muscle and bone symptomatology, and gastrointestinal symptoms.

People living with HIV (PWH)

Nearly half of the population (754/1413 cases, 99.3 % male) were PWH. Almost one-third (31 %, $n = 284$) of individuals had concomitant sexually transmitted diseases and HIV, with syphilis being the most prevalent (20.4 %), followed by infections due to *Neisseria gonorrhoeae* (16.4 %).

PWH had a higher proportion of gastrointestinal symptoms and genital symptoms. PWH had a higher proportion of other STIs than

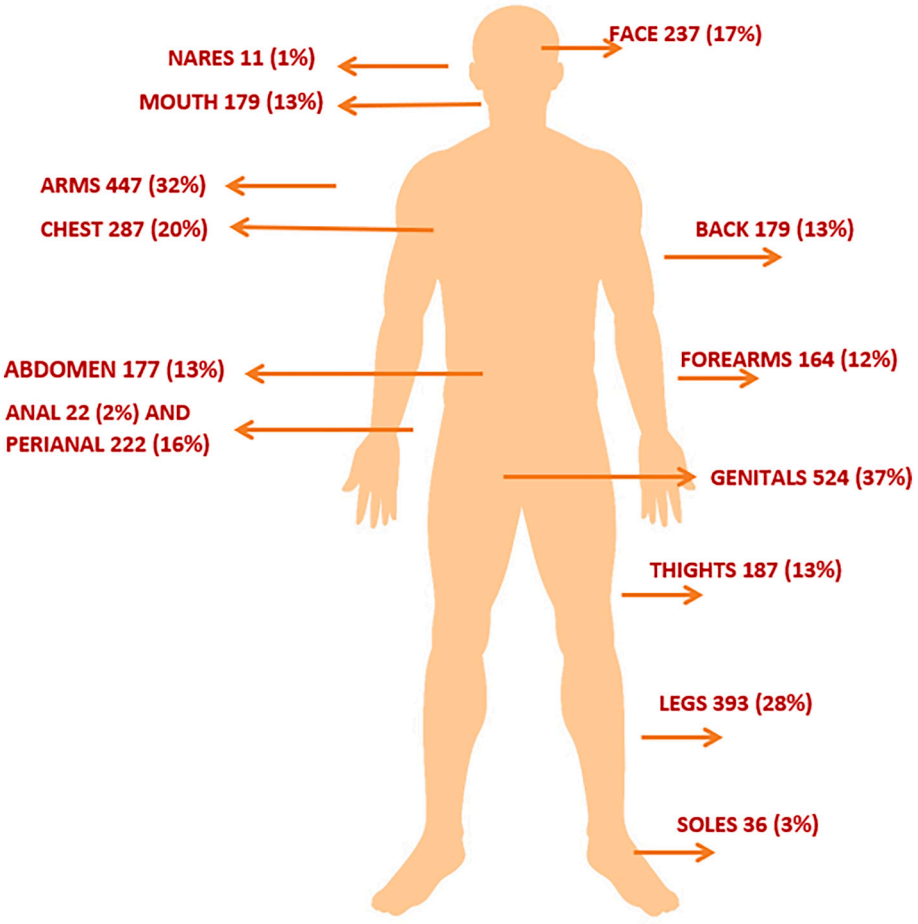

Fig. 1. 1 A. Distribution of skin lesions in Colombian confirmed in individuals diagnosed with mpox.

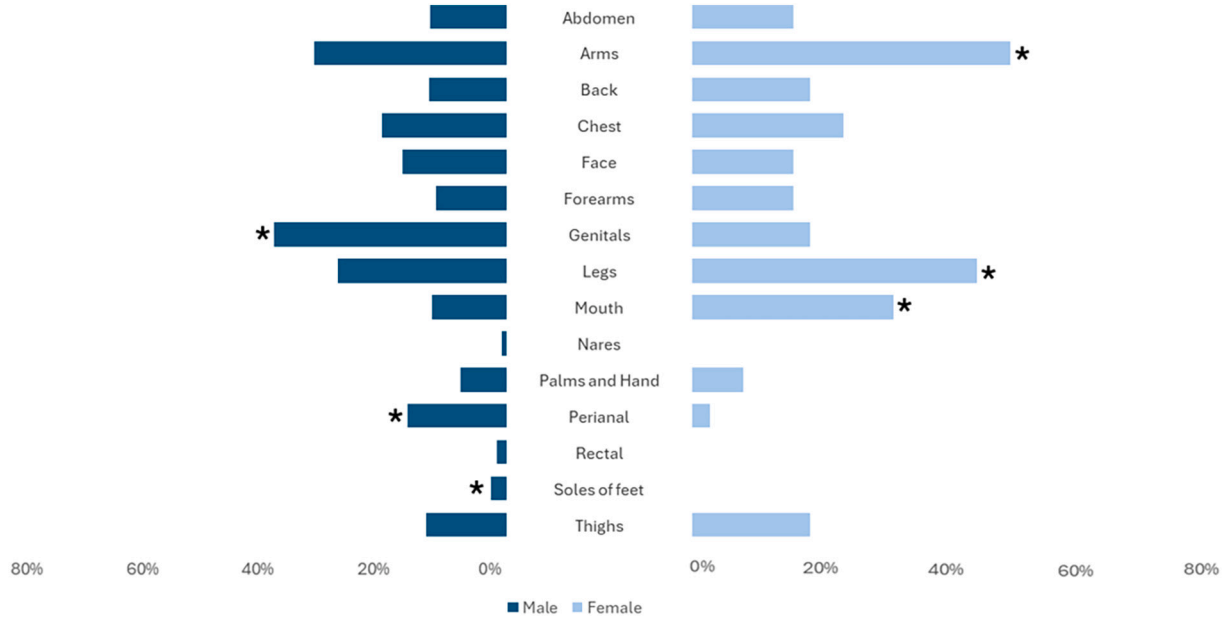

Fig. 2. A. Differences in the distribution of lesions between males and females with statistically significant ones shown with an asterisk (*).

PWoH. Overall, PWoH were younger than PWH (30 ± 13.2vs. 33 ± 12.5), being over-represented among individuals aged between 15 and 44. Other differences and characteristics can be seen in Table 2.

Gastrointestinal, muscle and bone symptomatology, psychological disturbances, respiratory symptoms, the presence of other STIs, the presence of syphilis, and urethritis symptomatology were present in a higher proportion in the non-suppressed group, although the magnitude of the difference was not significant. In contrast, proctitis

Table 2
Comparison of Clinical Characteristics in Colombian confirmed in individuals diagnosed with mpox by HIV status.[1, 2, 3, 4, 5]

Characteristic	PWoH, *N* = 639	95 % CI [2]	PWH, *N* = 754	95 % CI.1 [2]	p-value [3]	q-value [4]
Sex					<0.001	<0.001
Male	605 (95 %)	93 %, 96 %	748 (99 %)	98 %, 100 %		
Female	34 (5.3 %)	3.8 %, 7.4 %	5 (0.7 %)	0.24 %, 1.6 %		
Missing	0 (0 %)	0.00 %, 0.74 %	1 (0.1 %)	0.01 %, 0.86 %		
Age [1]	30 (26, 36)	31, 32	33 (29, 38)	34, 35	<0.001	<0.001
Age groups					0.011	0.014
15 to 44 years old	596 (93 %)	91 %, 95 %	672 (89 %)	87 %, 91 %		
45 to 64 years old	43 (6.7 %)	5.0 %, 9.0 %	81 (11 %)	8.7 %, 13 %		
older than 65 years old	0 (0 %)	0.00 %, 0.74 %	1 (0.1 %)	0.01 %, 0.86 %		
lymphadenopathy	639 (100 %)	99 %, 100 %	754 (100 %)	99 %, 100 %		
Syphillis	5 (0.8 %)	0.29 %, 1.9 %	53 (7.0 %)	5.4 %, 9.2 %	<0.001	<0.001
Other STIs	22 (3.4 %)	2.2 %, 5.3 %	262 (35 %)	31 %, 38 %	<0.001	<0.001
Proctitis symptomatology	22 (3.4 %)	2.2 %, 5.3 %	91 (12 %)	9.9 %, 15 %	<0.001	<0.001
Urethritis symptomatology	3 (0.5 %)	0.12 %, 1.5 %	21 (2.8 %)	1.8 %, 4.3 %	<0.001	0.001
Sore throat symptomatology	639 (100 %)	99 %, 100 %	754 (100 %)	99 %, 100 %		
Psychological disturbance	2 (0.3 %)	0.05 %, 1.3 %	6 (0.8 %)	0.32 %, 1.8 %	0.3	0.4
Skins lesions	639 (100 %)	99 %, 100 %	754 (100 %)	99 %, 100 %		
Respiratory symptomatology	141 (22 %)	19 %, 26 %	178 (24 %)	21 %, 27 %	0.5	0.5
Muscle and skeletal symptoms	187 (29 %)	26 %, 33 %	212 (28 %)	25 %, 31 %	0.6	0.6
Gastrointestinal symptomatology	19 (3.0 %)	1.9 %, 4.7 %	52 (6.9 %)	5.2 %, 9.0 %	<0.001	0.001
Antibiotics	15 (2.3 %)	1.4 %, 3.9 %	45 (6.0 %)	4.4 %, 8.0 %	<0.001	0.001
Antifungals	0 (0 %)	0.00 %, 0.74 %	2 (0.3 %)	0.05 %, 1.1 %	0.5	0.5
Antivirals	0 (0 %)	0.00 %, 0.74 %	524 (69 %)	66 %, 73 %	<0.001	<0.001
BMI groups [5]						
Extremely obese	4 (0.6 %)	0.20 %, 1.7 %	4 (0.5 %)	0.17 %, 1.5 %		
Normal	71 (11 %)	8.8 %, 14 %	239 (32 %)	28 %, 35 %		
Obese	3 (0.5 %)	0.12 %, 1.5 %	17 (2.3 %)	1.4 %, 3.7 %		
Overweight	18 (2.8 %)	1.7 %, 4.5 %	136 (18 %)	15 %, 21 %		
Underweight	8 (1.3 %)	0.58 %, 2.6 %	11 (1.5 %)	0.77 %, 2.7 %		
Missing	535 (84 %)	81 %, 86 %	347 (46 %)	42 %, 50 %		

PWH = people with HIV.
[1] Median (IQR); n (%).
[2] CI = Confidence Interval.
[3] Welch Two Sample *t*-test; Standardized Mean Difference; 2-sample test for equality of proportions without continuity correction; Two sample test for equality of proportions.
[4] False discovery rate correction for multiple testing.
[5] Body Mass Index (BMI. Underweight <20, Normal 20–24.9, Overweight 25–29.9, Obese 30–34.9, and Extremely Obese >35).

symptomatology was higher in the suppressed group. These results can be seen in Table 3.

When PWH were compared based on their CD4 T cell count, using it as a proxy for immune status, as a CD4 count of less than 200 cells/mm^3 is a key marker for an AIDS diagnosis this cutoff was chosen to do the following analysis. No statistically significant differences in age, musculoskeletal symptoms, proctitis and other conditions were detected among those groups (Table 4). PWH in the study was undergoing antiretroviral therapy (ART) with specific drug regimens, including tenofovir disoproxil fumarate/emtricitabine, abacavir/lamivudine, efavirenz, atazanavir, and atazanavir/ritonavir. According to the latest HIV viral load results, 22,6 % of people receiving ART were not virally suppressed; the mean viral load was 11,633.24 ± 54,966.62 copies/mL. When comparing PWH and PWoH who visited the emergency room, PWH had a higher frequency of consultations (78.3 % vs 48.3 %, *p*-value <0.00001). They used outpatient services to a lesser extent (9.8 % vs 36.4 % p-value <0.0001). No differences were found in the use of other services. Finally, PWH had a higher proportion of known mpox contacts (16.8 % vs. 14.2 %) in the 21 days prior. There were no differences in age, healthcare or laboratory worker status, or international travel before symptom onset.

To further analyses the relationship between variables, GLM and logistic regressions were carried out. The result of the GLM analysis found a relationship between BMI groups and HIV status, PWH were less likely to have normal weight (0.28), as well people with syphilis were less likely to have normal weight (odds 0.37). Regarding the logistic model, age and syphilis had a positive coefficient (0.05 and 2.07, respectively) when analyzed as predictors of HIV status (PWH), although the latter had a weak magnitude of effect, on the other hand, the presence of other STIs and BMI groups had negative association to HIV status. However, the magnitude of the effect was weak. Antiviral, antibiotics and antifungals presented a weak magnitude of effect and

Table 3
Clinical characteristics in Colombian PWH with confirmed mpox by virological suppression status.[1, 2, 3, 4, 5]

Characteristic	Non-suppressed, *N* = 57	95 % CI [2]	Suppression, *N* = 195	95 % CI.1[2]	Missing, *N* = 1141	95 % CI.2 [2]	p-value [3]	q-value [4]
Sex							0.011	0.021
Male	57 (100 %)	92 %, 100 %	195 (100 %)	98 %, 100 %	1101 (96 %)	95 %, 97 %		
Female	0 (0 %)	0.00 %, 7.9 %	0 (0 %)	0.00 %, 2.4 %	39 (3.4 %)	2.5 %, 4.7 %		
Missing	0 (0 %)	0.00 %, 7.9 %	0 (0 %)	0.00 %, 2.4 %	1 (<0.1 %)	0.00 %, 0.57 %		
Age [1]	33 (28, 38)	32, 36	34 (29, 39)	34, 36	32 (27, 36)	32, 33	<0.001	<0.001
Age groups							0.6	0.6
15 to 44 years old	51 (89 %)	78 %, 96 %	174 (89 %)	84 %, 93 %	1043 (91 %)	90 %, 93 %		
45 to 64 years old	6 (11 %)	4.4 %, 22 %	21 (11 %)	6.9 %, 16 %	97 (8.5 %)	7.0 %, 10 %		
older than 65 years old	0 (0 %)	0.00 %, 7.9 %	0 (0 %)	0.00 %, 2.4 %	1 (<0.1 %)	0.00 %, 0.57 %		
lymphadenopathy	57 (100 %)	92 %, 100 %	195 (100 %)	98 %, 100 %	1141 (100 %)	100 %, 100 %		
Syphillis	4 (7.0 %)	2.3 %, 18 %	7 (3.6 %)	1.6 %, 7.6 %	47 (4.1 %)	3.1 %, 5.5 %	0.5	0.5
Other STIs	14 (25 %)	15 %, 38 %	34 (17 %)	13 %, 24 %	236 (21 %)	18 %, 23 %	0.4	0.5
Proctitis symptomatology							<0.001	<0.001
Urethritis symptomatology	0 (0 %)	0.00 %, 7.9 %	0 (0 %)	0.00 %, 2.4 %	639 (56 %)	53 %, 59 %		
Sore throat symptomatology	57 (100 %)	92 %, 100 %	195 (100 %)	98 %, 100 %	502 (44 %)	41 %, 47 %		
Psychological disturbance	6 (11 %)	4.4 %, 22 %	29 (15 %)	10 %, 21 %	78 (6.8 %)	5.5 %, 8.5 %	<0.001	0.003
Skins lesions	3 (5.3 %)	1.4 %, 16 %	5 (2.6 %)	0.95 %, 6.2 %	16 (1.4 %)	0.83 %, 2.3 %	0.049	0.087
Respiratory symptomatology	57 (100 %)	92 %, 100 %	195 (100 %)	98 %, 100 %	1141 (100 %)	100 %, 100 %		
Muscle and skeletal symptoms	1 (1.8 %)	0.09 %, 11 %	1 (0.5 %)	0.03 %, 3.3 %	6 (0.5 %)	0.21 %, 1.2 %	0.4	0.4
Gastrointestinal symptomatology	57 (100 %)	92 %, 100 %	195 (100 %)	98 %, 100 %	1141 (100 %)	100 %, 100 %		
Antibiotics	20 (35 %)	23 %, 49 %	43 (22 %)	17 %, 29 %	256 (22 %)	20 %, 25 %	0.082	0.13
Antifungals	22 (39 %)	26 %, 52 %	49 (25 %)	19 %, 32 %	328 (29 %)	26 %, 31 %	0.14	0.2
Antivirals	8 (14 %)	6.7 %, 26 %	13 (6.7 %)	3.7 %, 11 %	50 (4.4 %)	3.3 %, 5.8 %	0.006	0.015
BMI groups [5]	1 (1.8 %)	0.09 %, 11 %	0 (0 %)	0.00 %, 2.4 %	59 (5.2 %)	4.0 %, 6.7 %	<0.001	<0.001
Extremely obese	0 (0 %)	0.00 %, 7.9 %	1 (0.5 %)	0.03 %, 3.3 %	1 (<0.1 %)	0.00 %, 0.57 %	0.3	0.4
Normal	48 (84 %)	72 %, 92 %	151 (77 %)	71 %, 83 %	325 (28 %)	26 %, 31 %	<0.001	<0.001
Obese								
Overweight	0 (0 %)	0.00 %, 7.9 %	0 (0 %)	0.00 %, 2.4 %	8 (0.7 %)	0.33 %, 1.4 %		
Underweight	31 (54 %)	41 %, 67 %	104 (53 %)	46 %, 60 %	175 (15 %)	13 %, 18 %		
Missing	2 (3.5 %)	0.61 %, 13 %	3 (1.5 %)	0.40 %, 4.8 %	15 (1.3 %)	0.77 %, 2.2 %		
Overweight	9 (16 %)	7.9 %, 28 %	34 (17 %)	13 %, 24 %	111 (9.7 %)	8.1 %, 12 %		
Underweight	2 (3.5 %)	0.61 %, 13 %	6 (3.1 %)	1.3 %, 6.9 %	11 (1.0 %)	0.51 %, 1.8 %		
Missing	13 (23 %)	13 %, 36 %	48 (25 %)	19 %, 31 %	821 (72 %)	69 %, 75 %		

PWH = people with HIV.
[1] Median (IQR); n (%).
[2] CI = Confidence Interval.
[3] Welch Two Sample *t*-test; Standardized Mean Difference; 2-sample test for equality of proportions without continuity correction; Two sample test for equality of proportions.
[4] False discovery rate correction for multiple testing.
[5] Body Mass Index (BMI. Underweight <20, Normal 20–24.9, Overweight 25–29.9, Obese 30–34.9, and Extremely Obese >35).

Table 4
Proportion and clinical characteristics in Colombian PLWH with confirmed mpox analyzed by CD4 count.[1, 2, 3, 4, 5]

Characteristic	CD4+ > 200 Cells/mm3, $N = 365$	95 % CI[2]	CD4 < 200 Cells/mm3, $N = 44$	95 % CI.1 [2]	Missing, $N = 984$	95 % CI.2 [2]	p-value [3]	q-value [4]
Sex							<0.001	<0.001
Male	365 (100 %)	99 %, 100 %	44 (100 %)	90 %, 100 %	944 (96 %)	94 %, 97 %		
Female	0 (0 %)	0.00 %, 1.3 %	0 (0 %)	0.00 %, 10 %	39 (4.0 %)	2.9 %, 5.4 %		
Missing	0 (0 %)	0.00 %, 1.3 %	0 (0 %)	0.00 %, 10 %	1 (0.1 %)	0.01 %, 0.66 %		
Age [1]	33 (29, 39)	34, 36	35 (30, 39)	33, 38	31 (27, 36)	32, 33	<0.001	<0.001
Age groups							0.001	0.003
15 to 44 years old	316 (87 %)	83 %, 90 %	38 (86 %)	72 %, 94 %	914 (93 %)	91 %, 94 %		
45 to 64 years old	49 (13 %)	10 %, 17 %	6 (14 %)	5.7 %, 28 %	69 (7.0 %)	5.5 %, 8.8 %		
older than 65 years old	0 (0 %)	0.00 %, 1.3 %	0 (0 %)	0.00 %, 10 %	1 (0.1 %)	0.01 %, 0.66 %		
lymphadenopathy	365 (100 %)	99 %, 100 %	44 (100 %)	90 %, 100 %	984 (100 %)	100 %, 100 %		
Syphillis	35 (9.6 %)	6.9 %, 13 %	1 (2.3 %)	0.12 %, 14 %	22 (2.2 %)	1.4 %, 3.4 %	<0.001	<0.001
Other STIs	106 (29 %)	24 %, 34 %	10 (23 %)	12 %, 38 %	168 (17 %)	15 %, 20 %	<0.001	<0.001
Proctitis symptomatology							<0.001	<0.001
Urethritis symptomatology	0 (0 %)	0.00 %, 1.3 %	0 (0 %)	0.00 %, 10 %	639 (65 %)	62 %, 68 %		
Sore throat symptomatology	365 (100 %)	99 %, 100 %	44 (100 %)	90 %, 100 %	345 (35 %)	32 %, 38 %		
Psychological disturbance	0 (0 %)	0.00 %, 1.3 %	0 (0 %)	0.00 %, 10 %	0 (0 %)	0.00 %, 0.48 %		
Skins lesions	48 (13 %)	9.9 %, 17 %	5 (11 %)	4.3 %, 25 %	60 (6.1 %)	4.7 %, 7.8 %	<0.001	<0.001
Respiratory symptomatology	9 (2.5 %)	1.2 %, 4.8 %	0 (0 %)	0.00 %, 10 %	15 (1.5 %)	0.89 %, 2.6 %	0.4	0.5
Muscle and skeletal symptoms	365 (100 %)	99 %, 100 %	44 (100 %)	90 %, 100 %	984 (100 %)	100 %, 100 %		
Gastrointestinal symptomatology	4 (1.1 %)	0.35 %, 3.0 %	0 (0 %)	0.00 %, 10 %	4 (0.4 %)	0.13 %, 1.1 %	0.4	0.5
Antibiotics	365 (100 %)	99 %, 100 %	44 (100 %)	90 %, 100 %	984 (100 %)	100 %, 100 %		
Antifungals	92 (25 %)	21 %, 30 %	8 (18 %)	8.7 %, 33 %	219 (22 %)	20 %, 25 %	0.4	0.5
Antivirals	107 (29 %)	25 %, 34 %	9 (20 %)	10 %, 36 %	283 (29 %)	26 %, 32 %	0.5	0.5
BMI groups[5]	26 (7.1 %)	4.8 %, 10 %	1 (2.3 %)	0.12 %, 14 %	44 (4.5 %)	3.3 %, 6.0 %	0.10	0.2
Extremely obese	9 (2.5 %)	1.2 %, 4.8 %	1 (2.3 %)	0.12 %, 14 %	50 (5.1 %)	3.8 %, 6.7 %	0.092	0.2
Normal	1 (0.3 %)	0.01 %, 1.8 %	0 (0 %)	0.00 %, 10 %	1 (0.1 %)	0.01 %, 0.66 %	0.5	0.5
Obese	294 (81 %)	76 %, 84 %	34 (77 %)	62 %, 88 %	196 (20 %)	17 %, 23 %	<0.001	<0.001
Overweight								
Underweight	0 (0 %)	0.00 %, 1.3 %	0 (0 %)	0.00 %, 10 %	8 (0.8 %)	0.38 %, 1.7 %		
Missing	166 (45 %)	40 %, 51 %	23 (52 %)	37 %, 67 %	121 (12 %)	10 %, 15 %		
Overweight	11 (3.0 %)	1.6 %, 5.5 %	1 (2.3 %)	0.12 %, 14 %	8 (0.8 %)	0.38 %, 1.7 %		
Underweight	86 (24 %)	19 %, 28 %	2 (4.5 %)	0.79 %, 17 %	66 (6.7 %)	5.3 %, 8.5 %		
Missing	10 (2.7 %)	1.4 %, 5.1 %	1 (2.3 %)	0.12 %, 14 %	8 (0.8 %)	0.38 %, 1.7 %		

PWH = people with HIV.
[1] Median (IQR); n (%).
[2] CI = Confidence Interval.
[3] Welch Two Sample *t*-test; Standardized Mean Difference; 2-sample test for equality of proportions without continuity correction; Two sample test for equality of proportions.
[4] False discovery rate correction for multiple testing.
[5] Body Mass Index (BMI. Underweight <20, Normal 20–24.9, Overweight 25–29.9, Obese 30–34.9, and Extremely Obese >35).

large standard errors.

To address the concern about the independence of effects and potential confounding, we conducted a multinomial logistic regression analysis with BMI categories (Obese, Overweight, Underweight) as the dependent variable and predictors including age, HIV status, syphilis, CD4 count categories, and viral load suppression (Table 5). The results suggest that several predictors influence BMI categories independently. For the Obese category, age showed notable associations, while CD4 count, and viral load suppression were less impactful. For the Overweight category, age, HIV status, and CD4 count could be contributors, suggesting that these factors independently influence variations in that BMI category. Similarly, for the Underweight category, HIV status showed strong associations, while age and CD4 count were less clearly associated. These findings suggest that while age plays an important role

Table 5
Logistic Regression Results for HIV Model.

Model 1					Model 2				
Variable	Estimate	Std. Error	OR (95 % CI)	p-value	Variable	Estimate	Std. Error	OR (95 % CI)	p-value
(Intercept)	−1.3	0.88	0.2 (0.04, 1.5)	0.1	(Intercept)	−0.1	0.7	0.8 (0.2, 3.6)	0.85
Age (continuous)	0.06	0.02	1.06 (1.0, 1.1)	0.0	Age group: 45–64 years old	0.9	0.4	2.6 (1.0, 6.4)	0.03
BMI: Normal	−0.7	0.7	0.48 (0.1, 2.0)	0.3	Age group: Older than 65	12.5	535.4	NA	0.98
BMI: Obese	0.6	1.0	1.88 (0.2, 13.6)	0.5	Syphilis	1.1	0.6	3.0 (0.9, 10.2)	0.07
BMI: Overweight	0.9	0.8	2.4 (0.4, 12.3)	0.2	BMI: Normal	1.1	0.7	3.2 (0.7, 13.2)	0.11
BMI: Underweight	−18.2	1451.6	0.00 (NA)	0.9	BMI: Obese	1.7	0.9	5.7 (0.8, 36.8)	0.06
Syphilis	2.0	1.3	8.00 (0.6, 97.2)	0.1	BMI: Overweight	2.0	0.7	7.9 (1.7, 36.0)	0.00
STI	−1.17	1.16	0.31 (0.03, 2.91)	0.314	BMI: Underweight	0.31	0.86	1.36 (0.24, 7.56)	0.719

in BMI changes, the effects of HIV and syphilis appear more specific. Overall, this analysis supports that the observed differences in BMI are not solely explained by individual predictors but rather reflect independent contributions of these factors.

On the other hand, the findings from our logistic regression models suggest associations between age, BMI categories, and HIV infection (Table 6). Individuals in the 45–64 years age group have a higher likelihood of being HIV-positive compared to younger individuals. This aligns with previous studies highlighting the increased vulnerability of middle-aged populations to HIV infection, potentially due to cumulative exposure risk and delayed diagnoses. The association between BMI and HIV status is particularly notable, as being overweight was linked to a higher likelihood of being HIV-positive. While obesity and syphilis also showed potential associations, their effects were less pronounced.

Table 6
Multinomial Logistic Regression Results for BMI Categories (Reference: Normal BMI).

Variable	BMI Category	Estimate	Std. Error	OR (95 % CI)	p-value
(Intercept)	Obese	−1.20	0.85	0.30 (0.06, 1.58)	0.151
	Overweight	−0.75	0.78	0.47 (0.11, 1.98)	0.329
	Underweight	−2.15	1.12	0.12 (0.01, 1.51)	0.090
Age (continuous)	Obese	0.08	0.03	1.08 (1.02, 1.14)	**0.008**
	Overweight	0.05	0.02	1.05 (1.01, 1.09)	**0.021**
	Underweight	−0.02	0.04	0.98 (0.90, 1.07)	0.650
HIV Positive	Obese	0.45	0.60	1.57 (0.48, 5.08)	0.450
	Overweight	0.87	0.53	2.39 (0.83, 6.92)	0.107
	Underweight	1.50	0.78	4.48 (0.99, 20.23)	0.051
Syphilis	Obese	0.33	0.70	1.39 (0.34, 5.63)	0.645
	Overweight	0.62	0.66	1.86 (0.51, 6.82)	0.348
	Underweight	1.12	0.90	3.06 (0.51, 18.45)	0.221
CD4 Count Categories	Obese	0.10	0.42	1.11 (0.49, 2.50)	0.804
	Overweight	0.48	0.38	1.62 (0.78, 3.34)	0.197
	Underweight	−0.41	0.58	0.67 (0.22, 2.06)	0.485
Viral Load Suppression	Obese	−0.20	0.55	0.82 (0.28, 2.37)	0.716
	Overweight	0.31	0.48	1.36 (0.52, 3.58)	0.530
	Underweight	−0.98	0.75	0.37 (0.08, 1.76)	0.212

Discussion

Despite the global scope of the outbreak, establishing a clear epidemiological connection between cases in this study and the endemic region of the mpox virus proved challenging, and it remains to be discovered [4,6]. The swift expansion of the outbreak and notable changes in epidemiology and clinical features added complexity to discerning direct connections [7]. As highlighted in this study, the characteristics of skin lesions, and their severity deviated from previous literature reports, underscoring the evolving nature of mpox in the current outbreak [5,11,15]. Additionally, buccal cavity and upper respiratory tract symptoms were more prevalent in this report than the one reported in the previous Colombian study [18].

An intriguing finding in this study, consistent with other research, is the paramount significance of the sexual route, particularly among men who have sex with men, in driving the outbreak [7,14,19]. This aligns with studies indicating higher viral loads in genital lesions than in other body parts, notably the respiratory tract [20,21].

Complications were not prevalent, although, in other series, cases involving anal receptive sex often necessitate pain-relieving medications. Commonly reported complications include proctitis, tonsillitis, paraphimosis, superinfections, and bacterial abscesses [21,22], some of which were present in this study. The timeline for the appearance of crusts, along with reported symptoms such as fatigue, myalgia, headache, and sore throat, deviated from some literature reports, highlighting the uniqueness of the current outbreak [5,6,8]. Skin lesions and lymphadenopathy were reported in all individuals, followed by mouth and upper respiratory tract symptomatology, indicating the systemic affectation of mpox disease and suggesting a relatively important presence of the mpox virus in mucosal tissues [5,6,20–22].

The high proportion of PLWH in this study, as observed in other cohorts, suggests a broad sexual network, highlighting the need to enhance follow-up and STI diagnosis in this community [22,23]. Notably, the low mortality rate observed in this study is consistent with other reports, underscoring the relatively manageable nature of the IIb mpox infection outbreak. Concomitant STIs were detected in a notable percentage, including Syphilis, Gonococcal infections, Chlamydial infections, and herpes, aligning with similar findings in other reports [22,23], albeit with minor variations in measured proportions in other studies and regions. As well, the proportion found in this paper differs from what was reported in the previous study conducted in Colombia, where only 10 % of cases had concurrent STIs; however, similarly, Syphilis and Gonococcal infections were the most reported diseases [4,6,8,22,23]. Regarding HIV, more than half the individuals had a positive diagnosis, although the proportion of people was smaller than those reported previously in other Colombian series [18]. The results of this study highlight that, although severe complications were infrequent, people with advanced HIV face a higher risk of adverse outcomes, particularly in the presence of severe immunosuppression. Documented cases of necrosis and sepsis in individuals with CD4 $<$ 200 cells/μL suggest that Mpox may manifest as an opportunistic infection in this population, emphasizing the importance of carefully assessing the immunological status of these individuals. These findings coincide with

previous research that has linked severe immunosuppression to higher rates of viral replication and systemic damage. In the Colombian context, this vulnerability may be exacerbated by structural factors such as the lack of access to specific treatments for Mpox, the limited availability of tecovirimat and vaccines, and regional inequalities in the provision of health services. The management of these cases requires a comprehensive clinical approach and a strengthening of public policies to guarantee equitable access to diagnostics and treatments.

On the other hand, the absence of significant differences in clinical outcomes according to the level of viral suppression and CD4 count $\geq$200/μL could indicate that other factors, such as co-infection with STIs (especially syphilis and gonorrhea), also influence the evolution of the disease in people with HIV. This aspect highlights the need for a multidisciplinary approach that includes preventive and therapeutic interventions directed not only at Mpox but also at the comorbidities prevalent in this population.

The findings regarding gastrointestinal symptoms of CD4 counts are particularly interesting. The increased proportion of individuals with gastrointestinal symptoms as the CD4 count rises may suggest a potential correlation between immune status and the manifestation of these symptoms, especially the possible improvement of MALT tissues [24–26]. This finding aligns with the general understanding of the immune system's role in maintaining gut health [25,26]. The comparison to cases without HIV provides context, highlighting that individuals with HIV may experience a distinct pattern of gastrointestinal symptoms influenced by their immunological status. Similarly, the higher prevalence of proctitis symptomatology in all CD4 groups compared to PWoH implies a potential link between immune compromise and an increased likelihood of proctitis [25,26].

The observations related to urethritis symptoms across different CD4 counts add another layer to the complexity of the disease [5,26–29]. The higher prevalence of urethritis in certain CD4 groups might indicate variations in the manifestation of mpox infection based on immune status. This warrants further investigation into how the virus interacts with the genitourinary system in individuals with different CD4 counts [26].

The spread of the hMPXV has been suggested to be partly attributed to the lack of immunity to other Orthopoxviruses, particularly due to the absence of variolation, smallpox vaccination, and exposure to cowpox or horsepox [30]. In this cohort, no person were vaccinated, emphasizing the potential role of vaccination in preventing the virus. Prevention strategies include live, nonreplicating, modified vaccines or the replication-competent smallpox vaccine.

The study reveals noteworthy distinctions in medication utilization and symptomatology between non-suppressed and suppressed populations, providing valuable insights into the clinical repercussions of HIV suppression [26].

Turning to symptomatology, several marked differences were observed. The non-suppressed group demonstrated a higher prevalence of gastrointestinal symptoms (14 % vs 6.7 %), hypothesizing a potential link between incomplete viral suppression and gastrointestinal manifestations. Similarly, a notable disparity in the prevalence of muscle and bone symptoms was noted, with the non-suppressed group exhibiting a higher incidence (38.6 % vs. 25.3 %). This prompts further exploration into the impact of viral replication on musculoskeletal health [26].

Psychological disorders were more prevalent in the non-suppressed group (1.7 % vs. 0.5 %), highlighting potential psychosocial implications associated with inadequate HIV control. Addressing mental health becomes crucial in the comprehensive care of individuals facing challenges in achieving viral suppression [24,26].

Respiratory symptoms also showed a higher incidence in the non-suppressed group (35.1 % vs. 22.3 %), underscoring the complex impact of HIV replication on respiratory health. This finding calls for an in-depth examination of respiratory complications and tailored interventions for this subgroup [24–27].

Urethritis symptoms were more pronounced in the non-suppressed group (5.2 % vs. 2.5 %), suggesting a potential association between incomplete viral suppression and genitourinary manifestations. Understanding the factors contributing to these symptoms is crucial for targeted clinical management [24–27].

The findings of the logistical regression suggest a possible link between BMI and HIV risk, potentially mediated by metabolic or immune system factors. Although syphilis showed a high odds ratio in both models, its association may be influenced by sample size limitations or confounding factors not accounted for in the models. Nevertheless, the observed trend aligns with the well-documented connection between syphilis and increased HIV susceptibility. The multinomial logistic regression for BMI categories further supports these findings, indicating that BMI variations are influenced by multiple factors, including age and HIV status. This underscores the complex interplay between metabolic health and infectious diseases. Our analysis highlights that middle-aged individuals and those in higher BMI categories may have an increased risk of HIV infection.

Lastly, the study highlighted a non-significant difference in the prevalence of syphilis and other STIs, as well as the differences in age groups are consistent with other literature reports of the current outbreak [25,26,28], highlighting the interconnectedness of HIV control and the risk of acquiring additional sexually transmitted infections as well as unknown sexual networks. This underscores the need for comprehensive sexual health strategies tailored to individuals facing challenges in achieving optimal HIV control (24 28–30). Overall, these findings contribute to our understanding of the clinical implications of incomplete viral suppression and point out the importance of tailored interventions for individuals with suboptimal HIV control [24–27,30].

However, certain limitations should be acknowledged in this study. The relatively confined geographic area from which people were recruited may affect the generalizability of the findings to the entire country. Despite recruiting from some of the largest cities in Colombia, the participant institutions demonstrated heterogeneity in individual follow-up and baseline characteristic assessment methods, introducing limitations in outcome and variable measurements; in addition, the lack of data on sociodemographic characteristics could create a limitation in the analysis. The retrospective nature of this research and its focus on some Health institutions further limit the generalizability of the results to the broader population. On the positive side, the study's strengths lie in its substantial number of individuals and the diversity of regions covered, enabling the assessment of a wide array of individuals with different lifestyles. Additionally, using Case Report Forms (CRFs) proposed by the World Health Organization (WHO) provided a standardized approach to capturing cases data and biological variables. This setting enhances the reliability and consistency of the study's findings, contributing to the robustness of the research methodology. The usefulness of the clinical records promoted by WHO for diseases such as COVID or monkeypox demonstrates their usefulness for the clinical characterization and rapid detection of disease patterns as occurred in mpox. Now that the WHO has once again declared the mpox outbreak a public health emergency of international concern with the spread of new clades [30], the rapid consolidation of clinical records allows us to understand whether there are indeed differences in forms of transmission, affected groups, clinical manifestations, lethality, etc., becomes important.

We must mention that in the Americas, social determinants of health play a crucial role in the unequal outcomes of Mpox, especially in people with advanced HIV [31–33]. Factors such as poverty, limited access to healthcare, and structural discrimination perpetuate the vulnerability of certain population groups. In Colombia, these disparities are manifested in the barriers faced by rural, Afro-descendant, and Indigenous communities in accessing timely diagnosis and treatment [34–36]. Additionally, the stigma associated with key populations, such as men who have sex with men and transgender individuals, exacerbates exclusion from the healthcare system, limiting early interventions and increasing the risk of severe complications [37]. This context highlights the need to

address comprehensive healthcare from an equity perspective to mitigate the disproportionate effects of Mpox on the most vulnerable populations.

A challenge highlighted by this study is the lack of access to specific antiviral treatments, and preventive vaccines in Latin America. This inequality reflects not only the centralization of resources in developed regions but also the lack of local infrastructure for the production and distribution of these interventions.

Conclusion

This study significantly enhances our comprehension of the Colombian mpox outbreak. The evidence presented, standardized using Case Report Forms (CRFs), and the comparison with findings from other studies underscore the importance of adopting an interdisciplinary approach in managing people afflicted with mpox. Emphasis should be placed on comprehensive individual support and continuous follow-up, with a particular focus on detecting and addressing concomitant sexually transmitted infections (STIs). The integrated care model, as proposed by this study, is pivotal for providing holistic and effective management to individuals affected by mpox, considering the evolving nature of the virus and its potential impact on various aspects of people health.

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CRediT authorship contribution statement

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Declaration of competing interest

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.gloepi.2025.100197.

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