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Brief Report

Hospitalization risk among patients with Mpox infection—a propensity score matched analysis

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Abstract

Background: Monkeypox (Mpox) is a reemerging, neglected viral disease. By May 2023, worldwide Mpox cases surpassed 87,000. Predictive factors for hospitalization with Mpox are lacking.

Objective: We aim to compare clinical characteristics and outcomes in hospitalized and nonhospitalized patients with Mpox infection.

Design: A multicenter retrospective case-control cohort of patients with Mpox infection.

Methods: We performed a propensity score match analysis from a global health network (TrinetX). We compare clinical characteristics and outcomes between hospitalized and nonhospitalized patients with Mpox.

Results: Of 1477 patients, 6% were hospitalized, 52% required an ED visit, and 29% received treatment at urgent care. After propensity score matching, 80 patients remained in each group. Hospitalizations were more common among Black persons (51% *versus* 33%, $p = 0.01$), people with HIV (50% *versus* 20%, $p < 0.0001$), and those with proctitis (44% *versus* 12.5%, $p < 0.001$).

Conclusion: Independent predictive factors of hospitalization in our cohort for Mpox included people who are Black with a diagnosis of HIV, severe proctitis, pain requiring opioids, and elevated lactate dehydrogenase. Greater recognition of factors associated with increased risk of Mpox severity and hospitalization is paramount.

Keywords: Mpox, Monkeypox virus, HIV/AIDS, hospitalization

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Background

Mpox is a reemerging, neglected viral infection that previously affected African countries over the last 50 years. By May 2023, worldwide Mpox cases surpassed 87,000. In the current outbreak, complications like proctitis, tonsillitis, and skin and soft tissue infections have been reported.[1,2] Mpox infection was associated with increased severity and occasional death in some vulnerable populations, particularly those with advanced human immunodeficiency virus (HIV) infection.[3] We also have a scarcity of drugs available to manage the disease.[4] Immunocompromising conditions are common among hospitalized patients with Mpox, with up to 80% of cases being in people with HIV.[5] However, we lack additional predictive risk factors associated with Mpox severity and hospitalization. Using a global health network, we compared clinical characteristics and outcomes in hospitalized and nonhospitalized patients with Mpox infection.

Methods

Patients ⩾18 years of age with Mpox were identified from TriNetX, a global federated research network, on February 24, 2023. We used the

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International Classification of Diseases and laboratory results to define the Mpox diagnosis (Supplementary Material). The patient population was divided into two cohorts based on the requirement for hospitalization within 1 month after the initial Mpox diagnosis since complications requiring admission are more commonly present within this timeframe. The primary outcome was to compare clinical features by hospitalization status within 1 month after Mpox diagnosis. Medication use, laboratory values, healthcare utilization, and death were compared between groups.

Statistical analyses were completed using the TriNetX platform. Continuous data were compared using independent *t*-tests, whereas categorical data were compared using χ^2 or Fisher's exact test. Outcomes were assessed by propensity score matching. Research utilizing TriNetX does not require ethical approval because patient-identifiable information is not accessible to users.

Results

We identified 1477 patients with Mpox, of which 52% required an emergency department (ED) visit, 29% received treatment at urgent care, and 6% were hospitalized. Among those hospitalized, <1% required ICU care, and no deaths were reported. The hospitalized group was more likely to be White or Black persons (Table 1). Patients requiring hospitalization reported more systemic symptoms and had higher proportions of immunocompromising conditions and HIV. More than half of admitted patients reported rash and a quarter fever, significantly higher than in non-admitted patients. Close to 60% of admitted patients had HIV compared to 31% of non-admitted patients. Syphilis, aplastic anemia, and diabetes mellitus, type 2 (DM2) were more commonly present in hospitalized patients. Overall, proctitis and cellulitis were the most common Mpox complications. While Mpox complications were infrequently recorded, they were significantly more common among hospitalized patients.

CD4 counts were significantly lower, and HIV ribonucleic acid (RNA) viral loads were significantly higher among patients requiring hospitalization. Prior use of opioids, immunosuppressants, and glucocorticoids was greater in those admitted. Tecovirimat and a previous smallpox vaccine were uncommon in both groups.

After propensity score matching, 80 patients remained in each group. Hospitalized patients were more likely to be Black persons (51% *versus* 33% $p = 0.01$). Furthermore, patients requiring admission had a higher prevalence of HIV (50% *versus* 20% $p < 0.0001$) and proctitis (31% *versus* 12.5%, $p = 0.004$) with higher lactate dehydrogenase (LDH; 344 ± 126 *versus* 221 ± 0, $p = 0.006$) and increased use of opioids for pain management (44% *versus* 12.5%, $p < 0.001$).

Discussion

We found a 6% hospitalization rate within 1 month after Mpox diagnosis, in which systemic symptoms and complications associated with Mpox were more common among those admitted. Hospitalized patients with Mpox were disproportionally young Black men with high rates of HIV infection or other immunosuppressive conditions. The reported overall hospitalization rate for

Table 1. Clinical characteristics of Mpox patients by hospitalization status.

Variable, Mean ± SD, *N* (%)	N	Overall, *N* = 1477	Hospitalized, *N* = 89	Nonhospitalized, *N* = 1388	*p*-Value
Demographics					
Age (years),	1477	35 ± 11.8	34 ± 11	35.1 ± 11.9	0.3882
Men	1477	1323 (90%)	80 (90%)	1243 (90%)	0.9203
White	1477	436 (30%)	38 (43%)	398 (29%)	0.0049
Hispanic	1477	212 (14%)	15 (17%)	197 (14%)	0.4877
Black	1477	438 (30%)	45 (51%)	393 (28%)	<0.0001

(Continued)

Table 1. (Continued)

Variable, Mean ± SD, *N* (%)	N	Overall, *N* = 1477	Hospitalized, *N* = 89	Nonhospitalized, *N* = 1388	*p*-Value
Symptoms					
Rash	1477	204 (14%)	49 (55%)	155 (11%)	<0.0001
Fever	1477	81 (5%)	20 (22%)	61 (4%)	<0.0001
Nausea	1477	35 (2%)	11 (12%)	24 (2%)	<0.0001
Headaches	1477	32 (2%)	10 (11%)	22 (2%)	<0.0001
Comorbidities*					
HIV	1477	487 (33%)	51 (57%)	436 (31%)	<0.0001
History of Syphilis	1477	267 (18%)	31 (35%)	236 (17%)	<0.0001
Neoplasm	1477	185 (13%)	17 (19%)	168 (12%)	0.0532
Aplastic anemia	1477	83 (6%)	17 (19%)	66 (5%)	<0.0001
DM2	1477	71 (5%)	12 (14%)	59 (4%)	<0.0001
Transplant status	1477	<10 (<1%)	<10 (<11%)	<10 (<1%)	<0.0001
Complications					
Proctitis	1477	143 (10%)	29 (33%)	114 (8%)	<0.0001
Cellulitis	1477	33 (2%)	15 (17%)	21 (2%)	<0.0001
Tonsillitis	1477	22 (2%)	10 (11%)	12 (1%)	<0.0001
Pneumonia	1477	<10 (<1%)	<10 (<11%)	<10 (<1%)	<0.0001
Labs**					
Creatinine (mg/dL)	315	1.0 ± 10.7	0.9 ± 0.4	1.0 ± 0.3	0.0188
AST (IU/mL)	175	29.1 ± 20	51.5 ± 103	29.2 ± 20.4	0.0052
Leukocytes (10^3/μL)	260	10.8 ± 87.1	10.3 ± 7.0	11.3 ± 64	0.9015
Lymphocytes (10^3/μL)	227	3.0 ± 1.2	2.5 ± 2.2	2.2 ± 2.5	0.5384
Hemoglobin (mg/dL)	254	14.5 ± 1.64	13.6 ± 1.8	14.5 ± 1.6	0.0004
Hemoglobin A1c (%)	43	5.87 ± 1.68	5.4 ± 1.1	5.9 ± 1.7	0.3609
CD4 count (cells/μL)	107	600 ± 336	286 ± 283	618 ± 337	0.0003
HIV RNA (copies/mL)	33	39k ± 81k	248k ± 200k	31k ± 73k	<0.0001
LDH (U/L)	24	254 ± 121	304 ± 131	261 ± 125	0.3823
Ferritin (ng/mL)	28	196 ± 90.6	234.6 ± 254.4	175.1 ± 88.6	0.635

(Continued)

Table 1. (Continued)

Variable, Mean ± SD, *N* (%)	N	Overall, *N* = 1477	Hospitalized, *N* = 89	Nonhospitalized, *N* = 1388	*p*-Value
Medications					
Opioid analgesics	1477	113 (8%)	40 (45%)	73 (5%)	<0.0001
Glucocorticoids	1477	107 (7%)	20 (22%)	87 (6%)	<0.0001
Immunosuppressants***	1477	10 (1%)	<10 (<11%)	10 (<1%)	<0.0001
Tecovirimat#	1477	<10 (<1%)	<10 (<11%)	<10 (<1%)	<0.0001
Vaccinia virus	1477	<10 (<1%)	<10 (<11%)	<10 (<1%)	<0.0001

In TriNetX, patient counts ⩽10 are rounded to 10, so the exact number is obfuscated for privacy purposes. DM2, Diabetes Mellitus, type 2
*Capture of comorbidities was not time bounded. Other variables were captured within 3 months before the Mpox diagnosis.
**Laboratory tests were not performed for all patients, which likely reflected differences in institutional and clinical practices.
***Immunosuppressants included: Tacrolimus, Mycophenolate mofetil, Mycophenolic acid, Cyclosporine, Azathioprine, Sirolimus, Infliximab, Basiliximab, Belatacept, Omalizumab, Siltuximab, Belumosudil, and Ustekinumab.
#Use of the medication within a month after Mpox infection.

paients with Mpox is 14%;[6] Higher for those with HIV (8% *versus* 3%). Additionally, patients with HIV are more likely to be symptomatic or present to the ED.[7] In addition to advanced HIV,[3] a history of organ transplantation and hematological malignancy are common among those hospitalized,[5] as seen in our study. We also observed higher HIV viral loads and lower CD4 counts in those admitted suggesting poor virologic control. People with HIV had more severe Mpox infections and presented with widespread, significant, necrotizing lesions and mucosal involvement.[3]

Mpox severity and hospitalization have disproportionately affected persons from minority ethnicities, mainly Black or African American, or Hispanic persons. We need to emphasize the importance of early disease recognition and increase the availability of Mpox vaccination, access to antiretroviral therapy, and linkage to care to close the racial disparity gap. In a report from Georgia, despite Black persons making up to 79% of Mpox infections, only 45% have received the first dose of the Jyneos vaccine.[8] Additionally, Black persons are less likely to receive tecovirimat than White or Hispanic persons based on data from CDC.

Independent predictive factors of hospitalization in our cohort for Mpox included people who are Black, a diagnosis of HIV, severe proctitis, pain requiring opioids, and elevated LDH.

Our study has some limitations. The retrospective nature of the follow-up cohort may introduce selection bias. Isolating the effect of hospitalization is complex and multifactorial, and selected available data may confound differences.

Conclusions

People with HIV, particularly those with poorly controlled HIV and Black persons are at increased risk of Mpox severity and hospitalization. Additional immunosuppressive conditions such as hematological malignancy and neoplasm may also play a role. Possible contributing causes for admission are increased tissue injury, proctitis, and pain. Increased awareness and vaccination of those populations at risk are paramount.

Declarations

Ethics approval and consent to participate

Any data displayed on the TriNetX Platform in aggregate form, or any patient-level data provided in a data set generated by the TriNetX Platform, only contains de-identified data as per the de-identification standard defined in Section §164.514(a) of the HIPAA Privacy Rule. Geographic reporting at the regional level prevents potential re-identification through the localization of patients or HCOs. Research utilizing TriNetX does not require ethical approval because patient-identifiable information is not accessible to users.

Consent for publication
Not applicable.

Author contributions
Andrés F. Henao-Martínez: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Project administration; Resources; Software; Supervision; Validation; Visualization; Writing – original draft; Writing – review & editing.

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Carlos Franco-Paredes: Conceptualization; Supervision; Writing – review & editing.

Jose Tuells: Investigation; Supervision; Writing – review & editing.

Daniel B. Chastain: Conceptualization; Data curation; Investigation; Methodology; Resources; Supervision; Writing – original draft.

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Availability of data and materials
The corresponding author had full access to data in the study and had final responsibility for the decision to submit the manuscript for publication. The datasets generated and analyzed in the current study are available from those subscribed to TrinetX or from the corresponding author upon reasonable request.

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Supplemental material
Supplemental material for this article is available online.

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