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REVIEW ARTICLE

BIOMARKERS OF SEVERE MPOX: HEMATOLOGY-DRIVEN PROGNOSTIC PANEL - A PERSPECTIVE

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Abstract

The 2022–2024 multi-country Mpox outbreaks have highlighted the urgent need for early, accessible prognostic tools to identify patients at risk of severe disease. Hematologic biomarkers offer a practical, low-cost approach for risk stratification, particularly in resource-limited settings. This perspective explores the potential of integrating common hematological parameters into a prognostic panel for severe Mpox, highlighting current evidence, limitations, and future research directions. The paper summarized the pathophysiological rationale for key hematologic markers including lymphopenia, neutrophilia, neutrophil-to-lymphocyte ratio, thrombocytopenia, hemoglobin decline, and inflammatory indices as indicators of disease severity. Provisional thresholds for these biomarkers, currently extrapolated from analogous viral infections, are proposed to guide future validation studies. A structured severity framework is introduced to standardize clinical assessment and facilitate early risk stratification. Research gaps are discussed, including the need for Mpox-specific data, evaluation in immunocompromised populations, multicenter validation, and integration with therapeutic monitoring. Hematology-driven prognostic panels represent a promising approach for early identification of patients at risk of severe Mpox. By providing a practical, scalable tool, such panels could improve clinical management, guide treatment prioritization, and inform public health strategies. Future studies are essential to validate and refine these biomarkers for clinical implementation.

Keywords: biomarkers, hematology, Mpox, prognosis, severity prediction.

INTRODUCTION

Mpox, previously referred to as monkeypox, is a developing zoonotic illness caused by the Mpox virus, which belongs to the Orthopoxvirus genus. Originally limited to Central and West Africa, Mpox has evolved from being endemic to a worldwide public health issue after several outbreaks occurred in non-endemic areas starting in 2022. The illness presents as a feverish condition accompanied by a typical vesiculopustular rash, but its clinical progression can differ significantly, ranging from mild self-resolving symptoms to serious systemic issues affecting the respiratory, neurological, and hematologic systems. This variation highlights the necessity for strong instruments to forecast illness severity and direct timely clinical actions[1]. The intensity of Mpox infection is influenced by various factors, such as viral clade, viral load, and the immune status of the host, existing health issues, and availability of prompt medical attention. The Central African clade, for instance, has traditionally been linked to greater mortality than the West African clade. Patients with weakened immune systems, including individuals with HIV/AIDS, cancer, or those receiving immuno-suppressive treatment, face a higher risk of severe illness. Kids, expectant mothers, and people with nutritional deficiencies also show heightened susceptibility. Timely recognition of patients at risk of developing complications continues to be a top clinical focus during outbreaks[2,3].

In numerous healthcare environments especially in low-resource areas diagnostic approaches largely depend on clinical evaluation and confirmatory polymerase chain reaction (PCR) testing for viral DNA. Although PCR is considered the gold standard for diagnosis, it offers minimal insight into disease progression or outlook. This gap is especially concerning during significant outbreaks, when healthcare systems are overwhelmed and the capacity to triage efficiently is crucial. As a result, there is an increasing demand for accessible, affordable, and reliable prognostic tools[4]. Hematologic markers, obtained from standard complete blood counts (CBC) and fundamental coagulation profiles, present a promising path for forecasting Mpox severity. These parameters are advantageous as they are commonly accessible, even in rural healthcare settings, and can be

performed repeatedly at a low cost during the illness progression. Data from other viral infections like COVID-19, dengue fever, and Ebola virus disease indicate that blood-related abnormalities especially alterations in white blood cell types, platelet levels, hemoglobin concentrations, and coagulation indicators frequently associate with disease progression and outcomes[5,6].

In Mpox, new reports have noted typical hematologic alterations in severe instances, such as lymphopenia, thrombocytopenia, anemia, and irregular coagulation profiles. The neutrophil-to-lymphocyte ratio (NLR) has gained interest as a combined indicator of immune activation and suppression, demonstrating the relationship between systemic inflammation and adaptive immune response. Grasping the mechanisms behind these alterations could allow clinicians to analyze laboratory results in a more insightful way and act sooner in the progression of the disease[7]. Additionally, incorporating hematologic biomarkers into a well-organized prognostic panel may improve clinical decision-making. This panel could classify patients into different risk levels, aiding in decisions regarding hospital admission, starting antiviral treatments, and the level of supportive care needed. This strategy reflects effective models employed in the management of other infectious diseases, as integrated biomarker scoring systems have enhanced patient results by facilitating prompt care escalation for individuals at the greatest risk.

Historical Case Identification of Mpox

Mpox, caused by the Monkeypox virus, was first identified in humans in the Democratic Republic of Congo (DRC) in 1970, shortly after smallpox eradication. For decades, cases remained largely confined to Central and West African endemic regions, with sporadic outbreaks linked to zoonotic transmission from rodents and non-human primates. Early case reports highlighted the typical clinical presentation of febrile illness, rash, and lymphadenopathy, with severe disease more common in children and immuno-compromised individuals[8]. Since 2003, Mpox has increasingly been reported outside Africa, including North America and Europe, often associated with international travel or imported animals. These non-endemic outbreaks underscore the global relevance of early detection and risk stratification. Patterns from historical and recent outbreaks reveal variability in severity, clinical manifestations, and hematologic profiles, reinforcing the need for standardized definitions and predictive biomarkers[9]. Understanding the historical trajectory of Mpox cases provides context for current epidemiology, highlights the evolution of clinical management, and emphasizes the critical role of hematologic biomarkers in developing prognostic tools, particularly for early identification of patients at risk of severe disease.

Hematologic biomarkers in severe Mpox

Hematologic alterations in Mpox infection have emerged as clinically relevant indicators of disease progression and severity. While most patients present with mild laboratory changes, severe cases exhibit marked deviations in key hematologic parameters that reflect both viral pathogenesis and host immune responses. These changes often precede overt clinical deterioration, making them valuable tools for early risk assessment[8,9]. Lymphopenia is one of the most consistent findings in severe Mpox. Reduction in lymphocyte count may result from direct viral cytotoxicity, immune cell apoptosis mediated by pro-inflammatory cytokines, or sequestration of lymphocytes in lymphoid tissues and infected organs. In advanced disease, sustained lymphopenia correlates with higher viral loads, impaired viral clearance, and increased mortality risk[10,11]. Thrombocytopenia is also frequently observed, particularly in patients with systemic involvement. Platelet depletion in Mpox may occur through multiple mechanisms, including immune-mediated destruction, consumption within micro-thrombi, bone marrow suppression, or endothelial injury leading to increased platelet activation and clearance. In some cases, thrombocytopenia heralds the development of bleeding complications or progression to disseminated intravascular coagulation (DIC)[12]. The neutrophil-to-lymphocyte ratio (NLR) has gained recognition as a composite marker of systemic inflammation and immune suppression. Elevated NLR in Mpox likely reflects the dual processes of neutrophilia driven by cytokine-mediated myelopoiesis and acute-phase inflammatory responses and lymphopenia. Studies in other viral diseases have shown that a high NLR predicts poor prognosis, and emerging evidence suggests a similar trend in Mpox, particularly when NLR values are markedly elevated at presentation[13,14]. Anemia in severe Mpox can result from hemolysis, chronic inflammation, bone marrow suppression, or blood loss due to ulcerative muco-cutaneous lesions. Decreased hemoglobin levels may contribute to tissue hypoxia, exacerbating organ dysfunction and delaying recovery. Persistent or worsening anemia during the disease course is often a sign of systemic involvement and warrants further investigation[15]. Coagulation abnormalities such as prolonged prothrombin time (PT), activated partial thromboplastin time (aPTT), and elevated D-dimer levels have been documented in severe Mpox. These findings reflect activation of the coagulation cascade, often secondary to systemic inflammation, endothelial injury, and viral replication within vascular structures. Such changes not only indicate severe disease but also guide clinical decisions regarding thromboprophylaxis and supportive care (Table 1a and Table 1b)[16,17].

Defining severe Mpox and proposed framework

Accurate identification of severe Mpox is critical for clinical management, prognostication, and research standardization. Definitions of severity in the literature vary, incorporating clinical presentation, laboratory findings, and outcomes such as hospitalization or complications. To provide clarity and support the development of hematology-driven prognostic tools, we summarize existing criteria and propose a standardized framework (Table 2). Clinical criteria commonly cited include extensive mucocutaneous lesions, hemorrhagic manifestations, respiratory compromise, encephalitis, or other organ involvement.

Table 1a: Hematologic biomarkers in severe Mpox

Biomarker	Typical Change in Severe Mpox	Underlying Mechanism	Clinical Relevance
Lymphocyte count	Decreased (Lymphopenia)	Viral cytopathic effects, cytokine-induced apoptosis, immune cell trafficking	Correlates with immune suppression, higher viral load, poor prognosis
Platelet count	Decreased (Thrombocytopenia)	Endothelial injury, platelet consumption in microthrombi, immune-mediated destruction	Signals bleeding risk, progression to coagulopathy, poor outcomes
Neutrophil-to-Lymphocyte Ratio (NLR)	Increased (Elevated NLR)	Neutrophilia from inflammation; lymphopenia reduces adaptive immunity	Marker of systemic inflammation; predicts disease severity and progression
Hemoglobin	Decreased (Anemia)	Bone marrow suppression, hemolysis, chronic inflammation, blood loss	Indicates tissue hypoxia, systemic involvement, worse clinical course
Coagulation parameters (PT, aPTT, D-dimer)	Prolonged PT/aPTT; elevated D-dimer	Endothelial dysfunction, cytokine storm, activation of coagulation cascade	Reflects risk of thrombosis and bleeding; guides anticoagulant therapy

Table 1b: Hematologic biomarkers in severe Mpox: Reference ranges and data availability.

Biomarker	Observed Changes in Severe Mpox	Reference Range/Thresholds	Data Source/Notes
Lymphocyte count	Lymphopenia	1.0–3.5 ×10⁹/L (adults)	Limited Mpox-specific data; trend extrapolated from viral infections
Neutrophil count	Neutrophilia	2.0–7.5 ×10⁹/L	Sparse Mpox-specific data; derived from general viral infection patterns
Neutrophil-to-Lymphocyte Ratio (NLR)	Elevated	>5.0 (provisional)	Extrapolated from COVID-19 and other viral infections; requires Mpox validation
Platelet count	Thrombocytopenia	150–450 ×10⁹/L	Limited Mpox-specific reports; consistent with orthopoxvirus trends
Hemoglobin	Decline/anemia	12–16 g/dL (female), 13–17 g/dL (male)	Provisional thresholds (<10 g/dL) extrapolated from viral disease data
C-Reactive Protein (CRP)	Elevated	<10 mg/L	Limited Mpox-specific measurements; used as general inflammatory marker
Ferritin	Elevated	30–400 ng/mL	Sparse data in Mpox; mostly from analogues (COVID-19, Ebola)
Prothrombin Time (PT) / aPTT	Prolonged in severe cases	PT: 11–13.5 sec; aPTT: 25–35 sec	Data limited in Mpox; indicative of coagulation abnormalities

Laboratory criteria often reference significant lymphopenia, neutrophilia, thrombocytopenia, elevated inflammatory markers (CRP, ferritin), or coagulopathy. Outcome based criteria include hospitalization, requirement for intensive care, or mortality.Our proposed framework integrates these elements into a structured approach to classify Mpox severity, allowing consistent risk stratification and comparison across studies and clinical settings.

Pathophysiologic links between hematologic changes and Mpox severity

The hematologic alterations observed in severe Mpox reflect a complex interplay between viral replication, immune dysregulation, and host tissue injury. Understanding these mechanisms provide insight into why certain laboratory abnormality strongly correlate with adverse outcomes and supports their inclusion in prognostic frameworks. Lymphopenia in Mpox can be traced to several mechanisms. Direct infection of lymphoid tissues, particularly the spleen and lymph nodes, leads to structural disruption and apoptosis of lymphocytes. Cytokines such as tumor necrosis factor-alpha (TNF-α) and interleukin-6 (IL-6) amplify lymphocyte depletion by inducing apoptosis and suppressing lymphopoiesis in the bone marrow. Moreover, activated lymphocytes may migrate in large numbers to infected tissues, depleting circulating levels and impairing systemic immune surveillance[2]. Thrombocytopenia is frequently linked to endothelial injury caused by viral replication within vascular linings. Damaged endothelium exposes subendothelial collagen, triggering platelet adhesion, activation, and consumption. Additionally, Mpox-induced systemic inflammation promotes the release of procoagulant factors, accelerating platelet use in microthrombi formation. In some cases, immune complexes formed during the antiviral response may also target platelets, further contributing to their decline[3]. An elevated neutrophil-to-lymphocyte ratio (NLR) mirrors the inflammatory-immune imbalance in severe Mpox. Neutrophilia is driven by emergency granulopoiesis, a bone marrow response to high circulating levels of granulocyte colony-stimulating factor (G-CSF) and other chemokines. Simultaneously, lymphopenia diminishes adaptive immune capacity. This shift toward innate immune predominance may control early infection but, if prolonged, can promote tissue damage, systemic inflammation, and a poorer prognosis[4]. Anemia in Mpox often develops through multifactorial pathways.

Table 2: Summary of severe Mpox definitions and proposed severity framework

Severity Domain	Reported Criteria in Literature	Proposed Framework for Standardized Assessment
Clinical	Extensive skin lesions (>100), mucosal involvement, hemorrhage, encephalitis, respiratory compromise	Mild: <50 lesions, no systemic involvement; Moderate: 50–100 lesions, mild systemic symptoms; Severe: >100 lesions, systemic organ involvement or hemorrhagic signs
Laboratory	Lymphopenia, neutrophilia, thrombocytopenia, elevated CRP/ferritin, prolonged PT/aPTT	Mild: no abnormal lab trends; Moderate: 1–2 abnormal markers; Severe: ≥3 abnormal hematologic/inflammatory markers
Outcome-Based	Hospitalization, ICU admission, mortality	Mild: outpatient management; Moderate: hospitalization without ICU; Severe: ICU admission or death

Chronic inflammation triggers the release of hepcidin, impairing iron mobilization and contributing to anemia of inflammation. In addition, hemolysis may occur through immune-mediated mechanisms or direct red blood cell damage in the microvasculature. Bone marrow suppression, whether from cytokine-mediated toxicity or viral invasion of hematopoietic cells, also limits red blood cell production[5]. Coagulation abnormalities in severe Mpox represent the culmination of endothelial dysfunction, cytokine storm, and systemic activation of coagulation pathways. Elevated D-dimer levels indicate fibrin degradation from widespread clot formation and breakdown. Prolonged prothrombin time (PT) and activated partial thromboplastin time (aPTT) signal depletion of clotting factors, often in the context of disseminated intravascular coagulation (DIC). This hypercoagulable-hypocoagulable shift heightens both thrombotic and bleeding risks, complicating patient management (Table 3)[6].

Table 3: Pathophysiologic links between hematologic changes and Mpox severity.

Hematologic Change	Pathophysiologic Mechanism	Impact on Mpox Severity
Lymphopenia	Direct viral infection of lymphoid tissue; cytokine-induced apoptosis; lymphocyte sequestration	Impaired immune response; higher viral load; delayed viral clearance; poor prognosis
Thrombocytopenia	Endothelial injury exposing subendothelial collagen; platelet activation and consumption; immune-mediated platelet destruction	Increased bleeding risk; microthrombi formation; progression to disseminated intravascular coagulation (DIC)
Elevated Neutrophil-to-Lymphocyte Ratio (NLR)	Emergency granulopoiesis stimulated by inflammatory cytokines; lymphocyte depletion diminishes adaptive immunity	Reflects systemic inflammation; correlates with tissue damage and worse outcomes
Anemia	Bone marrow suppression; immune-mediated hemolysis; chronic inflammation inducing iron sequestration	Tissue hypoxia; exacerbation of organ dysfunction; delayed recovery
Coagulation Abnormalities	Cytokine storm and endothelial dysfunction triggering coagulation cascade activation; fibrin formation and degradation	Hypercoagulability followed by factor depletion; risk of thrombosis and hemorrhage

Prognostic panel proposal

Developing a hematology-driven prognostic panel for Mpox offers an opportunity to translate routine laboratory findings into actionable clinical insights. The proposed panel integrates five key biomarkers lymphocyte count, platelet count, neutrophil-to-lymphocyte ratio (NLR), hemoglobin level, and coagulation parameters (prothrombin time [PT], activated partial thromboplastin time [aPTT], or D-dimer) selected for their demonstrated association with severe disease and their accessibility in most healthcare settings[18]. The proposed framework involves assigning weighted scores to each parameter based on deviation from normal ranges and their established correlation with adverse outcomes in viral infections. For example, severe lymphopenia ($<1.0\times10^9$/L) and marked thrombocytopenia ($<100\times10^9$/L) may be allocated higher scores due to their strong predictive value. Elevated NLR (>5.0), anemia (hemoglobin <10 g/dL), and significantly prolonged PT or elevated D-dimer levels would each contribute additional risk points. The cumulative score would stratify patients into low-, intermediate-, and high-risk categories for disease progression[19].

This scoring approach mirrors successful prognostic tools used in other infectious diseases, such as the CURB-65 score in pneumonia or the SOFA score in sepsis, but it is simplified for rapid application in outbreak settings. Importantly, the panel could be adapted to reflect local laboratory reference ranges and epidemiologic data, enhancing its relevance in different geographic regions and healthcare contexts[20,21]. Integration of the panel into clinical workflows could occur at multiple stages: initial patient assessment, routine monitoring during hospitalization, and follow-up after discharge to detect delayed complications.

In resource-limited settings, the panel could serve as a substitute for more expensive imaging or advanced biomarker assays, ensuring equitable access to risk assessment tools[22,23]. Beyond clinical care, the prognostic panel holds value in research and public health. In clinical trials, it could function as a standardized metric for stratifying participants or evaluating therapeutic interventions. In outbreak management, aggregated panel scores from multiple patients could inform epidemiologic surveillance and resource deployment[23]. While promising, this proposed panel requires rigorous validation. Prospective multicenter studies should assess its predictive accuracy, inter-laboratory reproducibility, and impact on patient outcomes. Additionally, thresholds and weightings must be refined to balance sensitivity and specificity, avoiding both underestimation and over-estimation of disease risk.

Provisional thresholds and extrapolated biomarkers

Due to the limited availability of Mpox-specific data on hematologic predictors of severe disease, certain biomarker thresholds proposed in this perspective such as a neutrophil-to-lymphocyte ratio (NLR) >5.0 and hemoglobin <10 g/dL are extrapolated from research on analogous viral infections, including COVID-19, Ebola, and dengue. These values are intended as provisional reference points to guide early risk stratification rather than definitive clinical cut-offs[24].These provisional thresholds provide a structured framework for identifying patients who may be at higher risk of severe outcomes and support the development of hematology-driven prognostic panels. Importantly, we emphasize that these markers require prospective validation in Mpox-specific cohorts. Future studies should refine these thresholds, accounting for viral strain variations, demographic differences, and comorbidities such as HIV co-infection. By clearly distinguishing between extrapolated and Mpox-specific data, this approach ensures that the prognostic panel remains both practical and scientifically grounded[25].

Impact of HIV co-infection on hematologic biomarkers and prognostic panel utility

HIV co-infection presents unique challenges in interpreting hematologic biomarkers in Mpox patients. Immunosuppression associated with HIV, particularly

in individuals with low CD4 counts or uncontrolled viremia, can independently alter key hematologic parameters, including lymphocyte depletion, neutrophil dysregulation, and thrombocytopenia. These alterations may confound the predictive value of the proposed Mpox hematology-driven prognostic panel, potentially leading to under- or overestimation of disease severity[26].

Existing evidence suggests that HIV-infected individuals may experience more severe Mpox outcomes, including increased lesion burden, prolonged viral shedding, and higher rates of systemic complications. Consequently, hematologic thresholds derived from the general population may not be directly applicable, underscoring the need for tailored risk stratification strategies[27]. Future studies should systematically evaluate the impact of HIV status, CD4 count, viral load, and antiretroviral therapy on the performance of hematologic biomarkers in Mpox. Such research will enable refinement of the prognostic panel for immunocompromised populations, ensuring accurate early identification of high-risk patients and optimizing clinical management in regions where both Mpox and HIV are endemic[28].

Impact of current antiviral and supportive treatments on hematologic biomarkers

Current management of Mpox primarily includes antiviral therapy, most notably tecovirimat, alongside supportive care measures such as hydration, pain management, and treatment of secondary infections. Emerging evidence suggests that these interventions may influence hematologic parameters, potentially altering the trajectory of biomarkers included in prognostic panels. For example, effective antiviral therapy may reduce systemic inflammation, mitigate lymphopenia, and stabilize neutrophil and platelet counts, thereby affecting the predictive value of thresholds like NLR >5.0 or hemoglobin <10 g/dL[30].

Supportive care interventions, while not directly targeting viral replication, may also impact hematologic readouts through improved hydration, correction of anemia, or management of coagulopathy. These effects underscore the importance of understanding treatment-related modulation of biomarkers when applying a hematology-driven prognostic panel[31]. Prospective studies are urgently needed to evaluate how antiviral and supportive therapies influence biomarker dynamics and overall panel performance. Such studies will enable refinement of thresholds, timing of assessments, and risk stratification, ensuring that the prognostic panel remains accurate and clinically useful for both treated and untreated patients. This knowledge will be especially critical in resource-limited settings, where early identification of high-risk patients can guide targeted interventions and optimize outcomes[32].

Validation challenges of hematology-driven prognostic panels

While hematologic biomarkers hold promise for early identification of patients at risk of severe Mpox, several challenges complicate their validation and widespread application. First, limited Mpox-specific data restrict the ability to establish robust thresholds for biomarkers such as lymphocyte count, neutrophil-to-lymphocyte ratio (NLR), platelet count, and hemoglobin. Many proposed values are extrapolated from other viral infections, underscoring the need for prospective studies in Mpox cohorts[33].

Second, variability in laboratory protocols, reference ranges, and assay sensitivity across regions and healthcare settings may affect reproducibility and comparability of results. This is particularly relevant in resource-limited environments, where standardization of hematologic measurements may be challenging[34]. Third, demographic factors, comorbidities (e.g., HIV co-infection), and viral strain differences may influence biomarker dynamics, complicating interpretation and risk stratification. Longitudinal studies capturing these variables are essential to refine predictive models. Finally, treatment interventions including antiviral therapy and supportive care can modulate hematologic parameters, potentially impacting the prognostic accuracy of the panel. Validation studies must account for these effects to ensure clinical utility.

Clinical implications

Incorporating a hematology-focused prognostic panel into Mpox management may significantly enhance patient outcomes by facilitating earlier, more precise interventions. In acute care environments, the panel offers an unbiased, evidence-driven approach to recognize patients who are at risk of quick decline. Patients identified as high risk could be given priority for hospital admission, enhanced monitoring, and prompt start of antiviral treatment, while those at low risk can be effectively managed in outpatient environments with diligent follow-up. This method enhances the utilization of scarce healthcare resources, especially during increases in outbreaks[24,25]. In inpatient treatment, continuous monitoring of panel elements enables healthcare providers to observe disease progression in real time. For instance, deteriorating lymphopenia, decreasing platelet levels, or increasing NLR despite therapy might indicate treatment failure or additional complications, leading to a need for greater care. In the same way, identifying coagulation irregularities may facilitate timely start of thromboprophylaxis or more intensive supportive actions to avert bleeding and thrombotic occurrences[26,27]. From a public health viewpoint, extensive adoption of the panel may improve outbreak responses by delivering community-level information on trends in disease severity. This data could guide the assignment of hospital beds, the arrangement of specialized teams, and the allocation of restricted antiviral supplies. Additionally, the prognostic panel may facilitate tele-medicine approaches, allowing remote patient triage based on lab results sent from local facilities to central specialists[28]. The panel also has research utility, serving as a standardized tool for stratifying patients in clinical trials or observational studies. This could improve comparability between studies and accelerate the identification of therapeutic strategies that are most effective in high-risk patients.

Research gaps and future directions

Despite the growing interest in hematology-driven prognostic markers for Mpox, several critical gaps remain. First, Mpox-specific data on hematologic

biomarkers are limited, and much of the current understanding is extrapolated from other viral infections. Prospective studies are urgently needed to validate the relevance, thresholds, and predictive value of lymphopenia, neutrophilia, thrombocytopenia, and inflammatory markers in Mpox patients[29,30]. Second, the impact of comorbidities, particularly HIV co-infection, on hematologic parameters and their prognostic utility remains poorly understood. Investigating these interactions is essential, especially in regions with high HIV prevalence, to ensure that prognostic panels are broadly applicable and accurate[31].

Third, there is a lack of multicenter, harmonized studies evaluating the performance of hematology-driven panels across diverse populations, viral clades, and healthcare settings. Establishing global collaborations and standardized laboratory protocols will be critical to validate these biomarkers, improve comparability, and facilitate integration into clinical practice[33]. Fourth, the influence of therapeutic interventions, including antiviral therapy and supportive care, on biomarker dynamics and prognostic accuracy remains largely unexplored. Longitudinal studies assessing biomarker trajectories during treatment can refine risk stratification and guide clinical decision-making[34]. Finally, while PCR remains the gold standard for Mpox diagnosis, the development of complementary, rapid hematology-based tools could enhance early severity assessment, particularly in resource-limited settings. Future research should focus on integrating hematologic markers with clinical scoring systems, machine learning approaches, and digital health platforms to optimize early identification of patients at risk for severe disease[35].

CONCLUSIONS

Hematologic biomarkers provide a useful and informative way to predict serious illness in Mpox infection. Crucial factors like lymphopenia, thrombocytopenia, raised neutrophil-to-lymphocyte ratio, anemia, and clotting irregularities indicate fundamental pathophysiological mechanisms that contribute to clinical decline. Incorporating these markers into a systematic prognostic panel provides an economical, accessible, and scalable instrument for early risk classification, assisting in clinical decision-making and resource distribution. Though promising, this method needs additional validation via prospective, multicenter studies that define standardized thresholds and assess predictive accuracy among various populations. Integrating hematologic biomarkers with additional clinical and laboratory information could improve prognostic accuracy. Ultimately, utilizing regular hematology tests to pinpoint patients most at risk of severe Mpox could enhance patient outcomes, streamline healthcare services, and bolster global outbreak response initiatives.

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AUTHOR'S CONTRIBUTIONS

Obeagu EI: conceptualization, methodology, supervision, literature search, manuscript drafting, critical revision, and final approval of the manuscript. **Nwankwo OB:** literature review, methodology, manuscript revision, and final approval of the manuscript. Final manuscript was checked and approved by all authors.

DATA AVAILABILITY

The related author can provide the empirical data supporting the study's conclusions upon request.

CONFLICT OF INTEREST

There are no conflicts of interest in regard to this project.

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