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A Systematic Review of the Effects of the COVID-19 Pandemic on Laboratory Systems in West Africa

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ADMINISTRATIVE INFORMATION

Support - No funding was received to conduct this review.

Review stage at the time of initial registration - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 7 November 2026 and was last updated on 7 November 2026.

INTRODUCTION

Review question / Objective Research question: How devastating were the effects of the COVID-19 pandemic on the health laboratory systems in West Africa, and what responses were documented?
The main objective was to assess the extent of the COVID-19 pandemic's impact on West African health laboratory systems and synthesize lessons learned to shape laboratory-centered pandemic preparedness in the Subregion.

Rationale Despite half a decade of post-Ebola investments, West Africa's laboratory system entered the COVID-19 pandemic with significant structural fragilities, manifested in limited molecular diagnostic infrastructure, an inadequate biomedical workforce, near-total dependence on imported reagents and consumables, fragmented information systems, and uneven sub-national reach. While impressive scale-up was achieved during the pandemic – from 2 to 43 testing-capable African countries in three months, and from 3 to 158 SARS-CoV-2 laboratories in Nigeria over two years – the gains were achieved largely through emergency repurposing of tuberculosis platforms, donor-funded reagent flows, and ad hoc workforce mobilization rather than through structural reform. To further explain the fragility, the sub-region reported inequities in access to COVID-19 tests, unacceptable turnaround times for test results, weak integration of laboratory data into surveillance systems, and a continued insignificant (1%) share of global SARS-CoV-2 genomic sequences from African laboratories.
The disengagement of partners after the acute phase of the pandemic, the contraction of donor financing in the post-pandemic period, and the broader fragmentation of the global health-security architecture create a real risk that capacity built during COVID-19 will erode, replicating the post-Ebola pattern of capacity decay. Current studies on the West African laboratory response have been country-specific (e.g., Nigeria, Ghana, Mali, Senegal, The Gambia, Benin, Niger), descriptive,

and have focused mainly on the early phase of the pandemic. Few have applied a coherent health-systems-resilience framework, integrated quantitative laboratory-performance data with qualitative accounts from laboratory directors, biomedical scientists, and policymakers, or examined whether the lessons learned have been translated into institutionalized preparedness reforms across the West African subregion.
This study addresses these gaps by systematically reviewing eligible previous studies, assessing their methodological designs and quality, and synthesizing their results to create a unified, reliable, and unbiased report on the effects of the COVID-19 pandemic and subsequent global lockdowns on West African laboratory systems.

Condition being studied Effects of COVID-19 pandemic on West African Laboratory Systems.

METHODS

Search strategy This systematic review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines. PubMed, EMBASE, and WHO Global Index Medicus were searched for literature published between March 2020, when the COVID-19 outbreak was declared a pandemic, and February 2026.

Participant or population Human health laboratory systems. These included people working in public health and clinical labs; national reference laboratories; hospital laboratories; and peripheral sites in West Africa (Benin, Burkina Faso, Cabo Verde, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo).

Intervention The COVID-19 pandemic.

Comparator Not applicable.

Study designs to be included Observational studies, interventional studies, systematic reviews, and Cochrane reports.

Eligibility criteria • Quantitative or qualitative studies
• Human studies
• Studies that focused on COVID-19
• Studies that measured COVID-19 effects or impacts on laboratory services
• Geographical areas of study limited to the West African subregion.

Information sources PubMed, EMBASE, WHO Global Index Medicus, and grey literature sources.

Main outcome(s) The outcomes were the diagnostic/testing capacity (platform count, tests/day), turnaround time, testing coverage/utilization, stock and supply chain performance, workforce/skills, quality management, and biosafety/biosecurity.

Quality assessment / Risk of bias analysis The methodological quality of included studies was assessed independently by two independent reviewers using the Mixed Methods Appraisal Tool (MMAT) version 2018. The MMAT was selected because it allows concomitant appraisal of diverse study designs within a single framework, including mixed-methods, quantitative descriptive, and non-randomized studies. We assessed each study against the five methodological quality criteria relevant to its design category. Reviewers resolved disagreements by discussing them with a third assessor. In accordance with MMAT guidelines, we did not calculate overall quality scores; instead, we reported detailed criterion-level assessments.

Strategy of data synthesis Following the quality assessment of the selected literature, a meta-analysis was attempted to quantitatively synthesize and present the pooled findings. Data extraction from the included studies was performed using Elicit, an AI-powered research assistant to identify and tabulate continuous outcome data, study characteristics, and data completeness indicators. All the extracted data were reviewed and verified against the original source documents.
The full texts were assessed for heterogeneity, and substantial clinical and methodological heterogeneity was observed across the studies, precluding meta-analytic pooling; thus, a narrative synthesis was conducted instead.
Because of the significant heterogeneity observed in the study design, setting, and outcome measurement across the ten included studies, narrative synthesis was adopted as the primary method of data synthesis and evidence integration, in line with the Synthesis Without Meta-Analysis (SWiM) reporting guideline.

Subgroup analysis Qualitatively, the selected studies were characterized by participants (laboratory staff and those in other specialties in West African countries) and methodological characteristics (observational studies, randomized trials, descriptive, quantitative, and qualitative). Each subgroup was subjected to narrative synthesis.

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Sensitivity analysis Given the heterogeneity in study populations and methodological designs across the included studies, the overall conclusions were assessed to determine whether they were consistent across clinical subgroups or disproportionately influenced by findings from particular subgroups.

Language restriction Only the papers published in English language were selected as eligible.

Country(ies) involved Nigeria, Sierra Leone, Zambia.

Keywords COVID-19, SARS-CoV-2, Pandemic, Outbreak, Pandemic OR Outbreak, Effects, impactsEffects OR ImpactsLaboratory SystemsServicesDiagnostic testing.

Dissemination plans We plan to publish the systematic review in a peer-reviewed journal.

Contributions of each author

Author 1 - Bolarinde Joseph Lawal - Author 1 conceived the idea, led the systematic review, and drafted the manuscript.
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Author 2 - Charlie Chaluma Luchen - Author 2 independently reviewed the list of selected studies for accuracy, and contributed to drafting the manuscript.
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