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A Meta-Analysis of Artificial Intelligence-Assisted Chest X-Ray Interpretation in Ethiopian Primary Care: A Systematic Review for thePeriod

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Abstract

Background: A critical shortage of radiologists in Ethiopian primary care leads to substantial diagnostic delays. Artificial intelligence (AI) for chest X-ray interpretation is a proposed technological solution, but its summarised accuracy and practical feasibility in this specific, resource-constrained context require evaluation.

Purpose and objectives: This meta-analysis aimed to systematically assess the diagnostic performance and operational feasibility of AI-assisted chest X-ray interpretation within Ethiopian primary care settings, synthesising evidence from 2021 to 2023.

Methodology: A systematic review and meta-analysis was conducted per PRISMA guidelines. Multiple databases were searched for studies published between 2021 and 2023 evaluating AI algorithms for chest X-ray interpretation in Ethiopian primary or secondary care. Pooled sensitivity, specificity, and area under the curve (AUC) were calculated using a bivariate random-effects model.

Findings/Key insights: Seven studies met the inclusion criteria. Pooled analysis indicated AI algorithms had high diagnostic accuracy for detecting tuberculosis, the most studied pathology. Pooled sensitivity was 0.89 (95% CI: 0.85–0.92) and specificity was 0.86 (95% CI: 0.82–0.89). Key operational insights highlighted the necessity of stable internet connectivity and the importance of embedding AI tools within established clinical workflows, not as standalone systems.

Conclusion: AI-assisted chest X-ray interpretation demonstrates promising diagnostic performance for tuberculosis in low-resource Ethiopian settings. However, successful implementation depends on overcoming specific infrastructural and operational barriers.
Recommendations: Implementation should prioritise hybrid human-AI workflow models, invest in core digital infrastructure, and develop context-specific validation and training protocols for healthcare workers. Further research is needed on AI performance for other pulmonary pathologies prevalent in the region.
Key words: artificial intelligence, chest X-ray, primary health care, diagnostic accuracy, Ethiopia, meta-analysis
Contribution statement: This study provides the first consolidated evidence on the accuracy and practical considerations for deploying AI-assisted chest X-ray interpretation in Ethiopian primary care, offering evidence for national digital health strategy.

Keywords: *Artificial intelligence, chest radiography, primary health care, Sub-Saharan Africa, diagnostic accuracy, meta-analysis, Ethiopia*