



Impact of a digital chest X-ray and artificial intelligence campaign on pulmonary tuberculosis case detection in a Malawian prison, 2013

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Abstract

Prisons in sub-Saharan Africa are high-risk settings for pulmonary tuberculosis transmission. Conventional case detection in these environments, often reliant on symptom screening and sputum smear microscopy, has limited sensitivity. This brief report evaluates the impact of a campaign using digital chest X-ray with artificial intelligence-based interpretation on pulmonary tuberculosis case detection among inmates in a large prison in Lilongwe, Malawi. A cross-sectional campaign was conducted. All consenting inmates underwent digital chest X-ray. Images were analysed concurrently by on-site clinicians and by automated artificial intelligence software, which provided an abnormality score. Individuals with abnormal radiographs or tuberculosis symptoms provided sputum for Xpert MTB/RIF testing. Diagnostic yield and programme metrics were analysed. The campaign screened a high proportion of the prison population. Artificial intelligence-assisted chest X-ray screening identified a considerable number of radiographically abnormal cases that were not identified by symptom screening alone. The prevalence of bacteriologically confirmed tuberculosis among those screened was 2.1%, which was substantially higher than the routine case detection rate prior to the campaign. Integrating digital chest X-ray with artificial intelligence interpretation into active case-finding campaigns in Malawian prisons is feasible and can markedly increase the detection of pulmonary tuberculosis cases compared to traditional methods. Prison health programmes in high-burden settings should consider piloting and scaling up artificial intelligence-assisted chest X-ray screening as part of comprehensive tuberculosis control strategies. Further operational research is needed to assess cost-effectiveness and optimal implementation models. tuberculosis, prisons, artificial intelligence, chest X-ray, case detection, Malawi, public health All authors contributed to the design, implementation, analysis, and manuscript preparation. All reviewed and approved the final manuscript.

Keywords: *tuberculosis, case detection, digital chest X-ray, artificial intelligence, prison health, sub-Saharan Africa*

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