

Title: Active case finding and detection of TB Infection among incarcerated populations using an artificial intelligence-aided portable handheld X-ray machine in Himachal Pradesh, India

Background and challenges to implementation: Tuberculosis (TB) remains a major health challenge in congregate settings, particularly prisons, where overcrowding and coexisting health issues contribute to elevated infection rates. National Tuberculosis Elimination Program (NTEP), Government of India's 100-Days End-TB campaign aimed to screen vulnerable groups, including incarcerated population. In District Jail, Mandi, Himachal Pradesh, the health administration in coordination with prison department and community stakeholders conducted AI-enabled handheld X-ray screening to detect active TB and identify TB infections among people deprived of their liberty through effective multi-sectoral collaboration.

Intervention: In December 2024, a targeted TB screening initiative was launched in Mandi jail. A total of 206 incarcerated individuals were screened using an AI-equipped handheld X-ray device and 10 symptoms for TB. Individuals with symptoms or abnormal X-rays were classified as persons with presumed TB, and their samples were sent for NAAT (Nucleic Acid Amplification Test). Confirmed cases were enrolled in the TB care cascade. Asymptomatic individuals with normal X-rays underwent Cy-TB skin testing. Those testing positive were started on a shorter TB Preventive Treatment (3HP), while others were scheduled for follow-up after three months. The screening parameters included: (i) detection of abnormal chest X-rays, (ii) diagnostic yield of asymptomatic TB, and (iii) TB infection positivity. Data was analysed on Ni-kshay (India's digital TB surveillance system) using SPSS ver22.

Results: Of the 206 incarcerated people screened, 15 asymptomatic individuals had abnormal chest X-rays. NAAT testing confirmed TB in 3 persons (20% diagnostic yield), all of whom began treatment (*Figure*). Among 203 people deprived of their liberty who underwent Cy-TB testing, 72 (35%) were positive for latent TB infection and were started on preventive therapy. Rest were followed up after three months, with no progression to active TB.

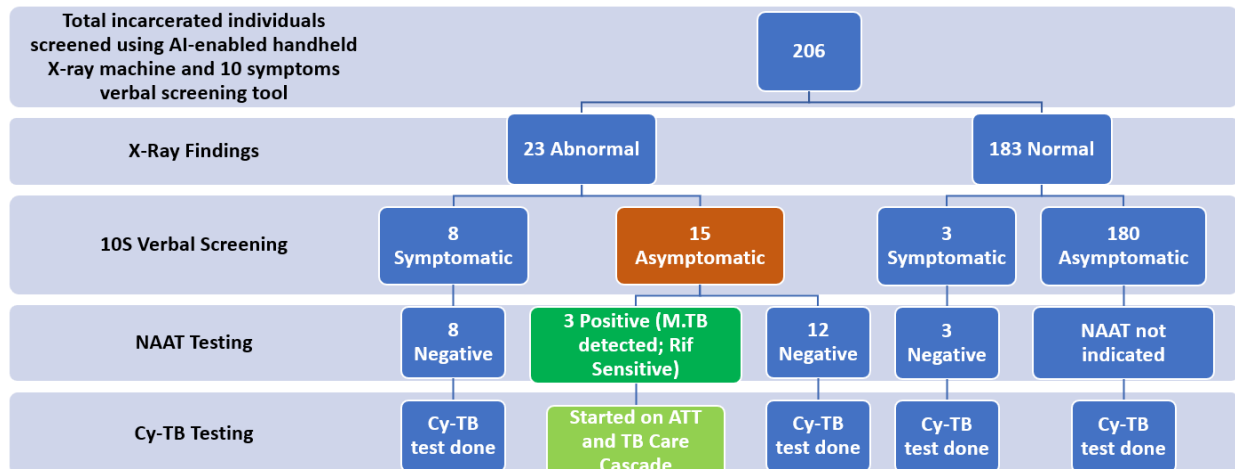


Figure.

Conclusions: AI-assisted handheld X-ray screening proved valuable in detecting asymptomatic TB in a prison setting. The initiative highlights the role of technology and coordinated efforts in improving TB detection and prevention in high-risk environments.

Summary: AI-enabled TB screening in Prison Mandi identified asymptomatic TB cases using handheld X-ray and NAAT testing. Cy-TB testing also revealed a high prevalence of TB infection. This initiative underscores the importance of integrating innovative diagnostic tools with regular screening and preventive strategies to control TB in high-risk, congregate environments.