ujiyari

UPSC & STATE PCS CURRENT AFFAIRS · UJIYARI.COM

EDITORIAL ANALYSIS

The Evolving Diagnostic Landscape for Tuberculosis — Technology vs Access

THE HINDU

24 March 2026

SUBJECTS COVERED

SCIENCE & TECH SOCIAL ISSUES

GS PAPERS

GS2 GS3

CURATED & WRITTEN BY

Bharat Choudhary

UPSC Educator & Content Creator •
linkedin.com/in/epicbharat

ujiyari

The Evolving Diagnostic Landscape for Tuberculosis — Technology vs Access

The Hindu 24 March 2026 GS2 GS3

TH The Hindu | MAINS RELEVANCE: GS Paper 2 GS Paper 3 |

INTERVIEW ANGLE

"India has made technological strides in TB diagnostics, but is the weakest link really the technology or the last-mile delivery?"

The Evolving Diagnostic Landscape for Tuberculosis — Technology vs Access

> *On World Tuberculosis Day (March 24, 2026), The Hindu's editorial examines how India has transitioned from sputum smear microscopy to molecular diagnostics and AI-powered tools, yet argues that diagnostics remain the weakest link in India's TB elimination strategy due to persistent access gaps.*

THE TECHNOLOGICAL LEAP

India's TB diagnostic arsenal has evolved dramatically over the past decade:

From Sputum to Molecular Testing

GENERATION	TECHNOLOGY	SENSITIVITY	TIME TO RESULT
Traditional	Sputum smear microscopy	50-60%	24-48 hours
First molecular	CBNAAT (GeneXpert)	95%+	2 hours
Point-of-care	Truenat	93%+	1 hour
AI-assisted	Portable X-ray + AI	90%+	Minutes
Emerging	Tongue swab sampling	Under evaluation	30 minutes

WHO's 2026 Endorsements

The World Health Organisation has recently endorsed:

- **Near point-of-care molecular tests** — decentralised testing away from district labs

- **Tongue swab sampling** — non-invasive, no sputum needed (critical for children and HIV-positive patients)
- **Sputum pooling strategies** — batch testing to reduce costs in high-burden settings

THE ACCESS GAP — WHERE TECHNOLOGY FAILS

Despite these advances, the editorial argues that technology without equitable access is meaningless:

Rural-Urban Divide

- **Urban areas**: Access to CBNAAT and Truenat at district hospitals
- **Rural and tribal areas**: Still dependent on sputum microscopy at PHCs
- Only **15% of Primary Health Centres** have molecular diagnostic capacity
- Average distance to nearest CBNAAT machine in rural India: **50-80 km**

Diagnostic Delays

- Average time from symptom onset to TB diagnosis: **2-3 months**
- In rural areas: **3-6 months** (due to multiple visits to traditional healers and private practitioners before reaching a diagnostic facility)
- Each month of delay = continued transmission to 10-15 contacts

The Private Sector Problem

- **50%+ of TB patients** first visit private practitioners
- Private labs often use less sensitive tests (rapid antibody kits — banned by WHO since 2012)
- Notification by private practitioners remains poor despite being mandatory since 2012

SPECIAL DIAGNOSTIC CHALLENGES

Paediatric TB

- Children cannot produce sputum — traditional microscopy fails
- Gastric aspirate and nasopharyngeal aspirate are invasive and low-yield
- Tongue swab sampling could be transformative for paediatric diagnosis
- India has approximately **3-4 lakh** paediatric TB cases annually

Extra-Pulmonary TB (EPTB)

- Affects lymph nodes, bones, kidneys, meninges
- Accounts for **15-20%** of all TB cases in India
- Extremely difficult to diagnose — requires biopsy, culture, or advanced molecular tests

- Often misdiagnosed as cancer or other conditions

Drug-Resistant TB

- MDR-TB diagnosis requires drug susceptibility testing (DST)
- CBNAAT detects rifampicin resistance in 2 hours — but only rifampicin
- Full DST panel takes **6-8 weeks** through culture methods
- Line Probe Assay (LPA) reduces this to **48 hours** but needs biosafety lab infrastructure

THE AI REVOLUTION IN TB SCREENING

India has deployed over **3,000 AI-powered portable X-ray units** that can:

- Screen chest X-rays in seconds with 90%+ accuracy
- Work on battery power in remote locations
- Flag presumptive TB cases for molecular confirmation
- Screen entire villages during active case-finding campaigns

However, AI is a screening tool, not a diagnostic tool — it identifies presumptive cases that still need molecular confirmation.

THE EDITORIAL'S PRESCRIPTION

1. **Decentralise molecular testing** to PHC level (not just district hospitals)
2. **Integrate AI screening with molecular confirmation** in a single visit
3. **Mandate private lab quality standards** and enforce notification
4. **Invest in tongue swab technology** for paediatric and EPTB diagnosis
5. **Build biosafety infrastructure** for full drug susceptibility testing at sub-district level

UPSC RELEVANCE

CBNAAT, Truenat, GeneXpert, Line Probe Assay, WHO TB diagnostics endorsements

MAINS GS-II:

Health infrastructure, rural-urban healthcare divide, public-private partnership in TB diagnosis

MAINS GS-III:

AI in healthcare, biotechnology, innovation in diagnostics

INTERVIEW:

Balance between technological advancement and equitable access in public health

📌 FACTS CORNER — KNOWLEDGEPEDIA

TB DIAGNOSTIC TECHNOLOGIES:

Sputum smear microscopy: Traditional, 50-60% sensitivity, cheap but low accuracy

CBNAAT (Cartridge-Based Nucleic Acid Amplification Test): GeneXpert platform, 95%+ sensitivity, detects rifampicin resistance

Truenat: Indian-made (Molbio Diagnostics, Goa), battery-operable, point-of-care

LPA (Line Probe Assay): Detects MDR-TB in 48 hours

AI X-ray: 3,000+ units deployed, 90%+ accuracy, screening tool

INDIA'S TB BURDEN:

Annual cases: ~27 lakh (26% of global burden)

Annual deaths: ~3.2 lakh

MDR-TB cases: ~1.19 lakh annually

Paediatric TB: ~3-4 lakh cases

Asymptomatic cases: 50% of detected

WHO TARGETS (END TB STRATEGY, 2015):

90% reduction in TB deaths by 2030 (vs 2015)

80% reduction in incidence by 2030

Zero catastrophic costs for TB patients

OTHER RELEVANT FACTS:

Ni-kshay portal: National TB notification system

Private sector notification: Mandatory since 2012

TB eliminated country example: Sri Lanka (low-incidence)

BCG vaccine efficacy: 0-80% (highly variable by geography)

M72/AS01E: Promising new TB vaccine in Phase III trials

Sources: The Hindu , WHO , PIB

CURATED & WRITTEN BY

Bharat Choudhary

UPSC Educator & Content Creator

linkedin.com/in/epicbharat

📖 Read Full Article on Ujiyari →

https://ujiyari.com/editorials/2026/03/tb-diagnostic-landscape-evolution/