From 99DOTS to 99DOTSLite in Gujarat: A Pragmatic Leap in TB Treatment Adherence

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Abstract:

In 2013, Microsoft Research India launched a digital adherence technology (DAT) called 99DOTS which was created to overcome low treatment adherence in India's tuberculosis (TB) program. It employed the use of envelope-based medication delivery with concealed numbers which were unlocked and dialed by the patient to record compliance. Although successful in small-scale pilots, widespread adoption revealed several weaknesses such as dependence on packaging, complexity, and imprecision. To address these, the Central TB Division introduced a simplified version of its system, 99DOTSLite, in 2023, which relies on district-specific toll-free numbers (TFNs) printed on the medication packs or ID cards. Patients verify intake by making a missed call which gets automatically registered in Ni-kshay and thus followed up in real time in case of missed doses. In comparison to the previous systems, 99DOTSLite is affordable, compatible with any TB regimen, user-friendly, and easily integrated with the digital TB environment of India. Even though issues with phone access, connection, and possible false reporting are possible, 99DOTSLite is an open-ended, patient-centered innovation essential to India TB elimination activities.

Introduction and Origins of 99DOTS:

Tuberculosis (TB) remains one of India's most pressing public health concerns, accounting for over a quarter of global TB cases, according to the WHO Global TB Report 2023.[1] In order to eradicate tuberculosis in India by 2025, the National Tuberculosis Elimination Programme (NTEP) made addressing the problem of inadequate treatment adherence especially in environments with limited resourcesa top priority. In this context, the innovation of 99DOTS emerged in 2013, developed by Microsoft Research India as a low-cost digital adherence technology (DAT).[2]

The system used envelope-wrapped TB pills printed with hidden phone numbers, revealed when the patient took their daily dose. Patients were instructed to make a free call to this number, which automatically logged their adherence in a centralized system accessible to health workers. The first pilot was launched in 2014 at St. Johns Medical College, Bengaluru, with approximately 20 HIV-TB co-infected patients.[3,4] By 2017, over 93,000 patients had been enrolled under NTEP across India.[5]

However, as the system was scaled up, it revealed limitations in sustainability, including dependency on special packaging, operational burden, and usability challenges for both providers and patients.[6] Additionally, a 2020 evaluation of 99DOTS noted variability in accuracy of adherence reporting when compared to video directly observed therapy (vDOT), raising questions about reliability in real-world settings.[7] Further studies also reported differences in patient acceptability across geographies, highlighting the need for a more simplified and inclusive model.[8]

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The Need for 99DOTSLite:

To address these limitations, the Central TB Division introduced 99DOTSLite in 2023 - a streamlined and scalable version of 99DOTS.[6] It eliminates the need for envelope-based packaging and hidden codes. Instead, 99DOTSLite uses district-specific toll-free numbers (TFNs), which are saved in patient's phones or placed as stickers/stamps on medication strips or boxes. Patients confirm dose intake through a missed call to the TFN, triggering an automatic "thank you" message and logging adherence in Ni-kshay, India's digital TB registry.[9]

This transition represented a significant improvement in terms of logistics, cost, and compatibility. 99DOTSLite supports pediatric, drug-resistant TB (DR-TB), and short-course regimens, unlike the earlier version which was limited by packaging format. It also integrates real-time adherence alerts and dashboard-level supervision for program managers.[6]

Operational Features of 99DOTSLite:

The system involves several core steps:

- A unique TFN is assigned to each district and saved in patients phones under "99DOTSLite".
- TFNs are affixed via stickers or stamps on TB ID cards or medication packs.
- Patient's make a missed call after taking medication and receive a confirmation SMS.
- The system logs adherence on the Ni-kshay dashboard (Real-Time-Web-Dashboard).
- If no call is received for 3 consecutive days, a telephonic follow-up is initiated; if 7 days are missed, a home visit is triggered.
- These features help achieve NTEP indicators such as ≥80% patient coverage under ICT-based adherence and <20% missing three or more doses.[6]

Moreover, 99DOTSLite reduces digital adherence costs by 30-40% per patient, compared to envelope-based systems, making it more sustainable in the long run.[9]

Launch and Expansion:

The official launch of 99DOTSLite took place on April 19, 2023, in Ranchi district, Jharkhand, where stakeholders reported strong acceptability and technical feasibility.[10] Drawing on the early operational lessons, Gujarat piloted the model in Rajkot and Ahmedabad districts.[11] Maharashtra, Karnataka, Uttar Pradesh, Tamil Nadu, and West Bengal are among the states that have included 99DOTS Lite in their NTEP strategy as of the middle of 2024.[6] The dashboard integration into Ni-kshay has enabled more effective, real-time tracking and supervision, which has become a cornerstone of India s digital TB control ecosystem.[9]

Operational Advantages:

99DOTSLite offers several key benefits:

- Envelope-free design: No special printing or logistics needed.
- Compatibility with all TB regimens, including paediatric and DR-TB.
- Low-tech Low-Cost Solution: Operates on basic phones with no internet required.
- AI-powered alerts: Automatically detects adherence lapses.[6] Allows health workers for real time adherence tracking daily via a dashboard.
- Reduced training burden: ASHA workers and DOT providers find it easier to implement and counsel patients.
- Cost-effective: Digital monitoring expenses are reduced significantly.[9]
- Patient-friendly: Requires minimal digital literacy, making it suitable for vulnerable populations.

Moreover, compared to vDOT and family-DOT models, 99DOTSLite offers an optimal balance between technological innovation and practical field deployment in India's vast TB program.[9,12]

Challenges and Considerations:

Despite its strengths, the model faces challenges:

- Some patients, especially in tribal and remote areas, lack access to mobile phones.

- Poor network connectivity continues to hinder consistent reporting.
- Patients may forget to save the TFN or fail to make calls despite taking medication.
- Patients may call the number without taking the medicine, or caregivers/others may call on their behalf creating false adherence data.
- Follow-up mechanisms require sustained workforce engagement.

Additionally, the accuracy of self-reported adherence via missed calls though improved remains an area needing continuous evaluation. Comparisons with vDOT and SMS-based systems have shown that while 99DOTSLite increases reach, the quality of adherence monitoring may still be influenced by patient behavior.[7,9]

Conclusion:

99DOTSLite marks a transformative step in TB care delivery, representing a shift from logistics-heavy solutions to minimalist, scalable, patient-centric models. Gujarat s leadership in adopting and adapting the platform demonstrates its feasibility and potential for national scale-up. With structured training, stakeholder engagement, and ongoing research, 99DOTSLite can serve as a vital component of India's TB elimination roadmap.

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