

ICMR study finds drone-enabled TB sample transport can reduce diagnosis time and patient expenses in remote Telangana

Research under the ICMR's i-DRONE initiative demonstrates the potential of drone technology to strengthen access to TB diagnostic services in difficult-to-reach areas

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The Indian Council of Medical Research (ICMR), under its flagship *i-DRONE* initiative, has demonstrated that drone-assisted transport of tuberculosis (TB) sputum samples can significantly improve access to diagnostic services for people living in remote and underserved areas.

The findings emerge from a programme-based study conducted in Yadadri-Bhuvanagiri district of Telangana in collaboration with AIIMS Bibinagar and the District TB Office under National TB Elimination Programme (NTEP). The study compared the conventional system of patient travel for TB diagnosis with a drone-enabled model in which sputum samples were collected at nearby Primary Health Centres (PHCs) and sub-centres (SCs) and transported by drones to designated TB diagnostic laboratories (TUs).

The study enrolled 840 participants and found that the median turnaround time for TB diagnosis decreased from 15 days to 5 days following the introduction of drone-based sample transport. Diagnostic delays were also significantly reduced, enabling earlier confirmation of disease and facilitating faster clinical decision-making.

Importantly, the study observed a substantial reduction in the financial burden borne by patients. The mean out-of-pocket expenditure (OOPE) associated with seeking TB diagnosis reduced from approximately ₹9,451 under the conventional transport system to around ₹91 during the drone-enabled phase. The reduction was largely attributable to lower travel costs, reduced wage loss, and the availability of sputum collection closer to patients' homes. Notably, the median OOPE during the drone phase was zero, indicating that many participants incurred no travel-related expenses for diagnosis. The intervention was implemented through a hub-and-spoke network connecting 11 Primary Health Centres, 60 sub-centres and four TB Units, allowing patients to submit sputum samples at health facilities nearer to their villages instead of travelling long distances to diagnostic centres.

Speaking on the findings, Dr. Rajiv Bahl, Secretary, Department of Health Research and Director General, ICMR, said, "Affordable and timely access to diagnosis remains central to India's TB elimination efforts. This study demonstrates how technology can help bridge geographical barriers and reduce the burden on patients, particularly those living in remote areas. The evidence generated through the *i-DRONE* initiative will help inform future public health innovations while complementing existing healthcare delivery systems."

Alongside the quantitative findings, healthcare workers participating in the study reported that drone-enabled transport reduced delays, improved operational efficiency and was well accepted by communities after initial familiarisation. The study also identified operational considerations such as weather, payload limitations and the need for continued training, underscoring the importance of careful planning for wider implementation.

The researchers have noted that the findings are based on programme implementation in one district and provide important operational evidence for evaluating the role of drone-enabled logistics in strengthening healthcare delivery in geographically challenging settings. Further implementation across diverse settings will help build additional evidence for informed decision-making.

The study adds to the growing evidence generated under the ICMR *i-DRONE* initiative, which is exploring the safe and effective use of drones for transporting vaccines, medicines, blood products, diagnostic specimens, tissues etc. to improve healthcare access in difficult terrains across the country. The full study may be accessed at: <https://journals.theunion.org/content/ijtdo/3/2/70.abstract>

Another publication about the study can be accessed at:

<https://journals.sagepub.com/doi/full/10.1177/20552076251406320>

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