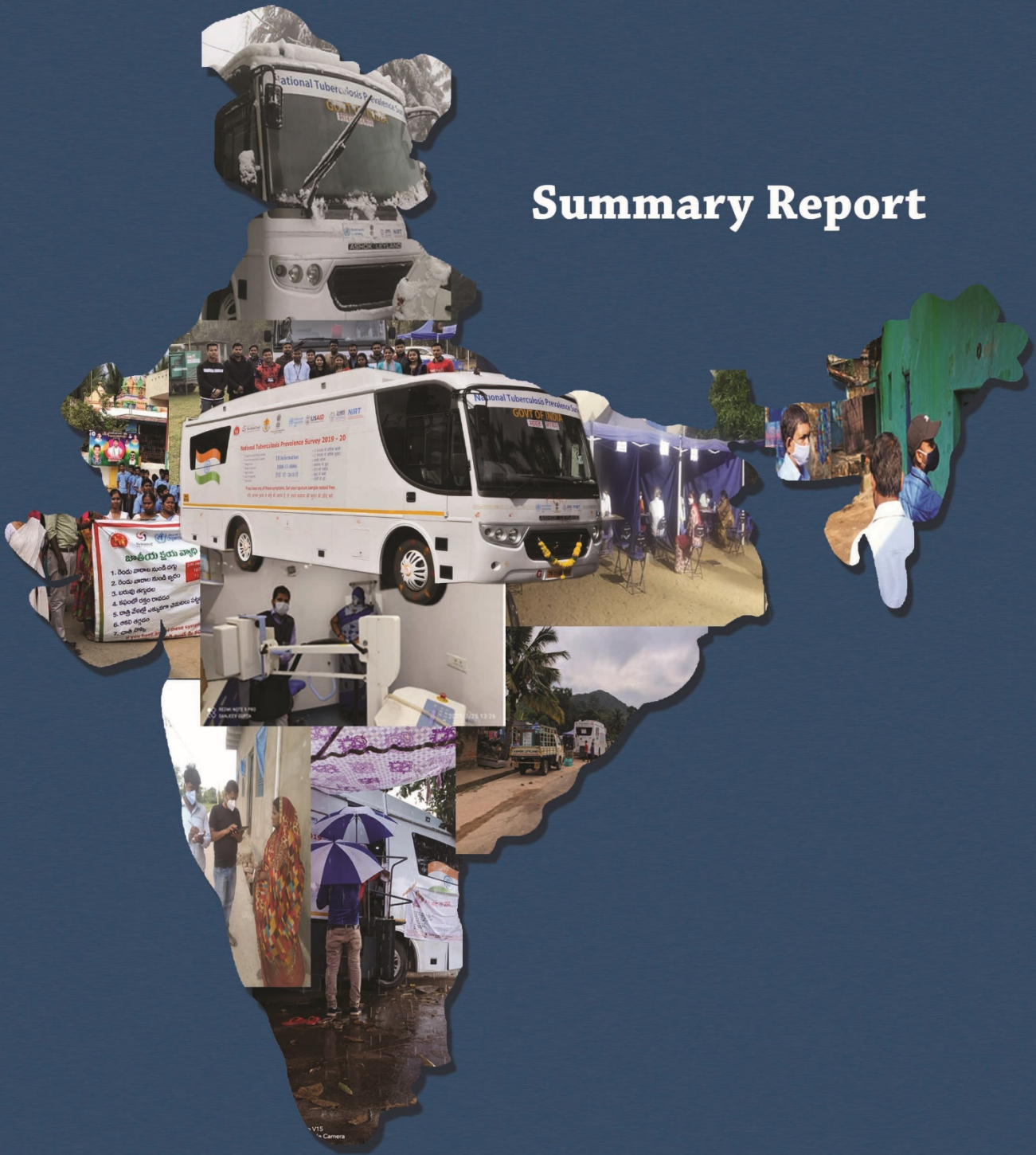# National TB Prevalence Survey in India
(2019-2021)

Summary Report

ICMR | NIRT
INDIAN COUNCIL OF MEDICAL RESEARCH
NATIONAL INSTITUTE FOR RESEARCH IN TUBERCULOSIS

NATIONAL HEALTH MISSION
राष्ट्रीय स्वास्थ्य मिशन

सत्यमेव जयते
Ministry of Health & Family Welfare
Government of India

NATIONAL TUBERCULOSIS ELIMINATION PROGRAMME
TB Harega Desh Jeetega

World Health Organization
COUNTRY OFFICE FOR India

National TB Prevalence Survey in India

2019 - 2021

Indian Council of Medical Research (ICMR), New Delhi

ICMR-National Institute for Research in Tuberculosis (NIRT), Chennai

Ministry of Health and Family Welfare (MOHFW), Government of India, New Delhi

Central TB Division (CTD) and National Tuberculosis Elimination Programme(NTEP),

World Health Organisation(WHO), India Office, New Delhi

State TB Cells of all States and Union Territories, India

State TB Cells of all States and Union Territories, India

ICMR National JALMA Institute for Leprosy & Other Mycobacterial Diseases, Agra

ICMR National Institute of Occupational Health, Ahmedabad

ICMR Regional Medical Research Centre, Bhubaneswar

ICMR Regional Medical Research Centre, NE Region, Dibrugarh

ICMR Regional Medical Research Centre, Gorakhpur

ICMR National Institute of Nutrition, Hyderabad

ICMR National Institute of Research in Tribal Health, Jabalpur

ICMR National Institute for Implementation Research on Non-Communicable Diseases, Jodhpur

ICMR National Institute of Cholera and Enteric Diseases, Kolkata

ICMR National Institute of Cancer Prevention and Research, Noida

ICMR Rajendra Memorial Research Institute of Medical Sciences, Patna

ICMR National AIDS Research Institute, Pune

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Abbreviations

AERB	Atomic Energy Regulatory Board
AFB-S	Acid-Fast Bacilli Smear
AP	Andhra Pradesh
ATT	Anti TB Treatment
BMI	Body Mass Index
BPL	Below Poverty Line
BR	Bihar
C & DST	Culture & Drug Sensitivity Test
CBNAAT	Cartridge Based Nucleic Acid Amplification Test
CEB	Census Enumeration Board
CG	Chhattisgarh
CHC	Community Health Centre
CI	Confidence Interval
CPMU	Central Project Management Unit
CR	Computer Radiography
CTD	Central Tuberculosis Division
CXR	Chest X-Ray
DEO	Data Entry Operator
DL	Delhi
DR	Digital Radiography
DST	Drug Sensitivity Testing
DTC	District TB Centre
DTO	District TB Officer
EC	Ethics Committee
GJ,DN,DD	Gujarat, Dadra, Nagar Haveli, Daman, Diu
GPS	Global Positioning System
GX	GeneXpert
HB	Haemoglobin
HIV	Human Immunodeficiency Virus
HP,UK,JK	Himachal Pradesh, Uttarakhand, Jammu & Kashmir
HR	Haryana
ICMR	Indian Council of Medical Research
IEC	Information, Education And Communication
IGRA	Interferon Gamma Release Assay
IPW	Inverse Probability Weighting
IRL	Intermediate Reference Laboratory
IT	Information Technology
JH	Jharkhand
KA	Karnataka
KL,LD	Kerala, Lakshadweep
LC	Liquid Culture
LT	Laboratory Technician

MCPTB	Microbiologically Confirmed Pulmonary Tuberculosis
MDG	Millennium Development Goal
MGIT	Mycobacteria Growth Indicator Tube
MH,GA	Maharashtra, Goa
MO	Medical Officer
MoHFW	Ministry of Health and Family Welfare
MOTT	Mycobacterium Other Than Tuberculosis
MP	Madhya Pradesh
MS	Microsoft
MTB	Mycobacterium tuberculosis
NA	Not Applicable
NATBPS	National TB Prevalence Survey
NE	North Eastern States (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura And Sikkim)
NGO	Non-Government Organization
NIRT	National Institute for Research in Tuberculosis
NRL	National Reference Laboratory
NTM	Non Tuberculous Mycobacteria
NTEP	National Tuberculosis Elimination Programme
OD	Odisha
OR	Odds Ratio
PB,CH	Punjab, Chandigarh
PCR	Polymerase Chain Reaction
PHC	Primary Health Centre
PID	Personal Identification
PTB	Pulmonary Tuberculosis
QR	Quick Response
RIF	Rifampicin
RJ	Rajasthan
RNTCP	Revised National Tuberculosis Control Programme
SD	Standard Deviation
SDG	Sustainable Development Goals
SEC	Site Ethics Committee
SM	Smear Microscopy
SOP	Standard Operating Procedure
SNRL	Supranational Reference Laboratory
STC	State TB Cell
STDC	State TB Demonstration & Training Centre
STLS	Senior TB Laboratory Supervisor
STO	State TB Officer
STS	Senior Treatment Supervisor
TB	Tuberculosis
TBPS	Tuberculosis Prevalence Survey
TN,PY,AN	Tamil Nadu, Pondicherry, Andaman & Nicobar

TS	Telangana
UDC	Upper Division Clerk
UP	Uttar Pradesh
USAID	United States Agency For International Development
WB	West Bengal
WHO	World Health Organization

Executive Summary

The National TB Prevalence survey in India was conducted from 2019 to 2021 to know the actual disease burden of TB at a national level. The survey estimated the point prevalence of microbiologically confirmed pulmonary TB (PTB) among persons ≥15 years in age in India at the national level and for 20 individual states / state groups. The survey also explored the health seeking behaviour and estimated the prevalence of TB infection.

Central TB Division, which is part of the Ministry of Health and Family Welfare, Government of India was the main funding agency. Technical assistance on the design of the survey, data management, monitoring its implementation was provided by WHO country office for India. Department of Health Research and Indian Council of Medical Research (ICMR), New Delhi provided technical, administrative and financial support. ICMR- National Institute for Research in Tuberculosis (NIRT) was the primary agency which implemented the survey in collaboration with the other regional ICMR institutes and all the State TB Cells of the country.

The survey protocol, design and Standard Operating Procedures (SOPs) were developed in accordance with the global guidelines provided in the *Tuberculosis prevalence surveys: a handbook* by WHO. The recruitment and training of staff was done with standardised training modules. Pilot survey was carried out in few sites to identify implementation difficulties. Based on the challenges identified during the pilot survey, the protocol and SOPs were modified.

It was a population based cross-sectional study, done during 2019-2021 across India except the 2 union territories of Andaman & Nicobar islands and Lakshadweep islands. Cluster sampling design was used for the survey. The country was divided into 20 state groups. Probability proportionate to size of the population was used to determine the number of clusters in each of the 20 state / state groups and then simple random sampling with replacement' (SRSWR) was used for selection of the clusters in the state/state groups. A total national sample size of 5,00,000 was calculated, distributed over 625 clusters with 800 population per cluster. All the eligible study participants, underwent symptom screening using a standard questionnaire and chest X-ray screening.

(Chest X-ray was deferred for pregnant women.) Participants with chest symptoms suggestive of TB and/or with past history of TB and/or currently on TB treatment and/or having an abnormal chest X-ray were eligible for sputum examination. First sputum sample was collected at the spot and CBNAAT for detection of MTB and rifampicin resistance was done at the field level. Second sputum sample was collected next day early morning and transported in cold chain to the assigned reference laboratory, where smear microscopy and liquid culture was done. A conditional third sputum sample was collected if the first sample detected MTB on CBNAAT. Sample was transported to the assigned reference laboratory, where CBNAAT, smear microscopy and liquid culture were done. All the current chest symptomatic, those currently on ATT and participants with past history of TB treatments were interviewed regarding the health seeking behavior. In select clusters, the prevalence of TB infection was also estimated using IGRA testing. A total of 354541 population was covered, of which 90.9% (322480 out of 354541) of the eligible population participated in the survey. Among 322480 who participated, 100% had symptom screening results and 97.1% had chest X-ray results. 13% (41932 out of 322480) among those who participated were eligible for sputum, and 88.7% (37190 out of 41932) submitted at least one sample.

In this survey, 981 were identified as microbiologically confirmed PTB patients. The prevalence of microbiologically confirmed PTB in $\geq$ 15 years age was 316 per lakh population (95% Confidence Interval: 290-342) in the country and varied from 151 per lakh (Kerala) to 534 per lakh (Delhi). The prevalence of all forms of TB for all ages in India was 312 per lakh population (286 - 337) for the year 2021. The highest prevalence for all forms of TB was 747 per lakh (510 - 984) in Delhi and the lowest was 137 (76 - 198) in Gujarat. The prevalence of TB infection among population $\geq$ 15 years age is 31.4% (95% Confidence Interval : 27.2 – 33.5). Higher prevalence of PTB was observed in older age group, males, malnourished, smokers, alcoholics and known diabetics. The Prevalence to Notification ratio ranges from 1.52 (1.34 - 1.70) for smear to 2.85 (2.61 - 3.10) for CBNAAT.

The majority (64%) of symptomatic population did not seek health care services. The reasons were ignoring the symptoms (68%), not recognising the symptoms as TB (18%), self-treatment (12%) and couldn't afford to seek care (2%). Among the 36% of survey participants who sought care for their symptoms, there was equal preference for government and private facilities.

We should prioritize the interventions in high prevalent states with focus on screening of elderly, malnourished, diabetics, and implement strategies to reduce the Prevalence to Notification gap. We have to continue engaging the private sector for increased case notification. We have to focus on health education in the general community for the symptom awareness and to improve the health seeking behaviour of the symptomatic. Further evaluation, to assess the impact of COVID on TB estimates in the high and low burden states is ongoing.

Chapter 1

Introduction

Chapter 1 Introduction

Tuberculosis (TB) disease continues to be a major public health problem globally and is still associated with social stigma in many parts of the world [1] . Efforts for TB control have progressed steadily over the years and considerable progress has been made in terms of diagnostics, treatment regimens and coverage [2]. However, monitoring the progress of TB control by measuring the TB disease burden at the country level has always been a challenge. In India, a National TB Prevalence Survey was done in 1955-1958 in several districts and block levels in few areas which has its limitation. Though, WHO estimates that India has achieved Millennium Development Goals (MDGs) related to TB, these are based on case notifications and expert opinions, rather than direct measurements like prevalence surveys. Many local/ state level TB prevalence surveys carried out in the last few decades have revealed that the prevalence of TB has continued to be high, though varied, in different parts of the country[4][5]. The estimated prevalence of microbiologically confirmed PTB in 9 sites among individuals ≥15 years of age varied between 170 to 528 averaging at 350 per 100000 populations [6].

Noticeably, nationwide TB survey was never repeated after 1956 and this makes it all the more important to conduct a nationwide TB prevalence survey, if we really want to closely monitor the progress towards TB control with the aim to 'End TB' as per Sustainable Development Goals (SDGs).

While, it is important to know the disease burden at national level; considering the diversity and variation of burden of disease across the country, it is equally important to know the state level prevalence of TB. One of the major challenges affecting the national program is the health-seeking behaviour of the population because it creates a high risk for prolonged transmission [7]. Patients with undiagnosed PTB predominantly act as reservoirs for the disease and delay in the diagnosis may worsen the disease condition, increase the out-of-pocket expenditure and also increase the risk of TB transmission in the community [8]. In this context we conducted a Nationwide TB Prevalence Survey to estimate the national and state wise prevalence of TB . This will form the baseline for monitoring progress against the SDGs related to TB.

1.1 Objectives

Primary objectives:

- To estimate the point prevalence of microbiologically confirmed pulmonary TB among persons aged ≥15 years in India at the National level
- To estimate the point prevalence of microbiologically confirmed pulmonary TB among persons aged ≥15 years individually for 20 states / state groups.

Secondary objectives:

- To explore health seeking behaviour of survey participants who are symptomatic and currently on TB treatment.
- To estimate the prevalence of TB infection among the surveyed.
- To find out the source of treatment, [whether NTEP or non-NTEP] among persons having history of ATT (previous / current) in the past one year.
- To estimate the expenditure incurred by survey participants who are currently on TB treatment
- To profile socio-demographic and associated risk factors of survey participants including nutrition, diabetes and smoking.

Chapter 2

Methodology

Chapter 2 Methodology

2.1 Study Design

A population-based cross-sectional survey covered the entire country of India, except two small Union Territories i.e. Andaman & Nicobar islands and Lakshadweep islands which has less than 0.05% of the country's population. These islands were excluded due to anticipated logistical and transportation issues. The country was grouped into 20 State groups, where either a single state was allocated to one group for larger states or few states were clubbed together forming a single state group for smaller states.

2.2 Sampling Strategy

Multi stage cluster sampling design was used to estimate the sample size for the survey. The calculated sample size was allocated to 20 state groups based on their contribution to the national population size.

2.2.1 Cluster Selection

Cluster was defined as a population in a given village or a ward listed in the state group as per census 2011. For each state group all clusters were arranged sequentially with the population of the cluster against the name of the cluster in the adjacent column. Probability Proportionate to the Size (PPS) of the population method was used to determine the number of clusters in each of the 20 state groups. Thus, the number of clusters selected in each state group was based on the proportion of the population size of the state group.

2.3 Sample Size

The pooled prevalence of PTB in India among $\geq$ 15 years population during the period 2009 was 350/lakh population. It was assumed that, this average prevalence would have reduced from 350 to 270/100000 for the period 2017-18. For prevalence estimation of 20 State groups, a total national sample size of 5,00,000 was calculated using formula of $n1\# = [(Z)^2 P (1-p)]/(d*p)^2$, assuming an average expected prevalence (p) (Bacteriologically Positive) as 0.0027 in general population with relative precision (d), between cluster variation (k) = 0.4 and design effect of 1.5, the required Cluster size (m) was 800; number of clusters was 625 with assumed coverage = 85%.

2.4 Survey Organization

For smooth functioning and timely implementation with quality results, following structures and committees were formed. Survey implementation was guided by a Steering Committee (SC), Laboratory Committee, Radiology Committee, Training Committee, Administrative cum Coordination Committee, Data and Project Monitoring Committee. Central TB Division, which is part of Ministry of Health and Family Welfare (MoHFW), Government of India was the main funding agency and provided overall support in planning, implementation and monitoring the survey and was responsible for political commitment, resource mobilization, advocacy and policy direction. Technical assistance on the design of the survey, training module development, data management, monitoring its implementation was provided by WHO country office for India. Department of Health Research and Indian Council of Medical Research (ICMR), New Delhi provided technical, administrative, financial and legal support and approvals. They also reviewed and monitored the implementation of the survey technically and facilitated the dissemination of the results. National Institute for Research in Tuberculosis (NIRT), Chennai is one of the permanent institutes of the ICMR which implemented the survey in collaboration with the other regional ICMR institutes and all the State TB Cells of the country.

ICMR - NIRT was the central implementing agency for training, implementation, monitoring, data management and reporting of the survey. Survey was led and coordinated by the Central Project Management Unit (CPMU) at NIRT. The management, technical, procurement and finance wings were under the supervision of NIRT. CPMU comprised of survey coordinator, survey monitors, microbiologist, data manager, statistician, teleradiology consultant and administrative staffs and guided by the Principal Investigators (PI) of the survey. They were responsible for the coordination and monitoring of the timelines for the implementation of the survey, operationalisation of mobile X-ray unit in various state groups, recruitment and training of the human resources. They were also responsible for the coordination of the network of the TB reference laboratories for supporting the TB diagnostics required for the survey. They were also involved in the data management and analysis, and report writing. Regional ICMR institutes obtained required approvals from regional or local Ethics Committees, helped in preparing the implementation plan along with the states based on the local climate, road connectivity, cellular connectivity, language used in cluster site. They were also responsible for the management of the respective National TB Prevalence Survey project staff and their operations for survey completion in their state groups. They worked in coordination with the various state TB cell for the implementation of the survey. All the State TB Cells of the country, nominated a nodal person to coordinate the survey implementation in the respective states for training

the local District TB Officers, health care staff and the TB program staff to work in coordination with the National TB Prevalence Survey project staff during the various stages of the survey. A sensitization workshop was conducted for the site investigators, State TB Officers (STO) and WHO consultants regarding the protocol and the implementation of the National TB Prevalence Survey and the roles of the STOs and WHO consultants in ensuring the smooth conduct of the survey.

2.5 Fully Operational Mobile X-ray Unit

Twenty five mobile X-ray units were fabricated as shown in figure 1. The bus chases from Ashok Leyland Limited, India, Pro-rad atlas mobile X-ray units from Prognosys Medical Systems India, Aero-DR Digital Radiography, Wireless Solution and Image Pilot software from Konica Minolta, Japan, Firewall/Router MX-65 and wi-fi access points MX-42 from Cisco Meraki Systems, CBNAAT machines with laptops from Cepheid were procured and fabricated in the mobile X-ray Unit. The first and front part, a driver cum network system cabin provided space for the driver, a supporting staff and the Firewall/Router MX-65 from Cisco Meraki Systems, which transmitted the data from the local server to the central server located at the coordinating institute in Chennai. The second X-ray cabin, had 4 sided lead shielding, with a fixed chest stand which is suitable for Flat panel detectors and radiography cassettes. It was fabricated with the Pro-rad atlas mobile X-ray units which were approved for safety and quality assurance by Atomic Energy Regulatory Board [AERB]. The X-ray images from DR flat panel were directly received, viewed and managed in the laptop with image pilot software. The third cabin had the Cartridge Based Nucleic Acid Amplification testing facility (CBNAAT machine with 4 Modules), a refrigerator and storage space for the consumables for the CBNAAT testing. A 15 KVA 3 phase Cummins generators provided the power supply needed for the X-ray machines, CBNAAT machines and the data management systems for working in the field.

Figure 1 Mobile X-ray unit used in National TB Prevalence Survey

2.6 Data Management System

For the data collection in the field, 15 android tablets, 1 server and 4 laptops were provided to each survey team. An android application for field data collection, a web version of the software with online data entry option for the chest X-ray reporting, lab results reporting and dashboards for various monitoring indicators was developed. The application was installed in the android tablets, local servers and servers located in Chennai with security features. Through the Cisco Meraki wi-fi access points MX-42, the data entered in the android tablets were synced in real-time with a server placed in the mobile vans with VPN connectivity. The server of 25 mobile vans were related to a single central server through a secured Cisco tunnel located at the co-ordinating site and a back-up server located at a remote site. The data architecture and flow of information in the National TB Prevalence Survey is shown in figure 2.

Figure 2 Data architecture and flow of information in the National TB Prevalence Survey
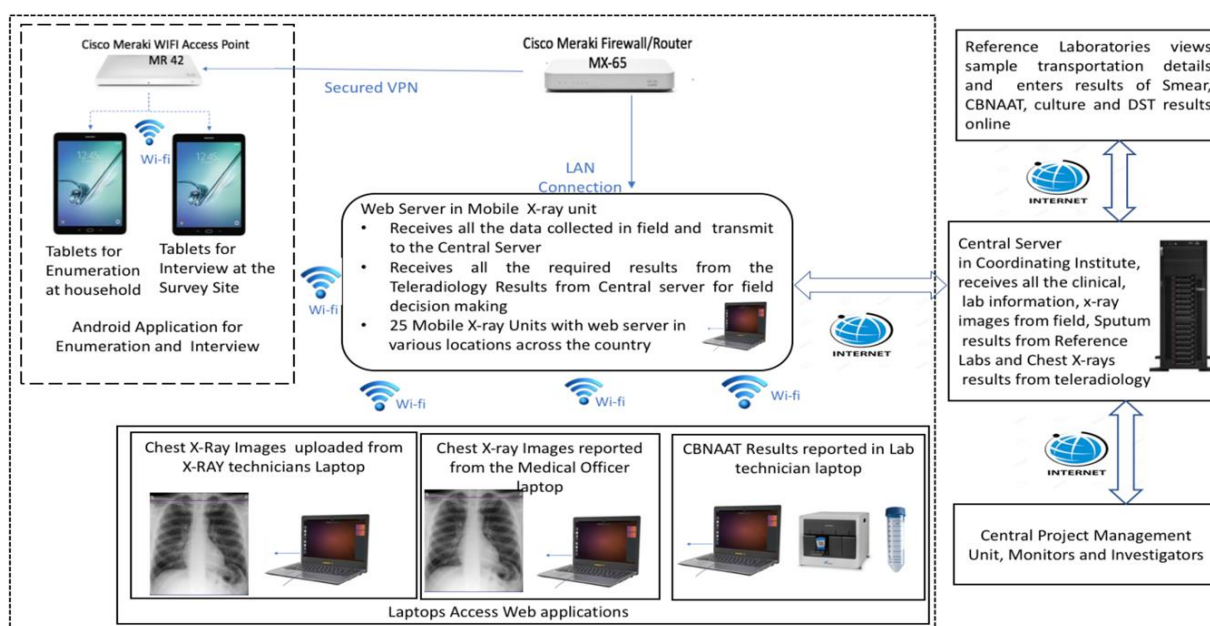
For operationalisation of the mobile X-ray units every team had a fuel-card for fuelling the buses and generators. The payment for the prepaid fuel cards were centrally managed by NIRT and it helped in monitoring the utilisation and performance. The movement of the buses were monitored by GPS devices and the working condition of the buses were tracked through the telematics solutions. All the teams were provided with 3-4 support vehicles for the movement of the survey staff to various locations along the planned survey clusters. The team were provided with the required survey tents, chairs, tables, and other equipment.

2.7 Human Resource

The survey operations were carried out in 20 state/state groups by 23 field teams. Each team comprised of 25 staff (23 in field, 2 in reference laboratory). Additional to the field team, a Central Project Management Unit comprising of 16 staff were functioning from ICMR – NIRT, Chennai.

2.8 Training of Survey Team

Training was conducted at the beginning of the survey for each field team in ICMR-NIRT, Chennai or at their respective nodal institutes. In addition to this, training designed specifically for medical officers, lab technicians, X-ray technicians, Data Entry Operators (DEO), Upper Division Clerk (UDC) and enumeration team were conducted. Refresher training was conducted when the teams resumed the survey activities after the COVID-19 lockdown.

2.8.1 Training and Sensitization of Various Stakeholders

A sensitization workshop was conducted for the Nodal officers, State TB Officers and WHO consultants regarding the protocol and the implementation of the National TB Prevalence Survey and the roles of the STOs and WHO consultants in ensuring the smooth conduct of the survey. During each presurvey visit the survey team also provided orientation to the local health officials and other stakeholders at the community level.

2.8.2 Training of Field Teams

All the 23 field teams underwent a standardized training which had the following components:

- understanding the rationale of the study & study protocol
- data collection techniques - theory & practice
- reporting and recording of the data, human subject protection – Good Clinical Practice and Good Laboratory Practice,
- team dynamics and management,
- interpersonal skills, verbal and non-verbal communication to effectively communicate, interact, and work with individuals and groups and
- community mobilisation for improving the survey participation.

2.8.3 Training of Medical Officers

All the field medical officers had a specialised training on chest X-ray reading, quality assurance procedures and good clinical practice. The medical officers were also trained on overall co-ordination and implementation of field activities.

2.8.4 Training of X-ray Technicians

X-Ray technicians were trained on quality and safety of chest X-ray imaging, routine care and maintenance of the equipment, maintenance and renewal of TLD badges, quality assurance procedures and explaining the procedure of chest X-ray examination to the participant.

2.8.5 Training of Lab Technicians

The field laboratory technicians were trained on standardized laboratory procedures for collection and transportation of sputum, handling spillage inside the mobile X-ray unit, processing sputum for CBNAAT, performing POCT like capillary haemoglobin and capillary blood glucose assessment, maintenance of the equipment and the consumables, biomedical waste disposal, and entry of results.

The reference laboratory technicians were trained on standardized laboratory procedures for specimen reception, processing sputum for AFB smear microscopy, processing sputum for culture, processing sputum for CBNAAT, performing C&DST, maintenance of the equipment and the consumables, quality assurance procedures and entry of results.

The field laboratory technicians were trained for IGRA clusters on standardized laboratory procedures for performing phlebotomy, collection of blood, packing and transportation of the samples, centrifugation and incubation. The laboratory technicians at NIRT, Chennai were specially trained in performing the IGRA test at the automated IGRA testing facility located in Tiruvallur campus of NIRT.

2.8.6 Training of Data Entry Operator (DEO)

The Data Entry Operators were trained on data architecture of the survey, handling of the software, maintenance of the IT equipment, syncing of the data to the central server, initiation and closure of cluster.

2.8.7 Training of UDC

All the UDCs were trained on maintenance of log books and registers and, maintenance and submission of bills of cluster activity.

2.8.8 Training of Enumeration Team and Health Assistants

Enumeration team was trained on census enumeration, community mobilization, symptom assessment, identification of eligible participants. The health assistants were trained on anthropometric measurement and blood pressure measurement.

2.8.9 Training of Teleradiology Panel

The teleradiology panel was trained on survey protocol and reporting of chest X-rays with respect to the survey.

2.8.10 Pilot Testing

After training, a pilot testing of the survey tools and procedures was carried out 1-2 months before the implementation of the survey, in four sites by four different teams in different terrains; which were not part of the survey. This helped to identify challenges in the implementation of the protocol, SOPs, and software based data collection and helped in strengthening the data collection tools and systems.

2.9 Reference TB Laboratory Network

The Laboratory support for the processing of the sputum specimens was provided by the 20 selected Reference Laboratories from the network of the existing NTEP accredited laboratories which were already providing support for the National TB Elimination Program in various TB diagnostics.

2.10 Fund Management

For the first time such a massive operation was largely funded by the Ministry of Health and Family Welfare, Government of India. Procurement of survey vans, equipment including digital X-ray, CBNAAT machines & cartridges, laboratory consumables were done by WHO India, with funding from Global Fund and handed over to NIRT for implementation. The funds for the survey were transferred by Central TB Division, Ministry of Health and Family Welfare, Government of India to Department of Health Research and ICMR and then to NIRT, which further disbursed the fund to 17 regional Institutes for the survey operations. Certain activities like mobile X-ray unit payments, insurances, tax payments, fuel payments and the salary of the staff were managed centrally to ensure the timely processing of the bills and payments and monitoring of the fund utilisation for further planning.

2.11 Ethics Approval

The Ethics committee approval was obtained from the NIRT- Institutional Ethics Committee. NIRT-Institutional Ethics Committee undertook a common review of the study protocol with the mutual agreement of all the participating sites as the Designated Ethics Committee for the survey. The Site Ethics Committee of all the participating ICMR institutes/sites reviewed the local ethical issues in the survey and provided their ethics approval for the survey at a regional level. The above arrangement was made as recommended by the ICMR Central Ethics Committee on Human Research.

2.12 Survey Operations

The Survey operations included 3 major activities

- Pre-Survey : community engagement and survey site preparation before the actual survey activities began.
- Survey : consisted of cluster activities where actual data collection were done.
- Post-Survey : activities included referring of the identified TB patients to the local NTEP network for the initiation of anti-TB treatment, referring of participants identified with increased blood pressure, increased blood sugar and decreased haemoglobin to nearby PHCs/ CHCs/other health facilities for further care and management.

2.12.1 Community Engagement

Community preparedness through community engagement was key for the successful conduct of the TB prevalence survey. The co-operation of the community was a vital factor for successful field activities. Communicating and engaging with the community actively helped build trust and confidence, and increased community participation. Various community engagement activities were organised to sensitize the community about TB prevalence survey and improve community participation. A special community mobilisation training especially in the context of COVID pandemic, was conducted for all the field teams to overcome the resistance and hesitancy from the community in the wake of COVID-19.

2.12.2 Pre Survey Activities

These included assessing the feasibility of conducting the field operation and sensitisation of the selected cluster by (i) meeting the officials, urban ward/village leader and briefing them about the survey, (ii) estimating the number of eligible population (15 years or older) in the selected village, (iii) selecting additional village(s) if the number of the eligible population was less than 800, (iv) requesting cooperation from local people for the implementation of the survey, (v) estimating the travel time from previous cluster to the selected cluster, considering road condition, accessibility for the mobile X-ray unit to reach the survey site, (vi) updating the Census Enumeration Block (CEB) maps and numbering the households and generating a random number household to start the survey, (vii) assessing the culture, customs, main industry and occupations in the cluster to plan the survey activity (viii) meeting the local health department and the local administration and sensitizing about the survey and requesting for local support and help, (ix) identifying the local volunteers and training them, (x) arranging for the stay and food for the survey team. Once the above activities were completed, the team sent the pre survey visit report with the contact details of the local officials, an updated CEB map, the random number starting point for the households, and the location of the mobile X-ray unit's placement for the survey operations to the CPMU, where they were reviewed and documented.

2.12.3 Survey Activities

The actual survey activities started with census enumeration with the objective to identify the eligible participant in each household visited and mobilise them to the survey site, where the mobile X-ray unit, with the interviewers were located. After obtaining informed written consent, all the participants were subjected to anthropometry, symptom screening using a standardised questionnaire, point of care testing for haemoglobin and blood sugar and X-ray examination (pregnant women were

excluded.). Based on the interview and the presence of abnormal chest X-ray findings, eligible individuals were identified and sputum specimens were collected for testing for TB as per the pre-defined algorithm. In 55 selected clusters along with the above mentioned activities, venous blood sample was collected from all the participants and IGRA testing was done to estimate the prevalence of TB infection.

Starting of the Cluster activities: The cluster map which was obtained during the pre-survey visit was used for mapping the household in the cluster. Institutional establishments like schools, offices, prisons, defence establishments, hospitals, nursing homes, hostels, etc. marked on the map were excluded from the survey. Selection of household for starting the survey in the village/ward was done randomly following a two-step process: (i) numbering of all houses in a cluster on the map, (ii) Using MS-Excel for random number generation for identifying the first house. After the first house was selected, subsequent houses were given the next serial numbers for census enumeration. Care was taken to ensure that no two houses were given the same house number. House numbering was also important for doing mop-up operations.

2.12.3.1 Enumeration of House

Enumeration of houses were done by the census team by visiting the household. Two enumeration teams did the household enumeration in opposite directions from each other, starting at the random number household, this ensured that the same household was not visited by the teams. All the household members were enumerated and the data was entered in the android tablet provided. A rapid assessment was made to ascertain the eligibility for participation in the survey. All individuals aged ≥15 years meeting the following inclusion and exclusion criteria were approached.

Inclusion criteria:

- Resident in the selected village / urban census enumeration block for previous one month at the time of visit to the household.
- Available in the household at the time of the survey.

Exclusion criteria:

- Institutional populations – schools, offices, prisons, defence establishments, hospitals, nursing homes, hostels etc.
- Those refusing to give consent of participation.
- Hospitalized residents.
- Seriously sick and bedridden unable to be X-rayed and give sputum specimen.

. The enumeration included the details of all the family members in the household and not only the eligible people. Eligible individuals were encouraged to participate in the survey. All eligible

participants were given a Participant Identity Card (PID Card) with a pre-printed QR code as shown in the figure 3.

Figure 3 Participant ID card for the National TB Prevalence Survey

The PID card consisted of 2 parts, in the first part the name, age, sex, address, and mobile number of participants, along with the QR code was printed on one side. This QR code was unique for every participant. At the back of this, the benefits of the survey to the participants was mentioned. The second part contained the details of the survey activities for the reference of the survey team. After the completion of each of the processes, the same was marked on the card. On the back of the second part, the QR stickers for the consent, first, second third sputum sample and the blood sample were printed in sticker formats. If an eligible person was not willing to participate in the survey, the reason for non-participation was documented. The enumeration process continued till 800 eligible participants were enrolled in the survey. In case in a particular cluster, 800 eligible participants were not available, then the next nearest village/ward was selected to complete the cluster requirement.

2.12.3.2 Consent and Interview

Eligible population were encouraged to participate in the survey. Written informed consent from eligible participants was taken in the local language before actual symptom screening and history elicitation by a trained interviewer. For children aged 15 to less than 18 years, assent from the

child and consent from the guardian were obtained. For those who were unable to read/understand, consent was obtained under the supervision of a witness who was not part of the survey team. After consenting, the participant underwent symptom screening and history elicitation by a trained interviewer. The interview consisted of questions on their socio-demographic details, respiratory symptoms, current and past history of TB, health-seeking behaviour and cost of TB-related expenses. Height, weight, blood pressure measurement and point of care tests (POCT) for random blood sugar and haemoglobin were also done at the survey site itself to provide basic health service to the participants of the survey.

2.12.3.3 Chest X-ray

All eligible participants who attended the survey were offered chest X-ray PA view in the mobile X-ray unit. For woman participants, pregnancy was ruled out by history and urine pregnancy test before taking a chest X-ray. The digital image was checked by the medical officer in real-time. The chest X-ray image was stored along with the survey participant number matched by both demographic details and bar code scanning. The X-ray was saved in the server in each mobile van which then got transmitted to the central server in NIRT

2.12.3.4 Sputum eligibility

Survey participants having persistent cough for ≥2 weeks, fever for ≥2 weeks, significant weight loss, presence of blood in sputum any time during last 6 months, chest pain in the previous one month, history of anti-TB treatment (previous/current) at the time of interview and individuals with any lesion on the chest X-ray suggestive of TB were eligible for sputum examination. Three to five ml of good-quality sputum was collected from all eligible participants under supervision in a separate area. First sputum sample was subjected to CBNAAT for detection of MTB and Rifampicin resistance in the survey van. Second sputum sample was collected and transported (in the cold chain) within 48 hours to a pre-identified reference laboratory for AFB smear microscopy, liquid culture and DST. A conditional 3rd sputum was collected if MTB was detected by CBNAAT in 1st sample and transported to the assigned reference laboratory, where CBNAAT, smear microscopy, liquid culture and DST was done. The screening strategy and diagnostic algorithm for the National TB Prevalence Survey is shown in figure 4. All diagnosed TB patients were linked with the National TB Elimination Programme (NTEP) of the country and were treated as per the program guidelines.

Figure 4 Screening strategy and diagnostic algorithm in National TB Prevalence Survey

All Eligible participants enrolled in the TB Prevalence Survey

Symptom screening using standard questionnaire
Chest X-ray PA view screening of all participants except pregnant women

Participants with :
- Symptoms suggestive of TB and/or
- Past history of TB and/or currently on TB treatment and/or
- Abnormal chest X-ray

Participants with :
- No symptoms suggestive of TB
- No past history of TB and not currently on TB treatment
- Normal chest X-ray

No sputum collected

First sputum specimen

Second sputum specimen

Conditional 3rd sputum if 1st sputum is positive

Third sputum specimen

CBNAAT for MTB in mobile medical unit in field

Liquid culture in reference laboratory

AFB-S microscopy in reference laboratory

CBNAAT for MTB in reference laboratory

Liquid culture in reference laboratory

AFB-S microscopy in reference laboratory

No TB | TB + | No TB | TB + | No TB | TB + | No TB | TB + | No TB | TB + | No TB | TB +

2.12.3.5 IGRA Clusters

In the selected IGRA clusters, 5 ml of venous blood was collected from all the participants. The venous sample was incubated and centrifuged at a nearby facility and transported to NIRT lab for testing. The national prevalence of TB infection was estimated. All the participants in the surveyed clusters in Gujarat underwent IGRA testing and the samples were tested in the laboratory in Ahmedabad with the support from the State TB cell, Gujarat.

2.12.4 Post Survey Activities

After the survey operations were over, the survey team shared the details of the cluster activities including the participants details to the local TB Program staff for following the sputum smear, culture or CBNAAT results from the reference laboratories and to start the participants on suitable treatment. The participants identified with increased blood pressure, increased blood sugar and decreased haemoglobin were referred for further care and management to nearby government health facilities. The consent forms were sent to ICMR-NIRT, Chennai for archiving.

2.13 Major Milestones in Survey Implementation

The major milestones for the overall project implementation including the operationalization of mobile X-ray units, trained human resources, functional laboratory systems with monitoring and supervision are shown in Table 1.

Table 1 Major milestones in survey implementation 2019-2021

S.No	Survey Component	Survey Major Milestones	Site	Date
1	Mobile X-ray Unit	Completed the registration for 21 buses	NIRT, Chennai	10/06/19
2		Verified that all 25 Mobile X-ray units had received License for operation from AERB	NIRT, Chennai	23/06/19
3		Completed the registration for remaining 4 buses	NIRT, Chennai	03/07/19
4	Data Management	Laptops and Tablets received by NIRT for the survey data collection system	NIRT, Chennai	09/07/19
5	Mobile X-ray Unit	Completed the Commissioning of the 23 Generators numbers	NIRT, Chennai	26/07/19
6	Laboratory Systems	MGIT consumables received by IRL/NRL	20 IRL/NRL	10/07/19
7	Trained Human Resources	Inductus HR Recruitment agency withdrew the services.	All sites	17/01/2019
		17 sites completed the recruitment process for 590 Posts, Published the results and sent the offer letter		18/01/2019- 31/03/2019
8		Recruited survey team staff joined	All sites	1/04/2019-31/05/2019
9	Pilot testing of the Survey tools	Pilot testing of the survey started	Tiruvallur	25/04/19

S.No	Survey Component	Survey Major Milestones	Site	Date
10		Start of the actual survey in Tamil Nadu and Pilot testing in other sites	All sites	1/6/2019-30/11/2019
11	Training for the different state teams at the state level nodal institutes	Tamil Nadu	NIRT, Tiruvallur	16/04/19 – 20/04/19
12		Uttar Pradesh	JALMA, Agra	23/04/19 – 27/04/19
13		Kerala	STC, Trivandrum	20/06/19 – 26/06/19
14		Maharashtra & Gujarat	NARI, Pune	10/07/19 – 15/07/19
15		Odisha, Jharkhand & Chhattisgarh	RMRC, Bhubaneshwar	16/07/19 – 21/07/19
16		West Bengal	NICED, Kolkata	19/08/19 – 23/08/19
17		Rajasthan	DMRC, Jodhpur	25/08/19 – 30/08/19
18		Bihar	RMRIMS, Patna	09/09/19 – 14/09/19
19		Telangana & Andhra Pradesh	NIN, Hyderabad	09/10/19 – 13/10/19
20		Madhya Pradesh	NIRTH, Jabalpur	14/10/19 – 18/10/19
21		Karnataka	NTI, Bengaluru	17/10/19 – 25/10/19
22		Punjab	STDC, Patiala	21/10/19 – 25/10/19
23		North East	RMRC, Dibrugarh	05/11/19 – 14/11/19
24	Centralised training for the standardisation of the data collection procedures	Sensitisation Workshop for State TB Officers	NIRT, Chennai	23/05/19 – 24/05/19
25		Sensitization Workshop for the Monitoring Committee	NIRT, Chennai	29/05/19
26		Training for Data Entry Operators	JALMA, Agra	16/08/18 - 17/08/18
27		Phlebotomy Training for Lab Technicians of the Tamil Nadu Field Team	NIRT, Chennai	19/08/19 – 20/08/19

S.No	Survey Component	Survey Major Milestones	Site	Date
28		IGRA Installation & Training	NIRT, Chennai	19/08/19 – 23/08/19
29		X-ray Technician Training-1st batch	NIRT, Tiruvallur	28/08/19 – 29/08/19
30		X-ray Technician Training- 2nd batch	NIRT, Tiruvallur	14/05/19 – 15/09/19
31		Medical Officers Training	NIRT, Tiruvallur	16/09/19 – 20/09/19
32		UDC Training	NIRT, Tiruvallur	17/09/19
33		Lab Technician Training- Tamil Nadu, Kerala, Karnataka, Andhra Pradesh and Telangana	NIRT, Chennai	17/09/19 – 19/09/19
34		IRL/NRL Microbiologist Training	NIRT, Chennai	20/09/19 – 21/09/19
35		Lab Technician Training- Uttar Pradesh and Madhya Pradesh	JALMA, Agra	24/09/19 – 26/09/19
36		Lab Technician Training- Gujarat, Rajasthan and Maharashtra	NIOH, Ahmedabad	
37		Lab Technician Training- Odisha, Jharkhand and Chhattisgarh	RMRC, Bhubaneshwar	
38		Lab Technician Training- West Bengal and Bihar	NICED, Kolkata	
39		Nutritional Methods training for all the teams	NIN, Hyderabad	18/11/2019- 23/11/2019
40	COVID Pandemic	Survey temporarily withheld due to COVID pandemic	All sites	23/03/20
41	COVID Infection Prevention Control	For all the teams the Infection, prevention and Control training given	Online	1/4/2020-5/4/2020

S.No	Survey Component	Survey Major Milestones	Site	Date
42	Community Mobilisation	Community Mobilisation Training especially in the context of COVID pandemic	Online	16/11/2020- 18/11/2020 23/11/2020
43	COVID Pandemic	Re-initiation of the National TB Prevalence Survey	All Sites	06/10/20
44	Teleradiology	Initiation of the Teleradiology Reporting	Online	01/12/20
45	Completion of the Field activity	Last cluster completed in Meghalaya	Meghalaya	05/09/21
46	Completion of the Culture Processing	Database lock : All the lab data entry for the CBNAAT/Smear/Culture locked on 10/11/2021 except for culture result of one cluster from Odisha, this will be added as addendum	NIRT	10/11/21
47	Data Analysis and Report writing	Data analysis and Report Writing	NIRT	15/11/21

Chapter 3

Data Management and Analysis

Chapter 3 Data Management and Analysis

3.1 Data Validation

Data validation was undertaken by the CPMU. The following were done on a daily basis and communicated to the respective authorities:

1. Checking for the completeness of data set and reviewing for missing information that can be obtained and updated.
2. Undertaking regular checks for completeness.
3. Validation of data entries i.e. logical checks.
4. Staff system training – no staff was provided with data entry rights until they completed training.
5. Benchmarking, both cluster level and field team, to identify data quality issues and trends; any discrepancies were investigated.
6. CRF creation, database set up, database validation, training, database change implementation and database management were done as per the recommended standards.

3.2 Checking for and Acting on Missing or Inconsistent Data

Any member of staff identifying inconsistency in data corrected it, if it was in the scope of their role/responsibility, otherwise they brought it to the attention of an appropriate team in-charge/team medical officer without delay. Errors and inconsistencies identified were investigated and addressed by site medical officer.

3.3 Managerial Arrangements for Data Quality Control

3.3.1 Site Level

Day-to-day management of data quality was with the respective site level medical officer and data entry operator. The standard operating procedures were followed.

3.3.2 Central Project Management Unit (CPMU) Level

Central Project Management Unit processed the data on daily basis and communicated the following with the team at the field. Daily summary of the data collected was shared among CPMU for quality assurance

- Data Summary – The daily and cumulative activity of their team was communicated with them to ensure the count
- Mistake List – The missing, inconsistency and errors were communicated with them via email on daily basis for immediate rectification
- Benchmark – The benchmark indicator was shared to assess their daily progress.
- Geo Coordinates of the enumerated households were plotted on daily basis to ensure whether the starting point was chosen without any bias, whether both the teams were moving in the opposite and/or in said direction and to monitor the daily progress of the team.

At the end of the cluster activity in each cluster a data counter was generated, CPMU cross checked the data collected in tab and data available in the van and central servers for quality. CPMU checked updates against key targets and standards. The daily change in the data entry into the software was monitored closely to ensure any loss or major change in data.

3.3.3. Data Management

After the completion of field activities, data entry options for the field staff was deactivated. After the completion of the lab sample processing, the data entry option for the IRL staff was deactivated.

Once the field and lab data entries were completed, the database was downloaded from the software. The data from the 20 clusters which were done by paper based data collection method were entered on Redcap/Excel and was merged with the downloaded database. The data was cleaned and organised to meet the requirements of the operational definitions mentioned below.

3.4 Study Definitions

1. **Enumerated population (N):** The enumerated population includes all individuals in the survey area who were assessed for eligibility based on the demographic details that were collected during census including eligible and ineligible individuals.
2. **Ineligible population:** If the individual met any one of the following criteria, then he/she was excluded from the study and called ineligible population.
   - Less than 15 years of age.

- Institutional populations – residing in the schools, offices, prisons, defence establishments, hospitals, nursing homes, hostels, etc.
- Hospitalized residents.
- Seriously sick and bedridden.
- Not available in the household at the time of the survey despite three consecutive visits for the interview.
- Not staying in the household for the last one month.
- Not willing and not consenting.

3. **Eligible study population (N1):**
   - Individuals who were 15 years of age or above.
   - Those who are living in the household of the selected cluster for the past four weeks before the initiation of cluster activity.
   - Those who consented for the interview.

4. **Non-participants:** Eligible study population who did not attend the survey screening by any method.

5. **Study participants (N2):** An eligible individual who has been screened for TB by at least one method (symptom screening or chest X-ray).

6. **Participants symptom screened (N3):** The Study participants who were screened for TB symptoms including persistent cough for ≥2 weeks, fever for ≥2 weeks, significant weight loss (loss of ≥4.5kg of the usual body weight over the past 6 months), presence of blood in sputum at any time during the last 6 months, chest pain in the last one month and history of TB treatment (past/current).

7. **Participants chest X-ray screened (N4):** The study participants who were not pregnant and were screened by chest X-ray PA view.

8. **Participant eligible for sputum examination (N6):** A participant who was eligible for sputum examination by at least one screening method (symptom screening or Chest X-ray)**.**

9. **Participant eligible for sputum examination based on symptom screening:** A Participant was eligible for sputum examination if they had any of the following:
   - TB symptomatic: An individual with any of the following symptoms is defined as TB Symptomatic and is eligible for sputum evaluation.
     - Persistent cough for ≥2 weeks
     - Fever for ≥2 weeks
     - Significant weight loss (loss of ≥4.5kg of the usual body weight over the past 6 months)

- o Presence of blood in sputum at any time during the last 6 months.
- o Chest pain in last one month.
- History of TB.
- Currently on TB Treatment.

10. **Participant eligible for sputum examination based on chest X-ray:** A Participant is eligible for sputum examination if they have a chest X-ray classified as:

    A. Abnormality detected, significant, not tuberculosis.

    B. Abnormality detected, significant, unclassified.

    C. Abnormality detected, significant, no active disease.

    D. Abnormality detected, significant tuberculosis.

11. **Bacteriologically positive by CBNAAT:**

- A participant who has the following results either in the first and/or third sample was considered Bacteriologically Positive by CBNAAT :

      o MTB Detected High

      o MTB Detected Medium

      o MTB Detected Low

      o MTB Detected Very Low

- The higher grade in either of the sample result was considered as the final CBNAAT Result. (MTB Detected High > MTB Detected Medium > MTB Detected Low > MTB Detected Very Low > MTB Not Detected > Not Available/Invalid/Error.)

12. **Bacteriologically positive by culture:**

- A participant who has the following results either in the second and/or third sample was considered Bacteriologically Positive by MGIT Culture

      o Positive

- The higher grade in either of the sample result was considered as the final MGIT Culture result. (Positive > Contamination> Negative > Not Available)

13. **Bacteriologically positive by AFB smear status:**

- A participant who has the following results either in the second and/or third sample was considered Bacteriologically Positive by AFB Smear

      o 3+

      o 2+

      o 1+

      o Scanty

- The higher grade in either of the sample result was considered as the final AFB Smear Result.

(3+ > 2+ > 1+ > Scanty > Negative > Not Available)

14. **Microbiologically confirmed pulmonary TB** patient was defined as a participant with any one of the following criteria :

   1. 2 Bacteriological Evidence: [2 specimens positive for TB either by smear or culture or CBNAAT] or

   2. 1 Bacteriological Evidence and One Radiological Evidence by Central Teleradiology or local field medical officer [1 specimen positive by smear or CBNAAT or Culture and X-ray abnormal by the central reader / field medical officer].

15. **Isolated microbiologically positive TB** patient was defined as a presumptive pulmonary TB patient with 1 Bacteriological Evidence [1 specimen positive by smear or CBNAAT or Culture] with no radiological evidence of TB.

16. **Clinically diagnosed TB** patient was defined as a participant with X-ray abnormality suggestive of TB by at least 2 central readers and not microbiologically confirmed TB.

17. **Primary Sampling Unit**: Cluster [Wards/Villages] in India.

18. **Stratum**: State Group of India.

19. **Sampling Weightage**: Each cluster will have the weightage which is equal to the Inverse to its selection probability from the sampling frame.

3.5 Data Analysis:

Descriptive analysis for summarizing the characteristics of survey participants was performed. All the statistical analysis was done using Stata16 (Stata Corporation, College Station, TX, USA). The confidence interval was estimated using the exact binomial formula. The statistical difference between the proportions was tested using Z – proportion test and the association were assessed using chi-square test for association.

3.5.1 Estimation of Prevalence of Bacteriologically Confirmed Pulmonary TB Among Adults

To estimate the primary outcome i.e. the prevalence of bacteriologically confirmed pulmonary TB among adults in India, we calculated the point prevalence with 95% confidence intervals using "svy" (with "p weights" specified) at the national and state group levels. "svy" command was used to derive the proportions based on inverse probability weightage and post-stratifications. The post stratification weighting was applied using projected population of India to account for the relative contribution of each participants in the survey, to maximize the representativeness of the study[9]. A logistic regression with robust standard errors was used to determine the state group level prevalence.

A random-effects models at cluster level was performed to adjust for clustering effects. These estimates were adjusted using "p weights" derived based on the inverse probability of the cluster selection [10]. All these estimates were standardized for age and gender as recommended by the WHO [11].

Multiple imputations were done using the chained equation (i.e., "ice") for missing values in CBNAAT, smear, liquid culture and microbiologically confirmed PTB status. For the imputation, the combination of predictors consisting of age, gender, chest X-ray finding, urban, rural and TB symptoms were used to derive individual-level missing values. In this imputation method, 20 datasets were generated to derive the best estimate and its confidence interval using (i.e., "mim") Rubin's rules [12]. Based on the data derived from multiple imputation, adjusted prevalence rates of smear-positive TB, CBNAAT-positive TB, culture-positive TB, and bacteriologically confirmed TB were calculated as suggested by Floyd et al, 2013 [13].

3.5.2 Estimation of Prevalence of All Forms of TB

To estimate the prevalence of all forms of TB for all ages in the country, the microbiologically confirmed PTB prevalence among those aged ≥15 years measured from the national survey was adjusted for pulmonary TB in children, the proportion of children among the total country population and extra-pulmonary TB in all ages.

Then the Prevalence to Notification Ratio was estimated using the estimated prevalence of CBNAAT and or smear-positive cases given in the annualised NTEP Notification rate of adult PTB cases, 2021 [14].

To assess the change in the observed prevalence trend between the pre and during lockdown period, Interrupted Time Series (ITS) analysis was used to estimate the significance of the basic trend before and after the COVID interruption. We also compared the month wise TB prevalence against the confirmed COVID cases and mortality using Spearman rank coefficient of correlation [15].

Chapter 4

Quality Assurance

Chapter 4 Quality Assurance

Every process and procedure of this large scale survey was planned with the aim of quality data generation. Every stage of the survey, starting from the clusters sampled, identification of the selected cluster for survey activities, selection of planned eligible population, identification of symptoms, positioning of participants for chest X-rays, reporting of chest X-rays, classification of sputum eligible participants, collection of good quality sputum, testing of sputum samples for MTB by CBNAAT, smear, liquid culture, entry of data, transmission of data from field to central server, data curation, data analysis and reporting has a risk of bias. Efforts were taken to minimise errors in all these steps based on the previous experiences nationally and internationally.

4.1 Protocol Development and Survey Implementation

The protocol was developed by a team of experts in the country based on the *Tuberculosis prevalence surveys: a handbook* by WHO. All key documents (protocols, SOPs including methods, implementation modality, training modules) were developed by ICMR - NIRT in collaboration with CTD and WHO, India country office. They were further validated by the various expert committees of the prevalence survey and endorsed by the steering committee before implementation. The selection of clusters were done randomly and was checked by 4 experts independently.

4.2 Data Management

The survey data collection was software based and the software for data collection had all the required validations to prevent avoidable errors and improve the data quality. The epidemiology statistics department of NIRT monitored and provided regular feedback on the data reaching the central server from all the field teams, reference laboratories and the chest X-ray reporting. Indirect indicators of quality such as age and gender distribution among the surveyed participants, proportion of pregnant women, etc were checked and found satisfactory and corroborated with external evidences. All the survey data was synced and stored in the central server located at ICMR-NIRT, Chennai. The data backup for the central server was created in three different locations. The cleaning of the database was conducted thoroughly before data analysis to prevent the misclassification of variables.

4.3 Field Activities

All field team members were trained as a team and specifically for each of their respective roles. Refresher trainings were also conducted on a regular basis. After completion of the training, pilot survey was conducted, this helped in strengthening the survey implementation. Only after completing the adequate training, the staff were engaged in the survey. A standardised presurvey checklist along with contact details of the community level officials and volunteers, updated CEB map, random number generation screenshot and geo-coordinates of the random number household prepared by the field teams were reviewed by the CPMU before the initiation of the cluster. During the cluster activity, real time monitoring of the data collection was also done by CPMU. The Geo Coordinates of the enumerated households were plotted on daily basis to check whether the starting point was chosen in accordance with the generated random number without any bias and whether both the teams were moving in the opposite and/or in said direction and to monitor the daily progress of the team. Daily data checks, comparing the collected data with the bench mark data, reviewing the data for logical errors were done by CPMU for quality assurance. At the time of cluster closure, the data was checked for completeness. Multiple field monitoring visits were done by CPMU team, scientists from NIRT and other ICMR institutes, STO, DTO and WHO consultants to ensure the quality implementation of the survey. Additional monitoring field visits were conducted during the course of the survey. The visits focused on all aspects of the survey process to identify problems and to address problems noted.

4.4 Chest X-Ray

Qualified field medical officers, field X-ray technicians and central teleradiology panel were trained on standard operating procedures to ensure quality assurance. A basic on the spot QA test of the chest X-ray taken was carried out by the medical officer. If the image quality was not acceptable, the X-ray was repeated. Medical officers based their judgement on parameters such as rotation, penetration, inclusion of the entire area of interest and accuracy of demographic data. After initiation of teleradiology reading, if the participants was eligible for sputum either by field MO report and/or teleradiology report, their sputum sample was collected. All the chest X-ray images were read by 2 teleradiologists, If there was a discrepancy between the 2 readers' report a third umpire reader reported the X-ray.

4.5 Laboratory

Standardization of laboratory procedures was essential, as many laboratories were involved. A quality assurance system was in place to ensure that all laboratories involved performed procedures in accordance with SOPs.

4.5.1 At the Survey Site

All the laboratory technicians were trained on Standard Operating Procedures. Pre-printed QR coded specimen labels unique for each PID was used. During sample testing and entry of results the QR code was scanned to prevent transcription errors and duplication. Temperature monitors were used to ensure that the temperature of the refrigerator was between 2°-8°C and the temperature of the CBNAAT cabin was 20° – 25°C. The field laboratory technicians recorded the temperature every 2 hours and entered in a google sheet. This google sheet was monitored on a daily basis by the CPMU. Regular CBNAAT equipment calibration checks were performed. The major challenge in transportation of sputum sample, especially during the COVID pandemic due to the lockdown restrictions was delay in sputum transportation leading to contamination of the samples. To overcome this challenge, a specialised agency was identified and utilised for transportation of sputum samples from the field to the reference laboratory within 24-48 hours in cold chain. The duration and temperature of the transported sputum samples were monitored by means of google sheet.

4.5.2 Reference Laboratory

Regular monitoring of quality indicators (contamination and recovery rate) was done. The Quality Assurance team conducted at least 1 visit to each participating laboratory and checked all specimens retained on two days of visit for quality. The quality assurance of the smear, CBNAAT and culture was done as per the recommended NTEP guidelines for the reference laboratories.

Chapter 5

Results

Chapter 5 Results

5.1 Summary of Survey findings

The National TB Prevalence Survey enumerated 4,85,010 household members and assessed for eligibility for participation in the survey, of which 3,54,541 (73.1%) were eligible and were enrolled in the survey. Of those eligible, 3,22,480 (90.9%) participants consented for the survey and were screened by at least one method. All underwent symptom screening, while 3,13,112 (97.1%) underwent both symptom screening and chest X-ray examination. Among those who were screened, 41,932 were eligible for sputum collection.

Of those eligible for sputum collection :

a) First sample was tested for 37,190 (88.69%) and in 825 (2.22%) MTB was detected by CBNAAT.

b) Second sample was tested for 35,086 (83.67%) of which 403 (1.15%) were positive for AFB smear and 467 (1.33%) were positive by culture.

c) Among the 825 MTB detected by CBNAAT in the first sample, 737(89.33%) third sample were collected, of which in 528 (71.6%) MTB was detected by CBNAAT, 279 (37.86%) were positive by smear and 289(39.21%) were positive by culture.

Overall, for all the 3 sputum tests examined together, in 825 (2.2%) MTB was detected by CBNAAT, 445 (1.27%) were positive for AFB smear and 526 (1.55%) were positive by culture. Overall there were 981 microbiologically confirmed PTB patients identified in the survey. (Figure 5)

Figure 5 Flow of participants enumerated, enrolled, screened, sputum examined and diagnosed with microbiologically confirmed PTB in the Prevalence survey, India 2019-2021

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                    ┌─────────────────────────────────┐
                    │ Individual enumerated in census │
                    │        N = 4,85,010             │
                    └─────────────────────────────────┘
                                    │
                                    │──────────►  Ineligible Population (Excluded) : 1,30,469
                                    │             Age less than 15 years        : 84681 (17.5%)
                                    │             Not staying in household
                                    │             for previous 1 month          : 32139 (6.6%)
                                    │             Not willing to respond         : 11068 (2.3%)
                                    │             Hospitalised/sick/
                    ┌─────────────────────────────────┐    bed ridden/others      : 2581 (0.5%)
                    │   Eligible study population      │
                    │   N1 = 3,54,541 (73.15%)         │
                    └─────────────────────────────────┘
                                    │
                                    │──────────►  Non Participants : 32,061
                                    │             Not available during home visit : 11524 (3.3%)
                                    │             Refused to give consent          : 19226 (5.4%)
                    ┌─────────────────────────────────┐    Others                 : 1311 (0.4%)
                    │ Study participants screened by   │
                    │        any one method            │
                    │   N2 = 3,22,480 (90.9%)          │
                    └─────────────────────────────────┘
```

Participants symptom screening
N3 = 3,22,480 (100%)

Participants chest X-ray screening
N4 = 3,13,112 (97.1%)

Study participants screened by both methods
N5 = 313112 (97.1%)

Total number of individuals eligible for sputum examination by both symptom and X-ray
N6 = 41,932 (13%)

1st sputum
Processed N7 = 37190 (88.69%)
MTB detected by CBNAAT = 825 (2.22%)

2nd sputum
Processed N8 = 35086 (83.67%)
Smear positive = 403 (1.15%)
Culture positive = 467 (1.33%)

3rd sputum
Processed = 737 (89.33%)
MTB detected by CBNAAT = 528 (71.64%)
Smear positive = 279 (37.86%)
Culture positive = 289 (39.21%)

Sputum result
MTB detected by CBNAAT = 825 (2.22%)
Smear positive = 445 (1.27%)
Culture positive = 526 (1.5%)

Microbiologically confirmed pulmonary TB patients : 981 (0.30%)

5.2. Coverage of the Clusters

The survey covered 443 out of the 625 clusters in the planned duration of 2.5 years. Among the 443 clusters 111 clusters were completed from June 2019-March 2021 and 332 clusters were covered during the COVID pandemic. The survey was halted temporarily on 24th March 2020 due to the nation-wide lockdown due to the COVID-19 pandemic and restarted on 6th October 2020. There were also certain delays due to the COVID second wave which affected the survey implementation. There were challenges in coverage area and participation of community due to the fear of COVID, but the survey teams and the NTEP staff coordinated the community mobilisation efforts and maximised the coverage and participation rate. Table 2 shows that 12 (60%) state groups achieved a minimum of 80 percent and above coverage while the remaining 8 (40%) state groups achieved a 50% to less than 80% coverage of the planned clusters.

Table 2 Coverage of clusters in the survey at the national and state group level 2019-2021

State Group	No. of clusters as per protocol	No. of clusters covered	% Covered	Protocol Precision	Achieved precision
Telangana	18	18	100.00%	0.35	0.084
Jharkhand	17	17	100.00%	0.36	0.096
Kerala	17	17	100.00%	0.36	0.061
Punjab	15	15	100.00%	0.38	0.093
Chhattisgarh	13	13	100.00%	0.41	0.116
Delhi	9	9	100.00%	0.49	0.131
Gujarat	32	31	96.88%	0.26	0.046
Andhra Pradesh	25	23	92.00%	0.3	0.079
Tamil Nadu	38	32	84.21%	0.24	0.062
Northeast States	25	21	84.00%	0.3	0.082
Odisha	21	17	80.95%	0.32	0.088
Maharashtra	57	46	80.70%	0.2	0.038
Himachal Pradesh, Uttarakhand, Jammu & Kashmir	15	10	66.67%	0.38	0.125
Karnataka	31	20	64.52%	0.27	0.071
Madhya Pradesh	38	22	57.89%	0.24	0.082
Bihar	55	31	56.36%	0.2	0.073

State Group	No. of clusters as per protocol	No. of clusters covered	% Covered	Protocol Precision	Achieved precision
Haryana	13	7	53.85%	0.41	0.189
Rajasthan	36	19	52.78%	0.25	0.107
Uttar Pradesh	104	52	50.00%	0.14	0.065
West Bengal	46	23	50.00%	0.22	0.059
India	**625**	**443**	**70.88%**	**0.09**	**0.018**

Geographical Coverage of the survey: The survey covered all the regions, terrain and geography providing good geographical coverage and representation of the survey in the country (Figure 6).

Figure 6 Geographical coverage of the clusters in the National TB Prevalence Survey in India, 2019-2021
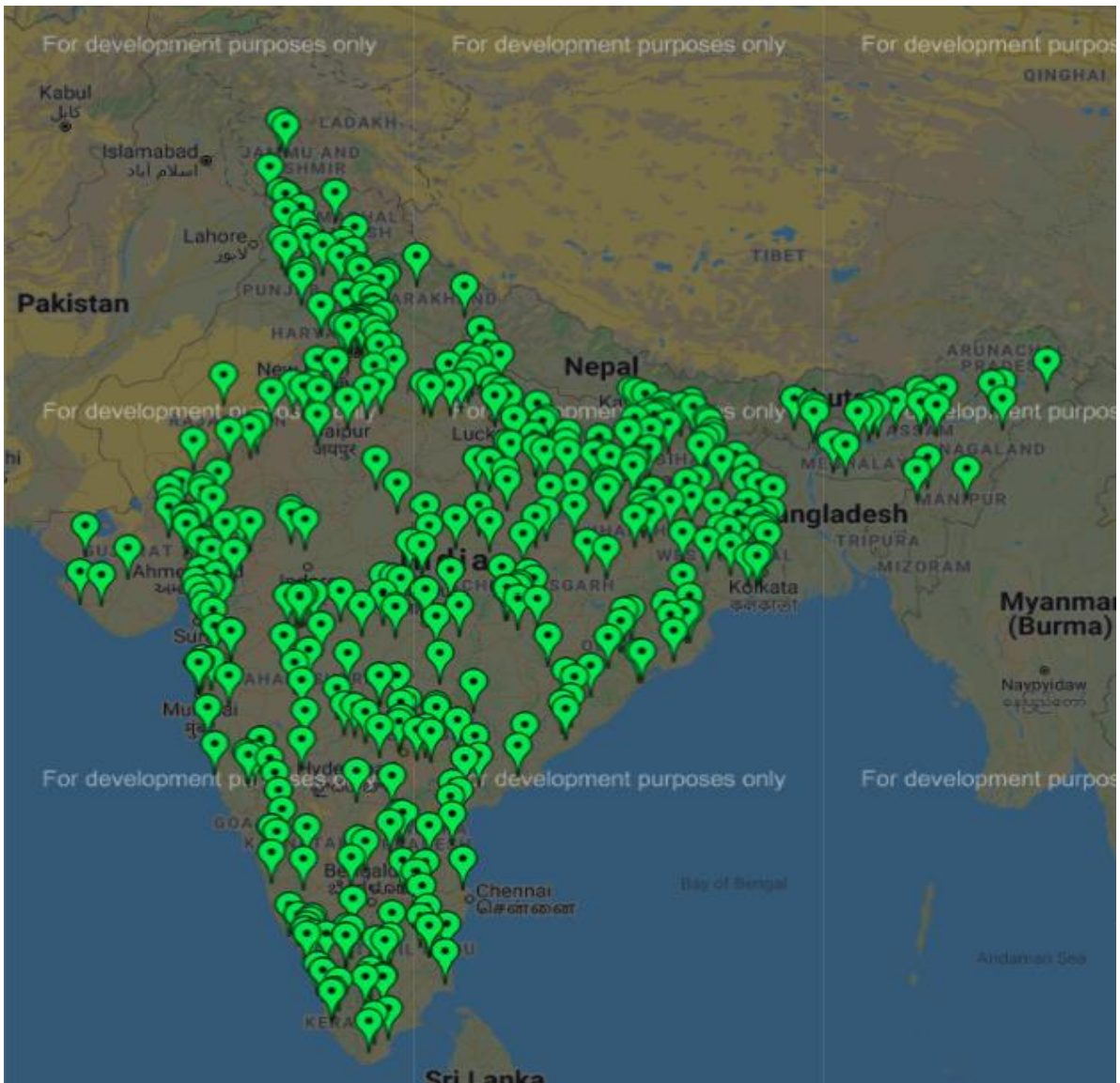
We compared the covered and non-covered clusters' corresponding TU, district and state groups level notification rates for a) all forms of TB and b) PTB during the periods of 2019, 2020 and 2021 using Z proportion test. Figure 7 and 8 shows that there is no difference in the notification among the covered cluster and the non-covered clusters at the state group level. Similar trend was observed at the district and TU level.

Figure 7 Notification of all forms of TB among covered and non-covered survey clusters at state group level
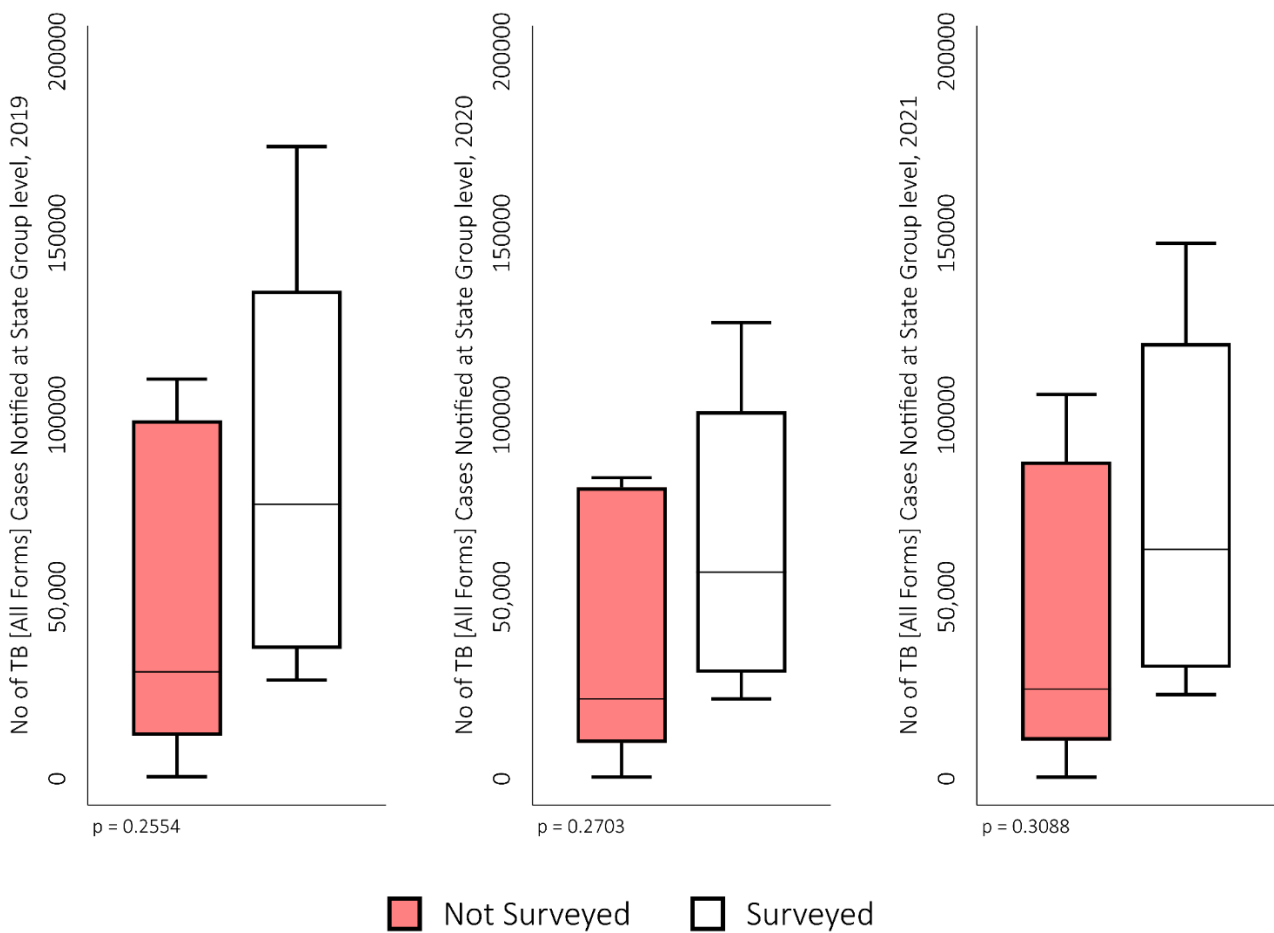
Figure 8 Notification of pulmonary TB among covered and non-covered survey clusters at state group level
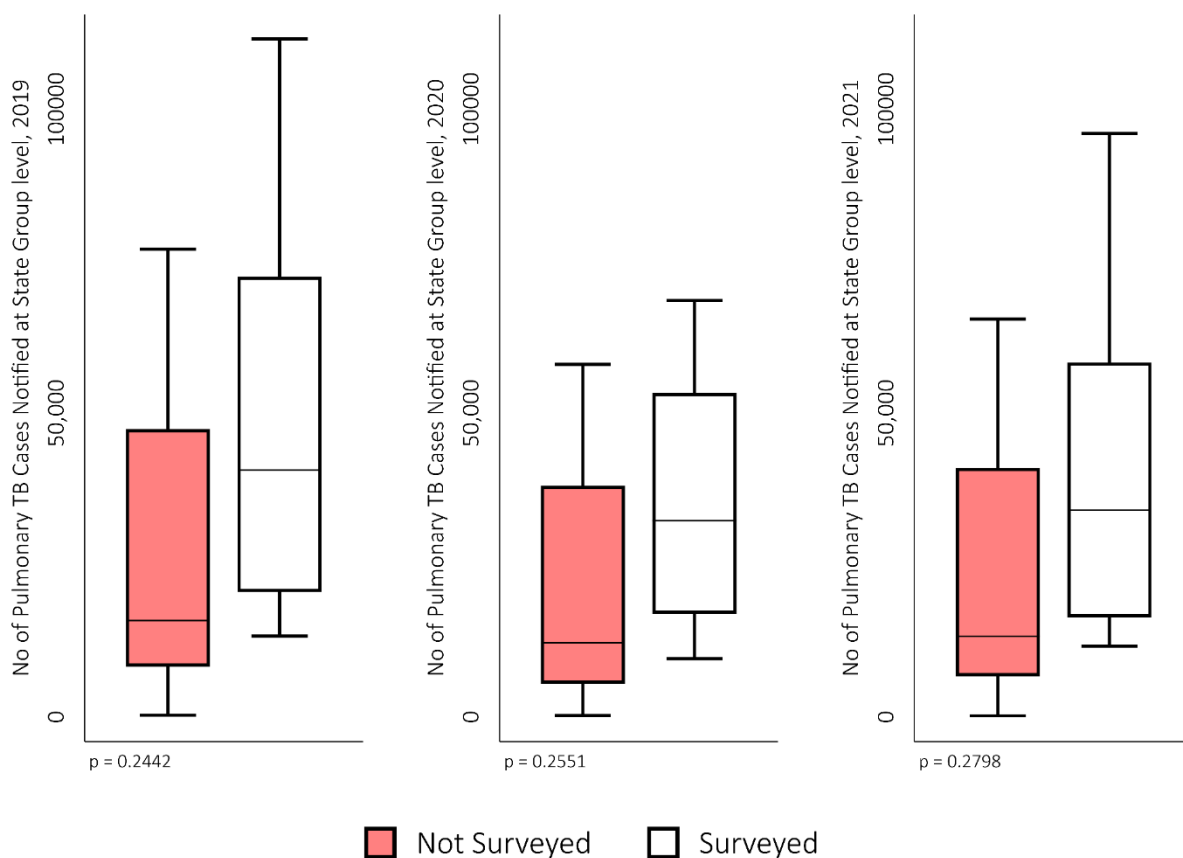
5.3 Enumeration and Proportion of Eligible and Ineligible Population

We have enumerated 4,85,010 individuals in the household and among them 3,54,541 (73.1%) were eligible for the survey. Among the ineligible population, 84,681 (17.5%) were aged less than 15 years and this was the major reason for ineligibility. Other reasons included not staying in the household for the previous one month [32,139 (6.6%)], participant not willing to respond [11,068(2.3%)], hospitalized residents, seriously sick, bedridden and others [2,581 (0.5%)](Table 3). Among the ineligibles 57% were male and 43% were females. Apart from those below 15 years, more ineligibles were observed in the younger age group of 15-24 and 25-34 as compared to the other age groups.

Among the eligible population of 3,54,541, there were 1,78,239 (50.3%) females and 1,76,283 (49.7%) males and the remaining 19 were transgender (Table 3).

Table 3 Enumerated individuals (eligible and ineligible) by reason for ineligibility by gender, age group and state group in the survey

| | Ineligible | | | | | | | | Eligible Population | | Total |
| | Age less than 15 Years | | Not staying in household for previous one month | | Participant was not willing to respond | | Hospitalized residents, Seriously sick, bed ridden and others | | | | |
	n	%	n	%	n	%	n	%	N1	%	n
Overall	84,681	17.5%	32,139	6.6%	11,068	2.3%	2,581	0.5%	3,54,541	73.1%	4,85,010
Gender											
Female	40,449	17.3%	8,650	3.7%	5,531	2.4%	1,525	0.7%	1,78,239	76.0%	2,34,394
Male	44,221	17.6%	23,487	9.4%	5,534	2.2%	1,056	0.4%	1,76,283	70.3%	2,50,581
Transgender	11	31.4%	2	5.7%	3	8.6%	0	0.0%	19	54.3%	35
Age Group in years											
0 to 4	20,418	100.0%									20,418
5 to 14	64,263	100.0%									64,263
15 to 24			9,544	10.9%	3,446	3.9%	264	0.3%	74,435	84.9%	87,689
25 to 34			8,174	10.1%	2,542	3.2%	230	0.3%	69,708	86.4%	80,654
35 to 44			6,264	8.2%	1,874	2.4%	184	0.2%	68,174	89.1%	76,496
45 to 54			4,510	6.8%	1,511	2.3%	219	0.3%	59,715	90.5%	65,955

	Ineligible								Eligible Population		Total
	Age less than 15 Years		Not staying in household for previous one month		Participant was not willing to respond		Hospitalized residents, Seriously sick, bed ridden and others				
	n	%	n	%	n	%	n	%	N1	%	n
55 to 64			2,353	4.6%	937	1.8%	353	0.7%	47,155	92.8%	50,798
≥65			1,294	3.3%	758	2.0%	1,331	3.4%	35,354	91.3%	38,737
State Group											
Andhra Pradesh	1,350	6.0%	96	0.4%	47	0.2%	6	0.0%	21,076	93.4%	22,575
Bihar	3,056	8.5%	705	2.0%	1,165	3.3%	97	0.3%	30,742	86.0%	35,765
Chhattisgarh	2,736	20.6%	1,067	8.0%	48	0.4%	37	0.3%	9,416	70.8%	13,304
Delhi	581	6.4%	32	0.4%	14	0.2%	7	0.1%	8,454	93.0%	9,088
Gujarat	3,169	10.6%	1,727	5.8%	11	0.0%	34	0.1%	24,905	83.4%	29,846
Himachal Pradesh, Uttarakhand, Jammu & Kashmir	4,359	36.5%	553	4.6%	307	2.6%	115	1.0%	6,601	55.3%	11,935
Haryana	2,696	43.2%	1,797	28.8%	1,144	18.4%	107	1.7%	490	7.9%	6,234
Jharkhand	8,527	46.0%	1,704	9.2%	1,004	5.4%	424	2.3%	6,884	37.1%	18,543
Karnataka	5,670	26.3%	3,162	14.7%	368	1.7%	264	1.2%	12,100	56.1%	21,564

	Ineligible								Eligible Population		Total
	Age less than 15 Years		Not staying in household for previous one month		Participant was not willing to respond		Hospitalized residents, Seriously sick, bed ridden and others				
	n	%	n	%	n	%	n	%	N1	%	n
Kerala	4,783	24.3%	3,325	16.9%	1,893	9.6%	221	1.1%	9,434	48.0%	19,656
Maharashtra	4,072	8.3%	2,029	4.2%	959	2.0%	151	0.3%	41,562	85.2%	48,773
Madhya Pradesh	2,054	7.5%	624	2.3%	249	0.9%	66	0.2%	24,338	89.0%	27,331
North Eastern States	4,548	16.8%	1,292	4.8%	524	1.9%	154	0.6%	20,531	75.9%	27,049
Odisha	6,107	29.3%	1,285	6.2%	86	0.4%	197	0.9%	13,178	63.2%	20,853
Punjab	2,453	17.0%	1,708	11.9%	894	6.2%	184	1.3%	9,151	63.6%	14,390
Rajasthan	15,205	69.6%	2,607	11.9%	1,172	5.4%	217	1.0%	2,651	12.1%	21,852
Tamil Nadu	2,643	8.2%	1,456	4.5%	717	2.2%	67	0.2%	27,529	84.9%	32,412
Telangana	2,453	12.5%	1,670	8.5%	894	4.5%	184	0.9%	14,493	73.6%	19,694
Uttar Pradesh	15,205	25.0%	2,602	4.3%	1,172	1.9%	217	0.4%	41,650	68.5%	60,846
West Bengal	2,643	11.3%	1,456	6.2%	717	3.1%	67	0.3%	18,417	79.0%	23,300

5.4 Participation Rates in Different Groups

Table 4 Eligible individuals n(%), classified in to non-participants and participants by gender & age group

	Not Participating Reasons						Study Participants		Study eligible population
	Not available during the home visit		Refused to give consent		Other Reasons				
	n	%	n	%	n	%	N_2	%	N_1
Overall	11,524	3.3%	19,226	5.4%	1,311	0.4%	322480	91.0%	3,54,541
Gender									
Female	4,901	2.5%	8,587	4.4%	582	0.3%	180356	92.8%	1,94,426
Male	6,623	4.1%	10,638	6.6%	729	0.5%	142106	88.8%	1,60,096
Transgender	0	0.0%	1	5.3%	0	0.0%	18	94.7%	19
Age Group in years									
15 to 24	2,751	3.7%	4,699	6.3%	338	0.5%	66647	89.5%	74,435
25 to 34	2,719	3.9%	4,623	6.6%	345	0.5%	62021	89.0%	69,708
35 to 44	2,321	3.4%	3,582	5.3%	248	0.4%	62023	91.0%	68,174
45 to 54	1,884	3.2%	3,046	5.1%	195	0.3%	54590	91.4%	59,715
55 to 64	1,138	2.4%	1,906	4.0%	116	0.2%	43995	93.3%	47,155
≥65	711	2.0%	1,370	3.9%	69	0.2%	33204	93.9%	35,354
State Group									
Andhra Pradesh	14	0.2%	577	7.6%	167	2.2%	6831	90.0%	7,589
Bihar	713	2.9%	1,332	5.4%	28	0.1%	22750	91.6%	24,823
Chhattisgarh	476	5.9%	345	4.3%	44	0.5%	7182	89.3%	8,047

	Not Participating Reasons						Study Participants		Study eligible population
	Not available during the home visit		Refused to give consent		Other Reasons				
	n	%	n	%	n	%	N₂	%	N₁
Delhi	447	8.0%	583	10.4%	55	1.0%	4515	80.6%	5,600
Gujarat	89	0.7%	795	5.8%	149	1.1%	12569	92.4%	13,602
Himachal Pradesh, Uttarakhand, Jammu & Kashmir	596	3.7%	104	0.6%	12	0.1%	15518	95.6%	16,230
Haryana	684	4.9%	1,565	11.2%	35	0.3%	11628	83.6%	13,912
Jharkhand	2,611	7.0%	3,759	10.1%	116	0.3%	30628	82.5%	37,114
Karnataka	449	2.5%	243	1.4%	32	0.2%	17143	95.9%	17,867
Kerala	735	4.4%	87	0.5%	30	0.2%	15975	94.9%	16,827
Maharashtra	0	0.0%	1,426	10.5%	0	0.0%	12216	89.5%	13,642
Madhya Pradesh	88	0.8%	1,175	10.3%	0	0.0%	10134	88.9%	11,397
North Eastern States	403	2.6%	497	3.2%	2	0.0%	14432	94.1%	15,334
Odisha	1,001	4.0%	769	3.1%	11	0.0%	22956	92.8%	24,737
Punjab	230	1.6%	658	4.6%	0	0.0%	13567	93.9%	14,455
Rajasthan	373	0.9%	3,012	7.2%	270	0.6%	37990	91.2%	41,645
Tamil Nadu	711	3.9%	809	4.4%	16	0.1%	16881	91.7%	18,417
Telangana	90	0.6%	140	1.0%	658	4.6%	13567	93.9%	14,455
Uttar Pradesh	174	0.4%	86	0.2%	3,012	7.3%	37990	92.1%	41,262
West Bengal	514	2.8%	178	1.0%	809	4.4%	16881	91.8%	18,382

Among the 3,54,541 eligible population 3,22,480 (91%) participated in the survey after providing the written informed consent. Females (92.8%) had a higher participation rate compared to males (88.8%). We also observed increasing participation rate as the age group increased. The participation rate varied across the state groups ranging from 80.6% in Delhi to 95.9% in Karnataka (Table 4).

The urban clusters had relatively less participation compared to rural clusters with a median coverage of 92.1% with range between 50.8% - 100%. Rural clusters had a coverage of 92.9% and range of 64.9%-100% and urban clusters had a coverage of 90.6% with range of 50.8%-100% as shown in figure 9.

Figure 9 Participation rates in rural and urban clusters in the survey
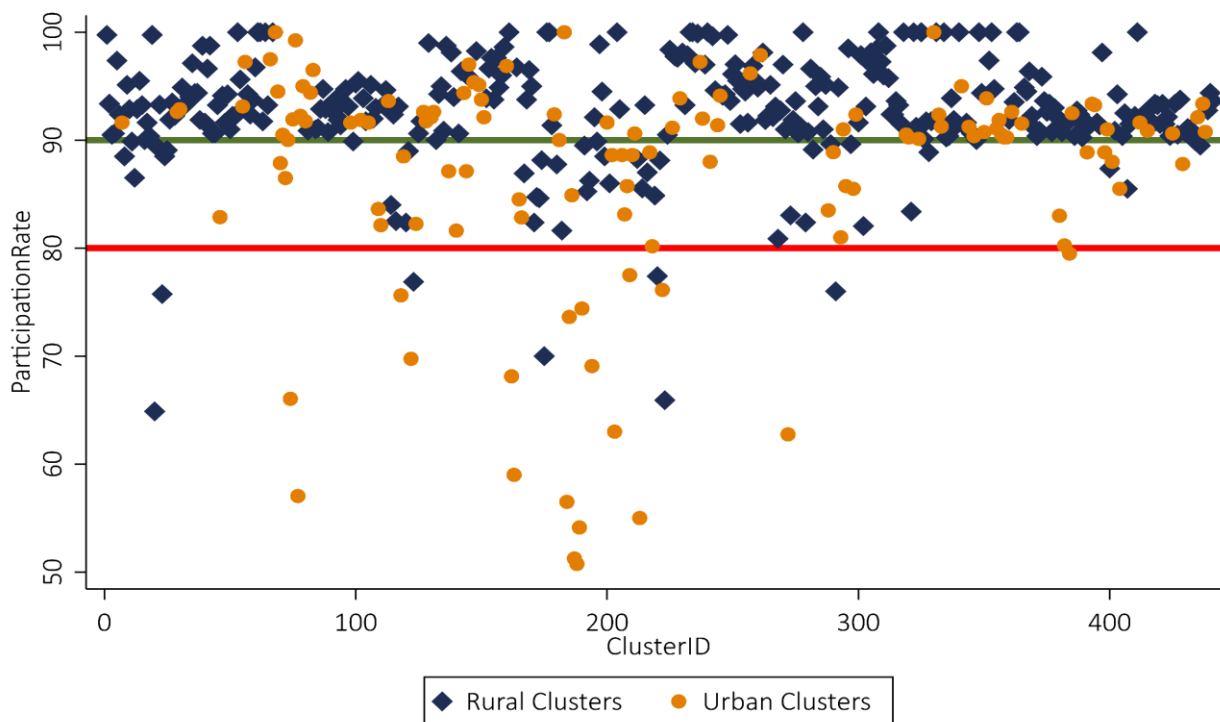
5.5 Comparison of Census Population and Study Participants

Figure 10 Comparison of census population and enumerated population by age group and gender
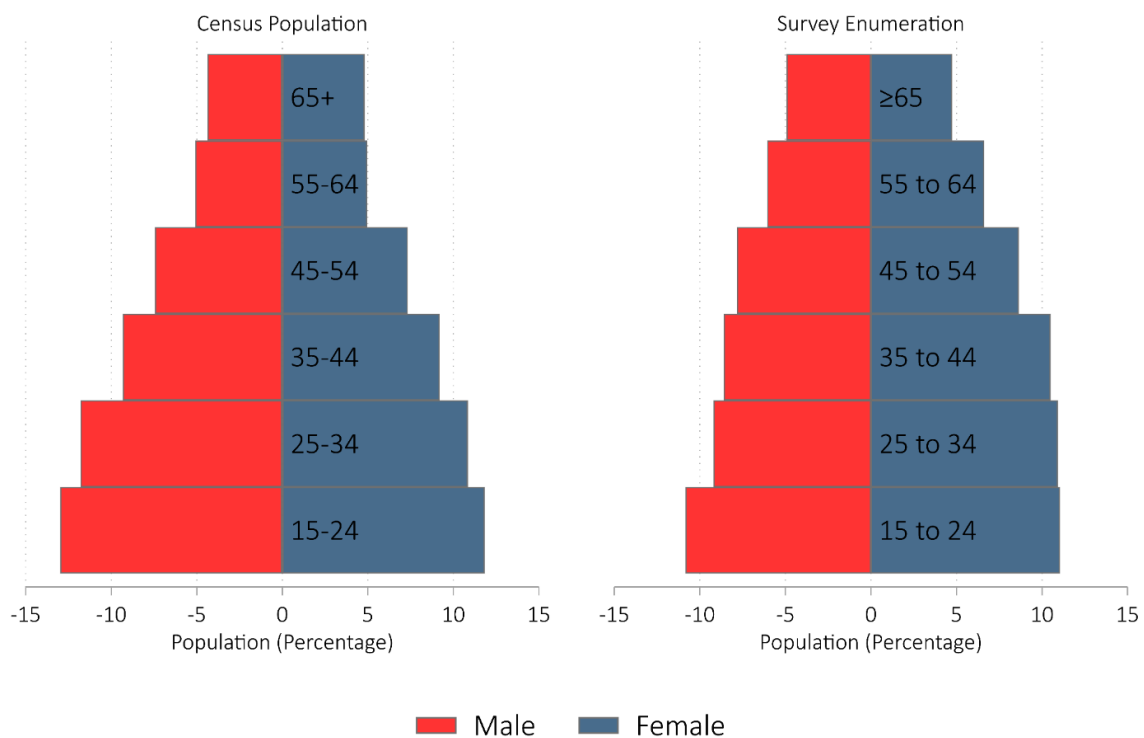
Figure 10 shows that the surveyed population was similar in age and gender to the census population

5.6 Coverage of Chest X-ray and Symptoms Screening Among the Participants

We had 97% coverage of chest X-ray and 100% coverage of symptom screening among the surveyed participants. Pregnant women were excluded from undergoing chest X-ray examination.

Table 5 Coverage of chest X-ray screening and symptom screening

Factors	Total Eligible	Chest X-ray screening		Symptom screening	
	N_1	N_4	%	N_3	%
Overall	3,22,480	3,13,112	97.1%	3,22,480	100%
Gender					
Male	1,42,106	1,38,619	97.5%	1,42,106	100%
Female	1,80,356	1,74,478	96.7%	1,80,356	100%
Transgender	18	15	83.3%	18	100%
Age Group (in Years)					

Factors	Total Eligible	Chest X-ray screening		Symptom screening	
	N_1	N_4	%	N_3	%
15 to 24	66,647	63,407	95.1%	66,647	100%
25 to 34	62,021	59,215	95.5%	62,021	100%
35 to 44	62,023	60,669	97.8%	62,023	100%
45 to 54	54,590	53,733	98.4%	54,590	100%
55 to 64	43,995	43,425	98.7%	43,995	100%
≥65	33,204	32,663	98.4%	33,204	100%
State Group					
Andhra Pradesh	16,151	15,991	99.0%	16,151	100%
Bihar	23,339	22,655	97.1%	23,339	100%
Chhattisgarh	10,075	9,796	97.2%	10,075	100%
Delhi	6,831	6,202	90.8%	6,831	100%
Gujarat	22,750	22,588	99.3%	22,750	100%
Himachal Pradesh, Uttarakhand, Jammu & Kashmir	7,182	7,090	98.7%	7,182	100%
Haryana	4,515	4,472	99.0%	4,515	100%
Jharkhand	12,569	12,361	98.3%	12,569	100%
Karnataka	15,518	14,834	95.6%	15,518	100%
Kerala	11,628	11,003	94.6%	11,628	100%
Maharashtra	30,628	29,669	96.9%	30,628	100%
Madhya Pradesh	17,143	16,235	94.7%	17,143	100%
North Eastern States	15,975	15,864	99.3%	15,975	100%
Odisha	12,216	11,846	97.0%	12,216	100%
Punjab	10,134	10,024	98.9%	10,134	100%
Rajasthan	14,432	13,872	96.1%	14,432	100%
Tamil Nadu	22,956	21,300	92.8%	22,956	100%
Telangana	13,567	13,482	99.4%	13,567	100%
Uttar Pradesh	37,990	37,158	97.8%	37,990	100%
West Bengal	16,881	16,670	98.8%	16,881	100%
N_1 - Study Eligible Population					
N_3 – Number of participants symptom screened					
N_4 – Number of participants chest X-ray screened					

5.7 Chest X-ray Findings in the Study Participants

5.7.1 Chest X-ray Abnormalities in the Study Participants by Gender and Age Group

Table 6 Chest X-ray findings by gender and age group in the survey

Factors	Normal		Abnormal		Unknown		Total (Of those with an X-ray)
	N_{4a}	%	N_{4b}	%	N_{4c}	%	N_4
Overall	2,81,563	89.9%	31,400	10.0%	149	0.0%	313112
Gender							
Male	1,21,807	87.9%	16,748	12.1%	64	0.0%	138619
Female	1,59,742	91.6%	14,651	8.4%	85	0.0%	174478
Transgender	14	93.3%	1	6.7%	0	0.0%	15
Age Group (in Years)							
15 to 24	61,261	96.6%	2,116	3.3%	30	0.0%	63407
25 to 34	55,907	94.4%	3,267	5.5%	41	0.1%	59215
35 to 44	55,792	92.0%	4,855	8.0%	22	0.0%	60669
45 to 54	47,571	88.5%	6,139	11.4%	23	0.0%	53733
55 to 64	36,173	83.3%	7,230	16.6%	22	0.1%	43425
≥65	24,859	76.1%	7,793	23.9%	11	0.0%	32663
State Group							
Andhra Pradesh	14,936	93.4%	1,036	6.5%	19	0.1%	15991
Bihar	20,052	88.5%	2,603	11.5%	0	0.0%	22655
Chhattisgarh	8,622	88.0%	1,174	12.0%	0	0.0%	9796
Delhi	5,276	85.1%	926	14.9%	0	0.0%	6202
Gujarat	20,646	91.4%	1,942	8.6%	0	0.0%	22588
Himachal Pradesh, Uttarakhand, Jammu & Kashmir	6,584	92.9%	506	7.1%	0	0.0%	7090
Haryana	3,987	89.2%	394	8.8%	91	2.0%	4472
Jharkhand	11,190	90.5%	1,171	9.5%	0	0.0%	12361
Karnataka	13,449	90.7%	1,385	9.3%	0	0.0%	14834
Kerala	9,592	87.2%	1,411	12.8%	0	0.0%	11003
Maharashtra	26,319	88.7%	3,350	11.3%	0	0.0%	29669

Factors	Normal		Abnormal		Unknown		Total (Of those with an X-ray)
	N4a	%	N4b	%	N4c	%	N4
Madhya Pradesh	15,112	93.1%	1,096	6.8%	27	0.2%	16235
North Eastern States	14,093	88.8%	1,771	11.2%	0	0.0%	15864
Odisha	10,764	90.9%	1,081	9.1%	1	0.0%	11846
Punjab	9,231	92.1%	790	7.9%	3	0.0%	10024
Rajasthan	12,794	92.2%	1,078	7.8%	0	0.0%	13872
Tamil Nadu	18,918	88.8%	2,381	11.2%	1	0.0%	21300
Telangana	12,336	91.5%	1,146	8.5%	0	0.0%	13482
Uttar Pradesh	32,586	87.7%	4,567	12.3%	5	0.0%	37158
West Bengal	15,076	90.4%	1,592	9.6%	2	0.0%	16670

For the definition of normal and abnormal chest X-ray readings refer the definition section.
unknown chest X-ray results includes inconclusive due to poor X-ray image quality, indeterminate and/or missing.

Figure 11 Chest X-ray abnormalities per lakh population by age group and gender among the study participants
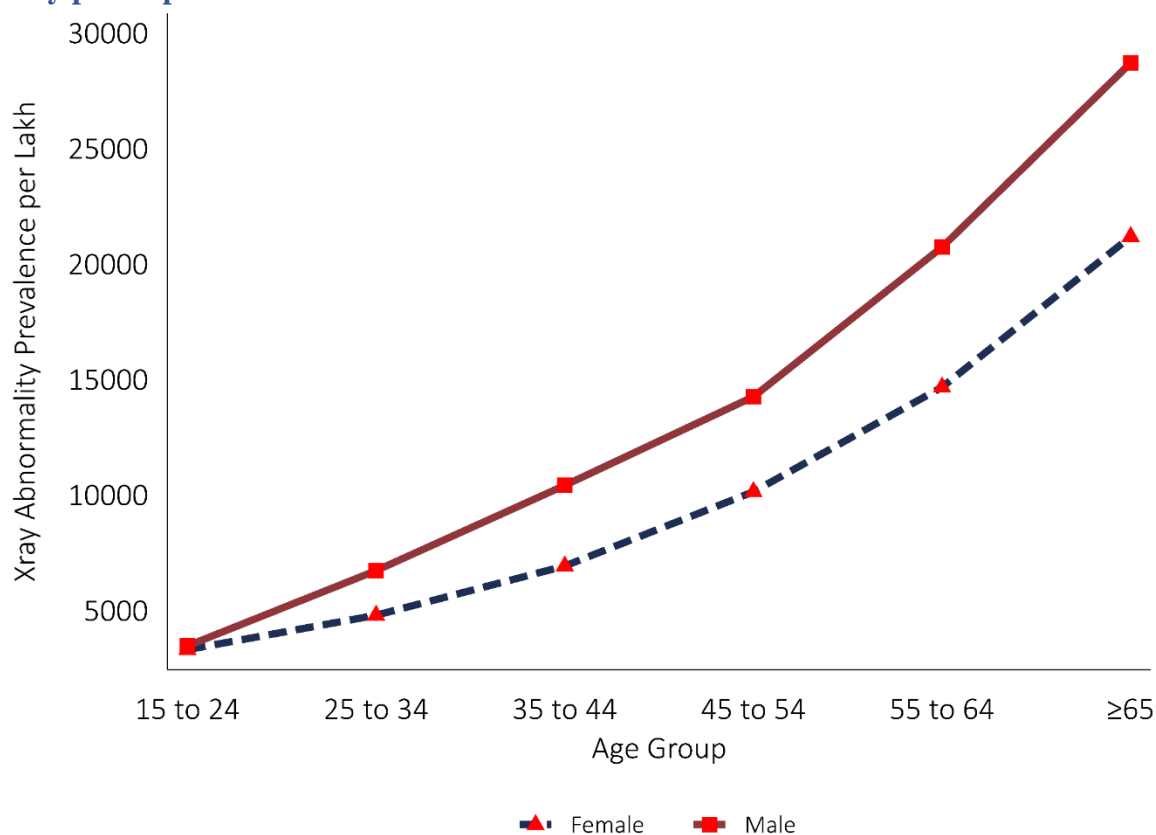
Among those participants who underwent chest X-ray examination 31,400 (10%) had abnormal chest X-ray. Males (12.1%) had higher percentage of abnormality compared to females (8.4%) as shown in table 6 and figure 11. The percentage of abnormalities increased as the age group increased and was maximum in the ≥ 65 years age group. The abnormalities across the states varied from 6.5% in Andhra Pradesh to 12.8% in Kerala.

5.7.2 Quality Assurance by Teleradiology

Teleradiology reporting was done to ensure the quality of chest X-ray reporting done by the field medical officers. We observed fair agreement of chest X-ray reading between the field medical officer and central teleradiology panel as shown by the Prevalence Adjusted, Bias Adjusted Kappa in table 7. This indicates that the quality of the chest X-ray reporting done was of good quality.

Table 7 Agreement of chest X-ray reading between the field medical officer and central teleradiology panel

X-ray report by field MO	X-ray report by central teleradiology panel			Total
	Normal	Abnormal	NA	
Normal	249970 (78.7)	6412 (2)	10132 (3.2)	266514 (83.9)
Abnormal	18850 (5.9)	6056 (1.9)	1223 (0.4)	26129 (8.2)
NA	19609 (6.2)	858 (0.3)	4408 (1.4)	24875 (7.8)
Total	288429 (90.8)	13326 (4.2)	15763 (5)	317518 (100)
Observed agreement				91% (90.9 - 91.1)
PABAK [Prevalence Adjusted Bias Adjusted Kappa] agreement				82% (81.8 - 82.2)
The agreement calculation was based on the observation with valid (i.e. Negative or Positive) results in both test				
NA - Results not available				

5.7.3 Clinically Diagnosed TB

We observed that 4475 (1.8%) participants had chest X-ray abnormality suggestive of TB by at least 2 central readers, which was not microbiologically confirmed TB and hence classified as clinically diagnosed TB. This is a higher percentage of chest X-ray abnormality which indicates the importance of using chest X-ray examination in TB case detection activities.

5.8 Current Symptoms Among the Participants

We observed that symptoms were more among the male participants compared to the female participants and symptomatic percentages increased as age increased in both gender as seen in figure 12. Cough (2.6%), chest pain (1.9%), expectoration (1.6%) and loss of appetite (1%) were the most common symptoms reported. Males reported higher percentages across all the symptoms when compared to females as seen in table 8.

Figure 12 Symptomatics per lakh population by age and gender among the study participants
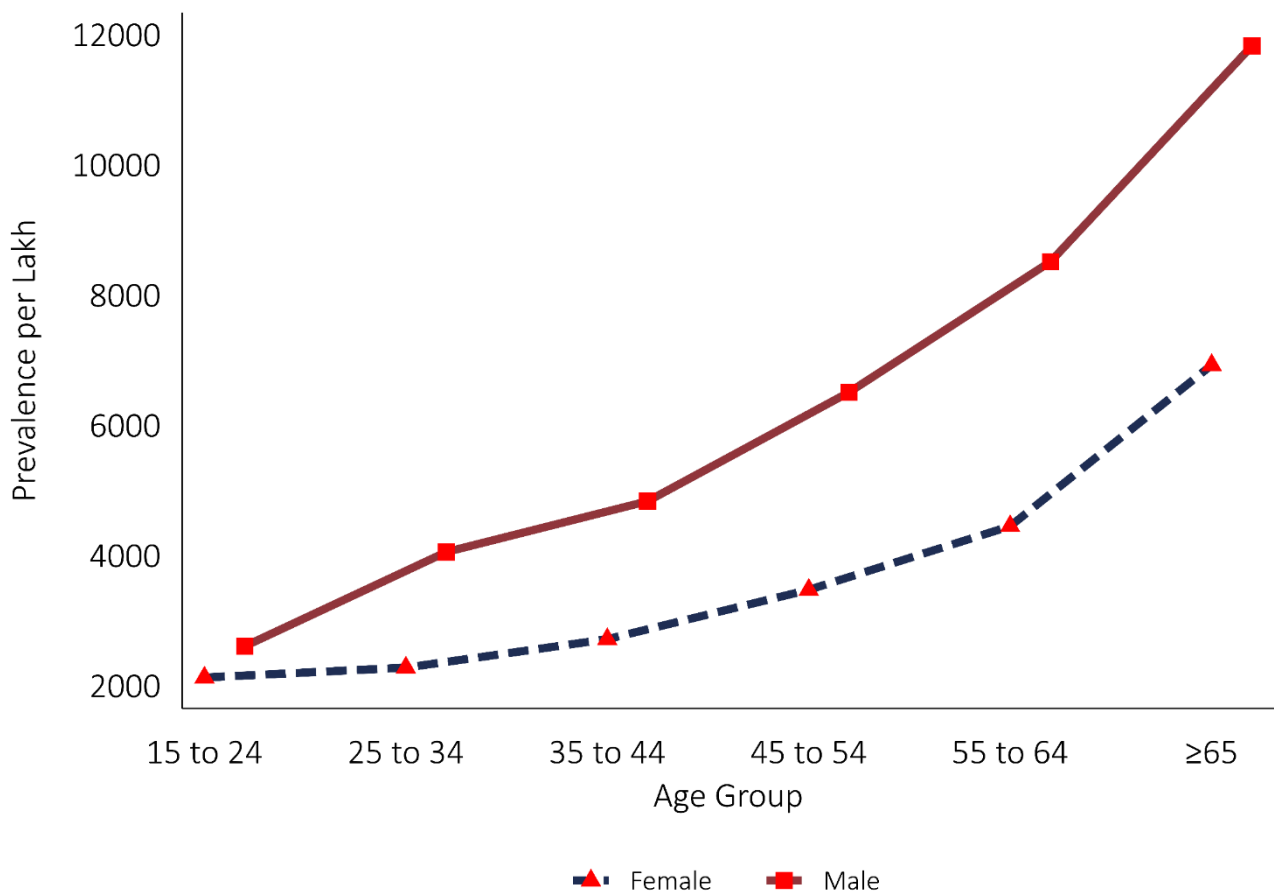
Table 8 Symptomatics among participants by gender and age group

		Cough		Fever		Weight Loss		Blood in Sputum		Chest pain		Expectoration		Night Sweats		Appetite Loss	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Overall	3,22,480	8,375	2.60	1,704	0.50	2,118	0.70	1,541	0.50	6,207	1.90	5,035	1.60	2,067	0.60	3,340	1.00
Gender																	
Male	1,42,106	5,201	3.70	890	0.60	1,263	0.90	903	0.60	3,505	2.50	3,154	2.20	1,159	0.80	1,823	1.30
Female	1,80,356	3,174	1.80	814	0.50	855	0.50	638	0.40	2,702	1.50	1,881	1.00	908	0.50	1,517	0.80
Transgender	18	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Age Group (in Years)																	
15 to 24	66,647	814	1.20	203	0.30	287	0.40	194	0.30	652	1.00	499	0.70	232	0.30	391	0.60
25 to 34	62,021	992	1.60	247	0.40	348	0.60	256	0.40	812	1.30	602	1.00	290	0.50	469	0.80
35 to 44	62,023	1,205	1.90	289	0.50	322	0.50	249	0.40	1,033	1.70	726	1.20	355	0.60	517	0.80
45 to 54	54,590	1,516	2.80	327	0.60	406	0.70	313	0.60	1,213	2.20	907	1.70	441	0.80	642	1.20
55 to 64	43,995	1,778	4.00	324	0.70	375	0.90	294	0.70	1,232	2.80	1,031	2.30	390	0.90	652	1.50
≥65	33,204	2,070	6.20	314	0.90	380	1.10	235	0.70	1,265	3.80	1,270	3.80	359	1.10	669	2.00
State Group																	
Andhra Pradesh	16,151	508	3.10	23	0.10	110	0.70	53	0.30	302	1.90	160	1.00	140	0.90	255	1.60
Bihar	23,339	719	3.10	137	0.60	157	0.70	153	0.70	630	2.70	168	0.70	139	0.60	212	0.90
Chhattisgarh	10,075	96	1.00	15	0.10	31	0.30	8	0.10	96	1.00	72	0.70	17	0.20	48	0.50
Delhi	6,831	302	4.40	83	1.20	37	0.50	54	0.80	155	2.30	142	2.10	54	0.80	46	0.70
Gujarat	22,750	185	0.80	24	0.10	54	0.20	30	0.10	131	0.60	108	0.50	38	0.20	66	0.30

	Cough			Fever		Weight Loss		Blood in Sputum		Chest pain		Expectoration		Night Sweats		Appetite Loss	
	N	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Himachal Pradesh, Uttarakhand, Jammu & Kashmir	7,182	172	2.40	35	0.50	37	0.50	38	0.50	139	1.90	105	1.50	25	0.30	90	1.30
Haryana	4,515	118	2.60	13	0.30	43	1.00	15	0.30	77	1.70	44	1.00	32	0.70	39	0.90
Jharkhand	12,569	156	1.20	40	0.30	115	0.90	75	0.60	306	2.40	201	1.60	141	1.10	178	1.40
Karnataka	15,518	439	2.80	31	0.20	58	0.40	15	0.10	370	2.40	78	0.50	84	0.50	157	1.00
Kerala	11,628	471	4.10	96	0.80	67	0.60	70	0.60	146	1.30	428	3.70	81	0.70	118	1.00
Maharashtra	30,628	476	1.60	148	0.50	190	0.60	81	0.30	459	1.50	387	1.30	134	0.40	354	1.20
Madhya Pradesh	17,143	225	1.30	145	0.80	108	0.60	58	0.30	283	1.70	159	0.90	83	0.50	106	0.60
North Eastern States	15,975	188	1.20	39	0.20	119	0.70	106	0.70	336	2.10	113	0.70	113	0.70	112	0.70
Odisha	12,216	271	2.20	33	0.30	84	0.70	41	0.30	226	1.90	126	1.00	68	0.60	72	0.60
Punjab	10,134	157	1.50	37	0.40	60	0.60	32	0.30	148	1.50	102	1.00	44	0.40	77	0.80
Rajasthan	14,432	536	3.70	110	0.80	298	2.10	137	0.90	497	3.40	498	3.50	279	1.90	373	2.60
Tamil Nadu	22,956	995	4.30	87	0.40	99	0.40	164	0.70	352	1.50	1,000	4.40	52	0.20	155	0.70
Telangana	13,567	267	2.00	51	0.40	67	0.50	76	0.60	259	1.90	335	2.50	122	0.90	152	1.10
Uttar Pradesh	37,990	1,727	4.50	501	1.30	269	0.70	215	0.60	1,017	2.70	666	1.80	349	0.90	604	1.60
West Bengal	16,881	367	2.20	56	0.30	115	0.70	120	0.70	278	1.60	143	0.80	72	0.40	126	0.70
Total	3,22,480	8,375	2.60	1,704	0.50	2,118	0.70	1,541	0.50	6,207	1.90	5,035	1.60	2,067	0.60	3,340	1.00

N - Total number of enumeration

5.9 Current Status of Diagnosis and Treatment

Figure 13 shows that more males were currently on TB treatment compared to females. In the age group of 15-24 there was no gender differences, but in the 25-34 years and 55-65 years age group higher percentages of males were on treatment, while the trend of treatment in other age groups were similar between males and females. This indicates the current gaps in treatment coverage of the older age groups and females.

Figure 13 Survey participants currently on TB treatment per lakh population by age group and gender
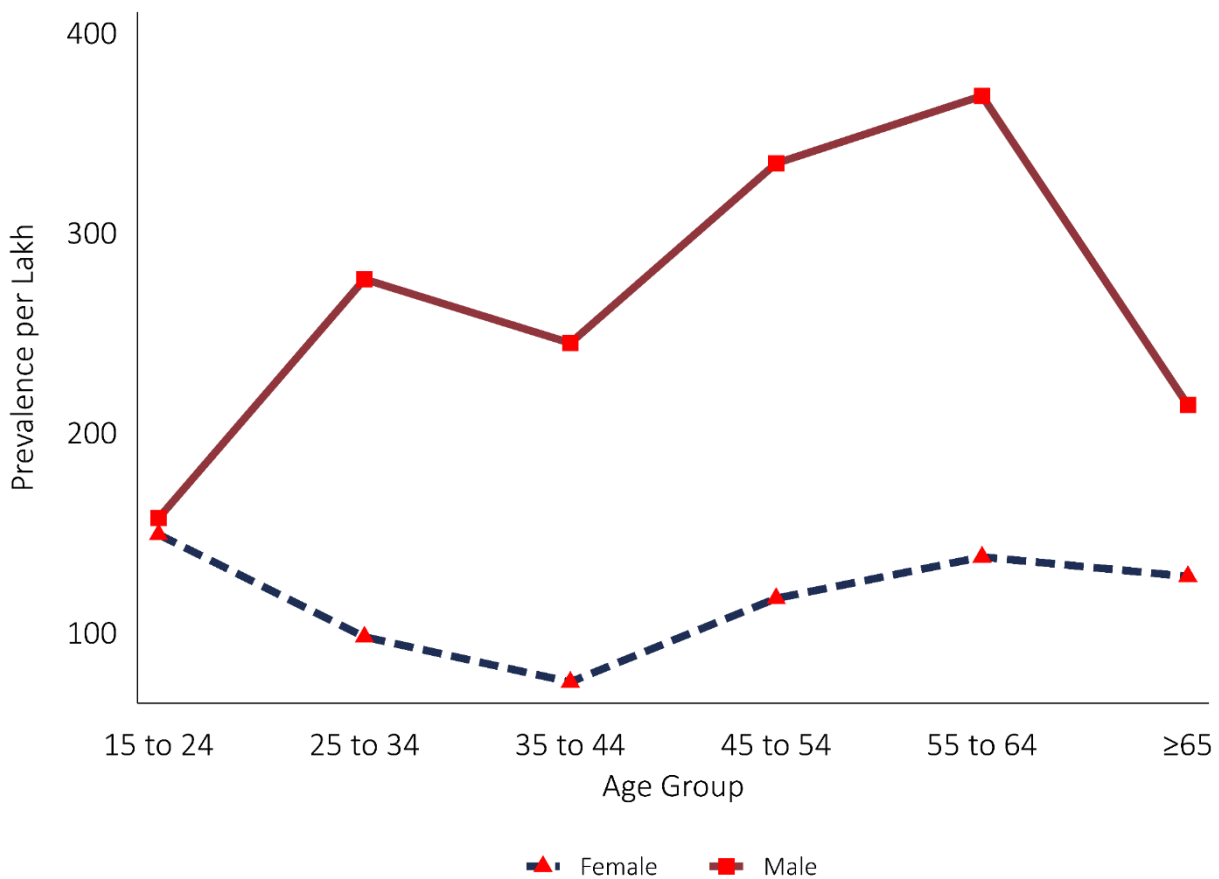
5.10 Past History of TB Treatment

Figure 14 shows that the past history of TB treatment increases over age in both gender and males have reported a higher percentage of TB treatment history compared to females and shows an increasing trend across the age groups.

Figure 14 Survey participants with history of TB treatment per lakh population by age group and gender
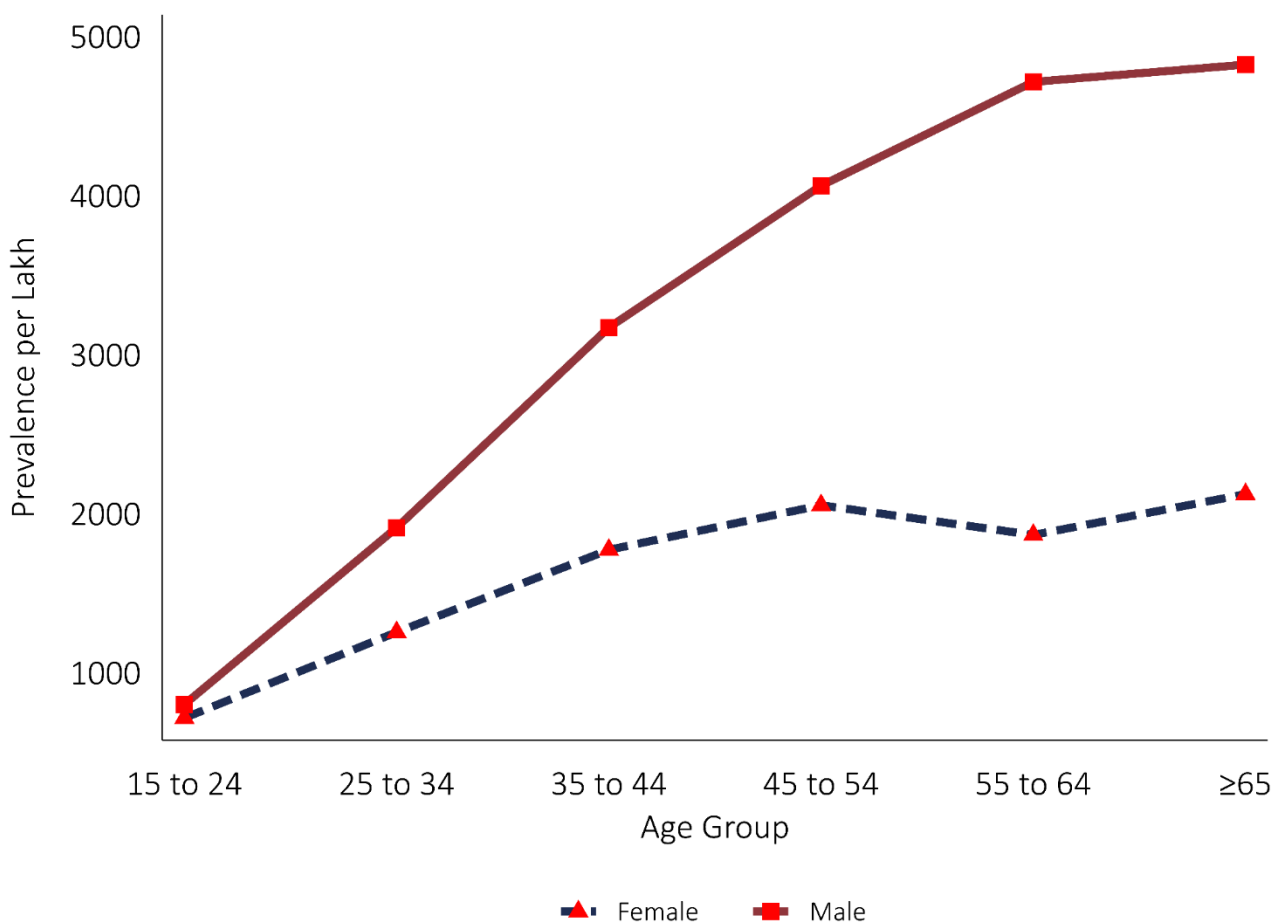
5.11 CBNAAT Results

Table 9 and Table 10 gives the MTB detection by CBNAAT among the sputum eligible participants and the CBNAAT MTB detection rate was 2.0% (825) and the rifampicin resistance was 7.6% (63). Detection rate among participants with normal CXR was 0.3% (36) and abnormal CXR was 2.5% (787). Detection rate among participants with no symptoms was 1.4% (315) and those with symptoms was 2.6% (510). We observed the rifampicin resistance based on CBNAAT to be 7.6% (Table 10). Rifampicin resistance was seen relatively higher among participants with normal chest

X-ray and among symptomatics. The CBNAAT MTB detection rates were highest in low, followed by medium and high level of detection in the survey indicating early detection. (Table 11). We also observed that CBNAAT positivity increased with age and in male gender compared to females. (Figure 15)

Table 9 CBNAAT MTB results among eligible for sputum examination based on chest X-ray and symptoms

	CBNAAT (MTB)						Total
	Detected[#]		Not detected[#]		Sub-	NA[$]		
	N	%	n	%	Total	n	%	
Eligible for sputum examination according to X-ray								
Normal	36	0.3%	9,378	90.3%	9414	976	9.4%	10,390
Abnormal	787	2.5%	26,679	85.0%	27466	3934	12.5%	31,400
Unknown	2	1.4%	101	71.1%	103	39	27.5%	142
Eligible for sputum examination according to symptoms								
No	315	1.4%	18,534	82.6%	18849	3588	16.0%	22,437
Yes	510	2.6%	17,624	90.4%	18134	1361	7.0%	19,495
Unknown	0	0.0%	0	0.0%	0	0	0.0%	0
Eligible for sputum examination according to X-ray or symptom								
	825	2.0%	36158	86.2%	36983	4949	11.8%	41932
NA - Results not available								
# - Percentage was calculated out of sub-total								
$ - Percentage was calculated out of total								

Table 10 Rifampicin resistance status by CBNAAT results among sputum eligible participants

	CBNAAT [Rifampicin resistance]								Total
	Not Detected		Detected		Indeterminate		NA		
	n	%	n	%	n	%	n	%	
X-Ray reading									
Normal	21	58.3%	4	11.1%	4	11.1%	7	19.4%	36
Abnormal	684	86.9%	59	7.5%	33	4.2%	11	1.4%	787
Unknown	2	100.0%	0	0.0%	0	0.0%	0	0.0%	2
Eligible for sputum examination according to symptoms									
No	290	92.1%	8	2.5%	14	4.4%	3	1.0%	315
Yes	417	81.8%	55	10.8%	23	4.5%	15	2.9%	510
Unknown	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0
Eligible for sputum examination according to X-ray or symptom									
	707	85.7%	63	7.6%	37	4.5%	18	2.2%	825
NA - Results not available									

Figure 15 MTB detected by CBNAAT per lakh population by age group and gender
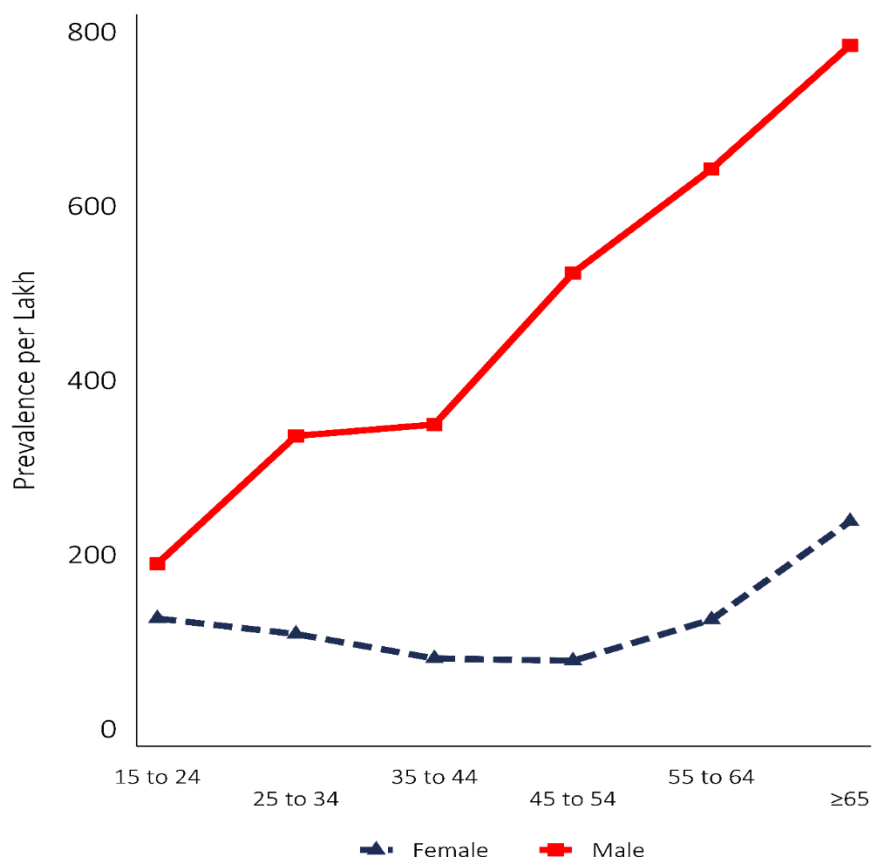
Table 11 Grading of CBNAAT MTB results among sputum eligible participants

	CBNAAT																Total
	MTB Detected V Low[#]		MTB Detected Low[#]		MTB Detected Medium[#]		MTB Detected High[#]		MTB Not Detected[#]		Sub-Total	Indeterminate		NA[$]			
	n	%	n	%	n	%	n	%	n	%		n	%	n	%		
X-Ray reading																	
Normal	0	0.0%	30	0.3%	3	0.0%	3	0.0%	9,378	90.3%	9414	0	0.0%	976	9.4%		10,390
Abnormal	0	0.0%	473	1.5%	213	0.7%	101	0.3%	26,679	85.0%	27466	0	0.0%	3934	12.5%		31,400
Unknown	0	0.0%	1	0.7%	0	0.0%	1	0.7%	101	71.1%	103	0	0.0%	39	27.5%		142
Eligible for sputum examination according to symptoms																	
No	0	0.0%	203	0.9%	79	0.4%	33	0.1%	18,534	82.6%	18849	0	0.0%	3588	16.0%		22,437
Yes	0	0.0%	301	1.5%	137	0.7%	72	0.4%	17,624	90.4%	18134	0	0.0%	1361	7.0%		19,495
Unknown	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0	0.0%	0	0.0%		0
Eligible for sputum examination according to X-ray or symptom																	
	0	0.0%	504	1.2%	216	0.5%	105	0.3%	36158	86.2%	36983	0	0.0%	4949	11.8%		41932

NA - Results not available

$ - Percentage was calculated out of total

- Percentage was calculated out of sub-total

5.12 AFB Smear Microscopy Results

Table 12 shows AFB smear positivity among the sputum eligible participants and the positivity rate was 1.1% (445). Positivity rate among participants with normal CXR was 0.4% (44) and abnormal CXR was 1.3% (400). Positivity rate among participants with no symptoms was 0.8% (172) and those with symptoms was 1.4% (273) . The AFB smear positivity rates were 0.4% in scanty and 1+ grading, followed by 0.1% in 2+ and 3+ smear grading in the survey indicating early detection (Table 13). The AFB smear positivity rate increased across age group in males and they had higher positivity rates compared to females (Figure 16). Among the females the positivity rate had an increasing trend across all the age groups except in the age group 35-44 and 45-54 (Figure 16).

Table 12 AFB smear microscopy results among sputum eligible participants

	AFB Smear							Total
	Positive#		Negative#		Sub-Total	NA$		
	n	%	n	%		n	%	
Eligible for sputum examination according to X-ray								
Normal	44	0.4%	8,883	85.5%	8927	1463	14.1%	10,390
Abnormal	400	1.3%	25,657	81.7%	26057	5343	17.0%	31,400
Unknown	1	0.7%	101	71.1%	102	40	28.2%	142
Eligible for sputum examination according to symptoms								
No	172	0.8%	17,647	78.7%	17819	4618	20.6%	22,437
Yes	273	1.4%	16,994	87.2%	17267	2228	11.4%	19,495
Unknown	0	0.0%	0	0.0%	0	0	0.0%	0
Eligible for sputum examination according to X-ray or symptom								
	445	1.1%	34641	82.6%	35086	6846	16.3%	41932
NA - Results not available								
# - Percentage was calculated out of sub-total								
$ - Percentage was calculated out of total								

Table 13 Grading of AFB smear microscopy among sputum eligible participants

	AFB Smear Results												Total
	Scanty#		1+#		2+#		3+#		Negative#		Sub-Total	NA$		
	n	%	n	%	n	%	n	%	n	%		n	%	
X-Ray reading														
Normal	20	0.2%	18	0.2%	2	0.0%	4	0.0%	8,883	85.5%	8927	1463	14.1%	10,390
Abnormal	129	0.4%	169	0.5%	47	0.1%	55	0.2%	25,657	81.7%	26057	5343	17.0%	31,400
Unknown	1	0.7%	0	0.0%	0	0.0%	0	0.0%	101	71.1%	102	40	28.2%	142
Eligible for sputum examination according to symptoms														
No	61	0.3%	76	0.3%	17	0.1%	18	0.1%	17,647	78.7%	17819	4618	20.6%	22,437
Yes	89	0.5%	111	0.6%	32	0.2%	41	0.2%	16,994	87.2%	17267	2228	11.4%	19,495
Unknown	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0	0.0%	0
Eligible for sputum examination according to X-ray or symptom														
	150	0.4%	187	0.4%	49	0.1%	59	0.1%	34641	82.6%	35086	6846	16.3%	41932
NA - Results not available														
# - Percentage was calculated out of sub-total; $ - Percentage was calculated out of total														

Figure 16 AFB smear positives per lakh population by age group and gender
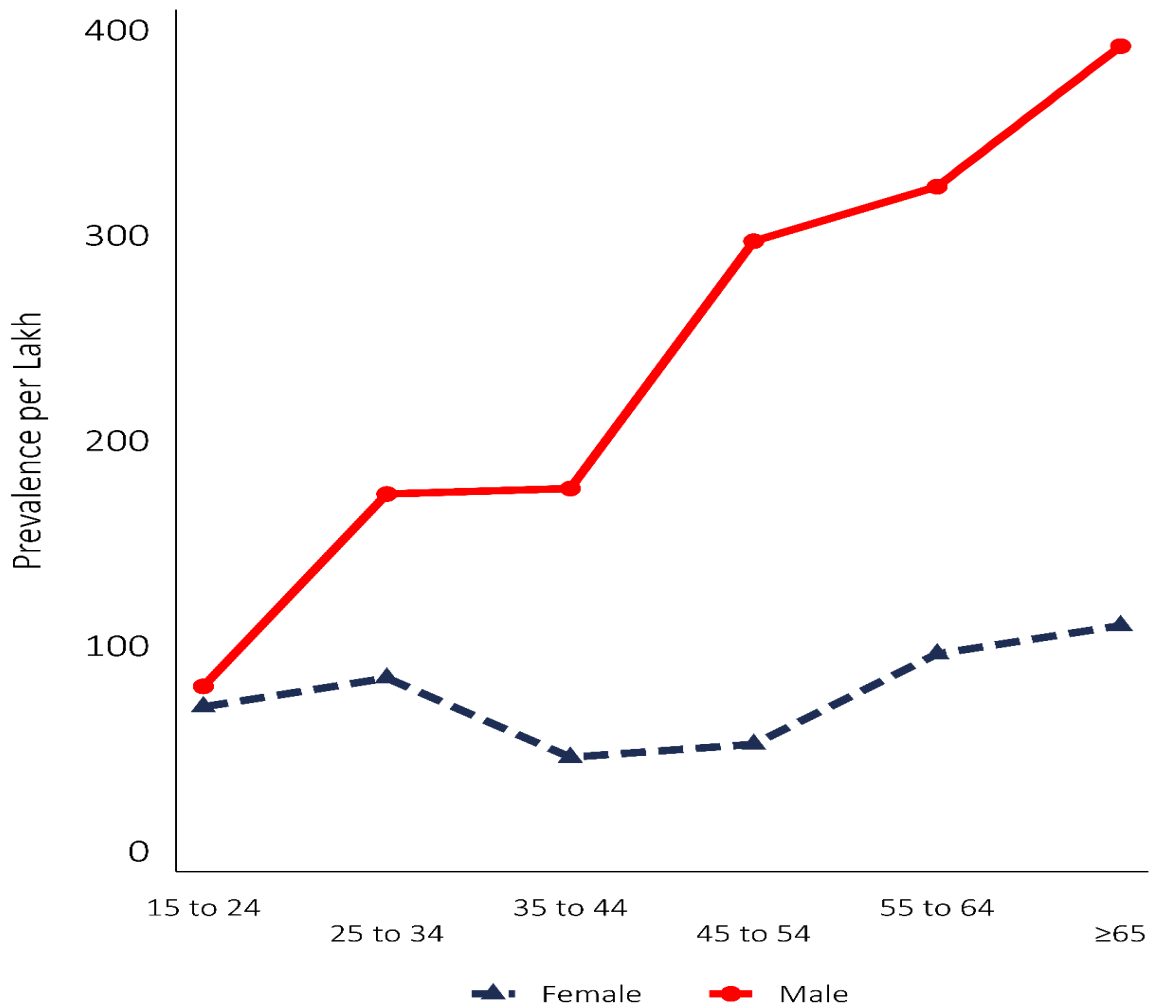
5.13 Culture Results

Table 14 shows MGIT culture positivity among the sputum eligible participants and the MGIT culture positivity rate was 1.3% (526). Positivity rate among participants with normal CXR was 0.5% (52) and abnormal CXR was 1.5% (473). Positivity rate among participants with no symptoms was 1% (215) and those with symptoms was 1.6% (311) . Figure 17 shows that the positivity rate for culture increased across the age group and males had relatively higher positivity rate compared to females.

Table 14 Culture results among sputum eligible participants

	Culture							Total
	Positive[#]		Negative[#]		Sub-Total	NA[$]		
	N	%	n	%		n	%	
Eligible for sputum examination according to X-ray								
Normal	52	0.5%	7,616	73.3%	7668	2722	26.2%	10,390
Abnormal	473	1.5%	22,156	70.6%	22629	8771	27.9%	31,400
Unknown	1	0.7%	90	63.4%	91	51	35.9%	142
Eligible for sputum examination according to symptoms								
No	215	1.0%	15,181	67.7%	15396	7041	31.4%	22,437
Yes	311	1.6%	14,681	75.3%	14992	4503	23.1%	19,495
Unknown	0	0.0%	0	0.0%	0	0	0.0%	0
Eligible for sputum examination according to X-ray or symptom								
	526	1.3%	29862	71.2%	30388	11544	27.5%	41932
# - Percentage was calculated out of sub-total								
$ - Percentage was calculated out of total								
NA - Results not available								

Figure 17 Culture positives per lakh population by age group and gender
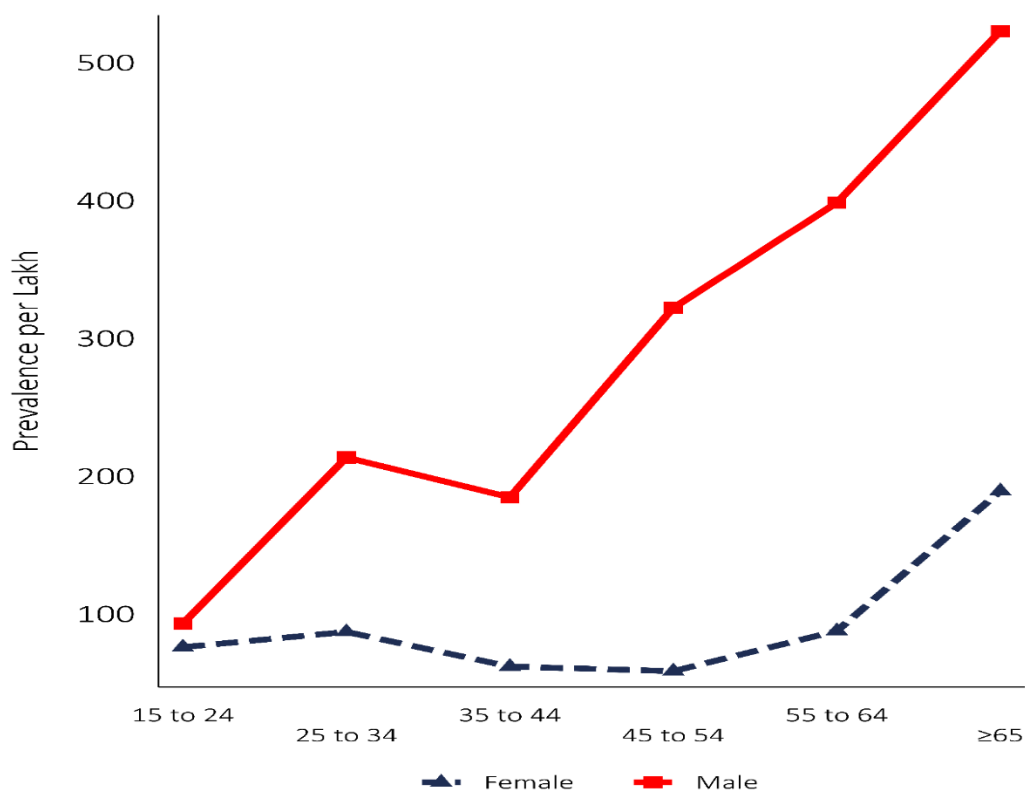
5.14 Bacteriological Results

Table 15 shows the Bacteriological (Smear/CBNAAT/MGIT culture) positivity among the sputum eligible participants and the positivity rate was 2.5% (1051). Positivity rate among participants with normal CXR was 1% (101) and abnormal CXR was 3% (947). Positivity rate among participants with no symptoms was 1.9% (418) and those with symptoms was 3.2% (633).

Table 15 Bacteriological (CBNAAT and/or AFB smear and/or Culture) results among sputum eligible participants

	Either Positive [CBNAAT and/or AFB Smear and/or MGIT Culture]							Total
	Positive[#]		Negative[#]		Sub-Total	NA[$]		
	n	%	N	%		n	%	
Eligible for sputum examination according to X-ray								
Normal	101	1.0%	9,404	90.5%	9505	885	8.5%	10,390
Abnormal	947	3.0%	26,701	85.0%	27648	3752	11.9%	31,400
Unknown	3	2.1%	105	73.9%	108	34	23.9%	142
Eligible for sputum examination according to symptoms								
No	418	1.9%	18,561	82.7%	18979	3458	15.4%	22,437
Yes	633	3.2%	17,649	90.5%	18282	1213	6.2%	19,495
Unknown	0	0.0%	0	0.0%	0	0	0.0%	0
Eligible for sputum examination according to X-ray or symptom								
	1051	2.5%	36210	86.4%	37261	4671	11.1%	41932
NA - Results not available								
# - Percentage was calculated out of sub-total								
$ - Percentage was calculated out of total								

Table 16 gives the correlation between the CBNAAT and the AFB smear results and the agreement for the results are good between both the tests.

Table 16 Comparison between CBNAAT and AFB smear results of sputum eligible participants

First Sample CBNAAT MTB	Second Sample Smear Microscopy Result			Total
	Negative	Positive	NA	
Not Detected	33897 (81.3%)	101 (0.2%)	2066 (5%)	36064 (86.5%)
Detected	509 (1.2%)	301 (0.7%)	14 (0%)	824 (2%)
Error /Invalid	192 (0.5%)	0 (0%)	15 (0%)	207 (0.5%)
NA	85 (0.2%)	1 (0%)	4493 (10.8%)	4579 (11%)
Total	34683 (83.2%)	403 (1%)	6588 (15.8%)	41674 (100%)
Observed Agreement				98.2% (98.1 - 98.4)
PABAK [Prevalence Adjusted, Bias Adjusted Kappa] Agreement				96.5% (96.2 - 96.8)
The agreement calculation was based on the observation with valid (i.e. Negative or Positive) results in both test				
NA – Results not available,				

Table 17 gives the Prevalence Adjusted Bias Adjusted Kappa agreement between the CBNAAT and the MGIT culture results and the agreement for the results are 96.6% (96.3 - 96.9) which shows a good correlation between both the test results.

Table 17 Comparison between CBNAAT and culture results of sputum eligible participants

First sample CBNAAT MTB	Second sample culture result				Total
	Negative	Positive	Contamination	NA	
Not Detected	29279 (70.26%)	142 (0.34%)	4467 (10.7%)	2176 (5.2%)	36064 (86.6%)
Detected	367 (0.88%)	324 (0.78%)	111 (0.27%)	22 (0.05%)	824 (1.98%)
Error/Invalid	168 (0.40%)	1 (0%)	23 (0.06%)	15 (0.04%)	207 (0.50%)
NA	74 (0.18%)	0 (0%)	12 (0.03%)	4493 (10.78%)	4579 (10.99%)
Total	29888 (71.7%)	467 (1.12%)	4613 (11.07%)	6706 (16.09%)	41674 (100%)
Observed agreement					98.3% (98.2 - 98.5)
Prevalence Adjusted Bias Adjusted Kappa (PABAK) agreement					96.6% (96.3 - 96.9)
The agreement calculation was based on the observation with valid (i.e. Negative or Positive) results in both test					
NA – Results not available,					

Table 18 shows Prevalence Adjusted Bias Adjusted Kappa agreement between the MGIT cultures and the AFB smear results and the agreement for the results are 97.7% (97.4 - 97.9) which shows a good correlation between both the test results.

Table 18 Comparison between culture and AFB smear results among sputum eligible participants

Second sample smear result	Second sample culture result				Total
	Negative	**Positive**	**Contamination**	**NA**	
Negative	29766 (71.4%)	243 (0.6%)	4553(10.9%)	121 (0.3%)	34683 (83.2%)
Positive	111 (0.3%)	224 (0.5%)	60 (0.1%)	8 (0%)	403 (1%)
NA	11 (0%)	0 (0%)	0 (0%)	6577 (15.8%)	6588 (15.8%)
Total	29888 (71.7%)	467 (1.1%)	4613 (11.1%)	6706 (16.1%)	41674 (100%)
Observed agreement					98.8% (98.7 - 99)
Prevalence Adjusted Bias Adjusted Kappa (PABAK) agreement					97.7% (97.4 - 97.9)
The agreement calculation was based on the observation with valid (i.e. Negative or Positive) results in both test					
NA – Results not available					

Table 17 and 18 gives an overall contamination rate of 11.1% which was within the acceptable limits for such a large scale survey amidst the nationwide lockdown due to COVID 19 pandemic. There were challenges in the sample transportation and supply chain maintenance of consumables to the reference laboratories during the pandemic. A separate agency was then engaged to transport the sputum samples within 24-48 hours in cold chain from the cluster site to the reference laboratories and the collection and delivery was tracked through google forms. The supply chain issues with the reference laboratories were managed with support from Central TB Division by diverting the consumables from other laboratories that had additional stocks.

Table 19 Microbiologically confirmed pulmonary TB

	CB+	S+	C+	CB+ S+	CB+ C+	S+ C+	CB+ S+ C+	CB+ S+ C-	CB+ S- C+	CB+ S- C-	CB- S- C+	CB- S+ C-	CB- S+ C+	Total
1 Bacteriological Evidence and 1 Radiological Evidence														
n	42	23	1	0	0	0	0	0	0	136	92	36	0	**330**
%	12.70	7	0.30	0	0	0	0	0	0	41.20	27.90	10.90	0	**33.6**
≥2 Bacteriological Evidence														
n	26	0	0	33	0	0	248	62	135	128	0	0	19	**651**
%	4	0	0	5.10	0	0	38.10	9.50	20.70	19.70	0	0	2.90	**66.4**
Total														
n	68	23	1	33	0	0	248	62	135	264	92	36	19	**981**
%	6.90	2.30	0.10	3.40	0	0	25.30	6.30	13.80	26.90	9.40	3.70	1.90	**100**
CB - CBNAAT Result, S - AFB Smear Result, C - Culture Result														

Table 19 shows that 651 (66%) were classified as microbiologically confirmed PTB based on 2 bacteriological evidence with any 2 positive results either in CBNAAT or smear microscopy or MGIT Culture and 330 (34%) were classified as microbiologically confirmed PTB based on one bacteriological evidence either in CBNAAT, smear microscopy or MGIT Culture with chest X-ray abnormality by teleradiology panel/field medical officer.

5.15 Estimation of Microbiologically Confirmed Pulmonary TB Prevalence Among Population Aged ≥ 15 Years in India

The best estimates of the microbiologically confirmed PTB in India was 316 (290-342) per lakh population for the year 2021. The prevalence of microbiologically confirmed PTB was higher in males and in the 55 years and above age group. We observed an increasing trend of the microbiologically confirmed PTB prevalence as the age group increases in both the gender. (Table 20 and Figure 18)

Table 20 Prevalence of microbiologically confirmed pulmonary TB among population aged ≥ 15 years in India (per 100 000 population) by gender, age group and states

	P	N	Crude Prevalence	Robust standard errors model with imputation and inverse probability weighting
India	981	322480	304 (285 - 324)	316 (290 - 342)
Gender				
Female	276	180374	153 (136 - 172)	154 (131 - 177)
Male	705	142106	496 (460 - 534)	472 (429 - 514)
Age				
15 to 34	260	128668	202 (178 - 228)	220 (190 - 250)
35 to 54	298	116613	256 (227 - 286)	296 (258 - 335)
≥55	423	77199	548 (497 - 603)	588 (516 - 660)
State Group				
Andhra Pradesh	49	16151	303 (225 - 401)	265(138 - 392)
Bihar	77	23339	330 (260 - 412)	327 (236 - 417)
Chhattisgarh	45	10075	447 (326 - 597)	454 (285 - 624)
Delhi	35	6831	512 (357 - 712)	534 (365 - 704)

	P	N	Crude Prevalence	Robust standard errors model with imputation and inverse probability weighting
Gujarat	31	22750	136 (93 - 193)	141 (78 - 203)
Himachal Pradesh, Uttarakhand, Jammu & Kashmir	22	7182	306 (192 - 463)	344 (154 - 534)
Haryana	19	4515	421 (254 - 656)	465 (326 - 605)
Jharkhand	44	12569	350 (254 - 470)	352 (201 - 503)
Karnataka	40	15518	258 (184 - 351)	276 (180 - 372)
Kerala	15	11628	129 (72 - 213)	115 (47 - 184)
Maharashtra	50	30628	163 (121 - 215)	161 (105 - 218)
Madhya Pradesh	66	17143	385 (298 - 490)	386 (199 - 573)
North Eastern States	45	15975	282 (206 - 377)	276 (123 - 429)
Odisha	31	12216	254 (172 - 360)	243 (141 - 345)
Punjab	28	10134	276 (184 - 399)	283 (197 - 368)
Rajasthan	69	14432	478 (372 - 605)	484 (361 - 607)
Tamil Nadu	67	22956	292 (226 - 371)	301 (241 - 360)
Telangana	36	13567	265 (186 - 367)	287 (199 - 376)
Uttar Pradesh	182	37990	479 (412 - 554)	481 (397 - 566)
West Bengal	30	16881	178 (120 - 254)	167 (82 - 252)
Crude prevalence and their Confidence Interval are calculated with exact binomial probability theory				
P – Diagnosed as Tuberculosis positive				
N – Number of population screened and or considered				

Figure 18 Prevalence of microbiologically confirmed pulmonary TB among population aged ≥ 15 years in India (per 100 000 population) by age group and gender
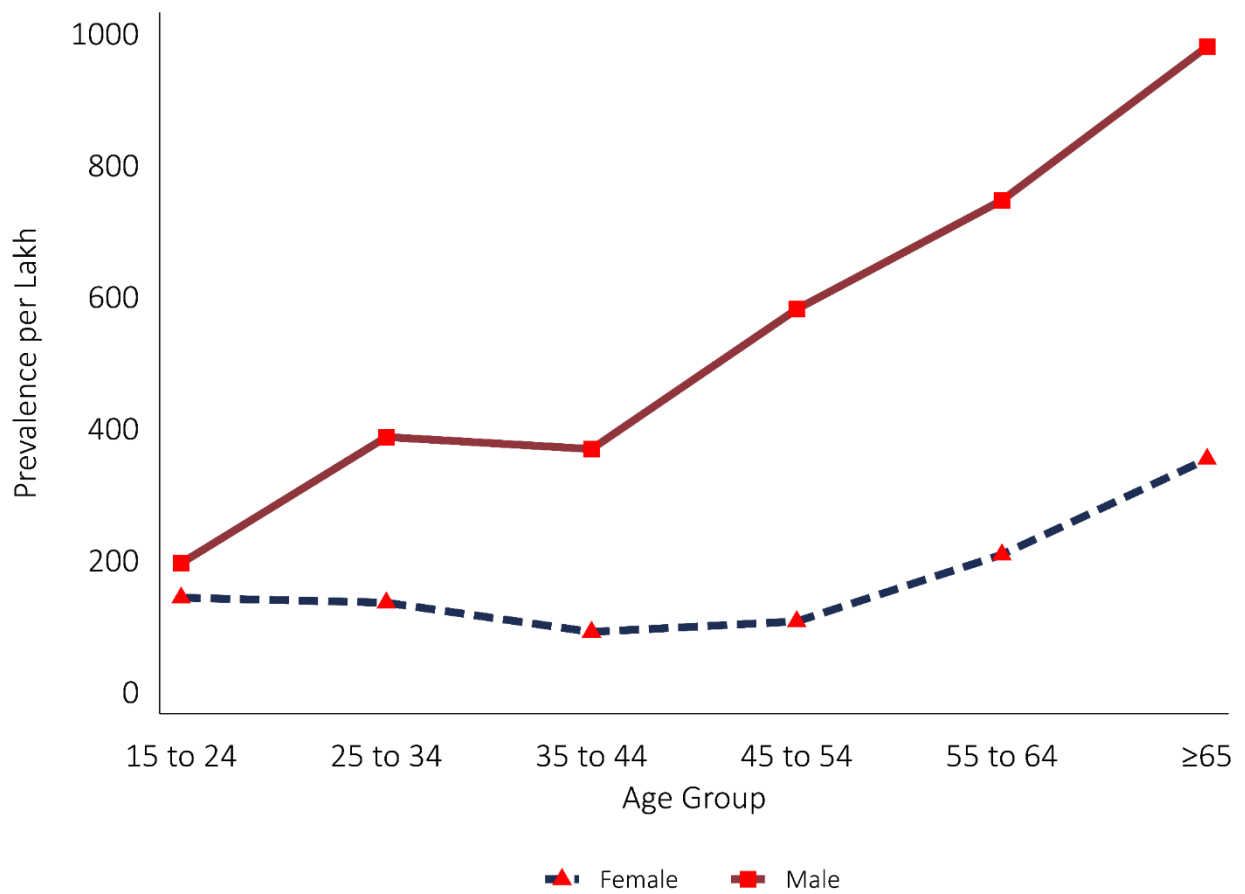
We observed that individuals with abnormal chest X-ray, Body Mass Index (BMI) < 18.5, more than any one symptom suggestive of TB, diabetes, past TB patients, alcohol consumption and smoking had higher likelihood to be TB positive. (Figure 19)

Figure 19 Risk factors associated with TB
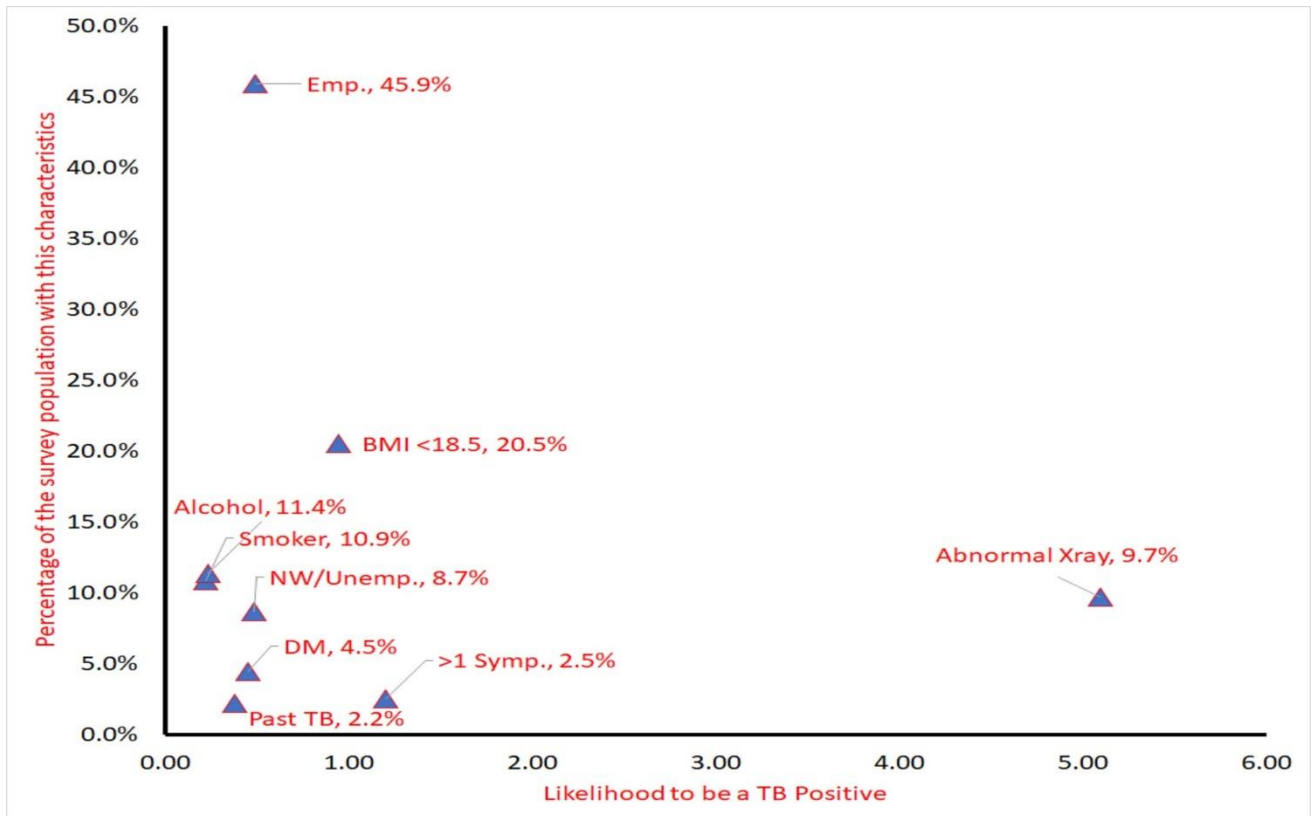
5.16 Estimation of Microbiologically Confirmed Pulmonary TB Prevalence Among Population Aged ≥ 15 Years in State Groups

The best estimates of the microbiologically confirmed PTB for the 20 state groups are given in the figure 20. The lowest was observed in Kerala with 115 per lakh and the highest was observed in Delhi with 534 per lakh population. The prevalence of microbiologically confirmed PTB in these state groups also had a similar age and sex distribution and trend.

Figure 20 Prevalence of microbiologically confirmed pulmonary TB among population aged ≥ 15 years in India (per 100 000 population) by states
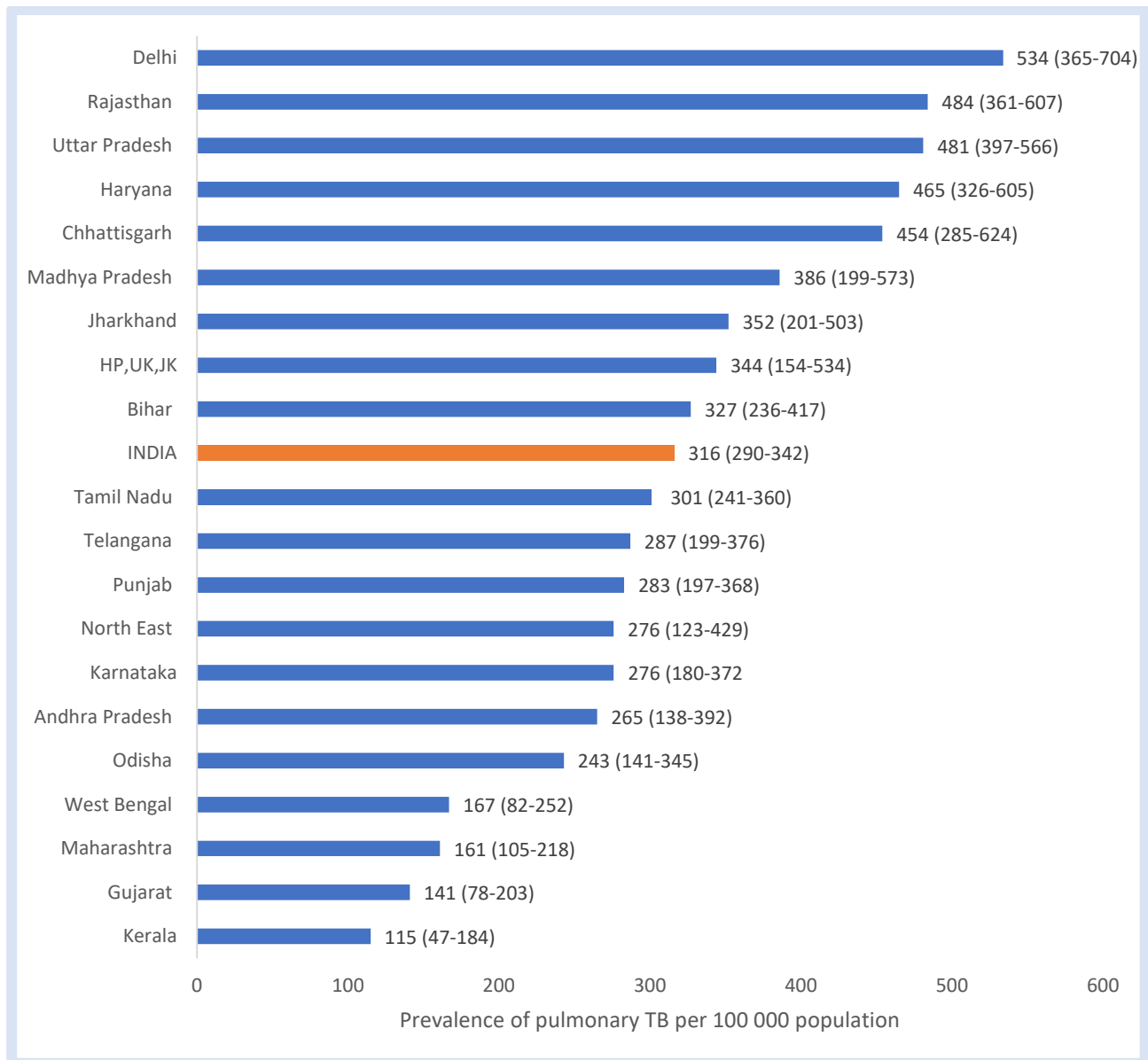
5.17 Estimation of Prevalence of all forms of TB among all age groups

Table 21 and figure 21 show the prevalence of all forms of TB among all age groups at national and state group level in India. The highest prevalence was in Delhi and the lowest prevalence was in Gujarat. Delhi was the only state group which completed the survey before the COVID pandemic and Haryana was the only state group which started the survey during the second wave of COVID.

Table 21 Adjusted prevalence of all forms of TB among all age groups in India

	PTB prevalence of India [Aged≥15 Years]	TB prevalence of India after adjusting for all forms of TB and Paediatric age group
India	316 (290 - 342)	312 (286 - 337)
Andhra Pradesh	265 (138 - 392)	274 (143 - 405)
Bihar	327 (236 - 417)	261 (189 - 333)
Chhattisgarh	454 (285 - 624)	451 (283 - 619)
Delhi	534 (365 - 704)	747 (510 - 984)
Gujarat	141 (78 - 203)	137 (76 - 198)
Himachal Pradesh, Uttarakhand, Jammu & Kashmir	344 (154 - 534)	378 (169 - 588)
Haryana	465 (326 - 605)	477 (333 - 620)
Jharkhand	352 (201 - 503)	288 (164 - 412)
Karnataka	276 (180 - 372)	304 (198 - 410)
Kerala	115 (47 - 184)	149 (60 - 237)
Maharashtra	161 (105 - 218)	199 (129 - 268)
Madhya Pradesh	386 (199 - 573)	337 (174 - 501)
North Eastern States	276 (123 - 429)	274 (122 - 426)
Odisha	243 (141 - 345)	247 (143 - 351)
Punjab	283 (197 - 368)	314 (219 - 410)
Rajasthan	484 (361 - 607)	432 (322 - 541)
Tamil Nadu	301 (241 - 360)	322 (258 - 385)
Telangana	287 (199 - 376)	296 (204 - 387)
Uttar Pradesh	481 (397 - 566)	427 (352 - 501)
West Bengal	167 (82 - 252)	179 (88 - 270)

Figure 21 Prevalence of all forms of TB among all age groups in India (per 100 000 population) by states

State	Prevalence (95% CI)
Delhi	747 (510-984)
Haryana	477 (333-620)
Chhattisgarh	451 (283-619)
Rajasthan	432 (322-541)
Uttar Pradesh	427 (352-501)
HP,UK,JK	378 (169-588)
Madhya Pradesh	337 (174-501)
Tamil Nadu	322 (258-385)
Punjab	314 (219-410)
India	312 (286-337)
Karnataka	304 (198-410)
Telangana	296 (204-387)
Jharkhand	288 (164-412)
North East	274 (122-426)
Andhra Pradesh	274 (143-405)
Bihar	261 (189-333)
Odisha	247 (143-351)
Maharashtra	199 (129-268)
West Bengal	179 (88-270)
Kerala	149 (60-237)
Gujarat	137 (76-198)

Prevalence of all form of TB among all age groups per 100 000 population

5.18 Estimation of Prevalence to Notification Ratio

Table 22 shows the smear and/or CBNAAT prevalence to notification ratio (P:N) for age group ≥15 years in India and the state groups. The national P:N ratio was 2.84 (2.61 - 3.07). The highest was observed in Chhattisgarh and lowest was observed in Gujarat.

Table 22 Estimated Smear/CBNAAT Prevalence to Notification Ratio

	Adjusted PTB prevalence by AFB smear/CBNAAT ≥ 15 years per lakh population from prevalence survey	Adult PTB case Notification rate Per Lakh population 2021	Prevalence to Notification ratio (P: N)
India	300.2 (275.5 - 324.8)	105.6 (105.4 - 105.8)	2.84 (2.61 - 3.07)
State Group			
Andhra Pradesh	301.8 (160.0 - 443.5)	116.8 (115.9 - 117.7)	2.58 (1.38 - 3.77)
Bihar	329.6 (240.4 - 418.7)	79.5 (79.0 - 80.0)	4.15 (3.04 - 5.23)
Chhattisgarh	373.8 (241.9 - 505.8)	70.5 (69.6 - 71.5)	5.30 (3.48 - 7.08)
Delhi	422.1 (277.5 - 566.6)	189.0 (187.1 - 190.9)	2.23 (1.48 - 2.97)
Gujarat	131.6 (67.4 - 195.9)	145.4 (144.5 - 146.3)	0.91 (0.47 - 1.34)
Himachal Pradesh, Uttarakhand, Jammu & Kashmir	322.8 (146.5 - 499.1)	101.1 (100.0 - 102.2)	3.19 (1.46 - 4.88)
Haryana	444.4 (326.1 - 562.8)	159.9 (158.4 - 161.3)	2.78 (2.06 - 3.49)
Jharkhand	296.8 (178.0 - 415.6)	110.7 (109.7 - 111.8)	2.68 (1.62 - 3.72)
Karnataka	275.5 (186.9 - 364.1)	67.6 (67.0 - 68.2)	4.08 (2.79 - 5.34)
Kerala	115.2 (46.5 - 183.8)	34.6 (34.0 - 35.2)	3.33 (1.37 - 5.22)
Maharashtra	154.8 (98.9 - 210.6)	83.1 (82.6 - 83.6)	1.86 (1.20 - 2.52)
Madhya Pradesh	370.5 (197.0 - 544.0)	142.9 (142.1 - 143.7)	2.59 (1.39 - 3.79)
North Eastern States	276.3 (125.2 - 427.5)	73.9 (73.2 - 74.7)	3.74 (1.71 - 5.72)
Odisha	243.0 (140.8 - 345.3)	77.4 (76.6 - 78.2)	3.14 (1.84 - 4.41)
Punjab	313.5 (215.9 - 411.2)	121.6 (120.3 - 122.8)	2.58 (1.79 - 3.35)
Rajasthan	427.6 (297.1 - 558.1)	137.6 (136.7 - 138.4)	3.11 (2.17 - 4.03)
Tamil Nadu	283.6 (213.7 - 353.5)	77.3 (76.7 - 77.9)	3.67 (2.79 - 4.54)
Telangana	296.5 (211.4 - 381.6)	113.3 (112.2 - 114.4)	2.62 (1.88 - 3.34)
Uttar Pradesh	444.9 (369.3 - 520.5)	143.3 (142.9 - 143.8)	3.10 (2.58 - 3.62)
West Bengal	156.0 (91.0 - 220.9)	64.0 (63.5 - 64.5)	2.44 (1.43 - 3.43)

Table 23 shows the CBNAAT prevalence to notification ratio for age group ≥15 years in India and the state groups. The national P:N ratio was 2.85 (2.61 - 3.10). The highest was observed in Chhattisgarh and lowest was observed in Gujarat.

Table 23 Estimated CBNAAT Prevalence to Notification Ratio

	Adjusted TB prevalence by CBNAAT per lakh population from prevalence survey	Adult PTB case notification rate per lakh population 2021	Prevalence to Notification ratio (P: N)
India	301.3 (275.1 - 327.4)	105.6 (105.4 - 105.8)	2.85 (2.61 - 3.10)
State Group			
Andhra Pradesh	236.7 (117.4 - 356.1)	116.8 (115.9 - 117.7)	2.03 (1.01 - 3.03)
Bihar	392.4 (291.3 - 493.6)	79.5 (79 - 80)	4.94 (3.69 - 6.17)
Chhattisgarh	405.2 (253.9 - 556.5)	70.5 (69.6 - 71.5)	5.75 (3.65 - 7.78)
Delhi	420.7 (256.9 - 584.5)	189 (187.1 - 190.9)	2.23 (1.37 - 3.06)
Gujarat	137.5 (71.4 - 203.6)	145.4 (144.5 - 146.3)	0.95 (0.49 - 1.39)
Himachal Pradesh, Uttarakhand, Jammu & Kashmir	307.2 (147.3 - 467.2)	101.1 (100 - 102.2)	3.04 (1.47 - 4.57)
Haryana	459.8 (336.7 - 582.9)	159.9 (158.4 - 161.3)	2.88 (2.13 - 3.61)
Jharkhand	274.5 (163.6 - 385.4)	110.7 (109.7 - 111.8)	2.48 (1.49 - 3.45)
Karnataka	265 (170.6 - 359.4)	67.6 (67 - 68.2)	3.92 (2.55 - 5.27)
Kerala	133.8 (56.5 - 211)	34.6 (34 - 35.2)	3.86 (1.66 - 5.99)
Maharashtra	137.5 (81.2 - 193.8)	83.1 (82.6 - 83.6)	1.65 (0.98 - 2.32)
Madhya Pradesh	333.6 (192.7 - 474.5)	142.9 (142.1 - 143.7)	2.33 (1.36 - 3.30)
North Eastern States	262.2 (135.5 - 388.8)	73.9 (73.2 - 74.7)	3.55 (1.85 - 5.21)
Odisha	258.3 (153 - 363.7)	77.4 (76.6 - 78.2)	3.34 (2.00 - 4.65)
Punjab	241.7 (149.4 - 334)	121.6 (120.3 - 122.8)	1.99 (1.24 - 2.72)
Rajasthan	397.5 (276.2 - 518.7)	137.6 (136.7 - 138.4)	2.89 (2.02 - 3.75)
Tamil Nadu	276 (198 - 353.9)	77.3 (76.7 - 77.9)	3.57 (2.58 - 4.54)
Telangana	312.1 (226.6 - 397.6)	113.3 (112.2 - 114.4)	2.75 (2.02 - 3.48)
Uttar Pradesh	471.1 (379.7 - 562.5)	143.3 (142.9 - 143.8)	3.29 (2.66 - 3.91)
West Bengal	171.6 (92.5 - 250.7)	64 (63.5 - 64.5)	2.68 (1.46 - 3.89)

Table 24 shows the AFB smear prevalence to notification ratio for age group ≥15 years in India and the state groups. The national P:N ratio was 1.52 (1.34 - 1.70). The highest was observed in Karnataka and lowest was observed in Maharashtra.

Table 24 Estimated AFB smear Prevalence to Notification Ratio

	Adjusted TB prevalence by smear per lakh population from prevalence survey	Adult PTB case notification rate per lakh Population 2021	Prevalence to Notification ratio (P:N)
India	160.4 (141.1 - 179.6)	105.6 (105.4 - 105.8)	1.52 (1.34 - 1.70)
State Group			
Andhra Pradesh	184.3 (80.7 - 287.9)	116.8 (115.9 - 117.7)	1.58 (0.70 - 2.45)
Bihar	162.8 (92.2 - 233.4)	79.5 (79 - 80)	2.05 (1.17 - 2.92)
Chhattisgarh	206.7 (126.8 - 286.5)	70.5 (69.6 - 71.5)	2.93 (1.82 - 4.01)
Delhi	211.4 (62.5 - 360.4)	189 (187.1 - 190.9)	1.12 (0.33 - 1.89)
Gujarat	98.9 (39 - 158.8)	145.4 (144.5 - 146.3)	0.68 (0.27 - 1.09)
Himachal Pradesh, Uttarakhand, Jammu & Kashmir	41.3 (0 - 102.2)	101.1 (100 - 102.2)	0.41 (0.00 – 1.01)
Haryana	155.6 (37 - 274.3)	159.9 (158.4 - 161.3)	0.97 (0.23 - 1.70)
Jharkhand	271.3 (160.6 - 382)	110.7 (109.7 - 111.8)	2.45 (1.46 - 3.42)
Karnataka	269.9 (181.7 - 358.1)	67.6 (67 - 68.2)	3.99 (2.71 - 5.25)
Kerala	100.2 (29.5 - 171)	34.6 (34 - 35.2)	2.90 (0.87 - 4.85)
Maharashtra	30.4 (10.1 - 50.8)	83.1 (82.6 - 83.6)	0.37 (0.12 - 0.61)
Madhya Pradesh	305.8 (149.8 - 461.8)	142.9 (142.1 - 143.7)	2.14 (1.05 - 3.21)
North Eastern States	163.4 (65.4 - 261.4)	73.9 (73.2 - 74.7)	2.21 (0.89 - 3.50)
Odisha	307.8 (183.5 - 432.1)	77.4 (76.6 - 78.2)	3.98 (2.39 - 5.52)
Punjab	147.1 (60.2 - 234)	121.6 (120.3 - 122.8)	1.21 (0.50 - 1.91)
Rajasthan	202.9 (86.5 - 319.2)	137.6 (136.7 - 138.4)	1.47 (0.63 - 2.31)
Tamil Nadu	189.4 (128.3 - 250.5)	77.3 (76.7 - 77.9)	2.45 (1.67 - 3.21)
Telangana	235.4 (157.5 - 313.2)	113.3 (112.2 - 114.4)	2.08 (1.40 - 2.74)
Uttar Pradesh	94 (60.1 - 127.9)	143.3 (142.9 - 143.8)	0.66 (0.42 - 0.89)
West Bengal	148.8 (76.9 - 220.8)	64 (63.5 - 64.5)	2.33 (1.21 - 3.43)

5.19 Assessment of Impact of COVID – 19

To assess the trend or difference in outcome (i.e., TB Prevalence) between the pre and during the lockdown period, Interrupted Time Series (ITS) analysis was used.

The prevalence, during COVID pandemic was estimated using the data collected during pre-covid period and its prediction was extended to during COVID period to understand the difference.

Spearman correlation was performed to assess the relationship between the occurrence of COVID and the prevalence study finding over a month.

The following graphs show,

1. The observed prevalence trend over a month in the survey
2. The observed prevalence trend plotted based on the data collected pre-COVID and during COVID period.
3. Confirmed COVID cases reported over a month
4. Deceased COVID cases reported over a month

Figure 22 Interrupted Time series depicting the impact of COVID on TB prevalence

TB Positives- 981; p=0.0317
Red Colour- During COVID, Navy Colour- Pre-COVID
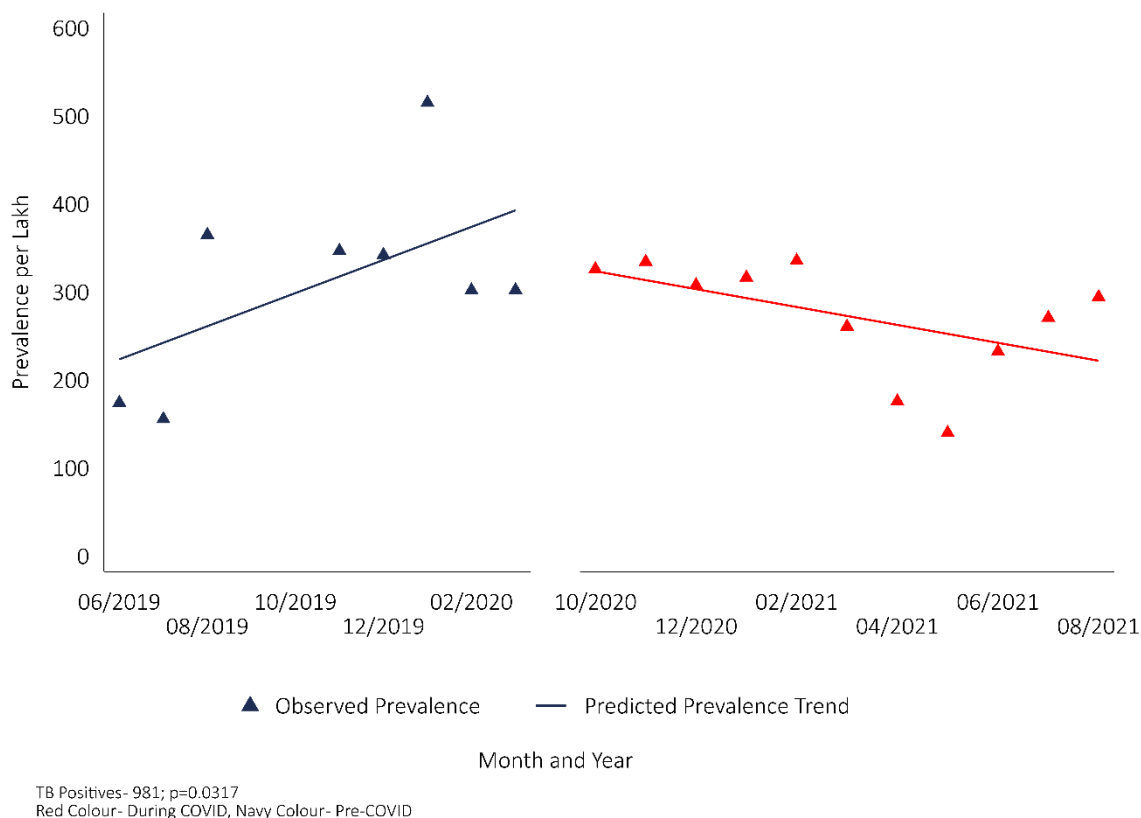
Figure 22 shows that there was a statistically significant change in trend of TB prevalence from October 2020 compared to before March 2020.

Figure 23 Graph depicting impact of COVID and death on TB prevalence

TB Positives- 981; Correlation [Observed TB vs COVID:-40.9 (p=0.082); Observed TB vs Death:-44.4 (p=0.057)]
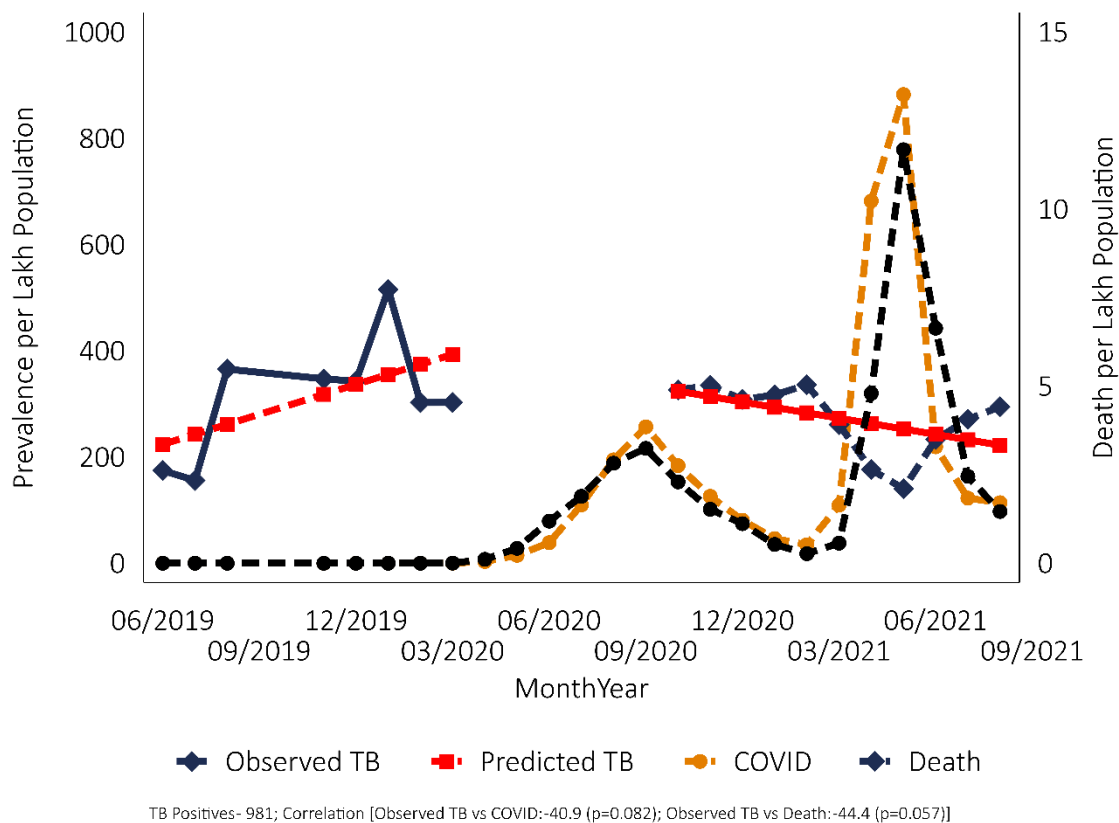
Figure 23 shows the dip in TB prevalence trend during the peak of second wave of COVID pandemic.

5.20 Health Care Seeking Behaviour

Among those who were screened for symptoms (3,22,480), 14176(4.4%) were eligible for sputum collection based on the symptoms. 14176 (4.4%) had chest symptoms. 8301 (58.6%) male participants and 5875 (41.4%) female participants reported having symptoms.(Table 25) Symptoms were more frequent in people aged ⩾65 years than among those aged 15–24 years. The participants were interviewed for health seeking behavior, 5156 (36.4%) sought care for their symptoms, and 9020 (63.6%) did not seek care for their symptoms (Figure 24).

Among those who sought care, the place of healthcare consultation was distributed equally between government facility and private facility in the country, but varied among the states (Table 25). In the states of North East, Chhattisgarh, Odisha, Haryana, Karnataka, Jharkhand, West Bengal, Kerala, Rajasthan and Andhra Pradesh more participants had approached a Government health care facility for relief of symptoms. Whereas, in the states of Bihar, Maharashtra, Himachal Pradesh, Uttarakhand, Jammu Kashmir, Telangana, Madhya Pradesh, Uttar Pradesh, Delhi and Punjab more participants had approached a Private health care facility for relief of symptoms. In other states like Tamil Nadu and

Gujarat, the participants had approached Government and Private facility almost equally. There wasn't much difference in the health seeking behaviour of male and female participants. 36.4% females had consulted and 36.3% males had consulted for their symptom. 39% of participants aged ≥65 years had sought care, while only 32% of participants aged 18-24 had sought care. Also participants with more than 4 symptoms were more likely to seek care.

Majority [9020 (63.6%)] did not seek care for their symptoms. This proportion varied from 46% (Kerala) to 88% (Haryana) among different states (Table 26). Among those who did not seek care for their symptoms, 6187 (68.6%) had ignored the symptoms of TB, 1633 (18.1%) had not recognised the symptoms as illness, 1049 (11.63%) had self-treated for their symptoms, and 151 (1.67%) could not afford to seek care.

Figure 24 Health care seeking behaviour among symptomatics in the survey
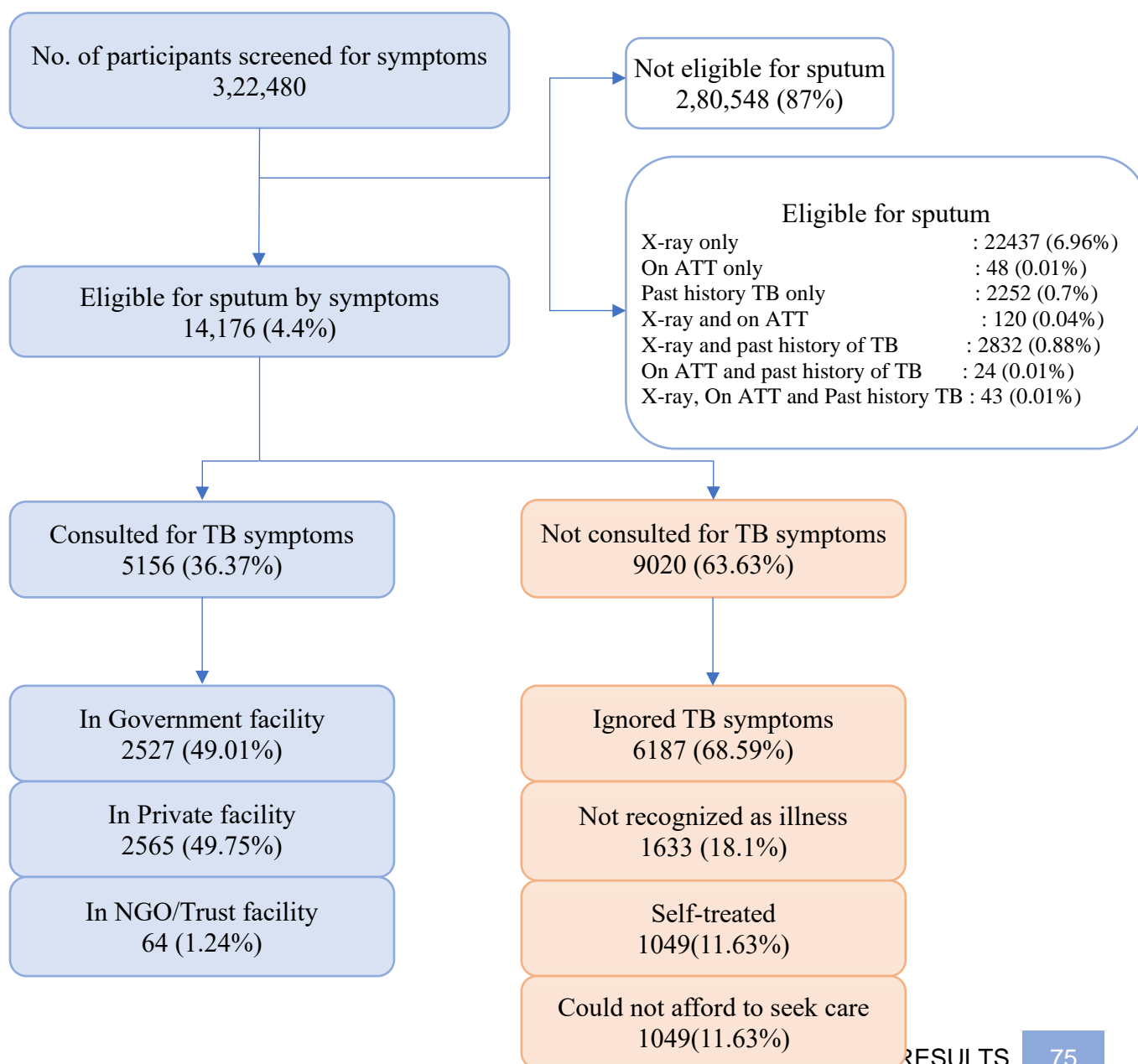
Table 25 First level of service providers among symptomatics who sought care in the survey

	With TB symptoms	Consulted$	Government	Private	NGO/ Trust
Overall	14176	5156 (36.4%)	2527 (49%)	2565 (49.7%)	64 (1.2%)
Gender					
Female	5875	2140 (36.4%)	951 (44.4%)	1167 (54.5%)	22 (1%)
Male	8301	3016 (36.3%)	1576 (52.3%)	1398 (46.4%)	42 (1.4%)
Age Group					
15 to 24	1570	504 (32.1%)	197 (39.1%)	297 (58.9%)	10 (2%)
25 to 34	1865	659 (35.3%)	308 (46.7%)	346 (52.5%)	5 (0.8%)
35 to 44	2215	792 (35.8%)	359 (45.3%)	424 (53.5%)	9 (1.1%)
45 to 54	2624	957 (36.5%)	501 (52.4%)	442 (46.2%)	14 (1.5%)
55 to 64	2776	1025 (36.9%)	548 (53.5%)	464 (45.3%)	13 (1.3%)
≥65	3126	1219 (39%)	614 (50.4%)	592 (48.6%)	13 (1.1%)
State Group					
Andhra Pradesh	706	258 (36.5%)	147 (57%)	109 (42.2%)	2 (0.8%)
Bihar	1108	282 (25.5%)	91 (32.3%)	189 (67%)	2 (0.7%)
Chhattisgarh	210	67 (31.9%)	52 (77.6%)	15 (22.4%)	0 (0%)
Delhi	397	123 (31%)	54 (43.9%)	69 (56.1%)	0 (0%)
Gujarat	337	171 (50.7%)	88 (51.5%)	81 (47.4%)	2 (1.2%)
Himachal Pradesh, Uttarakhand,	299	117 (39.1%)	40 (34.2%)	77 (65.8%)	0 (0%)

	With TB symptoms	Consulted$	Government	Private	NGO/ Trust
Jammu & Kashmir					
Haryana	175	21 (12%)	14 (66.7%)	7 (33.3%)	0 (0%)
Jharkhand	457	126 (27.6%)	80 (63.5%)	46 (36.5%)	0 (0%)
Karnataka	560	271 (48.4%)	180 (66.4%)	91 (33.6%)	0 (0%)
Kerala	884	480 (54.3%)	294 (61.3%)	182 (37.9%)	4 (0.8%)
Maharashtra	1259	580 (46.1%)	198 (34.1%)	382 (65.9%)	0 (0%)
Madhya Pradesh	415	95 (22.9%)	35 (36.8%)	58 (61.1%)	2 (2.1%)
North Eastern States	454	153 (33.7%)	131 (85.6%)	22 (14.4%)	0 (0%)
Odisha	440	124 (28.2%)	92 (74.2%)	32 (25.8%)	0 (0%)
Punjab	277	118 (42.6%)	51 (43.2%)	66 (55.9%)	1 (0.8%)
Rajasthan	901	311 (34.5%)	179 (57.6%)	126 (40.5%)	6 (1.9%)
Tamil Nadu	1716	517 (30.1%)	265 (51.3%)	248 (48%)	4 (0.8%)
Telangana	729	348 (47.7%)	130 (37.4%)	218 (62.6%)	0 (0%)
Uttar Pradesh	2247	807 (35.9%)	289 (35.8%)	479 (59.4%)	39 (4.8%)
West Bengal	605	187 (30.9%)	117 (62.6%)	68 (36.4%)	2 (1.1%)
$ - Percentage was calculated based on number of individuals with symptoms and based on consulted for the rest.					

Table 26 Reasons for not seeking care among symptomatic study participants

	With TB symptoms	Not consulted$	Not recognized as illness	Could not afford to seek care	Ignored	Self-treated
Overall	14176	9020 (63.6%)	1633 (18.1%)	151 (1.7%)	6187 (68.6%)	1049 (11.6%)
Gender						
Female	5875	3735 (63.6%)	704 (18.8%)	63 (1.7%)	2547 (68.2%)	421 (11.3%)
Male	8301	5285 (63.7%)	929 (17.6%)	88 (1.7%)	3640 (68.9%)	628 (11.9%)
Age Group						
15 to 24	1570	1066 (67.9%)	209 (19.6%)	17 (1.6%)	736 (69%)	104 (9.8%)
25 to 34	1865	1206 (64.7%)	214 (17.7%)	12 (1%)	842 (69.8%)	138 (11.4%)
35 to 44	2215	1423 (64.2%)	273 (19.2%)	25 (1.8%)	963 (67.7%)	162 (11.4%)
45 to 54	2624	1667 (63.5%)	315 (18.9%)	34 (2%)	1129 (67.7%)	189 (11.3%)
55 to 64	2776	1751 (63.1%)	290 (16.6%)	29 (1.7%)	1220 (69.7%)	212 (12.1%)
≥65	3126	1907 (61%)	332 (17.4%)	34 (1.8%)	1297 (68%)	244 (12.8%)
State Group						
Andhra Pradesh	706	448 (63.5%)	93 (20.8%)	3 (0.7%)	219 (48.9%)	133 (29.7%)
Bihar	1108	826 (74.5%)	216 (26.2%)	15 (1.8%)	521 (63.1%)	74 (9%)
Chhattisgarh	210	143 (68.1%)	33 (23.1%)	2 (1.4%)	102 (71.3%)	6 (4.2%)
Delhi	397	274 (69%)	25 (9.1%)	5 (1.8%)	225 (82.1%)	19 (6.9%)
Gujarat	337	166 (49.3%)	41 (24.7%)	4 (2.4%)	96 (57.8%)	25 (15.1%)
Himachal Pradesh, Uttarakhand,	299	182 (60.9%)	30 (16.5%)	3 (1.6%)	126 (69.2%)	23 (12.6%)

	With TB symptoms	Not consulted$	Not recognized as illness	Could not afford to seek care	Ignored	Self-treated
Jammu & Kashmir						
Haryana	175	154 (88%)	12 (7.8%)	0 (0%)	114 (74%)	28 (18.2%)
Jharkhand	457	331 (72.4%)	229 (69.2%)	5 (1.5%)	91 (27.5%)	6 (1.8%)
Karnataka	560	289 (51.6%)	15 (5.2%)	0 (0%)	144 (49.8%)	130 (45%)
Kerala	884	404 (45.7%)	98 (24.3%)	3 (0.7%)	238 (58.9%)	65 (16.1%)
Maharashtra	1259	679 (53.9%)	138 (20.3%)	28 (4.1%)	434 (63.9%)	79 (11.6%)
Madhya Pradesh	415	320 (77.1%)	25 (7.8%)	27 (8.4%)	241 (75.3%)	27 (8.4%)
North Eastern States	454	301 (66.3%)	19 (6.3%)	7 (2.3%)	213 (70.8%)	62 (20.6%)
Odisha	440	316 (71.8%)	14 (4.4%)	11 (3.5%)	273 (86.4%)	18 (5.7%)
Punjab	277	159 (57.4%)	17 (10.7%)	1 (0.6%)	126 (79.2%)	15 (9.4%)
Rajasthan	901	590 (65.5%)	100 (16.9%)	3 (0.5%)	446 (75.6%)	41 (6.9%)
Tamil Nadu	1716	1199 (69.9%)	101 (8.4%)	2 (0.2%)	984 (82.1%)	112 (9.3%)
Telangana	729	381 (52.3%)	114 (29.9%)	3 (0.8%)	238 (62.5%)	26 (6.8%)
Uttar Pradesh	2247	1440 (64.1%)	195 (13.5%)	25 (1.7%)	1073 (74.5%)	147 (10.2%)
West Bengal	605	418 (69.1%)	118 (28.2%)	4 (1%)	283 (67.7%)	13 (3.1%)

$ - Percentage was calculated based on number of individuals with symptoms and based on not consulted for the rest.

Cost for the diagnosis and treatment of TB among participants

Table 27 shows the cost for diagnosis, treatment and indirect cost associated with TB management among participants with history of TB and currently on Treatment. Among the survey participants who had past history of TB a. the median cost for diagnosis was Rs.2000 ranging from Rs.500 to Rs.9000. b. the median cost for treatment was Rs.5000 ranging from Rs.1000 to Rs.15000. c. the median indirect cost involved was Rs.2000 ranging from Rs.500 to Rs.9000. d. the median Total cost for TB diagnosis and treatment was Rs.7000 ranging from Rs.1000 to Rs.30000.

Among the survey participants who were currently on TB treatment a. the median cost for diagnosis was Rs.2500 ranging from Rs.500 to Rs.10000. b. the median cost for treatment was Rs.5000 ranging from Rs.500 to Rs.20000. c. the median indirect cost involved was Rs.2000 ranging from Rs.500 to Rs.9000. d. the median Total cost for TB diagnosis and treatment was Rs.6000 ranging from Rs.1000 to Rs.28000.

Table 27 Total cost in INR for the diagnosis and treatment of TB among participants who had history of TB and Currently on Treatment

	n	Mean	SD	Min	Median	Max
Past history of TB						
Diagnosis cost	7056	3009	2589	500	2000	9000
Treatment cost	7056	5835	4329	1000	5000	15000
Indirect cost	7056	3339	2686	500	2000	9000
Total cost	7056	12183	8026	2000	10000	33000
Currently on ATT						
Diagnosis cost	577	3382	3172	500	2500	10000
Treatment cost	577	6877	6431	500	5000	20000
Indirect cost	577	3082	2814	500	2000	9000
Total cost	577	13341	10590	1500	10000	39000

Table 28 shows the cost for diagnosis, treatment and indirect cost associated with TB management among participants with history of TB treatment in public, private and NGO/Trust hospitals. The median cost for diagnosis, treatment, indirect cost was less among the public hospitals, higher in NGO/Trust hospitals and highest in private hospitals. The total median cost for TB diagnosis and treatment in a. Government hospitals was Rs.5500 ranging from Rs.500 to Rs.9000 b. Private hospitals

was Rs.11000 ranging from Rs.1100 to Rs.30000. c. NGO/trust hospitals was Rs.9500 ranging from Rs.1000 to Rs.30000.

Table 28 Total cost in INR for the diagnosis and treatment of TB among participants who had history of TB by service provider

	n	Mean	SD	Min	Median	Max
Past history of TB [Government]						
Diagnosis cost	4983	2609	2182	500	2000	9000
Treatment cost	4983	4697	3237	1000	4000	15000
Indirect cost	4983	2957	2382	500	2000	9000
Total cost	4983	10263	6505	2000	9000	33000
Past history of TB [Private]						
Diagnosis cost	2055	3982	3178	500	3000	9000
Treatment cost	2055	8595	5296	1000	8000	15000
Indirect cost	2055	4273	3121	500	4000	9000
Total cost	2055	16849	9350	2000	16000	33000
Past history of TB [NGO/ Trust]						
Diagnosis cost	18	2500	2176	500	2000	9000
Treatment cost	18	5833	4105	1000	6000	15000
Indirect cost	18	2728	2452	500	1750	9000
Total cost	18	11061	7546	2000	9500	30000

Table 29 shows the cost for diagnosis, treatment and indirect cost associated with TB management among participants who are currently on TB treatment in public, private and NGO/Trust hospitals. The median cost for diagnosis, treatment, indirect cost was less among the public hospitals, higher in NGO/Trust hospitals and highest in private hospitals. The total median cost for TB diagnosis and treatment in a. Government hospitals was Rs.5000 ranging from Rs.1000 to Rs.28000 b. Private hospitals was Rs.13250 ranging from Rs.1000 to Rs.28000.

Table 29 Total cost in INR for the diagnosis and treatment of TB among participants currently on TB treatment by service provider

	n	Mean	SD	Min	Median	Max
Currently on ATT [Government]						
Diagnosis cost	413	2808	2786	500	2000	10000
Treatment cost	413	5125	5086	500	3500	20000
Indirect cost	413	2480	2373	500	1500	9000
Total cost	413	10414	8857	1500	7500	39000
Currently on ATT [Private]						
Diagnosis cost	164	4827	3608	500	4500	10000
Treatment cost	164	11287	7310	500	10000	20000
Indirect cost	164	4599	3243	500	5000	9000
Total cost	164	20713	11028	1500	20000	39000

5.21 Estimation of Prevalence of TB Infection

For estimating the prevalence of TB infection at the national level we planned to do a minimum of one IGRA cluster in every state group. While the survey was being planned, State TB Cell, Gujarat had planned to cover all the survey participants in the state with IGRA testing. In this TB infection survey 55 clusters were covered of which 31 clusters were in Gujarat and 24 clusters were in other 19 state groups with a minimum of one IGRA cluster covered in each state group. 34,988 samples were collected for IGRA testing, of which 34,648 (99.03%) were accepted for testing. 10,865 (31.6%) were positive for IGRA, 21,947 (63.34%) were negative for IGRA and the remaining were indeterminates. This gives a crude prevalence of TB infection among population age $\geq$ 15 years of 31.3 percentage (30.8-31.9). Prevalence of TB infection in India among population aged $\geq$ 15 years was 21.7 percentage (19.4-23.9) (model by robust standard error). We observed higher prevalence of TB infection in males compared to females. Also the prevalence of TB infection increased in males up to the age group of 45-54 years and further age groups in males showed a declining trend of TB infection. In females the prevalence of TB infection increased till the age group of 45-54 years and in further age groups also we observed a similar trend.

Figure 25 Flow of participants who underwent IGRA testing in the survey for TB infection

No. of clusters surveyed for prevalence of TB infection
55 (31 in Gujarat and 24 in other state groups)

No. of samples collected
34988

No. of samples rejected
340 (0.97%)

No. of samples accepted for IGRA test
34648 (99.03%)

Indeterminates
1826 (5.3%)

IGRA Negatives
21947 (63.34%)

IGRA positives
10865 (31.36%)
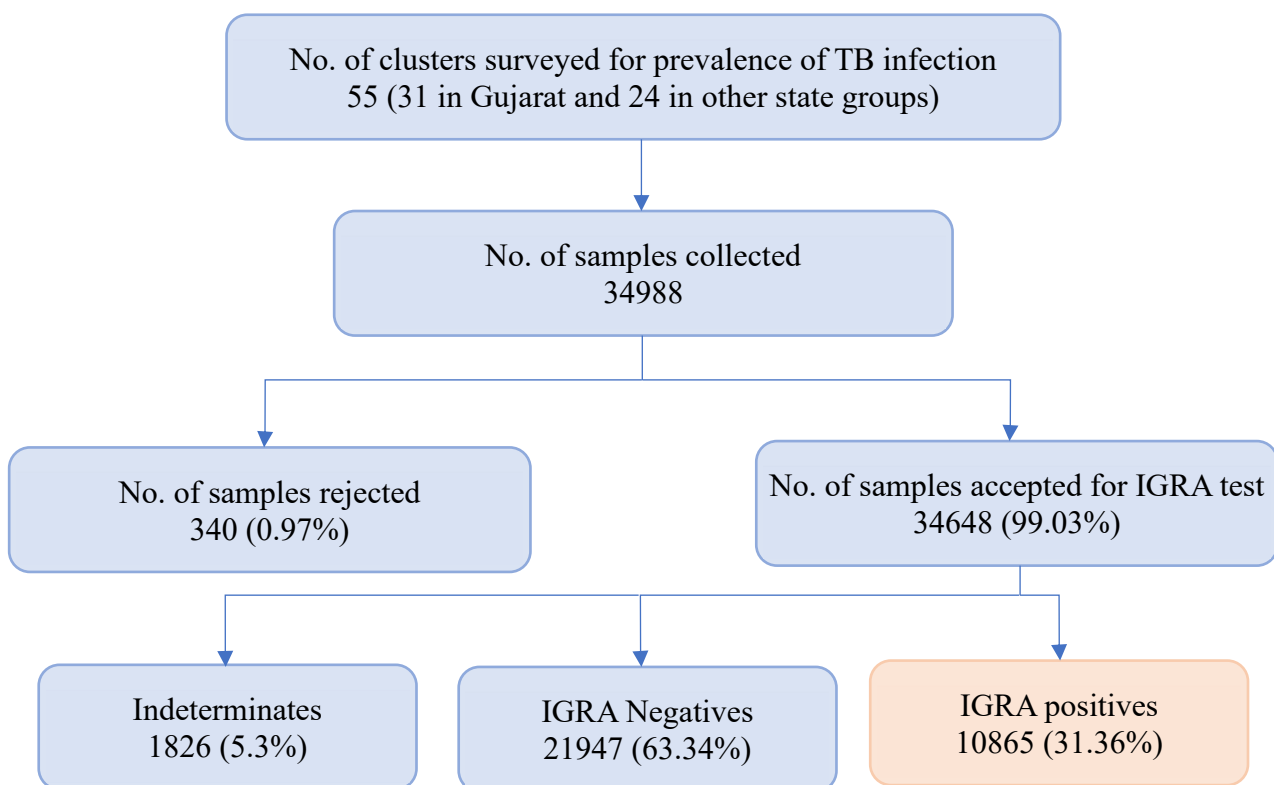
Figure 26 Survey participants with Latent TB Infection per lakh population by age group and gender
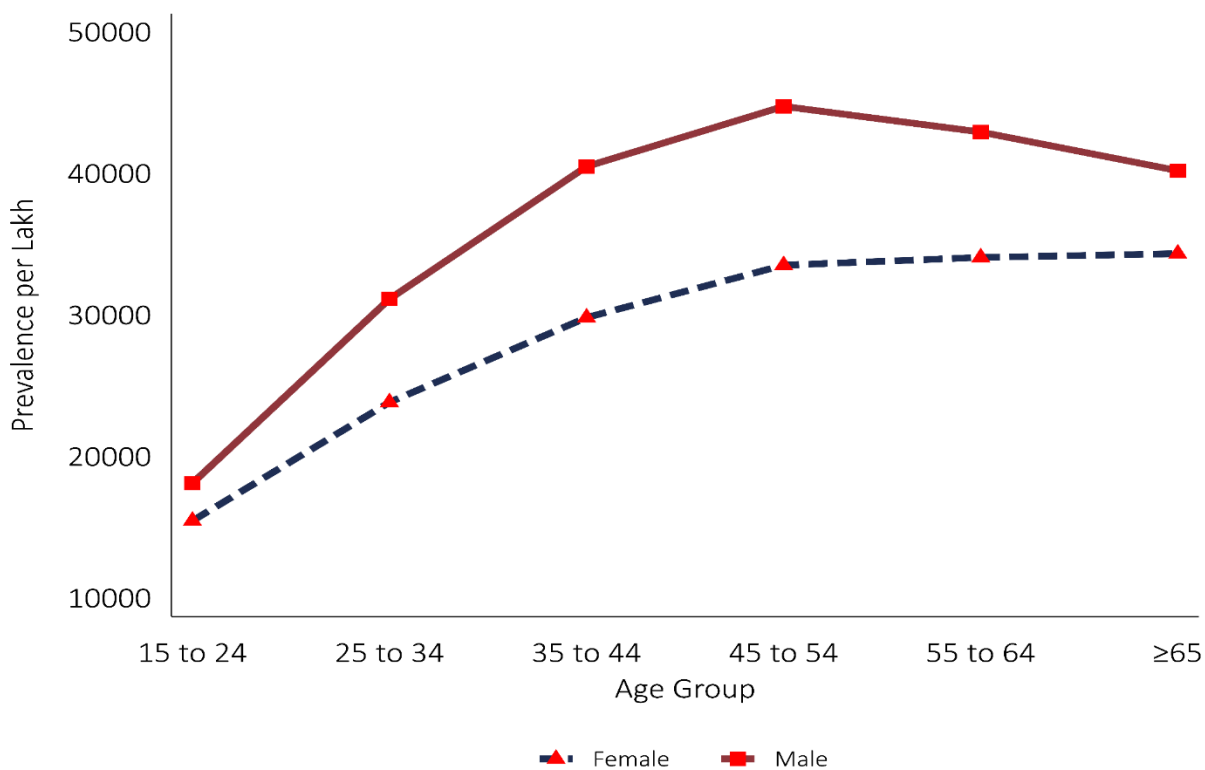
Figure 27 Prevalence of Latent TB Infection among diabetics by age group and gender
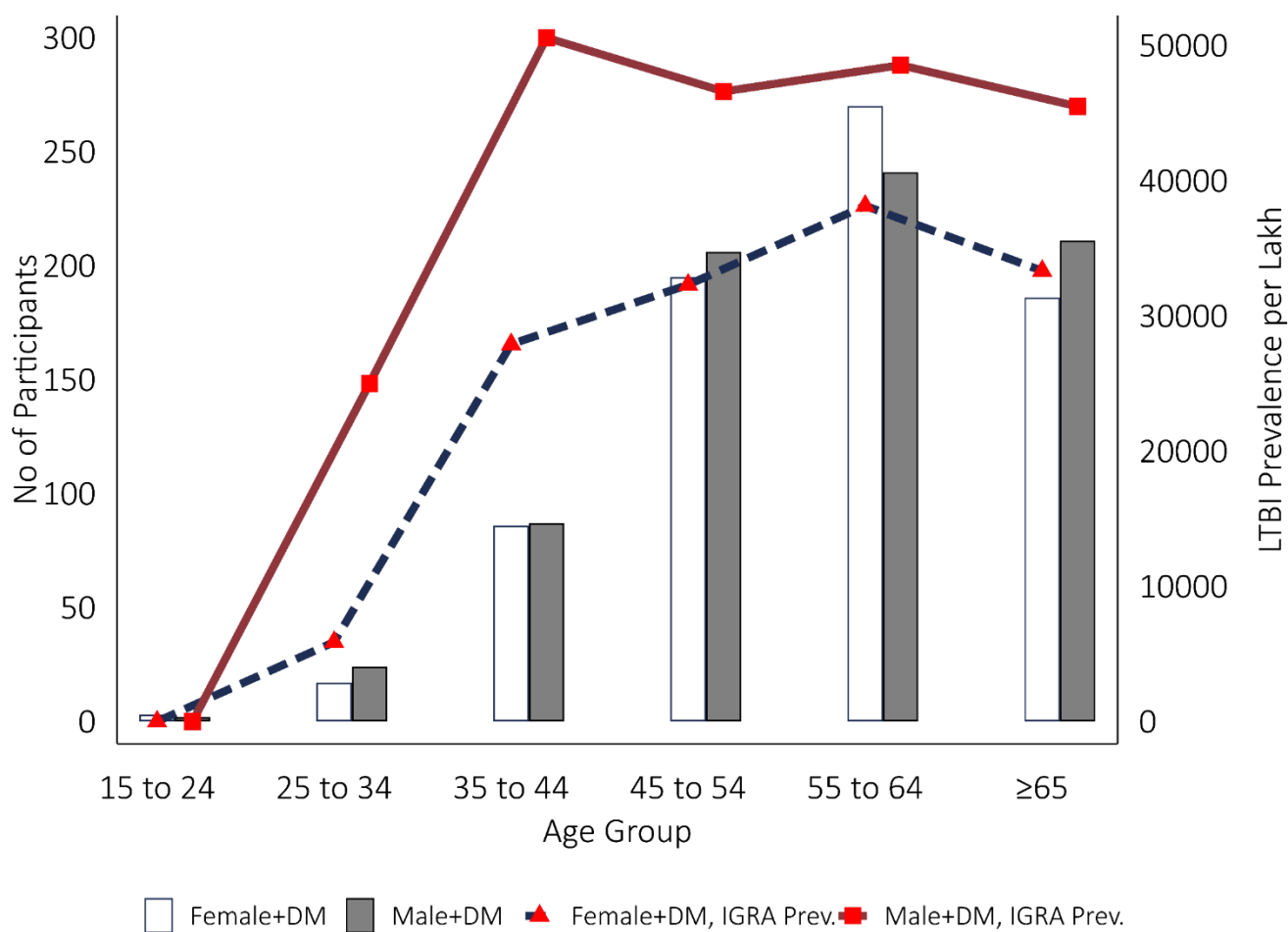
The figure 27 shows an increasing trend of prevalence of latent TB infection across the age group and more among diabetic males compared to diabetic females.

5.22 Programmatic Implications

The diagnostic algorithm in the survey highlights the importance of using molecular test in diagnosing TB. 33 % of cases were exclusively diagnosed based on molecular test. Molecular test when combined with diagnosis by smear and culture methods increased the detection rate 78.4% (Figure 28). Hence, NTEP can prioritise molecular test coverage in the program.

42.6 % of the TB cases in the survey would have been missed if chest X-ray was not included. Hence NTEP should prioritise use of Chest X-rays in program wherever feasible (Figure 29).

Also, among the 981 TB patients diagnosed in the survey, 118 (12%) were already on ATT treatment, while 863 (88%) were not on treatment for TB. Among the 863 TB cases diagnosed, 634 were newly diagnosed for TB in the survey, while 229 were diagnosed with TB who had a history of TB treatment

in the past (Figure 30). A considerable number of prevalent TB cases were contributed by patients with past history of TB. Hence, NTEP needs close follow up of patients completing treatment for early detection of recurrent TB and plan interventions for preventing recurrence of TB.

Figure 28 Yield of TB positivity by diagnostic method in survey
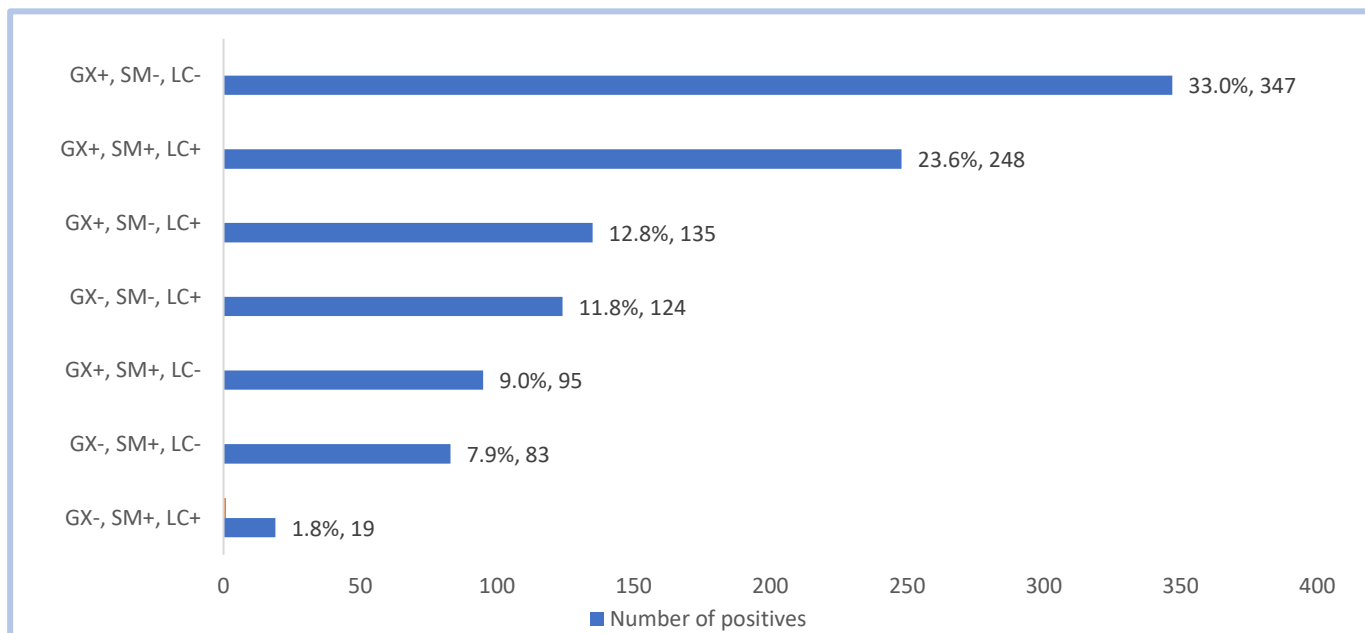
Figure 29 Usefulness of digital chest X-rays in survey
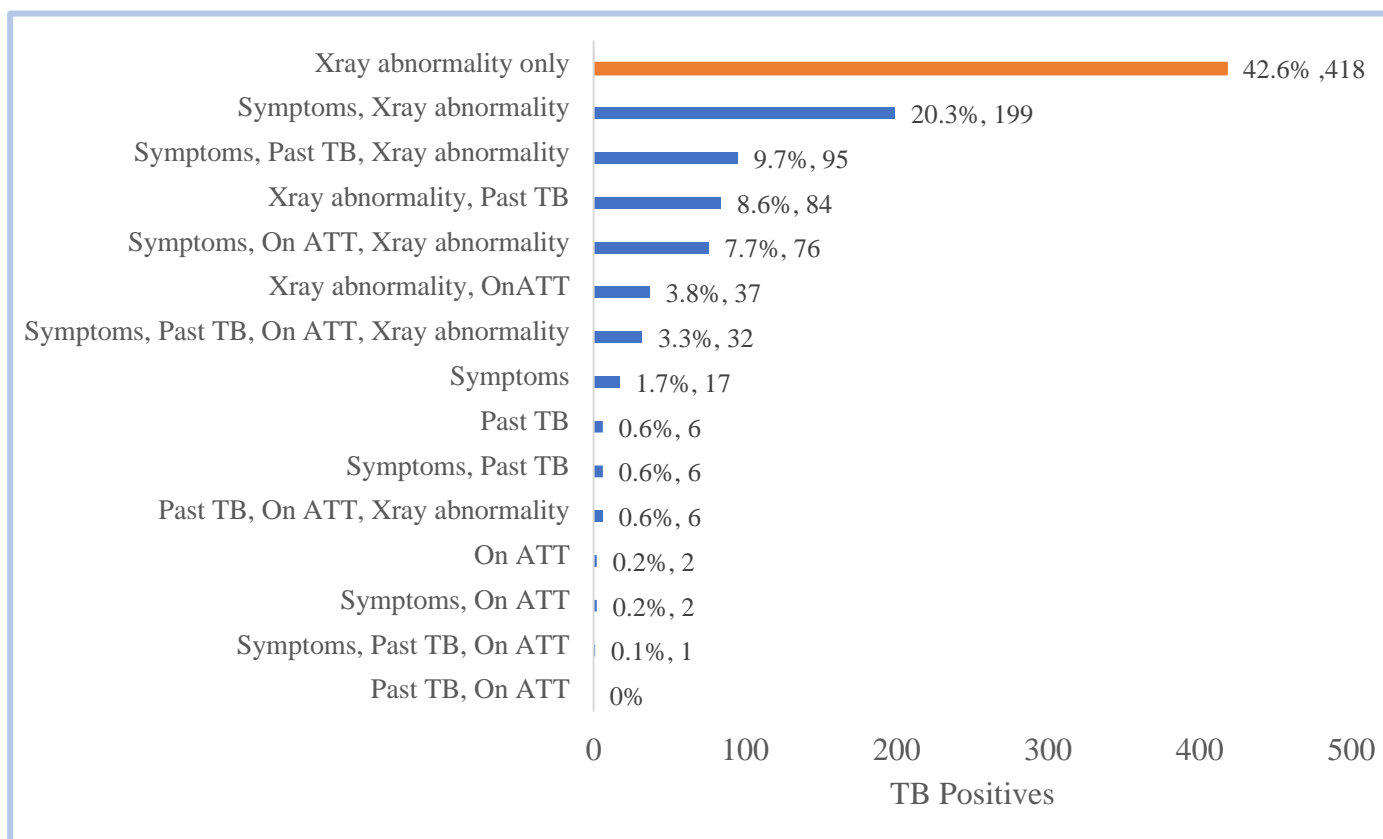
Figure 30 Prevalent (survey) TB cases by type

```
                 ┌─────────────────────────────────────┐
                 │  Total participants diagnosed with  │
                 │           TB in survey              │
                 │                981                  │
                 └─────────────────────────────────────┘
                    │                           │
          ┌─────────▼──────────┐      ┌─────────▼──────────┐
          │ Participants       │      │ Participant        │
          │ diagnosed in       │      │ diagnosed in       │
          │ survey, currently  │      │ survey, currently  │
          │ not on treatment   │      │ on treatment       │
          │ 863 (88%)          │      │ 118 (12%)          │
          └────────────────────┘      └────────────────────┘
             │              │
   ┌─────────▼────────┐  ┌──▼──────────────────────┐
   │ Participants     │  │ Participant with past    │
   │ newly diagnosed  │  │ history of TB,           │
   │ with TB          │  │ recurrence diagnosed     │
   │ 634/863 (73.4%)  │  │ in survey                │
   │ 634/981 (64.6%)  │  │ 229/863(26.6%)           │
   │                  │  │ 229/981( 23.4%)          │
   └──────────────────┘  └──────────────────────────┘
```
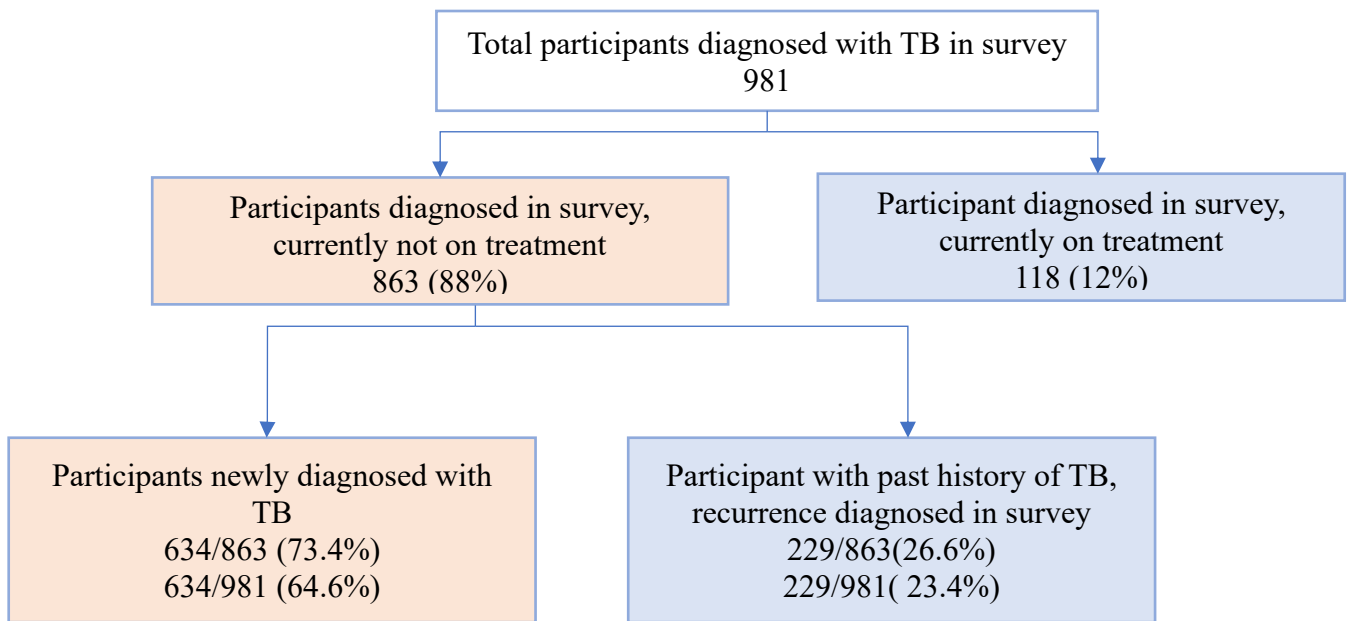
Chapter **6**

Strengths, Challenges & Limitations

Chapter 6 Strengths, Challenges and Limitations

This was the Largest, Nation-wide prevalence survey of TB in an endemic country covering over 350000 population with advanced data management systems, digital chest X-rays within the support of existing reference laboratories and quality assurance procedures. Survey identified areas with high TB burden, which will help the programme managers and policymakers to prioritise and plan specific TB elimination strategies in the country more effectively. The major strength of this mammoth survey which was largely funded by the Government of India was multi-sectoral involvement including local, state, and central government.

Being one of the world's largest TB prevalence surveys, coordination and management was the biggest challenge, especially in the pandemic, but the support and leadership from all the stake holders, along with technologies like google forms, google meet, other virtual platforms and digital technologies, helped us coordinate and manage the survey in the best possible manner. Since the X-ray machines were on frequent use and on movement from cluster to cluster, we had encountered several breakdown of X-ray machines but since the maintenance was included in the purchase we were able to resolve it at the earliest. In places where there were possibilities we had spare mobile X-ray units in reserve which were diverted. In places where it was not possible, we hired portable digital X-ray machines. Other major challenge was the sputum transportation due to the lock down in the middle of the survey. Due to pandemic we had challenges in sample transportation from the field to the reference laboratories, but we had engaged a separate sample transportation agency for sputum throughout the country to be transported in cold chain in 24-48 hours. Human resources management especially among the COVID pandemic was very challenging because of the risk and fear of COVID among health care workers. But we continued those staff who were willing to continue to work with required precautions for Infection Prevention and Control (IPC) of COVID. We provided the support in terms of training for IPC, appropriate Personal Protective Equipment's (PPE) like masks, gloves, PPE suits, sanitisers. Facilitation for the vaccination of the survey staff was ensured. Due to the COVID pandemic, there were unexpected delays, fear, and concern about the survey, especially in terms of stigma as both COVID and TB were respiratory diseases, but we tried to address it through the community engagement and mobilisation activities

Though we were not able to achieve the coverage of all the planned clusters, we would be able to have best estimates as we have achieved the desired precision set in the protocol. We have tried to address and minimise all the biases starting from the planning stage to the data analysis stage with appropriate planning, training, monitoring and quality control.

Chapter 7

Conclusion & Recommendations

Chapter 7 Conclusion and Recommendations

Prevalence of microbiologically confirmed PTB among 15 years and above in India was 316/lakh population with the highest PTB prevalence of 534/lakh in Delhi and the lowest PTB Prevalence of 115/lakh in Kerala. Higher PTB Prevalence was observed in older age group, males, malnourished, smokers, alcoholics and known diabetics. COVID has impacted the community level chest X-ray abnormality in general and would have impacted the TB prevalence. Prevalence of PTB infection among the surveyed in India was 21.7%. 63% of the chest symptomatic did not seek health care and majority had ignored the symptoms and did not recognized it as illness. Among the 37% who consulted, they have equally approached the public(49%) and private sector (49%). A considerable amount of prevalent TB cases were contributed by patients with past history of TB. Hence, NTEP needs close follow up of patients completing treatment for early detection of recurrent TB and plan interventions for preventing recurrence of TB. NTEP needs to prioritise scale up of molecular test and chest X-ray screening under program conditions for increasing the efficiency of case finding and early diagnosis of TB.

Based on the varying state TB prevalence's we need to prioritize the interventions in high prevalent states and plan for elimination in low prevalent states. More interventions for men like occupation screening for TB, nutritional interventions for malnourished, old age screening and interventions for promoting smoking and alcohol cessation needs to be scaled up for better control of PTB to address the factors which have more contribution towards the PTB burden. Scale up treatment of TB infection as per the new TB preventive therapy guidelines. Emphasis on health education by various means and strategies is required for improving the symptom awareness among the general community to improve the health care seeking behavior and thereby prevent the further spread of TB. To continue engaging the private sector for more case notification and the patient centered care. Further evaluate the states with high and low burden of prevalence of TB to assess the impact of COVID as future research area.

Chapter 8

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Chapter 8 References

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Chapter 9

Annexures

Chapter 9 Annexures

9.1 Details of completed clusters

S.No	Cluster number	Team	State	District	Name Of Cluster	Type	2011 Census Population	Date of start of cluster	Date of end of cluster
1	302	11	Tamil Nadu	Thiruvallur	Chinnamandalai	Rural	1099	1-Jun-2019	10-Jun-2019
2	305	11	Tamil Nadu	Kancheepuram	Gunduperumbedu	Rural	1020	24-Jun-2019	6-Jul-2019
3	306	11	Tamil Nadu	Kancheepuram	Kundrathur (TP) Ward No.-0005	Urban	2693	8-Jul-2019	22-Jul-2019
4	307	11	Tamil Nadu	Kancheepuram	Velichi	Rural	821	25-Jul-2019	7-Aug-2019
5	308	11	Tamil Nadu	Kancheepuram	Kunnathur	Rural	2183	8-Aug-2019	13-Aug-2019
6	331	11	Tamil Nadu	Krishnagiri	Muthuganapalli	Rural	3460	4-Nov-2019	12-Nov-2019
7	314	11	Tamil Nadu	Salem	Sathapadi	Rural	3155	15-Nov-2019	23-Nov-2019
8	313	11	Tamil Nadu	Salem	Dasinayakkanpatti	Rural	804	26-Nov-2019	4-Dec-2019
9	315	11	Tamil Nadu	Erode	Dhoddampalayam	Rural	4153	14-Dec-2019	21-Dec-2019
10	337	11	Tamil Nadu	Tiruppur	Muthanampalayam (CT) Ward No.-0001	Urban	26014	30-Dec-2019	9-Jan-2020
11	332	11	Tamil Nadu	Coimbatore	Sirumugai (TP) Ward No.-0006	Urban	402	17-Jan-2020	27-Jan-2020
12	333	11	Tamil Nadu	Coimbatore	Odderpalayam	Rural	7403	1-Feb-2020	9-Feb-2020
13	335	11	Tamil Nadu	Coimbatore	Coimbatore (M Corp.) Ward No.-0064	Urban	8405	14-Feb-2020	6-Mar-2020
14	336	11	Tamil Nadu	Coimbatore	Coimbatore (M Corp.) Ward No.-0069	Urban	23021	9-Mar-2020	18-Mar-2020
15	301	11	Tamil Nadu	Thiruvallur	Peravallur	Rural	2101	5-Oct-2020	14-Oct-2020
16	309	11	Tamil Nadu	Vellore	Gudiyatham (M) Ward No.-0001	Urban	2051	16-Oct-2020	28-Oct-2020
17	310	11	Tamil Nadu	Tiruvannamalai	Kidampalayam	Rural	2845	28-Oct-2020	2-Nov-2020
18	311	11	Tamil Nadu	Viluppuram	Thimmachur	Rural	2809	5-Nov-2020	12-Nov-2020
19	320	11	Tamil Nadu	Cuddalore	Karunguli	Rural	5449	17-Nov-2020	26-Nov-2020
20	321	11	Tamil Nadu	Cuddalore	Elanangur	Rural	1179	29-Nov-2020	9-Dec-2020
21	318	11	Tamil Nadu	Ariyalur	Asaveerankudikkadu	Rural	3981	12-Dec-2020	2-Jan-2021
22	317	11	Tamil Nadu	Tiruchirappalli	Unniyur	Rural	2460	2-Jan-2021	16-Jan-2021
23	316	11	Tamil Nadu	Karur	Thalapatti	Rural	4903	17-Jan-2021	26-Jan-2021
24	322	11	Tamil Nadu	Thiruvarur	Nedumbalam	Rural	3215	27-Jan-2021	2-Feb-2021

S.No	Cluster number	Team	State	District	Name Of Cluster	Type	2011 Census Population	Date of start of cluster	Date of end of cluster
25	324	11	Tamil Nadu	Madurai	Karisalpatti	Rural	1835	6-Feb-2021	12-Feb-2021
26	325	11	Tamil Nadu	Madurai	Thirumangalam (M) Ward No.-0014	Urban	6107	14-Feb-2021	21-Feb-2021
27	326	11	Tamil Nadu	Theni	Timmarasanayakkanur	Rural	20218	23-Feb-2021	3-Mar-2021
28	327	11	Tamil Nadu	Theni	Kadamalaikundu	Rural	23650	6-Mar-2021	16-Mar-2021
29	330	11	Tamil Nadu	Tirunelveli	Nambithalaivanpattayam	Rural	2748	19-Mar-2021	28-Mar-2021
30	329	11	Tamil Nadu	Tirunelveli	Tirunelveli (M Corp.) Ward No.-0015	Urban	8450	30-Mar-2021	5-Apr-2021
31	328	11	Tamil Nadu	Thoothukkudi	Milavittan (CT) Ward No.-0001	Urban	45863	8-Apr-2021	13-Apr-2021
32	319	11	Tamil Nadu	Ariyalur	Periyakurichi	Rural	3533	21-Jul-2021	2-Aug-2021
33	577	1	Delhi	North West	Dmc (U) (Part) Ward No.-0023	Urban	94843	2-Nov-2019	12-Nov-2019
34	578	1	Delhi	North East	Karawal Nagar (Ct) Ward No.-0271	Urban	85400	26-Nov-2019	8-Jan-2020
35	579	1	Delhi	North East	Mandoli (CT) Ward No.-0264	Urban	43454	9-Jan-2020	24-Jan-2020
36	581	1	Delhi	East	Dallo Pura (Ct) Ward No.-0214	Urban	35055	25-Jan-2020	4-Feb-2020
37	583	1	Delhi	South West	Dmc (U) (Part) Ward No.-0120	Urban	64252	5-Feb-2020	15-Feb-2020
38	584	1	Delhi	South West	Dmc (U) (Part) Ward No.-0131	Urban	54383	16-Feb-2020	24-Feb-2020
39	585	1	Delhi	South West	Dmc (U) (Part) Ward No.-0146	Urban	52171	25-Feb-2020	4-Mar-2020
40	582	1	Delhi	West	Dmc (U) (Part) Ward No.-0102	Urban	62412	5-Mar-2020	15-Mar-2020
41	580	1	Delhi	East	Dmc (U) (Part) Ward No.-0229	Urban	59503	16-Mar-2020	23-Mar-2020
42	19	1	Uttar Pradesh	Gautam Buddha Nagar	Noida (CT) Ward No.-0001	Urban	637272	10-Oct-2020	17-Oct-2020
43	77	3	Uttar Pradesh	Bara Banki	Shah Pur	Rural	1386	14-Dec-2019	24-Dec-2019
44	51	2	Uttar Pradesh	Lucknow	Ghuskar	Rural	3482	20-Dec-2019	9-Jan-2020
45	78	3	Uttar Pradesh	Bara Banki	Bija Pur	Rural	1811	13-Jan-2020	23-Jan-2020
46	52	2	Uttar Pradesh	Lucknow	Sirsa	Rural	4173	15-Jan-2020	31-Jan-2020
47	49	2	Uttar Pradesh	Lucknow	Lucknow (M Corp.) Ward No.-0002	Urban	41971	4-Feb-2020	22-Feb-2020
48	72	3	Uttar Pradesh	Pratapgarh	Narayanpur	Rural	3480	8-Feb-2020	24-Feb-2020
49	50	2	Uttar Pradesh	Lucknow	Lucknow (M Corp.) Ward No.-0064	Urban	17919	23-Feb-2020	4-Mar-2020
50	73	3	Uttar Pradesh	Kaushambi	Chhekawa Uparhar	Rural	3274	29-Feb-2020	4-Mar-2020
51	48	2	Uttar Pradesh	Lucknow	Dudhara	Rural	1757	14-Mar-2020	21-Mar-2020
52	16	1	Uttar Pradesh	Ghaziabad	Muradnagar (NPP) Ward No.-0019	Urban	2871	19-Oct-2020	27-Oct-2020
53	37	2	Uttar Pradesh	Sitapur	Mathana	Rural	2343	21-Oct-2020	30-Oct-2020
54	17	1	Uttar Pradesh	Ghaziabad	Hapur (NPP) Ward No.-0028	Urban	6914	29-Oct-2020	5-Nov-2020
55	38	2	Uttar Pradesh	Sitapur	Ragua	Rural	2859	31-Oct-2020	6-Nov-2020
56	71	3	Uttar Pradesh	Chitrakoot	Tadi Mustkil	Rural	2491	18-Mar-2020	6-Nov-2020
57	18	1	Uttar Pradesh	Ghaziabad	Rasoolabad Nanpur	Rural	5831	6-Nov-2020	12-Nov-2020
58	75	3	Uttar Pradesh	Allahabad	Akhari Shahpur	Rural	2607	6-Nov-2020	19-Nov-2020
59	14	1	Uttar Pradesh	Meerut	Meerut (M Corp.) Ward No.-0006	Urban	19060	20-Nov-2020	27-Nov-2020

S.No	Cluster number	Team	State	District	Name Of Cluster	Type	2011 Census Population	Date of start of cluster	Date of end of cluster
60	39	2	Uttar Pradesh	Sitapur	Tambaur-Cum-Ahamdabad (NP) Ward No.-0010	Urban	2106	7-Nov-2020	28-Nov-2020
61	76	3	Uttar Pradesh	Allahabad	Uchadih	Rural	6389	19-Nov-2020	1-Dec-2020
62	35	2	Uttar Pradesh	Kheri	Maruwa Pasichim	Rural	5621	29-Nov-2020	7-Dec-2020
63	15	1	Uttar Pradesh	Meerut	Meerut (CB) Ward No.-0003	Urban	8918	1-Dec-2020	8-Dec-2020
64	4	1	Uttar Pradesh	Muzaffarnagar	Khatauli Rural (Ct) Ward No.-0001	Urban	14949	11-Dec-2020	19-Dec-2020
65	74	3	Uttar Pradesh	Allahabad	Gagawr	Rural	1304	4-Dec-2020	21-Dec-2020
66	36	2	Uttar Pradesh	Kheri	Pipra Marora	Rural	2122	15-Dec-2020	9-Jan-2021
67	3	1	Uttar Pradesh	Muzaffarnagar	Akbagarh	Rural	1921	6-Jan-2021	14-Jan-2021
68	102	3	Uttar Pradesh	Mirzapur	Vijaypur	Rural	12775	8-Jan-2021	19-Jan-2021
69	40	2	Uttar Pradesh	Hardoi	Hannpasigawan	Rural	2208	11-Jan-2021	20-Jan-2021
70	2	1	Uttar Pradesh	Muzaffarnagar	Mohammadpur Rai	Rural	4274	15-Jan-2021	24-Jan-2021
71	103	3	Uttar Pradesh	Mirzapur	Kudaran	Rural	1674	19-Jan-2021	29-Jan-2021
72	43	2	Uttar Pradesh	Hardoi	Karim Nagar Saidapur	Rural	7463	22-Jan-2021	30-Jan-2021
73	1	1	Uttar Pradesh	Saharanpur	Husainpur	Rural	710	25-Jan-2021	7-Feb-2021
74	104	3	Uttar Pradesh	Sonbhadra	Dhanaura	Rural	3413	2-Feb-2021	12-Feb-2021
75	20	1	Uttar Pradesh	Bulandshahr	Sikandrabad (NPP) Ward No.-0010	Urban	4937	8-Feb-2021	14-Feb-2021
76	42	2	Uttar Pradesh	Hardoi	Barra Sarain	Rural	2212	31-Jan-2021	17-Feb-2021
77	44	2	Uttar Pradesh	Hardoi	Hazratpur	Rural	1051	18-Feb-2021	28-Feb-2021
78	100	3	Uttar Pradesh	Varanasi	Bhitari	Rural	5137	18-Feb-2021	28-Feb-2021
79	24	1	Uttar Pradesh	Mahamaya Nagar	Hasayan (NP) WARD NO.-0005	Urban	739	15-Feb-2021	4-Mar-2021
80	98	3	Uttar Pradesh	Jaunpur	Thunhi	Rural	2563	1-Mar-2021	8-Mar-2021
81	21	1	Uttar Pradesh	Bulandshahr	Hasangarh (CT) Ward No.-0001	Urban	6541	6-Mar-2021	17-Mar-2021
82	96	3	Uttar Pradesh	Jaunpur	Ratasi	Rural	1944	10-Mar-2021	20-Mar-2021
83	22	1	Uttar Pradesh	Aligarh	Ainchana	Rural	2362	18-Mar-2021	26-Mar-2021
84	41	2	Uttar Pradesh	Hardoi	Kankapur Ubariya	Rural	2349	4-Mar-2021	26-Mar-2021
85	97	3	Uttar Pradesh	Jaunpur	Markha Pur	Rural	780	21-Mar-2021	27-Mar-2021
86	23	1	Uttar Pradesh	Aligarh	Satha	Rural	5326	31-Mar-2021	7-Apr-2021
87	58	2	Uttar Pradesh	Kannauj	Bahishar	Rural	3745	4-Apr-2021	14-Apr-2021
88	25	1	Uttar Pradesh	Mathura	Gokul (NP) Ward No.-0007	Urban	671	8-Apr-2021	16-Apr-2021
89	61	2	Uttar Pradesh	Etawah	Nagla Lalman	Rural	547	17-Apr-2021	26-May-2021
90	62	2	Uttar Pradesh	Etawah	Samther	Rural	5365	28-May-2021	6-Jun-2021
91	27	1	Uttar Pradesh	Agra	Jajau	Rural	8435	27-May-2021	14-Jun-2021
92	59	2	Uttar Pradesh	Etawah	Hardoi	Rural	5685	8-Jun-2021	16-Jun-2021
93	82	3	Uttar Pradesh	Sultanpur	Fulauna	Rural	1028	8-Apr-2021	17-Jun-2021

S.No	Cluster number	Team	State	District	Name Of Cluster	Type	2011 Census Population	Date of start of cluster	Date of end of cluster
94	134	4	Maharashtra	Nashik	Musalgaon	Rural	8124	23-Nov-2019	2-Dec-2019
95	148	5	Maharashtra	Pune	Dehu Road (Cb) Ward No.-0007	Urban	4725	25-Nov-2019	20-Dec-2019
96	133	4	Maharashtra	Nashik	Ghoti Bk. (Ct) Ward No.-0001	Urban	24838	3-Dec-2019	22-Dec-2019
97	137	5	Maharashtra	Thane	Thane (M Corp.) Ward No.-0045	Urban	10687	21-Dec-2019	10-Jan-2020
98	130	4	Maharashtra	Nashik	Khadakohol	Rural	1411	11-Jan-2020	20-Jan-2020
99	138	5	Maharashtra	Thane	Badlapur (M Cl) Ward No.-0014	Urban	3843	11-Jan-2020	28-Jan-2020
100	131	4	Maharashtra	Nashik	Nashik (M Corp.) Ward No.-0041	Urban	11100	21-Jan-2020	10-Feb-2020
101	144	5	Maharashtra	Mumbai Suburban	Greater Mumbai (M Corp.) (Part) Ward No.-2487	Urban	206590	4-Feb-2020	22-Feb-2020
102	132	4	Maharashtra	Nashik	Nashik (M Corp.) Ward No.-0045	Urban	7591	11-Feb-2020	25-Feb-2020
103	109	4	Maharashtra	Jalgaon	Javkhede Kh.	Rural	1628	26-Feb-2020	8-Mar-2020
104	139	5	Maharashtra	Mumbai Suburban	Greater Mumbai (M Corp.) (Part) Ward No.-1045	Urban	185572	7-Mar-2020	22-Mar-2020
105	108	4	Maharashtra	Jalgaon	Jalgaon (M Corp.) Ward No.-0026	Urban	4514	12-Mar-2020	26-Mar-2020
106	140	5	Maharashtra	Mumbai Suburban	Greater Mumbai (M Corp.) (Part) Ward No.-1048	Urban	272240	22-Feb-2020	29-Mar-2020
107	126	4	Maharashtra	Chandrapur	Masal Bk	Rural	2078	30-Oct-2020	7-Nov-2020
108	125	4	Maharashtra	Gondiya	Khamkhurra	Rural	1899	8-Nov-2020	15-Nov-2020
109	124	4	Maharashtra	Nagpur	Nagpur (M Corp.) Ward No.-0099	Urban	16270	18-Nov-2020	27-Nov-2020
110	123	4	Maharashtra	Nagpur	Nagpur (M Corp.) Ward No.-0097	Urban	32551	6-Dec-2020	15-Dec-2020
111	122	4	Maharashtra	Nagpur	Nagpur (M Corp.) Ward No.-0095	Urban	19911	4-Jan-2021	12-Jan-2021
112	121	4	Maharashtra	Nagpur	Nagpur (M Corp.) Ward No.-0002	Urban	31716	13-Jan-2021	20-Jan-2021
113	120	4	Maharashtra	Nagpur	Mowad (M Cl) Ward No.-0007	Urban	507	21-Jan-2021	28-Jan-2021
114	119	4	Maharashtra	Wardha	Nachangaon	Rural	18761	30-Jan-2021	8-Feb-2021
115	151	5	Maharashtra	Bid	Dhokwad	Rural	249	7-Feb-2021	17-Feb-2021
116	117	4	Maharashtra	Amravati	Shendola Kh.	Rural	2542	15-Feb-2021	23-Feb-2021
117	154	5	Maharashtra	Osmanabad	Saramkondi	Rural	2845	18-Feb-2021	28-Feb-2021
118	116	4	Maharashtra	Amravati	Shendurjana (M Cl) Ward No.-0017	Urban	1517	24-Feb-2021	5-Mar-2021
119	152	5	Maharashtra	Latur	Salgara Bk.	Rural	1978	1-Mar-2021	9-Mar-2021
120	112	4	Maharashtra	Akola	Murtijapur (M Cl) Ward No.-0019	Urban	2557	7-Mar-2021	18-Mar-2021
121	155	5	Maharashtra	Solapur	Hiraj	Rural	3136	9-Mar-2021	18-Mar-2021
122	111	4	Maharashtra	Akola	Saundala	Rural	2807	19-Mar-2021	26-Mar-2021
123	160	5	Maharashtra	Sangli	Sangli Miraj Kupwad (M Corp.) Ward No.-0053	Urban	5484	18-Mar-2021	30-Mar-2021
124	110	4	Maharashtra	Buldana	Andhera	Rural	5023	27-Mar-2021	5-Apr-2021

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125	159	5	Maharashtra	Sangli	Inam Dhamani	Rural	5424	30-Mar-2021	7-Apr-2021
126	157	5	Maharashtra	Kolhapur	Kenavade	Rural	2374	9-Apr-2021	16-Apr-2021
127	127	4	Maharashtra	Hingoli	Chikhali	Rural	1974	5-Apr-2021	19-Apr-2021
128	158	5	Maharashtra	Kolhapur	Haldavade	Rural	1026	16-Apr-2021	23-Apr-2021
129	128	4	Maharashtra	Jalna	Tirthpuri	Rural	10148	19-Apr-2021	5-May-2021
130	129	4	Maharashtra	Aurangabad	Wadgaon Kolhati (Ct) Ward No.-0001	Urban	65620	5-May-2021	17-May-2021
131	107	4	Maharashtra	Jalgaon	Varad Seem	Rural	5361	17-May-2021	26-May-2021
132	156	5	Maharashtra	Ratnagiri	Wadi Kh	Rural	167	11-May-2021	31-May-2021
133	106	4	Maharashtra	Jalgaon	Vanjole	Rural	1036	26-May-2021	5-Jun-2021
134	105	4	Maharashtra	Jalgaon	Muktainagar	Rural	23970	6-Jun-2021	16-Jun-2021
135	147	5	Maharashtra	Raigarh	Murud Janjira (M Cl) Ward No.-0011	Urban	652	1-Jun-2021	16-Jun-2021
136	141	5	Maharashtra	Mumbai Suburban	Greater Mumbai (M Corp.) (Part) Ward No.-1141	Urban	48710	12-Jul-2021	1-Aug-2021
137	143	5	Maharashtra	Mumbai Suburban	Greater Mumbai (M Corp.) (Part) Ward No.-2486	Urban	102918	12-Jul-2021	1-Aug-2021
138	142	5	Maharashtra	Mumbai Suburban	Greater Mumbai (M Corp.) (Part) Ward No.-1564	Urban	391381	4-Aug-2021	12-Aug-2021
139	145	5	Maharashtra	Mumbai	Greater Mumbai (M Corp.) (Part) Ward No.-0417	Urban	54783	5-Aug-2021	12-Aug-2021
140	173	6	Bihar	Gaya	Tirkha	Rural	864	20-Dec-2019	28-Dec-2019
141	189	7	Bihar	Muzaffarpur	Bazidpur	Rural	6309	13-Jan-2020	28-Jan-2020
142	172	6	Bihar	Gaya	Baiju Bigha	Rural	2245	29-Nov-2019	30-Jan-2020
143	190	7	Bihar	Muzaffarpur	Harchanda	Rural	6458	7-Feb-2020	16-Feb-2020
144	166	6	Bihar	Bhagalpur	Jahangira	Rural	3634	31-Jan-2020	17-Feb-2020
145	191	7	Bihar	Muzaffarpur	Manipur Dahila	Rural	3378	17-Feb-2020	11-Nov-2020
146	192	7	Bihar	Muzaffarpur	Madhopur Susta	Rural	4805	12-Nov-2020	26-Nov-2020
147	187	7	Bihar	Madhubani	Mahinathpur	Rural	5552	27-Nov-2020	7-Dec-2020
148	170	6	Bihar	Gaya	Malsari	Rural	1747	29-Feb-2020	16-Dec-2020
149	186	7	Bihar	Madhubani	Durgipatti	Rural	3588	8-Dec-2020	5-Jan-2021
150	188	7	Bihar	Madhubani	Parsa	Rural	16704	6-Jan-2021	16-Jan-2021
151	185	7	Bihar	Madhepura	Laualagaon	Rural	21768	17-Jan-2021	27-Jan-2021
152	184	7	Bihar	Madhepura	Ruhua Urf Harpur Hingo	Rural	5300	28-Jan-2021	14-Feb-2021
153	171	6	Bihar	Gaya	Uparahauli	Rural	2079	10-Feb-2021	17-Feb-2021
154	183	7	Bihar	Madhepura	Dinapatti	Rural	3694	15-Feb-2021	25-Feb-2021
155	207	7	Bihar	Rohtas	Dehri (Nagar Parishad) Ward No.-0022	Urban	2450	19-Feb-2021	1-Mar-2021

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156	182	7	Bihar	Madhepura	Raibhir	Rural	9576	26-Feb-2021	9-Mar-2021
157	206	6	Bihar	Rohtas	Agrer	Rural	3774	2-Mar-2021	13-Mar-2021
158	211	7	Bihar	Sitamarhi	Kurhar	Rural	5213	10-Mar-2021	17-Mar-2021
159	165	6	Bihar	Bhagalpur	Jaipur Chuhar	Rural	23135	18-Feb-2020	22-Mar-2021
160	177	6	Bihar	Kaimur (Bhabua)	Bhatauli	Rural	1164	14-Mar-2021	22-Mar-2021
161	208	7	Bihar	Samastipur	Sothiawan	Rural	5737	18-Mar-2021	1-Apr-2021
162	203	7	Bihar	Purba Champaran	Loknathpur	Rural	2447	2-Apr-2021	9-Apr-2021
163	201	7	Bihar	Purba Champaran	Kaithwalia	Rural	3865	6-Jun-2021	15-Jun-2021
164	176	6	Bihar	Kaimur (Bhabua)	Khudra	Rural	2081	5-Apr-2021	17-Jun-2021
165	168	6	Bihar	Buxar	Shukraulia	Rural	2295	29-Jun-2021	7-Jul-2021
166	202	7	Bihar	Purba Champaran	Dhaka (NP) Ward No.-0012	Urban	1335	29-Jun-2021	7-Jul-2021
167	167	6	Bihar	Bhojpur	Gunri	Rural	13910	9-Jul-2021	17-Jul-2021
168	216	6	Bihar	Vaishali	Majhauli	Rural	6165	10-Jul-2021	24-Jul-2021
169	196	6	Bihar	Nalanda	Sonawan	Rural	2247	23-Jul-2021	30-Jul-2021
170	210	6	Bihar	Saran	Marhaura (NP) Ward No.-0013	Urban	1601	25-Jul-2021	2-Aug-2021
171	237	8	West Bengal	Nadia	Muratipur (P)	Rural	5208	22-Jan-2020	31-Jan-2020
172	244	9	West Bengal	Hugli	Uttar Narayanpur	Rural	2175	10-Jan-2020	3-Feb-2020
173	246	9	West Bengal	Hugli	Hugli-Chinsurah (M) Ward No.-0017	Urban	7204	27-Jan-2020	11-Feb-2020
174	238	8	West Bengal	Nadia	Santipur (M) Ward No.-0021	Urban	9243	6-Feb-2020	23-Feb-2020
175	248	9	West Bengal	Puruliya	Raghunathpur (M) Ward No.-0005	Urban	1423	16-Mar-2020	13-Jan-2021
176	236	8	West Bengal	Nadia	Dafarpota	Rural	9295	13-Mar-2020	20-Jan-2021
177	239	9	West Bengal	North Twenty Four Parganas	Kalsara	Rural	2165	13-Jan-2021	21-Jan-2021
178	235	8	West Bengal	Nadia	Harekrishnapur	Rural	3295	21-Jan-2021	11-Feb-2021
179	257	9	West Bengal	Paschim Medinipur	Sharsa	Rural	757	31-Jan-2021	17-Feb-2021
180	234	8	West Bengal	Barddhaman	Raniganj (M) Ward No.-0014	Urban	3779	11-Feb-2021	20-Feb-2021
181	259	9	West Bengal	Paschim Medinipur	Goalpota	Rural	64	20-Feb-2021	3-Mar-2021
182	232	8	West Bengal	Barddhaman	Galsi	Rural	10700	5-Mar-2021	16-Mar-2021
183	247	9	West Bengal	Bankura	Bamun Pathri	Rural	431	8-Mar-2021	22-Mar-2021
184	231	8	West Bengal	Barddhaman	Shyambazar	Rural	3308	18-Mar-2021	26-Mar-2021
185	233	8	West Bengal	Barddhaman	Bara Dhamas	Rural	2228	31-Mar-2021	16-Apr-2021
186	258	9	West Bengal	Paschim Medinipur	Mahulbani	Rural	255	9-Apr-2021	16-Apr-2021
187	218	8	West Bengal	Jalpaiguri	Raichenga	Rural	12892	8-Jul-2021	25-Jul-2021
188	253	9	West Bengal	South Twenty Four Parganas	Karimnagar	Rural	5443	9-Jul-2021	26-Jul-2021
189	219	8	West Bengal	Koch Bihar	Bakla	Rural	2426	28-Jul-2021	6-Aug-2021
190	224	7	West Bengal	Murshidabad	Bansbari	Rural	3407	17-Aug-2021	30-Aug-2021

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191	229	8	West Bengal	Birbhum	Kaytha	Rural	13154	18-Aug-2021	30-Aug-2021
192	228	6	West Bengal	Murshidabad	Dhulian (M) Ward No.-0019	Urban	3072	16-Aug-2021	30-Aug-2021
193	262	9	West Bengal	Purba Medinipur	Baruttar Hingli	Rural	4840	20-Aug-2021	30-Aug-2021
194	289	10	Madhya Pradesh	Jabalpur	Khango	Rural	332	22-Nov-2019	30-Nov-2019
195	269	10	Madhya Pradesh	Damoh	Kodiya	Rural	669	17-Dec-2019	26-Dec-2019
196	290	10	Madhya Pradesh	Jabalpur	Jabalpur (M Corp.) Ward No.-0017	Urban	10922	5-Dec-2019	8-Jan-2020
197	267	10	Madhya Pradesh	Sagar	Jagrai Kalan	Rural	586	9-Jan-2020	5-Feb-2020
198	268	10	Madhya Pradesh	Sagar	Chandpur	Rural	4547	6-Feb-2020	25-Feb-2020
199	266	10	Madhya Pradesh	Panna	Hardwahi(Bhawanipur)	Rural	419	27-Feb-2020	12-Mar-2020
200	270	10	Madhya Pradesh	Satna	Telani	Rural	1043	12-Mar-2020	26-Nov-2020
201	272	10	Madhya Pradesh	Rewa	Rewa (M Corp.) Ward No.-0030	Urban	4086	27-Nov-2020	12-Dec-2020
202	271	10	Madhya Pradesh	Satna	Kubari	Rural	758	15-Dec-2020	21-Dec-2020
203	300	10	Madhya Pradesh	Singrauli	Pondi Naugai	Rural	3389	12-Jan-2021	31-Jan-2021
204	299	10	Madhya Pradesh	Anuppur	Bijuri (M) Ward No.-0007	Urban	7675	5-Feb-2021	23-Feb-2021
205	292	10	Madhya Pradesh	Dindori	Khamhariya Mya Dungariya	Rural	684	5-Mar-2021	19-Mar-2021
206	273	10	Madhya Pradesh	Umaria	Akhdar	Rural	3466	20-Mar-2021	1-Apr-2021
207	291	10	Madhya Pradesh	Narsimhapur	Narsimhapur (M) Ward No.-0009	Urban	2366	13-Apr-2021	23-Apr-2021
208	286	10	Madhya Pradesh	Betul	Balni	Rural	965	23-May-2021	4-Jun-2021
209	295	10	Madhya Pradesh	Balaghat	Tirodi (CT) Ward No.-0001	Urban	8451	7-Jun-2021	22-Jun-2021
210	276	10	Madhya Pradesh	Ujjain	Ujjain (M Corp.) Ward No.-0026	Urban	6055	20-Jul-2021	1-Aug-2021
211	293	21	Madhya Pradesh	Chhindwara	Rajola	Rural	610	28-Jul-2021	11-Aug-2021
212	275	10	Madhya Pradesh	Ujjain	Nagda (M) Ward No.-0029	Urban	1824	3-Aug-2021	12-Aug-2021
213	298	3	Madhya Pradesh	Ashoknagar	Jolan	Rural	603	5-Aug-2021	15-Aug-2021
214	274	10	Madhya Pradesh	Ujjain	Sandawda	Rural	1084	13-Aug-2021	18-Aug-2021
215	294	21	Madhya Pradesh	Chhindwara	Manakwadi	Rural	1581	12-Aug-2021	24-Aug-2021
216	357	12	Rajasthan	Jodhpur	Dugarpura	Rural	832	17-Nov-2019	2-Dec-2019
217	358	12	Rajasthan	Jalor	Bhainswara	Rural	5321	10-Dec-2019	29-Dec-2019
218	359	12	Rajasthan	Pali	Radawas	Rural	1746	13-Jan-2020	26-Jan-2020
219	356	12	Rajasthan	Nagaur	Joshiyad	Rural	1619	2-Feb-2020	12-Feb-2020
220	360	12	Rajasthan	Ajmer	Sursura	Rural	6484	26-Feb-2020	14-Oct-2020
221	364	12	Rajasthan	Bhilwara	Antali	Rural	3174	14-Oct-2020	25-Oct-2020
222	365	12	Rajasthan	Bhilwara	Bhairoo Khera	Rural	376	26-Oct-2020	4-Nov-2020
223	374	12	Rajasthan	Udaipur	Netaji Ka Bara	Rural	913	6-Nov-2020	27-Nov-2020
224	353	12	Rajasthan	Jaipur	Harkishanpura	Rural	1524	2-Dec-2020	22-Dec-2020
225	350	12	Rajasthan	Jaipur	Bhankhari	Rural	8028	23-Dec-2020	12-Jan-2021

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226	351	12	Rajasthan	Jaipur	Bobas	Rural	4582	13-Jan-2021	22-Jan-2021
227	352	12	Rajasthan	Jaipur	Dayal Nagar	Rural	1706	23-Jan-2021	7-Feb-2021
228	346	12	Rajasthan	Dhaulpur	Bagthar	Rural	4524	8-Feb-2021	17-Feb-2021
229	347	12	Rajasthan	Karauli	Gaondiyapura	Rural	1041	18-Feb-2021	24-Feb-2021
230	348	12	Rajasthan	Sawai Madhopur	Chauth Ka Barwara	Rural	14038	11-Mar-2021	23-Mar-2021
231	349	12	Rajasthan	Dausa	Gaonli	Rural	622	24-Mar-2021	29-Jun-2021
232	344	2	Rajasthan	Alwar	Alwar (M Cl) Ward No.-0013	Urban	4712	24-Jul-2021	3-Aug-2021
233	367	12	Rajasthan	Banswara	Vageri	Rural	1169	18-Jul-2021	6-Aug-2021
234	345	2	Rajasthan	Alwar	Alwar (M Cl) Ward No.-0048	Urban	5500	4-Aug-2021	15-Aug-2021
235	383	13	Gujarat	Gandhinagar	Dhamasna	Rural	4864	4-Feb-2020	24-Feb-2020
236	386	13	Gujarat	Ahmadabad	Ahmadabad (M Corp.) Ward No.-0002	Urban	53630	29-Nov-2019	2-Mar-2020
237	384	13	Gujarat	Gandhinagar	Borisana (OG) Ward No.-0011	Urban	17998	25-Feb-2020	6-Mar-2020
238	385	13	Gujarat	Gandhinagar	Halisa	Rural	4768	9-Mar-2020	20-Mar-2020
239	379	13	Gujarat	Mahesana	Bechar Alias Becharaji (Ct) Ward No.-0001	Urban	12574	6-Nov-2020	13-Nov-2020
240	378	13	Gujarat	Patan	Chanasma (M) Ward No.-0006	Urban	3028	19-Nov-2020	25-Nov-2020
241	376	13	Gujarat	Banas Kantha	Moriya	Rural	1568	26-Nov-2020	3-Dec-2020
242	377	13	Gujarat	Patan	Vayad	Rural	6235	4-Dec-2020	9-Dec-2020
243	380	13	Gujarat	Sabar Kantha	Panthal	Rural	1916	15-Dec-2020	23-Dec-2020
244	381	13	Gujarat	Sabar Kantha	Dharol	Rural	1980	24-Dec-2020	1-Jan-2021
245	382	13	Gujarat	Sabar Kantha	Bhutavad	Rural	2559	2-Jan-2021	19-Jan-2021
246	391	13	Gujarat	Anand	Sardarpura	Rural	2178	19-Jan-2021	26-Jan-2021
247	392	13	Gujarat	Anand	Anand (M) Ward No.-0001	Urban	19979	27-Jan-2021	3-Feb-2021
248	393	13	Gujarat	Mahisagar	Viraniya	Rural	3680	4-Feb-2021	11-Feb-2021
249	394	13	Gujarat	Dohad	Makwana Na Varuna	Rural	1604	16-Feb-2021	23-Feb-2021
250	396	13	Gujarat	Chhota Udaipur	Kalarani	Rural	2305	24-Feb-2021	6-Mar-2021
251	395	13	Gujarat	Vadodara	Vadodara (M Corp.) Ward No.-0004	Urban	160969	7-Mar-2021	14-Mar-2021
252	398	13	Gujarat	Bharuch	Ilav	Rural	3201	18-Mar-2021	25-Mar-2021
253	399	13	Gujarat	Bharuch	Chasvad	Rural	1431	27-Mar-2021	4-Apr-2021
254	397	13	Gujarat	Bharuch	Tham	Rural	2453	5-Apr-2021	11-Apr-2021
255	400	13	Gujarat	Navsari	Moldhara	Rural	2049	17-Apr-2021	24-Apr-2021
256	401	13	Gujarat	Navsari	Hond	Rural	2192	25-Apr-2021	3-May-2021
257	402	13	Gujarat	Valsad	Khanda	Rural	2573	5-May-2021	13-May-2021
258	390	13	Gujarat	Junagadh	Sardargadh	Rural	3819	20-May-2021	29-May-2021
259	389	13	Gujarat	Porbandar	Porbandar (M) Ward No.-0006	Urban	9933	30-May-2021	5-Jun-2021

S.No	Cluster number	Team	State	District	Name Of Cluster	Type	2011 Census Population	Date of start of cluster	Date of end of cluster
260	388	13	Gujarat	Rajkot	Targhadiya	Rural	1748	6-Jun-2021	13-Jun-2021
261	404	13	Gujarat	Surat	Surat (M Corp.) Ward No.-0043	Urban	193253	16-Jun-2021	25-Jun-2021
262	403	13	Gujarat	Surat	Kamlapor	Rural	1485	26-Jun-2021	4-Jul-2021
263	405	13	Gujarat	Tapi	Dhajamba	Rural	3146	5-Jul-2021	12-Jul-2021
264	375	13	Gujarat	Kachchh	Ratadiya	Rural	1029	19-Jul-2021	07-27-2021
265	387	13	Gujarat	Ahmadabad	Ahmadabad (M Corp.) Ward No.-0031	Urban	79409	28-Jul-2021	5-Aug-2021
266	432	14	Karnataka	Mysore	Ukkalagere	Rural	2325	14-Dec-2019	22-Dec-2019
267	433	14	Karnataka	Chamarajanagar	Thimmarajipura	Rural	1734	27-Nov-2019	16-Jan-2020
268	437	14	Karnataka	Kolar	Byrakur	Rural	2361	16-Jan-2020	6-Feb-2020
269	423	14	Karnataka	Tumkur	Tumkur (CMC) Ward No.-0019	Urban	8370	7-Feb-2020	3-Mar-2020
270	418	14	Karnataka	Shimoga	Bhimanakone	Rural	825	5-Jan-2021	13-Jan-2021
271	420	14	Karnataka	Udupi	Nalkur	Rural	4003	15-Jan-2021	23-Jan-2021
272	417	14	Karnataka	Davanagere	Kadaranahalli	Rural	553	24-Jan-2021	30-Jan-2021
273	421	14	Karnataka	Chikmagalur	Chikmagalur (CMC) Ward No.-0026	Urban	2560	6-Feb-2021	12-Feb-2021
274	415	14	Karnataka	Haveri	Araleshwar	Rural	2595	13-Feb-2021	18-Feb-2021
275	413	14	Karnataka	Dharwad	Hubli-Dharwad (M Corp.) Ward No.-0016	Urban	11358	18-Feb-2021	25-Feb-2021
276	414	14	Karnataka	Dharwad	Hubli-Dharwad (M Corp.) Ward No.-0025	Urban	22232	26-Feb-2021	4-Mar-2021
277	409	14	Karnataka	Belgaum	Kagihal	Rural	2645	14-Mar-2021	22-Mar-2021
278	408	14	Karnataka	Belgaum	Rajapur	Rural	8122	23-Mar-2021	30-Mar-2021
279	407	14	Karnataka	Belgaum	Pattankudi	Rural	8362	31-Mar-2021	6-Apr-2021
280	410	14	Karnataka	Bijapur	Bijapur (CMC) Ward No.-0006	Urban	7961	7-Apr-2021	13-Apr-2021
281	412	14	Karnataka	Bidar	Malkapur	Rural	2366	22-Apr-2021	21-Jun-2021
282	411	14	Karnataka	Bidar	Talbhog	Rural	2216	7-Jul-2021	14-Jul-2021
283	427	14	Karnataka	Bangalore	Bbmp (M Corp.) Ward No.-0146	Urban	30667	19-Jul-2021	3-Aug-2021
284	431	19	Karnataka	Bangalore	Bbmp (M Corp.) Ward No.-0185	Urban	46943	5-Aug-2021	17-Aug-2021
285	430	14	Karnataka	Bangalore	Bbmp (M Corp.) Ward No.-0171	Urban	48991	5-Aug-2021	19-Aug-2021
286	444	15	Andhra Pradesh	Visakhapatnam	Seethanagaram	Rural	4834	27-Nov-2019	27-Jan-2020
287	442	15	Andhra Pradesh	Visakhapatnam	Cheedikada	Rural	1511	28-Jan-2020	11-Feb-2020
288	446	15	Andhra Pradesh	West Godavari	Mallipudi	Rural	3045	3-Mar-2020	30-Mar-2020
289	462	15	Andhra Pradesh	Chittoor	Thippireddigaripalle	Rural	4692	30-Dec-2020	11-Jan-2021
290	456	15	Andhra Pradesh	Y.S.R.	Nidizivve	Rural	1961	16-Jan-2021	25-Jan-2021
291	454	15	Andhra Pradesh	Y.S.R.	Nallaballe	Rural	1066	27-Jan-2021	6-Feb-2021
292	457	15	Andhra Pradesh	Y.S.R.	Lebaka	Rural	3927	9-Feb-2021	15-Feb-2021

S.No	Cluster number	Team	State	District	Name Of Cluster	Type	2011 Census Population	Date of start of cluster	Date of end of cluster
293	445	15	Andhra Pradesh	East Godavari	Gokavaram	Rural	16389	12-Feb-2020	5-Mar-2021
294	455	15	Andhra Pradesh	Y.S.R.	Erraballe	Rural	8821	26-Feb-2021	8-Mar-2021
295	460	15	Andhra Pradesh	Anantapur	Madakasira	Rural	21464	11-Mar-2021	21-Mar-2021
296	461	15	Andhra Pradesh	Anantapur	Hindupur (M) Ward No.-0025	Urban	3775	27-Mar-2021	4-Apr-2021
297	453	15	Andhra Pradesh	Sri Potti Sriramulu Nellore	Thiruveedhipadu	Rural	544	6-Apr-2021	16-Apr-2021
298	458	17	Andhra Pradesh	Kurnool	Jampapuram	Rural	3119	15-Apr-2021	23-Apr-2021
299	452	15	Andhra Pradesh	Prakasam	Nekunampuram @ Pokur	Rural	7870	25-Apr-2021	5-May-2021
300	451	17	Andhra Pradesh	Prakasam	Tangutur	Rural	27652	5-May-2021	18-May-2021
301	448	17	Andhra Pradesh	Guntur	Merikapudi	Rural	4861	4-Jul-2021	11-Jul-2021
302	450	15	Andhra Pradesh	Prakasam	Chimakurthi	Rural	30279	8-Jul-2021	17-Jul-2021
303	449	17	Andhra Pradesh	Guntur	Chiluvuru	Rural	7952	12-Jul-2021	20-Jul-2021
304	447	17	Andhra Pradesh	Krishna	Gosaveedu	Rural	2914	21-Jul-2021	1-Aug-2021
305	438	15	Andhra Pradesh	Srikakulam	Kondavada	Rural	268	24-Jul-2021	2-Aug-2021
306	439	15	Andhra Pradesh	Srikakulam	Sambara	Rural	4134	4-Aug-2021	14-Aug-2021
307	459	17	Andhra Pradesh	Kurnool	Masapeta	Rural	2855	12-Aug-2021	19-Aug-2021
308	441	15	Andhra Pradesh	Srikakulam	Srungavarapukota	Rural	28304	24-Aug-2021	2-Sep-2021
309	500	17	Telangana	Warangal	Kampalle	Rural	3974	5-Dec-2019	18-Dec-2019
310	475	16	Odisha	Khordha	Olasingha	Rural	1872	17-Dec-2019	28-Dec-2019
311	473	16	Odisha	Dhenkanal	Atinda	Rural	1056	9-Jan-2020	2-Feb-2020
312	476	16	Odisha	Puri	Olandi	Rural	449	3-Feb-2020	14-Feb-2020
313	470	16	Odisha	Kendrapara	Biranilakanthapur	Rural	673	15-Feb-2020	28-Feb-2020
314	471	16	Odisha	Kendrapara	Golarahat	Rural	659	28-Feb-2020	6-Mar-2020
315	474	16	Odisha	Anugul	Tikarapada	Rural	751	11-Mar-2020	18-Mar-2020
316	481	16	Odisha	Baudh	Chhatrang	Rural	774	16-Nov-2020	23-Nov-2020
317	480	16	Odisha	Kandhamal	Kalingabadi	Rural	277	24-Nov-2020	3-Dec-2020
318	479	16	Odisha	Kandhamal	Rupagan	Rural	885	15-Dec-2020	22-Dec-2020
319	463	16	Odisha	Sundargarh	Tumulia	Rural	3311	24-Dec-2020	4-Jan-2021
320	472	16	Odisha	Cuttack	Cuttack (M Corp.) Ward No.-0037	Urban	9508	22-Feb-2021	7-Mar-2021
321	478	16	Odisha	Ganjam	Rajapur	Rural	18	22-Mar-2021	30-Mar-2021
322	477	16	Odisha	Ganjam	Patisonapur	Rural	3440	4-Apr-2021	14-Apr-2021
323	482	16	Odisha	Nabarangapur	Boriguda	Rural	979	19-Mar-2021	7-Jul-2021
324	483	16	Odisha	Koraput	Bari	Rural	631	9-Jul-2021	22-Jul-2021
325	467	16	Odisha	Bhadrak	Uttarbad	Rural	2423	29-Jul-2021	9-Aug-2021
326	465	16	Odisha	Mayurbhanj	Mituani	Rural	2435	18-Aug-2021	30-Aug-2021
327	498	17	Telangana	Warangal	Samudrala	Rural	3315	20-Jan-2020	1-Feb-2020

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328	517	18	Jharkhand	Ranchi	Karge	Rural	4665	27-Nov-2019	6-Feb-2020
329	499	17	Telangana	Warangal	Ghanpur (Station) (Ct) Ward No.-0001	Urban	12721	1-Feb-2020	11-Feb-2020
330	515	18	Jharkhand	Ranchi	Churi (CT) Ward No.-0001	Urban	24876	7-Feb-2020	21-Feb-2020
331	496	17	Telangana	Nalgonda	Nalgonda (M) Ward No.-0001	Urban	4425	20-Feb-2020	3-Mar-2020
332	514	18	Jharkhand	Hazaribagh	Hazaribag (Nagar Parishad) Ward No.-0018	Urban	4673	22-Feb-2020	6-Mar-2020
333	495	17	Telangana	Nalgonda	Chityala (CT) Ward No.-0001	Urban	13752	3-Mar-2020	13-Mar-2020
334	497	17	Telangana	Nalgonda	Jangam	Rural	5663	10-Nov-2020	19-Nov-2020
335	490	17	Telangana	Medak	Masaipet	Rural	6146	21-Nov-2020	27-Nov-2020
336	516	18	Jharkhand	Ranchi	Ranchi (M Corp.) Ward No.-0043	Urban	21354	12-Mar-2020	30-Nov-2020
337	488	17	Telangana	Medak	Chepial	Rural	4373	28-Nov-2020	4-Dec-2020
338	507	18	Jharkhand	Bokaro	Patki	Rural	2136	1-Dec-2020	13-Dec-2020
339	489	17	Telangana	Medak	Mogdampalle	Rural	10948	11-Dec-2020	18-Dec-2020
340	494	17	Telangana	Rangareddy	Chigralpalle	Rural	1457	19-Dec-2020	2-Jan-2021
341	493	17	Telangana	Rangareddy	Ghmc (M Corp.) Ward No.-0126	Urban	56774	2-Jan-2021	9-Jan-2021
342	508	18	Jharkhand	Purbi Singhbhum	Jamshedpur (NAC) Ward No.-0067	Urban	1152	8-Jan-2021	19-Jan-2021
343	492	17	Telangana	Hyderabad	Ghmc (M Corp.) (Part) Ward No.-0071	Urban	49565	20-Jan-2021	28-Jan-2021
344	486	17	Telangana	Nizamabad	Bodhan (M) WARD NO.-0016	Urban	2308	29-Jan-2021	8-Feb-2021
345	518	18	Jharkhand	Gumla	Bharno	Rural	8680	27-Jan-2021	8-Feb-2021
346	485	17	Telangana	Nizamabad	Changal	Rural	3756	9-Feb-2021	16-Feb-2021
347	506	18	Jharkhand	Dhanbad	Dhanbad (M Corp.) Ward No.-0012	Urban	19535	10-Feb-2021	21-Feb-2021
348	484	17	Telangana	Adilabad	Kagaznagar (M) Ward No.-0001	Urban	27421	17-Feb-2021	26-Feb-2021
349	502	18	Jharkhand	Giridih	Mandardih	Rural	1175	21-Feb-2021	2-Mar-2021
350	501	17	Telangana	Khammam	Bhuvanapalle	Rural	2980	27-Feb-2021	6-Mar-2021
351	503	18	Jharkhand	Deoghar	Gariya	Rural	1489	4-Mar-2021	12-Mar-2021
352	491	17	Telangana	Hyderabad	Ghmc (M Corp.) (Part) Ward No.-0102	Urban	42054	13-Mar-2021	22-Mar-2021
353	504	18	Jharkhand	Godda	Kita Gorgawan	Rural	598	14-Mar-2021	22-Mar-2021
354	487	17	Telangana	Nizamabad	Bodhan (M) Ward No.-0031	Urban	1667	26-Mar-2021	2-Apr-2021
355	513	18	Jharkhand	Palamu	Medininagar (Daltonganj) Ward No.-0023	Urban	2172	13-Apr-2021	22-Apr-2021
356	511	18	Jharkhand	Palamu	Patan	Rural	787	11-Jun-2021	23-Jun-2021
357	512	18	Jharkhand	Palamu	Kajarma	Rural	1084	24-Jun-2021	1-Jul-2021
358	509	18	Jharkhand	Palamu	Kumbhi Khurd	Rural	2160	7-Jul-2021	20-Jul-2021
359	510	18	Jharkhand	Palamu	Tukbera	Rural	3500	21-Jul-2021	29-Jul-2021
360	505	18	Jharkhand	Sahibganj	Banapara	Rural	101	31-Jul-2021	12-Aug-2021

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361	531	19	Kerala	Idukki	Thankamony	Rural	24389	7-Nov-2019	18-Nov-2019
362	533	19	Kerala	Kottayam	Kondoor	Rural	20510	25-Nov-2019	4-Dec-2019
363	532	19	Kerala	Kottayam	Teekoy	Rural	9418	14-Dec-2019	13-Jan-2020
364	534	19	Kerala	Pathanamthitta	Kadapra	Rural	23502	19-Jan-2020	29-Jan-2020
365	535	19	Kerala	Pathanamthitta	Kunnamthanam	Rural	20573	1-Feb-2020	16-Feb-2020
366	528	19	Kerala	Ernakulam	Kuzhuppilly	Rural	23858	22-Feb-2020	9-Mar-2020
367	529	19	Kerala	Ernakulam	Kochi (M Corp.) Ward No.-0022	Urban	14723	19-Oct-2020	4-Nov-2020
368	530	19	Kerala	Ernakulam	Kochi (M Corp.) Ward No.-0066	Urban	5970	5-Nov-2020	25-Nov-2020
369	527	19	Kerala	Palakkad	Kottoppadam-I	Rural	14085	2-Dec-2020	3-Jan-2021
370	526	19	Kerala	Malappuram	Parappanangadi	Rural	35243	3-Jan-2021	19-Jan-2021
371	525	19	Kerala	Malappuram	Nediyiruppu	Rural	30462	19-Jan-2021	12-Feb-2021
372	520	19	Kerala	Wayanad	Pozhuthana	Rural	6406	13-Feb-2021	27-Feb-2021
373	522	19	Kerala	Kozhikode	Puthuppadi	Rural	25965	3-Mar-2021	15-Mar-2021
374	523	19	Kerala	Kozhikode	Madavoor	Rural	28672	17-Mar-2021	25-Mar-2021
375	524	19	Kerala	Kozhikode	Cheruvannur (CT) Ward No.-0001	Urban	61614	27-Mar-2021	3-Apr-2021
376	521	19	Kerala	Kozhikode	Villiappally (CT) Ward No.-0001	Urban	34502	7-Apr-2021	23-Apr-2021
377	519	19	Kerala	Kannur	Chirakkal (CT) Ward No.-0001	Urban	45601	25-Apr-2021	4-May-2021
378	547	20	Punjab	Fatehgarh Sahib	Gobindgarh (M Cl) Ward No.-0016	Urban	6062	10-Dec-2019	12-Jan-2020
379	539	20	Punjab	Ludhiana	Sasrali (62)	Rural	2636	13-Jan-2020	4-Feb-2020
380	540	20	Punjab	Ludhiana	Ludhiana (M Corp.) Ward No.-0023	Urban	12541	5-Feb-2020	20-Feb-2020
381	545	20	Punjab	Kapurthala	Phagwara (M Cl) Ward No.-0002	Urban	3681	25-Feb-2020	8-Mar-2020
382	546	20	Punjab	Hoshiarpur	Kandhala Jattan (31)	Rural	3249	12-Mar-2020	9-Oct-2020
383	536	20	Punjab	Gurdaspur	Dhidowal (86)	Rural	415	9-Oct-2020	25-Oct-2020
384	538	20	Punjab	Gurdaspur	Dhariwal (M Cl) Ward No.-0010	Urban	1050	26-Oct-2020	11-Nov-2020
385	537	20	Punjab	Gurdaspur	Bal (404)	Rural	2230	16-Nov-2020	28-Nov-2020
386	542	20	Punjab	Moga	Badhni Kalan (101)	Rural	4843	19-Jan-2021	28-Jan-2021
387	548	20	Punjab	Moga	Bhaikha (76)	Rural	1427	29-Jan-2021	7-Feb-2021
388	544	20	Punjab	Amritsar	Wazir Bhullar (10)	Rural	4324	10-Feb-2021	19-Feb-2021
389	549	20	Punjab	Mansa	Bahadarpur (168)	Rural	6146	25-Feb-2021	8-Mar-2021
390	550	20	Chandigarh	Chandigarh	Kaimbwala	Rural	6050	9-Apr-2021	24-Apr-2021
391	541	20	Punjab	Ludhiana	Ludhiana (M Corp.) Ward No.-0059	Urban	29961	10-Mar-2021	27-Mar-2021
392	543	20	Punjab	Bathinda	Fatehgarh Nouabad (33)	Rural	1748	3-May-2021	27-May-2021
393	564	20	Haryana	Ambala	Kathe Majra (81)	Rural	1072	27-May-2021	6-Jul-2021
394	565	20	Haryana	Ambala	Ambala (M Cl) Ward No.-0005	Urban	5284	7-Jul-2021	21-Jul-2021
395	575	20	Haryana	Gurgaon	Gurgaon (M Corp.) Ward No.-0019	Urban	22265	18-Jul-2021	1-Aug-2021

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396	566	20	Haryana	Yamunanagar	Yamunanagar (M Cl) Ward No.-0018	Urban	12951	23-Jul-2021	4-Aug-2021
397	573	20	Haryana	Jhajjar	Lagarpur(74)	Rural	1188	3-Aug-2021	17-Aug-2021
398	570	20	Haryana	Hisar	Puthi Saman (60)	Rural	7923	6-Aug-2021	20-Aug-2021
399	568	20	Haryana	Panipat	Panipat (M Cl) Ward No.-0031	Urban	4832	24-Aug-2021	2-Sep-2021
400	558	21	Chhatisgarh	Raipur	Kesli(Shikari)	Rural	1763	8-Dec-2019	18-Dec-2019
401	560	21	Chhatisgarh	Raipur	Mudpar	Rural	1089	16-Jan-2020	26-Jan-2020
402	561	21	Chhatisgarh	Raipur	Mandhar	Rural	7735	4-Feb-2020	17-Feb-2020
403	559	21	Chhatisgarh	Raipur	Nawapara	Rural	273	18-Feb-2020	27-Feb-2020
404	563	21	Chhatisgarh	Dhamtari	Thuha	Rural	1645	28-Feb-2020	6-Mar-2020
405	553	21	Chhatisgarh	Raigarh	Munda Gaon	Rural	3112	12-Mar-2020	21-Mar-2020
406	556	21	Chhatisgarh	Durg	Bemetara (M) Ward No.-0016	Urban	1290	2-Nov-2020	21-Nov-2020
407	554	21	Chhatisgarh	Bilaspur	Chuktipani	Rural	1641	21-Nov-2020	11-Dec-2020
408	552	21	Chhatisgarh	Surguja	Pahiya	Rural	1119	11-Dec-2020	4-Jan-2021
409	551	21	Chhatisgarh	Koriya	Kewrabahra	Rural	188	5-Jan-2021	16-Jan-2021
410	562	21	Chhatisgarh	Raipur	Raipur (M Corp.) Ward No.-0038	Urban	13794	16-Jan-2021	8-Feb-2021
411	557	21	Chhatisgarh	Durg	Bhilai Nagar (M Corp.) Ward No.-0011	Urban	7950	9-Feb-2021	28-Feb-2021
412	555	21	Chhatisgarh	Kabeerdham	Jamuniya	Rural	1379	3-Mar-2021	13-Mar-2021
413	599	22	Himachal Pradesh	Kangra	Mahankal (1020)	Rural	513	8-Dec-2019	8-Jan-2020
414	600	22	Himachal Pradesh	Shimla	Pagog (323)	Rural	1355	9-Jan-2020	30-Jan-2020
415	596	22	Uttarakhand	Hardwar	Salempur Mahdood	Rural	21645	5-Feb-2020	25-Feb-2020
416	597	22	Uttarakhand	Hardwar	Bhagtanpur Abidpur Urf Ibrahim	Rural	20306	29-Feb-2020	14-Oct-2020
417	594	22	Uttarakhand	Pithoragarh	Pithoragarh (NPP) Ward No.-0005	Urban	3435	31-Oct-2020	23-Feb-2021
418	593	22	Uttarakhand	Rudraprayag	Tyunkhar	Rural	1656	24-Feb-2021	14-Mar-2021
419	595	22	Uttarakhand	Hardwar	Landhaura (NP) Ward No.-0009	Urban	2523	15-Mar-2021	27-Mar-2021
420	589	22	Jammu & Kashmir	Anantnag	Reni Pora	Rural	3509	4-May-2021	21-May-2021
421	588	22	Jammu & Kashmir	Anantnag	Sir Hama	Rural	5960	22-May-2021	6-Jun-2021
422	590	22	Jammu & Kashmir	Jammu	Ghomanhasan (MC) Ward No.-0002	Urban	484	28-Jul-2021	19-Aug-2021
423	605	23	Assam	Nagaon	Rupahi Town (Ct) Ward No.-0001	Urban	8052	15-Feb-2020	28-Feb-2020
424	617	23	Assam	Darrang	Mangaldoi (MB) Ward No.-0003	Urban	1973	12-Mar-2020	20-Mar-2020
425	609	23	Assam	Sivasagar	Salaguri	Rural	2764	27-Nov-2019	2-Apr-2020
426	606	23	Assam	Sonitpur	Garakhia Pukhuri	Rural	971	29-Feb-2020	3-Nov-2020
427	608	23	Assam	Sonitpur	Barkatia Bari	Rural	2260	28-Nov-2020	12-Dec-2020
428	607	23	Assam	Sonitpur	No.3 Siruani	Rural	2293	13-Dec-2020	19-Dec-2020
429	610	23	Assam	Sivasagar	Ranga Pothar	Rural	5406	9-Jan-2021	23-Jan-2021
430	611	23	Assam	Karbi Anglong	Thare Teron	Rural	136	24-Jan-2021	30-Jan-2021

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431	615	23	Assam	Nalbari	Bagurihati	Rural	2954	31-Jan-2021	7-Feb-2021
432	603	23	Assam	Dhubri	Pachim Ratiadaha Pt.Iii	Rural	2179	8-Feb-2021	13-Feb-2021
433	602	23	Assam	Dhubri	Kaimari Pt.Vi	Rural	1491	13-Feb-2021	20-Feb-2021
434	614	23	Assam	Kamrup	Saniadi	Rural	10894	21-Feb-2021	1-Mar-2021
435	612	23	Assam	Cachar	Doyapore Pt Iii	Rural	790	3-Mar-2021	11-Mar-2021
436	613	23	Assam	Hailakandi	Abdullapur Pt I	Rural	1010	12-Mar-2021	19-Mar-2021
437	616	23	Assam	Nalbari	Bhanganmari	Rural	15252	21-Mar-2021	29-Mar-2021
438	604	23	Assam	Barpeta	Kholabandha N.C.	Rural	12968	31-Mar-2021	4-May-2021
439	620	23	Manipur	Thoubal	Tentha	Rural	9087	18-Apr-2021	11-Jul-2021
440	601	23	Arunachal Pradesh	Changlang	Gautompur Bl.I - Iii	Rural	2426	12-Jul-2021	1-Aug-2021
441	622	23	Nagaland	Mon	Longching Village	Rural	4024	3-Aug-2021	12-Aug-2021
442	618	23	Meghalaya	West Garo Hills	Upper Mibonpara	Rural	699	16-Aug-2021	24-Aug-2021
443	619	23	Meghalaya	South Garo Hills	Goka Wakchol	Rural	214	28-Aug-2021	10-Sep-2021

9.2 TB Prevalence by models

	P	N	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
India	981	3,22,480	304 (285 - 324)	305 (279 - 333)	304 (280 - 331)	306 (278 - 337)	306 (279 - 335)	316 (290 - 342)
Gender								
Female	276	1,80,374	153 (136 - 172)	153 (132 - 177)	151 (131 - 174)	148 (126 - 174)	146 (125 - 171)	154 (131 - 177)
Male	705	1,42,106	496 (460 - 534)	499 (452 - 550)	491 (448 - 539)	506 (455 - 563)	498 (450 - 552)	472 (429 - 514)
Age								
15 to 34	260	1,28,668	202 (178 - 228)	202 (176 - 233)	200 (175 - 229)	198 (168 - 234)	196 (167 - 230)	220 (190 - 250)
35 to 54	298	1,16,613	256 (227 - 286)	256 (224 - 292)	262 (231 - 297)	260 (223 - 302)	266 (230 - 307)	296 (258 - 335)

	P	N	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
≥55	423	77,199	548 (497 - 603)	551 (486 - 625)	553 (489 - 625)	565 (496 - 644)	567 (498 - 645)	588 (516 - 660)
State Group								
AP	49	16,151	303 (225 - 401)	304 (198 - 467)	303 (202 - 456)	304 (194 - 479)	303 (196 - 468)	265 (138 - 392)
BR	77	23,339	330 (260 - 412)	331 (250 - 439)	324 (246 - 427)	331 (247 - 444)	324 (243 - 432)	327 (236 - 417)
CG	45	10,075	447 (326 - 597)	449 (301 - 670)	440 (296 - 654)	449 (287 - 700)	440 (281 - 689)	454 (285 - 624)
DL	35	6,831	512 (357 - 712)	515 (382 - 694)	488 (363 - 658)	515 (363 - 731)	488 (338 - 706)	534 (365 - 704)
GJ, DN,DD	31	22,750	136 (93 - 193)	136 (88 - 212)	149 (99 - 225)	136 (86 - 216)	149 (97 - 230)	141 (78 - 203)
HP, UK,JK	22	7,182	306 (192 - 463)	307 (180 - 525)	297 (178 - 496)	307 (166 - 570)	297 (160 - 550)	344 (154 - 534)
HR	19	4,515	421 (254 - 656)	423 (315 - 566)	398 (291 - 545)	423 (293 - 609)	398 (256 - 620)	465 (326 - 605)
JH	44	12,569	350 (254 - 470)	351 (231 - 534)	345 (230 - 518)	351 (224 - 552)	345 (221 - 538)	352 (201 - 503)
KA	40	15,518	258 (184 - 351)	258 (171 - 390)	258 (173 - 385)	258 (167 - 401)	258 (168 - 397)	276 (180 - 372)
KL,LD	15	11,628	129 (72 - 213)	129 (71 - 235)	162 (93 - 285)	129 (68 - 246)	162 (86 - 307)	115 (47 - 184)
MH,GA	50	30,628	163 (121 - 215)	164 (118 - 227)	190 (144 - 250)	164 (117 - 229)	190 (143 - 253)	161 (105 - 218)
MP	66	17,143	385 (298 - 490)	386 (233 - 642)	381 (231 - 628)	386 (225 - 663)	381 (223 - 650)	386 (199 - 573)
NE	45	15,975	282 (206 - 377)	282 (167 - 478)	283 (171 - 468)	282 (161 - 494)	283 (165 - 486)	276 (123 - 429)
OD	31	12,216	254 (172 - 360)	254 (169 - 383)	263 (177 - 393)	254 (163 - 396)	263 (170 - 409)	243 (141 - 345)

	P	N	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
PB,CH	28	10,134	276 (184 - 399)	277 (203 - 379)	281 (205 - 384)	277 (197 - 390)	281 (197 - 400)	283 (197 - 368)
RJ	69	14,432	478 (372 - 605)	480 (378 - 611)	468 (371 - 590)	480 (371 - 621)	468 (364 - 602)	484 (361 - 607)
TN, PY,AN	67	22,956	292 (226 - 371)	293 (239 - 359)	294 (240 - 362)	293 (237 - 362)	294 (237 - 365)	301 (241 - 360)
TS	36	13,567	265 (186 - 367)	266 (195 - 362)	268 (196 - 366)	266 (191 - 371)	268 (191 - 377)	287 (199 - 376)
UP	182	37,990	479 (412 - 554)	481 (399 - 580)	467 (390 - 560)	481 (398 - 583)	467 (388 - 562)	481 (397 - 566)
WB	30	16,881	178 (120 - 254)	178 (104 - 304)	186 (112 - 309)	178 (101 - 314)	186 (108 - 320)	167 (82 - 252)
Model - 1, Crude prevalence and their Confidence Interval is calculated with exact binomial probability theory								
Model - 2, Robust standard errors								
Model - 3, Random-effects logistic regression								
Model - 4, Robust standard errors with imputation								
Model - 5, Random-effects logistic regression with imputation								
Model - 6, Robust standard errors with imputation and inverse probability weighting								
P – Diagnosed as Tuberculosis Positives								

9.3 Quality indicators of TB survey

Quality Indicators	NATBPS	Benchmark
Eligible out of enumerated	73%	72-76 %
Interviewed out of eligible	91%	80-90 %
Symptomatic out of interviewed	4.3%	6-7 %
Past H/O ATT	2%	2-3 %
Currently on ATT	0.2%	0.2 – 0.3 %
Eligible participants undergoing X-ray	97%	95 – 97 %
Participants eligible for sputum based on X-ray result	10%	8-12 %
Participants eligible for sputum based on symptom screening	7%	7-8 %
Eligible for sputum based on X-ray and symptom screening	14%	10-12 %
Benchmark is based on previous surveys in India in the last 20 years.		

9.4 Equipment and consumable

The technical specification of some the important equipment used in the survey is given below.

S.No	Item	Technical specification
1	Mobile Survey bus	• 25 new Mobile x-ray buses (23 teams and 2 spare bus). • The bus chases from Ashok Leyland Limited. • Fabricated by Jesai Healthcare India Private Limited with aerodynamic windows with toughened glass, sheet metal anti-corrosive body, marine ply 12mm thick with 2mm anti skid high resistant vinyl flooring • Body dimensions: Internal width 2200 - 2400 mm, Internal length 5000 -7000 mm, Internal height 2000 – 2400 mm • 1st cabin : Driver cum network system cabin - provided space for the driver, a supporting staff and the Firewall/Router MX-65 from Cisco Meraki Systems. • 2nd cabin : X-ray cabin - 4 sided lead shielding, with a fixed chest stand which is suitable for Flat panel Detectors and Computed Radiography cassettes. It was fabricated with the Pro-rad atlas mobile x-ray units which are Atomic Energy Radiation Board [AERB] approved for safety and quality assurance. It was also fitted with a roof mounted AC and air vent. • 3rd Cabin : provided space for CBNAAT testing facility, refrigerator, washbasin, and storage space for the consumables. It was also fitted with a roof mounted AC and air vent. • The entrance and exit of the survey bus was ergonomically designed with detachable steps to facilitate movement of participants. • 3 phase electric wiring with plugs / sockets as well as alternator for generator • Water tanks with electronic functional hydraulic pumps for storage of water. • 1 spare tyre, 1 standard Toolkit. • Original documents of Registration certificate, PUC, road tax payment receipt, etc.
2	X-ray machine	• 6kW Digital radiography system of each mobile van contains high frequency X-Ray Generator, CR Reader, and DR Flat panel. The real time image is displayed and transferred to central sever via internet. • The High frequency X-ray generator is having a kV range of 40kV to 120kV & mA range of 50 mA to 150 mA and the electronic timer for radiographic exposures is of 0.01s to 2.4s. • The X-ray tube has rotating anode which spins around 2800rpm with focal spot size of 0.6mm and 1.3mm. The thermal capacity of anode is 107kHU.

		• LED warning signal light, placed outside the X-ray room flashes during exposure to indicate radiation exposure. • Image display laptop. • Thermoluminescence Dosimeter (TLD) is provided to the X-ray Technicians for radiation dose monitoring.
3	Generator and power supply	• 15 KVa diesel generator is provided for electric power supply. • The survey bus is also fitted with 3 UPS for seamless power supply : ○ 2KVA Emerson UPS - supplying lab cabinet ○ 2KVA EATON UPS - supplying network cabinet ○ 3KVA BPL UPS - CR reader and system
4	IT equipment	**Field data collection:** • 15 Android tablets with UI for Enumeration with connectivity to local server only using local wi-fi. • Android tablets with UI for participant interview with connectivity to local server only using local wi-fi. • 4 DELL Latitude 7480 and 7290 laptop with ○ 6th Gen Intel Core i7-6600U Processor ○ 14"Non-Touch LCD with camera/mic ○ 512GB SATA HDD ○ 16GB DDR4 RAM ○ Windows 2010 Prof 64-bit • The 4 laptops are used for : ○ lab sample collection and results entry ○ Radiologist with UI for receiving and viewing Chest x rays from DR panel and uploading the images to website. ○ Medical officer to report the X-rays. ○ DEO for data entry and correction. • 2D barcode scanners **Van Data Centre:** • DELL Precision 7520 rugged laptop ○ Intel Core Xeon E3-1575M v5 Quad Core Xeon, ○ 32GB DDR4 2667MHz RAM ○ 15.6" FHD TN (1920x1080) Anti-Glare LED-backlit, Non-Touch LCD with Camera/Mic ○ 2x512GB, Solid State Drive (SSD) 6Gb/s • 1 wi-fi router for each vehicle – Cisco MX65 • 2 wi-fi access point - Cisco MR42 • 3 USB data cards • EXTERNAL HDD FOR X-RAY BACKUP • Biometric attendance device-1 **Central Data Centre:** • Dell R740 Server • PowerEdge R740/R740XD Motherboard • Intel Xenon Silver 41102 IG, 8C/16T, 9.6GT/s 11M Cache Turbo, HT(85W) ddr2-2400

		- iDRAC Group Manager, Enabled, Factory Generated password - Chassis with up to 8 X2.5" SAS/SATA Hard Drives fro 1/2CPU configuration - PowerEdge 2U Standard Bezel Riser Config 4X8 slots PowerEdge R740 Shipping(ICC) and Material 16GB RDIMM, 2400 MT/s, Dual Rank, x4 Data Width - 6Qty - Chassis 8 Bay 2.5" Hard Drive; 300GB 15K RPM SAS 12Gbps 2.5in Hot-plug Hard Drive - 4 Qty 32GB ROMM , 2666T/s Dual Rank 16GB SD Card For IDSDM - 2 Qty - QLogic 2562, Quad Port 8Gb Optical Fibre Channel HBA - 1 Qty 16X DVD-ROM Drive SATA - 1Qty - PERC H730 Integrated RAID Controller, 2GB Cache - Hard Drive 05 Nos. - Dual, Hot-plug, Redundant Power Supply (1+1), 1100W - QLogic 57800 2x10Gb BT + 2x1Gb BT Network - QLogic 57800 2x10Gb BT + 2x1Gb BT Network Daughter Card - Dell EMC NX3240 Storage -1 - PowerEdge R740/R740XD Motherboard - Intel Xenon Silver 41102 IG, 8C/16T, 9.6GT/s 14M Cache Turbo, HT(85W) ddr2-2400 - SWITCH Dell Networking N4032F 24 10GbE SFP+ auto-sensing (10Gb/1Gb) fixed ports - Up to 32 10GbE ports using breakout cables and optional QSFP+ module - One hot swap expansion module bay - Dual hot-swappable redundant power supplies (460W) - SECURITY GATEWAY – CISCO MX400
5	Lab consumables	- Disposable gloves - Surgical masks - Bio medical waste disposal bags - Alcohol based hand Sanitisers - Tourniquet - Alcohol swab - Sterile lancet - Hemoglobinometer with strips - Glucometer with strips - Cotton rolls - Needle destroyer - Cotton balls/swabs

		• Container for sharps disposal
		• 1% Hypochlorite Solution
6	Sputum sample collection and Transportation	• Disposable Falcon tubes - • Thermocol boxes with conditioned icepacks for transporting the sputum sample in cold chain.
7	CBNAAT processing	• GeneXpert Dx System equipped with appropriate software: 4 module GeneXpert instrument, laptop, barcode reader, printer and Operator Manual • Xpert *M. tb* /RIF kit (containing GX IV Cartridge, buffer and sterile transfer pipette)
8	IGRA testing	• Appropriate size sterile disposable needles • 4 QFT-Plus tubes (nil, tb 1, tb 2, mitogen). • Incubator. • Centrifuge machine.
9	Accessories	• Sphygmomanometer • Stadiometer • Weighing scale • First Aid box • Canopy tents • Foldable tables • Chairs • Waste bins • First aid kit

9.5 Participant information sheets and Consent forms

9.5.1 Participant information sheet for adults

National survey for state-wise prevalence of microbiologically confirmed pulmonary tuberculosis in India

National Institute for Research in Tuberculosis

<u>Participant Information Sheet for Adults</u>

Dear Participant,

You are invited to be part of a research study conducted by Indian Council of Medical Research-National Institute for Research in Tuberculosis (ICMR-NIRT), Chennai in collaboration with the Central TB Division (CTD), Ministry of Health and Family Welfare, Government of India and World Health Organization, India (WHO, India).

Please find below the relevant information regarding the study for you to make a voluntary decision regarding your participation in the study. You are requested to ask any questions regarding the study for necessary clarifications.

Information about the Research study:

The purpose of the study is to assess the burden of Pulmonary Tuberculosis disease and TB infection in India at country level and selected State / State groups level. Among chest symptomatic and TB patients we would also be assessing the health care seeking behavior and cost incurred on TB diagnosis and treatment in the surveyed communities.

Study Procedures:

If you are willing to take part in this research study, you will have to undergo the following investigations;

- You will be screened for symptoms of TB
- You will be subjected to take a Chest X-Ray [If you are pregnant you would not undergo Xray investigation]
- If you have chest symptoms or any abnormalities in the chest X-Ray, you would be requested to give two sputum's specimens
- First sputum's samples will be tested for TB in the survey van itself.
- Second sputum sample will be sent to the nearest reference laboratory for smear microscopy, liquid culture and Susceptibility test to TB drugs if culture is positive.
- Third sputum sample will be collected and transported to the nearest IRL for performing repeat CBNAAT, Smear Microscopy, liquid culture and DST, if the first sputum sample is CBNAAT positive.
- An additional sputum sample will be collected and a repeat CBNAAT will be performed in the survey van if the CBNAAT results of the first sputum sample is INVALID/ERROR/NO RESULT.
- All diagnosed TB patients will be linked with RNTCP and will be treated as per programmed policy. In case if you are a chest symptomatic or diagnose with TB in past we will be asking you the places you visited to get your diagnosis, treatment, the duration of treatment and the amount of money spent by you on TB treatment.

- About 5 ml (1 teaspoon) of blood will be drawn for doing hemoglobin, blood glucose and a blood test to detect the presence of TB infection

Specimen storage

Some of your blood, sputum specimens that are left over after all required study testing is done may be stored for a period of 5 years and will be used for TB-related research. These samples will be stored with protection of your identity. The stored specimen will be used for future studies, if needed, after obtaining proper approval from the scientific/ethics committee.

Benefits of the study

Benefits to study participants: If you are participating in this study, you will get benefitted by getting screened for TB and can be diagnosed early and treated appropriately free of cost. The result of the tests which you undergo will be communicated by the RNTCP staff.

Benefits to the community: This study will provide information on the burden of TB infection, disease and risk factors for TB disease at the country and state/state group level. It will also help the Government in understanding the health care seeking behavior and the cost incurred for the diagnosis and treatment of TB to the general population. The above information will help the TB Control Program in framing newer strategies and interventions for ending the TB disease in India.

Risks involved

Minimal Risk: Drawing of blood for investigations may cause transient pain. All blood draws will be done by trained staff to minimize discomfort. If you have any issues you can approach the Medical Officer at the survey site for help.

Payment for study participants

Refreshments will be offered to all individuals participating in the survey.

Voluntary participation and withdrawal

Taking part in this study is voluntary. You may withdraw from the study without having to provide a reason. Your routine medical management will continue even if you decide not to take part in this study or withdraw from the study.

Privacy and confidentiality

You will be assigned a unique identification number (ID) to be used on study forms, in the study database, and on study specimens. None of the study forms, study database, or study specimens will contain your/ name or other information that could be used to identify you. The document linking your IDs to your name and medical record numbers will be kept in a locked office, will not be accessible to personnel not associated with the study. Your identity will remain confidential, except as required by law. Data from the study will be stored under lock and key in a secure area. Data derived from the study will be coded, with only the Principal Investigator or his/her designated research colleagues having access to the code. Any scientific presentation or publication will not reveal your identity individually. You may choose to deny providing any information which you may feel uncomfortable to share during your participation in the study.

Contact persons

If you have any questions regarding this study, you can contact Dr Sriram Selvaraju (Ph No: 044-28369723), National Institute for Research in TB, Chetpet, Chennai (Phone No: 044 - 2836 9500). For any issues related to violation of your rights as human research participant you can contact, Secretary, NIRT IEC at 044-28369567.If you are willing for participation in this study, please sign the Informed Consent Form stating your willingness.

National survey for state-wise prevalence of microbiologically confirmed pulmonary tuberculosis in India

National Institute for Research in Tuberculosis
Consent Form for Adult Participants
(If contacts are unable to read, form will be read out before obtaining consent)

Name: **Age/Sex:**   **Study ID:**

I _____ have read information sheet of the study titled "**National survey for state-wise prevalence of microbiologically confirmed pulmonary tuberculosis in India**" and have discussed with the study investigators about the purpose of the study, the procedures involved, the anticipated risks and benefits involved, subject safety procedures and protection of rights of study subjects. I have been given the opportunity to ask questions, which have been answered to my satisfaction. I understand that my participation in this study is voluntary and that I may refuse to participate. I also understand that if, for any reason, I wish to discontinue participation in this study at any time, I will be free to do so.

I understand that as a participant in this study, my identity, medical records, and data relating to this research study will be kept confidential, except as required by law. If I have any questions concerning my rights as a research subject in this study, I may contact any of the study investigators at any time point. As I am fully informed of the study, its risks and benefits, I hereby consent to the procedures set forth. Also, I have received a signed copy of this consent form.

Declaration

I _____ have read / understood the consent form and I understand all the information given. I have also understood the terms and conditions of the study and rights about the study. **I wish** to participate in this study of my own free will and give my consent to participate in this study.

Use of specimen for future research

1. I consent to have my specimens stored for use in future research studies, without consulting me a ⬜

2. I do not consent to have my specimens stored for use in future research studies ⬜

3. I consent to have my specimens stored to be used for future research studies, after consultin ⬜ again

_____   _____   ___/___/____
Participant's Name   Participant's Signature / Thumb impression   Date

_____   _____   ___/___/____
Witness's Name   Witness's signature   Date

_____   _____   ___/___/____
Name of Principal Investigator   Signature of the Principal Investigator   Date

National survey for state-wise prevalence of microbiologically confirmed pulmonary tuberculosis in India

National Institute for Research in Tuberculosis

Participant Information Sheet for children aged15 <18 years

Dear Child Participant,

You are being invited to participate in a research study conducted by Indian Council of Medical Research- National Institute for Research in Tuberculosis (ICMR-NIRT), Chennai in collaboration with the Central TB Division (CTD), Ministry of Health and Family Welfare, Government of India and World Health Organization, India (WHO, India).

Before approaching you, we have approached your Parent/Guardian (Legally Acceptable Representative) to inform about this study and they have consented your participation in this study.

Please find below the relevant information regarding the study for you to make a voluntary decision regarding your participation in the study. You are requested to ask any questions regarding the study for necessary clarifications.

Information about the Research study:

The purpose of the study is to assess the burden of Pulmonary Tuberculosis disease and TB infection in India at country level and selected State / State groups level. Among chest symptomatic and TB patients we would also be assessing the health care seeking behaviour and cost incurred on TB diagnosis and treatment in the surveyed communities.

Study Procedures:

If you are willing to take part in this research study, you will have to undergo the following investigations;
- You will be screened for symptoms of TB
- You will be subjected to take a Chest X-Ray
- If you have chest symptoms or any abnormalities in the chest X-Ray, you would be requested to give two sputum's specimens
- First sputum's samples will be tested for TB in the survey van itself.
- Second sputum sample will be sent to the nearest reference laboratory for smear microscopy, liquid culture and Susceptibility test to TB drugs if culture is positive.
- Third sputum sample will be collected and transported to the nearest IRL for performing repeat CBNAAT, Smear Microscopy, liquid culture and DST, if the first sputum sample is CBNAAT positive.
- An additional sputum sample will be collected and a repeat CBNAAT will be performed in the survey van if the CBNAAT results of the first sputum sample is INVALID/ERROR/NO RESULT.
- All diagnosed TB patients will be linked with RNTCP and will be treated as per programmed policy. In case if you are a chest symptomatic or diagnose with TB in past we will be asking you the places you visited to get your diagnosis, treatment, the duration of treatment and the amount of money spent by you on TB treatment.
- About 5 ml (1 teaspoon) of blood will be drawn for doing hemoglobin, blood glucose and a blood test to detect the presence of TB infection

Specimen storage:

Some of your blood, sputum specimens that are left over after all required study testing is done may be stored for a period of 5 years and will be used for TB-related research. These samples will be stored

with protection of your identity. The stored specimen will be used for future studies, if needed, after obtaining proper approval from the scientific/ ethics committee.

Benefits of the study

Benefits to study participants: If you are participating in this study, you will get benefitted by getting screened for TB and can be diagnosed early and treated appropriately free of cost. The result of the tests which you undergo will be communicated by the RNTCP staff.

Benefits to the community: This study will provide information on the burden of TB infection, disease and risk factors for TB disease at the country and state/state group level. It will also help the Government in understanding the health care seeking behavior and the cost incurred for the diagnosis and treatment of TB to the general population. The above information will help the TB Control Program in framing newer strategies and interventions for ending the TB disease in India.

Risks involved

You may feel uncomfortable answering questions about your health. Your responses will be documented, but they will only be shared with health care workers if you have symptoms or signs suggestive of TB. Otherwise, your responses will not be shared with anyone who is not a part of this project. Drawing of blood for investigations may cause transient pain. All blood draws will be done by trained staff to minimize discomfort. If you have any issues you can approach the Medical Officer at the survey site for help.

Payment for study participants

Refreshments will be offered to all individuals participating in the survey.

Voluntary participation and withdrawal

Taking part in this study is voluntary. You may withdraw from the study without having to provide a reason. Your routine medical management will continue even if you decide not to take part in this study or withdraw from the study.

Privacy and confidentiality

You will be assigned a unique identification number (ID) to be used on study forms, in the study database, and on study specimens. None of the study forms, study database, or study specimens will contain your/ name or other information that could be used to identify you. The document linking your IDs to your name and medical record numbers will be kept in a locked office, will not be accessible to personnel not associated with the study. Your identity will remain confidential, except as required by law. Data from the study will be stored under lock and key in a secure area. Data derived from the study will be coded, with only the Principal Investigator or his/her designated research colleagues having access to the code. Any scientific presentation or publication will not reveal your identity individually. You may choose to deny providing any information which you may feel uncomfortable to share during your participation in the study.

Contact persons

If you have any questions regarding this study, you can contact Dr Sriram Selvaraju (Ph No: 044-28369723), National Institute for Research in TB, Chetpet, Chennai (Phone No: 044 - 2836 9500). For any issues related to violation of your rights as human research participant you can contact Secretary, NIRT IEC at 044-28369567.

If you are willing for participation in this study, please sign the Ascent Form stating your willingness.

National survey for state-wise prevalence of microbiologically confirmed pulmonary tuberculosis in India

National Institute for Research in Tuberculosis

Assent Form for Children aged 15 to < 18 years

(If study participant is unable to read, form will be read out before obtaining consent)

Name of child: Age / Sex: Study ID:

I _____ have read / been read out the Participant information sheet for children aged 15 to <18 years of the study titled "**National survey for state-wise prevalence of microbiologically confirmed pulmonary tuberculosis in India**" and have discussed with the study investigators about the purpose of the study, the procedures involved, the expected risks and benefits involved and protection of rights of study participants.

I have been given the opportunity to ask questions, which have been answered to my satisfaction. I understand that my participation in this study is voluntary and that I may refuse to participate. I also understand that if, for any reason, I wish to discontinue my participation in this study at any time, I will be free to do so.

I understand that as a participant in this study, I / my parent / legally authorized representative will not be paid money for my participation. I understand that my identity, medical records, and data relating to this research study will be kept confidential, except as required by law. I understand that if I have any questions concerning my rights as a research subject in this study, I may contact any of the study investigators at any time point.

As I am fully informed of the study, its risks and benefits, I hereby declare my willingnes to the procedures set forth. Also, I have received a copy of the Participant information sheet for children aged 15 to < 18 years.

<u>Declaration</u>

I _____ have read / been read out the consent form and I understand all the information given. I have also understood the terms and conditions of the study and my rights about the study. I wish to participate in this study of my own free will and give my willingness (assent) to participate in this study.

<u>Use of specimen for future research</u>

1. I assent to have my specimens stored for use in future research studies,

without consulting me again

2. I do not assent to have my specimens stored for use in future research studies

3. I assent to have my specimens stored to be used for future research studies,

after consulting me again then

_____   _____   ___/___/____
Child participant's Name   Child participant's Signature / Thumb impression   Date

_____   _____   ___/___/____
Parent/Legally authorized   Parent/Legally authorized representative   Date
representative name   signature / thumb impression

_____   _____   ___/___/____
Witness's Name   Witness's signature   Date
(if Child participant/ Parent/
Legally authorized
representative is illiterate)

_____   _____   ___/___/____
Investigator's name   Investigator's signature   Date

National survey for state-wise prevalence of microbiologically confirmed pulmonary tuberculosis in India

National Institute for Research in Tuberculosis

<u>Parental/Guardian Information Sheet for Children aged 15-<18 years</u>

Dear Parent/Guardian (Legally Acceptable Representative)

We invite you/your child to participate in the research study conducted by Indian Council of Medical Research- National Institute for Research in Tuberculosis (ICMR-NIRT), Chennai in collaboration with the Central TB Division (CTD), Ministry of Health and Family Welfare, Government of India and World Health Organization, India (WHO, India).Since he/she is aged less than 18 years we request your consent in their participation.

Please find below the relevant information regarding the study for you to make a voluntary decision regarding your child's participation in the study. You are requested to ask any questions regarding the study for necessary clarifications.

Information about the Research study:

The purpose of the study is to assess the burden of Pulmonary Tuberculosis disease and TB infection in India at country level and selected State / State groups level. The age group eligible for this survey is above 15 years. Among chest symptomatic and TB patients we would also be assessing the health care seeking behavior and cost incurred on TB diagnosis and treatment in the surveyed communities.

Study Procedures:

If your child is to take part in this research study, they will have to undergo the following investigations; The child will be

- Screened for symptoms of TB
- Subjected to take a Chest X-Ray
- If the child has chest symptoms or any abnormalities in the chest X-Ray, they would be requested to give two sputum's specimens
- First sputum's samples will be tested for TB in the survey van itself.
- Second sputum sample will be sent to the nearest reference laboratory for smear microscopy, liquid culture and Susceptibility test to TB drugs if culture is positive.
- Third sputum sample will be collected and transported to the nearest IRL for performing repeat CBNAAT, Smear Microscopy, liquid culture and DST, if the first sputum sample is CBNAAT positive.
- An additional sputum sample will be collected and a repeat CBNAAT will be performed in the survey van if the CBNAAT results of the first sputum sample is INVALID/ERROR/NO RESULT.
- All diagnosed TB patients will be linked with RNTCP and will be treated as per programmed policy. In case if you are a chest symptomatic or diagnose with TB in past we will be asking you the places you visited to get your diagnosis, treatment, the duration of treatment and the amount of money spent by you on TB treatment.
- Capillary blood will be collected from all participants for performing a point of care blood test to determine the level of blood glucose and hemoglobin.
- About 5 ml (1 teaspoon) of venous blood will be drawn from participants of selected 52 clusters across the country for performing a blood test to detect the presence of TB infection

Specimen storage:

Some of the child's blood, sputum specimens that are left over after all required study testing is done may be stored for a period of 5 years and will be used for TB-related research. These samples will be stored with protection of identity. The stored specimen will be used for future studies, if needed, after obtaining proper approval from the scientific/ethics committee.

Benefits of the study
Benefits to study participants: If your child is participating in this study, they will get benefitted by getting screened for TB and if they have TB, they can be diagnosed early and treated appropriately free of cost. The result of the tests which you undergo will be communicated by the RNTCP staff.
Benefits to the community: This study will provide information on the burden of TB infection, disease and risk factors for TB disease at the country and state/state group level. It will also help the Government in understanding the health care seeking behavior and the cost incurred for the diagnosis and treatment of TB to the general population. The above information will help the TB Control Program in framing newer strategies and interventions for ending the TB disease in India.
Risks involved
Your child may feel uncomfortable answering questions about his/her health. The responses will be documented, but they will only be shared with health care workers if he/she has symptoms or signs suggestive of TB. Otherwise, their responses will not be shared with anyone who is not a part of this project. Drawing of blood for investigations may cause transient pain. All blood draws will be done by trained staff to minimize discomfort. If you/your child has any issues you can approach the Medical Officer at the survey site for help.

Payment for study participants

Refreshments will be offered to all individuals participating in the survey.

Voluntary participation and withdrawal

Taking part in this study is voluntary. Your child may withdraw from the study without having to provide a reason. Your child's routine medical management will continue even if you/your child decide not to take part in this study or withdraw from the study.

Privacy and confidentiality

You child will be assigned a unique identification number (ID) to be used on study forms, in the study database, and on study specimens. None of the study forms, study database, or study specimens will contain your child's name or other information that could be used to identify your children. The document linking your IDs to your name and medical record numbers will be kept in a locked office, will not be accessible to personnel not associated with the study. Your child's identity will remain confidential, except as required by law. Data from the study will be stored under lock and key in a secure area. Data derived from the study will be coded, with only the Principal Investigator or his/her designated research colleagues having access to the code. Any scientific presentation or publication will not reveal your child's identity individually. You child may choose to deny providing any information which you may feel uncomfortable to share during your participation in the study.

Contact persons

If you have any questions regarding this study, you can contact Dr Sriram Selvaraju (Ph No: 044-28369723), National Institute for Research in TB, Chetpet, Chennai (Phone No: 044 - 2836 9500). For any issues related to violation of your rights as human research participant you can contact Secretary, NIRT IEC at 044-28369567. If you are willing to allow your child to participate in this study, please sign the Parent / Guardian (Legally Acceptable Representative) Consent Form stating your willingness

National survey for state-wise prevalence of microbiologically confirmed pulmonary tuberculosis in India

National Institute for Research in Tuberculosis
Parental/ Guardian Consent Form for the children aged 15 <18 years
(If participant is unable to read, form will be read out before obtaining consent)

Name of the Child: **Age/Sex:**   **Study ID:**

Name of the Parent/Guardian:

I _____ have read the Parent / Guardian information sheet of the study titled "National survey for state-wise prevalence of microbiologically confirmed pulmonary tuberculosis in India" and have discussed with the study investigators about the purpose of the study, the procedures involved, the anticipated risks and benefits involved, subject safety procedures and protection of rights of study subjects.

I have been given the opportunity to ask questions, which have been answered to my satisfaction. I understand that my child's participation in this study is voluntary and that I may refuse to have my child participate. I also understand that if, for any reason, I wish to discontinue my child's participation in this study at any time, I will be free to do so. I understand that as a participant in this study, my child's identity, medical records, and data relating to this research study will be kept confidential, except as required by law. If I have any questions concerning my child's rights of as a research subject in this study, I may contact any of the study investigators at any time point. As I am fully informed of the study, its risks and benefits, I hereby consent to the procedures set forth. Also, I have received a signed copy of this consent form.

Declaration

I _____ have read / understood the consent form and I understand all the information given. I have also understood the terms and conditions of the study and **my child's** rights about the study. **I wish my child** to participate in this study of my own free will and give my consent to participate in this study.

Use of specimen for future research

1.I consent to have my child's specimens stored for use in future research studies,

without consulting me again

2.I do not consent to have my child's specimens stored for use in future research studies

3.I consent to have my child's specimens stored to be used for future research studies,

after consulting me again

_____   _____   ____/____/_____
Participant's Name   Participant's Signature / Thumb impression   Date

_____   _____   ____/____/_____
Witness's Name   Witness's signature   Date

_____   _____   ___/___/____
Name of Principal Investigator   Signature of the Principal Investigator   Date

9.6 User Interface of enumeration

Step 1 :
Login

Step 2 :
Entering the name of Village/
Ward

Step 3 :
Entering the household address

Step 4 :
Entering the total number of
household members

Add a New Member

State Group: Pilot State Group
District: Pilot District
Village: Raisa

State: Pilot State
Cluster: Pilot Cluster 17
Household Address: 2A Ram Nagar

10-9-1993

Age *
26

Gender *
Male

Relation to Household Head *
Self

Occupation *
Agricultural Labourer

Duration Lived in Area(in months) *
312   ☑ Since Birth

Mobile Number
7004294010

Eligibility for enrollment(Y/N) *
Yes

Scan QR Code: ⌞ ⌟ SCAN   Submit

Add a New Member

State Group: Pilot State Group
District: Pilot District
Village: Raisa

State: Pilot State
Cluster: Pilot Cluster 17
Household Address: 2A Ram Nagar

26

Gender *
Male

Relation to Household Head *
Self

Occupation *
Agricultural Labourer

Duration Lived in Area(in months) *
312   ☑ Since Birth

Mobile Number
7004294010

Eligibility for enrollment(Y/N) *
Yes

Scanned QR Code: 0-0-17-1 ⊗

Scan QR Code: ⌞ ⌟ SCAN   Submit

Step 5:
Filling the
- D.O.B
- Age
- Gender
- Relation to household head
- Occupation
- Duration lived in the area
- Mobile number
- Eligibility for enrolment

Of the first household member

Step 6:
If the participant is eligible the QR code of the PID card is scanned and linked with the participant.

Participant Details

State Group: Pilot State Group

District: Pilot District

Village: Raisa

State: Pilot State

Cluster: Pilot Cluster 17

Household Address: 2A Ram Nagar

PID : 0-0-17-1

Name of the Participant Alok Kumar	**Date Of Birth** 10-9-1993
Age 26	**Gender** Male
Relation to Household Head Self	**Occupation** Agricultural Labourer
Duration Lived in Area(in months) 312	**Eligibility for enrollment(Y/N)** Yes
If excluded,(reason)	**Mobile Number** 7004294010

Back

Step 7 :
Successful enumeration of study participant

Family Member Details

State Group: Pilot State Group

District: Pilot District

Village: Raisa

State: Pilot State

Cluster: Pilot Cluster 17

Household Address: 2A Ram Nagar

Total Family members added :1/2 ✏

Eligible Participants :1   Non Eligible Participants :0

#	Name	Gender	Relationship to HOF	Eligibility		
1	Alok Kumar	Male	Self	Yes	👁	✏

Add New Member

Step 8 :
Adding other members of the household

Step 9:
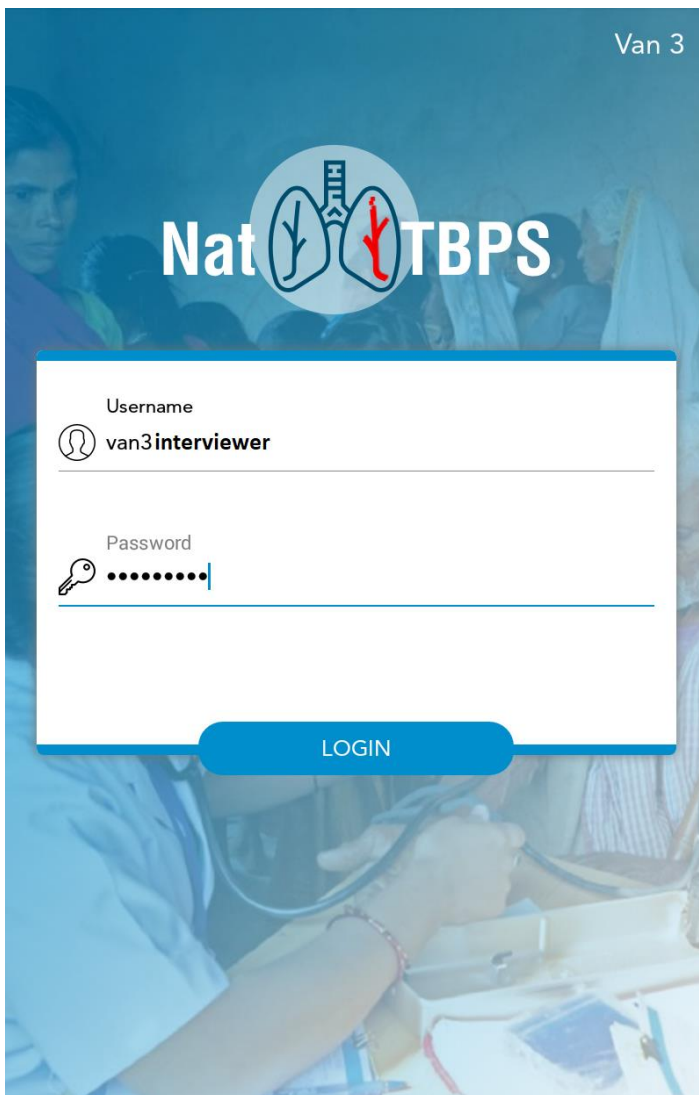Filling the details of other members.
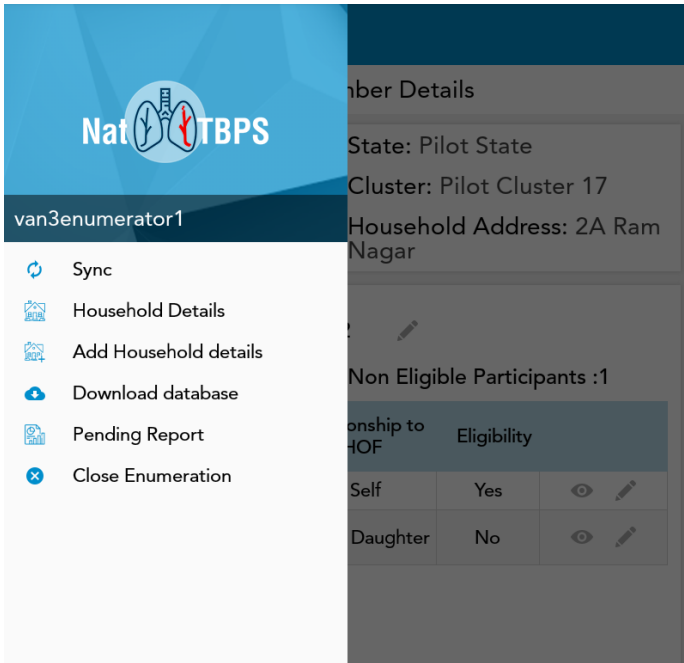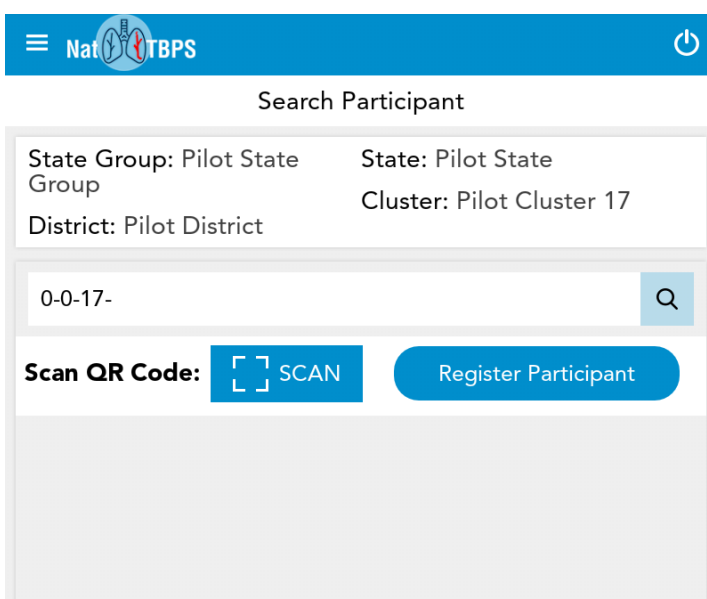
Step 10 :
Syncing the enumeration data
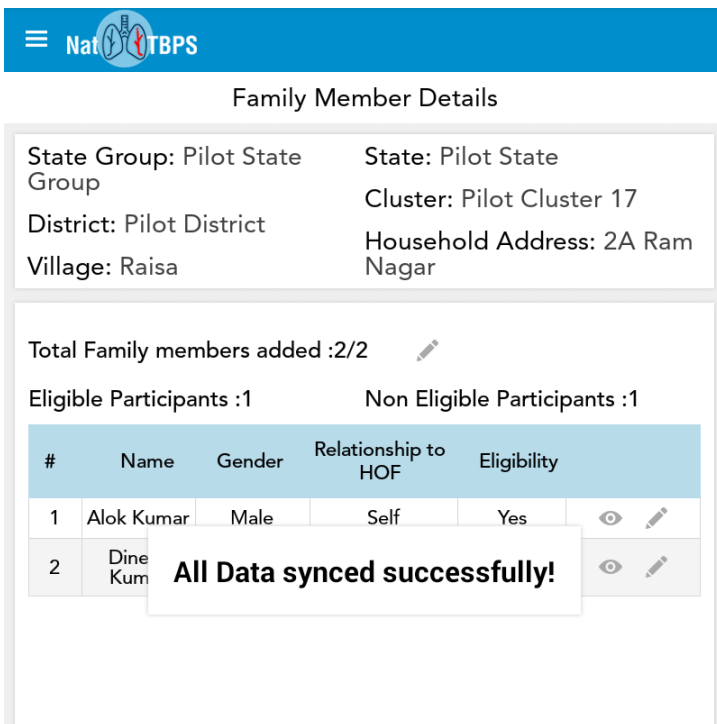
Step 11 :
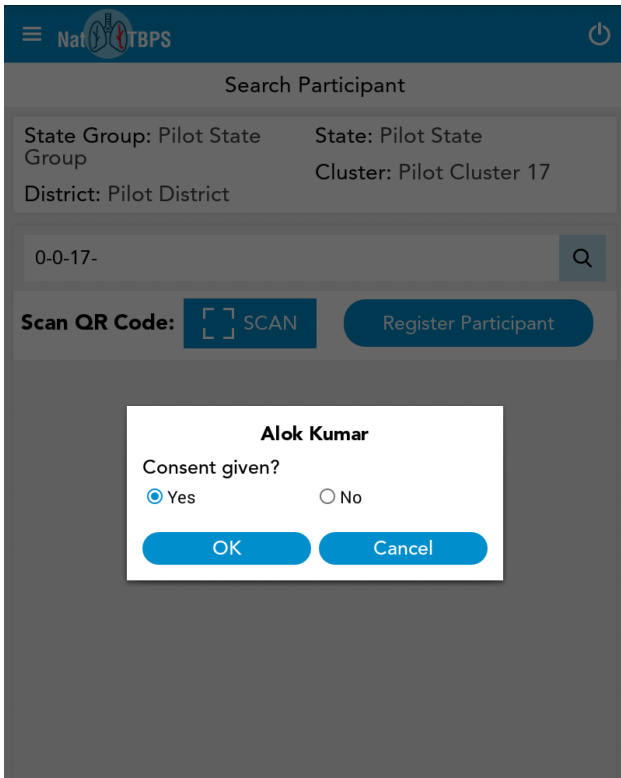Successful enumeration data sync

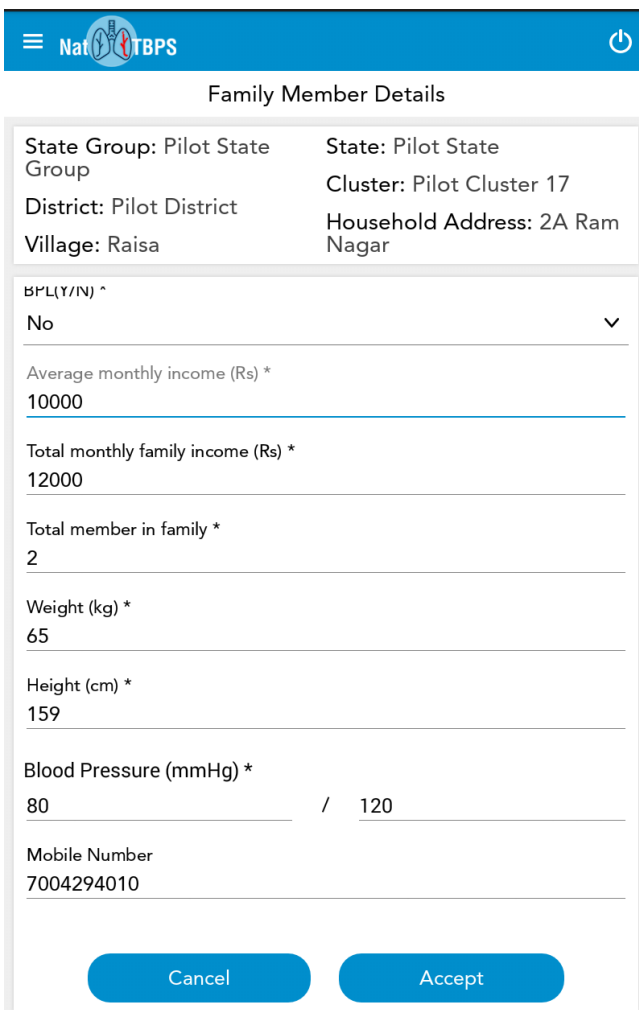## 9.7 User Interface of symptom screening

Step 1 :
Login

Step 2 :
Registering the participant by scanning the QR code on the PID card

Step 3 :
Verifying if the participant has given consent

Step 4 :
Filling demographic and anthropometric details

Step 5:
Symptom screening questionnaire

Interview Form 1

State Group: Pilot State Group

State: Pilot State

District: Pilot District

Cluster: Pilot Cluster 17

| Personal Details | Duration of Symptoms | Smoking & Alcohol Use | Comorbidities |

Required Fields

Since how many days you have cough (write 0 if no cough) *

0

Since how many days you have fever (write 0 if no fever) *

0

Do you have significant Weight loss (i.e. loss of 4.5kg or >5kg of the usual body weight over a period of 6–12 months)? *

No

Did you find presence of blood in sputum any time during the last 6 months? *

No

Did you have chest pain in last one month? *

No

Do you have expectoration since more than two weeks? *

No

Do you experience fatigue since more than a month? *

No

Interview Form 1

State Group: Pilot State Group

State: Pilot State

District: Pilot District

Cluster: Pilot Cluster 17

| Personal Details | Duration of Symptoms | Smoking & Alcohol Use | Comorbidities |

Do you have expectoration since more than two weeks?

No

Do you experience fatigue since more than a month? *

No

Do you experience night sweats since more than a month? *

No

Do you experience Loss of appetite since more than a month? *

No

Any other (specify)

Past History of ATT *

No

Currently on ATT *

No

Next

Step 6 :
Interview on smoking an alcohol history

Step 7 :
Questions on co-morbidities

Step 8:
Based on the symptom screening the eligibility for sputum examination is determined.

9.8 User Interface of X-ray report entry by medical officer

9.9 Presurvey visit checklist and contact details form

National TB Prevalence Survey – Presurvey Checklist				
STATE TEAM :			DATE :	
CLUSTER NAME :			CLUSTER CODE :	
S:NO	**ACTIVITY**	**YES**	**NO**	**REMARKS**
1	Are PID cards, adequate thermocol boxes, falcon tubes and CBB maps all ready?	Yes		
2	Number of CBNAAT cartridges obtained from DTC (DTO) for the cluster activities	Yes		
3	Contact details collected (RNTCP staff, DTO, Village sarpanch, PHC-MO, Asha worker, Anganwadi worker, BDO, VO)	Yes		
4	Cluster CEB maps for boundaries & landmarks identified ?	Yes		
5	Any new hamlets created?		No	
6	Is Polio micro plan map/ Anganwadi nutritional plan map / panchayat map for house hold marking collected?		No	
7	Any change in the originally selected cluster in terms of name, ward to which they belong or the district to which they belong?		No	
8	In case of multiple CEB maps for a village, is random number generated to select a map to begin survey activities?	Yes		Random Number :
9	Are random number screenshots saved ?	Yes		CEB Map Random Number : Household Random Number :
10	Is updated CEB map prepared?	Yes		
11	Are route map and survey site map prepared?	Yes		
12	Has the cluster mapping and household numbering been cross-verified? (Name of the staff)	Yes		
13	Is there adequate internet connectivity?	Yes		
14	Mention the nearest internet café with contact details	Yes		
15	Mention the GPS location of the survey site.	Yes		

16	Does the survey site selection hamper the daily activities of the cluster or vice versa? (example are they too close to busy market areas or industrial areas etc that may hamper survey activities or vice versa)		No	
17	Is sensitisation of local health staff & local community/ religious leader done ?	Yes		
18	Are there any religious, community, political sentiments that may hamper cluster activities ?		No	
19	Any local festivals, political or religious celebrations or community events to be held or planned during our period of survey activity, if yes, how many days?	Yes		
20	Are the local police and administration notified?	Yes		
21	Mechanism or first-hand contacts for resolving dispute to be discussed with RNTCP staff if police not available near by.		No	
22	Are the Pamphlets, handouts etc circulated ?	Yes		
23	Are Volunteers identified for cluster activity ?	Yes		
24	Are fan clubs, local youth committees etc identified, sensitised and sought help for community mobilization?		No	
25	Are Electrical supply (3 phase power supply back up),nearest petrol station, local mechanic shops identified?	Yes		
26	Is Local courier service for sputum transportation identified? What is the distance? / would human carrier be needed ?	Yes		
27	Is nearest govt health facility identified? (for BMW disposal, emergencies)	Yes		
28	Are medicines arranged from local PHC or MO?	Yes		
29	Is area for bio-medical waste disposal identified ?	Yes		
30	Nearest water supply for survey site activities ?		No	
31	Is nearest area where refreshments and food are available identified ?	Yes		
32	Are closest shop for xerox, print outs identified ?	Yes		
33	Is washroom facility for the survey staff-identified with proper water supply or system for storage of water?	Yes		

34	Is the place of stay for survey staff arranged?	Yes		a) WITHIN 5 KMS b) MORE THAN 5 KMS (WHY ?)
35	Is a safe parking site for van after each day's survey activity identified ?	Yes		
36	Are there any issues with the bus, generator, DR system, X-ray machine, CBNAAT?		No	
37	Are there adequate Chalks/markers/stickers for household numbering ?	Yes		
38	A3 size map for numbering	Yes		
39	Stationeries	Yes		

Presurvey Visit – Local Contact Details				
S.No	NAME	DESIGNATION	CONTACT	REMARKS
1		DISTRICT TB OFFICER		
2		DISTRICT HEALTH OFFICER		
3		CIVIL SURGEON		
4		DISTRICT PROGRAMME CO-ORDINATOR		
5		PHC-MO		
6		STS		
7		STLS		
8		TB-HV		
9		ASHA SUPERVISOR		
10		ASHA WORKER		
11		ANGANWADI WORKER		
12		MEDICAL SUPERINTENDENT		
13		BLOCK DEVELOPMENT OFFICER		
14		LOCAL POLICE STATION		
15		COMMUNITY LEADER		
16		RELIGIOUS LEADER		
17		FAN CLUBS		
18		ROTARY CLUB		
19		YOUTH CLUB/ SPORTS		
20		VOLUNTEER		
21		VOLUNTEER		
22		VOLUNTEER		
23		VOLUNTEER		

9.10 Referral forms

National Survey for the State Wise Prevalence of Microbiologically Confirmed Pulmonary Tuberculosis in India – CBNAAT positive Referral Form
(**CBNAAT Referral Form** is to be given when the specimen result found to be positive)

State -   Cluster -

During (NTBPS),_____'s sputum was tested with CBNAAT on ___/___/_____. His / Her results came as positive suggestive of Pulmonary Tuberculosis. Kindly evaluate him / her for further management and care

Date :-____/_____/_____   Signature :-_____

National Survey for the State Wise Prevalence of Microbiologically Confirmed Pulmonary Tuberculosis in India – Anaemia Referral Form
(**Anaemia Referral Form** is to be given when the adult's haemoglobin level is **less than 7.0 g/dL for women and less than 9.0 g/dL for men and pregnant women**)

State -   Cluster -

During (NTBPS),_____, was tested for anaemia on ___/___/_____. His / Her level of haemoglobin was_____ . ____g/dL, which indicates he / she has severe anaemia. Kindly evaluate him / her for further management and care

Date :-____/_____/_____   Signature :-_____

National Survey for the State Wise Prevalence of Microbiologically Confirmed Pulmonary Tuberculosis in India – Blood glucose referral form
(**Blood Glucose Referral form** is to be given when the adult's random glucose level is **greater than 140 mg/dL**)

State -   Cluster -

During (NTBPS), _____'s random blood glucose level was tested on ____ /____ /_____. His / Her random blood glucose level was _____ mg/dL. Kindly evaluate him / her for further management and care.

Date: -____ /_____ /_____   Signature: -_____

National Survey for the State Wise Prevalence of Microbiologically Confirmed Pulmonary Tuberculosis in India – Blood Pressure Referral Form
(**Blood Pressure Referral Form** is to be given when the adult's systolic pressure is **greater than 160 mm of Hg** and / or diastolic pressure is **greater than 100 mm of Hg**)

State -   Cluster -

During (NTBPS), _____'s blood pressure is checked on ___/___/_____. His / Her systolic pressure was _____mm of Hg and diastolic pressure was _____mm of Hg which is severely elevated. Kindly evaluate him / her for further management and care

Date: -____/_____/_____   Signature: -_____

9.11. Monitoring visit forms

National TB Prevalence Survey

Monitoring Checklist

State Team: Monitoring Members:

                                     1.
Cluster Name: 2.
                                     3.
                                     4.
Date Of Visit: 5.

S. No	Enumeration		Yes	No	Remarks
1	Are all houses in the cluster numbered?				
3	Are institutional establishments identified and excluded?				
3	Is the household random number generated?				
4	Is enumeration started from the random number household?				
5	Is GPS location of the random number house entered?				
6	Has the two teams visited the households in ascending and descending order from the random number household?				
7	Is location services enabled in enumerator tab 1?				
8	Is location services enabled in enumerator tab 2?				
9	Are Covid-19 precautionary measures (wearing masks, maintaining social distance, etc.) followed during enumeration?				
10	Does the enumerator	a) Introduce themselves?			
		b) Behave in an amicable manner?			
		c) Clearly explain the purpose of the visit?			
		d) Ask the necessary questions?			
		e) Effectively probe for answers?			
		f) Able to gather relevant information?			

			Yes	No	Remarks
		g) Follow inclusion and exclusion criteria to determine the eligibility of the participant ?			
		g) Enter the information given by the participant without any alteration?			
		h) Wrap up by informing about the next step of the survey?			
11	Are the collected data synced regularly?				
12	Are the details scanned and PID card handed to the participant?				

S.No	Registration	Yes	No	Remarks
13	Are the necessary arrangements made to follow COVID precautions at survey site? (Social distancing, hand sanitization stations, temperature monitoring, etc.)			
14	Is the participant wearing a face mask while visiting the survey site?			
15	Is social distancing followed at cluster site?			
16	Is the participant advised on following appropriate COVID precautions?			
17	Does the participant have a PID card?			
18	Is the PID number matching with enumerated number on the enumeration list?			
19	Is the flow of process in the survey site arranged properly?			
20	Is the participant reception area arranged properly?			
21	Is the participant informed about the next step to be done?			

S.No	Informed Consent	Yes	No	Remarks
22	Was the PID number verified?			
23	Is the participant being explained in his/her local language? If no, is an interpreter used?			

24	Are all the elements of the participant information sheet explained to the participant? a) Information about the study b) Specimen storage c) Benefits of the study to the participant and the community d) Risks associated e) Voluntary participation and withdrawal f) Privacy and confidentiality			
25	Has the participant understood what has been explained to him/her ?			
26	If participant is literate: Is the Participant signing the consent form? If no, why?			
27	If the participant is illiterate, has the participant's thumb impression been obtained ? If no, why?			
28	Has an impartial witness signed for the illiterate participant?			
29	If the participant is 15- 18 years of age: a) Is the Assent form signed by the participant and witness signature obtained ? b) Is the Consent form signed by the parent/LAR (Legally Authorized Representative)?			
30	Is the date and time mentioned in the informed consent at the end of the day?			
31	Has the PTO/HA signed the consent form?			
32	Has the Medical Officer Counter signed the Consent form?			
33	Is the consent box checked in the PID card of the participant?			
34	Is the participant notified about the next step which is to be done?			

S.No	Anthropometry and Blood Pressure assessment	Yes	No	Remarks
35	Is the PID card cross-verified?			
36	Is the height scale being positioned properly?			
37	Are the markings on the tape seen properly?			
38	Is there any physical damage to the tape?			
39	Are the participants positioned properly for height measurement ?			
40	Is there any errors in the weighing machine? (e.g. zero errors) If yes, please elaborate			
41	Is the weighing machine positioned properly on a flat surface?			
42	Is the working condition of the weighing machine checked every day?			
43	Is there any error in the Sphygmomanometer? If Yes, please specify.			
44	Is the Sphygmomanometer positioned properly as per the instructions given?			
45	Are the height, weight and blood pressure values entered correctly?			
46	Is the participant notified about the next step which is to be done?			
S.No	Interview	Yes	No	Remarks
47	Is the PID number verified and informed consent box checked in the PID card ?			
48	Is the participant given privacy during the interview?			
49	Is the interviewer speaking in the primary language of the participant ? If no, is an interpreter being used ?			
50	Is the interviewer correctly explaining the questions to the participant?			

S.No		Yes	No	Remarks
51	Is the interviewer asking questions as worded in the questionnaire?			
52	Is the interviewer making sure that the participant has understood the question asked?			
53	Is the interviewer giving enough time to the participant to answer the question asked ?			
54	Is the interviewer recording the information and statements given by the participant without altering anything ?			
55	Is the interview checkbox marked in the PID card of the participant after the completion of the interview?			
56	Is the participant informed about the next step which is to be done?			

S.No	POCT	Yes	No	Remarks
57	Is the PID number verified and informed consent box checked in the PID card ?			
58	Are participants given information about the blood test?			
59	Is the procedure explained to the participant?			
60	Is skin disinfection done before the collection of blood sample?			
61	Have the participants been pricked for more than 2 times?			
62	Is the volume of capillary blood collected 10µl?			
63	Are the test values entered correctly?			
64	Were the referral slips been given to participants with abnormal RBS and Haemoglobin value?			
65	Is the appropriate checkbox marked in the PID card of the participant after the completion of the test?			

S.No	First Sputum Sample Collection	Yes	No	Remarks
66	Is the PID number verified?			

67	Did the lab technician explain the sputum and home sputum collection procedure to the participants?			
68	Are the falcon tubes labelled with details by permanent marker?			
69	Is the sputum collection site away from the survey site?			
70	Is the volume of sputum sample 3-5 ml?			
71	Was the good quality sputum sample collected?			
72	Is the QR code correctly identified and stuck on the falcon tube?			

S.No	CBNAAT	Yes	No	Remarks
73	Is the PID number verified?			
74	Is the CBNAAT processing site away from the survey site?			
75	Are the falcon tubes shaken properly?			
76	Is the sample dilution buffer clear before adding the liquid?			
77	Are data entered into the CBNAAT system?			
78	Is the appropriate checkbox marked in the PID card of the participant once sputum collection is completed?			
79	Are the following errors if any noted and intimated to CPMU? • Temperature • Cartridge • Poor electrical connection • Machine malfunction			

S.No	Second And Third Sputum Sample	Yes	No	Remarks
80	Is the PID number verified?			
81	Was the sputum collected early morning or at the spot?			
82	Is the volume of sputum sample 3-5ml?			
83	Was the participant instructed to collect the sputum sample near the window or outside the home?			
84	Is the time of early morning sputum noted?			

S.No		Yes	No	Remarks
85	Were the falcon tubes tightly sealed and packed with zip lock covers?			
86	Are the second and 3rd samples maintained in cold chain until handing over to transportation agency			

S.No	Transportation	Yes	No	Remarks
87	Is the agency identified for sputum transport notified daily?			
88	At what time does the agency personnel come to the cluster site for pick up?			
89	Does the packaging take place under proper condition?			
90	Is the temperature noted before transportation?			

S.No	IGRA Activities In The Field	Yes	No	Remarks
91	Is the PID number verified?			
92	Are all the four tubes labelled with PID number?			
93	Is the procedure of blood collection explained to the participants?			
94	Is skin disinfection done before the collection of blood?			
95	Is the correct positioning of participants arm during venepuncture done?			
96	Is volume of sample collected 1ml in each tube?			
97	Is blood collected in all four tubes?			
98	Are the collected tubes shaken 10 times?			
99	Are the collected samples kept upright at room temperature?			
100	Are the collected samples transported at room temperature?			
101	Are the details of collected samples entered?			
102	Is the appropriate checkbox marked in the PID card of the participant once blood collection is completed?			

S.NO	IGRA activities in incubation site	Yes	No	Remarks

103	Are the samples incubated within 16 hours of collection?			
104	Are the samples incubated at 37 +/-1 degree centigrade?			
105	Did the incubation process happen for 16-22 hours?			
106	Did the centrifugation happen at 2000 rpm for 15 minutes?			
107	Are the samples packed and transported in cold chain?			

S.No	Biomedical Waste Management	Yes	No	Remarks
108	Is the BMW disposed through proper colour coding system?			
109	Are the cartridges disposed in red bins?			
110	Are cotton and soiled wastes disposed in yellow bin?			
111	Are general wastes discarded properly?			
112	Are BMW tagged and tightly packed before disposal?			
113	Is the local PHC notified about the bio-disposable waste management?			

S.No	Xray Equipment	Yes	No	Remarks
114	Is regular maintenance of X Ray machine done? ➢ Daily Checks • Integrity of Warning and Danger labels			
115	Is the Xray machine working well ?			
116	Is Chest stand in proper condition?			
117	Is the revolving stool maintained properly?			
118	Is the DR panel and Laptop functioning well ?			
119	Is the CR System computer and CPU in working condition?			
120	Is the CR Scanner in good condition?			
121	Is the bus parked in a flat plane ?			
122	Is there any other issue with the Xray machine ? If yes, has it been informed to the CPMU ?			
S.No	X-ray Technician	Yes	No	Remarks
123	Are both the technicians present?			
124	Are the technicians wearing their Lead Apron?			
125	Are the technicians wearing the TLD badge?			

S.No		Yes	No	Remarks
126	Accidental exposure, if any? If yes, has it been informed to CPMU ?			

S.No	Participant	Yes	No	Remarks
127	Is the PID number verified?			
128	Has the apron been given to the participant?			
129	Was clear instructions on removing jewelry given to participants?			
130	Is the positioning of the patients done correctly ?			
131	Has the LMP status been enquired?			
132	Was the pregnancy status confirmed?			

S.NO	Quality of chest Xray	Yes	No	Remarks
133	Identification markings outside the lung field ? a) Name b) PID number			
134	Defective lung fields (If you observe that any defective part of the lung fields, even a small portion, select Yes)			
	Poor inspiration (If you find all of the lower line of the 10th rib (usually of the right lung) seen below the line of the right diaphragm, select Yes)			
	Oblique positioning (If you observe that the sterno-clavicular joints are asymmetrically placed and the differences of more than 5mm between the right and the left, select Yes)			
	Position of clavicles (If you observe that the clavicles are visualized apart from the 4th rib bones on X-ray, select Yes)			
	Position of scapula (If you observe that the right or left scapula, or both are visualized more than 1 cm in the lung fields, select Yes)			
	Asymmetric Density of lungs (If you observe that the density of right and left lungs is not symmetric [except in the case where this caused by physical deformity of the patient], select Yes)			
	Foreign Substances (If you observe that foreign substance(s) are visualized in the lung fields, select Yes)			
135	Contrast a) Lung field b) Lung Periphery c) Mediastinum d) Cardiac Shadow	Good	Fair	Poor
136	Sharpness			

S.No	Assessment Of Other Staff	Yes	No	Remarks
137	Has the medical officer been trained in reading and reporting of the Chest X-rays ?			
138	Has the DEO backed up all the Xray images ?			

S.No	Data Management	Yes	No	Remarks
139	Is cross checking the details of the participants done?			
140	Have all PID card been collected by the DEO after completing the survey?			
141	Is the data syncing happening in local server from all the used tablets?			
142	Similarity of Van server data to the central server data has been checked • Enumeration • Interview • lab data • x-ray data			
143	Has next cluster been decided by the MO, Nodal officers and intimated to CPMU for cluster change ?			
144	Has Next PID cards been received counted and verified?			
145	Is daily maintenance of data done?			
146	Is the EOD sheet updated on regular basis?			
147	Has PID cards been properly distributed among the enumeration teams and cross verified?			
148	Is Updating of work being done (screenshot of the dashboard) in case of any network connectivity issues?			

Comment:

Strengths:

Areas of improvement:

Date:
Venue:

Signature and Name of the Monitor

9.12 Human Resource

S.NO	Human Resource	Number per team	Total Number
Field teams Human Resource			
1	Scientist C (Medical)/Scientist B (Medical)/ Junior Medical Officer	1	23
2	Project Technical Officer (Senior Investigator)	1	23
3	Project Technical Officer (Senior Technical Assistant)	1	23
4	Project Technical Officer (Medical Social Worker)	1	23
5	Project Assistant (Field investigator)	2	46
6	Project Technician III (Laboratory Technician)	3	69
7	Project Technician III (X-Ray Technician)	2	46
8	Data Entry Operator (Grade B)	1	23
9	Project Technician II (Health Assistant)	6	138
10	Project Technician II (Laboratory Assistant)	1	23
14	Senior Project Assistant (UDC)	1	23
11	Driver-cum-mechanic	1	23
12	Multi Tasking Staff (Helper)	1	23
15	Multi Tasking Staff (Sweeper)	1	23
13	Project Technician III (Laboratory Technician) (for IRL)	2	46

S.No	Human Resource	Total Number
Central Project Management Unit Human Resource		
1	Consultant (Survey Coordinator)	1
2	Scientist C/ Scientist B/ Junior medical officer (Survey Monitors)	4
3	Consultant (Data Manager)	2
4	Scientist C (Microbiology)	1
5	Scientist C (Statistics)	1
6	Project Technical Officer (Statistics)	1
7	Consultant(Teleradiology)	1
8	Consultant Microbiology (Non-medical)	1
9	Project Officer (SO)	1
10	Senior Project Assistant (UDC)	4

9.13. Gallery

Inauguration of National TB Prevalence Survey at the TB Harega Desh Jeetega campaign by the Honorable Health Minister of India in New Delhi

Survey team of Andhra Pradesh

Survey team of North Eastern states

Survey team of Bihar

Survey team of Chhattisgarh

Survey team of Gujarat

Survey team of Himachal Pradesh, Uttarakhand and Jammu & Kashmir

Survey team of Jharkhand

Survey team of Karnataka

Survey team of Kerala

Survey team of Maharashtra

Survey team of Madhya Pradesh

Survey team of Odisha

Survey team of Punjab, Chandigarh and Haryana

Survey team of Rajasthan

Survey team of Telangana

Survey team of Tamil Nadu and CPMU

Survey team of Uttar Pradesh

Survey team of Uttar Pradesh

Survey team of Uttar Pradesh

Survey team of West Bengal

Survey team of West Bengal

Sensitization workshop on National TB Prevalence Survey for various stakeholders conducted at ICMR - NIRT, Chennai

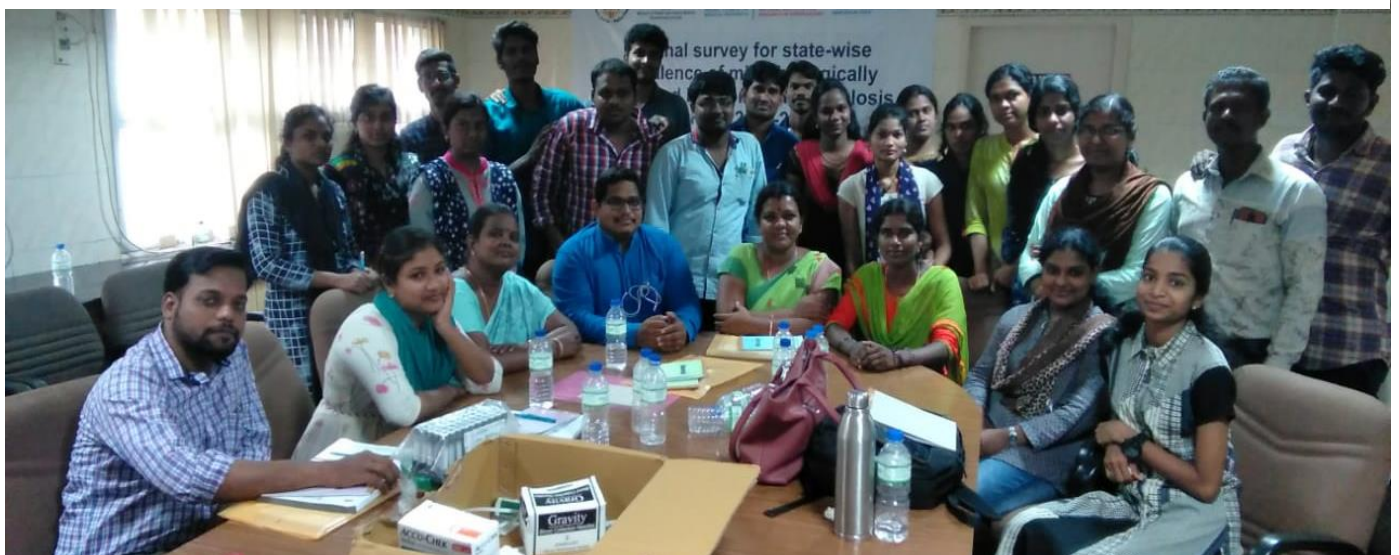# Training of field teams of National TB prevalence survey at various sites
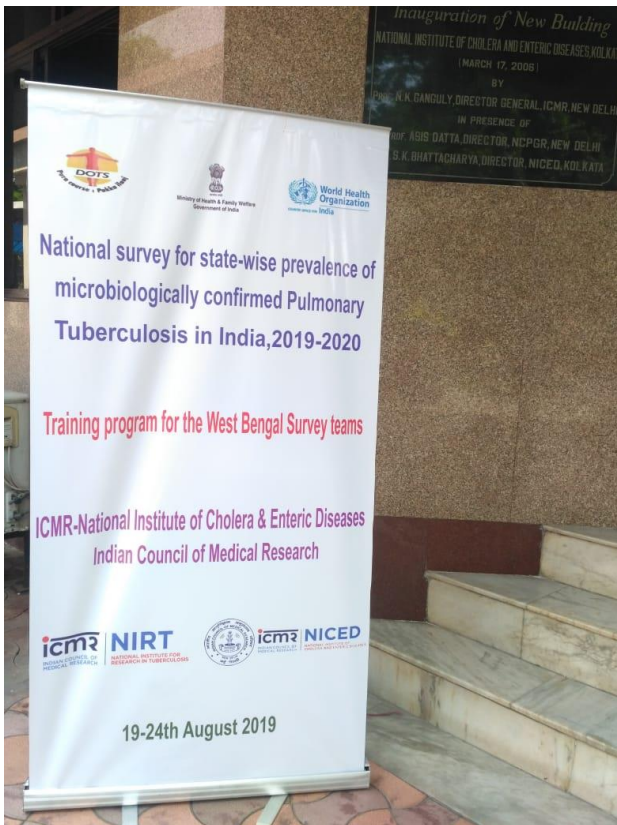
Training workshops for medical officers conducted at ICMR-NIRT, Chennai
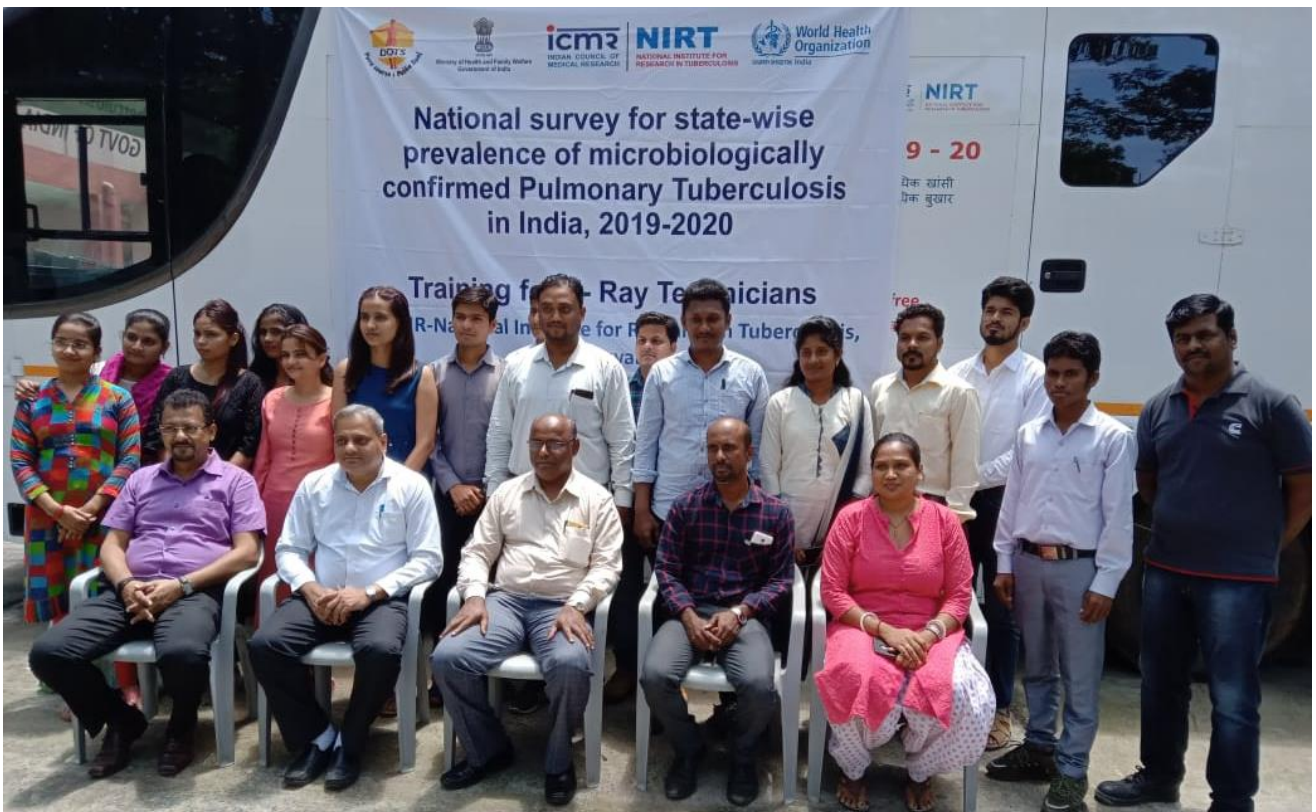

Training of Lab Technicians

Training of Data Entry Operators

Training of X-ray Technicians

Community engagement activities

Pre survey activities: (clockwise from left) Meeting officials and sensitization of community, Numbering of households, Updated CEB map, Route map and Survey site map.

Enumeration of household by the census teams

Survey site, registration, interview and POCT

Mobile X-ray unit and participant being positioned for chest X-ray

Sputum collection and CBNAAT testing of sputum at field level

Referral to NTEP network and Initiation of TB treatment

Monitoring visits of NATBPS

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