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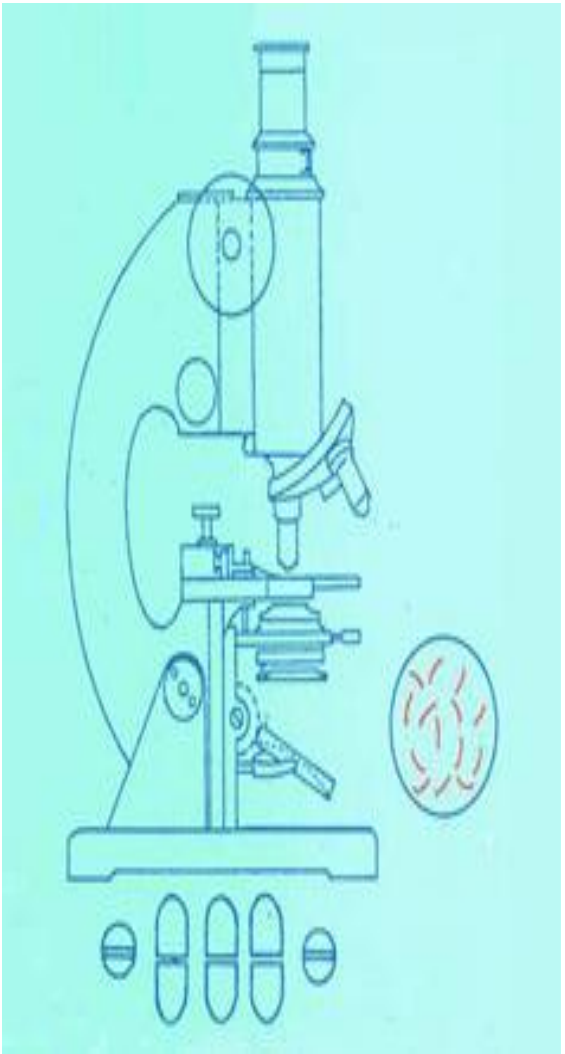

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SPECIAL THANKS

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Tuberculosis preventive therapy is the treatment offered to individuals who are considered to be at risk for TB disease in order to reduce that risk. The latent TB infection is one of the important components envisaged to bring down the TB incidence. The National Strategic Plan (2017-25) of India in its framework has explicitly stated the proportion on TB preventive therapy as an outcome indicator. The article entitled, "Challenges and programmatic solutions for TB preventive therapy in India" aptly describes the anticipated problems and suggests the ways out for its implementation.

The Directly observed treatment strategy has been the backbone of Revised National TB Control Programme. One of the factors for successful completion of patients' treatment is the type of treatment supporter assigned for the patients. They have a daunting task of providing moral support to the patients and ensuring their compliance to treatment. The article "Treatment supporters and their role in ensuring adherence to TB treatment under Revised National Tuberculosis Control Programme" describes the various types of institutional and community treatment supporters. The author has also assessed the adherence amongst supporters.

Tuberculosis during pregnancy is certainly a challenge to manage. The review article on "Management of Tuberculosis during Pregnancy-A Review" makes an effort to highlight the importance and impact of maternal TB on fetus, the findings of screening activities and the treatment aspects of drug-sensitive and resistant tuberculosis.

Bio-containment is important to preserve the health of personnel working in laboratories dealing with airborne infectious agents. The level of containment needed is dependent on how effectively dangerous the organism is being handled. The article "Perspectives on Bio Safety Laboratory III Design" provides an overview of types of bio-safety laboratories; discuss their engineering features and designs. The in-depth insights help the programme personnel to rationalize their views on containment at laboratories.

In the era of TB elimination, understanding the dynamics of vitamin D, the vitamin D receptors and Tuberculosis disease is vital. At a cellular level, the vitamin D acts on vitamin D receptor through immunomodulation, a change in vitamin receptor genes through polymorphism may lead to development of TB disease. The article entitled, "Expressions of polymorphisms in Vitamin D receptor gene among TB patients in India: Leave no stone unturned!" emphasizes on the interaction of vitamin D, vitamin D receptors, more common polymorphism and their role on developing disease. An appeal is made to the programme for extensive molecular level research to identify commoner types of vitamin D receptor polymorphism in India and devise appropriate treatment strategies.

- ***Editor***

NTI Bulletin 2017, 53/1&4, 2 - 5

CHALLENGES AND PROGRAMMATIC SOLUTIONS FOR TUBERCULOSIS PREVENTIVE THERAPY IN INDIA

R. Deshmukh[1] & R. Munje[2]

INTRODUCTION

Tuberculosis (TB) is a global public health problem and one of the leading causes of deaths due to an infectious disease, worldwide. There were an estimated 10 million new TB cases and 1.3 million TB deaths globally in 2017.[1] India is a high TB burden country with estimated 2.8 million new cases in 2017 and accounts for 27% of global burden.[2]

Ending global TB epidemic is one of the Sustainable Development Goals (SDG) target for 2030.The World Health Organization (WHO) "End TB Strategy" has set target for 95% reduction in TB deaths and 90% reduction in TB incidence rate by 2035, as compared to 2015.[3]

The National Strategic Plan (NSP) for TB elimination in India (2017-2025) aims to achieve a rapid decline in Tuberculosis mortality, morbidity and sets ambitious targets towards TB elimination by 2025[4]. The WHO predicts 10% decline of annual TB incidence per year by 2025 with universal health coverage, use of current and new tools like a vaccine, a point-of-care test, new drugs, shorter regimens for treatment of active TB and latent infection.[3]

Despite remarkable success in the expansion of TB diagnostic services, public private partnerships and programmatic management of drug-resistant TB (DR-TB) services in the past decade, the decline of TB incidence in India is too slow to achieve the End TB Strategy targets.

Experiences and evidences from countries, which have achieved or on track to achieve the end TB targets highlight the need for a comprehensive approach including system strengthening accelerated case finding, treatment and prevention of TB[5].

Tuberculosis preventive therapy is one of the important components of NSP (2017-2025) for TB elimination in India. NSP results framework outcome indicator target includes 90% identified or eligible individuals for preventive therapy to be initiated on treatment by the end of 2025.[4]

Latent TB infection (LTBI) diagnosis and treatment

The WHO defines LTBI as a "state of persistent immune response to stimulation by Mycobacterium Tuberculosis antigens with no evidence of clinically manifest active TB"[6]. Mycobacterium TB bacilli in these individuals are dormant but still alive. There is granuloma formation, which walls off bacteria. The individual is asymptomatic, infected with TB but not an active case of TB. However, there is risk of developing active TB in 5-10% individuals during their lifetime. There is significantly higher risk of infants, young children less than 5 years and immune compromised individuals like people living with HIV (PLHIV) for developing active TB[6].

Nearly 1.7 billion (23%) of world's population are estimated to have latent TB

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Key words: *Pulmonary tuberculosis, Prevention and Control, LTBI, IGRA, Tuberculin skin Test, Rifapentine, Community health workers, India*

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infection from this reservoir, 5-10% of individuals will develop active TB depending on the risk of developing TB. [1, 6] Identifying and treating the LTBI reservoir is critical to achieve TB elimination in India.

The WHO LTBI Guideline Development Group (GDG) identified increased risk for progression to active TB among PLHIV, adult and child TB contacts, patients on dialysis and underweight people.[6] WHO GDG recommended TB preventive therapy in these groups. The new recommendation as per WHO LTBI guidelines 2018 highlights provision of TB preventive therapy to children aged ≤ 5 years, adolescents and adults who are household contacts of people with bacteriologically confirmed pulmonary TB, not having active TB disease. Several other reports like Institute of Medicine report, American Thoracic society and the Centers for Disease Control and Prevention highlight the need to strengthen efforts for prevention of TB in contacts of bacteriological confirmed cases.[7, 8]

Active TB disease must be excluded before initiating preventive treatment. For individuals with TB symptoms or abnormal chest radiographic findings, the investigations should be performed in accordance with Revised National TB Control Program (RNTCP) Technical and Operational guidelines (TOG).[9] Contacts who are excluded from active TB after investigations may be considered for preventive treatment.

As of now, there is no gold standard test for LTBI diagnosis. The WHO GDG strongly recommends the use of either Tuberculin skin test (TST) or Interferon Gamma Release Assay (IGRA) depending on the feasibility and affordability of these tests for a country. However, the group recommended LTBI testing should not be a requirement for initiating TB preventive treatment for PLHIV and less than 5 years old child household contacts, particularly in countries with high TB incidence.[6]

LTBI treatment or preventive therapy is treatment offered to individuals who are considered to be at risk for TB disease, in order to reduce that risk.6 A systematic review of randomized control trials (RCTs) involving PLHIV showed that isoniazid monotherapy reduces the overall risk of TB by 33% (RR 0.67; 95% CI 0.51; 0.87), and for people who had positive TST, the preventive efficacy reached 64% (RR 0.36; 95% CI 0.22; 0.61). Moreover, the efficacy of the 6-month regimen was not significantly different from that of 12 months' daily isoniazid monotherapy (RR 0.58; 95% CI 0.3;1.12).10 Another systematic review showed that the efficacy and the safety profile of 3-4 months' daily rifampicin plus isoniazid were similar to those of 6 months' isoniazid.[11,12].

Newest treatment choice of LTBI treatment includes 3-month weekly regimen of rifapentine plus isoniazid. This is based on results of two RCTs which found no significant difference in the incidence of active TB between participants given a 3-month weekly regimen of rifapentine plus isoniazid and 6 or 9 months of isoniazid monotherapy (RR 0.73, 95% CI 0.23;2.30). Furthermore, the risk for hepatotoxicity was found to be low and completion rates were high with the 3-month weekly regimen of rifapentine plus isoniazid.[13-16]

The efficacy of currently available preventive treatment regimens ranges from 60-90 %.[17] GDG also noted that rifampicin and rifapentine containing regimen should be prescribed with caution to PLHIV who are on Anti-retroviral therapy (ART) because of potential drug interactions. It is recommended that rifapentine-containing regimens should not be administered with dolutegravir until more information becomes available.[18, 19]

Implementing TB preventive therapy (TPT) in India will reduce the reservoir of infection and also help in preventing recurrence of past disease. Moreover, implementation of TPT will reduce the risk of TB among HIV–infected individuals.

CHALLENGES AND PROGRAMMATIC SOLUTIONS

Programmatic management of latent TB infection is critical to achieve TB elimination in India. However, several challenges have been envisaged in implementation of LTBI management.

The key challenges and programmatic solutions include:

1. **Policy**: Guidelines for programmatic management of LTBI are in progress as of now. National guidelines for testing algorithm and treatment regimen will be required to guide program managers for implementation of LTBI management.

2. **Human resource**: Identification of contacts, referral for LTBI diagnosis, treatment, adverse drug events management and follow-up of TB preventive services will need health workers in rural and urban areas. Additional human resource will be needed for reaching out to eligible group. Involvement of general health system staff like Accredited Social Health Activist (ASHA), Auxiliary nurse midwife (ANM) and Medical officers (MO) at primary health centers will be fundamental for preventive management at peripheral level.

3. **Training**: RNTCP training program is predominantly focused on programmatic management of TB. Training component for programmatic management of LTBI needs to be developed for various levels of health staff.

4. **Diagnosis**: RNTCP diagnostic services are equipped for TB/DR-TB diagnosis but do not include LTBI diagnosis. Developing diagnostic algorithm for various groups, strengthening laboratory infrastructure to incorporate LTBI diagnostic tests and decentralization of LTBI diagnostic services especially radiology services will be required. Utilization of general health system laboratory and radiology services at peripheral health institution level and multitasking at laboratory facilities will reduce the delay in diagnosis and further linkage to preventive treatment.

5. **Treatment**: Policy on treatment regimen and availability of drugs for the eligible population is in progress as of now. Adverse events management for LTBI treatment needs to be in place. Engagement of general health system for decentralized treatment, counseling and adverse drug event management will help in improving the preventive treatment completion.

6. **Recording and reporting**: Mechanism for recording, reporting of LTBI diagnosis, treatment and follow-up is not in place as of now. Developing records, reports, data management and upgrading NIKSHAY for incorporating LTBI management will be required.

7. Information, education & communication (IEC): TB associated stigma is an important barrier for uptake of LTBI services. IEC designed to reduce the stigma and increase awareness regarding preventive treatment in eligible population will be helpful to increase the uptake of LTBI services.

In conclusion, addressing the challenges for effective management of LTBI in programmatic settings in India will be important for achieving the NSP (2017-25) outcome indicators and towards fast-track achieving NSP goal for rapid decline in burden of TB.

Conflict of interest: Nil.

DISCLAIMER:

The findings and conclusions in these reports are those of the authors and do not necessarily represent the official position of the World Health Organization, USAID or Government of India.

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NTI Bulletin 2017, 53/1&4, 6 –12

TREATEMENT SUPPORTERS & THEIR ROLE IN ENSURING ADHERENCE TO TB TREATMENT UNDER THE REVISED NATIONAL TUBERCULOSIS CONTROL PROGRAMME – A RECORD BASED STUDY IN BENGALURU

S K Tripathy[1]

ABSTRACT

Objective: To analyze the frequency of treatment interruption in new smear positive Tuberculosis (TB) patients taking treatment under supervision of various treatment supporters in Bengaluru city from1st Oct 2010 to 30th Sepember 2011.

Method: Retrospective record-based cohort study of routinely recorded data collected from treatment card of new smear positive TB patients registered in 9 Tuberculosis Unit(TU) of Bengaluru city from 1st Oct 2010 to 30th Sep 2011 with validation of data by cross checking with TB register and treatment supporter register maintained at Designated Microscopy Centre (DMC).

Result: Total of 1,864 new smear positive TB patient's treatment cards were evaluated during the period and among them 329(18%) patients had treatment interruption for one or more days during intensive phase. Of the 329 new smear positive TB patients 90(27%) were taking treatment under the supervision of community Treatment supporter and rest 239(73%) under the supervision of Institutional Treatment supporter. The frequency of treatment interruption was found to be significantly lower ($P<0.05$) in patients taking treatment under the supervision of community treatment supporter than institutional treatment supporter. The treatment success rate (91%) was significantly higher in patients taking treatment under supervision of community treatment supporter than those taking treatment under the supervision of institutional treatment supporter (80%).

Conclusion: Treatment interruption was relatively less among those TB patients taking treatment under community treatment supporter than those taking treatment under the support of Institutional treatment supporter and hence community Directly Observed Treatment (DOT) should be encouraged.

INTRODUCTION

Proper case management and complete cure of TB patients is one of the prime responsibilities of all physicians who treat them for successful TB control globally.[1] Compliance of the patient for the total duration of treatment of TB is a challenge as it involves treatment for a minimum of 6 months.[2] Up to half of TB patients having self-administered treatment do not complete their treatment leading to spread of infection to other uninfected individuals in the community.[3] Poor adherence may also lead to relapse, failure, drug resistance TB and death.[4] RNTCP, India has adopted the internationally recommended directly observed treatment short

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course (DOTS) strategy after pilot testing in 1993. Under the strategy a treatment supporter who is acceptable and accessible to the TB patients and accountable to the health system supervises and supports them for completion of the treatment.[5] Treatment supporters who are also called as DOT providers may be any health worker from the health centre where patient is taking treatment, such as pharmacist, staff nurse, lab technician, TB health visitor or from the community in which the patient is residing, such as Anganwadi worker, Accredited social health activists (ASHA), Link worker, Teacher, Alternative medicine health provider. Community DOT has been introduced in the program as a part of decentralization effort and to avoid inconvenience caused to the patient. As per the programme guidelines retrieval activity are to be carried out by the treatment supporter within 24 hrs of missing of scheduled supervised dose both during intensive and continuous phase by home visit and counseling so that the patient can be brought back to the health system for completion of rest of treatment.[5] Supervision of treatment is most essential during the intensive phase of treatment as maximum reduction in infectiousness takes place during this phase.[6] Despite supervision by treatment supporter many of the TB patients taking treatment under DOTS interrupt treatment frequently. Successful outcome in a TB patient who has interrupted treatment is considered as an indicator of prompt retrieval activity by the treatment supporter. A record-based analysis of the new smear positive TB patients taking treatment under DOTS in Bengaluru city during the period 1st Oct 2010 to 30th Sepember 2011 who had treatment interruption during intensive phase was undertaken to know about the support provided by various types of treatment supporters in ensuring adherence to treatment of tuberculosis from a provider's perspective.

METHOD:

Study design & study settings

This is a retrospective cohort study of the routinely collected data by RNTCP which is managed by BBMP in Bengaluru city. Public health TB control services was provided through total 9 Tuberculosis Units (TU) and 50 Designated microscopy centers (DMC) for a population of 9.5 million during 2010-11 in the city.[7]As per RNTCP norms in 2010-11, 1 TU was catering to a population of approximately 500 thousand population and 1 DMC to approximately 100 thousand population.[5] A TB patient under the public health system in urban setup after being diagnosed and routine home visit by the TB health visitor is counseled by the medical officer of the concerned peripheral health institution (PHI) or DMC on the organization of treatment by DOT and a treatment card is filled up. As per the choice of the patient and in consultation with treating medical officer the patient wise boxes and treatment card are then handed over to the assigned treatment supporter for supervision of treatment. For those opting for community treatment supporter duplicate treatment card was provided to the treatment supporter with original kept at PHI or DMC for fortnightly update. All the treatment supporters were trained in RNTCP.

Definitions

For defining new smear positive TB and treatment outcome routine RNTCP definitions were used[5]. Favorable treatment outcome was defined as those TB patients having cured and treatment completed and rest all with other outcomes such as died, transferred out, lost to follow up, failure was defined as unfavorable outcome.

Treatment interruption was defined as a TB patient who has missed taking the scheduled supervised dose for one or more days.

Community treatment supporter was defined as a person who volunteered to administer DOT as per guidelines and who belonged to the community where the patient resided but not a government health worker or a member of the family. Institutional treatment supporter was defined as any Government health worker in the Institution either PHI or DMC

who was trained by RNTCP & administered DOT.

Data collection and analysis

Treatment card of all the new smear positive TB patients registered during 1st Oct 2010 to 30th Sep 2011 were collected by field workers of National Tuberculosis Institute and the relevant data from the treatment card was crosschecked with the TB register and treatment supporter list available in respective DMC. After crosschecking the extracted data was double entered in EpiData entry software Version 3.1 (The EpiData Association, Odense, Denmark). Data analysis was done with the help of EpiData analysis software & Open Epi software, version 2.3 (Emory University, Atlanta, GA, USA). Two tailed chi-square test and Yates's correction was used for determining significance.

ETHICS APPROVAL

Ethics approval for the study was obtained from the Ethics Committee of the National Tuberculosis Institute, Bangalore, India.

RESULT

A total of 2,099 new smear positive TB patients were registered during 1st Oct 2010 to 30th Sep 2011 under RNTCP in Bengaluru city. The treatment card of 1,864(89%) patients could be collected for evaluation. Among the 1,864 TB patients 604(32%) were taking treatment under the supervision of Institutional Treatment supporter and the rest 1,260(68%) were supervised by community treatment supporter. Treatment interruption was found in 239(19%) patients among those taking treatment under the supervision of Institutional treatment supporter and 90(15%) among those taking treatment under the supervision of community treatment supporter (Figure1). On analysis of proportion of patient having treatment interruption among different types of Institutional treatment supporter, those taking treatment under the supervision of ANM (27%) and others such as pharmacist, lab technician, etc., had maximum treatment interruption (31%) and among the community Treatment supporter those taking under the supervision of alternative medicine provider had maximum interruption (25%) (Table1).

More than 40% of TB patients were having treatment interruption for less than 10 days in both the groups. Overall frequency of treatment interruption was significantly lower ($P<0.05$) among smear positive TB patients taking treatment under the supervision of community Treatment supporter than those taking under the supervision of Institutional Treatment supporter (Table2).

DISCUSSION

This retrospective record-based analysis has shown that treatment interruption was significantly higher in those TB patients supervised by Institutional treatment supporter than those supervised by community treatment supporter. Previous studies and Meta-analysis have reported that long waiting time due to heavy workload, lack of privacy, inconvenient opening times and poor upkeep of health facility are few of the causes of poor adherence in those TB patients taking treatment under the supervision of Institutional Treatment supporter.[8-13] Although the access to healthcare is more convenient in urban than the rural setup, the distance of the health centre from patients' home is a reason for treatment interruption.[13] Poor follow up, inadequate retrieval activity and impolite behavior by the provider in Institutional DOT centre have also been found to be reasons for non adherence[13].

Among the community Treatment supporter in Bengaluru city majority of new smear positive TB patients were supervised by trained community health worker such as link worker and their retrieval activity were optimum in comparison to other community volunteers as the frequency of treatment interruption was less. Similarly, among the Institutional treatment supporter majority of patients were being supervised by TB health visitor who are field workers recruited by RNTCP and the frequency

of interruption was less than others.

One of the most important finding of the analysis was more than 40% of patients were having treatment interruption for less than 10 days which indicates that retrieval of the patient by counseling and home visit can bring back majority of the TB patient back to the health system. This emphasizes the importance of DOT as a mode of supervision, which is essential for ensuring adherence to TB treatment particularly in a high TB burden country like India.

One of the frequent arguments against DOT is the time needed to present for taking of direct observation of treatment compromises their ability to attend to other daily tasks.[12] Many feel direct supervision by health worker as 'distrust' by the public health system.[12]

With the availability of community treatment supporter near their residence or place of work and availability of flexible timing and more choices for the patient, the adherence of the patient has considerably improved. Supervised family DOT as an option has also been explored by many studies as an alternative and has been found to be effective particularly in hilly and difficult to reach areas where direct observation of treatment is not feasible.[14, 15]

There is lack of data in India on the usefulness of family DOT as a mode of supervision and support for treatment in adult TB patients. The argument against family DOT is irregular supervision by a family member sometimes may compromise the programme.[16]

However, family DOT as a mode of treatment supervision has been introduced in India for the TB patients who are seriously ill bedridden patients and children. In such situations the family member who is assigned with the responsibility to observe treatment are trained well and supported during the process by a health worker with frequent visit to the house.[17]

In recent years, patients and health care providers have taken advantage of the improved access to information and communication technology (ICT) globally and in India. Use of digital treatment support such as video observed treatment (VOT), drug administration monitoring devices (Medication Event Monitoring System box,99DOT), SMS communication for treatment and follow up has been advocated by WHO Global TB programme for ensuring adherence to treatment which may lead to better treatment outcome.[18]

There are a few limitations in our study. Adherence to treatment of TB may also be affected by other confounding factor such as adverse reaction beside supervision by treatment supporter that was not analyzed here. This is an analysis of the records routinely maintained at public health facilities which may not be always error free. Some of the TB patients may have changed treatment supporter during treatment which may not have been captured in the records.

CONCLUSION:

The frequency of treatment interruption was less in TB patients who were taking treatment under the supervision of community treatment supporter than those taking under the supervision of Institutional treatment supporter. However, to further reduce the frequency of treatment interruption, other modes of treatment support may also be explored keeping in view the requirement of TB patient's privacy and flexibility in choices after due assessment of its feasibility and acceptability under local conditions.

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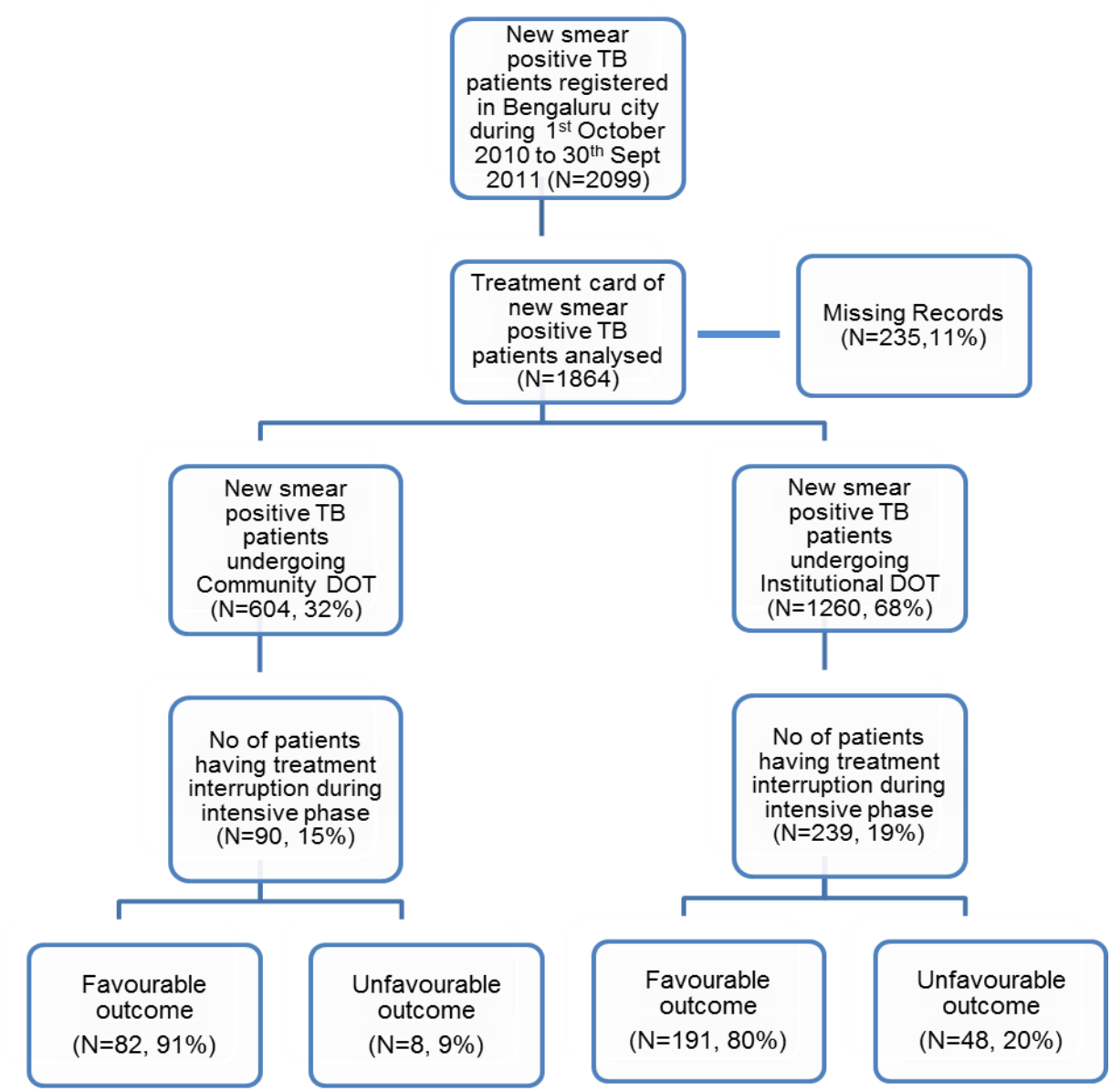

Fig-1: Flowchart of new smear positive TB patients undergoing DOTS in Bengaluru city from 4th QR 2010 3rd QR 2011 and having treatment interruptions during intensive phase

Table1: New smear positive TB patients of Bengaluru city taking treatment under supervision of different Treatment supporter during 4thQR 2010 to 3rdQR 2011 and treatment interruption among them

Treatment supporter		Total no of patients	With treatment interruption N (%)
Community Treatment supporter	Community health workers	430	67(16)
	Allopathic doctor	95	10(11)
	Alternative medicine providers	12	3(25)
	shopkeepers	16	1(6)
	Teachers	2	0(0)
	others	49	9(6)
Total		604	90(15)
Institutional Treatment supporter	TB health visitors	1008	163 (16)
	Staff nurses	8	0 (0)
	ANM	15	4 (27)
	Others	229	72 (31)
Total		1260	239(19)

Table2: Various interval of treatment interruption during intensive phase among new smear positive TB patients taking DOTS in Bengaluru city during 20101-11

Treatment interruption (days)	No of patients N (%)	Community Treatment supporter N (%)	Institutional Treatment supporter N (%)	P value
1-10	150(46)	44 (49)	106 (44)	P>0.05
11-20	63(19)	15 (17)	48 (20)	P>0.05
21-30	56(17)	16 (18)	40 (17)	P>0.05
>30	60(18)	15 (16)	45 (19)	P>0.05
Total	329	90	239	P<0.05

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MANAGEMENT OF TUBERCULOSIS DURING PREGNANCY – A REVIEW

A Poornima[1]

SUMMARY

Tuberculosis (TB) is an infectious airborne disease. TB is the tenth leading cause of death worldwide ranking above Human Immunodeficiency Virus / Acquired Immuno-deficiency Virus (HIV/AIDS).TB mainly affects women when they are economically and reproductively active. TB during pregnancy especially in HIV-infected women is associated with increased maternal mortality and morbidity. The risk of neonate getting TB infection shortly after birth is significantly higher. If active TB disease is diagnosed in a neonate, it must be treated with full course of anti-tuberculosis drugs. If there is no evidence of active disease, Isoniazid prophylaxis Therapy (IPT) should be given. Early detection and prompt initiation of TB treatment is the best way to prevent transmission of TB from mother to child, reduce the morbidity and mortality due to TB disease and also to reduce the risk of poor treatment outcomes. Hence, there is a need for systematic screening for active TB in pregnant women. Antenatal clinic attendee rates are very high in the country as the Reproductive and Child Health (RCH) programme receives high priority and is a leading public health programme in the country. Screening pregnant women for TB in Maternal and Child Health (MCH) clinics provides an exceptional opportunity to identify and reach women in need of TB case diagnosis as a majority of women access health care during pregnancy at least once. TB Symptoms screening must be undertaken for all mothers attending the antenatal clinics at every visit and those who are symptom screen positive must be immediately linked to the nearest laboratory for early TB diagnosis and decision on TB treatment initiation. The management of tuberculosis in pregnancy is a multidisciplinary approach, with the team comprising of pulmonologist/physician, obstetrician, neonatologists, public health officials and counselors. Correct chemotherapy is the best way to prevent transmission of TB to baby.

The treatment regimen has to be followed as per Revised National Tuberculosis Control Programme (RNTCP) technical and operational guidelines for TB control in India 2016 (TOG). Breastfeeding should not be discouraged for woman being treated with first line anti-TB drugs because the concentration of these drugs in breast milk is too small to produce toxicity in the nursing newborn. Pregnancy is not a contraindication for treatment of active drug resistant TB, but poses great risk to both mother and fetus.

Drug Resistant TB (DR-TB) should be managed according to the Programmatic Management of Drug Resistant TB (PMDT) in India 2017 guidelines. Birth control is strongly recommended for all non-pregnant sexually active women receiving therapy for drug resistant TB. This is to avoid the potential consequences for both mother and fetus resulting from drug resistant TB.

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Key words: *Pregnancy, Lactation, BCG, Anti Tubercular Agents, Tuberculosis, Multi-drug resistant, India*

1. INTRODUCTION

TB is an infectious airborne disease. TB is the tenth leading cause of death worldwide, and since 2011, it has been the leading cause of death from a single infectious agent, ranking above human immunodeficiency virus - HIV/AIDS.[1]Pulmonary tuberculosis, which affects lungs, is more infectious form of disease and is more common than extra pulmonary Tuberculosis (EPTB). Extra pulmonary tuberculosis affects organs other than lungs such as lymph nodes, pleura, bones and joints meninges of brain, intestine, genitourinary tract etc. The burden of EPTB ranges from 15 to 20% of all TB cases in HIV negative patients, while in HIV- positive patients, it accounts for 40 to 50% of new TB cases. Female genital TB includes TB affecting uterus, fallopian tubes and / or ovaries.[6]

TB mainly affects women when they are economically and reproductively active, the impact of the disease is also strongly felt by their children and families. Males are more likely to be affected by TB disease compared to females. Due to Stigma, social discrimination, cultural and financial barriers, the health seeking behavior of most of the women is often delayed resulting in delayed presentation and more severe illness. Morbidity and mortality in TB is increasing due to emergence of drug resistance and co-infection with HIV. Factors such as malnutrition, diabetes, immunodeficiency state, tobacco use can exacerbate the risk of TB disease. Mother to neonatal transmission of disease is well known. Hence, early detection and correct full course of chemotherapy with anti TB drugs is the best way to prevent transmission of TB from mother to child and also for achieving successful maternal and neonatal outcomes. Pregnancy is not a contraindication for treatment of active TB disease. TB treatment is safe during pregnancy. Breastfeeding should be encouraged and mother should be advised about cough hygiene measures. Women of childbearing age should be counseled regarding current or planned pregnancy and also advised about various methods of contraception.

2. BURDEN OF TUBERCULOSIS DISEASE IN WOMEN

Globally in 2017, the estimated TB incidence was 10.0 million (range 9.0–11.1 million), of which 3.2 million were women. Among the total mortality, due to TB disease was 1.57 million (including 0.3 million among people living with HIV (PLHIV)), mortality due to TB disease in HIV negative women was 37% and in HIV positive women was 43%.[1]

In India, in 2017 the estimated TB incidence was 2.74 million, accounting for 27% of the global TB burden. The estimated TB incidence in females was 9,54,000. India accounted for 32% of global TB deaths among HIV-negative people and for 27% of the combined total TB deaths in HIV-negative and HIV-positive people.

Urogenital TB makes up approximately 4% of all EPTB cases annually in India.[6] This may be an underestimate of the true number of cases, as there is difficulty in diagnosing the condition and also due to lack of clear case definitions.

3. IMPACT OF TB ON MATERNAL HEALTH

The effects of TB on pregnancy may be influenced by various factors like the severity of the disease, nutritional status of mother, presence of concomitant disease, immune status, extent of the disease, stage of pregnancy, the presence of extra pulmonary spread, HIV co-infection and availability of facilities for early diagnosis and treatment. TB in pregnancy especially in HIV-infected women is associated with increased maternal mortality and morbidity, neonatal morbidity, low birth weight babies, premature birth, intrauterine growth retardation, increased risk of TB transmission to the infant and increased infant mortality.[9,10] Evidence from India has found that TB among mothers living with HIV is associated with double risk of vertical transmission of HIV to the urban child.[4]

3.1 Effect of maternal TB on fetus and neonate

Depending upon whether the mother has pulmonary or extra-pulmonary TB, the route of transmission varies. Mother to child transmission of TB can occur by following ways:[11&12]

- **In utero**
  - Haematogenous spread through the umbilical vein
  - aspiration or swallowing of infected amniotic fluid
- **Intrapartum Period**

  Aspiration /ingestion of infected amniotic fluid or genital secretions.
- **Postpartum**
  - Infection may occur through aerosol spread (inhalation of droplet nuclei).
  - Through infected breast milk from an active tuberculosis lesion in the breast.

3.1.1 Congenital TB

True congenital TB is rare. The risk of neonate getting TB infection shortly after the birth is significantly higher.

Cantwell et al. proposed diagnosis of congenital tuberculosis in the presence of proven tuberculosis disease and at least one of the following; [14]

(i) Lesions in the newborn baby during the first week of life.

(ii) A primary hepatic complex or caseating hepatic granulomata.

(iii) Tuberculosis infection of the placenta or the maternal genital tract.

(iv) Exclusion of the possibility of postnatal transmission by investigation of contacts, including hospital staff.

The diagnosis of TB in the newborn may be challenging. Clinical suspicion is important as early symptoms are often nonspecific and may be indistinguishable from those of other congenital infections. With congenital TB, symptoms are usually seen in the second and third weeks of the infant's life, radiographic abnormalities may also be present but these generally appear later and a definitive diagnosis rests on the culture of M. tuberculosis from tissues or fluids. If active disease is diagnosed, TB must be treated with full course of anti-tuberculosis drugs. If there is no evidence of active disease, isoniazid prophylaxis should be given.

4. IMPACT OF PREGNANCY ON TB

Immunological changes associated with pregnancy present an opportunity for mycobacterial infection or re-activation. TB is believed to get flared up by the stress of pregnancy, especially in association with a poor nutritional status, immuno-deficient state, or co-existent diseases. The loss of protective antibodies in mother during lactation also favors the development of post-partum TB.[11] However, more studies are needed to substantiate the hypothesis. Pregnancy symptoms can mask TB symptoms resulting in delayed diagnosis of TB. If anti-tuberculosis treatment is started early in pregnancy, the outcome is same as that in non-pregnant patients and late diagnosis is associated with increase in obstetric morbidity and preterm labour.

5. SYSTEMATIC SCREENING

Early detection and prompt initiation of TB treatment is the best way to prevent transmission of TB from mother to child, reduce the morbidity and mortality due to TB disease and also to reduce the risk of poor treatment outcomes. Untreated TB or delayed diagnosis and late initiation of treatment may lead to severe consequences affecting both mother and child. Hence, there is a need for systematic screening for active TB disease in pregnant women.

WHO's End TB strategy includes systematic screening for active TB in high risk groups within the first component of pillar [1,7]

which highlights the need for early diagnosis of TB. Systematic screening for active TB is predominantly provider-initiated. Screening for TB in pregnancy comes under conditional recommendations 6 of WHO guidelines for systematic screening for active TB.[18] The initial screening includes screening for symptoms (screening either for cough lasting for >2 weeks, or screening for any symptom compatible with TB, including cough of any duration, haemoptysis, weight loss, fever or night sweats) or screening with chest radiography. If symptom screening is used initially, then chest radiography can be used as a second screen to improve the pretest probability of the subsequent diagnostic test, and to reduce the number of people who need to undergo further diagnostic evaluation. Screening can be made efficient by combining screening for TB with screening for HIV.[21] Diagnosis and treatment of TB in pregnancy is multidisciplinary, requiring input from all the physicians involved in the care of mother and fetus. If the chest x-ray is necessary, suitable shielding will limit fetal radiation exposure to less than 0.3 mrads and should not harm the fetus.[22]

There were 9 studies which screened pregnant women. Studies included screening of pregnant women attending antenatal clinics, pregnant women receiving prevention-of-mother-to-child-transmission (PMTCT) care for HIV prevention, and women presenting for delivery. Among pregnant women screened, the overall median Number Needed to Screen (NNS) was 144 (IQR 47-1457) and the weighted mean was 169 (25-3847).In 4 of the 9 studies(one in the USA, one in India and two in South Africa) screening was conducted in HIV-infected women only. The weighted mean NNS among the 4 studies focusing on pregnant women with HIV in medium & high incidence countries was 36 (25-88). Not any single study significantly affected the overall weighted mean and overall NNS.

Antenatal clinic attendee rates are very high in the country as the RCH programme receives high priority and is a leading public health programme in the country[2]. Screening pregnant women for TB in MCH clinics provides an exceptional opportunity to identify and reach women in need of TB case diagnosis as a majority of women access health care during pregnancy at least once. Antenatal care provides good opportunity for TB screening as mothers will be receptive to counseling regarding TB disease and prevention of TB transmission to child. Strengthening Linkages between maternal health and TB management can contribute to the reduction of maternal and newborn mortality too. In over-crowded antenatal clinics (ANC), there is a chance of TB through air-borne infections. Necessary preventive measures like cleanliness, wearing masks are to be taken by both the patients and the clinic. Antenatal clinic should follow airborne infection control measures according to the guidelines on airborne infection control - 2010 which is available in TBC India official website (www.tbcindia.gov.in).

TB Symptoms screening must be undertaken for all mothers attending the antenatal clinics at every visit and those who are symptom screen positive must be immediately linked to the nearest laboratory for early TB diagnosis and decision on TB treatment initiation. TB screening should be done by doctors and health workers whenever patients visit the antenatal clinics. Studies or data regarding TB screening in the antenatal setting is limited. Hence, there is a need for operational research in TB screening among antenatal mothers so that TB screening methods can be integrated in antenatal clinics.

6. DIAGNOSIS OF TB IN PREGNANCY

TB disease in pregnancy may present with diagnostic challenges, mainly because of the often-nonspecific nature of the early symptoms of the disease, such as malaise and fatigue, which may be attributed to pregnancy and not raise the suspicion of TB disease. Despite this, the presentation of TB in pregnant women is similar to that in non-pregnant individuals, with pulmonary TB being the most common

manifestation of the disease. The most important step in making the diagnosis of TB in pregnancy is the identification of risk factors for TB disease and specific enquiry about the symptoms which may be suggestive of TB disease.[12]History of exposure to individuals with chronic cough or active TB should also be obtained. TB screening should be done in settings of high HIV prevalence, as the rates of TB disease in pregnant women are high in these settings. The TB diagnostic algorithm as per the revised national TB control program (RNTCP) is shown in figure1&2.

The diagnostic tools for microbiological confirmation of TB and diagnostic algorithm for drug sensitive and drug resistant TB is same as for non-pregnant individuals as per RNTCP technical and operational guidelines for TB control in India 2016 and Guidelines on Programmatic Management of Drug-Resistant TB in India 2017.

7. MANAGEMENT OF TB IN PREGNANCY

Untreated tuberculosis imposes a far greater hazard to pregnant woman and her fetus than those undergoing treatment for the disease. Before initiating treatment for TB, women of childbearing age should be asked about current or planned pregnancy and counseled appropriately. The management of tuberculosis in pregnancy is a multi disciplinary approach, with the team comprising the pulmonologist/physician, obstetrician, neonatologists, public health officials and counselors.

7.1 Drug Sensitive TB

Microbiologically confirmed TB case refers to presumptive TB patient with biological specimen positive for acid fast bacilli or positive for mycobacterium tuberculosis on culture or positive for tuberculosis through quality assured rapid molecular diagnostic test.

Clinically diagnosed TB case refers to a presumptive TB patient who is not microbiologically confirmed but has been diagnosed with active TB by a clinician on the basis of x-ray abnormalities, histopathology or clinical signs with a decision to treat the patient with full course of anti-TB treatment.

A TB patient whose biological specimen is sensitive to both isoniazid and rifampicin will be categorized as micro-biologically confirmed drug sensitive TB. More than 90% of the TB is drug sensitive.

Correct chemotherapy is the best way to prevent transmission of TB to baby. The treatment regimen and duration in pregnant women should be the same as that in non-pregnant women. All first line Anti TB drugs except streptomycin is safe in pregnancy.

Streptomycin should be avoided in pregnancy as it is ototoxic to the fetus. Successful treatment of TB is important for successful maternal and neonatal outcomes.

The treatment regimen has to be followed as per RNTCP technical and operational guidelines for TB control in India 2016.

The principle of treatment of drug sensitive TB is to administrate daily fixed dose combinations of first line anti-tuberculosis drugs in appropriate weight bands.

Treatment in intensive phase (IP) will consist of eight weeks of isoniazid, rifampicin, pyrazinamide and ethambutol in daily dosages as per four weight band categories. There will be no need for extension of IP. Only Pyrazinamide will be stopped in continuation phase (CP) while the other drugs will be continued for another 16 weeks as daily dosages.

7.1.1 Breastfeeding

Breastfeeding women should receive a full course of TB treatment. Breastfeeding should not be discouraged for woman being treated with first line anti-TB drugs because the concentration of these drugs in breast milk is too small to produce toxicity in the nursing new born. For the same reason, drugs in breast milk are not an

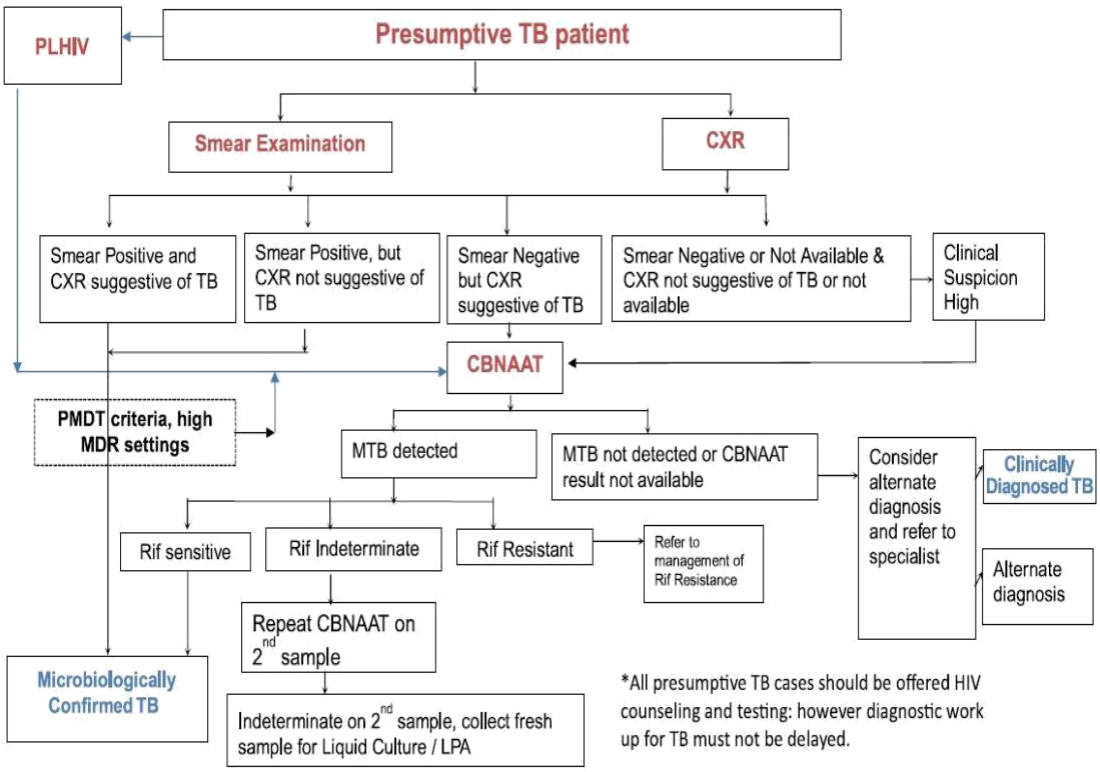

Figure 1: Diagnostic Algorithm for Pulmonary TB

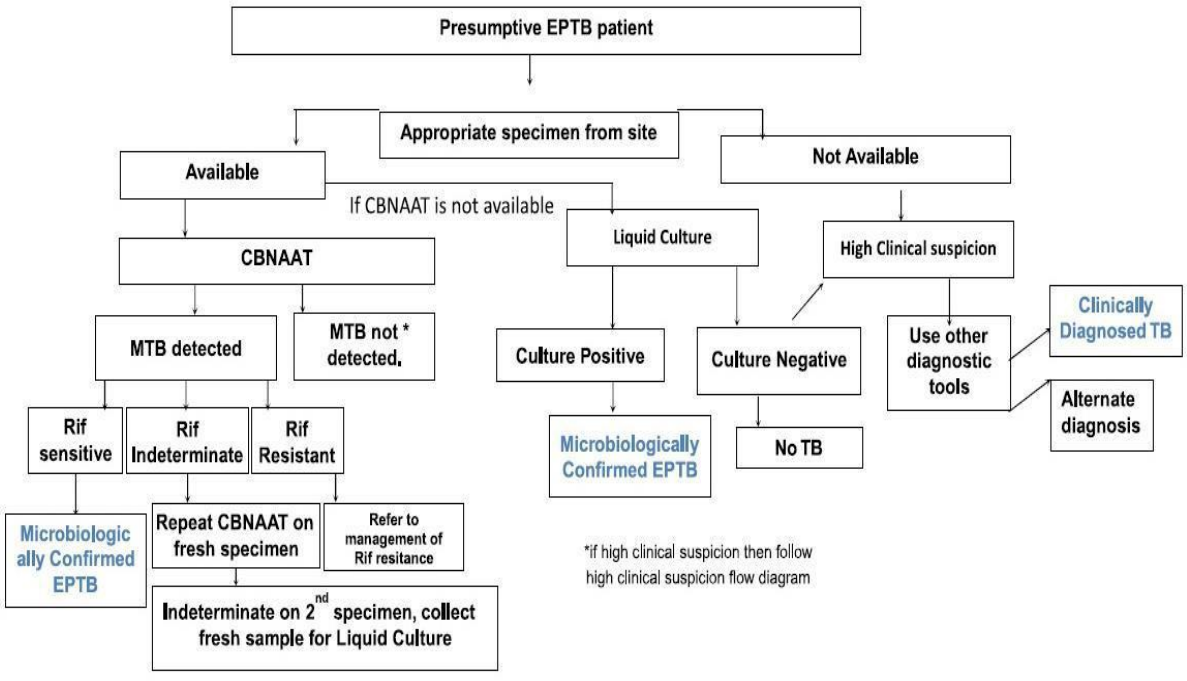

Figure 2: Diagnostic Algorithm for Extra Pulmonary

effective treatment for TB disease or latent TB infection in nursing infant. Mother should be advised about cough hygiene measures such as covering the mouth and nose while coughing, sneezing or any act which produce sputum droplets.

Pyridoxine 10 mg/day supplementation is recommended for all pregnant or breastfeeding women taking isoniazid. Mothers receiving Isoniazid and their breastfed infants should be supplemented with vitamin B6 (pyridoxine), recommended dose of pyridoxine in infants is 5mg/day.

A child born to a mother who was diagnosed to have TB in pregnancy should receive INH prophylaxis for 6 months, provided congenital TB has been ruled out. BCG vaccination can be given at birth even if INH prevention therapy is planned. The dose of INH for preventive therapy is 10 mg/kg body weight administrated daily for minimum period of 6 months.

7.2 Drug Resistant TB

The following are the definitions and classification for DR-TB patients. [3]

Presumptive DR-TB: It refers to the following patients in order of their risk:

- TB patients found positive on any follow-up sputum smear examination.
- During treatment with first line drugs including treatment failures;
- Pediatric TB non-responders;
- TB patients who are contacts of DR-TB;
- Previously treated TB patients;
- New TB patients with HIV co-infection;
- All notified new TB patients

A patient is confirmed to have drug resistant TB, only when the results are from a RNTCP quality-assured Culture & DST Laboratory and by a RNTCP-endorsed testing method. Such patients are classified according to the following definition:

Mono-resistance TB (MR): A TB patient, whose biological specimen is resistant to one first line anti-TB drug only.

Poly - drug resistance TB (PDR): A TB patient, whose biological specimen is resistant to more than one first-line anti-TB drug, other than both H and R.

Rifampicin resistance (RR): A TB patient, whose biological specimen is resistant to R, detected using phenotypic or genotypic methods, with or without resistance to other anti-TB drugs. It includes any resistance to R, in the form of mono-resistance, poly-resistance, MDR or XDR.

Multidrug resistance TB (MDR): A TB patient, whose biological specimen is resistant to both H and R with or without resistance to other first-line anti-TB drugs. MDR-TB patients may also have additional resistance to any/all FQ or any/all SLI anti-TB drug.

Extensive drug resistance (XDR): A MDR-TB patient whose biological specimen is additionally, resistant to at least a FQ (Ofx, Lfx, Mfx) and a SLI anti-TB drug (Km, Am, Cm).

All women of childbearing age should be tested for pregnancy as part of the pre-treatment evaluation and whilst on treatment if there is a history of amenorrhea of any duration.[3]

Pregnancy is not a contraindication for treatment of active drug resistant TB, but poses great risk to both mother and fetus. There is lack of experience in treating pregnant women with DR-TB. Teratogenicity has been demonstrated with only some of the drugs used to treat MDR-TB. It is prudent to solicit the opinion of an experienced Gynaecologist / Obstetrician while treating such patients. The risk and benefits of treatment should be carefully considered with the primary goal of smear conversion to protect the health of mother and child, both before and after birth. Most pregnant patients should be started on treatment as soon as the diagnosis is made. Delaying treatment carries a risk, as TB can advance quickly in pregnant patient. DR-TB patients found to be pregnant prior to treatment initiation or whilst on treatment are evaluated in

consultation with a Gynaecologist / Obstetrician taking into consideration the following factors:

- Risks and benefits of MDR-TB treatment
- Severity of the MDR-TB
- Gestational age
- Potential risk to the fetus

Further management of DR-TB patients who are pregnant prior to initiation of treatment or whilst on treatment are based on the duration of pregnancy.

7.2.1 If the duration of pregnancy is <20 weeks

The patient should be advised to opt for a Medical Termination of Pregnancy (MTP) in view of the potential severe risk to both mother and fetus. If the patient is willing, she should be referred to a Gynaecologist/Obstetrician for MTP following which a shorter MDR –TB regimen can be initiated (if the patient has not started treatment) or continued (if the patient is already on treatment) by the DR-TB Centre Committee.

7.2.2 For patients who are unwilling for MTP or have pregnancy of >20 weeks

(making them ineligible for MTP), the risks to mother and foetus need to be explained clearly and a modified conventional MDR TB regimen started or continued as detailed below:

- **For patients in the first trimester (≤ 12 weeks):** Kanamycin and Ethionamide are omitted from the regimen and PAS is added.
- **For patients who have completed the first trimester (>12 weeks):** Kanamycin is replaced with PAS. Post-partum, PAS maybe replaced with Kanamycin and continued until the end of the Intensive Phase.

In women of reproductive age who have been initiated on shorter MDR-TB regimen and became pregnant in spite of precautions and use of contraceptives, the risks to mother and fetus need to be explained clearly.

- If the pregnancy is <20 weeks, the decision on continuing shorter MDR-TB regimen would depend upon the willingness of the patient to opt for an MTP.
- If she is unwilling for MTP or has a pregnancy of more than 20 weeks duration, she needs to be shifted to modified conventional MDR-TB regimen.

Similarly, Km must be replaced with PAS in pregnant women considered for initiation or continuation of the regimen for H mono/poly DR-TB. Avoid Aminoglycosides as it is particularly toxic to the developing fetal ear. Ethionamide can increase the risk of nausea and vomiting associated with pregnancy, more so since teratogenic effects have been observed in animal studies. If injectable agents, Eto/Pto or other drugs were withheld because of the pregnancy, they can be added back postpartum to make more complete regimen.

Pregnant DR-TB patients need to be monitored carefully both in relation to treatment and progress of the pregnancy. This approach should lead to good results, since the patient should be smear-negative at the time of parturition, and mother and infant do not need to be separated

7.3 Breastfeeding

In lactating mothers on treatment, most anti-TB drugs will be found in the breast milk in concentrations that would equal only a small fraction of the therapeutic dose used in an infant. However, any effects on infants of such exposure during the full course of drug-resistant TB treatment have not been established.[3,19]

A woman who is breastfeeding and has active drug-resistant TB should receive a full course of DR-TB treatment. Timely and properly applied chemotherapy is the best way to prevent transmission of tubercle bacilli to the baby.[20] Breastfeeding should be encouraged as long as the patient is sputum negative. When the mother and infant are together, this common time should be spent in well-ventilated areas or outdoors. The mother should use a surgical mask until she becomes sputum smear negative.

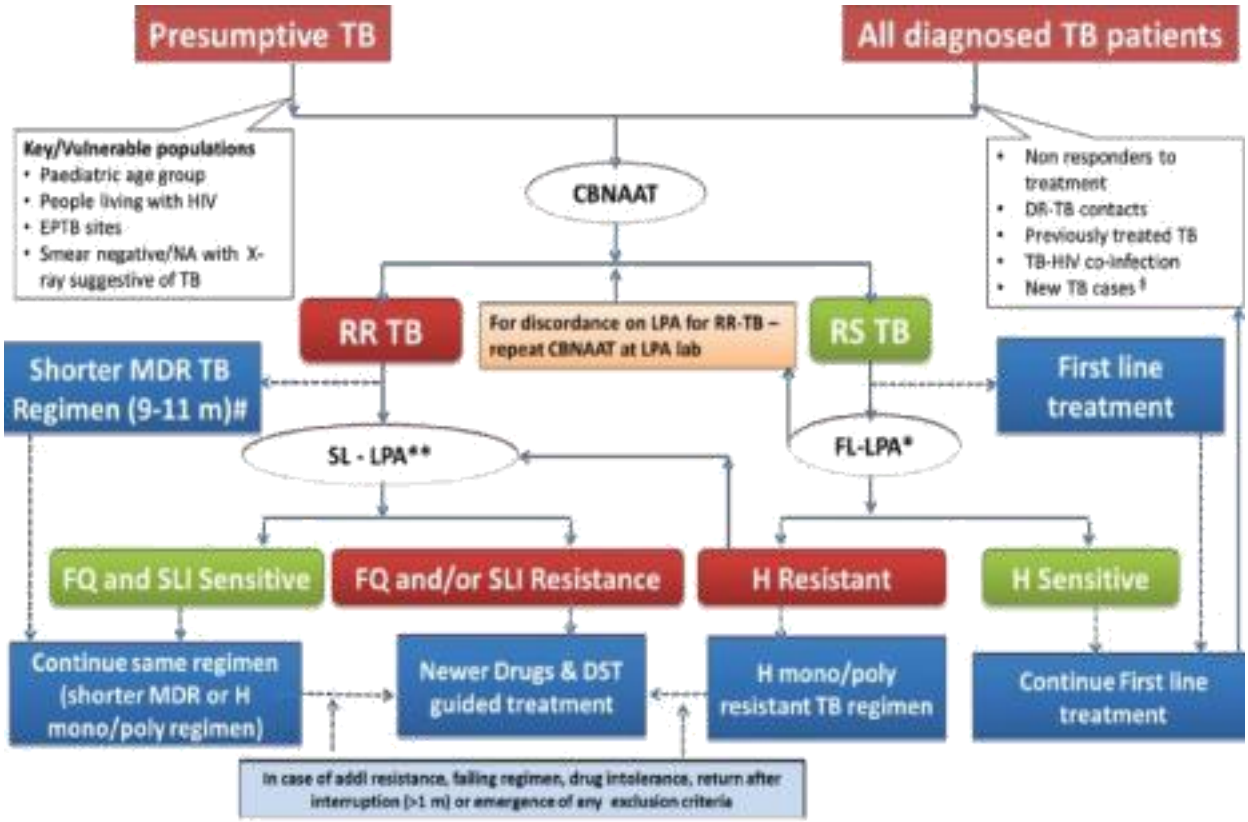

Figure 3: Integrated drug resistant TB algorithm

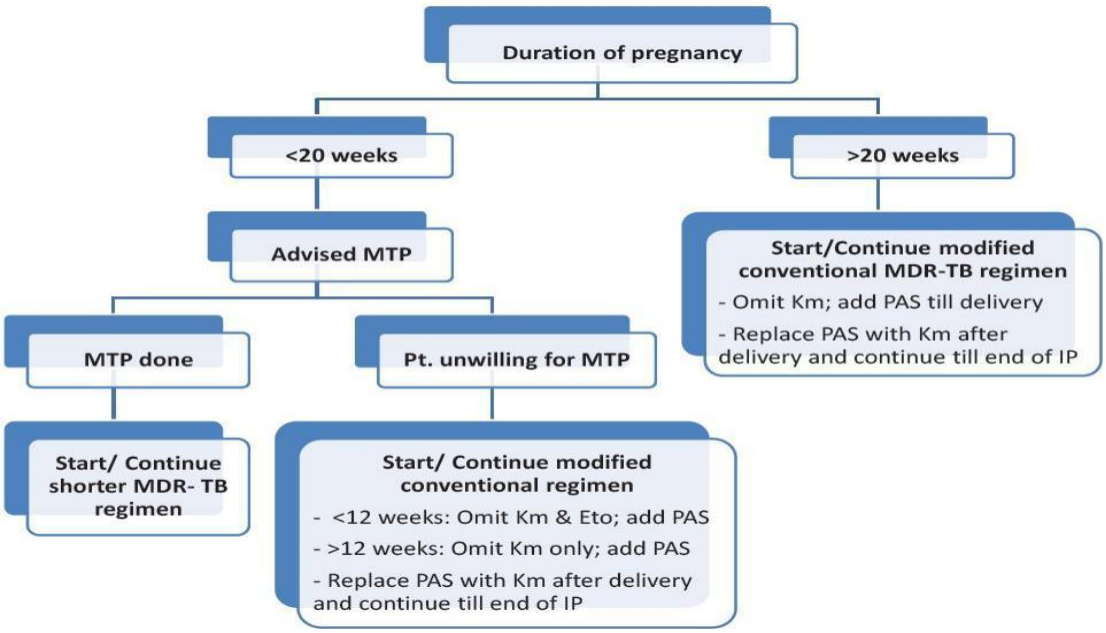

Figure 4: Management of DR-TB patients with pregnancy

8. TB and Contraception

Birth control is strongly recommended for all non-pregnant sexually active women receiving therapy for drug-resistant TB because of the potential consequences for both mother and fetus resulting from drug-resistant TB treatment during pregnancy. Women of child bearing age identified as presumptive MDR TB case should be advised to use a reliable and appropriate contraceptive method till the results of culture and DST are available.[19]

Rifampicin is a potent inducer of hepatic enzymes. Rifampicin interacts with contraceptive drugs, resulting in decreased

efficacy of protection against pregnancy. For patients with mono & poly-resistant TB but who are susceptible to R, may choose between two options following consultation with physician, namely:

- Use of oral contraceptive pill containing a higher dose of oestrogen (50ug).
- Use of another form of contraception such as barrier methods (condoms / diaphragms), intrauterine devices (Cu T) or depomedroxy progesterone based on individual preference and eligibility, so that potential risk to both mother and foetus can be prevented.

Oral contraceptives might have decreased efficacy due to vomiting and drug interactions with second line anti-TB drugs. Hence, women suffering from TB and using contraceptive pills should be advised to use some alternative contraception method. Patients who vomit directly after taking an oral contraceptive can be at risk of decreased absorption of the drug and therefore of decreased efficacy. These patients should be advised to take their contraceptives apart from times when they may experience vomiting caused by the anti-TB treatment medications. Patients, who vomit at any time directly after or within the first two hours after taking the contraceptive tablet, should use a barrier method of contraception until a full month of the contraceptive tablets being tolerated.

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NTI Bulletin 2017, 53/1&4, 24 - 32

PERSPECTIVES ON BIOSAFETY LABORATORY III DESIGN

G. Sebastian[1]

INTRODUCTION

We are living in an era of uncertainty and change. New infectious agents and diseases are emerging day by day. Work with infectious agents in public and private research, public health, clinical and diagnostic laboratories, and in animal care facilities have mushroomed. Recent world events have demonstrated new threats of bioterrorism. For these reasons, organizations and laboratory directors are compelled to evaluate and ensure the effectiveness of their bio safety programs, the proficiency of their workers, as well as the capability of equipment, facilities, and management practices to provide containment and security of microbiological agents.

Bio-containment facility across the country too often does not live up to the guidelines. Laboratory Bio safety is a huge apprehension among every biomedical and medical settings. Due to the increase in awareness, the need for establishing bio safety and bio security measures has gained momentum in health institutions. During the onsite visits of dozens of labs, it has been found that nearly one-third of the bio safety cabinets intended to protect Laboratory workers from deadly pathogens did not work properly.[1]

There are basically four basic controls of bio safety viz. Engineering, Personnel protective Equipment, Standard Operating Procedures and Administrative Controls. If any of these basic controls are compromised, it can lead to Laboratory Associated Infections and can cause fatal outcomes to laboratory personnel.[2]

Laboratory bio safety describes the application of specific practices, safety equipment and specially designed laboratories to create a safe environment, both within and outside the laboratory, for work conducted with infectious agents and toxins. In addition, there is monitoring for occupationally acquired infections and staff training, as appropriate[3].

Classification of laboratories on Bio safety levels

The classification of Laboratories is designed keeping within the principles of Bio safety and Bio security. Bio safety is achieved by implementing various degrees of laboratory control and containment, through Laboratory design and access restrictions, professional expertise and training, use of containment equipment, and safe methods of managing infectious material in a laboratory setting. [4]

Bio security involves “securing” or limiting access to the facilities, research materials and information.

Bio-safety Level 1

Bio safety level one, the lowest level, pose a minimal potential threat to laboratory workers and the environment and do not consistently cause disease in healthy adults. Research with these agents is generally performed on standard open laboratory benches without the use of special containment equipment.

BSL 1 labs are not usually isolated from

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***Key words**: Bio safety, Laboratories, Decontamination, India*

the general building. Training on the specific procedures is given to the lab personnel, who are supervised by a trained microbiologist or scientist.[5]

Bio safety Level 2

Bio safety level two, would cover work with agents causing human disease, in other words, pathogenic or infectious organisms posing a moderate hazard. Basic Laboratory with restricted access and containment during processes, especially during aerosol producing techniques etc., is required. In this level use of Bio safety cabinets and Autoclaves is recommended. [6]

Bio safety Level 3

BSL 3 facility is required where samples from clinical, diagnostics, research and production facilities or where the work with infectious agents is performed which may cause serious or potentially lethal disease. These are indigenous or exotic agents that may cause serious or lethal disease via aerosol transmission, i.e., simple inhalation of particles or droplets. The pathogenicity and communicability of these agents dictates the next level of protective procedures and barriers.[7]

Bio safety Level 4

Agents requiring BSL 4 facilities and practices are extremely dangerous and pose a high risk of life-threatening disease. These facilities provide the maximum protection and containment. To the BSL 3 practices, we add requirements for complete clothing change before entry, a shower on exit and decontamination of all materials prior to leaving the facility. The BSL 4 laboratory should contain a Class III biological safety cabinet (B. SC.) but may use a Class I or II B. SC. in combination with a positive-pressure, air-supplied full-body suit. Usually, BSL 4 laboratories are in separate buildings or a totally isolated zone with dedicated supply and exhaust ventilation. Exhaust streams are filtered through high-efficiency particulate air (HEPA) filters, depending on the agents used.[8]

Pre-requisites for construction of BSL III Laboratory:

The purpose of predesign is to identify and document factors so as to ensure that the design will yield an effective workplace that is responsive to scientific objectives as well as it should be ergonomic safe. Therefore, a clear and detailed outline of scientific framework, objective, and pre-requisites such as manpower, space and funding along with proper plan for utilization of the facilities should be made before preparing the conceptual plan. A preliminary flow chart of laboratory work should be clearly defined to achieve the objectives of the laboratory. Laboratory protocols should be developed to identify those areas where bio safety can be breached or compromised using the standard operating procedures, administrative and personal protective equipment control or engineering control of laboratory. This will provide information as to which type of laboratory, modular construction or reinforced cement concrete type construction would be suitable for the proposed work. Along with the site selection, due importance should be given to the work practices which includes engineering controls.[9]

The common features of BSL 3 laboratory include unidirectional air flow using room pressure gradients of negative pressure, exhaust air being HEPA (high efficiency particulate air) filtered and proper procedures for disposal of biomedical waste. Strict bio safety guidelines should be followed for disposal of

hazardous waste. The containment laboratories should be designed in such a way that air discharged should pass through exhaust HEPA filters. The specification of HEPA filters used here should be that it should be able to filter 0.3-micron air-borne particles with filtering capacity of 99.97 percent efficiency. [10]

Appropriate Personal Protective Equipment (PPE) should be worn in the laboratory as per the bio safety level guidelines. Hand washing with appropriate disinfectant should be inculcated as general practice. There should be proper mechanism for the disposal of biomedical waste. The waste generated in the laboratory should be disinfected with appropriate disinfectant and then it should be autoclaved before disposing off in accordance with the state / local pollution control regulations.[11]

Types of BSL 3 Laboratory:

BSL 3 Laboratory with anteroom as an access zone:

An ante room which serves as an access room to the internal laboratory. This anteroom is usually used for changing attires or donning PPE. Such type of BSL facility does not have dedicated autoclave attached to the BSL 3. The biomedical waste generated in this laboratory is usually disinfected by spraying with 5% phenol disinfectant and subsequently sealed in polythene bags and transported to an autoclave room.[12] This type of model is popular due to the low cost of construction and ease of downgrading it for activities with less infectious aerosols such as BSL 2.

BSL 3 laboratory with restricted corridor as an access zone:

This model provides access to BSL 3 area directly from the laboratory corridor with restricted entry. The first door is come across after entering the corridor and the BSL 3 space begins when entering the rooms. Such facility is used when upgrading existing laboratory space to BSL 3 level and reduces the cost of overall construction of the facility.[13]

BSL 3 laboratory with BSL 2 laboratory access:

In this setup anteroom is large and used as working BSL 2 laboratory and provides small BSL 3 facility as an extension. Such model works well for small laboratories with limited budget settings.

BSL 3 Laboratory suite:

This type of model is used in large research settings or in huge volume settings dedicated for manipulation of high-risk group organisms. This type of facility often provides dunk tank cum pass box and double door autoclave to allow decontamination to take place prior to hazardous biomedical waste materials leaving the laboratory.[14]

Bio safety cabinets and decontamination autoclaves are important part of such a containment facility, although autoclaves are not required to be placed within the BSL 3 laboratories. However, the laboratories with large amount of hazardous waste should consider providing pass box through autoclaves to decontaminate materials before leaving the facility. Exhaust ventilation should be provided above the exterior door of the autoclave to remove the heat and steam when the door is opened. [15]

Establishment of basic objectives, workflow, SOPs and evaluation for need of a BSL 3 laboratory:

The main objective of establishment of containment laboratories for handling Risk Group –III organisms usually include procedures like handling of clinical samples, safe environment for detection, identification,

propagation and manipulation of organisms in the laboratory. Certain national and international criteria like procedures involving propagation of Risk Group II agents in large volumes, procedures involving potential aerosol infection risks and in such cases which could lead to higher virulence of risk group II organisms use BSL 3 laboratory or the work practices of BSL 3. The site selected for construction of BSL 3 laboratory should have adequate and consistent utilities like electricity and water and three tier security protection. The area should be free from earthquake geographical zone, and other natural calamities like possible landslides and heavy rain should also be taken into consideration. [16]

Milestone steps to proceed for construction a BSL 3 Laboratory:

The important steps in early construction phase includes drawing development phase, preparation of construction document, final specification, finding the right construction agency / contractor and awarding the tender to agency, hiring a consultant as per the requirement and commissioning which leads to successful completion of the work in timely manner. The final proposal with drawing and all other details including specifications of the essential and stand-alone equipment for release of funds should be put forward so that tenders can be advertised. Tender must be customized to select a professional organization, having experience of constructing such kind of laboratory. While choosing a construction agency, they should be having the following credentials such as successful and timely completion of at least one similar project which includes construction, testing, commissioning and validation of BSL 2 /or BSL 3 laboratory including civil works, electrical works, HVAC works, BMS, Door interlocks, access control system, primary barrier containment equipment, decontaminating system etc. The ability of construction agency for designing and planning, proper evaluation of architectural layout plans, men and material movement plans, zoning plans, specialized systems and services and utilities schemes, laboratory commissioning and validation protocols, laboratory security protocols and integration of laboratory[16]. A committee should be formed and given the responsibility of accountability and authority. A detailed flowchart of the construction work must be chalked out and a schematic drawing is prepared to enable detailed planning in lines with the bio safety guidelines. A member in the committee should have the overall responsibility for functioning and safety of the laboratory. It is advisable to place a few people from scientific and engineering background in a functioning BSL 3 laboratory preferably or in a higher-level laboratory for a few months so that they get the exposure and experience of a functional laboratory. Placement of all safety equipment like fire extinguishers, water sprinklers etc. within the facility should also be incorporated and the placement of autoclaves, chemical kill tank, air handling units, exhaust filters, must be chalked out in detail in the drawing. Complete Heating Ventilation Air Condition (HVAC) design calculations and air flow diagrams for maintenance of unidirectional airflow and negative pressure as compared to the ambient within the facility must be prepared. Sensitive equipment like microscopes which are sensitive to vibrations should not be placed on a slab–on-grade or near to structural column. Adequate knowledge and skills to handle equipment with pneumatic controls and logic principles of mechanical engineering in handling of complex building management systems (BMS) should be developed. Certain standalone equipment with requirement of electrical supply of transient or low voltage fluctuations and low

harmonics along with adequate voltage requirements for uninterrupted power supply should be chalked out during the planning stage. While ordering equipment, care should be taken to understand their installation and calibration requirements and essential details for its maintenance. Developing an "Engineering Manual" for the operation of the facility is desirable. Necessary approvals should also be taken from the local fire departments and get the fire safety norms certificate.

Following points must be kept in mind while designing:[9]

Design features:

1. The laboratory must be separated from areas that are open to unrestricted traffic flow within the building. Additional separation may be achieved by placing the laboratory at the blind end of a corridor, or constructing a partition and door or access through an anteroom (e.g. a double-door entry or basic laboratory – Bio safety Level 2), describing a specific area designed to maintain the pressure differential between the laboratory and its adjacent space. The anteroom should have facilities for separating clean and dirty clothing and a shower may also be necessary.
2. Anteroom doors may be self-closing and interlocking so that only one door is open at a time. A break-through panel may be provided for emergency exit use.
3. Surfaces of walls, floors and ceilings should be water-resistant and easy to clean. Openings through these surfaces (e.g. for service pipes) should be sealed to facilitate decontamination of the rooms(s).
4. The laboratory room must be sealable for decontamination. Air-ducting systems must be constructed to permit gaseous decontamination.
5. Windows must be closed, sealed and break-resistant.
6. A hand-washing station with hands-free controls should be provided near each exit door.
7. There must be a controlled ventilation system that maintains a directional airflow into the laboratory room. A visual monitoring device with or without alarm(s) should be installed so that staff can at all times ensure that proper directional airflow into the laboratory room is maintained.
8. The building ventilation system must be so constructed that air from the containment laboratory – Bio safety Level 3 is not recirculated to other areas within the building. Air may be high-efficiency particulate air (HEPA) filtered, reconditioned and recirculated within that laboratory. When exhaust air from the laboratory (other than from biological safety cabinets) is discharged to the outside of the building, it must be dispersed away from occupied buildings and air intakes. Depending on the agents in use, this air may be discharged through HEPA filters. A heating, ventilation and air-conditioning (HVAC) control system may be installed to prevent sustained positive pressurization of the laboratory. Consideration should be given to the installation of audible or clearly visible alarms to notify personnel of HVAC system failure. All HEPA filters must be installed in a manner that permits gaseous decontamination and testing.
9. Biological safety cabinets should be sited away from walking area and out of cross

currents from doors and ventilation systems. The exhaust air from biological safety cabinets, should be passed through HEPA filters and must be discharged in such a way as to avoid interference with the air balance of the cabinet or the building exhaust system.

10. An auto clave for the decontamination of contaminated waste material should be available in the containment laboratory. If infectious waste has to be removed from the containment laboratory for decontamination and disposal, it must be transported in sealed, unbreakable and leak proof containers according to national or international regulations, as appropriate.
11. Backflow-precaution devices must be fitted to the water supply. Vacuum lines should be protected with liquid disinfectant traps and HEPA filters, or their equivalent. Alternative vacuum pumps should also be properly protected with traps and filters.
12. The containment laboratory – Bio safety Level 3 facility design and operational procedures should be documented. Further in addition to the above-mentioned facilities it is desirable to incorporate the following features.[17,18]
    a) Ample space must be provided for the safe conduct of laboratory work and for cleaning and maintenance.
    b) Walls, ceilings and floors should be smooth, easy to clean, impermeable to liquids and resistant to the chemicals and disinfectants normally used in the laboratory. Floors should be slip-resistant.
    c) Laboratory Furniture must be sturdy and capable of supporting anticipated loading and uses and must be spaced so that areas around and under benches, cabinets and equipment must be accessible for cleaning. Bench tops should be impervious to water and resistant to acids, alkalis, organic solvents and moderate heat. Bench tops should have marine/drip edging for spill control Laboratory furniture and casework should be designed with ergonomic considerations (e.g. adjustable work surface heights, selection of biological safety cabinets, adequate knee clearances for seated work, adequate toe clearances for standing work, wall cabinet heights, etc.). Closed cabinets rather than open shelving should be used for storage. Cabinets/shelves should have angled tops or be built up to the ceiling to facilitate cleaning.
    d) Illumination should be adequate for all activities. Undesirable reflections and glare should be avoided.
    e) Storage space must be adequate to hold supplies for immediate use and thus prevent clutter on bench tops and in aisles. Additional long-term storage space, conveniently located outside the laboratory working areas, should also be provided. Space and facilities should be provided for the safe handling and storage of solvents, radioactive materials and liquefied gases.
    f) Facilities for storing outer garments and personal items should be provided outside the laboratory working areas.
    g) Facilities for eating and drinking and for rest should be provided outside the laboratory working areas.

h) Hand-washing basins, with running water if possible, should be provided in each laboratory room, preferably near the exit door. Sinks must be hands-free. Infrared sensors are preferable, but may not be suitable for all laboratories. In cases where infrared sensors cannot be used, knee-operated sinks are preferable to foot-operated.[18,19] All penetrations must be perpendicular to the surface and must be sealed to be gas-tight. Penetrations must be sealed with non-rigid, non-shrinking, silicone or latex sealant; for fire-rated walls, apply sealant before fire stopping. All pipes into the BSL-3 laboratories should be secured to prevent movement. Fixtures must be resistant to corrosion of bleach and other disinfectants. Back-flow prevention devices must be installed on all faucets (including industrial water). All pipes must be identified using labels and tags. Water supply control should be located outside the containment area. Plumbing should discharge directly to a sanitary sewer.

i) Doors (preferably self-closing) should have vision panels & appropriate fire ratings.

j) An auto clave or other means of decontamination should be available in appropriate proximity to the laboratory.

k) Safety systems should cover fire & electrical emergencies and should provide emergency shower and eyewash facilities.

l) First-aid rooms suitably equipped & readily accessible should be available

m) In the planning of new facilities, consideration should be given to the provision of mechanical ventilation systems that provide an inward flow of air without recirculation. If there is no mechanical ventilation, windows should be able to be opened and should be fitted with arthropod-proof screens.

n) A dependable supply of good quality water is essential. There should be no cross connections between sources of laboratory and drinking-water supplies. An anti-back flow device should be fitted to protect the public water system.

o) There should be a reliable and adequate electricity supply and emergency lighting to permit safe exit. Electrical hazards can be categorized into two main types: those that can result in an electrical shock and those that can cause fires and/or explosions. Electrical shocks can be avoided by ensuring that all equipment and electrical installations are inspected and tested regularly including earthing/grounding systems. Do not overload electrical circuits. Minimize or eliminate the use of multi-outlet power strips. When power strips are necessary, the safety officer of the facility or a licensed electrician must approve their use. A stand-by generator is desirable for the support of essential equipment, such as incubators, biological safety cabinets, freezers, etc., and for the ventilation of animal cages.

p) There should be an adequate and reliable supply of gas. Good

maintenance of the installation is mandatory. Laboratories are occasionally the targets of vandals. Physical and fire security must be considered. Strong doors, screened windows and restricted issue of keys are compulsory. Other measures should be considered and applied, as appropriate, to augment security

Post construction operations:

Testing and commissioning of "on-site" equipment should be done by the construction contractor followed by demonstration to authorized person or project management consultant for the facility. Testing and validation of the commissioning process of equipment are performed in presence of the facility in-charge and Bio safety Officer. Final testing and commissioning should take place in presence of committee or project team.

Testing and commissioning of some of the equipment are crucial to the proper functioning of the containment, such as airflow patterns and pressures within isolators and bio safety cabinets, temperature profiles in autoclaves, procedures for decontamination and sterilization, operation of HVAC systems, capacity calculations of HVAC systems, checking of ceiling panels, dunk tanks, shower cabinets/air shower, water outlets, air leak in ducts and plenums, doors and view panels and functioning of all alarm systems. Before taking over the facility one should verify all the requirements as per the approved layouts, such as electrical connections (raw, essential and UPS), local area network (LAN) connections, servers, water connections, sewage connections, hardware fittings, telephones and intercoms, functioning of the BMS with all the desired parameters, fine settings of access control and all the inventories are working according to the laid-out plan.

After taking over the laboratory the staffs' must be adequately trained on all the SOPs including the stand-alone equipment. Once the necessary approvals from the Fire departments and Municipal Corporation are obtained, the laboratory can be put into operation, and can enter into the validation phase. Validation documents includes commissioning reports of all major equipment, important SOPs of lab workflow, equipment use, and engineering controls maintenance which includes servicing, calibration & validation decontamination & emergency protocols.

Maintenance of equipment records, log books, certification details and maintenance report book, entry and exit record sheets, entry of shower printouts from access control, records of daily checks, requisition file and equipment calibration file should be available in the laboratory. The record and performance of BMS, room pressures, temperature and humidity should be presented to the validation committee.

After the successful completion of the validation procedure and acquiring certificate to use the facility the laboratory is ready to deliver the services. The major maintenance requires review of the contingency plan for emergency during regular operation mode so that any possible failure of any ongoing controls can be handled without breaching bio safety such as BMS, UPS and DG set and autoclaves. Annual Maintenance Contracts (AMC) of all-important equipment should be done in advance to ensure continuity of routine maintenance.

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NTI Bulletin 2017, 53/1&4, 33 - 35

EXPRESSIONS OF POLYMORPHISMS IN VITAMIN D RECEPTOR GENE AMONG TB PATIENTS IN INDIA: LEAVE NO STONE UNTURNED!

M K Shilpashree[1]

INTORDUCTION

Globally, tuberculosis continues to be a major public health problem despite all the efforts to control the disease. India accounts for nearly 27% of global TB burden and the Government of India has recently pledged to eliminate tuberculosis by 2025 which is five years far ahead of Sustainable Development Goals (SDGs) of World Health Organization.1Currently, the incidence and mortality of TB in India is about 279 and 32 per lakh population. In 2017, there were an estimated 28 lakh TB cases and 4.5 lakh TB deaths in India. About 40% of the Indian population is exposed to tuberculosis bacilli and nearly 10% develop active tuberculosis. [1]

Tuberculosis is a disease manifesting due to the interaction of multiple factors which include the infectious agent, virulence of the infectious agent, host genetic factors, immune status of the host and environmental factors. One of these host genetic factors plays a major role in the development of active tuberculosis after exposure to the bacilli.

Vitamin D receptor gene: Interaction at cellular level

Vitamin D which acts through vitamin D receptor has an immune modulatory effect. The process of immune modulation is affected by the polymorphism of vitamin D receptor gene and has been studied extensively. As the host immune status is serum vitamin D, it acts through vitamin D Receptor (VDR) gene complex at cellular level. On initial exposure to Mycobacterium tuberculosis, the Toll like receptors of the human macrophages get activated; there is up-regulation of 1-α hydroxylase enzyme gene and the vitamin D receptor(VDR) gene. The formation of vitamin D3-VDR complex leads to induction of cathelicidin and killing of the TB bacilli.[2]

This response may be influenced by the various vitamin D receptor gene polymorphism and there are nearly 470 identified different polymorphisms exhibited by the vitamin D receptor gene; of which four polymorphism - ApaI, FokI, BmrI and TaqIare frequently expressed and extensively studied.[3] Most of the studies have come up with conflicting results. The variance in results may be attributed to the ethnicity of the population being studied and the bias in sample size.

Polymorphism study findings:

A study conducted by Selvaraj et al., on the regulatory role of vitamin D receptor (VDR) gene variants of *Bsm*I, *Apa*I, *Taq*I, and *Fok*I polymorphisms on vitamin D3-modulated macrophage phagocytosis with live Myco-bacterium tuberculosis and lympho-proliferative response to M Tuberculosis culture filtrate antigen in patients with pulmonary tuberculosis and in normal healthy subjects has suggested that genotypes BBAAtt and extended genotype BBAAtt have protective effect in normal

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healthy subjects. However, the number of cases was 46 which might be small to come to an effective conclusion and also the controls were not matched. [4]

A study done on the Gujarati Asians residing in London revealed that the VDR gene polymorphism independently did not affect susceptibility to TB whereas the low levels of Vitamin D and the TT/Tt genotype and untraceable Vitamin D levels and ff genotype together contributed to the development of TB. [5]

The FokI gene polymorphism has been extensively studied and the results are quite contradicting. Most of the studies suggest that FokI polymorphism has led to increased susceptibility to TB in the East and South East Asian population and Mexican population while the Egyptian population had shown no susceptibility.[6] The only study conducted in Andhra Pradesh, India has shown no significant association between the FokI and TB susceptibility.

The TaqI polymorphism has also shown varying results in different races. Studies in the African and Iraqi population has suggested a protective role.[7] The same polymorphism however, has shown increased susceptibility to TB in the South and West Asians (Indians).[8] In the Romanians, homozygous polymorphism confers resistance to TB while heterozygosity increases susceptibility to TB.

The variant homozygotes and heterozygotes for the BsmI polymorphism have greater protection against TB than the wild homozygotes in the European population. A systematic review however has suggested that this polymorphism increases the risk of susceptibility to TB. [9,10]

Implications on TB control efforts in India

The country has embraced the magnanimous task of TB elimination by 2025 and the Revised National TB Control Programme (RNTCP) is relentlessly working towards its achievement. We are unique with diverse population and ethnicity. It is an established fact that Vitamin D and VDR gene polymorphism (especially ApaI, FokI, BmrI and TaqI) has an important role in development of TB and the study findings are not consistent. These earlier studies conducted had limitations like the Indian population was not covered, the sample size was small and not all the studies looked into the four main polymorphism and hence no conclusion can be drawn based on these studies.

There is an urgent need for the country to prioritize research to look into the impact of Vitamin D and VDR gene polymorphism on the ongoing TB transmission. It is desired that the country should have state specific data on the magnitude of VDR gene polymorphism among TB patients and the general population. Specific protection measures against the Vitamin D and VDR gene polymorphism among the high risk or general population might help in preventing the occurrence and spread of TB disease. Thus, in the quest of achieving zenith the country should not leave no stone unturned and fall short in its efforts.

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NTI Bulletin 2017, 53/1&4, 36 - 39

1. EXPENDITURE INCURRED FOR DIAGNOSIS AMONG NEW TB PATIENT NOTIFIED BY RNTCP IN BENGALURU CITY

Objectives:

- To compare mean delay from onset of symptoms till initiation of anti-TB treatment among TB patients notified by public sector in 2017 with the mean delay among TB patients notified by public sector in 2005.
- To estimate expenditure incurred by TB patients towards diagnosis of TB.

Methodology:

Study was carried out among new adult TB patients initiated on ATT by public providers in BBMP, RNTCP reporting Unit, Bengaluru. An estimated 228 new adult TB patients initiated on ATT by public sector were recruited into the study, using systematic sampling. TU wise, a list of PHIs was obtained from STO's Office. The data collection was carried out from Sepember 2017 – February 2018.

PHIs to be visited for enrolment of study participants were purposively selected each month while ensuring:

(i) Total number of patients enrolled during the course of the study from hospitals and PHIs are in the ratio of total number notified by these two groups of PHIs.

(ii) Enrolled patients were uniformly spread all over the BBMP limits, depending on the number initiated on ATT in the month in a given selected PHIs, either all patients were enrolled or a systematic sampling was performed.

Data was collected by personally interviewing each patient at a place and time convenient to them using a semi-structured pre-tested interview schedule.

Expected Outcome:

These studies will provide information on:

- Change in diagnostic delay and treatment initiation among patients in public sector from the previous study conducted in 2005.
- Difference in total diagnostic delay and treatment initiation among patients in public sector.
- The findings will be useful to identify the extent of avoidable Out of Pocket Expenditure (OOPE) towards diagnosis and design appropriate interventions for the same.
- In addition, experience gained during the study will be useful for field investigators in exploring a state level study on expenditure incurred by TB patients during the course of TB treatment, at a later point of time.

Current Status:

Data Collection completed and analysis and report writing are under progress.

2. DIAGNOSIS AND TREATMENT PRACTICES AMONG THE TREATING PHYSICIANS FOR THE MANAGEMENT OF EXTRA PULMONARY TB IN SELECTED TERTIARY CARE HEALTH FACILITIES IN BENGALURU CITY–AN EVALUATION BASED ON MIXED METHOD

Objectives:

- To find out proportions of Extra Pulmonary Tuberculosis (EPTB) patients diagnosed and / or treated in selected tertiary health facilities in Bengaluru City as per current RNTCP guidelines during 2017.
- To find out provider constraints in adherence to these guidelines

Methodology:

Record review of all EPTB patients diagnosed / treated in selected hospitals during January – Dec 2017 will be undertaken to find out adherence to RNTCP guidelines. The following records as per availability will be examined and data collated and compiled for each patient into a pre-designed data extraction form:

- Out patient records (If available in the health facility)
- In-patient records (paper-based/MRD/HMIS records)
- Hospital based/external Lab records & reports
- Referral for treatment register
- DOTS register
- TB Notification registers
- RNTCP treatment cards
- DMC/CBNAAT lab or C & DST registers
- Record of Anti-TB drug sales based of Schedule H1 registers.
- NIKSHAY Database of Notified TB patients

Expected Outcome:

Based on study results, appropriate recommendations wherever needed will be given to Health care providers of the tertiary health facilities towards effective implementation of EPTB Guidelines and the findings will help in strengthening Linkages and appropriate utilization of RNTCP services for early and accurate diagnosis of EPTB.

Findings will be useful for formulating appropriate targeted interventions in the form of training & skill development of Practitioners and advocacy for additional resource mobilization.

Current Status:

Approved by Institutional Ethics Committee (IEC) Pilot study has been completed in P.D. Hinduja Hospital. Protocol, SOPs, Questionnaires were revised accordingly. Visit has been undertaken to look into the feasibility of the study and had discussion with the stakeholders at St. Marthas Hospital. Several rounds of meeting conducted along with Dr. Sharath from ESI hospital in finalizing the title of the study protocol and study formats.

Revised protocol and questionnaires were presented to the Technical Coordination Committee (TCC) and suggestion and modifications were incorporated accordingly. The revised protocol was presented for IEC approval on 2nd Jun 2018 and got approved.

3. SYSTEMATIC SCREENING FOR PULMONARY TUBERCULOSIS AMONG WOMEN ATTENDING PUBLIC MATERNITY HOSPITALS FOR ANTENATAL AND POST-NATAL CARE IN BENGALURU

Objectives:

- To find out the feasibility of systematic TB screening among women attending public maternity hospitals for antenatal and post-natal care in Bengaluru city.
- To find out the proportion of women having microbiologically confirmed pulmonary TB but not diagnosed through routine health care services.

Methodology:

4000 participants (Women attending public maternity hospitals for anti-natal / post-natal care in Bengaluru city) from selected public maternity hospitals in Bengaluru will be included in the study. The study is planned to be conducted at purposively selected 4-8 public sector maternity hospitals in Bengaluru city. Estimates sample size will be allocated equally to these facilities.

All consecutive women attending maternity hospitals for ante-natal/ post-natal care (up to 6 weeks after child birth) as out-patient will be enrolled into the study after obtaining their informed written consent, till the allocated sample size is achieved. Each participant will be screened at each visit during our study period, but will be counted as one for the purpose of sample size. They will be subjected to screening for the symptoms of pulmonary TB i.e. Cough or fever of any duration, Hemoptysis in last 3 months, significant weight loss and night sweats.

Screening will be done by NTI Field investigators. Those found screened positive (presence of any of the above symptoms) will be eligible for sputum examination. HIV status, presence of previously diagnosed/gestational diabetes if any and personal habits (tobacco/alcohol use) will be recorded. Symptomatic HIV reactive women will be eligible for sputum examination irrespective of the duration of symptoms.

Among those eligible for sputum examination, 1 spot sputum specimen will be collected under sterile conditions. Specimen will be transported to NTI Laboratory for examination by Xpert MTB/RIF, used to identify Mycobacterium tuberculosis (MTB) DNA and resistance to Rifampicin (RIF). Those found positive by molecular test will be labelled as microbiologically confirmed pulmonary TB cases. Those found negative will be advised to consult the attending clinician for further advice and management.

Non-symptomatic participants will be advised to report development of such symptoms in future to the hospital and they will be cared for under routine RNTCP guidelines.

Expected Outcome:

Evidence based Recommendation for incorporating systematic screening for TB in maternal care services.

Current Status:

IEC approval obtained and field work has to be started.

4. PREDICTORS OF UNFAVORABLE TUBERCULOSIS TREATMENT OUTCOME IN TB – HIV CO-INFECTED PATIENTS IN KARNATAKA

It is a retrospective cohort study to be undertaken in collaboration with Karnataka State TB Cell and Karnataka State AIDS Prevention Society (KSAPS)

Objectives:

- To find out the proportions of HIV co-infected new TB patients registered for treatment with first line anti-TB drugs under RNTCP in Karnataka during Jul – Dec 2017 treated successfully.
- To determine the association between socio-demographic and clinical factors with unfavorable TB treatment outcome.
- To develop a model for prediction of the risk of unfavorable TB treatment outcome among HIV infected new pulmonary TB patients at the time of registration under RNTCP.

Methodology:

The study will be carried out in a state-wide representative cohort of HIV co-infected new TB patients registered in the state during Jul to Dec 2017.

Dependent variable:

TB treatment outcome – Successfully treated (cured /treatment completed) / unfavorable treatment outcome (failed/ LTFU/ died/ switched to cat IV) / not evaluated.

Data Collection:

Administrative approval from the State TB Cell and KSAPS will be obtained. Their officials shall be apprised of the study and requested to advise selected district health authorities to extend support for data collection.

On visiting the respective district, the Field Health Officials shall meet the District TB and HIV Programme Officers for their co-operation in data collection.

Data for the variables as listed above will be collected in individual data collection sheets for each HIV co-infected TB patient registered. For data pertaining to ATT, the preferred source will be case based digitized data obtained from respective DTOs or downloaded from Nikshay. 4 visits of 10 days each will be made to each district during 3rd quarter of 2018 for data collection.

Upon completion of the study, results will be shared with Karnataka State TB Cell, Karnataka State AIDS Prevention Society (KSAPS) and International Union against Tuberculosis and Lung Disease and to other stakeholders through published papers.

Expected Outcome:

Knowledge gained on variables associated with unfavorable outcome will be useful to design appropriate strategies to improve the treatment success rate.

Predictive risk model will help the programme workers to identify patients likely to have unfavorable outcome of ATT.

Current Status:

Approved by IEC Field work has to be started.

Training and Supervisory Activities
January – Dec 2017

1. Revised National Tuberculosis Control Programme (RNTCP)

S No	Category of Personnel	Period	No. of Participants
1	Sr. Treatment Supervisor / District Programme Coordinator and STLS from Andhra Pradesh	20th – 24th Nov 2017	33
2		27th Nov – 1stDec 2017	36
3		27th Nov – 1stDec 2017	07

2. Training of Trainers (ToT) on RNTCP Technical and Operational Guidelines for TB Control in India – 2017

S No	Category of Personnel	Period	No. of Participants
1	District TB Officers, Sr. Regional Directors, Regional Director, Chest Physician, Associate Professors, Deputy civil Surgeon(TB), Regional Directors, Assistant Professors, Medical Officers, Regional Directors, Specialist, Professor & Superintendents, HOD (TB &RD), Sr. Residents, Deputy Director of Medical Services	6th – 10th Feb 2017	37
2		27th Feb– 3rd Mar 2017	40
3		4th – 8th Sep 2017	29

3. PMDT (Programmatic Management of Drug Resistant TB) Training

S No	Category of Personnel	Period	No. of Participants
1	District TB Officer, Nodal Officer DRTB Centre, Sr. Medical Officer, Medical Officer	17th–19th Jan 2017	24
2		22nd–24th Jan 2017	29
3		31st Jan–2nd Feb 2017	29

4. TOT on Programme for Financial Management Services (PFMS)

S No	Category of Personnel	Period	No. of Participants
1.	State level Accountants and Procurement and logistics officers	21st& 22nd Jun 2017	26

5. Review and Update on Public Private Partnership

S No	Category of Personnel	Period	No. of Participants
1	IEC (ACSM) Officers	3rd Jul 2017	32
2	Programme Officer, State IEC Officer & other various participants	4th – 5th Jul 2017	35

6. Training for IEC / Advocacy, Communication and Social Mobilization (ACSM) Officers

S No	Category of Personnel	Period	No. of Participants
1	IEC / ACSM Officers	3rd Juy 2017	32

7. National Level Training on Drug and Vaccines Distribution Management System(DVDMS) for use under RNTCP

S No	Category of Personnel	Period	No. of Participants
1	Programme officers, Data Entry Operators, Store keepers, Pharmacists, Procurement and Logistics Officers (in five batches on different dates)	12th – 14th Jul 2017	35
2		19th - 21st Jul 2017	32
3		26th – 28th Jul 2017	12
4		2nd -4th Aug 2017	36
5		16th – 18th Aug 2017	47

8. State Level Training on Drug and Vaccines Distribution Management System (DVDMS) under RNTCP

S No	Category of Personnel	Period	No. of Participants
1	Pharmacist, Sr. Treatment Supervisor, District Programme Coordinator, Data Entry Operator, Pharmacist, DR-TB/TB-HIV Supervisor, Sr. Specialist, District	26th – 27th Dec 2017	40
2	DOTS Plus Supervisor, PPM coordinator, District TB Officer and Sr. Health Assistant	28th – 29th Dec 2017	35

9. Bedaquiline DST Training

S No	Category of Personnel	Period	Total Participants
1	Joint DHS (TB), Professor, STF Chairperson, WHO Medical Consultant, District TB Officer, Medical Officer, Microbiologist, TB/HIV Coordinator, Director, National Consultant TB, HOD, CMO, Sr. Medical Officer, Research Officer, State DRTB Coordinator, Assistant Director, Nodal Officer, Officials from WHO, India and Country Technical Advisor	7th – 11th Aug 2017	15

10. Orientation of RNTCP recent updates

S No	Category of Personnel	Period	No. of Participants
1	Post Graduate students (in three batches on different dates)	17thAug 2017	26
2		18thAug 2017	24
3		21stSep 2017	09

11. Training in External Quality Assurance (EQA)

S No	Category of Personnel	Period	No. of Participants
1	DTOs, Medical Officer's Microbiologists, STLSs and LTs (in three batches)	19th – 23rd Jun 2017	12
2		18th – 22nd Sep 2017	11
3		11th – 15th Dec 2017	06

12. Training in Liquid Culture MGIT 960 (First line and Second line DST)

S No	Category of Personnel	Period	No. of Participants
1	Laboratory Technician, Microbiologist and Technical Officer Microbiologist	12th – 15th Jun 2017	08

13. Second Line LPA training course for Laboratory Personnel

S No	Category of Personnel	Period	No. of Participants
1	Jr. Bacteriologist, Microbiologists, Sr. Laboratory Technicians, and Laboratory Technician	24th & 25th May 2017	11
2		9th to 13th Oct 2017	09

14. EQA- CBNAAT Training in Preparation of Dried Tube Specimen for Xpert MTB/RIF for proficiency Testing Training

S No	Category of Personnel	Period	No. of Participants
1	Consultant Microbiologists and Laboratory Technicians	1st -5th May 2017	11

15. Training in Molecular detection of MDR- TB by PCR based Line Probe Assay

S No	Category of Personnel	Period	No. of Participants
1	Associate Professors, Laboratory Technician, Microbiologist and Consultant Microbiologist (in four batches)	4th– 8thSep 2017	05
2		11th–15thSep 17	10
3		9th– 13thOct 2017	09
4		4th– 8thDec 2017	05

16. Collaborative training activities with:

a. CTD-NTI-CDC- The Union Operations Research Capacity Building workshop and project mentorship for professionals working with the RNTCP

S No	Category of Personnel	Period	No. of Participants
1	Director STDC, WHO RNTCP Consultants, STO, DTO, Medical Officers and IRL Microbiologists	May 17-26, 2017	06

b. NTI – SAARC / NTP Nepal - TB Management Training

S No	Category of Personnel	Period	No. of Participants
1	SAARC Regional Training on Management Information for Action (MIFA) for TB& HIV/AIDS Control Programmes.	1st – 5th Sep 2017	12

17. Other workshops / Meetings/ CME

S No	Category of Personnel	Period	Participants
1	Zonal Task Force Meeting held in Guwahati	19th - 20th Jan 2017	Dr. C Ravichandra
2	E-training module content development workshop	30th - 31st Jan 2017	Participants from CTD and NTI
3	Training for the master trainers for the Bedaquiline held at Ahmedabad.	21st – 23rd Feb 2017	Dr. C Ravichandra
4	Joint activity of NTI& Academy of Family Physicians of IndiaatNTIto commemorate World TB Day	24thMar 2017	Total 41, Physicians from Academy of Family Physicians, India
5	Sensitization cum Training Workshop for ICMR-RNTCP TrueNAT Demonstration Study (in four batches)	24thApr 2017	Total 141, Programme Managers and lab personnel from different states of India
6		26thApr 2017	
7		28thApr 2017	
8		1stMay2017	

18. International Center of Excellence for Laboratory Training (ICELT)

S No	Name of Training	Participating Labs.	Date	Participants
1	National TOT Training on Second Line probe assay Testing MTBDRSL V.2 (in five batches)	Intermediate Reference Laboratories, C & DST Laboratories & Medical colleges	8th - 9th May 2017	10
2			11th-12th May 2017	10
3			15th - 16th May, 2017	10
4			18th-19th May 2017	10
5			22th -23th May 2017	10

19. Comprehensive training for laboratory personnel

Sl. No.	Date	Place / State	No. of Participants
1	24th Mar to 6th Apr 2017	Bengaluru, Karnataka	02
2		Ranchi, Jharkhand	01
3		Bhopal, Madhya Pradesh	01
4		Ajmer, Rajasthan	01
5	3rd to 15th Jul 2017	Assam	02
6		Bhopal	02
7		Tamil Nadu	02
8		Tripura	02
9		Uttar Pradesh	03
10	23rd Oct–4th Nov 2017	Sr. Lab technicians, Microbiologists, Medical college Professors	11

20. Second Line LPA Training for C&DST Labs

Sl. No.	Date	Place / State	No. of Participants
1	24th- 25th May 2017	NTI, Bengaluru	All NTI Lab Staffs

21. Liquid culture DST training for laboratory personnel

Sl. No.	Date	Place / State	No. of Participants
1	12th-16th Jun 2017	Rajasthan	08

22. LPA Training

Sl. No.	Date	Place / State	No. of Participants
1	4th to 8th Sep 2017	Karnataka	02
2		Maharashtra	02
3		Punjab	01
4	11th to 15th Sep 2017	Karnataka	01
5		Kerala	01
6		Maharashtra	04
7		Puducherry	01
8		Tamil Nadu	01
9	4th to 5th Dec 2017	Kashmir	02
10		Maharashtra	02
11		West Bengal	01

23. Ms. Kyle DuGrey from CDC, Atlanta and Dr. Kishore from ICELT, NTI Bengaluru facilitated CBNAAT training

Sl. No.	Date	Place / State	No. of Participants
1	1st to 5th May 2017	Bengaluru, Karnataka	08
2	8th& 9th May 2017		05

24. Modular Training

S No.	Date	Place / State	No. of Participants
1	27th Nov - 1st Dec 2017	Andhra Pradesh	06

25. Sensitization on TB Control Programme for Undergraduates/ Postgraduates / medical / paramedical students

Sl. No.	Date	Category Of Students	No. of students	Organisation
1	05-01-17	BPT Students	25	Acharya Institute of Health sciences, Bangalore.
2	12-01-17	B. Sc.(N)	38	St.John's College of nursing, Bangalore.
3	13-01-17	B. Sc.(N) GNM	20 28	Narayana Hrudayalaya College of Nursing, Bangalore.
4	20-01-17	PG's Community medicine	06	A.J. College of Medical sciences, Mangalore
5	23-01-17	B. Sc.(N)	55	St.Philomina's college of nursing, Bangalore.
6	30-01-17 & 31-01017	B. Sc.(N)	79	NIMHANS, Bangalore
7	20-02-17 & 21-02-17	PG's Pulmonary medicine	8	GSL College & Hosp. Rajahmundry, Andhra Pradesh
8	22-02-17	BAMS Students	60	Santhigiri Ayurveda Medical College, Palakkad, Kerala
9	28-02-17	GNM	28	Lakshmi Memorial Inst. Of Nursing, Mangalore
10	01-03-17	B. Sc.(N)	52	Global college of Nursing, Bangalore

Sl. No.	Date	Category Of Students	No. of students	Organisation
11	02-03-17	B. Sc.(N)	37	Global college of Nursing, Bangalore
12	03-03-17	B. Sc.(N)	28	Sri Sathya Sai Institute of Higher Medical Sciences college of nursing, Bangalore
13	07-03-17	MBBS VII Term	54	Sapthagiri Inst. of medical sciences & RC, Bangalore
14	08-03-17	B. Sc.(N)	50	Florence college of nursing, Bangalore
15	10-03-17	B. Sc.(N)	55	Vaidehi Inst. Of Nursing sciences & RC, Bangalore
16	16-03-17	PG's-Public Health Dentistry	09	KLE's Inst. of Dental sciences, Bangalore
17	20-03-17	Health Inspectors Trainees	30	Air force medical Training center, Bangalore
18	05-04-17	B. Sc.(N)	31	MVJ College of Nursing
19	11-04-17	B. Sc.(N)	27	Acharya College of Nursing
20	11-04-17	M. Sc.(N)	05	----------do----------
21	19-04-17	B. Sc.(N)	32	St. Martha's College of Nursing
22	29-05-17	B. Sc.(N)	30	SJB (BGS) College of Nursing
23	30-05-17	GNM	38	SJB (BGS) School of Nursing
24	03-07-17	M. Sc.(N)	08	SJB (BGS) College of Nursing
25	13-07-17	B. Sc.(N)	50	St.John's College of Nursing. Bangalore
26	14-07-17	BAMS	59	Ahalia Ayurvedic Medical college, Palakkad, Kerala.
27	26-07-17	M. Sc. Life science	26	Mount Carmel college of Nursing, Bangalore
28	06-11-17	M. Sc. Biotechnology	30	Reva University, Bangalore
29	07-11-17	---------do-----	30	----------do----------
30	17-11-17	B. Sc.(N)	40	Goutham college of nursing , Bangalore
31	20-11-17	GNM	30	Goutham school of nursing , Bangalore
32	04-12-17	B. Sc.(MLT)	36	Acharya Inst. of Health Science, Bengaluru

Sl. No.	Date	Category Of Students	No. of students	Organisation
33	05-12-17	B. Sc.(MIT)	38	----------do----------
34	05-12-17	B. Sc.(N)	24	Sri Devraj Urs College of Nursing, Kolar, Karnataka.
35	07-12-17	M. Sc.(Microbiology)	20	Maharani's science college for Women, Bengaluru
36	20-12-17	M. Sc.(Microbiology)	08	University of Madras, T.N
37	21-12-17	B. Sc.(N)	37	NIMHANS, Bengaluru
38	21-12-17	B. Sc.(N)	35	NIMHANS, Bengaluru

26. MEETINGS/CONFERENCES/SEMINARS/WORKSHOPS ETC.ORGANIZED/ATTENDED

The Director, faculty and technical staff of NTI participated as Facilitators for training programmes, Resource persons for workshops and delegates in Conferences conducted both at NTI and outside. The details are furnished below:

A. At Different parts of India

S No	Particulars	Date	Resource person
1	Conducted onsite training in DST by liquid culture at KMS Hubli	31st Jan-3rdFeb 2017	Mr.Jayaganesh and Mr. Prathap
2	Gave onsite training in Liquid culture DST at RIMS Raichur	13th- 17thFeb 2017	Mr.Somashekarayya & Mr.Prathap
3	Attended Second Meeting of the Technical Specifications committee for TB laboratory equipment, consumables and infrastructure held at Nirman Bhawan, New Delhi	20th Feb 2017	Mrs. R.Lakshmi
4	Participated in international symposium on TB genomics organized by NIRT, Chennai	17th& 18th Feb 2017	Mr. George Sebastian and Mrs. R.Lakshmi
5	Attended Zonal Task Force (East Zone) at Ranchi, Jharkhand	4th& 5th Mar 2017	Mr. George Sebastian
6	Delivered a lecture on Current Status Prevention and Control of Tuberculosis in India" at Veterinary college Hebbal on World TB Day.	24th Mar 2017	Mr. George Sebastian

S No	Particulars	Date	Resource person
7	Attended a CME and gave Lecture on “Microbiological Diagnostic in TB – an overview” at Rajiv Gandhi Institute of Chest diseases Bangalore	24th Mar 2017	Mrs. R.Lakshmi
8	Attended quarterly review meeting of CDC-GHSA projects at NIMHANS, Bengaluru	29th May 2017	Dr. R.Lakshmi
9	Conducted onsite training in LPA at National Institute of Research In Tribal Health, Jabalpur	12th -15th Jun 2017	Mr. Pratap
10	Visited military hospital Pune for certification of culture and DST laboratory	19th - 23rd Jun	NTI Lab officials, Division Head Dr. Krishnamurthy, Mr. George Sebastian, Mrs. Reena, Mrs. Lakshmi
11	Conducted on site visit at RIMS Raichur to give onsite second line LPA training	28th & 29th Jun 2017	Mr. Somashekarayya
12	Visited GuruTegh Bahadur (GTB) Hospital, Mumbai, to give onsite second line LPA training	28th & 29th Jun 2017	Mr. Jaya Ganesh
13	Conducted visit to, KIMS, Hubli to give onsite second line LPA	28th & 29th Jun 2017	Mr. Prathap
14	Conducted visit to military Hospital, Pune and Intermediate Reference Laboratory (IRL), Pune for precertification	30th Jun & 1st Jul 2017	Dr. Krishnamurthy, Mr. George Sebastian, Mrs. Reena, Dr. Lakshmi,
15	Conducted on site second line LPA training in IRL, Karnataka	3rd & 4th Jul 2017	Mrs. Reena & Mrs. Bhagirathi
16	Conducted onsite training on 2ndline LPA at IRL, Aurangabad	4th & 5th Jul 2017	Mr. Jaya Ganesh
17	Conducted onsite training on 2nd line LPA at IRL, Pune STDC	4th & 5th Jul 2017	Mr. Prathap
18	Conducted onsite training on 2nd line LPA at IRL Ajmer	11th & 12th Jul 2017	Mr. Somashekarayya
19	Conducted onsite training on 2nd line LPA at IRL Jodhpur	11th-12th Jul 2017	Mr. Jaya Ganesh

S No	Particulars	Date	Resource person
20	Conducted onsite training on 2nd line LPA at SMS Jaipur Medical college	11th & 12th Jul 2017	Mr. Prathap
21	Conducted onsite training on 2nd line LPA at IRL BMHRC Bhopal	26th & 27th Jul 2017	Mr. Somashekarayya
22	Conducted onsite training on 2nd line LPA at GTB Mumbai	28th & 29th Jun 2017	Mr. Jaya Ganesh
23	Conducted onsite visit to IRL Bengaluru, to give Training in MGIT Liquid culture and DST	28th - 30th Aug 2017	Mr. Prathap
24	Attended North Zonal Task Force meeting at Leh Ladakh	11th - 13th Aug 2017	Dr. Krishnamurthy
25	Attended E- Procurement and GEM training at Institute of Govt. Finance and Accounts, Chennai	11th Sep - 13th Sep 2017	Dr. A. Krishnamurthy, Mr. George, Mr. Saravanan & Mr.Nagarajappa
26	Conducted onsite Evaluation in IRL, Rajiv Gandhi Institute of Chest Diseases, Bengaluru	20th Sep-23rd Sep 2017	Dr. K. Reena, Dr. R. Lakshmi, Dr. Rohini Sharma, Mr. Somashekarayya
27	Hand holding IRL Karnataka for smooth functioning of PMDT services	9th – 21st Oct 2017	Dr. Reena, Dr. Lakshmi & Mr. Somshekerayya
28	Pre-assessment visit to KIMS Hubli for certification in Liquid culture	12th Oct 2017	Dr. Reena & Mr. T. Pratap
29	Re assessment visit to IRL Karnataka	27th Oct 2017	Dr. Reena & Dr. Lakshmi
30	EQA OSE visit to Rajasthan	30th Oct – 4th Nov 2017	Dr. Rohini Sharma, Mr. Prathap & Mr.Somshekerayya
31	Joint Assessment of TB Diagnostic Network India- Debriefing meeting at New Delhi	30th & 31st Oct 2017	Dr. R.Lakshmi
32	Joint assessment of TB Diagnostic Network – site visit Bengaluru	1st Nov 2017 - 4th Nov 2017	Dr. P. Kumar, Dr. K. Reena & Dr. R. Lakshmi
33	EQA OSE to IRL Ajmer	1st Nov 2017 - 4th Nov 2017	Dr. Rohini S, Mr. T. Pratap & Mr. Somashekarayya
34	Deliver Guest Lecture at Telengana state conference of Tuberculosis	4th Nov 2017	Dr. K. Reena

S No	Particulars	Date	Resource person
35	Catridge Based Nuclic Acid Amplification Test (CBNAAT) site visit & EQA to Mysore and Chamrajnagara	7th Nov 2017	Dr. K. Reena, Dr. R. Lakshmi & Mr. Somashekarayya
36	Pre-assessment visit to C &DST labs, RIMS, Raichur	9th Nov 2017	Dr. R. Lakshmi & Mr. Somashekarayya
37	EQA OSE to IRL Nagpur	7th Nov - 14th Nov 2017	Dr. Rohini S, Mr. T. Pratap & Mr. K. Jayaganesh
38	CBNAAT & EQA site visit, Tumkur	10th Nov 2017	Dr. Reena & Ms. H. G. Mamatha
39	CBNAAT & EQA site visit, Mandya	14th Nov 2017	Dr. Reena & Mr. Somashekarayya
40	CBNAAT & EQA site visit,Pavagada	15th Nov 2017	Dr. Reena & Mr. Somashekarayya
41	Stake holder meeting on developing LIMS under RNTCP at Delhi	16th & 17th Nov Nov 2017	Dr. R. Lakshmi
42	CBNAAT site visit & EQA to Chikballapura& Kolar	18th Nov 2017	Dr. R. Lakshmi, Mr. Somashekarayya
43	CBNAAT site visit & EQA to Bijapur, Gulbarga, Bidar, Yadgir	21th Nov- 24th Nov 2017	Mr.Somashekarayya & Mr. T. Pratap
44	NRL Mentoring visit along with CTD – BMHRC, Bhopal	29th & 30th Nov 2017	Dr. K. Reena & Mr. Somashekarayya
45	Electron Microscopy training department of anatomy New Delhi	20th Nov 2017 – 2nd Dec 2017	Dr. Rohini
46	South-Zone-2 Zonal visit at Chennai	29th & 30th Nov 2017	Dr. Krishnamurthy
47	Attended South Zone-2 Zonal task force meeting at Chennai	28thNov-1st Dec 2017	Dr. Krishnamurthy
48	Attended NATCON workshop at Rajahmundry, Andhra Pradesh	15th – 18th Dec 2017	Dr. Krishnamurthy
49	Attended NATCON workshop at Rajahmundry, Andhra Pradesh	15th Dec 2017	Mr. George Sebastian
50	Re-Assessment of C& DST activities of IRL-Bengaluru	18th Dec 2017	Mr. Somashekharayya

B. At NTI

S N	Particulars	Date
1	**Data verification of NDRS:** Participated in the meeting chaired by DDG (TB) Presentation on NDRS was made and various study components were discussed at length.	5th - 6th Jan. 2017
2	Workshop on e- module content framework preparation workshop: Contributed towards preparation of "Introduction to RNTCP" part.	23rd -24th Jan 2017
3	Data verification of National Drug Resistance Survey (NDRS): Participated in the meeting which was attended by the officials of WHO HQ Geneva and WHO India Office, for data verification of NDRS.	25th - 27th Jan 2017
4	Inaugurated the E-training module content development workshop,	30th – 31st Jan. 2017
5	E-Training Module workshop: Participated and facilitated group work for case finding and diagnosis.	30th - 31st Jan 2017
6	Technical and Operational Guidelines workshop: Facilitated the workshop and delivered a talk on TB Case finding and diagnosis	27th Feb - 3rd Mar 2017
7	Technical & Operational Guidelines workshop: Delivered a talk on Research and Disaster Management	3rd Mar 2017
8	Technical session to commemorate the World TB Day: Dr. VK Chadha and Dr. SK Tripathi made presentations on 'Enhancing TB Care in Private Sector' and 'Treatment of drug resistant TB' respectively.	24th Mar 2017
9	Study tour of TB programme managers, Afghanistan: Facilitated and delivered lectures on TB Epidemiology, Diagnosis &case finding and Surveillance & Monitoring	10th Mar 2017
10	"Sensitization cum Training Workshop for ICMR-RNTCP TruNaat Demonstration Study" was held.	24th, 26th, 28th Apr & 1st May 2017
11	Dr. Gomathi from NRL National Institute of Research in Tuberculosis (NIRT), Chennai attended TruNaat and comprehensive Lab trainings and appreciated NTI for the support for organizing the trainings.	25th May 2017
12	Inaugurated Comprehensive training Course for Laboratory Personnel, addressed the participants both in inaugural and concluding sessions.	24th Apr to 6th May 2017
12	Inaugurated CDC-CTD-NTI follow up training for Xpert MTB/RIF Dried Tube Specimen for training NTI staff by CDC Atlanta facilitators.	1st to 12th May 2017
13	Attended concluding session of comprehensive training Course for laboratory personnel and addressed the participants	6th May 2017
14	Inaugurated 5 batches of Second line LPA training Course for laboratory	

S N	Particulars	Date
	personnel at ICELT- NTI, Bengaluru. Along with Director, DGHS; DDG (TB) and WHO NPO visited the concluding session on 12th May 2017 and DGHS distributed certificates to the participants	8th – 23rd May 2017
15	Expert Committee Meeting for alignment of DR TB treatment with NDRS	11th– 13th May 2017
16	Inaugurated OR capacity building workshop being organized by The Union with the support of CTD, CDC and NTI, addressed the participants in both inaugural and concluding sessions.	17th - 26th May 2017
17	Inaugurated Second line LPA training Course for NTI lab staff, for supervision, monitoring, evaluation of C&DST labs and provide appropriate support to IRLs in C&DST to the states.	24th - 27th May 2017
18	Inaugurated C&DST training, EQA training and PFMS training for Financial management (inaugurated along with DDG (TB)	12th – 22nd Jun 2017
19	Participated in Meeting for “alignment of DR-TB treatment with NDRS” in TCC room, NTI, chaired by DGHS. DG instructed CTD to re-visit the treatment regimen of drug sensitivity and drug resistant TB based on NDRS results.	21st Jun 2017
20	Participated in meeting on progress of Surveillance Unit in TCC room, NTI	22nd Jun 2017
21	Inaugurated 3 batches of National level training on Drug and Vaccines Distribution Management System (DVDMS)	12th Jul 2017 19th Jul 2017 26th Jul 2017
22	Inaugurated 2 batches of National level training on Drug and Vaccines Distribution Management System (DVDMS) by using CDAC software (4th & 5th batches) and Bedaquiline DST training: Orientation training for PG students of Medical Colleges, Karnataka.	2nd – 4th Aug 17 16th – 18th Aug 17 7th – 11th Aug 17 17th – 18th Aug 17
23	Inaugurated SAARC regional training on Management of Information for Acton (MIFA) for TB & HIV/AIDS Control Programmes. 2 Trainings on "First-line Line Probe Assay" and “ EQA for sputum smear Microscopy” were held. The delegates of SAARC Member Countries appreciated the training and the activities of the Regional Centre.	1st - 5th Sep 17 4th – 8th Sep 17 11th – 15th Sep 17 18th – 22nd Sep 17
24	Inaugurated the training on "First-line Line Probe Assay", addressed the participants in both inaugural and concluding sessions and distributed certificates on the concluding day. Inaugurated the “Comprehensive lab training” and addressed the participants	9th – 13th Oct 2017 23rd Oct – 4th Nov 2017

C. Meetings and Workshops

S No	Details	Period
1	Meeting with the authorities of Narayana Hrudayalaya, Bangalore regarding collaboration with NTI.	17th Jan 2017
2	- Participated in the launch of Tribal Project "Targeted Intervention to Expand and Strengthen TB Control in Tribal Populations under RNTCP" held at 7 Tigers Resort, Kanha National Park, Madhya Pradesh. - Held meeting with DDG (TB); Joint Secretary, Min. of H&FW, GOI; STO MP; DTO Jabalpur; Dr Rao from National Institute of Research and TB; and Hon'ble Minister of State for H&FW.	19th – 21stJan 2017
3	- Attended the Zonal Task Force meeting for South Zone for involvement of Medical College held at Kempegowda institute of Medical Sciences (KIMS), Bangalore. - Chaired the Scientific session & addressed inaugural & valedictory function & also made presentation on "Updates of RNTCP" on behalf of CTD, Govt. of India.	2nd & 3rd Feb 2017
4	- Participated in a meeting on "End TB Strategy" held at Trivandrum, Kerala in which officials from WHO, Govt. of India, Govt. of Kerala & partners participated. - Participated in the Inauguration of Launching daily regimen in Kerala, which was inaugurated by Hon'ble Health minister, Govt. of Kerala. Dr. V.K. Chadha Chaired the technical session on presentations by National Professional Officers and DDG(TB) regarding Global TB Elimination strategy & national strategic plan respectively.	6th & 7th Feb 2017
5	Actively participated in the National workshop on 'Expanding Bedaquline access and introduction of shorter regimen' held at Ahmadabad, Gujarat	21st - 23rd Feb 2017
6	- Meeting with Dr. Behera, Chairman National Task Force and Chairman National Research Committee, in PGIMR, Chandigarh. - Attended as an examiner in a Ph.D exam at Dept. of Bio chemistry in PGIMR,Chandigarh.	21st – 22nd Feb 2017
7	Attended the National Research Committee meeting held at DGHS, Ministry of Health & Family Welfare Govt. of India, New Delhi	23rd Feb 2017
8	Review meeting of the ongoing Multi centric Cohort Study of Recurrence of TB among newly diagnosed sputum positive PTB patients treated under RNTCP – Collaborative Study (RP/240) held at NIRT Chennai:	22nd - 23rd Feb 2017

S No	Details	Period
9	Attended the meeting on "Finalization of New Strategic plan of RNTCP – Consultative workshop" held in the Hotel HAYAT Residence, New Delhi. Dr. V. K. Chadha Participated as leader of the group on surveillance, monitoring and evaluation, research. Presented framework for the same. Gave inputs especially regarding intensified case finding and active case finding.	28th Feb. & 1st Mar 2017
10	- Participated in a meeting at DDG (TB) office chaired by DDG(TB) attended by Dr. Patrick Moonan, Head of CDC, Delhi Office, Dr. Ranjani Ramachandran (WHO NPO Lab). It was decided in the meeting that Genetic Sequencing of NDRS samples will be performed by NTI in a joint collaborative project of CDC – GOI – CTD – NTI.	2nd Mar 2017
11	Held discussions with the officers of TB Research Consortium Secretariat, ICMR, New Delhi on the progress of activities of group on epidemiology & Implementation Research.	2nd Mar 2017
12	Attended "India TB research Consortium" held in ICMR, New Delhi. The Epidemiology & Implementation Research group was chaired by Dr. Behera, from PGI Chandigarh along with Director NITRD, New Delhi and Director NTI as an expert. Finalized Research protocols to be taken up for research. Dr. V.K. Chadha, as group leader, drafted and presented three protocols; revised presentation made after obtaining inputs from working group.	6th & 7th Mar 2017
13	- Attended meeting with Director NIRT, Dr. Patrick Moonan, Head of CDC, Delhi Office, Dr. Ranjani Ramachandran (WHO NPO Lab), Dr Anand CTD Consultant, & Dr Lakshmi R from NRL, NTI in the Hotel Radisson and It was decided in the meeting to that as instructed by DDG(TB) the Sequencing of NDRS samples will be performed at NTI.	9th Mar 2017
14	Meeting with DDG (TB) in CTD, New Delhi. It was informed that DGHS desired to have a detailed discussion on NDRS findings along with experts of NTI, CTD & WHO. The finalized dates & venue of the meeting will be communicated by DDG(TB) to Director, NTI in due course of time.	14th Mar 2017
15	Participated in WHO SEARO Ministerial Meeting held in Le-meridian Hotel, New Delhi.	15th – 16th Mar 2017
16	- Meeting with VK Arora, Vice Chairmen of TB Association of India & Vice chairmen & Secretary of Andhra Pradesh TB Association in Vijayawada, Andhra Pradesh and Presented Dr. P V Benjamin oration on "Drug Resistance TB in India, Challenges & opportunities" in APTB conference	17th to 19th Mar 2017

S No	Details	Period
	in Vijayawada. The Hon'ble Minister Dr K V Rao felicitated Dr. Prahlad Kumar, Director, NTI by awarding Dr P V Benjamin award.	
17	- Attended the NDRS review meeting along with a team of experts of CTD & WHO, chaired by DGHS, Government of India in his office at Nirman Bhavan, New Delhi, and Director NTI presented the findings of NDRS to DGHS. - DGHS also decided that NTI will conduct Genetic Sequencing with the support of WHO & CDC on NDRS samples available in NTI.	30th Mar 2017
18	Participated in the "TB-Free India Summit" at Dharamshala, Himachal Pradesh along with the Secretary of the Union, to discuss Agenda for the Summit. During this period, also held meeting with DDG(TB); Economic Advisor & Joint Secretary to GOI and Regional Director of the Union, regarding support of NTI in the activities being carried out by CTD with the support of the Union.	6th - 8th Apr 2017
19	Participated in the "National Task Force Meeting for involvement of medical colleges in RNTCP" at Guwahati.	10th – 12th Apr 2017
20	Meeting was held with the officials of State TB Cell and the STO, Rajasthan. Various observations made by the NRL NTI team were discussed at length and the STO informed that appropriate action based on these suggestions provided by Director and the NTI team will be incorporated.	17th - 21st Apr 2017
21	Director held a meeting with the officials of SMS medical college, Jaipur regarding the support of medical college in strengthening early and accurate diagnosis of DR-TB and their management as well as support to other components of RNTCP.	29th Apr 2017
22	Attended the function in NTI auditorium organized by MS Ramaiah College faculty and Art Academy of Bengaluru University and an appeal was made by Director, NTI, to all the participants and invitees to support TB control by identifying all symptomatic and refer them to the closest health facilities.	7th May 2017
23	Attended as a member of Project Evaluation Committee (PEC) meeting held at Bengaluru and Goa, chaired by Dr V.M. Katoch, former DG, ICMR, Secretary Health Research, Min. of H&FW, GOI.DDG also participated as a member of this project in the meeting.	29th & 30th May 2017

S No	Details	Period
24	Meeting with Sri A.K. Jha, Joint Secretary and the Economic Advisor, GOI during his visit to Bengaluru. A brief presentation on technical activities being carried out at NTI was made to him.	11th Jun 2017
25	Meeting with DDG (TB) in CTD, New Delhi, to discuss Agenda of "Centre-State Summit for TB Elimination through Effective Partnerships" to be held in Nagpur, Maharashtra. Discussion on preparation of draft NDRS report and presentation of NDRS findings to the Hon'ble Union Minister for H&FW, GOI was also held.	5th Jul 2017
26	Participated in the Consultative Meeting on OR under Medical Colleges held in the Hotel Taj Mahal, New Delhi.	6th Jul 2017
27	Participation in 23rd NESCON 2017 at Mumbai and meeting was held with the organizers and various experts who attended NESCON.	7th -9th Jul 2017
28	Participated in the "Centre-State Summit for TB Elimination through Effective Partnerships" held at Nagpur, Maharashtra and chaired scientific sessions on both the days and held a meeting with STO, Maharashtra and CTD officials to finalise Agenda of the Summit.	27th, 28th& 29thJul 2017
29	Visited BBMP - RNTCP Coordinators office along with Dr. Ranjani Ramachandran, NPO, WHO and Dr Anand, CTD and had detailed discussion about active case-finding activities taken up and TruNaat rapid diagnostic tool to be implemented in Karnataka.	9th Aug 2017
30	Participated in the "National Programme Review Meeting of RNTCP" at Chandigarh. The findings of NDRS were presented in the inaugural day of the meeting. The Economic Advisor of Min. of H&FW, DDG (TB) and all STOs and participants of the meeting gave standing ovation to Director, NTI, for successful completion of landmark study.	12th -14th Sep 2017
31	Attended the meeting of "expert committee on regulation of newer anti-TB drugs in India" to discuss the introduction of second new drug "Delamanid" under PMDT through RNTCP programme in India, under the chairpersonship of Dr Soumya Swaminathan, Secretary Dept. of Health Research & DG-ICMR, held in New Delhi and provided inputs.	21st Sep 2017 22nd Sep 2017
32	Director held meeting with DGHS during his visit to Bengaluru and briefed the DG about the activities being carried out at the Institute.	27th Sep 2017

S No	Details	Period
33	Participated in the Indo-US delegation of the CDC and GOI held in conference hall of DGHS, New Delhi and made a presentation on the CDC supported activities being carried out at NTI.. - During the meeting held discussion with DDG (TB), Addl. DDG and DADG, CTD regarding technical support to be provided by NTI for RNTCP supervision, monitoring and evaluation. - Held discussion with Economic Advisor of Min. of H&FW regarding technical and administrative activities of NTI and also had discussion with Under Secretary, CCD Section, Min. of H&FW regarding construction of Guest House in NTI.	28th Sep 2017
34	Meeting with Dr Devesh Gupta, Addl. DDG and Dr Raghuram Rao, DADG, CTD to plan technical support to be provided by NTI for various components of RNTCP.	29th Sep 2017
35	Attended Gandhi Jayanthi – Ahimsa Mahotsav-2017 in Raj Bhavan, Bengaluru, where programmes were presented by various artists of Karnataka. His Excellency the Governor of Karnataka also graced the occasion and addressed the participants.	1st Oct 2017
36	Visited Sakara Hospital and Narayana Hrudayalaya, Bengaluru and some of the CBNAAT facilities in Bengaluru rural district.	12th Oct 2017
37	Attended the function inaugurated by MD NHM, Karnataka, in the office of Directorate of Health Services, Government of Karnataka for launching of the daily regimen.	13th Oct 2017
38	Visited Railway Hospital, Yelahanka, Bengaluru, regarding collaboration with NTI.	14th Oct 2017
39	Participated in the “31st Annual Update on Pulmonary and Critical Care” at the PGIMER, Chandigarh to deliver the prestigious “Dr. Dheeraj Gupta Memorial Oration” and made a presentation on “Overview of Drug Resistant Tuberculosis in India”.	22nd Oct 2017
40	participated in the discussion with National and International experts for evaluation of laboratory network of the country held in Hotel Taj Mansingh, New Delhi.	30th – 31st Oct 2017
41	Meeting at NTI with the team of experts for assessment of laboratories i.e., CDC Atlanta, CTD, International experts and TB control programme officials	30th Oct - 10th Nov 2017

S No	Details	Period
	of Karnataka, where a presentation was made on the activities carried out at NTI and EQA & PMDT activities at NRL NTI	
42	As part of assessment of laboratories, accompanied the team to IRL Bengaluru and one of the DMCs. STO Karnataka made a presentation, which was followed by visit to IRL Bengaluru and one of the DMCs.	1st Nov 2017
43	As a member of Internal expert team, visited Hyderabad and a presentation was made by the STO, Telengana, which was followed by visit to IRL Hyderabad and some of the PHIs	2nd Nov 2017
44	Visited Bhubaneswar to interact with Orrisa NRL & RNTCP experts	3rd & 4th Nov 2017
45	Participated in the final discussion on the comprehensive assessment of laboratories held at New Delhi. Chaired scientific sessions, guided the discussion on both the days and addressed the participants	7th & 8th Nov 2017 9th & 10th Nov 2017
46	Along with DDG TB, participated in a meeting held at Hotel Lalith, New Delhi where results of Phase III trial of Delamanid (New drug) were shared.	1st Dec 2017
47	Participated in the inaugural session of the training of SAARC experts for TB control activities and addressed the participants and attended meetings with Economic Advisor & Joint Secretary, Min. of H&FW, DDG TB and Director, NITRD, New Delhi to discuss various technical initiatives to be taken up at NTI during the year 2018.	4th Dec 2017
48	Director along with Addl. DDG, Dr. Devesh Gupta and other team members visited Rajiv Gandhi Institute of Chest Diseases to see the facilities available in the Centre.	5th Dec 2017
49	Visited Narayana Hrudayalaya and had interacted with the management of the Institute about collaboration between NTI and their Institute for PMDT and sensitization of their faculty on new technical and operational guidelines on PMDT, recently developed by CTD.	6th Dec 2017
50	Participated in a meeting organized by Asha Kiran, NGO held at Mysore on the occasion of 20 years celebration of the NGO.	10th Dec 2017
51	Meeting was held with Chairman, National OR Research Committee, at PGIMER, Chandigarh regarding strengthening of operations research in Medical Colleges and NTF for involvement of medical colleges.	27th Dec 2017
52	Attended viva-voce as an examiner to a PhD candidate at PGIMER, Chandigarh	28th Dec 2017

Use of mHealth to enhance TB referrals in a tribal district of India

Chadha S, Trivedi A, Nagaraja SB &Sagili K: ***Public Health Action*** *2017, 7, 123-126*

Background: A mobile health (mHealth) technology-based application was developed to help rural health care providers (RHCPs) identify and refer presumptive tuberculosis (TB) patients to the nearest microscopy centre for sputum examination using mobile applications on their smart phones.

Objective: To determine the feasibility and yield of presumptive TB case referrals by RHCPs using mHealth technology.

Methods: The project was implemented in the tribal population of Khunti District, Jharkhand State, India, from Apr 2012 to February 2015. 'ComCare', a mobile application designed as an aid for health care providers, was introduced and RHCPs were trained in its use.

Results: Of 171 RHCPs who were formally trained to identify and refer presumptive TB patients, 30 were trained in the use of mobile application. There were 35 referrals of presumptive TB patients per RHCP using the mobile application, and four each by RHCPs who were not using the application. Of the 194 TB cases diagnosed, RHCPs using the application contributed 127 (i.e., 4 TB cases per RHCP), while other RHCPs contributed 67 (0.5 TB case per RHCP).

Conclusion: mHealth technology was highly effective, and increased both public and private health care provider accountability to patients

Keywords: *mHealth; Rural health care providers; Tuberculosis; India*

Tuberculosis knowledge and attitude in aspiring doctors and nurses – Is it time for our TB teaching methods to evolve?

Acharya PR, D'Souza M & Sahoo R C : ***Indian J Tuberc****, 2017, 64, 20-25.*

Background: India accounts for nearly 24% of all the new tuberculosis (TB) cases globally. A good core knowledge and a positive outlook towards TB patients among our aspiring doctors and nurses are necessities for India to meet the Sustainable Development Goals (SDG) proposed by the WHO as a part of its post-2015 global TB strategy and to successfully combat the newer challenges posed by this disease in the future.

Aims: To evaluate knowledge related to transmission, prevention and treatment of tuberculosis amongst medical and nursing students. The study also aims to evaluate the attitude of students towards tuberculosis patients.

Methods: A self-administered pre-tested questionnaire was completed by 200 final year undergraduate medical and nursing students at a teaching medical college hospital. We collected information pertaining to general aspects of TB, its prevention and treatment and also the attitude of these prospective doctors and nurses towards treating/nursing TB patients.

Results: Most respondents (98.5%) were aware of the person to person transmission of the disease. 20% thought it could spread by fomites, 6.5% by shaking hands and 17% believed kissing could spread the disease. 72% of those surveyed did not think that healthcare workers were at greater risk of contracting TB. Only 52% of students knew that non-DOTS treatment was associated with a greater probability of patient defaults, development of drug-resistance, chronic disease and deaths. 27% of the students chose a simple surgical mask believing that it could protect them against nosocomial TB. Only 50% of nursing students were aware that the sputum smear examination was the diagnostic

test required to label the patient as an 'open' or infectious case. A reluctance to interact with TB patients for fear of personal safety was seen in 28% of both groups. 83% of nursing students and 53% of the medical students were willing to attend to TB patients in isolation wards. 98.5% of the participants believed that TB is a disease that can be prevented, treated and cured.

Conclusion: There exists considerable scope for improving knowledge in areas relating to disease transmission and the preventive aspects of TB among our healthcare students. Since the present curriculum was deemed as adequate by the students, newer learning methods may be needed to disseminate any additional knowledge. Healthcare students did not display any prejudice towards TB patients which augurs well for TB control activities in the future.

KEYWORDS: *Medical students; Nursing students; Tuberculosis, Teaching Methods*

Investigation of the risk factors for pulmonary tuberculosis: A case–control study among Saharia tribe in Gwalior district, Madhya Pradesh, India.

*Bhat J,Rao VG, Sharma RK, Muniyandi M, Yadav R &BhondleyMK****:Indian J Med Res,*** *2017, 146, 97-104.*

Background and objectives: Prevalence of pulmonary tuberculosis (PTB) is known to be high in the indigenous tribal community Saharia in Madhya Pradesh, India. The risk factors for PTB are not well known among them. This study was done to determine various risk factors associated with PTB in the indigenous/ ethnic community of Saharia.

Methods: A prevalence survey was conducted among Saharias of Gwalior district of Madhya Pradesh. The population surveyed was 12,123 which was the source of cases and controls for the present study. All the bacillary-positive cases and controls in the ratio of 1:5 were included in the survey. Data were collected by the trained health workers from the patients and controls using a semi-structured pre-coded and pre-tested questionnaire which included data on risk factors including demographic factors, host related factors and household factors. The individuals were also screened for diabetes mellitus and HIV. Results: Malnutrition and history of asthma were associated with an increased risk of PTB. More than 56 per cent cases were attributed to malnutrition and 12 per cent attributed to asthma. Low family income, alcohol consumption and smoking were the other contributors. The risk was higher in males as compared to females.

Interpretation and conclusions: The study emphasized that the main contributors were social factors. Nutrition supplementation, especially in tuberculosis (TB) patients and integrated approach to improve their living conditions are needed to control TB in this community.

KEYWORDS: *Malnutrition; Pulmonary tuberculosis; Risk factors; Tribal community*

Social capital & adverse treatment outcomes of tuberculosis: a case-control study

Deshmukh P R, Mundra A &DawaleA ***:Int J Tuberc Lung Dis,*** *2017, 21 (8), 941-946*

Settings: 'Social capital' refers to social norms, relationships, networks and values that affect the functioning and development of society. Social capital influences health positively, but its role in the treatment outcomes of tuberculosis (TB) is not known.

Objectives: To study the role of social capital in determining adverse TB treatment outcomes.

Design: Of 516 patients registered under the Revised National Tuberculosis Control Programme in 2014 in Wardha Tuberculosis Unit, Wardha, India, we included 88 patients with adverse treatment outcomes as cases and 187 controls from among those without adverse outcomes. Multiple logistic regressions were used to compare standardised Z-scores.

Result: A greater proportion of controls than

cases belonged to higher quartiles of social capital and its domains than cases, and the mean standardised Z-score was also consistently higher among controls than cases. Respectively 47% and 15% of cases and controls were in the poorest quartile of social capital, whereas respectively 10% and 33% of cases and controls were in the richest quartile. Each unit increase in Z-score of overall social capital reduced the odds of adverse treatment outcomes by 63.1%.

Conclusion: Appropriate interventions for building social capital for TB patients and linking them with the programme would improve programme performance.

KEYWORDS: *Treatment, TB, Revised National Tuberculosis Control Programme, Social norms*

Line probe assay for detection of Mycobacterium tuberculosis complex: An experience from Central India

*Desikan P, Panwalkar N, Mirza S B, Chaturvedi A, Ansari K, Varathe R, ChoureyM,Kumar P & Pandey M:****Indian J Med Res,*** *2017, 145, 70-73*

Background & objectives: Mycobacterium tuberculosis complex may sometimes not be detected in sputum samples of suspected multidrug-resistant tuberculosis (MDR-TB) patients by line probe assay (LPA) even though they are smear positive for acid-fast bacilli (AFB). This retrospective analysis was attempted to understand and document our experience with LPA for detection of M. tuberculosis complex and diagnosis of MDR-TB under programmatic conditions.

Methods: One thousand two hundred and ninety-four sputum samples of MDR-TB suspects that were smear positive for AFB, and received from February to Nov 2013, were tested by LPA for the presence of M. tuberculosis complex and resistance to isoniazid (INH) and rifampicin as per the diagnostic mandate of an accredited reference laboratory. As per the mandate, those samples that were negative for M. tuberculosis complex were cultured, and the growth again tested by LPA. A retrospective analysis of the results was carried out.

Results: M. tuberculosis complex could be detected in 1217 (94.04%) but not in 77 (5.9%) of smear-positive sputum samples. Of the 1217 positive samples, 232 (19.1%) were MDR, 130 (10.6%) were rifampicin monoresistant and 101 (8.3%) were INH monoresistant. Seven hundred and fifty four (61.9%) strains were found to be pan sensitive. Overall, 5.1 per cent of the sputum samples were negative for M. tuberculosis complex by LPA and culture. In at least 10 (0.77%) sputum samples smear positive for AFB, M. tuberculosis complex could not be identified by LPA though M. tuberculosis was present, as evidenced by culture positivity.

Interpretation & conclusions: LPA is a robust technique for diagnosis of drug-resistant TB that has provided the basis for rapid and effective control of drug-resistant TB in India. While the reasons for concomitantly negative LPA and culture results of smear-positive sputum samples from MDR-TB suspects may be many, the possible presence of non-tubercular mycobacteria in these samples and the likelihood of inappropriate therapy in these patients cannot be ruled out. Addition of culture to the diagnostic algorithm may enhance the diagnostic yield.

KEYWORDS: *Acid-fast bacilli, Mycobacterium tuberculosis, MDR-TB; Non-tuberculous mycobacteria, MDR-TB, Smear positive.*

Incidence and Clinical profiles of Pulmonary & Extra-Pulmonary Tuberculosis patients in North Indian population: A hospital based Retrospective study

Gaur P S, Suryakant, Bhaskar R, Singh S, Saxena P & Agnihotri S: ***Int. J. Res. Dev. Pharm. L. Sci,*** *2017, 6, 2773-2778*

Introduction: Tuberculosis (TB) is one of the most important global health problems. The

prevalence of TB is high among the developing world. This retrospective study was carried out to find the incidence and clinical profiles of pulmonary and extrapulmonary tuberculosis patients in North Indian population.

Material and methods: A retrospective analysis of 552 patients having EPTB and PTB was undertaken from the Dept. of Respiratory Medicine, King George's Medical University, U.P., Lucknow, out of which 300 were of pulmonary tuberculosis and 252 of EPTB. Demographic characteristics, clinical features and apparent risk factors of disease were obtained from medical case records of all patients visiting the hospital from. The Study included only the confirmed cases of EPTB and PTB with or without other co-infections.

Results: Results were tabulated and statistically studied. The prevalence of EPTB was higher among females than males as compared to PTB and this was statistically significant (p=0.001). No significant (p>0.05) association was found between EPTB and PTB according to the place of residence. However, the tobacco habit, smoking habit, alcohol use and family history were found to be significantly (p< 0.01) associated with the type of TB. Pleural (62.3%) site of EPTB was a most common site in EPTB patients. The study shows a significant (p=0.04) association between age distribution and disease condition (both EPTB and PTB) among males. A similar observation was found among female patients. The prevalence of EPTB was 1.80 times significantly higher among smokers. The prevalence of EPTB was also higher among those who had a family history of tuberculosis infection in comparison with new cases. Diabetes was present in 16.7% of the EPTB patients and MDR-TB was present in 12.7%. HIV was present in 8%. Most of the patients of EPTB were new cases (88.1) in comparison with the retreatment cases(11.9).

Conclusion: Among evaluated tuberculosis patients, maximum had EPTB. Pleural tuberculosis was the most common presentation of EPTB. Both pulmonary, as well as extrapulmonary forms of tuberculosis, affected the younger population, between 20-40 years of age, more commonly. The study shows female preponderance among EPTB cases as compared to PTB cases. In female population, EPTB affected younger age group as compared to male patients where PTB was found to be more common. A Higher proportion of EPTB cases were found to be HIV positive and suffering from diabetes as compared to PTB.

KEYWORDS: *Incidence, Pulmonary TB, Extra-Pulmonary TB, North India*

Tuberculosis treatment outcomes among disadvantaged patients in India

Jackson C, Stagg H R, Doshi A, Pan D, Sinha A, Batra R, Batra S, Abubakar I & Lipman M: ***PHA,*** *2017, 7, 134-140*

Setting: Urban slums and poor rural areas in India, 2012–2014.

Objective: To describe the characteristics of tuberculosis (TB) patients enrolled in treatment through Operation ASHA, a non-governmental organisation serving disadvantaged populations in India, and to identify risk factors for unfavourable treatment outcomes.

Design: This was a retrospective cohort study. Patient characteristics were assessed for their relationship with treatment outcomes using mixed effects logistic regression, adjusting for clustering by treatment centre and Indian state.
Outcomes were considered favourable (cured/treatment completed) or unfavourable (treatment failure, loss to follow-up, death, switch to multidrug-resistant TB treatment, transfer out).

Results: Of 8415 patients, 7148 (84.9%) had a favourable outcome. On multivariable analysis, unfavourable outcomes were more common among men (OR 1.31, 95%CI 1.15–1.51), older patients (OR 1.12, 95%CI 1.04–1.21) and previously treated patients (OR 2.05, 95%CI 1.79–2.36). Compared to pulmonary smear-negative patients, those with extra-pulmonary

disease were less likely to have unfavourable outcomes (OR 0.72, 95%CI 0.60–0.87), while smear positive pulmonary patients were more likely to have unfavourable outcomes (OR 1.38, 95%CI 1.15–1.66 for low [scanty/1+] and OR 1.71, 95%CI 1.44–2.04 for high [2+/3+] positive smears).

Conclusion: The treatment success rate within Operation ASHA is comparable to that reported nationally for India. Men, older patients, retreatment cases and smear-positive pulmonary TB patients may need additional interventions to ensure a favourable outcome.

KEYWORDS: *Epidemiology; DOTS; Slums; Mycobacteria*

Care seeking and treatment related delay among childhood tuberculosis patients in Delhi

Kalra A ***: India Int J Tuberc Lung Dis,*** *2017,21, 645-650*

Objective: To examine delays in treatment initiation among child tuberculosis (TB) patients and to identify associated factors.

Method: A multistage cluster random sampling strategy was used to select 175 parents/care givers of childhood TB patients from eight district TB centres covered by the Revised National Tuberculosis Control Programme in Delhi for interview in a cross-sectional survey. Binary logistic regression analysis was used to identify associated factors.

Results: Median estimated patient and health system delay was respectively 3 (range 1-300) and 41 days (range 10-397). Median total delay was 52 days (range 12-553). Among cases with self-reported delay, 64% of care givers thought that the symptoms would subside without treatment. In pulmonary cases, patient's sex, age of the primary care giver, religion and community were associated with patient delay. The child's place of birth and household size were associated with delay among extra-pulmonary TB cases. Type of first provider and number of providers consulted were associated with health system delay. Those who lived at a greater distance from their first health facility (OR 2.2, 95%CI 1.18-4.07) were more likely to experience prolonged patient delay.

Conclusions: As the considerable health system delays were related to the type and number of providers consulted, targeted strategies are required to bring the health system closer to these particularly vulnerable children and their care givers.

KEYWORDS: *Patient delay, TB, Children*

Physician's advice on quitting smoking in HIV and TB patients in south India: a randomised clinical trial

Kumar S R, Pooranagangadevi N, Rajendran M, Mayer K, Flanigan T, Niaura R, BalaguruS,Venkatesan P & Swaminathan S ***: Public Health Action,*** *2017, 7, 39-45*

Setting: National Institute for Research in Tuberculosis, Madurai, India.

Objective: To determine the efficacy of physician's advice on quitting smoking compared with standard counselling in patients with tuberculosis (TB) and patients with human immunodeficiency virus (HIV) infection.

Design/Methods: This was a clinical trial conducted in Madurai, south India, among 160 male patients (80 with TB and 80 with HIV), randomised and stratified by nicotine dependence (low/high according to the Fagerström scale), who received physician's advice with standard counselling or standard counselling alone for smoking cessation. Abstinence at 1 month was assessed by self-report and carbon monoxide breath analysis.

Results: The patients' mean age was 39.4 years (SD 8.5). Overall, 35% of the patients had high nicotine dependence. Most patients (41%) smoked both cigarettes and bidis. In a combined analysis including both the HIV and the TB groups, quit rates were 41% of the 68 patients in the physician group and 35% of 68 patients in the standard counselling arm.

Conclusions: Physician's advice to quit smoking delivered to patients with TB or HIV is feasible and acceptable. Smoking cessation could easily be initiated in TB patients in programme settings. Future studies should assess long term abstinence rates with a larger sample size to demonstrate the efficacy of physician's advice.

KEYWORDS: *Tuberculosis, HIV, Smoking*

Are partners of HIV-infected people being tested for HIV? A mixed-methods research from Gujarat, India

Selvaraj K, Kumar A M V, Chawla S, Shringarpure K S, ThekkurP, PalanivelC,Verma P B,Shah A N,Pandya K N, Roy G,SinghZ,Rewari B B&Dongre A R: ***Public Health Action,*** *2017, 7, 46-54*

Setting: Four selected antiretroviral therapy (ART) centres of Gujarat State, India, which accounts for 8% of the human immunodeficiency virus (HIV) burden in India.

Objectives: 1) To assess the proportion of people living with HIV (PLHIV) whose partners were not tested for HIV; 2) to assess socio demographic and clinical characteristics of index cases associated with partner testing; and 3) to understand perceived facilitators and barriers to partner testing and make suggestions on how to improve testing from the perspective of the health-care provider.

Design: A mixed-method design with a quantitative phase that involved reviewing the programme records of married PLHIV enrolled during 2011–2015, followed by a qualitative phase of key informant interviews.

Results: Of 3884 married PLHIV, 1279 (33%) did not have their partners tested for HIV. Factors including index cases being male, illiterate, aged >25 years, belonging to key populations, substance use and being in advanced clinical stages were more likely to be associated with partner non-testing. Non-disclosure of HIV status (due to fear of marital discord) and lack of awareness and risk perception were the key barriers to testing.

Conclusion: One third of PLHIV did not have their partners tested for HIV. Several factors were identified as being associated with the non-testing of partners, and solutions were explored that need to be implemented urgently if we are to achieve the 90–90–90 targets and end HIV.

KEYWORDS: *HIV testing, Operational research, HIV*

NTI Bulletin 2017, 53/1&4, 65 - 68

The Republic Day was celebrated on 26th Jan 2017 in the institute and the National Flag was hoisted and was followed by the National Anthem and the State Anthem. The celebration also included patriotic songs by the faculties and staff of NTI, cultural programme by children of NTI Staff, address by the Director and Vote of thanks. The programme concluded with refreshments to all.

Independence Day was celebrated under the leadership of the Director, NTI on 15th Aug 2017 and the National Flag was hoisted which was followed by the National Anthem and the State Anthem. Mr. Jameel, a staff from Epidemiology and Research division gave a brief talk on India's Freedom Fight and commemorated the great freedom fighters of our country. This was followed by the cultural programme by children of NTI staff, address by the Director and Vote of Thanks and refreshment was served to everyone.

Hindi week was celebrated from 7th to 14th of Sep 2017 by organizing different cultural activities like Hindi Antakshari, Hindi Dumb charades, Quiz, Solo Song competition, etc. and prizes were given to the winners on the final day.

Kannada Rajyotsava was celebrated by hoisting the State Flag by the Director NTI on 1stof Nov 2017 to commemorate the birth of the State of Karnataka. It was then followed by the State Anthem. On that occasion, different sports and cultural activities were organised for the staff from 6th -17th of Nov. It ended on 24th Nov 2017 by organizing a grand lunch for all the employees of NTI.

VISITORS:

During the year the Institute had the privilege of having the following dignitaries as visitors.

S No	Visitor	Date	Details of visit
1	Dr. Paramasivan and Dr. Umesh from FIND, NGO, India, New Delhi	9th & 11th Jan 2017	Discussed regarding formulating an action plan for the year 2017.
2	Officials from State TB Cell, Karnataka State Task Force, Medical College and WHO RNTCP Karnataka.	30th Jan 2017	Discussed regarding extending support of Director, NTI, for ZTF meeting being organized on 2-3 February 2017 in Bangalore. Director assured them the fullest support from NTI for successful organization of ZTF.
3	Dr D Behra, Chairmen National Task force, New Delhi	1st Feb 2017	Meeting regarding the involvement of Medical College in TB control in India.
4	Dr Ashu Pande, RNTCP Consultant, CTD, New Delhi	9th Feb 2017	- Dr Pande requested NTI, Director to provide support on series of trainings to be held on TOG, e-module &training for Bedaquiline CAP.
5	Dr. Ravi Kumar, Sr regional Director, Bangalore		Meeting regarding involvement of Regional Directors in the training being conducted at NTI on Technical & Operational Guidelines.

S No	Visitor	Date	Details of visit
6	Dr. Beg, Vice Chairman of TB Association of Andhra Pradesh	17th Feb 2017	Meeting regarding EPTB conference.
7	Ms. DeGruy Kyle, International Laboratory Branch, Division of Global HIV and TB, Centre for Disease Control, Atlanta	1st –13th May 2017	Held meeting on 10.05.2017 with I/c NRL, and Ms Kayle, CDC about CBNAAT EQA training. She appreciated the efforts of NTI for the initiative taken regarding EQA of CBNAAT machines.
8	Dr. R. Ramachandran	11th & 12th May 2017	To participate in the expert committee meeting on 12.05.2017 in the Institute.
9	IRL Microbiologist & RNTCP Consultant of the state of Karnataka, and Smt Chelvi from NIRT, Chennai	18th May 2017	Discussed about initiation of TruNat study being initiated in the Ramanagara and Davangere district in Karnataka from 22.05.2017.
10	Dr Patrick Moonan, CDC Atlanta and Dr S Anand, CTD, New Delhi and NRL NTI Microbiologist, Bangalore.	22nd & 23rd May 2017	To discuss the work plan of CDC-NTI-NIRT project.
11	Dr Sunil Kumar, Head of Pulmonary Medicine, CMH Hospital, Bengaluru.	22nd May 2017	To discuss NTI support for capacity building of the Chest Physicians working in Karnataka.
12	Dr Avijit Chaudhury, WHO, New Delhi and I/c CTU, NTI, Bangalore	30th – 31st May 2017	To discuss IT component of National Disease Prevalence Survey to be carried out by Government of India.
13	JD (TB), Karnataka, RNTCP Consultants and IRL team of Karnataka, DTOs of Bengaluru Rural & Urban and BBMP Supervisors	7th Jun 2017	Various issues related to smooth collaboration between the State TB Unit and NTI were discussed.
14	Dr Ramraje, Prof. & HOD of Chest & TB Dept. Mumbai and Dr Chandrashekar, Prof. & HOD of Chest & TB Dept., Chennai Medical College	20th Jun 2017	To discuss strengthening of medical college support to RNTCP under National Task Force for Medical Colleges mechanism.
15	Sri A.K. Jha, Joint Secretary and Economic Advisor, New Delhi, GOI	28th Jun 2017	A presentation on the activities being carried out at NTI was made by Director and a detailed interaction was held.
16	Shri Vijay Shankar, Chairman, IEC and Dr Omprakash, Member IEC, Bangalore	30th Jun 2017	Briefing on the Institute activities was made and role of ethics committee related to research was discussed at length.
17	A team from CDC Delhi Office Dr. ReshuAgarwal and Christine S and Department Head Lab, Consultant Microbiologists of NRL, I/c CTU and I/c ICELT, NTI, Bangalore	12th Jul 2017	To learn more about the work that is being carried out at NTI, and also to discuss how to move forward on some of the CDC supported projects. Detailed deliberations on CDC supported projects were discussed.

S No	Visitor	Date	Details of visit
18	Dr Salhotra, Addl. DDG, CTD, New Delhi	12th Jul 2017	To discuss at length the NTI support to CTD for accreditation and certification of C&DST labs, development of drug resistant surveillance system and CBNAAT EQA with the support of CDC.
19	Dr Sreenivas, NPO-TB, WHO, New Delhi	4th – 5th Aug 2017	To attend IEC meeting on 5th Aug 2017 in the Institute. Discussed regarding protocol to be presented in the meeting. Also discussed about NDRS report writing and publication of NDRS data in reputed journals.
20	Dr Ranjani Ramachandran, NPO, WHO and Dr Anand S, Consultant Microbiologist, CTD, New Delhi	8th Aug 2017	In connection with RNTCP activities in the state of Karnataka.
21	Dr Sunil, HOD, Pulmonary, Aster Hospital, Bengaluru	17th Aug 2017	To request Director for NTI support to organize CME in their hospital.
22	Team from FIND, NGO, India office in New Delhi and the experts identified by CTD & FIND India	1st Sep 2017	For site assessment of placing the whole genome sequencing unit at NTI. The DH, Lab and Consultant Microbiologists of NRL NTI also joined the discussion.
23	Team from IRL Karnataka Director, STDC, Sr. Microbiologist RNTCP Consultant, Karnataka. With I/c NRL, NTI and Consultant Microbiologist, NTI.	5th Oct 2017	To discuss NRL NTI support to IRL Karnataka. STDC Director, Karnataka requested the support of NRL NTI for IRL Karnataka.
24	Team from IRL Karnataka consisting of: Director, STDC; RNTCP Consultant of Karnataka. NRL NTI Team also joined the discussion	9th Oct 2017	The IRL Karnataka requested NTI to provide technical support for preparation of implementation of universal DST, introduction of new anti-TB drug “Delamanid” and strengthening all the districts and state level facilities for effective implementation of PMDT.
25	Dr S. Paramsivam and Dr Rohit Sarin from FIND India Office, New Delhi	18th Dec 2017	To discuss regarding collaborative projects. They requested the support of NTI in this regard. The FIND India officials assured that a proper action plan will be developed jointly.
26	Dr Devanand and Deputy Director, from Regional Health Office, GOI, Bengaluru	20th Dec 2017	To request NTI support for organization of half yearly review meeting of CBHI to be held at NTI on 11-12 January 2018.

Administration:

A. New Appointment to NTI

S No	Name	Designation	Date
1	Dr. Parvathi Anil	Medical Officer	10.07.2017

B. Promotions

S No.	Name	Designation	Date
1	Shri.B.V.Venkatachalppa, Computor	JSO	04.05.2017
2	Shri.R.Jitendra, Computor	JSO	17.07.2017

C. Retirements

S No.	Name	Designation	Date
1	Shri.K.Mohan	Head Clerk	31.05.2017
2	Shri.SLN Shalluvanaryana Swamilu	MTS	28.02.2017
3	Sri. Paul Raj	Lab Attendant	31.05.2017
4	Sri.M.Ramamuthry	Lab Assistant	31.12.2017

D. Transfers from NTI

S No.	Name	Designation	Date
1	Smt. N.Sangeetha	Chief Statistical Officer, NSSO, Bihar	01.03.2017
2	Shri. Mridul Das	JSO, Field Operation Division (FOD), NSSO, Bengaluru	04.05.2017
3	Shri. Nandish Prasad	JSO, RHO, Bengaluru	05.05.2017
4	Shri. Vishweshwara Sharma	JSO, Indian Bureau of Mines, Bengaluru	05.05.2017
5	Shri. Bipin Kumar Verma	JSO, DGMS, Dhanbadh, Jharkhand	31.07.2017

E. Transferred to NTI

S.No.	Name	Designation	Date
1	Shri. T.R.Sreenivas	DDG (Statistics) from FOD, NSSO, Bengaluru	21.07.2017
2	Dr. Sarika Jain Agrawal	Specialist Gr.III Microbiology from NCDC, Delhi	28.08.2017

NTI Bulletin 2017, 53/1&4, 69 -70

Guidelines to Contributors

The NTI Bulletin (erstwhile 'NTI Newsletter') is introduced and developed by National Tuberculosis Institute, as a media of exchange for the dissemination of information generated at local, regional and national level and feedback of information between the Institute and programme centers as well as teaching, research and training institutions. The scope of the Bulletin allows publications on Applied/Basic TB Research, Epidemiological, Sociological and operational aspects of TB prevention and Control. Operational aspects include viz., case finding, treatment, lost to follow up retrieval mechanisms, effective operationalization of DOTS, treatment of DR-TB, and importance of motivation as health education component under Advocacy, Communication and Social Mobilization. It also publishes program-oriented information under RNTCP. This provides a forum for discussing the problems faced by them in the local, regional, state and national level. This is an unpriced publication with an open access in the official website of NTI (www.ntiindia.kar.nic.in) and also distributed as per the mailing list maintained in the NTI library.

Format of Communication

The communications can be sent on any of the following formats viz., editorial, original articles, Review articles, field research/reports, case reports, practical applications, clinical problems, Field experience, success stories readers' write/readers' forum, view point and also as correspondence.

Submission of Manuscripts

It should be submitted (in MS Word doc format as e-mail attachment) online and hardcopy by post to the:

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Preparation of Manuscripts

Manuscripts should be presented in as concise a form as possible, typewritten in double space on one side of good paper of A4 size. Title page should contain the title of the article and a full list of all authors – the first name being that of the primary author. The name of the departments, institutions and research centers should be given in full. Abbreviations are not to be used.

The next page should contain an abstract of not more than 150 words providing clear information on the central question or hypothesis of the article. A brief note of the major results or conclusions of the study will be appropriate.

The text page is usually divided into:

Introduction: This must state briefly the current state of the article and indicate the main objective for undertaking the study. Material and methods should be precise and clear. Statistical methods are to be clearly expressed.

The Result Portion: should contain the usual tables and findings of the study. Tables are to be kept to a minimum. Figures or drawings if any should be clear and original should be sent.

The Discussion Portion: is the area for arguing the points of the articles and the results need not be repeated. The deductions should be logical and relate to other relevant studies. A brief conclusion/summary paragraph is helpful. Due acknowledgement is to be made and proper authority for quoting references and communications are to be included.

References All references should be cited in full; including the publisher, year, volume or issue and reference page numbers; numbered in the order in which they appear in the article. Material submitted is accepted on the understanding that it will be subject to editorial revision. Authors are informed about the revision of major nature only, though this cannot be guaranteed. Author will be supplied with a free copy of the journal in which his/her article is published. Full address of the author to whom the correspondence is to be addressed in this connection may please be mentioned.

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