APPRAISAL OF ISONIAZID PREVENTIVE THERAPY (IPT) AMONG PAEDIATRIC CONTACTS OF MICROBIOLOGICALLY CONFIRMED PULMONARY TUBERCULOSIS CASES IN JODHPUR DISTRICT, RAJASTHAN: A MIXED METHODS STUDY

Thesis

Submitted to

All India Institute of Medical Sciences, Jodhpur

In partial fulfilment of the requirement for the degree of

DOCTOR OF MEDICINE (MD)

(COMMUNITY MEDICINE)

July 2020

AIIMS, JODHPUR **DR. SANDIP YADAVA**

APPRAISAL OF ISONIAZID PREVENTIVE THERAPY (IPT) AMONG PAEDIATRIC CONTACTS OF MICROBIOLOGICALLY CONFIRMED PULMONARY TUBERCULOSIS CASES IN JODHPUR DISTRICT, RAJASTHAN: A MIXED METHODS STUDY

Thesis

Submitted to

All India Institute of Medical Sciences, Jodhpur

In partial fulfilment of the requirement for the degree of

DOCTOR OF MEDICINE (MD)

(COMMUNITY MEDICINE)

July 2020

AIIMS, JODHPUR **DR. SANDIP YADAVA**

DEPARTMENT OF COMMUNITY MEDICINE AND FAMILY MEDICINE
ALL INDIA INSTITUTE OF MEDICAL SCIENCES, JODHPUR

CERTIFICATE

This is to certify that this thesis entitled **"Appraisal of Isoniazid Preventive Therapy (IPT) among Paediatric Contacts of Microbiologically Confirmed Pulmonary Tuberculosis Cases in Jodhpur District, Rajasthan: A Mixed Methods Study"** is an original work of **Dr. Sandip Yadava** carried out under our direct supervision and guidance at Department of Community Medicine and Family Medicine, All India Institute of Medical Sciences, Jodhpur.

Guide

Dr. Pankaj Bhardwaj
Additional Professor
Department of CMFM
AIIMS Jodhpur

Forwarded by

14/01/2023

Dr. Pankaja Raghav
Professor and Head
Department of CMFM
AIIMS Jodhpur

Page | III

DEPARTMENT OF COMMUNITY MEDICINE AND FAMILY MEDICINE

ALL INDIA INSTITUTE OF MEDICAL SCIENCES, JODHPUR

CERTIFICATE

This is to certify that this thesis entitled **"Appraisal of Isoniazid Preventive Therapy (IPT) among Paediatric Contacts of Microbiologically Confirmed Pulmonary Tuberculosis Cases in Jodhpur District, Rajasthan: A Mixed Methods Study"** is an original work of **Dr. Sandip Yadava** carried out under our direct supervision and guidance at Department of Community Medicine and Family Medicine, All India Institute of Medical Sciences, Jodhpur.

Guide

Dr. Pankaj Bhardwaj
Additional Professor

Co-Guides

Dr. Srikanth S
Additional Professor

Dr. Manoj Kumar Gupta
Additional Professor

Dr. Akhil Dhanesh Goel
Associate Professor

Dr. Suman Saurabh
Assistant Professor

Page | IV

ALL INDIA INSTITUTE OF MEDICAL SCIENCES, JODHPUR

DECLARATION

I, hereby declare that the work reported in the thesis entitled entitled **"Appraisal of Isoniazid Preventive Therapy (IPT) among Paediatric Contacts of Microbiologically Confirmed Pulmonary Tuberculosis Cases in Jodhpur District, Rajasthan: A Mixed Methods Study"** embodies the result of original research work carried out by undersigned in the Department of Community Medicine and Family Medicine, All India Institute of Medical Sciences, Jodhpur.

I further state that no part of the thesis has been submitted either in part or in full for any other degree of All India Institute of Medical Sciences or any other institution/University.

Dr Sandip Yadava
Junior Resident
Department of Community Medicine & Family Medicine
All India Institute of Medical Sciences, Jodhpur

V | P a g e

ACKNOWLEDGEMENT

To the person who gave me the aim of being a health care professional, my teacher ***Mr. Ram Raj Verma***, and my brother ***Mr. Deepak Yadava***: I owe it all to you for the aspirations and dreams you filled in my eyes with all the love you had.

Even with all the hard work of people who contributed to bringing this study to reality, it would not have been possible to reach here and write this page if I did not have your support. My obeisance to you, ***GOD***.

The hard work that I have tried to translate into words in the following pages is not the work of one person but the efforts and support of a whole lot of people, and at this moment, I would like to share and dedicate the happiness I must all these special beings in my life.

I would like to thank my mentor and guide ***Dr Pankaj Bhardwaj sir,*** for guiding me in this research work and overall academics and helping me find a balance between every aspect of life. He has always been the driving force in helping me cross every hurdle as a budding researcher and enriched me with insights and more straightforward perspectives. I am grateful to have him as my guide for his constant support and guidance from the beginning, selecting a topic to every step of shaping the protocol and finally, executing of same, and reflection on the work in this thesis. I had always found him as my supporting pillar whenever I was down in fear. I am highly indebted to him.

I am grateful to my co-guide ***Dr Srikanth S.,*** for the valuable time he spent on discussions, advice, suggestions, and comments throughout the research work, which helped me in getting a better understanding of the topic. The way he looks at things has widened the horizon of my thoughts. He has been not only a teacher but also an elder brother who was by my side in times of stress.

I am grateful to my co-guide ***Dr Manoj Kr. Gupta*** for his guidance throughout the process. He is an inexhaustible source of knowledge, experience, and inspiration without any limitations of access. His understanding of the subject, as well as the community, and her critical inputs guided me in shaping this thesis.

I am grateful to my co-guide ***Dr Akhil Dhanesh Goel,*** for his guidance throughout the process. He is an excellent source of knowledge, experience, and inspiration and is always available for help. His understanding of the subject and the community and his

critical inputs guided me in shaping my thesis. He has always pushed me to solve every hurdle in my journey as a budding researcher and enriched me with insights and more evident perspectives. I am grateful to have him as my co-guide for his constant support and guidance from the beginning, selecting a topic to every step of shaping the protocol, executing the same, and reflecting on the work in this thesis. I had always found him as my supporting pillar throughout this journey. I am highly indebted to him.

I am grateful to my Head of Department, ***Prof. Pankaja Ravi Raghav,*** for her valuable input throughout the process. She is an inexhaustible source of knowledge, experience, and inspiration without access limitations. Her understanding of the subject and the community and her critical inputs guided me in shaping this thesis.

I thank all the faculty members of the department of CMFM for the valuable inputs they provided at the presentation at different stages and for providing support whenever required.

I would like to thank my batch mates and best friend, ***Dr Sri Devi G, Dr Mukund Gupta, Dr Bharat Vaishnav, and Dr Bindiya C. Gowda,*** for their constant support and for always keeping me sane.

I would also like to thank senior residents and junior residents of the department of CMFM, with special mention of my senior ***Dr. Anki Mittal, Dr. Vinoth R., Dr Pritish Baskaran, Dr Rehana VR, Dr. Mukul Maheshwari, Dr. Shaima, Dr Aswathy S.,*** and ***Dr Harimadhav V.*** and my lovely juniors ***Dr. Suseendar, Dr. Rajmohan, Dr. Sowmiya, Dr. Vishal***, ***Dr. Harshita, Dr. Tanya Singh, Dr. Akshay, Dr. Nishant, Dr. Aswathy*** and ***Dr. Rishabh Mehta*** for their help at multiple instances.

I want to thank ***Mr. Manoj Sharma*** (STS Pratap Nagar) a lot for being my contact and support from the Pratap Nagar TU and ***Mr. Ram Kishor Ji*** from TU Salawas, Jodhpur. Their understanding of the patient's behavior and the NTEP system in Jodhpur helped me execute the research. I would also like to thank ***Dr. Mool Singh***, DTO Jodhpur, and other staff of DTC Jodhpur for their support in the study.

I would be failing in my duty if I do not thank all the participants of my study. Without their cooperation, this thesis would not have been possible. They patiently provided me with their valuable time with the required information for the study.

I would also like to thank all my colleagues and the office staff of the department for extending their helping hand whenever required.

I would especially like to thank my parents, ***Mr. Ram Kewal Yadav*** and ***Mrs. Prema Devi,*** and my brother ***Mr. Deepak Yadav*** for making me what I am today. It was only possible with the love, support, and motivation of my parents and my wife, ***Dr. Oshin Khekare,*** so that I could live the dream I had seen.

Dr. Sandip Yadava

Table of Contents

List of tables

List of figures

List of abbreviations

AIDS	Acquired Immuno-Deficiency Syndrome
ANM	Auxiliary Nurse Midwife
ART	Anti-Retroviral Therapy
ASHA	Accredited-Social Health Activist
AWW	Anganwadi Worker
BPL	Below Poverty Line
BCMO	Block Chief Medical Officer
CHC	Community Health Centre
CHO	Community Health Officer
CMO	Chief Medical Officer
CTD	Central TB Division
DR	Drug Resistant
DS	Drug Sensitive
DMC	Designated Microscopy Centre
DOTS	Directly Observed Treatment, Short-Course
DST	Drug Sensitivity Testing
DR-TB	Drug Resistant Tuberculosis
DS-TB	Drug Sensitivity Tuberculosis
DTC	District Tuberculosis Centre
DTO	District Tuberculosis Officer
HIV	Human Immuno-Deficiency Virus
HCF	Healthcare facility
6H	Six-months of daily regimen Isoniazid monotherapy
HHC	Household Contacts
3HP	Three-months regimen of Isoniazid plus Rifapentine

HCWs	Healthcare Workers
IPT	Isoniazid Preventive Therapy
LT	Laboratory Technician
LTBI	Latent TB Infection
MDR-TB	Muti Drug Resistant Tuberculosis
MO	Medical Officer
MPW	Multi-purpose Workers
NGO	Non-Governmental Organization
NSP	New Smear Positive
NTEP	National Tuberculosis Elimination Programme
OR	Operational Research
PHC	Primary Health Centre
PLHIV	People Living with HIV/AIDS
SC	Sub-centre
STLS	Senior Tuberculosis Laboratory Supervisor
STO	State Tuberculosis Officer
STS	Senior Treatment Supervisor
TB	Tuberculosis
TST	Tuberculin Sensitivity Test
TU	Tuberculosis Unit
WHO	World Health Organization

SUMMARY OF THESIS

Background: Tuberculosis (TB) is an important contributor to morbidity and mortality (the third leading cause of death) in India. India reported around 2.6 million TB cases in 2020, which accounted for around one-fourth of the global burden of TB. This is causing around 480k mortality cases every year. Around 400 million Indians are suffering from LTBI, which needs to be effectively treated through prophylactic treatment by IPT. The government is putting in a lot of effort and taking lots of initiative to improve the IPT programme, despite IPT coverage in India being just 33%.

This study was planned to address the IPT implementation status and understand the major barriers to IPT implementation in Jodhpur, Rajasthan.

Objectives

a. To assess the proportion of notified TB patients for whom visit was made for assessment of household paediatric contacts of Jodhpur District.

b. To assess the proportion of paediatric contacts of notified microbiologically confirmed TB patients initiated on IPT in Jodhpur district.

c. To explore the hurdles in timely initiation and adherence for IPT among eligible paediatric contacts of notified tuberculosis cases in Jodhpur district.

Methodology

A mixed-methods study was conducted: in the quantitative phase, programme records were reviewed, and home visits were made for the assessment of paediatric contact in microbiologically confirmed pulmonary TB cases. The quantitative phase was followed by a qualitative phase in which health care workers, programme managers, and caregivers of paediatric contacts were interviewed to address the barriers to IPT implementation.

Results:

A total of 430 pulmonary TB cases were notified from the study area, and 383 were contacted. Out of 383 pulmonary TB cases, home visits were made for 24 (6.2%) for paediatric assessment for TB. A total of 232 paediatric contacts (<6 years) were identified from 178 index cases. Forty-four of 232 (18.9%) were screened for Tuberculosis. Out of the 232, 105 (45.2%) of the paediatric contacts initiated an IPT, and 33 (32.4%) of them completed the full course of the IPT. Content analysis of qualitative data revealed the hurdles at three levels. Challenges identified at the caregiver's level for IPT non-initiation were lack of awareness about IPT, lack of risk perception, no home visits by HCWs, social stigma, distance from the hospital, fear of drug toxicity, lack of family support, and relocation of children. Challenges identified at the provider level for IPT non-initiation were inadequate knowledge about IPT, no clear guidelines about IPT, staff shortages, staff deployment, a cumbersome screening process, and lack of training of peripheral healthcare workers. Challenges identified at the system level for IPT non-initiation were drug stockout, unavailability of TST and X-ray facilities, poor monitoring and surveillance, inadequate documentation, staff shortage, staff deployment, and insufficient training of HCWs.

Conclusion: Jodhpur's implementation of IPT falls short of expectations. To prevent children from becoming a future source of infections and developing from an illness into a disease state, this must be strengthened.

Chapter 1: INTRODUCTION

Tuberculosis (TB) is an airborne disease caused by *Mycobacterium tuberculosis* bacteria. It is an important contributor to morbidity and mortality (3rd leading cause of death) in India. According to the World Health Organization (WHO), India is one of the high-burden countries for TB, with approximately one-fourth of the global TB burden (1).

According to the WHO Global TB Report 2022, an estimated global total of 10.6 million people (95% CI; 9.9–11 million) got TB in 2021, equivalent to 134 cases (95% CI; 125–143) per 100,000 population. Among all these cases, most were reported from the region of South-East Asia (45%). Of the total TB burden, around 1.1 million (95% CI; 1.1M- 1.2M) cases were paediatric TB, and the MDR-TB burden was 450k (95%CI; 399k- 501k) in the year 2021(2).

India has been engaged in Tuberculosis control activities for more than 50 years. TB is still the most severe health crisis in India. Around 26 lakh (18-36 lakh) people are estimated to develop Tuberculosis every year, of which 3.33 lakh cases are of paediatric TB (3). TB kills an estimated 480,000 Indians every year and around 1,400 every day(2).

India has more than a million missing cases every year that are not properly dealt with, which means that they remain unnotified, and most others remain inadequately diagnosed and treated in the private and public sectors. This tragic life loss further adds to the suffering; poverty needs to end with concerted efforts from all of us(1).

With better and more effective interventions and technologies for the prevention, diagnosis, treatment, and care of TB, India now is prepared in a better way than it was ever before(1).

It is estimated that nearly 400 million Indians are suffering from latent TB infection(3). The risk is increased multifold in contacts of microbiologically confirmed TB cases, in TB-HIV co-infected, immune-compromised, and other co-morbid population groups(3). Around 71% of household contacts of pulmonary TB cases have been found to have latent TB infection(3). Preventing TB by active case finding amongst the high-risk population is a very important strategy to end

the TB. The TB Preventive Treatment (TPT) should be scaled on a priority basis to achieve a rapid decline in TB incidence. It is necessary to create an effective and efficient strategy for prompt delivery of TPT. There should be an easy and simpler way of screening for TB, and accordingly, delivery of TPT should be provided.

Studies that have shown that around 5-10% of TB-infected cases will develop TB disease in the future(1). Development of TB disease among LTBI (Latent TB infection) cases is most common in the first two years of initial infection(1). Therefore, it is especially important to identify such LTBI cases and protect them through TPT as soon as possible.

Continued detection of childhood TB to the tune of half a million cases per year indicates ongoing transmission at a higher rate in India, coupled with problems of malnutrition, HIV, poverty, illiteracy, lack of awareness, poor detection rate, noncompliance, apathy, and so on(4). TB disease in children under 15 years of age (also called paediatric tuberculosis) is a public health problem of special significance because it is a marker for recent transmission of TB. Also, of special significance is the fact that the infants and young children are more likely than older children and adults to develop life-threatening forms of TB disease (e.g., disseminated TB, TB meningitis). Among children, the greatest numbers of TB cases are seen in children younger than five years of age and in adolescents older than 10 years of age(5). The TB Preventive Treatment (TPT) for children with Isoniazid (INH) is one of the primary activities to improve the status of TB cases by finding them early to prevent the transmission of TB to children(6). INH Preventive Therapy (IPT) substantially reduces the risk of incidence of TB in paediatric household contacts of TB patients. The National TB Elimination Program (NTEP) of India prescribes a daily regimen of Isoniazid to all under-6 paediatric contacts for six months duration(7).

Already India started IPT (Isoniazid Preventive Therapy) a decade ago. Further, IPT is an important preventive component of the ‘Detect-Prevent-Treat-Build’ strategy envisaged in the national Strategic Plan for TB elimination 2017-2025. However, IPT coverage in India is low, around 33% (8). It is important to explore the factors leading to this low coverage so that necessary steps can be taken to improve the coverage.

Adherence to the TPT throughout course completion is a very important determinant of clinical benefit. Poor adherence and/or early cessation of TPT can increase the risk of individuals developing active TB disease and MDR-TB. As the success of this preventive approach is based on adherence to the TPT, proper monitoring and appropriate management of any adverse effect is crucial as well(3).

The current study was planned to find the proportion of notified TB patients with paediatric contacts where IPT was initiated and completed. An attempt was made to find out the reasons for non-initiation, delayed initiation, and non-adherence of IPT among paediatric contacts (up to 6 years) of pulmonary TB cases.

Chapter 2: RESEARCH QUESTIONS AND OBJECTIVES

Research questions

a. What proportion of tuberculosis patients have been visited for assessment of household paediatric contacts of Jodhpur District?

b. What is the percentage of paediatric contacts of notified microbiologically confirmed tuberculosis cases registered for IPT in Jodhpur district?

c. What are the hurdles in initiation and adherence for IPT among eligible paediatric contacts of sputum positive tuberculosis cases in Jodhpur district?

Objectives :

d. To assess the proportion of notified TB patients for whom visit was made for assessment of household paediatric contacts of Jodhpur District.

e. To assess the proportion of paediatric contacts of notified microbiologically confirmed TB patients initiated on IPT in Jodhpur district.

f. To explore the hurdles in timely initiation and adherence for IPT among eligible paediatric contacts of notified tuberculosis cases in Jodhpur district.

Chapter 3: REVIEW OF LITERATURE

To know the work already done in the field of TB Preventive Treatment (TPT) and to decide on the strategy, tools for screening for TB and intervention, and roll out of TB Preventive Treatment (TPT), a detailed review of literature was done. The review of literature was an ongoing process throughout the study period. Major websites accessed for relevant literature were PubMed, Google Scholar, and Scopus. Open search was also performed to find relevant articles.

The keywords used were:

On PubMed:

"isoniazid preventive therapy" AND ("Child, Preschool"[Mesh] OR "Infant"[Mesh] OR " paediatric" OR child*)

On Scopus:

(TITLE-ABS-KEY ("isoniazid preventive therapy") AND TITLE-ABS-KEY (child OR children OR paediatric OR infant OR pre-school))

On Google Scholar:

isoniazid+preventive+therapy+child

isoniazid+preventive+therapy+ paediatric

isoniazid+preventive+therapy+contact

Studies from last 10 years reporting proportion of paediatric contacts of microbiologically confirmed pulmonary TB cases screened for TB, initiated on IPT (IPT coverage), 6 months IPT adherence, and barriers in timely initiation and adherence are summarised in the Table 4, Table 8, Table 9, and Table 10 respectively.

3.1 Target Population for TB Preventive Treatment:

Table 1: Expanded eligible group including children >5 years, adolescents and adult HHC of microbiologically confirmed pulmonary TB cases

Target population	Strategy
People living with HIV (+ ART) Adults and children >12 months Infants <12 months with HIV in contact with active TB HHC below 5 years of microbiologically confirmed pulmonary TB patients	TPT to all after ruling out active TB disease
HHC above 5 years of microbiologically confirmed pulmonary TB patients	TPT among TBI positive# after ruling out TB disease

#Chest X Ray (CXR) and TBI testing would be offered wherever available, but TPT must not be deferred in their absence

Table 2: Expanded to other risk groups eligible for TB Preventive Therapy

Target population	Strategy
Individuals who are: • on immunosuppressive therapy • having silicosis • on anti-TNF treatment • on dialysis • preparing for organ or hematologic transplantation	TPT after ruling out TB disease among TBI positive

Source: Guidelines for Programmatic Management of TB Preventive Treatment in India 2021

3.2 Diagnosis of TB Infection (LTBI):

Diagnosis of LTBI cases is recommended by household visit by healthcare workers (HCWs) and active screening through clinical examination and other appropriate testing.

Ruling out TB disease is a very important step before initiating the TPT and ensuring the TBI will increase the certainty that individuals targeted for TPT would be benefited. It will also increase the confidence of provider as well as of beneficiary to start TPT, and chances of adherence for TPT will be high too(9).

There is no gold standard test to diagnose the TBI or could predict the progression to TB disease among the infected people(9).

Currently available tests for TBI are **Tuberculin sensitivity test (TST) & Interferon-Gamma Release Assay (IGRA),** both measures the immune sensitization (type-IV or delayed type-II hypersensitivity) to Mycobacterial protein antigen. TST detects the reaction to purified protein derivative (PPD) of the mycobacterium. IGRAs measure the amount of interferon-gamma released in vitro by white blood cells when mixed with *M. tuberculosis* antigens or the number of T-lymphocytes producing interferon-gamma. Negative results of these tests must be complemented by negative clinical history and other tests like chest X-ray, and sputum smear examination(9).

TST and IGRA is not required to foe test TBI before initiating TPT in PLHIV or children aged <5 years in contact of microbiologically confirmed TB cases. It should be offered wherever available. TPT should not be deferred in the absence of these screening tests(9).

Table 3: Comparison between TST and IGRA test

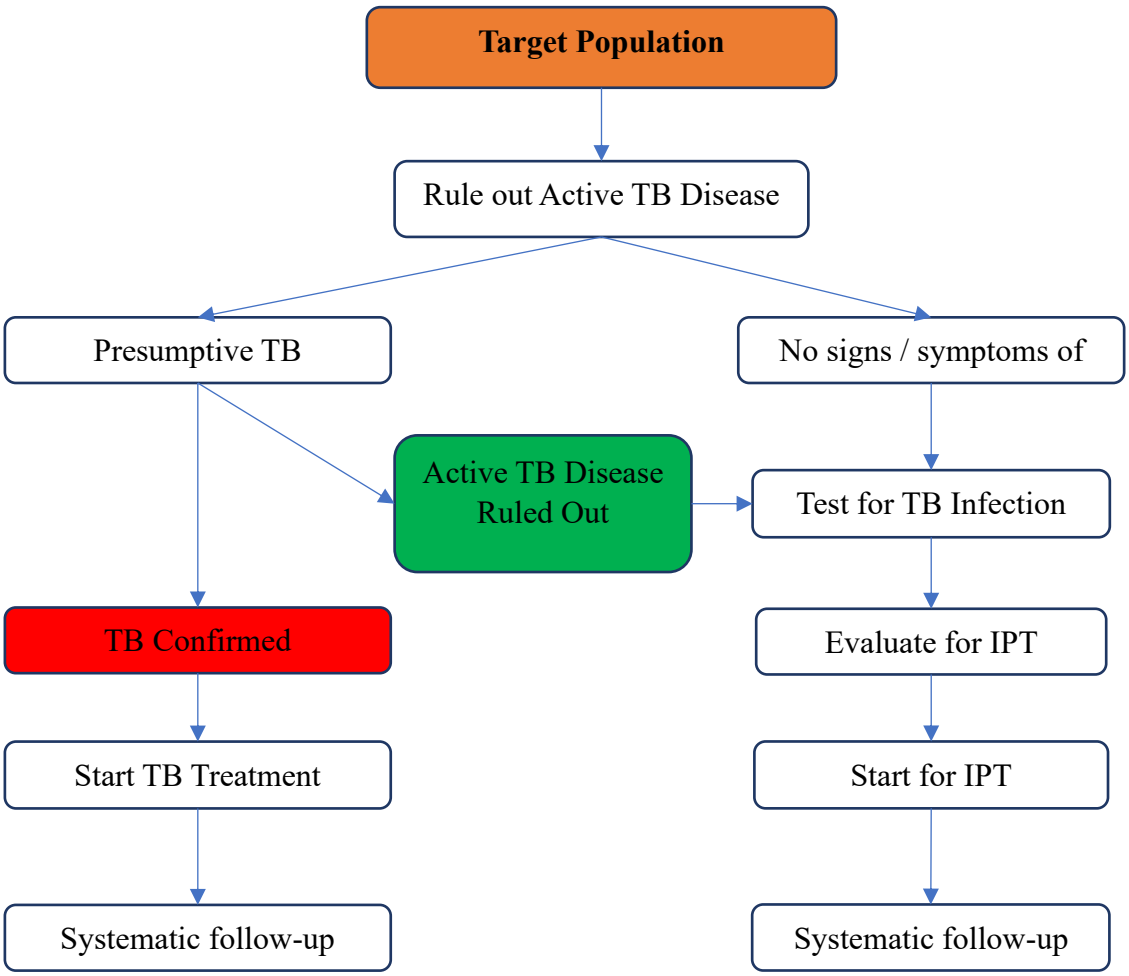
	TST	**IGRA**
Specificity	Low in BCG vaccinated	High also in BCG vaccinated
Sensitivity	High	High
Ease of use	Field friendly	Require labs and infrastructure
Cost of test	Low	High
Manufacturing	Complex old product	Complex, multiple components
Special populations		
Children	Affected by young age	Affected by young age
People living with HIV (PLHIV)	Requires info on HIV status for correct interpretation	Affected by HIV and low CD4 count

Source: Guidelines for Programmatic Management of TB Preventive Treatment in India 2021

Studies from last 10 years reporting proportion of paediatric contacts of microbiologically confirmed pulmonary TB cases screened for TB are summarised in the Table:4

Seid G. et al., 2020 conducted a mixed study design to prospectively assess the adherence to IPT among children under the age of 5 in contact with pulmonary TB patients, in their quantitative part they assessed total paediatric contacts screened to rule out TB disease before prescribing IPT in Ethiopia. They found 129 under five children were residing with index pulmonary TB cases, out of which they screened 125 (96.8%) for active TB disease(10).

Figure 1: Cascade of TB case finding and Preventive treatment



Source: Guidelines for Programmatic Management of TB Preventive Treatment in India 2021

Table 4: Review of literature for Paediatric Contacts Screened for Tuberculosis

Sr. No.	Author	Year of Publication	Study setting	Participants	Total Paed. Contacts	Screened
1.	Seid G	2020	Ethiopia	Children under 5 years	129	125 (96.8%)
2.	Belgaumkar V	2018	Delhi	Children under 6 years	178	49 (27.5%)
3.	Ranganath T. S	2018	Bangalore	Children under 6 years	110	95 (86.36%)
4.	Black F	2018	South Africa	Children under 5 years	261	184 (70.4%)
5.	Singh AR	2017	Bhopal	Children under 6 years	59	19 (32.2%)
6.	Adjobimey M	2016	Benin	Children under 5 years	499	497 (99.5%)
7.	Tadesse Y	2016	Ethiopia	Children under 5 years	283	237 (83.7%)
8.	Silva AP	2016	Brazil	Children under 5 years	1175	1078 (91.7%)
9.	Rekha B	2013	Chennai India	Children under 6 years	87	53 (60.9%)

Belgaumkar V. et al., 2018 conducted a mixed methods approach assess the IPT coverage in household paediatric contacts of pulmonary TB cases, also to assessed the barriers in effective implementation of Isoniazid Preventive Therapy (IPT) and at Sassoon General Hospital, Pune. Quantitative data was collected by using questionnaire and for qualitative data TB patients and Health Care Workers (HCW) were interviewed. Here they assessed the proportion of paediatric contacts screened for TB before giving IPT where they found that, out of 80 adult pulmonary TB cases, 24 (30%) reported that an HCP recommended TB screening of their child contacts and while 49/178 (28%) child contacts were screened(11).

Ranganath T. S. et al., 2018 determined the level of IPT adherence of children in contact with adults with smear positive pulmonary TB cases in Bangalore. A cross-sectional study was conducted by house-to-house visits, and patients or head of the family were interviewed after taking informed consent. Number of children <6 years in

the households, the extent of screening and isoniazid preventive therapy and various factors affecting it were studied. Totally 110 eligible Contacts of <6years were identified by household visits, and 95(86.36%) of contacts were screened for tuberculosis(12).

Black F. et al., 2018 assessed the practices regarding the identification and management of child contacts (<5 years) at primary care clinic in the Nelson Mandela Bay Health District, Eastern Cape Province, South Africa. A cross-sectional descriptive study was conducted using a retrospective record review of bacteriologically confirmed pulmonary TB case and their paediatric contacts were assessed for IPT administration. A total of 261 child contacts identified from 491 index TB cases. Of the 261 child contacts identified, 184 (70.5%) were screened for TB to rule out active TB disease(13).

Singh A. R. et al., 2017 assessed uptake of isoniazid preventive therapy (IPT) among child contacts (<6 years) of smear-positive tuberculosis (TB) patients where they found that, a total of 59 child contacts of 129 index patients, 51 were contacted. Among them, 19 of 51 (37%) were screened for TB and one had TB(14).

Adjobimey M. et al., 2016 assessed the feasibility and results of integrating a programme of isoniazid preventive therapy (IPT) in children aged, 5 years exposed to TB as part of the existing routine activities of the National Tuberculosis Program in the two large Tuberculosis (TB) centres at Benin, South Africa. In this study they have screened paediatric contacts of pulmonary TB cases, and IPT given to all those children in whom no evidence of TB was found. Total of 499 paediatric contacts were identified and they screened 497 before giving IPT(15).

Tadesse Y. et al., 2016 conducted a study to determine the coverage and outcome of implementation of IPT for eligible under-five year old children in 28 health facilities in two regions of Ethiopia. Total 282 under-five children registered as household contacts of these Sputum smear positive. Of these, 237 (84%) were screened for TB symptoms, and presumptive TB was identified in 16 (6.8%) children(16).

Silva A. P. et al., 2016 conducted a prospective questionnaire-based study with close child contacts or their parents at the time of prescribing IPT to assess the IPT adherence in three cities in Rio de Janeiro State. Out of 1175 paediatric contacts, 1078 children screened for LTBI of which 332 (30.8%) were TST-positive(17).

Rekha B. et al., 2013 conducted a prospective study to evaluate the effectiveness of an isoniazid preventive therapy (IPT) registers and card in improving the adherence of health care workers (HCWs) to programmatic guidelines in South India. Child contacts of smear positive PTB patients initiated on treatment, were screened, and IPT was initiated in asymptomatic children. Of 87 children identified aged <6 years, 71 (82%) were traced by HCWs; 53 (60.9%) were screened for TB before prescribing IPT(18).

3.3 TB Preventive Treatment (TPT):

Treatment is offered to the people who are at considerable risk of developing TB disease, to reduce that risk. It can also be considered as treatment for TB infection (9). Among those screened positive, the diagnosis needs to be established by one or several diagnostic tests and additional clinical assessments, which together have high accuracy(9).

Around 5-10% TB infected cases will develop TB disease in future. Development of TB disease among LTBI (Latent TB infection) cases is most common in the 1st two years from initial infection(9).

Therefore, it is especially important to identify those LTBI cases and protect them through TPT as soon as possible.

Adherence to the TPT throughout course completion are very important determinants of clinical benefit. Poor adherence and/or early cessation of TPT can increase the risk of individuals developing active TB disease, and MDR-TB. As the success of this preventive approach is based on adherence to the TPT, proper monitoring, and appropriate management of any adverse effect is very important(9).

3.3.1 **Regimen available for TPT**

Two regimens are recommended by WHO and NTEP for Tuberculosis Preventive Treatment:

Table 5: Six-months of daily regimen Isoniazid monotherapy

Regimen	Dose by age and weight band
6 months of daily isoniazid monotherapy (6H)	Age 10 years & older: 5 mg/kg/day Age <10 years: 10 mg/kg/day

Source: Guidelines for Programmatic Management of TB Preventive Treatment in India 2021

Table 6: Three-months regimen of Isoniazid plus Rifapentine

Three months of weekly rifapentine plus isoniazid (12 doses) (3HP)	**Age 2-14 years**					
	Medicine, formulation	10–15 kg	16–23 kg	24–30 kg	31–34 kg	>34 kg
	Isoniazid, 100 mg	3	5	6	7	7
	Rifapentine, 150 mg	2	3	4	5	5
	Isoniazid + rifapentine FDC (150 mg/150 mg)	2	3	4	5	5
	Age >14 years					
	Medicine, formulation	30–35 kg	36–45 kg	46–55 kg	56–70 kg	>70 kg
	Isoniazid, 300 mg	3	3	3	3	3
	Rifapentine, 150 mg	6	6	6	6	6
	Isoniazid + rifapentine FDC (300 mg/300 mg)	3	3	3	3	3

Source: Guidelines for Programmatic Management of TB Preventive Treatment in India 2021

Table 7: Comparison of TB preventive treatment options

	6H (IPT)	**3HP**
Medicines	Isoniazid	Isoniazid + rifapentine
Duration (months)	6	3
Interval	Daily	Weekly
Doses	182	12
Pill burden per dose (total number of pills for an average adult)	1 (182 pills)	9 pills with loose drugs (108 pills) 3 pills of FDC (36 pills)
Pregnant women	Safe for use	Not known
Interaction with ART	No restriction	Contraindicated: All PIs, NVP/NNRTIs, TAF Use: TDF, EFV (600 mg), DTG, RAL (without dose adjustment)
Toxicity	Hepatotoxicity (more), peripheral neuropathy, rash, gastrointestinal (GI) upset	Flu-like syndrome, hypersensitivity reactions, GI upset, orange dis-coloration of body fluids, rash, hepatotoxicity (less)
Absorption	Best absorbed on an empty stomach; up to 50% reduction in peak concentration with a fatty meal	Oral rifapentine bioavailability is 70% (not HP); peak concentration increased if given with a meal

Source: Guidelines for Programmatic Management of TB Preventive Treatment in India 2021

Studies published on IPT coverage, after 2010 reporting proportion of paediatric contacts of microbiologically confirmed pulmonary TB cases initiated on IPT (IPT coverage) are summarised in the Table: 8

Table 8: Review of literature for Proportion of Eligible Paediatric Contacts Initiated on six-months of IPT

Sr. No.	Author	Year of Publication	Study setting	Participants	Eligible for IPT	IPT Initiated
1.	Benoit Vasquez et.al	2022	Dominican Republic	Children under 5 years	212	85, 40.0%
2.	Sharma N	2021	Delhi	Children under 6 years	86	62, 72.0%
3.	Tolofoudie M	2021	Gambia	Children up to 4 years	130	128, 98.4%
4.	Amisi JA	2021	Kenya	Children under 5 years	472	427, 90.4%
5.	Sayedi SM	2020	Kabul	Children under 5 years	117677	101084, 85.8%
6.	Seid G	2020	Ethiopia	Children under 5 years	125	94, 75.2%
7.	Chacon A	2019	Quito	Children under 5 years	68	63, 92.6%
8.	Birungi FM	2019	Rwanda	Children under 5 years	94	84, 89.3%
9.	Gabriel Job	2019	Nigeria	Children under 5 years	57	55, 96.4%
10.	Belgaumkar V	2018	Delhi	Children under 6 years	33	28, 84.8%
11.	Ranganath	2018	South India	Children under 6 years	93	71, 76.4%
12.	Black F	2018	South Africa	Children under 5 years	182	108, 59.3%
13.	Okwara FN	2017	Kenya	Children under 5 years	414	414, 100%
14.	Datiko DG	2017	Ethiopia	Children under 5 years	3027	1761, 58.1%
15.	Singh AR	2017	Bhopal	Children under 6 years	18	11, 61.1%
16.	Egere	2016	Gambia	Children under 5 years	368	328, 89.1%
17.	Triasih R	2016	Indonesia	Children under 5 years	99	86, 86.8%
18.	Adjobimey M	2016	Benin	Children under 5 years	496	496, 100%
19.	Tadesse Y	2016	Ethiopia	Children under 5 years	221	142, 64.2%
20.	Silva AP	2016	Brazil	Children under 5 years	332	109, 32.8%
21.	Rekha B	2013	Chennai India	Children under 6 years	87	53, 60.9%
22.	Van Soelen N	2013	South Africa	Children under 5 years	54	54, 100%
23.	Rutherford ME	2012	Indonesia	Children under 5 years	82	82, 100%
24.	Gomes VF	2011	Guinea Bissau	Children under 5 years	609	609, 100%

Benoit Vásquez et al., 2022 conducted a descriptive study by using mixed methods and sequential explanatory approach. Interviews were conducted by using semi-structured questionnaire and content analysis was done to understand the barriers and facilitators for IPT administration in children who were contacts of a person diagnosed with sputum positive TB cases, as perceived by relatives and healthcare workers at Dominican Republic (DR). Total of 238 children were identified as contacts of 174 persons with SPPTB. Out of 238 only 86 (36%) received IPT(19).

Sharma N. et al., 2021 conducted exploratory prospective study to assess adherence to IPT and reasons for nonadherence among child contacts of microbiologically confirmed, drug sensitive, non-PLHIV Tuberculosis patients in Delhi. Study had reported timely initiation of IPT among 72.1% (62/86) of eligible paediatric contacts(20).

Tolofoudie M. et al., 2021 assessed the adherence, completion and adverse events among children who were household contacts of a newly diagnosed adult with smear-positive TB in Bamako, Mali. Children aged <5 years living in the same house with an adult smear-positive index case were enrolled in the study in the Bamako Region. Total 130 child contacts were eligible for IPT; 128/130 (98.5%) were started on IPT(21).

Amisi JA, et al. 2021 retrospectively reviewed the child contact management (CCM) cascade and reported IPT outcomes across ten clinics in western Kenya. Out of 472 eligible paediatric contacts for IPT, 427 (90%) were initiated on 6 months IPT(22).

Sayedi S. M. et al., in 2020 reviewed the TB control programme records in Afghanistan. They assessed the IPT implementation in the household paediatric contacts of microbiologically confirmed pulmonary TB cases and reported that the rates of IPT initiation was85.9%(23).

Seid G. et al., 2020 A mixed methods study design was used to prospectively assess the IPT coverage among paediatric contacts of pulmonary TB cases in Ethiopia. Total 129 under five children were identified, 125 children were eligible for IPT, and 94 (75.2%) were initiated on IPT(10).

Chacon A. et al., 2019 conducted a cohort study to determine the proportion of child contacts (under 5 years) of pulmonary TB cases, completed isoniazid preventive

therapy (IPT) in health facilities in Quito. Out of 68 eligible for IPT, 63 (92.6%) initiated on 6months IPT(24).

Birungi F. M. et al., 2019, a mixed method approach was used to prospectively assess adherence to IPT among eligible child contacts and its associated factors through a quantitative (observational cohort Study). This study reports the overall IPT coverage of 89.3%(25).

Gabriel-Job N. et al., 2019, conducted a study to identify active TB cases among children aged 0-5 years who are in close contact with adult cases of pulmonary TB (PTB), to determine the IPT coverage among the paediatric contacts in two health facilities of Rivers state, Nigeria. Reported the total IPT coverage of 96.4(26)%(26).

Belgaumkar V. et al., 2018 conducted a mixed methods approach assess the IPT coverage in household paediatric contacts of pulmonary TB cases. This study reports IPT coverage of 28 (57.14%) in paediatric contacts of microbiologically confirmed pulmonary TB cases(11).

Ranganath T. S. et al., 2018 conducted a cross-sectional study, data was collected by house-to-house visits, patients or head of the family were interviewed after taking informed consent. Study reports the IPT coverage of 76.4% in the household paediatric contacts of microbiologically confirmed TB cases(12).

Black F. et al., 2018 conducted a cross-sectional descriptive study using a retrospective record review of bacteriologically confirmed pulmonary TB case and their paediatric contacts were assessed for IPT administration. Out of 184 eligible, 108 were put on IPT prophylaxis. Overall IPT coverage was 58.7%. This indicates home-delivered IPT among child contacts of adults with smear-positive TB in The Gambia achieved verifiable high uptake rates(13).

Okwara F. N. et al., 2017 conducted longitudinal cohort study in informal settings of Nairobi, where children under 5 years of age in household contact with recently diagnosed smear positive TB adults were enrolled. Out of 414 eligible for IPT everyone started 6 months IPT, overall IPT coverage was 100%(27).

Datiko D. G. et al., 2017 assessed the impact of community-based approach to provide IPT at the household level on IPT uptake and its adherence in Ethiopia. Asymptomatic

children aged, 5 years were offered IPT and followed monthly. Total 3102 paediatric contacts of age up to 5 years. Out of 3102, 3027 were asymptomatic, only 1761(58.1%) were offered (and accepted) IPT due to INH shortage(28).

Singh A. R. et al., 2017 assessed uptake of isoniazid preventive therapy (IPT) among child contacts (<6 years) of smear-positive tuberculosis (TB) patients and its implementation challenges from healthcare providers' and parents' perspectives in Bhopal. Only 11 of 50 (22%) children were started on 6 months IPT(14).

Egere U. et al., 2016 conducted a study to evaluate uptake among paediatric contacts (age <5 years) of microbiologically confirmed pulmonary TB cases. Out of 404 contacts aged <5 years, 368 (91.1%) were offered IPT, 328 (89.4%) of which started IPT(29).

Triasih R. et al., 2016 prospectively evaluated adherence to IPT and its associated factors among child contacts (age 0–5 years) eligible for IPT. Out of 99 eligible children, 86 (86.8%) had initiated 6 months of IPT(30).

Adjobimey M. et al., 2016 assessed the feasibility and results of integrating a programme of isoniazid preventive therapy (IPT) among children aged 5 years residing with active pulmonary TB case at Benin, South Africa. In this study, overall IPT coverage was reported around 100%(15).

Tadesse Y. et al., 2016 conducted a study to determine the coverage and outcome of implementation of IPT for eligible under-five year old children in 28 health facilities in two regions of Ethiopia. Total of 282 under-five children registered as household contacts of these Sputum smear positive. Of these, 237 (84%) were screened for TB symptoms, and presumptive TB was identified in 16 (6.8%) children. Of 221 children eligible for IPT, 64.3% (142) received 6 months IPT(16).

Silva A. P. et al., 2016 conducted a prospective questionnaire-based study with close child contacts or their parents at the time of prescribing IPT to assess the IPT adherence in three cities of Rio de Janeiro State. Out of 1175 paediatric contacts, 332 (30.8%) were TST-positive; 115/332 (34.6%) were prescribed IPT, 109 (32.8%) initiated the 6 months of IPT(17).

Rekha B. et al., 2013 conducted a prospective study to evaluate the effectiveness of an isoniazid preventive therapy (IPT) registers and card in improving the adherence of health care workers (HCWs) to programmatic guidelines in South India. Child contacts of smear positive PTB patients initiated on treatment, were screened, and IPT was initiated in asymptomatic children. HCWs were trained in the use of the IPT register and card. Of 87 children were identified 53 were screened for TB and initiated on IPT(18).

Soelen V. N. et al., 2013 assessed association of presence of an IPT register and IPT coverage in child contacts of pulmonary TB cases. They reviewed routine programme data on IPT delivery to children during two time periods (May 2008–October 2008 and May 2011–October 2011), before and after the implementation of an IPT register used by routine clinic personnel. Total 54 children were identified, and all (100%) were put on 6 months of IPT(31).

Rutherford E. M. et al., 2012 prospectively determined rates of IPT adherence in children <5 years in an Indonesian lung clinic. IPT implementation was assessed and found IPT coverage of 100%(32).

Gomes V. F.et al., 2011, conducted a study to assess adherence to isoniazid preventive therapy (IPT) in children exposed to adult pulmonary tuberculosis (TB) at home. Children were enrolled on IPT if they were aged ⩽5 years and had positive a tuberculin skin test with induration of ⩾10 mm. Children were included from the demographic surveillance system of the Bandim Health Project in Bissau, Guinea-Bissau. Study assessed the IPT coverage among the paediatric contacts of microbiologically confirmed TB cases and reported 100% IPT coverage(33).

Studies published after 2010 reporting proportion of paediatric contacts of microbiologically confirmed pulmonary TB cases adherent for six-month IPT Table: 9

Table 9: Review of literature for Adherence of 6 months IPT in paediatric contacts of pulmonary TB cases

Sr. No.	Author	Year of Publication	Study setting	Participants	IPT Started	Adherent for 6 months IPT	Outcome (IPT Adherence %)
1.	Isaac	2022	Uganda	Children under 5 years	207	76	36.7
2.	Benoit Vasquez et.al	2022	Dominican Republic	Children under 6 years	85	49	57.6
3.	Sharma N	2021	Delhi	Children under 6 years	62	28	45.2
4.	Tolofoudie M	2021	Gambia	Children up to 4 years	128	83	64.8
5.	Amisi JA	2021	Kenya	Children under 5 years	427	205	48.0
6.	Sayedi SM	2020	Kabul	Children under 5 years	101084	69273	68.5
7.	Seid G	2020	Ethiopia	Children under 5 years	94	74	78.7
8.	Ariarathinam Newtonraj	2020	South India	Children under 6 years	31	25	80.64
9.	Chacon A	2019	Quito	Children under 5 years	63	46	73.0
10.	Birungi FM	2019	Rwanda	Children under 5 years	84	74	88.0
11.	Gabriel Job	2019	Nigeria	Children under 5 years	55	24	43.6
12.	Black F	2018	South Africa	Children under 5 years	108	4	**3.70**
13.	Ranganath	2018	South India	Children under 6 years	71	18	25.3
14.	Belgaumkar V	2018	Delhi	Children under 6 years	28	21	75.0
15.	Egere	2017	Gambia	Children under 5 years	328	255	77.7
16.	Okwara FN	2017	Kenya	Children under 5 years	414	368	88.9
17.	Datiko DG	2017	Ethiopia	Children under 5 years	1761	1615	**91.70**

18.	Singh AR	2017	Bhopal	Children under 6 years	11	10	90.9
19.	Triasih R	2016	Indonesia	Children under 5 years	86	50	58.1
20.	Adjobimey M	2016	Benin	Children under 5 years	496	427	86.0
21.	Tadesse Y	2016	Ethiopia	Children under 5 years	142	114	80.3
22.	Silva AP	2016	Brazil	Children under 5 years	109	73	66.9
23.	Rekha B	2013	Chennai India	Children under 6 years	53	39	73.5
24.	Van Soelen N	2013	South Africa	Children under 5 years	54	20	37.0
25.	Rutherford ME	2012	Indonesia	Children under 5 years	82	21	25.6
26.	Gomes VF	2011	Guinea Bissau	Children under 5 years	609	311	51.0

Sharma N. et al., 2021 conducted exploratory prospective study to assess adherence to IPT and reasons for non-adherence among child contacts of microbiologically confirmed, drug sensitive, non-PLHIV Tuberculosis patients in Delhi. The caregivers of the child TB contacts were interviewed face to face by the field investigator. The INH adherence was assessed in a total of 86 household child TB contacts. IPT had been initiated in 62 (72.1%) child TB contacts of which 61 (98.4%) received INH within 1 month of starting of ATT-DOTS therapy in the index TB patient of the household, and 28 out of 62 (45.3%) initiated the 6 months of IPT(20).

Newtonraj A. et al., 2020 retrospectively assessed the paediatric contact screening of smear-positive pulmonary tuberculosis (PTB) and the coverage of isoniazid preventive therapy (IPT) by review of treatment cards in Puducherry district of Puducherry State. Programme was conducted between the reference period of October 2018 and December. Total of 145 index cases were identified. Among them, total 35 children were <6 years of age, 31 (89%) were screened no one was positive for TB. All (31) were put on IPT, of which 25 (80.64%) completed 6 months of IPT(34).

Belgaumkar V. et al., 2018 conducted a mixed methods approach to assess the IPT coverage in household paediatric contacts of pulmonary TB cases, and also assessed

the barriers in effective implementation of Isoniazid Preventive Therapy (IPT) at Sassoon General Hospital, Pune. Quantitative data was collected by using questionnaire and for qualitative data TB patients and Health Care Workers (HCW) were interviewed.

Out of 80 adult pulmonary TB cases, 24 (30%) reported that an HCP recommended TB screening of their child contacts; 49/178 (28%) child contacts were screened.

Sixteen out of 49 screened (33%) children had active TB, and 28 (84.84%) of 33 screened negative were prescribed IPT. Twenty-one (75%) out of 28 completed 6 months of IPT(11).

Ranganath T. S. et al., 2018 determined the level of IPT adherence of children in contact with adults with smear positive pulmonary TB cases Bangalore. A cross-sectional study was conducted by house-to-house visits, patients or head of the family were interviewed after taking informed consent. Totally 110 eligible Contacts of <6years of age were identified by household visits, 95(86.36%) of contacts were screened for tuberculosis, 71(64.54%) were initiated with isoniazid preventive therapy in which 53(48.18%) of the contacts had incomplete therapy and only 18(25.35%) completed the IPT therapy(12).

Singh A. R. et al., 2017 assessed uptake of isoniazid preventive therapy (IPT) among child contacts (<6 years) of smear-positive tuberculosis (TB) patients and its implementation challenges from healthcare providers' and parents' perspectives in Bhopal. A total of 59 child contacts of 129 index patients, 51 were contacted. Among them, 19 of 51 (37%) were screened for TB and one had TB. Only 11 of 50 (22%) children were started and 10 of 50 (20%) completed IPT(14).

Rekha B. et al., 2013 conducted a prospective study to evaluate the effectiveness of an isoniazid preventive therapy (IPT) registers and card in improving the adherence of health care workers (HCWs) to programmatic guidelines in South India. Of 87 children identified aged <6 years, 71 (82%) were traced by HCWs; 53 were screened for TB and initiated on IPT, and 39 (73.58%) completed treatment(18).

Benoit Vásquez et al., 2022 conducted a descriptive study by using mixed methods and sequential explanatory approach. Interviews were conducted by using semi-structured questionnaire at Dominican Republic (DR). Total of 238 children were

identified as contacts of 174 persons with SPPTB. Out of 238 only 85 (36%) received IPT, and 49 (57.6%) completed 6 months IPT(19).

Isaac T. et al., 2022 assessed the factors associated with uptake of isoniazid preventive therapy among child contacts (under 5 years) of pulmonary tuberculosis cases in Greater Kibaale. A mixed method approach was used in this study. Total 207 children were recruited using convenience sampling methods and caregiver of the children completed a structured questionnaire. Bivariate, univariate, and multivariate Logistic regression analysis methods were used to identify factors associated with uptake of isoniazid preventive. Of the 207 participants, the uptake IPT was low at 36.7%(35).

Tolofoudie M. et al., 2021 assessed the adherence, completion and adverse events among children who were household contacts of a newly diagnosed adult with smear-positive TB in Bamako, Mali. Children aged <5 years living in the same house with an adult smear-positive index case were enrolled in the study in the Bamako Region. Adherence was assessed based on the number of tablets consumed in last 6 months. Total 130 child contacts were eligible for IPT; 128/130 (98.5%) were started on IPT and 83/128 (64.8%) completed with good adherence at the end of the 6 months, and without any significant adverse events(21).

Amisi JA, et al. 2021 retrospectively reviewed the child contact management (CCM) cascade and reported IPT outcomes across ten clinics in western Kenya. Total 553 child contacts were screened, 231 (42%) were found symptomatic. 74 (13%) of the child contacts were diagnosed with active TB disease and 7 with no clinical decision. Of 472 eligible for IPT, 427 (90%) initiated IPT, 205 (48%) were documented to complete therapy, and for rest no documentation was found. This shows gaps in the routine CCM care cascade related to completeness, monitoring, and documentation(22).

Sayedi S. M. et al., in 2020 reviewed NTP records in Afghanistan where Health workers were trained in contact screening, presumptive TB cases gave sputum for AFB smear microscopy; other diagnostics were used if patients could not produce sputum. Children under five (excluding those with active TB) were treated for latent TB infection by IPT. They calculated the yield and the number needed to screen and number needed to test to find a case of TB, as well as the rates of IPT initiation and completion. Total 142,797 bacteriologically confirmed TB cases were diagnosed in Afghanistan. The number of household members eligible for screening was estimated

to be 856,782, of whom 586,292 (68%) were screened for TB and 117,643 (20.1%) were found to be presumptive TB cases. The number needed to screen to diagnose a single case of TB (all forms) was 53.8; the number needed to test was 10.7. Out of total 117,677 under five children, 101,084 (85.9%) were initiated on IPT, and 69,273 (68.5%) completed treatment(23).

Seid G. et al., 2020 A mixed study design was used to prospectively assess the adherence to IPT among children under the age of 5 in contact with pulmonary TB patients through the quantitative study design and barriers of adherence in view of health care professionals and the family of children through a descriptive qualitative study in Ethiopia. Total 129 under five children were identified, 125/129 (96.8%) were screened, 94 (75.2%) were initiated on IPT, and 74 (78.7%) were completed the 6 months IPT(10). **Chacon A. et al., 2019** conducted a cohort study to determine the proportion of child contacts (under 5 years) of pulmonary TB cases, completed isoniazid preventive therapy (IPT) in health facilities in Quito. Out of 68 eligible for IPT, 63 (92.6%) initiated IPT, and 46 (73%) completed 6 months course of IPT(24).

Birungi F. M. et al., 2019, a mixed method approach was used to prospectively assess adherence to IPT among eligible child contacts and its associated factors through a quantitative (observational cohort Study), and to explore barriers to and facilitators of adherence to IPT a descriptive qualitative study was conducted. Out of the 84 child contacts who started IPT, 74 (88%) had complete adherence and ten (12%) had incomplete adherence(25).

Gabriel-Job N. et al., 2019, conducted a study to identify active TB cases among children aged 0-5 years who are in close contact with adult cases of pulmonary TB (PTB), to determine the IPT adherence, and to identify factors associated with non-adherence in two health facilities of Rivers state, Nigeria.

Children aged 0-5 years who were in close contact with newly diagnosed PTB cases were recruited for the study. They were screened for HIV and evaluated for TB using clinical features and standard laboratory investigations. Those without active TB disease were commenced on isoniazid preventive therapy (IPT) for six months at a daily dose of 5mg/kg after adherence counselling and followed up at the health centres.

Total of 63 children were recruited. Of the 55 children that commenced INH in the first Month, only 24 of them completed the six-Month course of INH, giving an IPT adherence rate of 49.6%(26).

Black F. et al., 2018 assessed the practices regarding the identification and management of child contacts (<5 years) at primary care clinic in the Nelson Mandela Bay Health District, Eastern Cape Province, SA. A cross-sectional descriptive study was conducted using a retrospective record review of bacteriologically confirmed pulmonary TB case and their paediatric contacts were assessed for IPT administration. A total of 261 child contacts identified from 491 index TB cases. Of the 261 child contacts identified, 184 (70.5%) were screened for TB, 2 started TB treatment and 108/184 (58.7%) started IPT. For the remaining 74 (40.2%) children, there was no documentation of further management. Only 4 (3.7%) children completed the 24-week IPT course(13).

Egere U. et al., 2017 conducted a study to evaluate uptake, adherence, and completion of isoniazid preventive therapy (IPT) among tuberculosis (TB) exposed children in the Gambia. Child (age <5 years) contacts of adults with smear-positive TB were prospectively enrolled. Following symptom screening, tuberculin skin testing and clinical assessment was done, and Isoniazid was provided monthly at home. Adherence was assessed by pill counts. Out of 404 contacts aged <5 years, 368 (91.1%) were offered IPT, 328 (89.4%) for whom started IPT, 18 (5.5%) dropped out and 310 (94.5%) remained on IPT to the end of the 6-month regimen, and 255/328 children (77.7%) completed all 6 months, with good adherence(29).

Okwara F. N. 2017 et al., 2017 conducted longitudinal cohort study in informal settings of Nairobi, where children under 5 years in household contact with recently diagnosed smear positive TB adults were enrolled. Structured questionnaires administered sought information on index case treatment, socio-demographics, and TB knowledge. Contacts were screened, and then put on daily isoniazid for 6 months and monitored for new TB disease, compliance, and side effects. In the starting 428 contacts were screened, and 14(3.2%) had evidence of TB disease, hence excluded. Of 414 contacts put on IPT, 368 (88.8%) completed the treatment(27).

Datiko D. G. et al., 2017 assessed the impact of community-based approach to provide IPT at the household level on IPT uptake and its adherence in Ethiopia. In this study

paediatric contacts of adults with smear-positive pulmonary TB (PTB) were visited at home and examined by health care workers (HCWs). Asymptomatic children aged ,5 years were offered IPT and followed monthly. Of 6161 PTB cases identified by HCWs in the community, 5345 (87%) were visited, and identified 3102 paediatric contacts of age up to 5 years. Out of 3102 3027 were asymptomatic, only 1761 were offered (and accepted) IPT due to INH shortage. Of these, 1615 (91.7%) completed the 6-month course(28).

Triasih R. et al., 2016 prospectively evaluated adherence to IPT and its associated factors among child contacts (age 0–5 years) eligible for IPT. They undertook in-depth interviews with care givers and a focus group discussion with health care workers, which were thematically analysed to explore the barriers and facilitators to IPT adherence from the perspective of both care givers and health workers. Out of 99 eligible children, 49 (49.5%) did not complete 6 months of IPT(30).

Adjobimey M. et al., 2016 assessed the feasibility and results of integrating a programme of isoniazid preventive therapy (IPT) in children aged, 5 years exposed to TB as part of the existing routine activities of the National Tuberculosis Program in the two large Tuberculosis (TB) centres at Benin, South Africa. In this study they have screened all paediatric contacts of pulmonary TB cases, and IPT given to all those children in whom no evidence of TB was found. Total of 499 paediatric contacts were identified out of which 497 were examined and prescribed IPT, 496 children started taking IPT and 427 (86%) adhered to IPT for at least 6 months(15).

Tadesse Y. et al., 2016 conducted a study to determine the coverage and outcome of implementation of IPT for eligible under-five year old children in 28 health facilities in two regions of Ethiopia. Total 282 under-five children registered as household contacts of these Sputum smear positive. Of these, 237 (84%) were screened for TB symptoms, and presumptive TB was identified in 16 (6.8%) children. Of 221 children eligible for IPT, 64.3% (142) received IPT, and 80.3% (114) of whom successfully completed six months of therapy(16).

Silva A. P. et al., 2016 conducted a prospective questionnaire-based study with close child contacts or their parents at the time of prescribing IPT to assess the IPT adherence in three cities in Rio de Janeiro State. Out of 1175 paediatric contacts, 1078 children

screened for LTBI, 332 (30.8%) were TST-positive; 115/332 (34.6%) were prescribed IPT, 109 (32.8%) initiated the IPT, and 73 (66.9%) completed the 6 months IPT(17).

Soelen V. N. et al., 2013 assessed association of presence of an IPT register and IPT coverage in child contacts of pulmonary TB cases. Total 54 children were identified, and all were put on IPT, and 20 (37%) of those who started, completed six months of IPT. After implementation of an IPT register, documented identification of child contacts, IPT initiation and IPT adherence documentation in TB exposed children was improved(31)**.**

Rutherford E. M. et al., 2012 prospectively determined rates of IPT adherence in children <5 years in an Indonesian lung clinic. Further, to investigate adherence barriers in-depth interviews were conducted with caregivers of children with good and poor adherence. Total eighty-two children eligible for IPT were included, 61 (74.4%) of which had poor adherence(32).

Gomes V. F.et al., 2011, conducted a study to assess adherence to isoniazid preventive therapy (IPT) in children exposed to adult pulmonary tuberculosis (TB) at home. Children were enrolled on IPT if they were aged ⩽5 years and had positive tuberculin skin test with induration of ⩾10 mm. Children were included from the demographic surveillance system of the Bandim Health Project in Bissau, Guinea-Bissau. The main outcome measures were adherence, completion rates and side effects during 9 months of IPT. The main outcome was 6 consecutive months of at least 80% adherence. A total 609 children of aged ⩽5 years were started IPT and, 311 (51%) completed 6 consecutive months of IPT(33).

Studies published on hurdles in timely initiation of IPT and its adherence, after 2010 reporting proportion of paediatric contacts of microbiologically confirmed pulmonary TB cases initiated on IPT (IPT coverage) are summarised in the Table: 10

Table 10: Review of literature for Hurdles in Timely Initiation and Adherence for 6 Months IPT

Sr. No.	Author	Year	Place of Study	Sample size	CONCLUSION	
					Provider Related	**Caregivers Related**
1.	Benoit Vasquez I G et al.	2022	Dominican Republic	2 IDIs in HCWs 2 IDIs in Parents of child contacts	• Frequent change in health personnel • Relation of child • Lack of perceived risk • Unavailability of TST	• Lack of perceived risk Fear of disclosure
2.	Chawla K et al.	2021	Karnataka India	IDIs of HCWs	<u>Patient Level:</u> • Stigma and fear of disclosure • Issues of working hours • Anxiety due to long course • Going to private hospitals • Fear of Coronavirus <u>Provider level:</u> • Incorrect address • Migrant patients • HCWs not provided due respect • Challenges in sample collection • Delay in getting tests done • Poor monitoring	

3.	Zeladita-Huaman J. et al.	2021	Lima, Peru	Interview of caregivers with semi-structured questionnaire		• Lack of knowledge about IPT • Low perceived benefit of IPT • Low caregiver's satisfaction with health services Caregiver not being index case
4.	Getachew seid et al.	2020	Ethiopia	14 IDIs with Parents of child contacts and 11 IDIs with HCWs	• Relocation	• Lack of perceived risk • Difficulty in giving drug to children
5.	Hirsch-Moverman et al.	2020	Lesotho	In-depth interview of 12 HCWs	<u>Patient Level:</u> • Lack of proper transport • Lack of perceived benefit • Fear of drug toxicity • Fear of disclosure <u>Provider level:</u> • Drug stock out • Difficulty in contact tracing and screening	

6.	Birungi FM	2019	Rwanda	In-depth interview of 23 caregiver of paediatric contacts 3 FGD among HCWs	• Relocation of child	• Drug toxicity • Poverty Lack of compliance with treatment guideline by HCWs
7.	Belgaumkar V. et al.	2018	Pune India	85 Interviews of patients by using semi structured questionnaire 25 Interview of HCWs by using semi structured questionnaire	<u>Patient Level:</u> • Fear of Drug toxicity • No awareness about IPT • No risk perception • Adult TB patient reluctant to bring their child • Distance of facility <u>Provider level:</u> • Inadequate knowledge • Stigma in HCWs about SSP-TB • Concern for development of drug resistance • Availability of INH • Poor monitoring	• No awareness about IPT • No perceived benefit • Worried about side effects • Lack of Risk Perception
8.	Singh AR et al.	2017	Bhopal India	14 IDIs in Caregiver's of child contacts 11 IDIs in HCWs	<u>Patient Level:</u> • Fear of Drug toxicity • Lack of awareness and risk perception <u>Provider level:</u>	• No home visit by HCWs • Lack of Information about IPT

					• Inadequate knowledge • Cumbersome screening process • Unavailability of drugs • Poor monitoring	• Erratic availability of INH • Lack of Risk Perception
9.	R. Triasih et al.	2016	Indonesia	In-depth interview of 13 caregiver of paediatric contacts and One FGD among HCWs	• Limited knowledge about IPT • High patient load in hospital	• High transport cost • Inadequate dose form of INH • Long course of INH • Fear of disclosure • Poor family support • Long waiting time in hospital
10.	Rutherford ME et al.	2012	Indonesia	In-depth interview of caregiver of paediatric contacts		• Distance of facility • No awareness about IPT • Worried about side effects • Lack of Risk Perception • Long waiting time in hospital

Chawla, K. et al., 2021, conducted a qualitative study to assess the challenges in implementing 6 months IPT among paediatric contacts of pulmonary TB cases at Bengaluru and Udupi.

In-depth interviews of key participants were adopted to explore the challenges in IPT implementation. Qualitative data analysis was done after developing transcripts by generating themes and codes. Key challenges were identified as stigma towards the disease, migrant patients with changing address, difficulty in sample collection, anxiety among parents due to long duration of the prophylactic treatment and adherence to IPT is not well documented, inadequate transportation from rural areas, and the ongoing COVID-19 pandemic. It is concluded that it is important for the National TB programme to address these challenges efficiently and effectively. Innovative solutions, feasible engagements, and massive efforts are to be taken by the programme to improve contact screening and isoniazid chemoprophylaxis implementation(36).

Belgaumkar V. et al., 2018 conducted a mixed methods approach to assess the IPT coverage in household paediatric contacts of pulmonary TB cases, also assessed the barriers in effective implementation of Isoniazid Preventive Therapy (IPT) at Sassoon General Hospital, Pune. For qualitative data TB patients and Health Care Workers (HCW) were interviewed.

Lack of TB screening and IPT provision for child contacts was associated with inadequate HCW counselling, a non-parent index case and lack of postgraduate HCP qualification(11).

Singh A. R. et al., 2017, Bhopal, a mixed-method approach was used, where in quantitative phase (review of programme records and house-to-house survey of smear-positive TB patients) followed by qualitative phase where interviews of healthcare providers and parents were conducted. Content analysis of qualitative data revealed lack of awareness, risk perception among parents, cumbersome screening process, isoniazid stock-outs, inadequate knowledge among healthcare providers and poor programmatic monitoring as main barriers to IPT implementation.

This study suggests that the National TB programme should counsel parents, train healthcare providers, simplify screening procedures, ensure regular drug supply, and introduce an indicator to strengthen monitoring and uptake of IPT(14).

Benoit Vásquez et al., 2022 conducted a descriptive study by using mixed methods and sequential explanatory approach. Interviews were conducted by using semi-structured questionnaire and content analysis was done to understand the barriers and facilitators for IPT administration in children who were contacts of a person diagnosed with sputum positive TB cases, as perceived by relatives and healthcare workers at Dominican Republic (DR).

Barriers identified include socioeconomic conditions of children and families, stigma, lack of information in clinical and follow-up records, lack of coordination between public and private providers and lack of coherence within national regulations. Facilitators include home based care of persons with TB and their contacts, transfer of treatment to a health centre near household, isoniazid availability, provision of information by health-workers and economic support for food and transportation(19).

Zeladita-Huaman J. et al., 2021 assessed the association between caregivers' knowledge and perceptions around adherence of isoniazid preventive therapy (IPT) among paediatric contacts of pulmonary TB cases in south Lima, Peru. In this retrospectively they reviewed medical records of children who initiated IPT during 2017–2018. They administered structured surveys to caregivers of the children about their knowledge about and perceptions of IPT and used a modified Poisson regression to determine factors associated with IPT completion.

A total of 550 children were identified, of whom 31% did not complete IPT. Independent factors associated with not completing IPT were low caregiver knowledge about TB as well as IPT, low caregiver perception of the importance of IPT, low caregiver satisfaction with the health services, experience of adverse events, and living in a household with moderate or severe family dysfunction(37).

Seid G. et al., 2020 A mixed study design was used to prospectively assess the adherence to IPT among children under the age of 5 years of age in contact with pulmonary TB patients through the quantitative study design and barriers of adherence in view of health care professionals and the family of children through a descriptive qualitative study in Ethiopia. Enrolment of eligible children for isoniazid preventive therapy in Ethiopia was still below the target of the WHO End-TB strategy by 2030. Child default after the first visit indicates a lack of understanding about the benefit and safety of preventive therapy in young children among families of TB patients, and

awareness-creating efforts by health extension workers will help to improve the outcomes(10).

Hirsch-Moverman Y. et al., 2020 conducted this study to explore attitudes of healthcare providers toward TB prevention and perceived facilitators and challenges to child contact management in Lesotho. Qualitative data were collected via group and individual in-depth interviews with 12 healthcare providers at five health facilities in one district and analysed using a thematic framework. Healthcare providers in the study were interested and committed to improve child TB contact management and identified facilitators and challenges to a successful childhood TB prevention program. Facilitators included: provider understanding of the importance of TB prevention and enhanced provider training on child TB contact management, with a particular focus on ruling out TB in children and addressing side effects. Challenges identified by providers were at multiple levels- structural, clinic, and individual and included: access to care, supply-chain issues, identification and screening of child contacts, and adherence to isoniazid preventive therapy(38).

Birungi F. M. et al., 2019, a mixed method approach was used to prospectively assess adherence to IPT among eligible child contacts and its associated factors through a quantitative (observational cohort Study), and to explore barriers to and facilitators of adherence to IPT a descriptive qualitative study was conducted. In the qualitative analysis, they identified factors relating to parents/caregivers, disease, household, and health-care providers as major themes determining IPT adherence. There was a high rate of IPT completion in this cohort of eligible child contacts living in Kigali. However, structural factors (poverty and relocation) were found to be the main barriers to IPT adherence that could be addressed by health-care providers(25).

Triasih R. et al., 2016 prospectively evaluated adherence to IPT and its associated factors among child contacts (age 0–5 years) eligible for IPT. They undertook in-depth interviews with care givers and a focus group discussion with health care workers, which were thematically analysed to explore the barriers and facilitators to IPT adherence from the perspective of both care givers and health workers. Thematic analyses revealed major barriers to and facilitators of adherence: regimen related, caregiver-related and health care-related factors, social support, and access(30).

Rutherford E. M. et al., 2012 prospectively determined rates of IPT adherence in children <5 years in an Indonesian lung clinic. Further, to investigate adherence barriers in-depth interviews were conducted with caregivers of children with good and poor adherence. Access, medication barriers, disease and health service experience and caregiver's TB and IPT knowledge and beliefs about TB and IPT were found to be important determinants of adherence in qualitative analysis. Adherence to IPT in this setting in Indonesia is extremely low and may result from a combination of financial, knowledge, health service and medication related barriers. Successful reduction of childhood TB urgently requires evidence-based interventions that address poor adherence to IPT(32).

Chapter 4: METHODOLOGY

4.1 Study design

A mixed-methods study was conducted. In the quantitative phase of the study, programme records from TB notification register were reviewed and patients were visited to their home to verify information related to their paediatric contacts. The quantitative phase was followed by a qualitative phase in which health care workers, programme managers, and caregivers of paediatric contacts were interviewed to address the barriers in IPT implementation.

4.2 Study setting

The study was conducted in the Jodhpur District of Rajasthan, comprising population of around 4.27 million. Under NTEP, Jodhpur District consists of one District TB Centre (DTC) and 18 TB units (TUs) [14-rural and 4-urban].

4.3 Sampling

4.3.1 Sample size

It was a time bound study. In Quantitative phase: All the paediatric contacts (<6 years) of microbiologically confirmed pulmonary TB cases notified in the 2^{nd}, 3^{rd}, and 4^{th} quarters of 2020 and the 1^{st} quarter of 2021 at the two selected TB units were included in the study.

In Qualitative phase: In-depth interviews with caregivers of IPT beneficiaries, DOTS providers, and key informant interviews with programme managers were conducted until data saturation was achieved.

4.3.2 Study population

For the quantitative phase, all the paediatric contacts of microbiologically confirmed pulmonary TB cases registered from April 2020 to March 2021 were included.

For the qualitative phase of the study, caregivers of IPT beneficiaries, DOTS providers, and programme managers were included.

4.3.3 Sampling technique

One urban and one rural TU were selected from 18 TUs in Jodhpur District by Simple Random Sampling.

Figure 2: Sampling technique for selection of TB Units

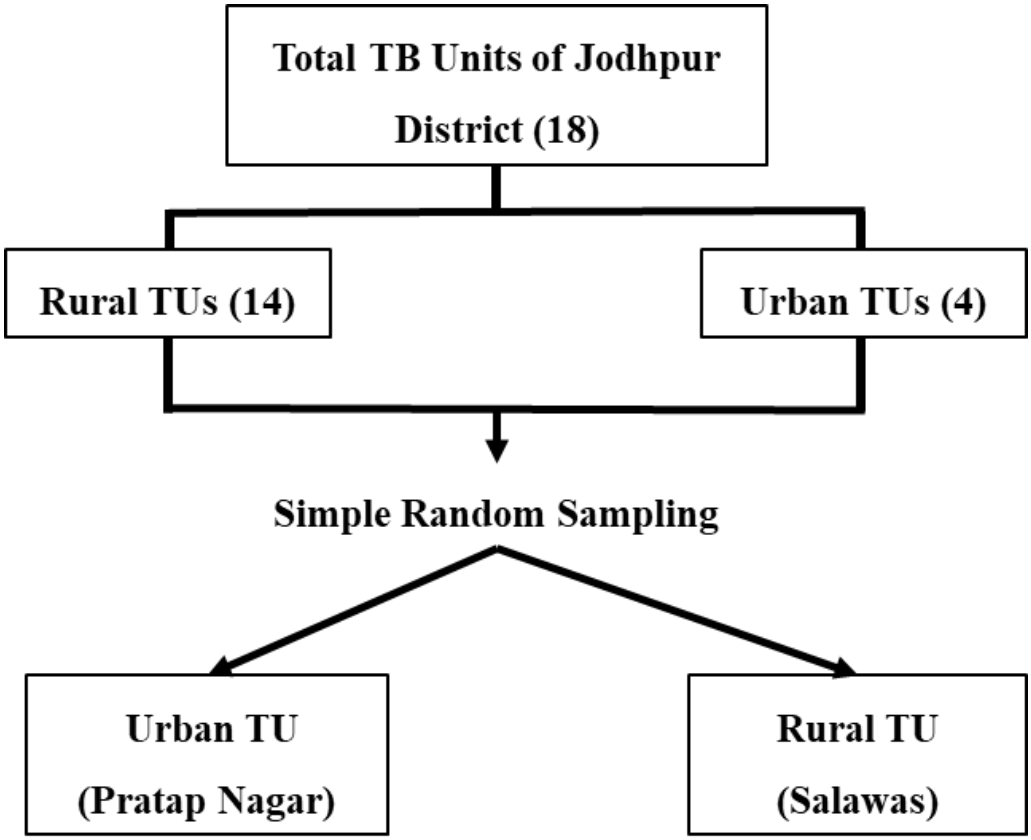


Table 11: Operational definitions used in this study

Parameters	Definitions
Microbiologically Confirmed Pulmonary-TB Cases	A patient with at least one out of two sputum specimens subjected for smear examination, tested positive by sputum microscopy or CBNAAT.
Isoniazid Preventive Therapy (IPT)	Short course of Isoniazid monotherapy (10mg/kg body weight) given prophylactically for all the household paediatric contacts (aged ≤6years) of sputum positive TB cases. IPT is given daily for 6 months on self-administration basis.
Child Contact	All children aged ≤6 years who are in contact with microbiologically confirmed TB case, who live or have lived (irrespective of duration) within the same household as the index case.
Index TB Patient	Smear-positive TB patient, perceived to be the source of infection in household contacts.
Eligible Paediatric Contacts for IPT	All the Paediatric contacts screened negative for TB, plus all those not screened for TB.
Initiation of IPT	Child contacts started on IPT within 1 month after the diagnosis of the index TB case.
Adherence to 6 Months IPT	Completion of full course of IPT within 7 months from date of initiation.

4.4 Data collection

4.4.1 Quantitative

Secondary data related to microbiologically confirmed pulmonary TB cases notified between April 2020 and March 2021 were extracted from TB notification registers and reviewed. These TB cases were contacted telephonically, and home visits were made to verify information regarding the paediatric contacts. A semi-structured, pretested questionnaire was used to interview all TB patients with paediatric contacts. It consisted of questions about the index case's basic demographic details, paediatric contacts, and IPT programme implementation. Those who could not be contacted even after 3–4 attempts by the investigator were not interviewed, and hence their paediatric contacts could not be included in the study.

Operational definitions used for data collection are given in the Table 4.1, which are according to the national guidelines(39–41).

PROCESS OF DATA COLLECTION

4.4.2 Qualitative

A total of twelve healthcare providers (one block chief medical officer, three medical officers, two senior treatment supervisors, two lab technicians, and four nursing staff working as DOTS providers) and 11 caregivers of paediatric contacts and patients with paediatric contacts were interviewed. The interview guides were prepared after a thorough review of the literature to explore the reasons for non-initiation and non-adherence of IPT from healthcare workers' and patients' perspectives. After completion, the summary of interviews was read to the participants and validated.

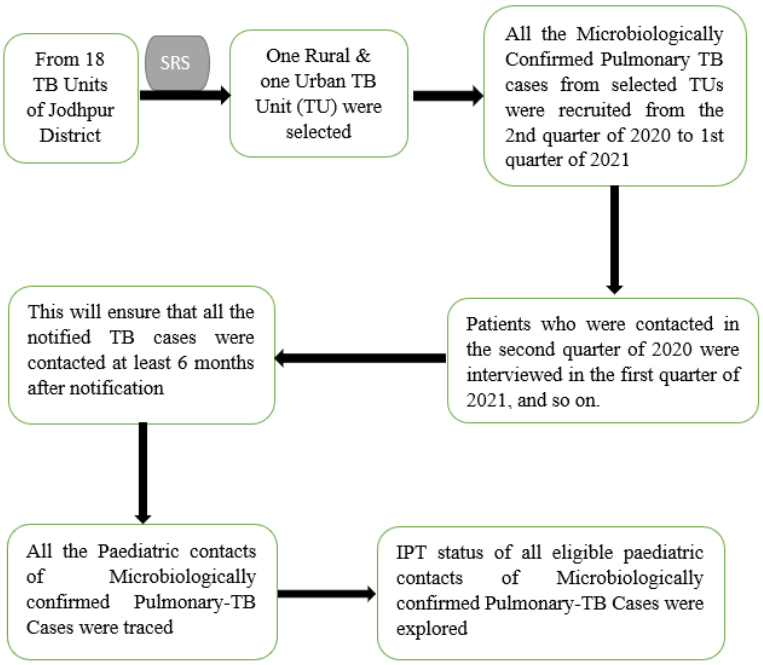
4.5 Study period

The total duration of the study was 18 months. Patients notified during the 2nd quarter of 2020 were assessed in the 1st quarter of 2021, ensuring that all notified TB cases were contacted at least 6 months after notification. The paediatric contacts were traced, and the IPT status of eligible paediatric contacts of sputum-positive TB cases was explored. Interviews with caregivers, patients, and healthcare staff were also conducted to explore the reasons for non-initiation and non-adherence of IPT.

4.6 Study Framework

4.6.1 Quantitative Phase:

Figure 3: Study framework for Quantitative phase



4.6.2 Qualitative Phase:

Figure 4: Study framework for Qualitative phase

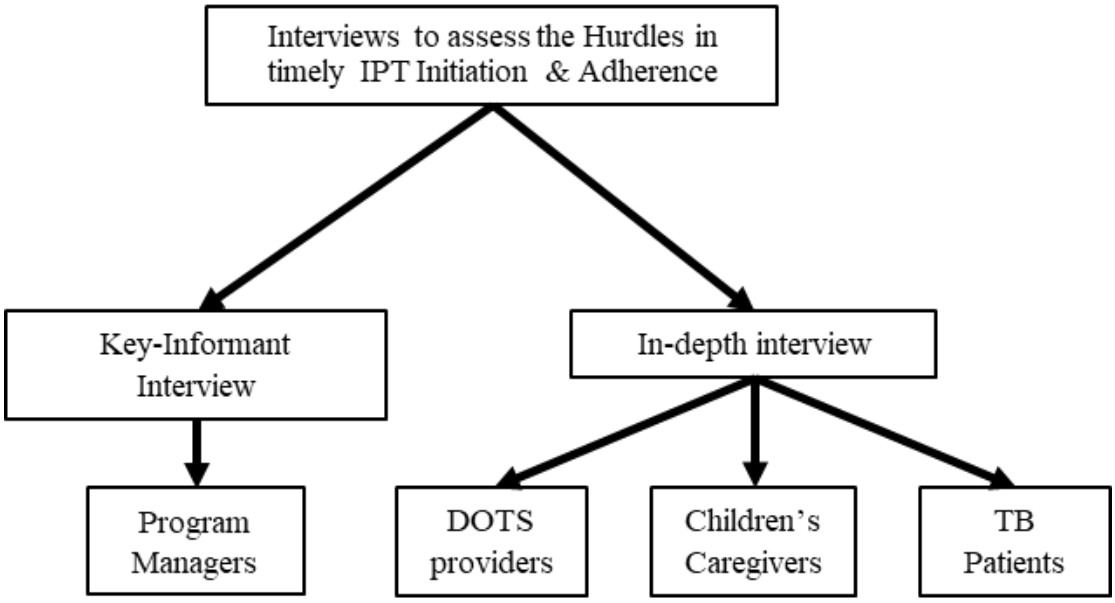
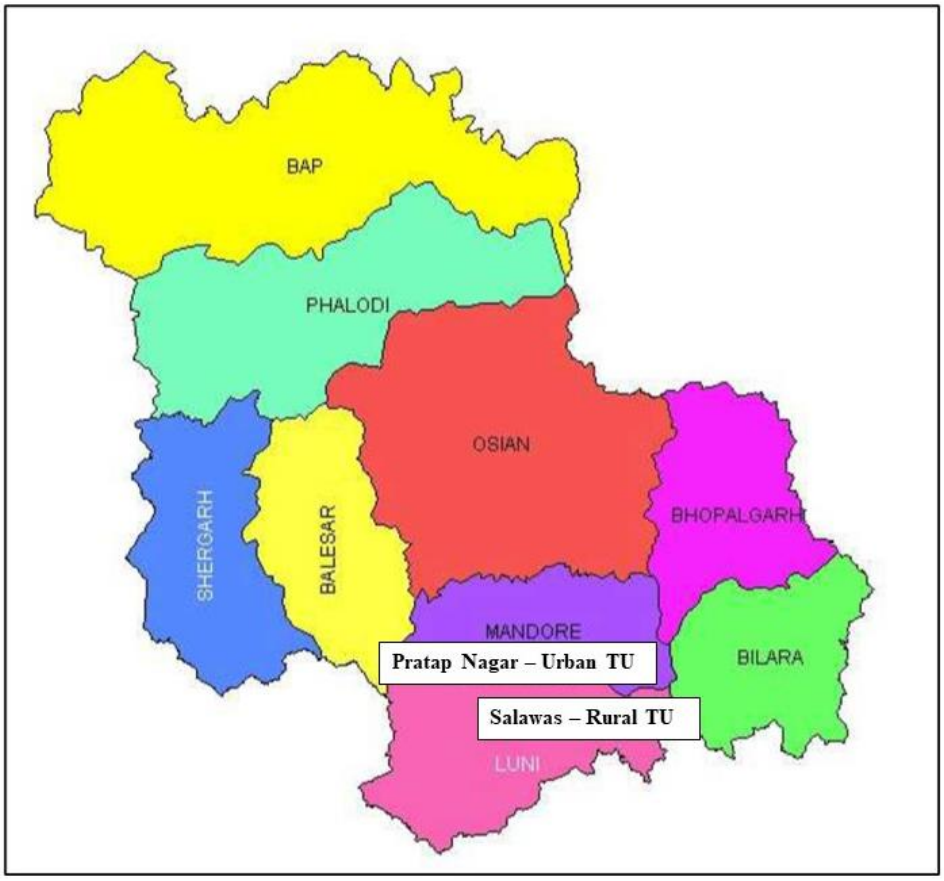


Figure 5: Block wise map of Jodhpur District



4.7 Statistical analysis

Data was entered in Microsoft Excel 2016. Data analysis was conducted with both Microsoft Office and Statistical Package for Social Sciences (SPSS) version 23. For Quantitative data, normality of data was checked. If found normally distributed, data was described by using mean and standard deviation. For data not found normally distributed, median and interquartile range was used.

All the categorical variables have been described using frequencies and percentages. Tests of significance were applied at a 95% confidence interval. Chi-square test and Fisher Exact test, as applicable, have been used for comparisons of categorical variables. In order to test the association between categorical variables, univariate logistic regression and multivariate logistic regression were used, and the unadjusted odd's ratios and adjusted odd's ratios were calculated. A correlation coefficient has been calculated for the association. A p-value of less than 0.05 has been considered significant.

For Qualitative data: content analysis of qualitative data was done after transcription and translation from Hindi/ Marwari to English language. Manual descriptive content analysis was carried out using standard procedures and consensus, with manual coding and theme generation. The themes and categories were reviewed by the guide and co-guides to reduce bias and increase interpretive credibility. Any disagreement was resolved by a common consensus.

4.8 Ethical approval and consent to participate

Ethical approval was obtained from the Institutional Ethical Committee (IEC) (AIIMS Jodhpur) vide their Ethical Clearance Certificate reference number AIIMS/IEC/2021/3349, dated- 12/03/2021. All participants were informed about the purpose of the study. Written-informed consent was obtained from all adult participants. A participant information sheet was given to each participant. Participants were assured of complete confidentiality of information and were informed that they could withdraw from the study at any time if they so desired. All the data collected was kept confidential.

Chapter 5: RESULTS

The results of the present study are described under following headings:

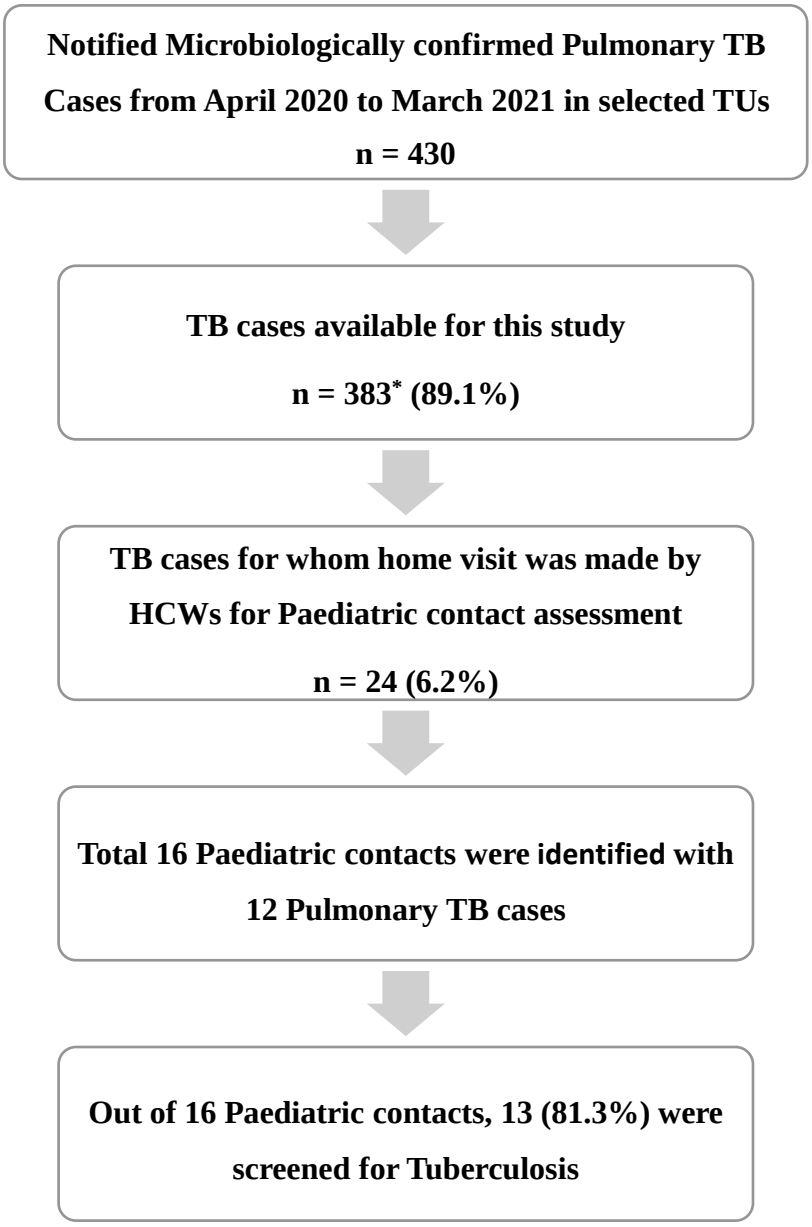
1. Flow of Participants in the study
2. Socio-Demographic Profile of Microbiologically confirmed Pulmonary TB Cases
3. Socio-Demographic Profile of Paediatric contacts of Microbiologically confirmed Pulmonary TB Cases
4. IPT Implementation status
5. Factors associated with IPT initiation
6. Factors associated with IPT adherence
7. Hurdles in timely initiation of IPT
8. Hurdles in 6 months IPT adherence

5.1 Flow of Participants in the study

The study was conducted in Pratap Nagar (Urban TU) and Salawas (Rural TU) areas of Jodhpur district in Rajasthan. All DOTS centres under the TUs were visited. Data regarding microbiologically confirmed pulmonary TB cases, registered from April 2020 to March 2021, were extracted from the TB notification register. A total of 430 microbiologically confirmed pulmonary TB cases were identified from the database. Out of those, 68.3% were males and 31.7% were females. Their mean ±SD age was 35.1 ±17.2 years.

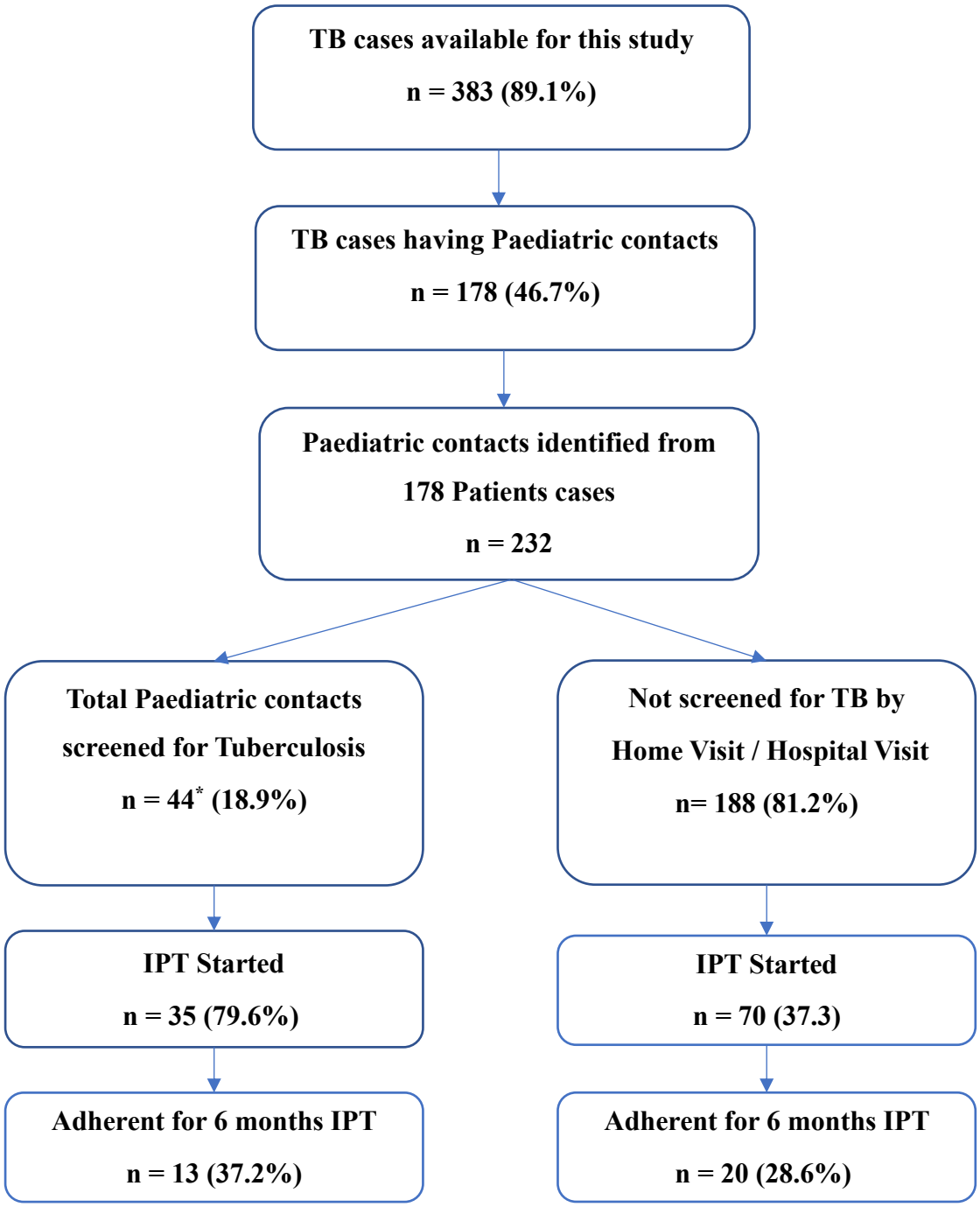
Among 430 cases, 383 (89.1%) were available for the study. Home visits made by health care workers was 24 (6.2%) for household paediatric assessment (Fig;5.1). A total of 16 paediatric contacts were identified and of these 13 were screened by HCWs during the home visit and 3 children left unscreened due to unknown reasons.

Figure 6: Flow of index cases in the study



*47 Index cases could not be traced due to unavailability of correct address or other contact details

Figure 7: Flow of the study participants



*13 paediatric contacts were screened by active surveillance and 31 by passive surveillance.

Out of 383 TB patients contacted during this study, 178 (46.7%) had paediatric contacts. A total of 232 paediatric contacts were identified, from these 178 index cases. Among them, 117 (50.4%) were males and 115 (49.6%) were females, their mean ±SD of age was 3.5 ±1.3 years.

A total of 44 (18.9%) of the 232 paediatric contacts had been screened for tuberculosis. This includes 13 child who were screened at home by health workers (active surveillance) and 31 child who got screened by visiting hospitals with their parents (passive surveillance). HCWs had made home visits for three more paediatric contacts but did not screen for tuberculosis due to unknown reasons. Out of these 44 screened children, 35 (79.54%) had been initiated on 6 months of IPT on time. Among them 13 (37.1%) were found to be adherent to the 6 months of IPT. Among the 188 paediatric contacts who had not been screened for tuberculosis, 70 (37.3%) had begun IPT without ruling out active TB disease, and out of these, 20 (28.6%) have completed the 6-month IPT course. Overall IPT coverage was 105/232 (45.2%) and overall adherence was 33/105 (31.4%) (Fig. 5.2).

5.2 Socio-Demographic Profile of Microbiologically Confirmed Pulmonary TB Cases

The socio-demographic characteristics of the index TB cases are shown in Table: 12. The mean age±SD of the study participants was 35.04±17.16 years. Majority of the cases were males, accounting for 68.4%, and 31.6% were females. The burden of the disease was found more (69.1%) in urban TU (Pratap Nagar) than in rural TU (Salawas) where it was 30.9%. Based on contact details available from the TB notification register, 89.1% of index cases were contacted; around 10.9% of cases could not be traced due to incorrect contact details.

Out of 383 cases contacted, 364 (95.1%) were alive, and 19 (4.9%) had died. Among these 383 cases, 178 (46.4%) had paediatric contact. A total of 232 paediatric contacts were identified. Majority (33.7%) of the TB cases had one paediatric contact (<6 years of age).

Table 12: Socio-demographic Profile of Microbiologically Confirmed Pulmonary TB Cases from selected TUs of Jodhpur District

Demographic Characteristics		Frequency n (%)
Age (n = 430)	<15 Years	48 (11.1)
	15 - 24	79 (18.3)
	25 - 34	87 (20.2)
	35 – 44	82 (19.0)
	45 – 54	74 (17.2)
	55 – 64	38 (8.8)
	≥65	22 (5.1)
Gender (n = 430)	Male	294 (68.4)
	Female	136 (31.6)
Residential area (n = 430)	Urban	297 (69.1)
	Rural	133 (30.9)
Contact details Documented (n = 430)	Documented	417 (97.0)
TB cases available for this study (n = 430)	Yes	383 (89.0)
Status of Index Patient (n = 383)	Live	364 (95.1)
	Died	19 (4.9)
TB cases having Paediatric Contacts (n = 383)	Paediatric Contact Present	178 (46.4)
Number of paediatric Contacts per Index case (n = 383)	0	205 (53.6)
	1	129 (33.6)
	2	45 (11.7)
	3	3 (0.7)
	4	1 (0.2)
Total Paediatric contacts		232

Table 13: Socio-demographic Profile of Paediatric Contacts of Microbiologically Confirmed Pulmonary TB Cases from selected TUs of Jodhpur District

Demographic Characteristics		Frequency n (%) (n = 232)
Age	<2 Years	16 (6.9)
	2-4 Years	159 (68.5)
	>4 Years	57 (24.5)
Gender	Male	117 (50.4)
	Female	115 (49.6)
Residential area	Urban	165 (71.1)
	Rural	67 (28.9)
Relation with Index Case	Parent	183 (78.8)
	Non-parent*	49 (21.9)
Father's Education	Illiterate	15 (6.4)
	≤5 years of schooling	26 (11.2)
	6-8years of schooling	25 (10.8)
	9-10 years of schooling	49 (21.1)
	Intermediate	63 (27.2)
	Graduate	51 (22.0)
	Post-graduate	3 (1.3)
Mother's Education	Illiterate	54 (23.3)
	≤5 years of schooling	40 (17.2)
	6-8 years of schooling	26 (11.2)
	9-10 years of schooling	66 (28.5)
	Intermediate	36 (15.5)
	Graduate	10 (4.3)
Father's Occupation	Professionals	17 (7.4)
	Skilled Worker	141 (60.7)
	Labourer	74 (31.9)
Socio-Economic Status_class (Mod._B.G, Prasad_Jan 2021)	SES-I	3 (1.3)
	SES-II	69(29.7)
	SES-III	95(40.9)
	SES-IV	62(26.7)
	SES-V	3(1.3)

*Non-parent: Index TB cases were not the parent of the paediatric contacts but residing in the same household.

5.3 Socio-demographic Profile of paediatric contacts of Microbiologically Confirmed Pulmonary TB Cases

The socio-demographic profile of the paediatric contacts is shown in Table: 13. A total of 232 paediatric contacts from 178 index pulmonary TB cases were identified. Among 232 paediatric contacts 117 (50.4%) were males and 115 (49.6%) were females, and their mean ±SD of age was 3.55 ±1.27 years. Majority (68.5%) of them belong to 2 to 4 years of age group.

Of 232, 165 (71.1%) are from urban areas, and 28.9% are from rural areas. For 183 (78.9%) paediatric contacts index case was parent, and for 21.1% paediatric contacts index cases were non-parent.

The educational status of the fathers of paediatric contacts was: 71.6% had completed ≥10 years of schooling, 22.0% had completed less than 10 years of schooling, and 6.4% were illiterate. Majority of mothers (mothers of paediatric contacts) had completed ≥10 years of schooling (48.3%), followed by those who had completed less than 10 years of schooling (28.4%), and 23.3% were illiterate. Majority are skilled workers (60.7%), 32.0% were labourers and very few (7.3%) were professionals. The majority of paediatric contacts (40.9%) are from the middle class (SES-III; Mod._B.G.Prasad_Jan 2021).

Table 14: IPT Implementation status among Paediatric Contact of Microbiologically Confirmed Pulmonary-TB Cases in Jodhpur District

Variables	Frequency n (%)
Home Visit by HCW (n = 232)	16 (6.89)
Screened for TB (n = 232)	44 (18.96)
Eligible For IPT (n = 232)	232 (100)
IPT Initiation for 6 months (n = 232)	105 (45.25)
Adherence for 6 months IPT (n = 105)	33 (31.42)

5.4 IPT Implementation status:

The IPT implementation status among the paediatric contacts of the microbiologically confirmed pulmonary TB cases in Jodhpur is shown in Table: 14. Out of 232 paediatric contacts, home visits were made for 16 (6.9%) paediatric contacts.

Out of 232, forty-four (18.9.0%) paediatric contacts were screened for TB. This group of 44 includes 13 who were screened at home by HCWs and 31 children who were screened after their parents brought them to the hospital. There was no evidence of active tuberculosis in any of the paediatric contacts. There were 232 eligible paediatric contacts for IPT initiation. IPT had been initiated in 105 (45.2%) of the 232 paediatric contacts who were eligible. A total of 105 children initiated 6 months of IPT which includes 35 initiated after screening, and 70 more children initiated IPT without any screening. Out of the 105 who have been initiated on IPT, 33 have completed the full IPT course. Overall adherence was found at 31.4% for 6 months of IPT.

Table 15: Factors associated with IPT Initiation among Paediatric Contacts of Microbiologically Confirm Pulmonary TB Cases in Jodhpur District (N = 232)

Variable	Subcategory	Total (n=232)	IPT Initiated (%)	IPT not Initiated (%)	p value[a]	OR (95%CI)
Age (Years)	<2 Years 2 – 4 Years 4-6 Years	16 159 57	4 (25.0) 73 (45.9) 28 (49.1)	12 (75.0) 86 (54.1) 29 (50.9)	0.221	--
Gender	Male Female	117 115	55 (47.0) 50 (43.5)	62 (53.0) 65 (56.5)	0.589	1 0.86 (0.51-1.45)
Residential Area	Urban Rural	165 67	77 (46.7) 28 (41.8)	88 (53.3) 39 (58.2)	0.499	1 0.82 (0.46-1.45)
Relation with Index Case	Non-parent Parent	49 183	14 (28.6) 91 (49.7)	35 (71.4) 92 (50.3)	0.008*	1 2.47 (1.24-4.90) *
Father's Education	<10 years of schooling ≥10 years of schooling	66 166	22 (33.3) 83 (50.0)	44 (66.7) 83 (50.0)	0.021*	1 2.00 (1.10-3.62) *
Father's Occupation	Unskilled Worker Skilled Worker & Professionals	74 158	16 (21.6) 89 (56.3)	58 (78.4) 69 (43.7)	<0.001*	1 4.67 (2.47-8.83) *
Mother's Education	<10 years of schooling ≥10 years of schooling	120 112	22 (18.3) 83 (74.1)	98 (81.7) 29 (25.1)	<0.001*	1 12.74 (6.81-23.85) *
Home Visit by HCW	No Home Visit Done	216 16	93 (43.1) 12 (75.0)	123 (56.9) 4 (25.0)	0.013*	1 3.96 (1.24-12.69) *
Screened for TB	Not Screened Screened	188 44	70 (37.2) 35 (79.5)	118 (62.8) 9 (20.5)	<0.001*	1 6.55 (2.97-14.44) *

[a]Pearson chi square test
*Statistically significant at 95% CL

5.5 Factors associated with IPT initiation:

As shown in Table: 15, the status of IPT initiation had significant differences in relation to the index case, the father's education, the father's occupation, the mother's education, home visits made by HCWs for paediatric assessment, and paediatric contacts screened for Tuberculosis. In the Bivariate logistic regression analysis status of IPT initiation had strongest association with mother's education (OR: 12.74, 95% CI: 6.81, 23.85) followed by paediatric contacts screened for TB (OR: 6.55, 95% CI: 2.97, 14.44), father's occupation (OR: 4.67, 95% CI: 2.47, 8.83), home visit made by HCWs for paediatric assessment (OR: 3.96, 95% CI: 1.24, 12.69) , relation with index case (OR: 2.47, 95% CI: 1.24, 4.90 and father's education (OR: 2.00, 95% CI: 1.10, 3.62)

Table 16: Multivariate logistic regression for association between socio-demographic factors and IPT initiation (N = 232)

Variable	Subcategory	Initiated IPT (%)	Not Initiated IPT (%)	OR (95%CI)
Relation with Index Case	Non-parent Parent	14 (28.6) 91 (49.7)	35 (71.4) 92 (50.3)	1 3.25 (1.35-7.85) *
Father's Education	<10 years of schooling ≥10 years of schooling	22 (33.3) 83 (50.0)	44 (66.7) 83 (50.0)	1 1.16 (0.53-2.52)
Father's Occupation	Unskilled Worker Skilled Worker & Professionals	16 (21.6) 89 (56.3)	58 (78.4) 69 (43.7)	1 2.39 (1.08-5.28) *
Mother's Education	<10 years of schooling ≥10 years of schooling	22 (18.3) 83 (74.1)	98 (81.7) 29 (25.1)	1 8.32 (4.14-16.69) *
Home Visit by HCW	Done Not Done	12 (75.0) 93 (43.1)	4 (25.0) 123 (56.9)	1 0.85 (0.16-4.47)
Screened for TB	Screened Not Screened	35 (79.5) 70 (37.2)	9 (20.5) 118 (62.8)	1 4.99 (1.74-14.28) *

*Statistically significant at 95% CL

Multivariate binary logistic regression analysis for these socio-demographic variables showed significant association of IPT initiation with mother's education (OR: 8.32, 95% CI: 4.14,16.69), paediatric contacts screened for TB (OR: 4.99, 95% CI: 1.74,14.28), relation with index case (OR: 3.25, 95% CI: 1.35,7.85), and father's occupation (OR: 2.39, 95% CI: 1.08,5.28) (Table: 16).

5.6 Factors associated with IPT adherence

As shown in the Table:17, among those who were initiated on IPT, their adherence for 6 months IPT found to have no significant differences for any of the assessed socio-demographic factors.

Table 17: Factors associated with IPT adherence for 6 months among Paediatric Contacts of Microbiologically Confirm Pulmonary TB Cases in Jodhpur District

Variable	Subcategory	Total (N=105)	Number Adherent for 6 months IPT n= 33 (%)	Number not Adherent for 6 months IPT n= 72 (%)	p value[a]
Age (Years)	<2 Years	4	1 (25.0)	3 (75.0)	
	2 – 6 Years	73	23 (31.5)	50 (68.5)	NA
	4-6 Years	28	9 (32.1)	19 (67.9)	
Gender	Male	55	18 (32.7)	37 (67.3)	0.764
	Female	50	15 (30.0)	35 (70.0)	
Residential Area	Urban	77	26 (33.8)	51 (66.2)	0.392
	Rural	28	7 (25.0)	21 (75.0)	
Relation with Index Case	Other	14	7 (50.0)	7 (50.0)	0.108
	Parent	91	26 (28.6)	65 (71.4)	
Father's Education	<10 years of schooling	22	7 (31.8)	15 (68.2)	0.965
	≥10 years of schooling	83	26 (31.3)	57 (68.7)	
Father's Occupation	Unskilled Worker	16	4 (25.0)	12 (75.0)	0.547
	Skilled Worker & Professionals	89	29 (32.6)	60 (67.4)	
Mother's Education[b]	<10 years of schooling	22	4 (18.2)	18 (81.8)	0.132
	≥10 years of schooling	83	29 (34.9)	54 (65.1)	
Home Visit by HCW[b]	Done	12	1 (8.3)	11 (91.6)	0.098
	Not Done	93	32 (34.4)	61 (65.5)	
Screened for TB	Screened	35	13 (37.1)	22 (62.8)	0.372
	Not Screened	70	20 (28.5)	50 (71.4)	

[a]Pearson chi square test
[b] Fisher exact test is used

5.7 Hurdles in timely initiation of IPT

Hurdles identified at the caregiver's level for timely initiation of IPT in paediatric contacts of microbiologically confirmed pulmonary TB cases were no home visits by healthcare workers, lack of awareness about IPT, lack of risk perception, relocation of children, and fear of drug toxicity (Table:18).

5.7.1 No home visits by HCWs

Screening of all the contacts of microbiologically confirmed pulmonary TB cases is being done by visiting their homes. IPT must be initiated after ruling out active TB disease. HCWs were not making home visits as many of them were not aware of this activity.

A 36-year-old father of a child contact mentioned; *"No one came to my home for checking my son"*

5.7.2 Lack of awareness about IPT

Patients and caregivers with paediatric contacts were not aware of IPT. Many of them have never heard of any such programme, so they never thought of going for screening and IPT initiation. Neither treating Doctor nor DOTS provider had discussed with them about IPT.

A 32-year-old male (Father of child contact) said,

"I am illiterate, no one talked about it and child is fine, so we never tried to get any medicine for her"

5.7.3 Lack of risk perception

Most of the time, children are asymptomatic, so caregivers do not realise that their children are at any risk. Whenever any HCW told them about IPT, they just ignored it as they didn't feel any need for it, and they just denied it.

A 38-year-old male (cured pulmonary TB patient) said,

"My daughter is absolutely fine, she is gaining weight and eating properly so I don't want to give any unnecessary drug to her"

A 46-year-old male (cured TB patient) mentioned,

"My child doesn't have any disease; he is absolutely fine. I don't want to give him any unnecessary medicine."

5.7.4 Relocation of children

Many patients sent their children to their relatives' homes when they got to know that they were suffering from Tuberculosis. They believe that, as their children do not live with them, they are safe. As children were relocated to other places, they were not available during the home visit by HCWs, so IPT could not be initiated. Relocation was one of the roadblocks for screening and initiation of IPT.

A 56-year-old male (active pulmonary TB case) said,

"Children are not staying with us, we sent them to our relative's home after diagnosis of this disease"

5.7.5 Social stigma and fear of social discrimination

Social stigma was one of the major barriers to the initiation of IPT. They used to simply keep their children hidden during home visits by HCWs. They don't want to talk about IPT for their children due to the fear of discrimination by their neighbours. As many patients had faced some discrimination (like; people stopped talking to them, neighbours stopped visiting their home, colleagues stopped having lunch with them, etc.), they did not want to face the same for their children.

A 46-year-old male (recovered TB case) said,

"My child is fine, if I start giving him any drug, neighbours will think he is also having disease and they will not allow their children to play with him, as they did same with me"

5.7.6 Distance of the hospital

Public health facilities are very far away in rural areas, so they are not easily accessible. Because they are mostly daily wage workers, they must take leave from work for hospital visits, which results in wage loss. They couldn't afford it as they were totally dependent on their daily wage. As hospitals were far away and transport facilities were not frequently available. Sometimes they had to wait more than an hour to get any public-transport.

As it was inconvenient for them because a child could not stay away from their mothe r for an extended period of time, they never took children to hospitals.

A 29-year-old male (father of 3-year-old child) said,

“Hospital is far, a full day is needed for hospital visit and he can’t stay outside for full day without his mother”

5.7.7 Lack of family support

In many cases, TB patients said they were abandoned while they were ill. Additionally, family members stopped visiting and talking to them. The kids needed to be taken to the hospital for screening and IPT initiation, but no one was available because they were sick. Family members weren’t helping them out financially or emotionally. Because they were worried about becoming sick, their life partner sometimes left the home.

A 22-year-old male (an active TB case) said,

“I was ill, no one was there to take care of me and my children, other family members were also not supporting us”

5.7.8 Fear of drug toxicity

Many parents had not initiated IPT for their children as they were worried about side effects and toxicity. Many TB patients were experiencing drug side effects as they were on antitubercular therapy (ATT). Some parents stated that the child is fine and that they did not want to give him any drugs that would harm him.

DOTS Provider,

“Some people used to hide that they have child at home, as they don’t want to give any medicine to them due fear of side effect”

Table 18: Barriers for initiation of IPT among child contacts as perceived by Caregivers in Jodhpur District

Themes	Verbatim quotes
1) No Home Visit by HCWs	'No one came to my home' (Father of child contact) 'Mam told; someone will come to your home to check your son but so for no one came' (Mother of child contact)
2) No awareness about IPT	'I am illiterate, and no one talked about it and child is fine, so we never tried to get any medicine for her' (Father of child contact) 'I don't know about any such program' (Father of Child contact)
3) Lack of Risk Perception	'My child is fine, so why should I give any unnecessary medicine to my child' (Mother of child contact) 'My daughter is absolutely fine, she is gaining weight and eating properly so I don't want to give any drug to her' (Father of Child contact)
4) Relocation of Paediatric Contacts	'Our children are not staying with us, we sent them to our relative's home after diagnosis of this disease' (Grandfather of child contact)
5) Social Stigma	'My child is fine, if I start giving him any drug, neighbours will think he is also having disease and they will not allow their children to play with him, as they did same with me' (Father of child contact)
6) Distance from Hospital	'Hospital is far, transport facility is not good, even for me it's very difficult to get the vehicle on time' (Father of child contact) 'Hospital is far, a full day is needed for hospital visit and he can't stay outside for full day without his mother' (Father of child contact)
7) Lack of family support	'I was ill, no one was there to take care of me and my children, other family members were also not supporting us (Father of child contact)

Hurdles identified at the provider's level for timely initiation of IPT were Inadequate knowledge about IPT, combersome screening process, lack of training, drug stockout, and shortage of staff (Table:19).

5.7.9 Inadequate knowledge about IPT among HCWs:

Limited knowledge of HCWs regarding IPT was found to be one of the major roadblocks to effective IPT implementation. Due to their inadequate knowledge, they were not confident enough to initiate IPT among eligible children.

DOTS Provider from a rural PHC said,

"I heard about IPT, but I don't know to whom we should give this"

5.7.10 Cumbersome screening process

Since many HCWs were not given adequate screening training, their understanding in this area is poor. The entire process of TST takes longer than three days, followed by a detailed workup for TB, which further takes time. This required lots of documentation and frequent visits to the hospitals, which was not convenient for parents either. They felt the whole screening process was a bit complicated.

DOTS Provider from an urban PHC mentioned,

"Screening process is very complicated, and I don't know about screening process clearly as I joined just six months ago'"

DOTS Provider from a rural PHC mentioned,

"TST is not available, and X-ray facility is also not available everywhere, so it is very difficult for us to screen the contacts properly"

5.7.11 Lack of training

As the current study was conducted during the COVID-19 peak, many HCWs are yet to be trained. The lack of training led to inadequate understanding of the importance of IPT and their role in IPT implementation. They were not clear about the guidelines so not confident enough to initiate the IPT on time.

Medical officer in-charge (Block Chief Medical Officer) from a CHC said,

"Peripheral workers are not trained about IPT due to Covid-19, so they are not clear about the program"

DOTS Provider from a PHC said,

"I am working as DOTS provider for three years; they directly posted me here without any training and then Covid-19 came so no training I got till now"

5.7.12 Drug stockout

The supply of isoniazid was erratic, which was one of the main obstacles to IPT implementation. Parents were frequently convinced to begin IPT for their kids, but treatment couldn't begin because INH wasn't available. The unavailability of INH was noted as a significant barrier to IPT deployment.

DOTS Provider from a CHC said,

"Drug supply is not regular so sometimes we are not able to initiate it, even patients are agreeing to give IPT for their child contact. One patient came multiple times for IPT but unfortunately that time drug was not available"

5.7.13 Shortage of staff

During in-depth interviews with HCWs, a shortage of staff was one of the major challenges identified. HCWs mentioned that more than half of the posts are vacant, and major re-deployments occurred due to COVID-19, which led to more staff shortages. Due to the shortage of staff, the workload for the HCWs increased tremendously, and they couldn't focus on IPT-related work.

DOTS Provider form an urban PHC narrated,

"Staff are very less in number; I am Lab In-charge, huge workload is already, and they gave me this work too, so how I can manage all this properly".

Table 19: Barriers for initiation of IPT among child contacts as perceived by DOTS Providers in Jodhpur District

Themes	Verbatim quotes
Patient Level	
1) Unawareness about IPT	'Their awareness is very low, even after multiple attempts of counselling they don't understand the importance of the IPT' (Medical officer of CHC)
	'This is totally new for them, so they don't agree to start any drug without any symptom' (DOTS Provider)
2) Reluctant to bring child for assessment	'They are very reluctant in bringing their child for assessment, they just ignore the advice given for their children as most of the time children are asymptomatic' (DOTS Provider)
	'They don't want to talk about children for IPT, whenever I tried to explain them about IPT they just ignore the conversation and always in rush to leave the conversation' (DOTS Provider)
3) Fear of Drug toxicity	'Some people used to hide that they have child at home, as they don't want to give any medicine to them due fear of side effects' (DOTS Provider)
Provider Level	
1) Inadequate knowledge about IPT	''Our knowledge of IPT is very limited so we are not confident to give IPT' (DOTS Provider)
	'I heard about IPT, but I don't know to whom we should give this' (DOTS Provider)
2) Cumbersome screening process	'Screening process is very complicated, and I don't know about screening process clearly as I joined just six months ago' (DOTS Provider)

	'TST is not available, and X-ray facility is also not available everywhere, so it is very difficult for us to screen the contacts properly' (DOTS Provider)
3) Lack of clear guideline	'We are not clear about guidelines for giving IPT, as screening is necessary before giving IPT, but in one training they said that we can give IPT even without screening for TB' (DOTS Provider)
4) Drug stock out	'Drug supply is not regular so sometimes we are not able to initiate it, even patients are agreeing to give IPT for their child contact. One patient came multiple times for IPT but unfortunately that time drug was not available' (DOTS Provider)
5) Shortage of staff	'Most of the posts are vacant and are giving extra charge to us. There is no dedicated staff for this work, we are doing this on rotation Basis' (DOTS Provider) 'Staff are very less in number; I am Lab In-charge, huge workload is already, and they gave me this work too, so how I can manage all this properly' (DOTS Provider)

5.8 Hurdles for six-month IPT adherence

The hurdles to 6 months' IPT adherence in paediatric contacts of microbiologically confirmed pulmonary TB cases identified at the caregiver's level were difficulty in administering the drug, lack of perceived benefit, distance of the hospital, social discrimination, long course of IPT, fear of drug side-effects, unavailability of isoniazid (INH), and fear of COVID-19 (Table: 20).

5.8.1 Fear of COVID-19

The current study was conducted during the peak of COVID-19. Due to this, caregivers were afraid of getting an infection, so they stopped going to hospitals to pick up IPT for their children. During COVID-19 peak major staff had been deployed to COVID-19 work so monitoring of IPT work was adversely affected.

DOTS provider from satellite hospital said,

"Everything was going fine; patients were coming to collect their medicine and INH for their children, too, and COVID-19 came. In fear of COVID-19, they stopped coming to the hospital and discontinued IPT for their children."

5.8.2 Difficulty in administering the drug

Difficulty in giving drug to younger children was identified as an important barrier for IPT adherence. Some children had difficulty in swallowing their medications, spitting them out, or even started vomiting after receiving the drug.

Thirty-six -years-old female (Mother of a child contact) said,

"It was very difficult to give her drug, she is very stubborn even we tried in food, milk and with chocolate also but she never took, so we had to stop the drug"

5.8.3 Lack of perceived benefit

Most parents initially began administering the medicine to their kids, but they soon stopped after failing to observe any positive effects. As children were apparently healthy so caregivers didn't feel giving drug anymore.

Mother of child contact (of a cured TB case) mentioned,

"Nothing was happening with that medicine, he didn't gain any weight, it was same as earlier, so we stopped giving unnecessary drug"

5.8.4 Long course of IPT

Many caregivers and providers stated that six-month therapy is extremely long, making it difficult to maintain compliance in seemingly healthy children. Because of the long course of therapy, multiple visits were required to complete the course, which made it more difficult for daily wage workers.

Forty-six years old male (Father of child contact) said,

"Somehow, we gave him for 2 months but after that he understood and stopped taking that drug. We tried to continue but he was not ready to take it anyhow. It was very difficult to give him drug regularly for six months, even he didn't have any disease"

5.8.5 Unavailability of isoniazid (INH)

Erratic drug availability was found to be a potential barrier to six-month IPT adherence. Many parents mentioned that the drug was not available in hospitals, even after frequent visits. Drugs were not available on the market, so they had to discontinue IPT for their children.

Father of child contact (cured TB case) said,

"Drug was not available in hospital, tried 2 to 3 times in hospital but it was not available, and I tried in local market also but didn't get the drug, so we had to stop his medicine"

5.8.6 Drug side-effects

The parents reported that the children started vomiting after the initiation of IPT, so they stopped giving drugs. Caregivers noted that vomiting was the most common side effect after being given the drug. Many of them complained that their appetite was reduced. They afraid of drug toxicity so they discontinued the therapy.

Mother of child contact said,

"Drug was not good, whenever we gave the drug, she started vomiting, so we stopped"

5.8.7 Distance to the hospital

Primary health care facilities in Rajasthan are distantly situated from the patients' residence in western Rajasthan. A primary health care centre or subcentre covers a large geographical area here since the density of population is very less in the surrounding areas. As frequent visits were required to collect the medicine, so distance of the hospitals identified as a potential barrier for IPT adherence. Their financial situation was exacerbated by high transportation costs and daily wage losses for daily wage workers. Instead of going to pick up medicine, they preferred to arrange food for their kids.

Father of child contact said,

"Hospital is far, and I don't have my own vehicle, and she was fine, so I stopped going to collect medicine for my daughter"

5.8.8 Social stigma and social discrimination

Many parents have noticed that other family members have changed their behaviour towards their kids. It was difficult for parents to accept this discrimination for their children, so they stopped giving IPT to their kids. When neighbours learned that children were receiving medication for tuberculosis, they too stopped allowing children into their homes.

Grandmother of child contact said,

"We were giving the drug him silently, one day our neighbour got to know that we are giving medicine to our child for TB, from then their children stopped visiting our home, and stopped playing with him. Everyone's behaviour changed towards him, so we stopped the drug"

Staff shortage, Staff deployment, High workload, drug stock out, and lack of proper monitoring are the major challenges in 6 months IPT adherence identified at provider level by IPT providers & other stakeholders (Table: 21).

5.8.9 Staff shortage

Staff shortage was one of the major hurdles identified for six-month IPT adherence. Staff shortage was mainly because most of the posts of HCWs were vacant. Major staff re-deployment during peak of COVID-19 pandemic occurred which led the situation more difficult. Shortage of staff puts high workload on existing HCWs which adversely affected the DOTS work. HCWs have been given multiple jobs, making it impossible for them to focus on effective implementation of IPT.

DOTS Provider posted at rural PHC mentioned,

"Here staff deployment is big issue. They are frequently deploying us to different hospitals due to this patient are facing lots of problem as they are they hesitant to discuss their illness to everyone"

DOTS Provider posted at rural PHC said,

"Workload is high here, so we are not able to manage all the work assigned to us. Even sometimes it is very difficult to manage TB cases properly"

5.8.10 Drug stock out

Irregular drug supply of the was perceived as an important barrier in six-month IPT adherence. Many HCWs reported that parents frequently came to receive INH for their children but had to leave empty-handed due to a lack of medicine in stock.

DOTS provider from an urban health centre mentioned,

"Availability of INH is also one of the important issues as sometimes it's supply is not regular, and it is not easily available drug in the market, so they have to stop the drug"

5.8.11 Lack of proper monitoring

Lack of monitoring and inadequate documentation were identified as a one of the key hurdles in IPT adherence. HCWs mentioned that poor documentation was due to a high workload and insufficient staff. There is no provision for adequate reporting of paediatric contacts in the current study setting. Inadequate monitoring was the outcome of insufficient documentation, which in turn caused poor adherence.

Medical officer In-charge posted at CHC said,

"There is no provision of proper documentation and monitoring for IPT, so DOTS providers forget to update information about this program"

Table 20: Barriers for Adherence of 6 months IPT among child contacts as perceived by Caregivers in Jodhpur District

Themes	Verbatim quotes
1) Difficulty in giving drug to children	'He was not taking so we stopped, whenever we tried to give him, he used to spit it, so we stopped' (Mother of child contact) 'It was very difficult to give her drug, she is very stubborn even we tried in food, milk and with chocolate also but she never took, so we had to stop the drug' (Mother of child contact)
2) No perceived benefit	'He didn't get any benefit with that, so we stopped, his appetite has not improved, so I stopped giving him' (Mother of child contact) 'Nothing was happening with that medicine, he didn't gain any weight, it was same as earlier, so we stopped giving unnecessary drug' (Mother of child contact)
3) Distance of Facility	'Hospital is far, and I used to go for work, so I was not able to go to hospital frequently, so stopped' (Father of child contact) 'Hospital is far, and I don't have my own vehicle, and she was fine, so I stopped going to collect medicine for my daughter' (Father of child contact)
4) Social discrimination	'We were giving the drug him silently, one day our neighbour got to know that we are giving medicine to our child for TB, from then their children stopped visiting our home, and stopped playing with him. Everyone's behaviour changed towards him, so we stopped the drug' (Mother of child contact)

5) Long course of INH	'Somehow, we gave him for 2 months but after that he understood and stopped taking that drug. We tried to continue but he was not ready to take it anyhow. It was very difficult to give him drug regularly for six months, even he didn't have any disease' (Father of child contact)
6) Fear of drug toxicity	'Drug was not good, whenever we gave the drug, she started vomiting, so we stopped' (Mother of child contact) 'His appetite got reduced after drug initiation, so we stopped after one month' (Grandmother of child contact)
7) Unavailability of INH	'Drug was not available in hospital, tried 2 to 3 times in hospital but it was not available, and I tried in local market also but didn't get the drug, so we had to stop his medicine' (Father of child contact)

Table 21: Barriers for Adherence of 6 months IPT among child contacts as perceived by DOTS Providers in Jodhpur District

Themes	Verbatim quotes
Patient Level	
3) Lack of perceived benefit	They don't understand the benefit of giving IPT to paediatric contacts. A TB patient, after giving IPT for 3 months to his son he stopped giving the drug and told 'my child is not getting any benefit from this, so I don't want to continue this unnecessarily' (DOTS Provider)
4) Long course of IPT	Giving drug for 6 months without any symptom is not acceptable for parents so they used to stop after giving for some days. 'My child is fine; I can't give him drug for 6 months unnecessarily' (DOTS Provider) 'Course duration is too long, so it becomes very difficult for parents to give medicine regularly for long duration' (Medical officer PHC)
5) Fear of side effects	'As this medicine is for children, parents are worried about toxic effect of drug, as it is for 6 months. I had started IPT for a child, after 7 to 10 days they came back and told that due to this medicine my child is not eating properly, and they stopped giving the drug' (DOTS Provider) 'Due fear of side effects may parents stop giving drug to their children. If child develop any minor illness like fever or headache also, they stop giving drug as they perceive that this is happening due to this drug' (DOTS Provider)
6) Fear of COVID-19	'Everything was going fine, patients were coming to collect their medicine and INH too for their children and Covid-19 came, in fear of Covid-19 they stopped coming to hospital and discontinued IPT for their children' (DOTS Provider)
Provider Level	
1) Staff shortage	'Staff is very less here so everyone is given multiple work due that we are unable to focus on this work. Due to shortage of staff, we don't have any dedicated staff for this work, we are just managing somehow.' (DOTS Provider) 'Due to shortage of staff workload on us is very high due to this, sometimes it becomes difficult to handle all these

	things and due to this sometimes we forget to ask about IPT from patients' (DOTS Provider)
2) Staff Deployment	'Here staff deployment is big issue. They are frequently deploying us to different hospitals due to this patient are facing lots of problem as they are they hesitant to discuss their illness to everyone' (DOTS Provider)
3) High Workload	'Workload is high here, so we are not able to manage all the work assigned to us. Even sometimes it is very difficult to manage TB cases properly' (DOTS Provider)
	'We are overloaded with works, so we are not getting time for this work' (DOTS Provider)
4) Drug stock out	'INH supply is not regular so sometimes we are not able to provide them, so they leave the course in between' (DOTS Provider)
	'Availability of INH is also one of the important issues as sometimes it's supply is not regular, and it is not easily available drug in the market, so they have to stop the drug' (DOTS Provider)
5) Lack of Monitoring	'There is no provision of proper documentation and monitoring for IPT, so DOTS providers forget to update information about this program' (Medical officer CHC)
	'We are asking peripheral workers for home visit to check whether they are taking IPT or not but there is no provision of strict reporting for IPT, so they are not doing properly' (DOTS Provider)

Figure 8: Thematic framework showing barriers in timely IPT Initiation

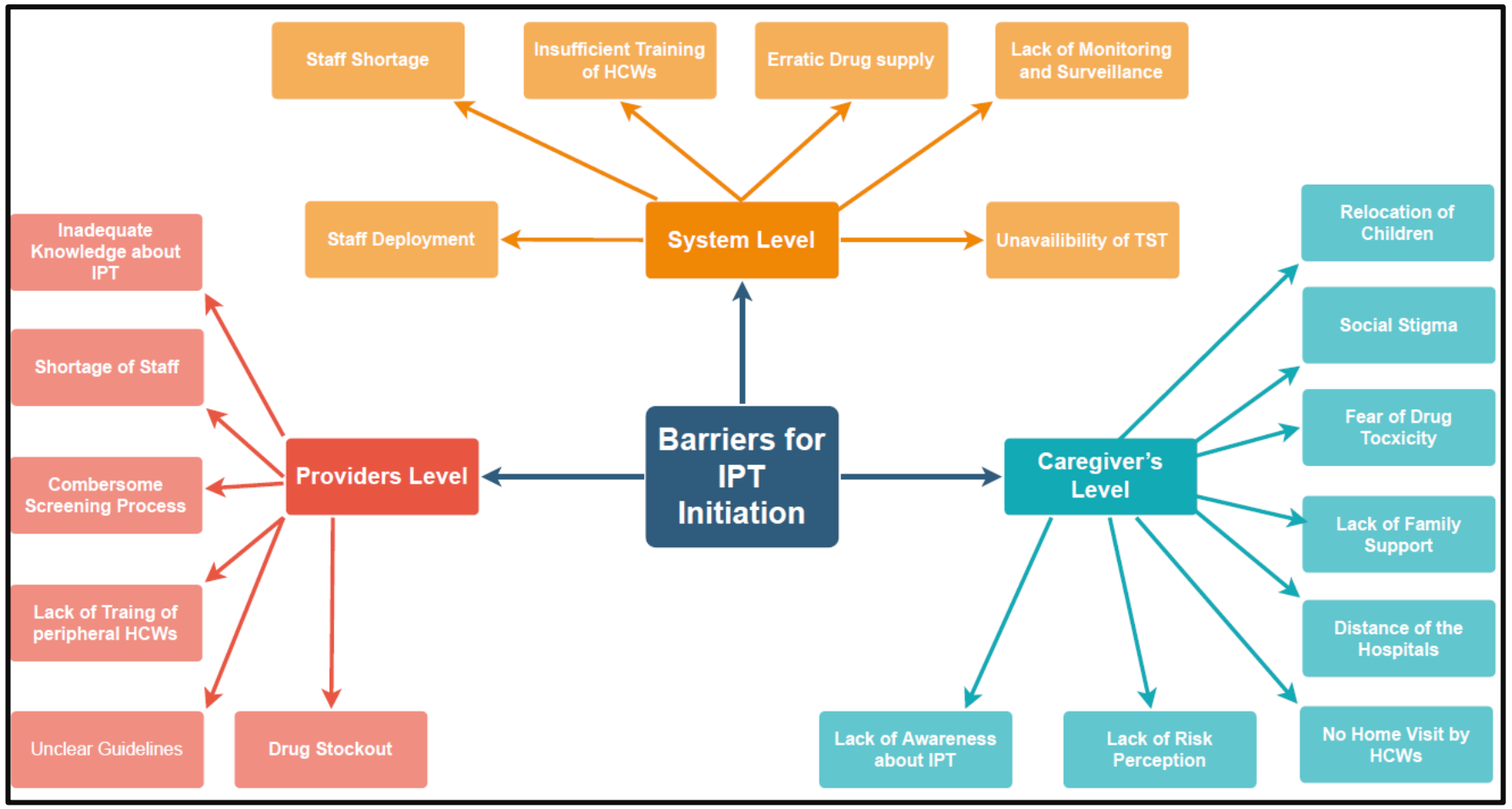
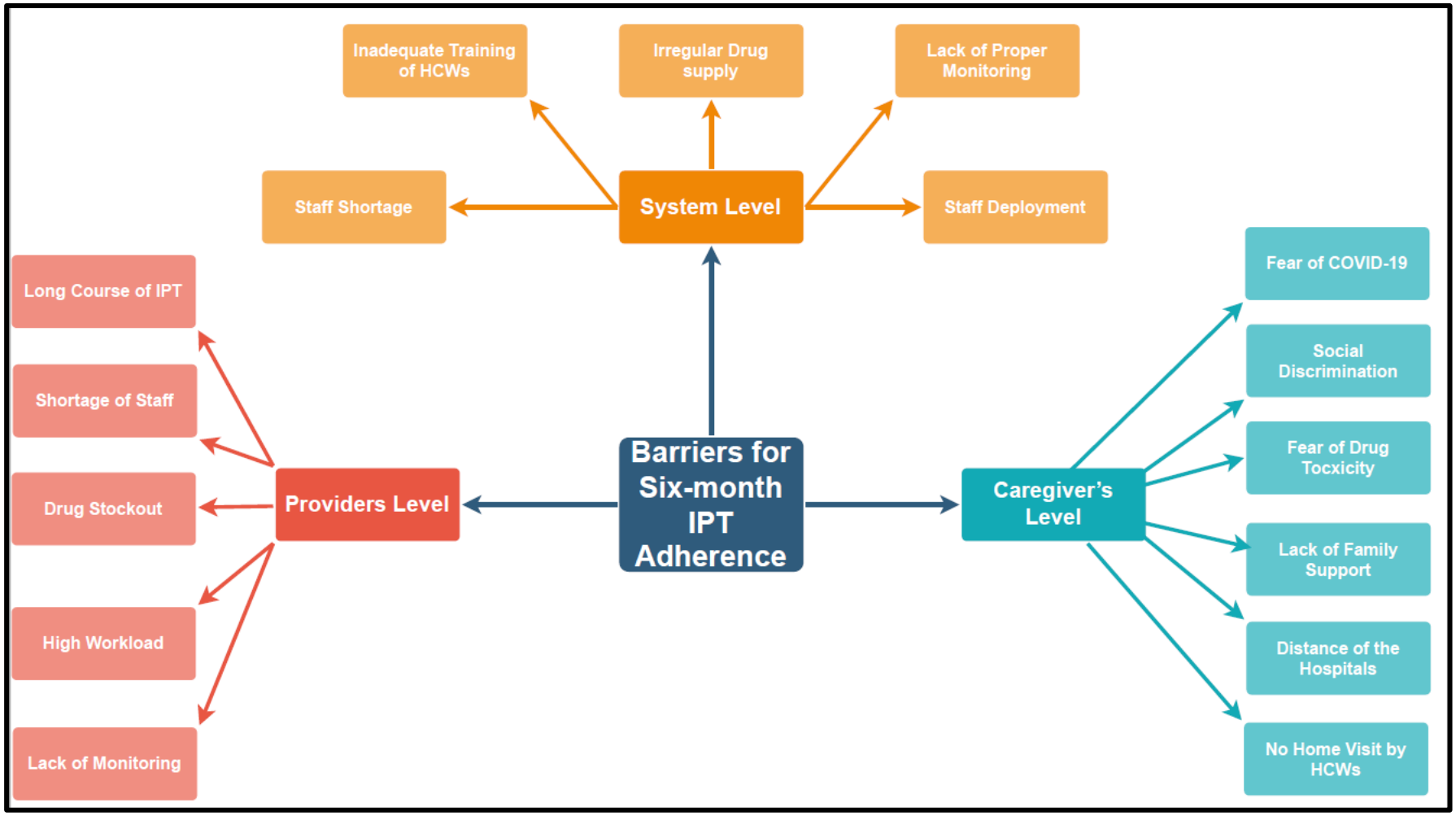


Figure 9: Thematic framework showing barriers in Six-month IPT Adherence



Chapter 6: DISCUSSION

This is one of the few studies from the western part of India on TB preventive therapy among paediatric contacts of pulmonary TB cases. According to this study, home visits by HCWs for paediatric assessment reached 6.2% of notified pulmonary TB cases as the study was conducted during peak of COVID-19. A total of 232 paediatric contacts from microbiologically confirmed pulmonary TB cases were identified during this study. Among the 232 children, 18.9% were screened for TB. None of the children were diagnosed with active TB disease. The total number of paediatric contacts eligible for IPT was 232. Among them, 45.2% had been initiated on 6-month IPT, which includes 70 (30.2%) children initiated on IPT without ruling out active TB disease. Among the 105 initiated on IPT 32.4% children had successfully completed the full course of IPT.

The hurdles identified in IPT initiation, and its adherence were at three levels: caregivers' level, provider's level and system level.

At the caregivers' level, lack of awareness about IPT, lack of risk perception, no home visits by HCWs, social stigma, distance of the hospital, fear of drug toxicity, lack of family support, and relocation of children were the major hurdles identified for initiation of IPT.

Challenges identified at the provider level for IPT initiation were inadequate knowledge about IPT, lack of clear guidelines, staff shortage, staff deployment, cumbersome screening process, and lack of training of auxiliary healthcare personnel about IPT.

Challenges identified at the system level for IPT initiation were drug stockout, unavailability of TST and X-ray facilities, poor monitoring and surveillance, staff shortage, staff deployment, and insufficient training of HCWs engaged in DOTS.

This study identified barriers for 6-month IPT adherence at caregivers' level were difficulty in giving the drug, lack of perceived benefit, distance of the hospital, social discrimination, long course of IPT, fear of drug toxicity, unavailability of isoniazid (INH), and fear of COVID-19.

Challenges identified at the provider level for 6-month IPT adherence were staff shortage, high workload, drug stock out, long course of IPT and lack of follow-up of paediatric contacts visit by HCWs.

Challenges identified at the system level for 6-month IPT adherence were erratic drug supply, lack of proper monitoring, Staff deployment and inadequate training of HCWs.

Current study reported that only 6.2% pulmonary TB cases were visited at their home by HCWs for paediatric assessment. This was due to a shortage of staff and multiple jobs that had been assigned to single HCWs, so it was difficult to go into the field on a regular basis. Some of the HCWs didn't know that they should make home visits for the assessment of paediatric contacts for pulmonary TB cases.

Most HCWs on the primary healthcare setting are working on a contract basis, their monthly salary is less compared to permanent staff, and transport cost for field visits puts an extra burden on their pocket. In 2017, **Singh A. R. et al.** from **Bhopal** reported that HCWs made home visits for paediatric assessment in 22.5% of pulmonary TB cases. Inadequate knowledge of guidelines and poor training of HCWs were the major challenges in making home visits for identification and assessment of paediatric contacts(14)**.**

In this study, it was found that 18.9% of the paediatric contacts were screened for TB. From the In-depth interview, the reasons identified for low screening were that the complete process of screening for TB is very cumbersome. This includes tuberculin sensitivity testing (TST); if the TST is positive and the child is suspected of having TB, a thorough TB workup should be done. They felt, it was complicated for them, and the availability of TST was erratic, so the screening was reduced. Studies from other parts of India reported screening rates ranging from 27.5–86.4%(11,12,14,18,42).

A study by **Rekha B. et al. (2013)** from **Chennai** reported a screening rate of 61.2%. Caregivers were concerned about contracting tuberculosis. Some had migrated outside the study area. HCWs had missed identifying approximately 18.2% of paediatric contacts, leaving them unscreened(18).

A study by **Ranganath T. S. et al. (2018)** from **Bangalore** reported that 86.3% of paediatric contacts were screened for tuberculosis. Major barriers identified for non-screening were lack of training and poor knowledge of HCWs about the screening process(12).

Among 232 eligible children, 45.2% had been initiated on IPT. Studies from other parts of India reported a better IPT initiation rate (60.9–84.8%)(11,12,14,18,20,42). In-depth

interviews with caregivers and healthcare providers revealed the various challenges of IPT initiation. Caregivers did not understand the severity and transmission risk of the disease which is coherent with the findings reported by **Singh A. R. et al. (2017)** from **Bhopal**(14). As the kids were apparently healthy and didn't have any symptoms suggestive of tuberculosis, they didn't feel any need to start IPT. People were reluctant to give any medication to their healthy-looking children. Similar findings had been reported by **Rekha B. et al., from Chennai**(18).

The present study found that many of them had not started IPT for their children out of fear of discrimination by their neighbours. They felt that if they will start giving medicine to their children people will consider them sick.

We also found in the present study that, fear of drug toxicity was one of the roadblocks for IPT initiation, as parents thought that medicine could harm the kids. TB patients from the same households had complaints about some side effects, like nausea, vomiting, vision disturbances, and changes in urine colour. This finding was consistent with challenges reported for initiation of IPT by study from Chennai(18).

Compared to non-parental index cases, IPT initiation performed better when the parent was the index case. Parents prohibited their children from interacting with tuberculosis-affected family members. They opted to send their child to a relative's house rather than administer IPT.

A study by **Alperstein G et al.,** from Australia, revealed that around 22.2% of caregivers did not understand the reason for prescribing IPT(43). Due to inadequate knowledge and poor training among HCWs regarding IPT, they were not confident enough to prescribe IPT. Inadequate understanding of the guidelines made them hesitant about giving IPT to eligible candidates. A previous study from South Africa by **Lester R et al. (2010)** reported that limited knowledge about IPT and a lack of proper guidelines for IPT provision among healthcare workers resulted in low IPT uptake and adherence(44)**.** Insufficient HCW training has a negative impact on the beginning of IPT. Most DOTS providers were yet to get trained, and many of them were even unaware of IPT. IPT doesn't have a reliable monitoring mechanism, and the documentation was poor in this area which affected IPT implementation negatively.

The availability of isoniazid (INH) was another important obstacle for starting IPT. Numerous times, parents consented to start IPT for their children, but treatment couldn't be started because INH wasn't available. One of the main obstacles to the IPT initiation highlighted by research from Bhopal and Pune was erratic supply of INH(11,14). As the current study was conducted During peak of COVID-19 pandemic due to which major staff re-deployments occurred. This re-deployment of staff during the pandemic led to staff shortage and frequently left no one available to look after IPT related work.

Current study reported the 6 months IPT adherence of 31.4% where majority of children stopped after taking few doses of IPT. Incomplete adherence to IPT is common, and consistent with other Indian studies (25.3-90.9%)(11,12,14,18,20,34). When IPT was recommended, the kids seemed to be in good health, which made it challenging for parents to understand why they should be giving their kids medicine. They stop administering the medication when no apparent benefit was perceived. Medication compliance is significantly influenced by patient's understanding and attitudes regarding the nature of sickness and advantages of preventative care. HCWs revealed that it was very challenging for them to counsel and convince the caregivers to be adherent to IPT for whole six-month. Making them comprehend the benefits of providing IPT to children who are asymptomatic was very challenging for HCWs. A mixed methods study by **Triasih R et al. (2017) from Indonesia** reported that lack of perceived benefit was the main reason for poor IPT adherence(30)**.** Study by **Ranganath T. S. et al. from Banagalore** reported that after giving IPT for few days many parents stopped giving the drug. They felt that their children were healthy and did not feel the need for therapy anymore(12).

Healthcare workers and caregivers both had been reported that six-months therapy is very long and difficult to maintain compliance in apparently healthy children. Due to the length of the therapy, multiple hospital visits were required to complete the course, making it more difficult for daily wage workers. Studies from **Chennai, Bangalore, Bhopal, and Pune** have reported long course of INH as a major barrier for IPT adherence(11,12,14,18). Frequent visits were needed to collect the medicine, which forced them to take leave from work. Their financial situation was exacerbated by high transportation costs and daily wage losses. Even if they took a single day off, daily wage earners found it exceedingly challenging to provide food for their families. Instead of going to pick up IPT, they decided to arrange for food.

According to studies by **Rutherford M. E. et al. (2012)** from **Indonesia, Seid G. et al. (2020)** from **Ethiopia** reported that younger children had poorer IPT adherence in comparison to older ones(10,32). One of the major obstacles was the challenge of giving medications to young children. This finding is also supported by our study. Caregivers frequently expressed that difficulty in drug administration was a significant barrier to IPT adherence. The difficulty of administering medications, according to caregivers, was a major obstacle to IPT adherence. Some children had trouble swallowing their medications, spitting them out, or even started vomiting after receiving the drug. The **Indonesian** study also revealed low adherence because of the medication's side effects(10). They reported that even modest side effects, including vomiting, loss of appetite, and diarrhoea after starting IPT, caused the therapy to be stopped. The current study found comparable barriers from caregivers who thought the medication wasn't appropriate. Following the start of therapy, children began to vomit, and inappropriate feeding was a common adverse effect noted by guardians.

Social stigma and discrimination were noted as significant obstacles to IPT adherence by **Benoit Vásquez et al. (2022)** from the **Dominican Republic** and **Belgaumkar V. et al., (2018)** from **Pune**(11,19). Most parents said that their children had experienced some stigma and discrimination from members of the family or from neighbours. These findings were likewise consistent with the findings of the current study. Many parents have noticed that other family members have stopped interacting with their kids. As discrimination was unacceptable to the parents, they stopped giving IPT to their children. When neighbours learned that children were receiving medication for tuberculosis, they too stopped allowing children into their homes.

Triasih R et al. (2017) from Indonesia reported that staff shortage was identified as a potential barrier for IPT adherence(30). In this study also staff shortage was a major roadblock in IPT adherence. Staff shortage was mainly because most of the posts of HCWs were vacant. Staff shortage was also due to frequent staff re-deployment which led the situation more difficult. Shortage of staff puts high workload on existing HCWs which adversely affected the DOTS work. HCWs have been given multiple jobs, making it impossible for them to concentrate on the execution of the IPT implementation.

IPT implementation at the provider level was observed to be hindered by inadequate monitoring and poor documentation reported by **Chawla K. et al. (2021)** from **Bengaluru** and **Belgaumkar V. et al. (2018)** from **Pune**(11,36). IPT defaults and reduced IPT adherence were caused by a lack of monitoring and inadequate documentation. The main obstacles to IPT adherence, according to the current study, were subpar monitoring and insufficient documentation. HCWs mentioned that poor documentation was due to a high workload and insufficient staff. There is no provision for adequate reporting of paediatric contacts in the current study setting. Inadequate monitoring was the outcome of insufficient documentation, which in turn caused poor adherence.

The COVID-19 pandemic was at its peak when the current study was being done. This pandemic condition had a negative impact on IPT initiation and adherence. Major HCWs re-deployment occurred during COVID-19 pandemic, which negatively impacted the IPT implementation. Caregivers were in a very anxious situation; they stopped going to pick up INH for their kids. Fear of contracting COVID-19 resulted in low IPT adherence. **Chawla K et al., (2021)** from **Bengaluru** found similar findings, stating that the majority of parents became alarmed and stopped the IPT for their kids(36).

A retrospective clinical records review from **Cape Town South Africa** reported that out of 525 paediatric contacts, less than half were screened. Among 525 children, 141 (26.8%) were initiated on six-month IPT and only 19 (13.4%) completed six-months of IPT. Inadequate and incomplete recording, suboptimal identification of paediatric contacts and poor monitoring were the main challenges in effective implementation of chemoprophylaxis for TB(45)**.**

Shivaramakrishna H R et al., 2014 from **New Delhi** reported screening of 80% child contacts, IPT initiation of 33.4%, and 23.1% adherence for 6 months IPT. No home visit by HCWs as they were not aware of their role and no education about IPT among caregivers were the main reason for non-initiation of IPT, and long course of IPT were the main reason for non-adherence(42).

The National TB Programme of Afghanistan was evaluated by **Sayedi S. M. et al. (2020),** who also reported a 68.5% IPT adherence rate. They employed contact screening as a starting point for the IPT of children of (under the age of five) who had

pulmonary TB contacts. They credited the counselling of parents for the value of IPT, the encouragement of parents to finish their children's IPT by HCWs, good follow-up with patients who missed a day of treatment, and an uninterrupted supply of isoniazid for this high completion rate. Mandatory contact registration and screening for all index TB patients led to an increase in case notifications and provided a way to identify kids who were eligible for the IPT. Additionally, they regularly monitored TB patients, allowing health professionals to recommend that they bring all contacts for screening. Besides that, HCWs visited index TB patients at home, providing them with an additional opportunity to screen all contacts and monitor IPT(23).

Chapter 7: STRENGTHS AND LIMITATIONS

7.1 Strengths of the study

The present study has a number of strengths. First of all, this study's mixed-method methodology not only quantified the problem's size but also included information on its causes, giving a comprehensive picture. Second, difficulties at various levels were highlighted through interviews with HCWs working in the NTEP at various levels. Thirdly, interviews with IPT beneficiaries' caregivers were conducted in order to understand the difficulties from their viewpoint. Fourth, efforts were made to take suggestions from HCWs and parents into consideration in order to better understand the difficulties they are facing. Fifth, the study was carried out in western India in a programmatic setting, reflecting realities on the ground. Sixth, both urban and rural settings were included in current study for comparative evaluation. Seventh, we followed internationally recognised standards for reporting the study's quantitative and qualitative components(46,47).

7.2 Limitations of the study

There were a few limitations. As the study looked at programme records, information loss due to inadequate recordkeeping was identified in numerous places. During interviews with child contact caregivers, challenges with recall and self-report bias might have occurred.

Few parents refused to participate in interviews because of the stigma and discrimination associated with TB in the study area. Screening status, IPT initiation, and IPT consumption duration were evaluated only based on interviews in some cases and could not be validated.

Chapter 8: CONCLUSION

Despite the WHO and NTEP recommendations, Jodhpur has low rates of paediatric contact screening, IPT initiation, and adherence. In order to lower the burden of the disease among children, paediatric contacts of pulmonary TB cases must be managed properly. According to the current study's findings, there were several places along the contact screening-treatment pathway where there was insufficient contact tracing and substantial attrition among children. Poor documentation and deviation from guidelines were also found.

Operational challenges such as suboptimal documentation tools, irregular drug supply, inadequate training of HCWs, and poor monitoring contributed to these outcomes. Caregivers related factors were identified such as lack of awareness, lack of risk perception, social stigma, fear of disclosure, and drug side-effects. On the provider's side, lack of training, inadequate knowledge about IPT, staff shortage, high workload, and inadequate understanding of guidelines were identified as factors leading to poor IPT implementation.

It is imperative for the programme to address these challenges efficiently and effectively. In order to increase uptake and give contact tracing, screening, and IPT administration monitoring top priority, the programme must implement novel ideas, workable engagements, and significant efforts. These would include training of healthcare workers, regular and adequate supply of drugs and counselling of TB patients and their family members. Furthermore, supervision and home visits by programme staff such as senior treatment supervisor (STS) and Community Health Officers (CHO), ANM and ASHA workers should be ensured for all patients within one month of diagnosis.

Chapter 9: RECOMMENDATIONS

According to NTEP, each TB patient should be linked to a DOTS provider in the community. They could be frontline health workers such as ASHA workers, Anganwadi workers, ANM, Multipurpose health worker or more recently CHO (Community Health Officers) at sub-centre level. However, this guideline must be implemented to ensure universal coverage of IPT among household contacts of microbiologically confirmed pulmonary TB patients.

A potential obstacle to IPT coverage which was noted was the absence of information due to inadequate documentation. A specific IPT-register for all household contacts should be maintained at sub-centre or health and wellness centre (HWC) parallel to the TB card of patient to ensure adequate documentation.

The contacts for index patients and contacts receiving IPT prophylaxis should be integrated into a single platform by DOTS providers. In doing so, data entry of compliance of index cases and IPT for contacts should be linked both offline in TB card and online in Nikshay portal. Thus, family affected by TB should be taken as a unit rather than only the TB patient. This would help to prevent loss to follow-up or incomplete adherence to IPT.

Index cases need to receive more specialised advice and in-depth counselling about their illness and the risk it poses to their contacts.

Because it necessitates daily medication delivery over a longer period of time, compliance with a six-month IPT was found to be poor. A shorter course of TB preventive therapy such the 3-month regimen should be implemented.

Development of simple screening tools and periodic training for all frontline HCWs should be implemented. Creation of interesting educational materials about TB prevention should be explored.

There are innovative tools for educating HCWs under NTEP for example *Swasth e-gurukul* is one such initiative of the World Health Organization. There is scope to emphasize the utility of these tools to improve the knowledge of HCWs. These could be integrated with existing smartphone-based platforms such as *Nikshay Mitra*.

Supervision and home visits by programme staff such as senior treatment supervisor (STS) and Community Health Officers (CHO), ANM and ASHA workers should be ensured for all patients within one month of diagnosis. These should be monitored by medical officer incharge and District TB officer on a weekly/monthly basis through review meetings and supervisory field visits.

REFERENCES

1. Revised National Tuberculosis Control Programme. National strategic plan for tuberculosis elimination 2017-2025. Central TB Division, Directorate General of Health Services,Ministry of Health and Family Welfare.2017,March.[Cited on 2022 Nov 12]. Available from https://tbcindia.gov.in/WriteReadData/NSP%20Draft%2020.02.2017%201.pdf
2. World Health Organization. Global Tuberculosis report 2022. [Cited 2022 Dec 6]. Available from https://www.who.int/teams/global-tuberculosis-programme/tb-reports
3. Cohen A, Mathiasen VD, Schön T, Wejse C. The global prevalence of latent tuberculosis: a systematic review and meta-analysis. Eur Respir J. 2019 Sep;54(3):1900655.
4. Indian Academy of paediatrics (IAP): (Cited on 2022 Dec 19). Available at: https://iapindia.org/indian- paediatrics/
5. Center for Disease Control. Testing for Tuberculosis. 2022. [Cited 2022 Dec 6]. Available from https://www.cdc.gov/tb/publications/factseries/skintest_eng.htm
6. Aprilidyawati R, Wahjuni CU, Yuliandari RD. OVERVIEW OF TUBERCULOSIS PREVENTIVE TREATMENT AMONG CHILDREN IN SURABAYA. In: Jurnal Berkala Epidemiologi. 2020 [cited 2022 Dec 26]. p. 275. Available from: https://e-journal.unair.ac.id/JBE/article/view/16322
7. Sharma N, Bhatnagar A, Basu S, Khanna A, Chopra KK, Banerjee B, et al. A comparison of patient treatment pathways among multidrug-resistant and drug-sensitive TB cases in Delhi, India: A cross-sectional study. Indian J Tuberc. 2020 Oct;67(4):502–8.
8. Saurabh S, Bhardwaj P. Tuberculosis Preventive Treatment in India: A Much-Needed Push Towards Achieving TB Elimination. J Fam Med Prim Care. 2021 Dec;10(12):4605–6.
9. National Tuberculosis Elimination Program. Programmatic management of drug resistance Tuberculosis. 2021. [Cited 2022 Dec 6]. Available from https://tbcindia.gov.in/WriteReadData/l892s/Guidelines%20for%20Programmatic

%20Management%20of%20Tuberculosis%20Preventive%20Treatment%20in%20India.pdf

10. Seid G, Tsedalu T, Ayele M. Adherence to Isoniazid Preventive Therapy among Under-Five Children in Contact with Adult Bacteriologically Confirmed Pulmonary Tuberculosis Patients: A Mixed-Method Study. Int J Microbiol. 2020 Sep 29;2020:e8834806.
11. Belgaumkar V, Chandanwale A, Valvi C, Pardeshi G, Lokhande R, Kadam D, et al. Barriers to screening and isoniazid preventive therapy for child contacts of tuberculosis patients. Int J Tuberc Lung Dis. 2018 Oct 1;22(10):1179–87.
12. Ranganath T S et al. A cross sectional study on IPT Adherence among childhood contacts of smear-positive Pulmonary TB. National Journal of Public Health.2018.3.11-15. Available from: https://journalgrid.com/view/article/rnjph/624
13. Black F, Amien F, Shea J. An assessment of the isoniazid preventive therapy programme for children in a busy primary healthcare clinic in Nelson Mandela Bay Health District, Eastern Cape Province, South Africa. South Afr Med J Suid-Afr Tydskr Vir Geneeskd. 2018 Feb 27;108(3):217–23.
14. Singh AR, Kharate A, Bhat P, Kokane AM, Bali S, Sahu S, et al. Isoniazid Preventive Therapy among Children Living with Tuberculosis Patients: Is It Working? A Mixed-Method Study from Bhopal, India. J Trop Pediatr. 2017 Aug 1;63(4):274–85.
15. Adjobimey M, Masserey E, Adjonou C, Gbénagnon G, Schwoebel V, Anagonou S, et al. Implementation of isoniazid preventive therapy in children aged under 5 years exposed to tuberculosis in Benin. Int J Tuberc Lung Dis. 2016 Aug 1;20(8):1055–9.
16. Tadesse Y, Gebre N, Daba S, Gashu Z, Habte D, Hiruy N, et al. Uptake of Isoniazid Preventive Therapy among Under-Five Children: TB Contact Investigation as an Entry Point. PloS One. 2016;11(5):e0155525.
17. Silva APB, Hill P, Belo MTCT, Rabelo SG, Menzies D, Trajman A. Non-completion of latent tuberculous infection treatment among children in Rio de Janeiro State, Brazil. Int J Tuberc Lung Dis. 2016 Apr 1;20(4):479–86.

18. Rekha B, Jagarajamma K, Chandrasekaran V, Wares F, Sivanandham R, Swaminathan S. Improving screening and chemoprophylaxis among child contacts in India's RNTCP: a pilot study. Int J Tuberc Lung Dis. 2013 Feb 1;17(2):163–8.

19. Benoit Vásquez GI, Morrobel AL, Benjumea-Bedoya D, del Corral-Londoño H. Barriers and facilitators for isoniazid preventive therapy (IPT) administration in children under 5 years of age in the Dominican Republic. BMC Infect Dis. 2022 Apr 11;22(1):359.

20. Sharma N, Basu S, Khanna A, Sharma P, Chopra KK, Chandra S. Adherence to Isoniazid Preventive Therapy among children living with tuberculosis patients in Delhi, India: An exploratory prospective study. Indian J Tuberc. 2022 Jan;69(1):100–3.

21. Tolofoudie M, Somboro A, Diarra B, Sarro YS, Drame HB, Togo ACG, et al. Isoniazid preventive therapy in child household contacts of adults with active TB in Bamako, Mali. Public Health Action. 2021 Dec 21;11(4):191–5.

22. Amisi JA, Carter EJ, Masini E, Szkwarko D. Closing the loop in child TB contact management: completion of TB preventive therapy outcomes in western Kenya. BMJ Open. 2021 Feb 23;11(2):e040993.

23. Sayedi SM, Seddiq MK, Rashidi MK, Qader G, Ikram N, Melese M, et al. Active household contact screening for tuberculosis and provision of isoniazid preventive therapy to under-five children in Afghanistan. PLOS ONE. 2020 Oct 9;15(10):e0240031.

24. Chacón A, Alarcón E, López L. [Factors associated with completion of isoniazid preventive therapy in children in Quito, Ecuador (2014-2016 and 2018)Fatores associados à adesão à terapia preventiva com isoniazida em crianças de Quito, Equador (2014-2016 e 2018)]. Rev Panam Salud Publica Pan Am J Public Health. 2019;43:e97.

25. Birungi FM, Graham SM, Uwimana J, Musabimana A, Van Wyk B. Adherence to isoniazid preventive therapy among child contacts in Rwanda : a mixed-methods study. 2019 Feb 11 [cited 2022 Dec 26]; Available from: https://scholar.sun.ac.za:443/handle/10019.1/123290

26. Paul N, Gabriel-Job N. Adherence to Isoniazid Preventive Therapy (IPT) among Children in Close Contact with Adult Pulmonary Tuberculosis (PTB) Patients. J Adv Med Med Res. 2019 Nov 9;1–8.

27. Okwara FN, Oyore JP, Were FN, Gwer S. Correlates of isoniazid preventive therapy failure in child household contacts with infectious tuberculosis in high burden settings in Nairobi, Kenya - a cohort study. BMC Infect Dis. 2017 Sep 16;17(1):623.

28. Datiko DG, Yassin MA, Theobald SJ, Cuevas LE. A community-based isoniazid preventive therapy for the prevention of childhood tuberculosis in Ethiopia. Int J Tuberc Lung Dis Off J Int Union Tuberc Lung Dis. 2017 Sep 1;21(9):1002–7.

29. Egere U, Sillah A, Togun T, Kandeh S, Cole F, Jallow A, et al. Isoniazid preventive treatment among child contacts of adults with smear-positive tuberculosis in The Gambia. Public Health Action. 2016 Dec 21;6(4):226–31.

30. Triasih R, Padmawati RS, Duke T, Robertson C, Sawyer SM, Graham SM. A mixed-methods evaluation of adherence to preventive treatment among child tuberculosis contacts in Indonesia. Int J Tuberc Lung Dis Off J Int Union Tuberc Lung Dis. 2016 Aug;20(8):1078–83.

31. Soelen N van, Preez K du, Wyk SS van, Mandalakas AM, Enarson DA, Reid AJ, et al. Does an Isoniazid Prophylaxis Register Improve Tuberculosis Contact Management in South African Children? PLOS ONE. 2013 Dec 10;8(12):e80803.

32. Rutherford ME, Ruslami R, Maharani W, Yulita I, Lovell S, Van Crevel R, et al. Adherence to isoniazid preventive therapy in Indonesian children: A quantitative and qualitative investigation. BMC Res Notes. 2012 Jan 6;5:7.

33. Gomes VF, Wejse C, Oliveira I, Andersen A, Vieira FJ, Carlos LJ, et al. Adherence to isoniazid preventive therapy in children exposed to tuberculosis: a prospective study from Guinea-Bissau. Int J Tuberc Lung Dis. 2011 Dec 1;15(12):1637–43.

34. Newtonraj. Status of contact screening and isoniazid preventive therapy for children under age six in Puducherry district, under the Revised National Tuberculosis Control Programme: An operational research. [cited 2022 Dec 26]. Available from: https://www.jcrsmed.org/article.asp?issn=2455-3069;year=2020;volume=6;issue=1;spage=24;epage=27;aulast=Newtonraj

35. Isaac T, Kizito O. Factors Associated with Uptake of Isoniazid Preventive Therapy among Children under 5 Years Tuberculosis Contacts in Greater Kibaale, Uganda. Am J Public Health Res. 2022 Apr 2;10(2):76–89.

36. Chawla K, Burugina Nagaraja S, Siddalingaiah N, Sanju C, Shenoy VP, Kumar U, et al. Challenges Perceived by Health Care Providers for Implementation of Contact Screening and Isoniazid Chemoprophylaxis in Karnataka, India. Trop Med Infect Dis. 2021 Sep 14;6(3):167.

37. Zeladita-Huaman J, Yuen CM, Zegarra-Chapoñan R, Curisinche-Rojas M, Egusquiza-Pozo V. Caregivers' knowledge and perceptions are associated with children's TB preventive treatment completion. Public Health Action. 2021 Jun 21;11(2):85–90.

38. Hirsch-Moverman Y, Mantell JE, Lebelo L, Howard AA, Hesseling AC, Nachman S, et al. Provider attitudes about childhood tuberculosis prevention in Lesotho: a qualitative study. BMC Health Serv Res. 2020 May 25;20(1):461.

39. Technical_and_operational_guidelines_for_tuberculosis_control_(2005).pdf. [cited 2022 Dec 20]. Available from: https://www.tbonline.info/media/uploads/documents/technical_and_operational_guidelines_for_tuberculosis_control_%282005%29.pdf

40. National Guidelines on diagnosis and treatment of paediatric Tuberculosis. [cited 2022 Dec 20]. Available from: https://tbcindia.gov.in/Write ReadData/l892s/3175192227Paediatric%20guidelines_New.pdf

41. Pothukuchi M, Nagaraja SB, Kelamane S, Satyanarayana S, Shashidhar null, Babu S, et al. Tuberculosis contact screening and isoniazid preventive therapy in a South Indian district: operational issues for programmatic consideration. PloS One. 2011;6(7):e22500.

42. Shivaramakrishna HR, Frederick A, Shazia A, Murali L, Satyanarayana S, Nair SA, et al. Isoniazid preventive treatment in children in two districts of South India: does practice follow policy? Int J Tuberc Lung Dis Off J Int Union Tuberc Lung Dis. 2014 Aug;18(8):919–24.

43. Alperstein G, Morgan KR, Mills K, Daniels L. Compliance with anti-tuberculosis preventive therapy among 6-year-old children. Aust N Z J Public Health. 1998 Apr;22(2):210–3.

44. Lester R, Hamilton R, Charalambous S, Dwadwa T, Chandler C, Churchyard GJ, et al. Barriers to implementation of isoniazid preventive therapy in HIV clinics: a qualitative study. AIDS Lond Engl. 2010 Nov;24 Suppl 5:S45-48.

45. Osman M, Hesseling AC, Beyers N, Enarson DA, Rusen ID, Lombard C, et al. Routine programmatic delivery of isoniazid preventive therapy to children in Cape Town, South Africa. Public Health Action. 2013 Sep 21;3(3):199–203.

46. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. Lancet Lond Engl. 2007 Oct 20;370(9596):1453–7.

47. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. Int J Qual Health Care J Int Soc Qual Health Care. 2007 Dec;19(6):349–57.

ANNEXURES

Annexure 'A': Ethical Clearance Certificate

अखिल भारतीय आयुर्विज्ञान संस्थान, जोधपुर
All India Institute of Medical Sciences, Jodhpur
संस्थागत नैतिकता समिति
Institutional Ethics Committee

No. AIIMS/IEC/2021/3514 Date: 12/03/2021

ETHICAL CLEARANCE CERTIFICATE

Certificate Reference Number: **AIIMS/IEC/2021/3349**

Project title: **"Appraisal of isoniazid preventive therapy among pediatric contacts of microbiologically confirmed pulmonary tuberculosis cases in Jodhpur, Rajasthan: A mixed methods study"**

Nature of Project:	**Research Project Submitted for Expedited Review**
Submitted as:	**M.D. Dissertation**
Student Name:	**Dr. Sandip Yadava**
Guide:	**Dr. Pankaj Bhardwaj**
Co-Guide:	**Dr. Srikanth S., Dr. Manoj Kumar Gupta, Dr. Akhil Dhanesh Goel & Dr. Suman Saurabh**

Institutional Ethics Committee after thorough consideration accorded its approval on above project.

The investigator may therefore commence the research from the date of this certificate, using the reference number indicated above.

Please note that the AIIMS IEC must be informed immediately of:

- Any material change in the conditions or undertakings mentioned in the document.
- Any material breaches of ethical undertakings or events that impact upon the ethical conduct of the research.

The Principal Investigator must report to the AIIMS IEC in the prescribed format, where applicable, bi-annually, and at the end of the project, in respect of ethical compliance.

AIIMS IEC retains the right to withdraw or amend this if:

- Any unethical principle or practices are revealed or suspected
- Relevant information has been withheld or misrepresented

AIIMS IEC shall have an access to any information or data at any time during the course or after completion of the project.

Please Note that this approval will be rectified whenever it is possible to hold a meeting in person of the Institutional Ethics Committee. It is possible that the PI may be asked to give more clarifications or the Institutional Ethics Committee may withhold the project. The Institutional Ethics Committee is adopting this procedure due to COVID-19 (Corona Virus) situation.

If the Institutional Ethics Committee does not get back to you, this means your project has been cleared by the IEC.

On behalf of Ethics Committee, I wish you success in your research.

Dr. Praveen Sharma
Member Secretary

Member secretary
Institutional Ethics Committee
AIIMS, Jodhpur

Basni Phase-2, Jodhpur, Rajasthan-342005; **Website:** www.aiimsjodhpur.edu.in; **Phone:** 0291-2740741 Extn. 3109
E-mail : ethicscommittee@aiimsjodhpur.edu.in; ethicscommitteeaiimsjdh@gmail.com

Annexure 'B': Participant information sheet (English)

Study Title:

Appraisal of Isoniazid Preventive Therapy among Pediatric Contacts of Microbiologically Confirmed Pulmonary Tuberculosis Cases in Jodhpur, Rajasthan: A Mixed Methods Study

Please read this form carefully. If you don't understand the language or any information in this document, please discuss with the study doctor. If you decide to volunteer to take part in this study you must sign the end of this form.

Introduction to the research study:

You are being asked to take part in this study because you have tuberculosis or one of your family members has tuberculosis. For preventing TB among child family members of TB patients, government has introduced 6-month course of Isoniazid drug.

Purpose of the study:

Purpose of this study is to find out the coverage of Isoniazid treatment. We also wish to find out the reason for low coverage of Isoniazid treatment among the household members and the hurdles for achieving full coverage of Isoniazid treatment.

Who can take part?

If you are detected as a TB patient in Jodhpur district from 1 April 2020 – 31 March 2021, you and your family members are eligible to be included in the study.

What will happen during the study?

- Data collector will conduct initial assessment as per routine procedure
- You will ask few specific questions regarding reasons for non-initiation of Isoniazid treatment, if any

Your role/responsibility in the study:

- Provide accurate information whenever asked
- Must inform the study doctor about any problem experienced during the study.

What are the potential benefits of participating in the study?

If you take part in this study you will help improve the Isoniazid treatment coverage in the country. It will help in achieving the elimination of TB in the country.

Risks:

There are no risks related to enrolment into the study.

Costs:

You will be incurring no extra expenditure because of the enrolment in the study.

Confidentiality of information:

Information from the study including your name, address, your name, recordings and reports will be reviewed only by authorized personnel from the sponsor or their representative, Ethics Committee or regulatory bodies. Information and results from this study may be presented at meetings or published in journals without including your name and personal identifications.

New information about the study:

Any new information available during the course of the study will be informed to you if it has relevance to your decision regarding continuing in the study.

Right to Withdraw:

You have the right to withdraw from the study whenever you feel like. You will not be asked any question for your withdrawal and no one will force you to continue your participation. The free treatment services available to you at AIIMS Jodhpur will not be affected in any way if you choose not to be a part of the study or choose to withdraw from the study.

Provision of free treatment for research related injury:

As this is an observational study and there is no chance of injury to you during data collection. Therefore, this is not applicable in your case.

In case of any complaint or in requirement of any clarification or assistance please contact the following person:

Dr. Sandip Yadava, Junior resident, Department of Community and Family Medicine, AIIMS Jodhpur, email: sandymgims2@gmail.com , Mob: +91 8999241153

Annexure 'C': Participant information sheet (Hindi)

अखिल भारतीय आयुर्विज्ञान संस्थान, जोधपुर, राजस्थान

मरीज हेतु सूचना प्रपत्र

अध्ययन का शीर्षक: जोधपुर, राजस्थान में पुल्मोनरी तपेदिक मामलों के बाल चिकित्सा संपर्कों के बीच आइसोनियाज़िड निवारक चिकित्सा का मूल्यांकन: एक मिश्रित तरीके का अध्ययन

कृपया इस फॉर्म को ध्यान से पढ़ें। यदि आप इस दस्तावेज़ में भाषा या किसी भी जानकारी को नहीं समझते हैं, तो कृपया डॉक्टर से चर्चा करें। यदि आप इस अध्ययन में भाग लेने का निर्णय लेते हैं, तो आपको इस फॉर्म के अंत पर हस्ताक्षर करना होगा।

अध्ययन का परिचय:

आपको इस अध्ययन में भाग लेने के लिए कहा जा रहा है क्योंकि आपको तपेदिक है या आपके परिवार के सदस्यों में से एक को तपेदिक है। टीबी रोगियों के बच्चे के परिवार के सदस्यों के बीच टीबी को रोकने के लिए, सरकार ने 6 महीने में आइसोनियाजिड दवा शुरू की है।

अध्ययन का उद्देश्य:

इस अध्ययन का उद्देश्य आइसोनियाजिड उपचार के कवरेज का पता लगाना है। हम घर के सदस्यों के बीच आइसोनियाज़िड उपचार के कम कवरेज और आइसोनियाज़िड उपचार के पूर्ण कवरेज को प्राप्त करने के लिए बाधाओं के कारण का भी पता लगाना चाहते हैं।

कौन भाग ले सकता है:

यदि आपको 1 अप्रैल 2020 से 31 मार्च 2021 तक जोधपुर जिले में टीबी रोगी के रूप में पाया जाता है, तो आप और आपके परिवार के सदस्य अध्ययन में शामिल होने के पात्र हैं।

अध्ययन के दौरान क्या होगा:

- डाटा कलेक्टर नियमित प्रक्रिया के अनुसार अध्ययन शुरू करेगा
- आप Isoniazid उपचार शुरू नहीं करने के कारणों के बारे में कुछ विशिष्ट प्रश्न पूछेंगे, यदि कोई हो
- डाटा कलेक्टर आपको प्रक्रिया के लिया के लिए मार्गदर्शन करेंगे

अध्ययन में आपकी भूमिका / जिम्मेदारी:

- जब भी पूछा जाए सटीक जानकारी दें
- अध्ययन के दौरान अनुभव की गई किसी भी समस्या के बारे में अध्ययन चिकित्सक को सूचित करना चाहिए।

Annexure 'C': Participant information sheet (Hindi)

अध्ययन में भाग लेने के संभावित लाभ क्या हैं:

यदि आप इस अध्ययन में भाग लेते हैं, तो आप संदिग्ध कोविड -१९ रोगियों का पता लगाने में मदद करेंगे, खासकर जो सीमित परीक्षण क्षमताओं के कारण छूट सकते है ।

चोट के लिए मुआवजा:

किसी भी अध्ययन से संबंधित चोट या बीमारी के मामले में, अध्ययन चिकित्सक (जांचकर्ता) यह सुनिश्चित करने के लिए जिम्मेदार होगा कि आपको उचित और मुफ्त चिकित्सा देखभाल प्रदान की जाती है। जांचकर्ता किसी अन्य मुआवजे के लिए उत्तरदायी नहीं होंगे।

जानकारी की गोपनीयता:

आपके नाम, पते, रिकॉर्डिंग और रिपोर्ट सहित अध्ययन की जानकारी को पूरी तरह गोपनीय रखा जाएगा।

अध्ययन के बारे में नई जानकारी:

अध्ययन जारी रखने के संबंध में आपके निर्णय की प्रासंगिकता होने पर अध्ययन के दौरान उपलब्ध कोई भी नई जानकारी आपको सूचित की जाएगी ।

स्वैच्छिक भागीदारी:

इस अध्ययन में भाग लेना स्वैच्छिक है। यदि आप इस शोध अध्ययन के लिए स्वयंसेवक हैं, तो आपको किसी भी समय रुकने का का अधिकार है और आपको इसके लिए कोई कारण बताने की आवश्यकता नहीं है। अध्ययन में भाग नहीं लेने का आपका निर्णय आपके भविष्य के उपचार को प्रभावित नहीं करेगा। जाँचकर्ता आपकी अनुमति के बिना किसी भी समय किसी अन्य कारण से अनुसंधान या उसमें आपकी भागीदारी को रोक सकता है।

किसी भी शिकायत या किसी स्पष्टीकरण या सहायता के लिए कृपया निम्नलिखित व्यक्ति से संपर्क करें:

डॉ संदीप यादव, रेजिडेंट, सामुदायिक और परिवार चिकित्सा विभाग, एम्स जोधपुर, ईमेल: sandymgims2@gmail.com, मोबाइल नंबर: +91 8999241153

Annexure 'D': Informed consent form for study participants (English)

All India Institute of Medical Sciences Jodhpur, Rajasthan

INFORMED CONSENT FORM

Appraisal of Isoniazid Preventive Therapy among Pediatric Contacts of Microbiologically Confirmed Pulmonary Tuberculosis Cases in Jodhpur, Rajasthan: A Mixed Methods Study Name of the Investigator: Dr Sandip Yadava, Mob. No. 8999241153

Patient/Volunteer Identification No.: _____

I, _____s/o or d/o_____
R/o _____
give my full, free, voluntary consent to be a part of the study **"Appraisal of Isoniazid Preventive Therapy among Pediatric Contacts of Microbiologically Confirmed Pulmonary Tuberculosis Cases in Jodhpur, Rajasthan: A Mixed Methods Study**", the procedure and nature of which has been explained to me in my own language to my full satisfaction. I confirm that I have had the opportunity to ask questions. I understand that my participation is voluntary and am aware of my right to opt out of the study at any time without giving any reason. In understand that the information collected about me and any of my medical records may be looked at by responsible individual from regulatory authorities. I give permission for these individuals to have access to my records.

Date: _____ _____

Place: _____ Signature/Left thumb impression

This is to certify that the above consent has been obtained in my presence.

Date: _____ _____

Place: _____ Signature of Investigator

1. Witness 1 2. Witness 2

_____ _____

Signature Signature

Name: _____ Name: _____

Address: _____ Address: _____

Annexure 'E': Informed consent form for study participants (Hindi)

अखिल भारतीय आयुर्विज्ञान संस्थान, जोधपुर, राजस्थान

सूचित सहमति प्रपत्र

अध्ययन का शीर्षक: **जोधपुर, राजस्थान में पुल्मोनरी तपेदिक मामलों के बाल चिकित्सा संपर्कों के बीच आइसोनियाज़िड निवारक चिकित्सा का मूल्यांकन: एक मिश्रित तरीके का अध्ययन**

अन्वेषक का नाम**: डॉ संदीप यादव, एम्स जोधपुर, मोबाइल: 8999241153**

रोगी पहचान संख्या.: _____

मैं,_____पुत्र /पुत्री_____

निवासी_____ निम्नलिखित अध्ययन **जोधपुर, राजस्थान में पुल्मोनरी तपेदिक मामलों के बाल चिकित्सा संपर्कों के बीच आइसोनियाज़िड निवारक चिकित्सा का मूल्यांकन: एक मिश्रित तरीके का अध्ययन** का हिस्सा बनने के लिए मेरी पूर्ण, नि: शुल्क एवं स्वैच्छिक सहमति देता/ देती हूँ । इसकी प्रक्रिया और प्रकृति मेरी पूरी संतुष्टि के लिए मेरी अपनी भाषा में मुझे समझाया गया है। मैं पुष्टि करता/ करती हूँ कि मेरे पास प्रश्न पूछने का अवसर था। मैं समझता/ समझती हूँ कि मेरी भागीदारी स्वैच्छिक है और किसी भी कारण के बिना, किसी भी समय अध्ययन से बाहर निकलने के मेरे अधिकार से अवगत हूं।

दिनांक: _____

स्थान : _____ हस्ताक्षर/बाएं अंगूठे की छाप

यह प्रमाणित करने के लिए कि उपर्युक्त सहमति मेरी उपस्थिति में प्राप्त की गई है।

तारीख :_____

स्थान: _____ हस्ताक्षर अन्वेषक

साक्षी 1 साक्षी 2

हस्ताक्षर_____ हस्ताक्षर_____

नाम: _____ नाम_____

स्थान : _____ स्थान:_____

Annexure 'F': Semi-structured questionnaire for study participants

Quantitative data collection Tool

Serial number of the child _____

1. TB number of index case: ----------
2. Living status of Index case: a. Alive ☐ b. Died ☐
3. TB Unit ----------
4. Age (In completed years): .....
5. Gender a. Male ☐ b. female ☐
6. Mother's education: .....
7. Father's education: .....
8. Father's occupation: .....
9. PHI from where index case was initiated on treatment: .....
10. Relation with Index case: a. Parent ☐ b. Non-parent ☐
11. Initial home visit by paramedical worker: a. Done b. Not done
12. Screening of child done for TB: a. Yes ☐ b. No ☐
13. Result of screening: a. Active TB ☐ b. No ☐
14. Whether TB treatment initiated, if child diagnosed as active TB case

    a. Yes ☐ b. No ☐
15. Whether chemoprophylaxis initiated if child was without active TB:

    a. Yes ☐ b. No ☐
16. Whether chemoprophylaxis completed if initiated to child

    a. Yes ☐ b. No ☐

Annexure ‘G’: In-depth Interview Guide for Caregivers

Date of Interview: **Name of the participant:**

Designation: **Interview start / end time:**

Name of the TU:

Name of the Interviewer:

1. Can you please tell me about Tuberculosis (which peoples are prone for this disease/ cause of TB/How we can prevent us from TB/)

2. As one of your family member is suffering from tuberculosis, have you ever worried that your children can get this disease

3. What are the precautions you are following to protect your children from this disease

4. During your treatment any health worker visited to your home to examine your kids

5. Are you aware of any preventive therapy available under NTEP for paediatric contacts (any drug/IPT/When IPT was started)

6. Can you please tell me about completion of the six-month IPT (completed? if not, why?)

7. Please tell me side effects of medicine, if your kid developed any

8. Please talk about challenges you faced in IPT initiation and completion of six-month IPT completion.

9. How can we further improve this chemoprophylaxis programme?

Annexure 'H': Interview Guide for Healthcare Workers

Date of Interview: **Name of the participant:**

Designation: **Interview start / end time:**

Name of the TU:

Name of the Interviewer:

1. Can you please tell me about of tuberculosis

2. Please tell me about risk of transmission of TB to paediatric contacts residing in same household

3. Can you please tell me about some preventive measures, by which development of TB disease can be prevented in exposed contacts (Chemoprophylaxis for TB/Any drug being given to prevent TB)

4. Please tell me about Isoniazid preventive therapy (who all are beneficiaries under NTEP/dose of INH/duration of therapy)

5. Can you please tell me, how you used to decide, to whom IPT should be given (Is it based on any test before prescribing IPT over these children / How do you screen for chemoprophylaxis)

6. What are the operational challenges involved in this: both at provider level and patient level (Any shortage of diagnostic tools / effectiveness of IPT/drug stockout/shortage of staff/Training of HCWs)

7. How do you ensure that children are taking IPT (Any monitoring system is there/pill count/empty drug strips)

8. How do you ensure treatment completion (programmatic/ patient-level)

9. Please tell me about the barriers in timely initiation of IPT in eligible children

10. Please tell me about barriers in six-month adherence (how we can improve it)

11. How can we further improve the chemoprophylaxis?

Annexure 'I': Key-informant Interview Guide for Programme Managers

Date of Interview: **Name of the participant:**

Designation: **Interview start / end time:**

Name of the TU:

Name of the Interviewer:

1. Can you please tell me about of tuberculosis

2. Please tell me about risk of transmission of TB to paediatric contacts residing in same household

3. Can you please tell me about some preventive measures, by which development of TB disease can be prevented in exposed contacts (Chemoprophylaxis for TB/Any drug being given to prevent TB/screening process before IPT initiation

4. Please tell me about Isoniazid preventive therapy (who all are beneficiaries under NTEP/dose of INH/duration of therapy)

5. How do you ensure regular supply of logistics at each public health facility (TST/INH)

6. How do you ensure effective IPT implementation in this area (Any monitoring system is there/empty drug strips/training of HCWs)

7. What are the operational challenges involved in this: both at provider level and patient level (Any shortage of diagnostic tools / effectiveness of IPT/drug stockout/shortage of staff/Training of HCWs)

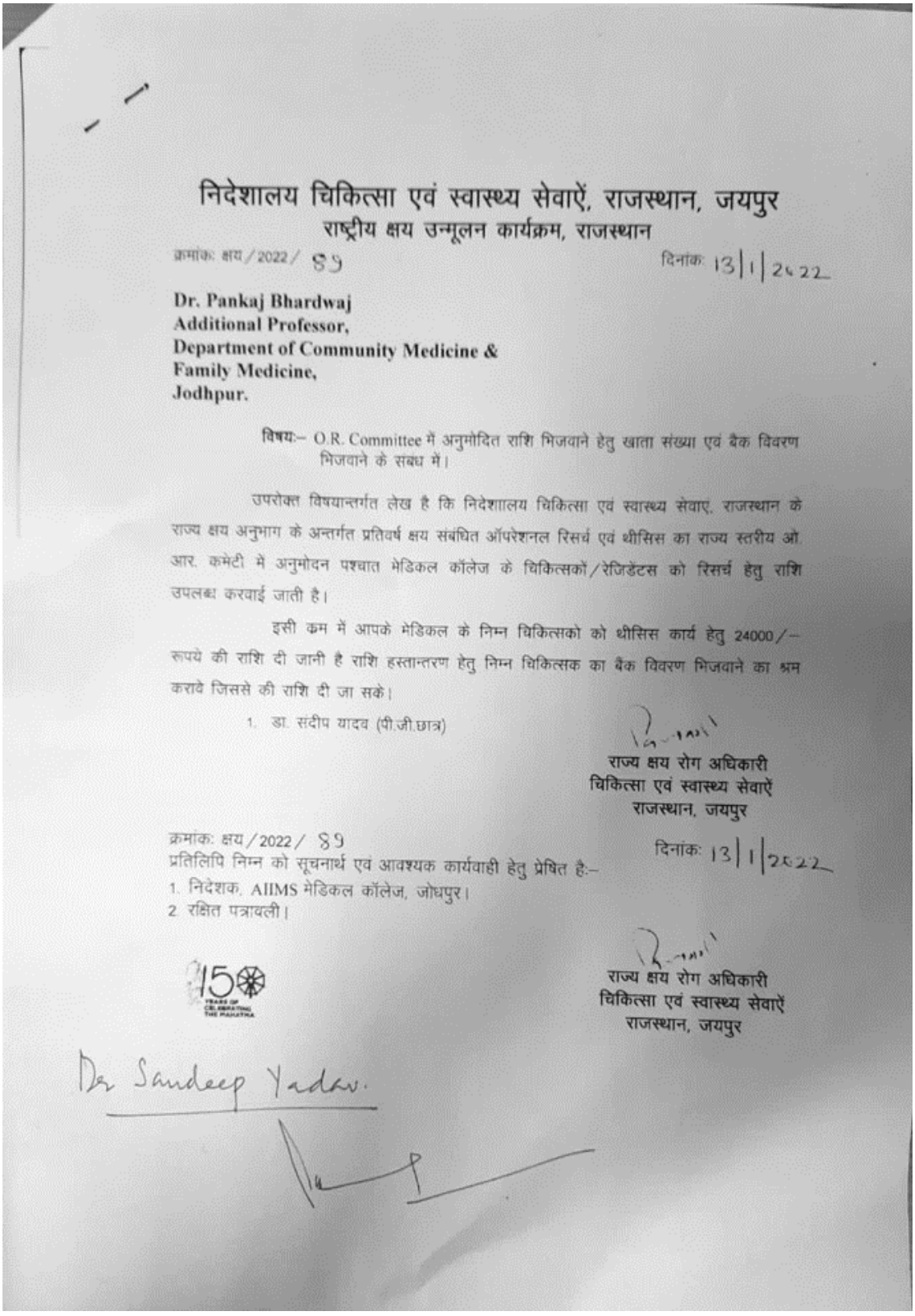
8. How do you ensure treatment completion (programmatic/ patient-level)

9. Please tell me about the barriers in timely initiation of IPT in eligible children

10. Please tell me about barriers in six-month adherence (how we can improve it)

11. How can we further improve the chemoprophylaxis?

Annexure 'J': O.R. Committee Financial Support for MD-Thesis



निदेशालय चिकित्सा एवं स्वास्थ्य सेवाऐं, राजस्थान, जयपुर
राष्ट्रीय क्षय उन्मूलन कार्यक्रम, राजस्थान

क्रमांक: क्षय/2022/ 89 दिनांक: 13/1/2022

Dr. Pankaj Bhardwaj
Additional Professor,
Department of Community Medicine &
Family Medicine,
Jodhpur.

विषय:– O.R. Committee में अनुमोदित राशि भिजवाने हेतु खाता संख्या एवं बैंक विवरण भिजवाने के संबंध में।

उपरोक्त विषयान्तर्गत लेख है कि निदेशालय चिकित्सा एवं स्वास्थ्य सेवाए, राजस्थान के राज्य क्षय अनुभाग के अन्तर्गत प्रतिवर्ष क्षय संबंधित ऑपरेशनल रिसर्च एवं थीसिस का राज्य स्तरीय ओ. आर. कमेटी में अनुमोदन पश्चात मेडिकल कॉलेज के चिकित्सकों/रेजिडेंटस को रिसर्च हेतु राशि उपलब्ध करवाई जाती है।

इसी कम में आपके मेडिकल के निम्न चिकित्सको को थीसिस कार्य हेतु 24000/– रूपये की राशि दी जानी है राशि हस्तान्तरण हेतु निम्न चिकित्सक का बैंक विवरण भिजवाने का श्रम करावे जिससे की राशि दी जा सके।

1. डा. संदीप यादव (पी.जी.छात्र)

राज्य क्षय रोग अधिकारी
चिकित्सा एवं स्वास्थ्य सेवाऐं
राजस्थान, जयपुर

क्रमांक: क्षय/2022/ 89 दिनांक: 13/1/2022
प्रतिलिपि निम्न को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित है:–
1. निदेशक, AIIMS मेडिकल कॉलेज, जोधपुर।
2. रक्षित पत्रावली।

राज्य क्षय रोग अधिकारी
चिकित्सा एवं स्वास्थ्य सेवाऐं
राजस्थान, जयपुर

Dr Sandeep Yadav.