Epidemiological profile of Tuberculosis patients in Vijayapura, North Karnataka: A hospital-based study.

By

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Dissertation Submitted To

B.L.D.E. DEEMED TO BE UNIVERSITY
VIJAYAPURA, KARNATAKA

In partial fulfilment of the requirements for the degree of

DOCTOR OF MEDICINE

In

COMMUNITY MEDICINE

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2024

DOI 10.5281/zenodo.15494016
https://zenodo.org/records/15494017

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ACKNOWLEDGEMENT

I thank the Lord Almighty for blessing me with the strength and insight I needed to complete this dissertation, and for being by my side throughout this incredible journey.

It gives me immense pleasure to express my deep sense of gratitude and sincere thanks to **Dr. M. C. Yadavannavar** M.D., Professor and Head, Department of Community Medicine. Shri. B. M. Patil Medical College, Vijayapura, for his exemplary guidance, moral support and constant encouragement which made this study possible.

My sincere thanks to **Dr. Aravind. V. Patil** M.S. Principal, Shri. B. M. Patil Medical College, Vijayapura, for permitting me to conduct this study.

It is my privilege and honour to extend my respect, regards and gratitude to **Dr. Shailaja. S. Patil** MD, **Dr. Rekha Udgiri** M.D., **and Dr. Gudadinni** M.D, Professors for their supervision and timely advice.

I would like to express my sincere gratitude to **Dr. Tanuja P Pattankar** M.D, **Dr. Chandrika Doddihal** M.D, **Dr. Praveen Ganganahalli** M.D, and **Dr. Santosh D. Patil** M.D, Associate Professors for their valuable suggestions and encouragement.

I express my sincere thanks to **Dr. Sandeep Yankanchi** MD, **Dr. Rashmi Hullali** MD and **Dr. Pooja Todalabagi** MD Assistant professors for their support and good wishes.

I am extremely thankful to **Mrs. Vijaya Sorganvi and Mr. Murugesh Math** Statisticians for their valuable help in statistical analysis of data.

I am very grateful to my postgraduate colleagues, **Dr. Shanoon Sharaf Ali, Dr. Kavi Malar, Dr. A Nagendra, Dr. Arun P Sasi** and **Dr Bhoomika** for their constant support and best wishes. My seniors**, Dr. Rupayan Kapri, Dr. Vijay Singh, Dr. K Priyanga** and **Dr. Arathy V** for their encouragement and support**.** I also thank my dear juniors **Dr. Subhajit G, Dr. Shamin E, Dr. Rachel. D, Dr. Jafeya R, Dr. Navarathna K, Dr. Shimona N** for their support.

I am thankful to all the non-teaching and clerical staff members of the Department of Community Medicine, Shri. B. M. Patil Medical College, Vijayapura for their co-operation. I also express my heartfelt gratitude to all the Study participants who consented to participate and generously contributed their time to provide the necessary information.

I am profoundly grateful to my mother, Mrs. Mariyamu K, whose unwavering love and sacrifices have been the foundation of my journey. Her constant encouragement and inspiration have guided me every step of the way, and without her, I would not be where I am today.

I also wish to honour the memory of my late father, Mr Nasser Eariyaden, whose legacy continues to inspire me. Additionally, I am deeply appreciative of my stepfather, Mr Musthafa Kappungal whose support and guidance have further enriched my life. Together, they have all played pivotal roles in shaping who I am, and I am forever thankful for their influence and love.

To my beloved wife, Dr Afiya V K your endless love, support, and understanding have been my greatest strength. Your unwavering belief in me has been a constant source of motivation, and I am deeply indebted to you for standing by me through every challenge and triumph.

To my sibling's Mr Favas Eariyaden and Mrs. Febina Eariyaden your love and constant support have been my pillars of strength. Your encouragement and belief in

my dreams have played a crucial role in my achievements, and I am immensely grateful to have you in my life.

Finally, to my dear daughter Erza Mariam Fyroose your innocent love and the joy you bring to my life have been my greatest inspiration. Your presence has given me the strength to persevere and strive for success, and I dedicate all my efforts to you.

Date: 15.07. 2024 **Dr. Fyroose Eariyaden**

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LIST OF ABBREVIATIONS

TB	Tuberculosis
WHO	World Health Organization
NTEP	National Tuberculosis Elimination Program
MDR/RR	Multidrug-resistant TB/Rifampicin-resistant TB
PTBER	Presumptive TB Examination Rate
MT	Mycobacterium tuberculosis
HIV	Human Immunodeficiency Virus
NTP	National Tuberculosis Programme
RNTCP	Revised National Tuberculosis Control Programme
DOTS	Directly Observed Treatment Short-course
STCI	Standards for TB Care in India
SPSS	Statistical Package for The Social Sciences.
UNICEF	United Nations International Children's Emergency Fund
BCG	Bacillus Calmette-Guérin
NTI	National Tuberculosis Institute
MDGs	Millennium Development Goals
AIDS	Acquired Immunodeficiency Syndrome
EPTB	Extrapulmonary Tuberculosis
CP	Continuation Phase
Z	Pyrazinamide
H	Isoniazid
R	Rifampicin
E	Ethambutol
S	Streptomycin
DM	Diabetes Mellitus
OR	Odds Ratio
ZN	Ziehl-Neelsen
HbA1c	Glycated Hemoglobin
NTRL	National Tuberculosis Reference Laboratory
BPL	Below Poverty Line
AFB	Acid Fast Bacilli
PUC	Pre-University Course
SSLC	Secondary School Leaving Certificate
ASHA	Accredited Social Health Activist
PHC	Primary Health Centre
APL	Above Poverty Line
AAY	Antyodaya Anna Yojana
SES	Socio-Economic Status
COPD	Chronic Obstructive Pulmonary Disease

ABSTRACT

BACKGROUND

Tuberculosis (TB) remains a significant global health challenge, despite advancements in its treatment. TB, a respiratory illness transmitted through the air, continues to impact millions worldwide, with 10.6 million cases reported in 2022, marking an increase from previous years. The disease perpetuates economic hardship and poverty, affecting individuals, families, and communities. In India, the National Tuberculosis Elimination Program (NTEP) reported a record high of 24.2 lakh cases in 2022, with substantial improvements in TB surveillance and case-finding strategies. The relationship between TB and malnutrition is bidirectional, with each exacerbating the other. Addressing the social determinants of TB through coordinated, multi-sectoral approaches is crucial for effective TB control. However, there is limited information on the socio-epidemiological factors influencing TB in regions like northern Karnataka. This study focuses on examining these factors in patients with drug-sensitive and drug-resistant TB in the Vijayapura district.

AIM AND OBJECTIVES OF THE STUDY

1. To assess the sociodemographic details, previous treatment history and clinical characteristics of T.B patients.
2. To understand the health-seeking behaviour and nutritional status of T.B. patients.
3. To evaluate comorbidities among T.B patients.

METHODOLOGY

This cross-sectional study was conducted from January to December 2023 at BLDE (Deemed to be University) Shri B. M. Patil Medical College Hospital & Research Centre, Vijayapura, an

agricultural district with a high TB burden. The study population included TB patients aged over 18 years who were treated at the hospital. Using convenient sampling, 180 patients were interviewed face-to-face with semi-structured questionnaires and underwent anthropometric measurements. Ethical clearance was obtained, and informed consent was assured. Inclusion criteria encompassed all diagnosed TB cases admitted during the study period, while exclusion criteria included non-consenting, critically ill patients, and pregnant or lactating women.

RESULTS

The study population comprised 63% males and 37% females, with a higher representation of young to middle-aged adults (37.2% aged 21-40). About 25.6% were uneducated, and socioeconomically, most participants were from middle or lower-middle-class backgrounds. Farmers (22.8%) and daily laborers (20.6%) were the predominant occupations, and 46.7% belonged to nuclear families. Among the 180 participants, 88.3% were newly diagnosed with TB, and 11.7% had a previous TB diagnosis. The majority (87.8%) had no history of contact with TB cases, and 58.9% had been vaccinated with BCG. Extrapulmonary TB was present in 51.1% of cases. HIV prevalence was low (1.1%), and 16.1% had diabetes. Most participants were non-smokers (74%) and non-alcoholics (75.6%).Housing conditions varied, with half living in pucca houses and 28.9% experiencing overcrowding. The majority (90%) were diagnosed through sputum examination. Hygiene practices showed 66.7% used facemasks, and 57.8% had correct cough etiquette knowledge. Nutritionally, 53.9% were underweight, while 31.7% had a normal weight. Pulmonary TB was more common among smokers and alcoholics, while extrapulmonary TB was more prevalent among non-smokers and non-alcoholics. Diabetic patients had a higher prevalence of pulmonary TB (72.4%).

Educational status influenced the choice of initial consultation, with higher-educated individuals preferring private hospitals. Previous TB diagnosis and treatment completion status also impacted the

choice of healthcare facilities. There was a significant association between BMI and TB type, with underweight individuals more likely to have pulmonary TB.

CONCLUSION

This cross-sectional study at BLDE (Deemed to be University) Shri B. M. Patil Medical College Hospital & Research Centre, Vijayapura, analyzed socio-demographic factors and healthcare-seeking behaviors among 180 TB patients. Significant associations were found between smoking, alcohol consumption, diabetes, BMI, and TB types. Educational status influenced healthcare-seeking behavior, with more educated individuals preferring private facilities. Previous TB diagnoses affected current treatment choices. These findings highlight the need for tailored health interventions to improve TB treatment adherence and healthcare accessibility, especially in high-prevalence areas.

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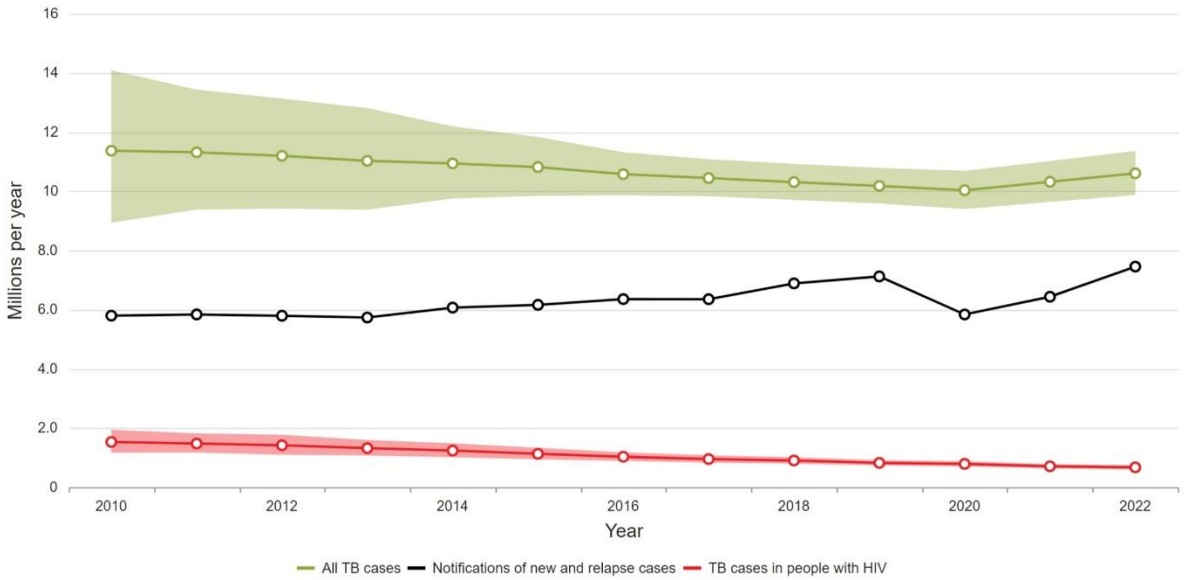
INTRODUCTION:

Tuberculosis (TB) has been a scourge of mankind from time immemorial, affecting countless lives and leaving a profound impact on human society and economies worldwide. Charles Dickens, in his novel *Nicholas Nickleby*, poignantly described TB as a "dread disease in which the struggle between soul and body is so gradual, quiet and solemn and the result so sure that day by day and grain by grain, the mortal part wastes and withers away." His words, written in the 19th century, remain a vivid reminder of the relentless nature of this disease.[1]

Throughout history, mankind has witnessed a remarkable transformation in the face of tuberculosis (TB), transitioning from an incurable disease to one that is now curable. Despite this progress, TB remains a significant public health challenge globally. TB, a respiratory illness transmitted through the air by coughing or sneezing, stands as the primary contributor to infectious diseases worldwide. Its impact extends beyond health, causing economic upheaval and perpetuating a cycle of poverty and illness that ensnares not only individuals but also families, communities, and entire nations [2]

In 2022, an estimated 10.6 million people fell ill with tuberculosis (TB) globally, equivalent to 133 incident cases per 100,000 population. The majority of TB cases in 2022 were reported. of which 46% is in the WHO regions of South-East Asia. The estimated 10.6 million cases in 2022 represent an increase from 10.3 million in 2021 and 10.0 million in 2020, marking a continuation of the reversal of the previously sustained downward trend observed up to 2020. The TB incidence rate (new cases per 100,000 population per year) similarly increased by 1.9% between 2020–2021 and 2021–2022. Consequently, the TB incidence rate in 2022 reverted to the level observed in 2019. From 2015 to 2022, the global reduction in the TB incidence rate was 8.7%, significantly falling short of the WHO End TB Strategy milestone, which aims for a 50% reduction by 2025.[3,4]

Figure 1: Global trends in the estimated number of incident cases

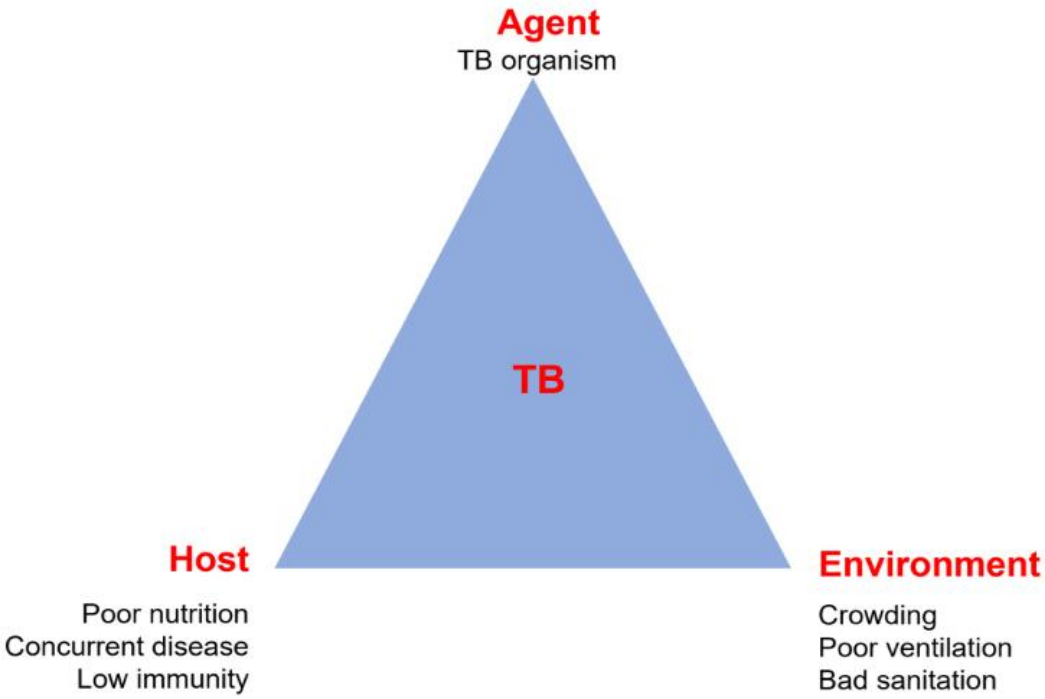


Despite the brief decline in TB notifications observed in 2020 and 2021, the National Tuberculosis Elimination Program (NTEP) in India achieved significant progress in 2022. This marked a milestone for TB surveillance efforts in the country, with a record high notification of 24.2 lakh cases, a 13% increase compared to 2021, translating to approximately 172 cases per lakh population. The period also saw the highest private TB case notifications to date, totalling 7.3 lakh cases. Additionally, 63,801 cases of multidrug-resistant TB (MDR/RR) were diagnosed. This progress resulted from enhanced efforts to find missed TB patients through strengthened case-finding strategies, both passive and active. The presumptive TB examination rate (PTBER) rose to 1281 per lakh population, a 68% increase from 763 in 2021. These achievements underscore the importance of continuing and intensifying TB surveillance and case-finding initiatives to sustain and build on this momentum.[5]

Tuberculosis and nutrition are intricately linked, with each influencing the other in a bidirectional relationship. Malnutrition has long been recognized as a risk factor for the development of tuberculosis, as it can weaken the immune system and make individuals more susceptible to infection.

Conversely, tuberculosis can contribute to malnutrition through various mechanisms, including increased metabolic demands, reduced appetite, and nutrient absorption issues.[6,7]

Figure 2: Epidemiological triad of tuberculosis



Mycobacterium tuberculosis is the causative agent of tuberculosis (TB), with its ability to resist drugs and its genetic variations, including lineage and mutations, being crucial agent factors. In humans, host factors encompass prior contact with TB, malnutrition, co-existing health conditions, compromised immunity, age, gender, and race. As TB spreads through the air, environmental factors such as overcrowding, poor ventilation, inadequate sanitation, and indoor air pollution significantly impact its transmission.

The risk of contracting TB is heightened by:

- Being in close proximity to someone with active TB
- The nutritional status of the individual
    - Presence of other health issues
    - Weakened immune system

Furthermore, susceptibility can be influenced by age, gender, genetic makeup, race, and ethnicity. Understanding the interactions between the agent, host, and environment is crucial for grasping the epidemiology of TB and devising effective prevention and treatment strategies. Environmental risk factors for TB can be mitigated by implementing airborne infection control measures like ensuring good ventilation, practicing hand hygiene, and following proper cough etiquette.

Role of Environmental Factors in the Transmission of Tuberculosis (TB)

Environmental factors significantly influence the transmission of TB, impacting both the risk of infection and the development of the disease. Key factors include:

1.**Housing Quality**: Poor housing, characterized by overcrowding and inadequate ventilation, facilitates TB transmission. High population density and cramped living conditions increase contact with infected individuals.

2. **Ventilation**: Poorly ventilated spaces allow TB bacteria to linger in the air, enhancing transmission risks. Proper ventilation reduces the concentration of infectious droplets.

3. **Socioeconomic Status**: Individuals with lower socioeconomic status are more likely to live in conditions conducive to TB spread, such as overcrowded and poorly ventilated homes. They also face barriers to accessing healthcare.

4. **Smoking and Lifestyle**: Smoking is a major risk factor, increasing susceptibility to TB infection and disease progression. Passive smoking, especially in children, heightens the risk of developing TB.

5. **Air Pollution**: Indoor air pollution from traditional biomass fuels used for cooking and heating in poorly ventilated homes exposes individuals to harmful particles, which can impair lung function and increase TB risk.

6.**Occupational Factors**: Certain jobs, especially those involving exposure to silica dust (e.g., mining) and healthcare settings with inadequate infection control, raise TB risk.

7. **Malnutrition**: Malnutrition weakens the immune system, making individuals more susceptible to TB infection and disease progression.

These factors create an environment where TB can thrive, highlighting the need for improved living conditions, ventilation, healthcare access, and lifestyle changes to mitigate TB transmission.

Preventive measures:

Enumerating Target Population and Contact Tracing:

Enumerating and contact tracing the target population is critical for the success of PMTPT. A weekly updated list of PLHIV, HHC, and other risk groups must be accessible to health-care providers at various facilities, including HWC, PPs, TU, ICTC, and ART centres. Health-care workers trace and assess eligibility through home visits, virtual communication, or facility visits, screening for high-risk groups by verifying eligibility, identifying contraindications, and providing TPT as per specified algorithms.

TB Preventive Treatment (TPT):

TPT options under NTEP are provided after ruling out active TB. Eligible groups include children over 5 years, adolescents, and adult HHC of pulmonary TB patients. Treatment regimens include 6-month daily isoniazid (6H) or 3-month weekly Isoniazid and Rifapentine (3HP) for those older than 2 years. Infants under 12 months and HHC below 5 years of pulmonary TB patients are also considered. Additionally, TPT is offered to children/adults on immunosuppressive therapy, silicosis, anti-TNF treatment, dialysis, or transplantation, with 3HP or 6H regimens.

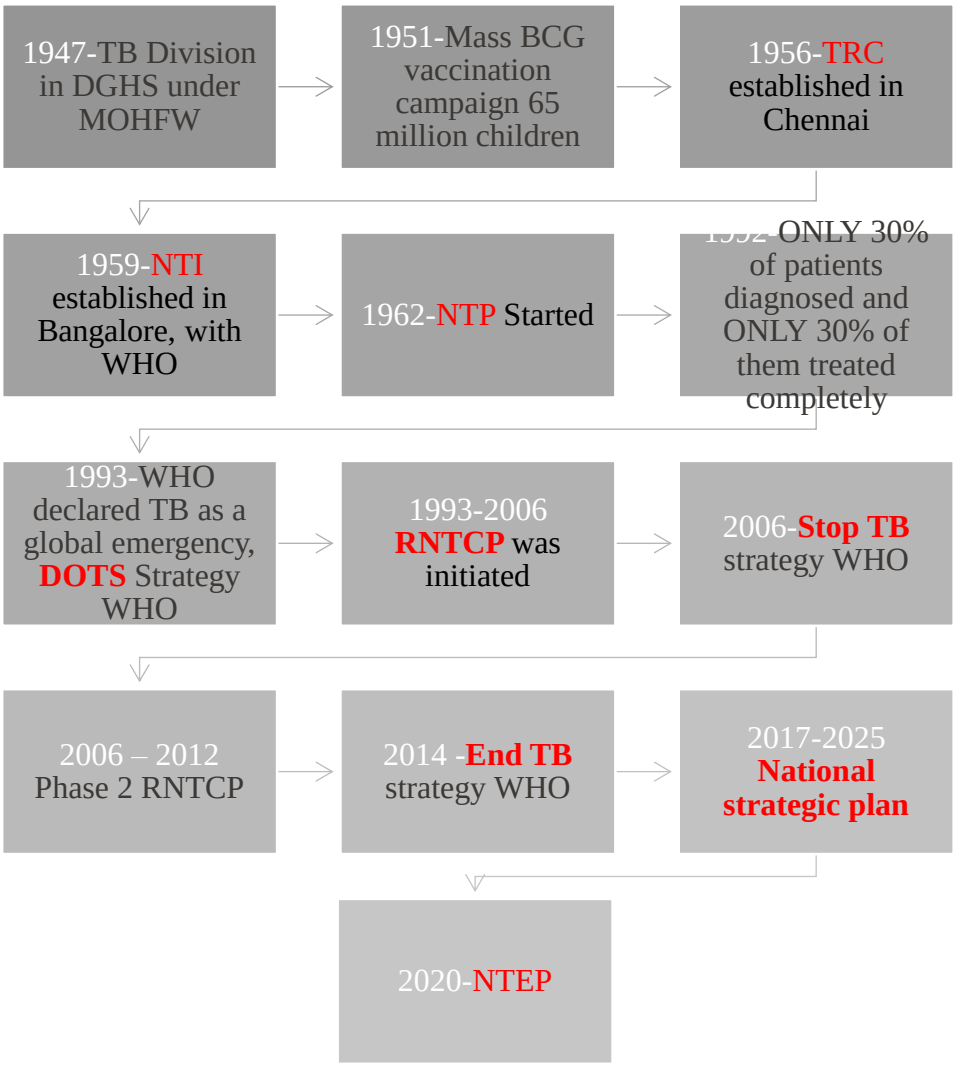
Community Engagement:

Community engagement is essential for TPT implementation and scaling up. Strategies include informing, consulting, collaborating with, and empowering the community. Responsibilities involve integrating contact investigations into the roles of existing health and community workforce, assessing community health workers' capacity, and providing training and capacity building. Efforts focus on creating demand for TPT, sensitizing TB survivors and PLHIV networks, and identifying community volunteers as treatment supporters. Systematic training and on-the-job capacity building are crucial for effective TB symptom screening.[2]

Implementing "health-in-all-policies" approaches to address the determinants of ill health can significantly enhance tuberculosis (TB) care and prevention efforts. Recognizing the broader determinants contributing to the TB epidemic necessitates coordinated action across multiple sectors and emphasizes the importance of accountability. Prioritizing action on the social determinants of TB is integral to establishing robust policies and supportive systems essential for TB control. Within this framework, there is consensus on the need for research to evaluate how social determinants impact TB risk[8].

A comprehensive understanding of socio-epidemiological factors and their interplay is crucial for effectively managing both drug-sensitive and drug-resistant TB. Nevertheless, there is limited information available, particularly in northern Karnataka and across the country, regarding the magnitude and direction of these interactions. Given this context, our study is focused on examining the social and epidemiological characteristics of patients with drug-sensitive and drug-resistant TB in the Vijayapura district.

Figure 3: EVOLUTION OF NTEP



National Tuberculosis Institute (NTI) was established in 1959 at Bengaluru by the Government of India in close collaboration with the WHO and UNICEF. The prime objective of the institute was to

formulate the National TB Control Programme best suited to a country like ours, where the TB problem was huge and the resources were inadequate. The draft District Tuberculosis Programme was prepared in the year 1961. This was pilot tested in Ananthpur district of Andhra Pradesh.

The National Tuberculosis Programme (NTP-1962) in India focused on domiciliary treatment, allowing patients to receive TB care at home, which made treatment accessible and reduced hospital transmission risks. The program used a standardized 12–18 months drug regimen, including medications like Isoniazid and Rifampicin, to ensure thorough treatment. All TB care was provided free of cost, making it accessible to all, particularly the underprivileged. Priority was given to newly diagnosed patients to quickly control the spread of TB, while previously treated patients also received care. The program relied on a mostly self-administered regimen, with regular follow-ups by healthcare workers to ensure adherence and address defaulters efficiently.

In 1992, the Government of India, reviewed the national programme and concluded that it suffered from

- Managerial Weakness,
- Inadequate Funding,
- Over-Reliance on X-Ray,
- Non-Standard Treatment Regimens,
- Low Rates of Treatment Completion,
- Lack of Systematic Information on Treatment Outcomes.

As a result, a Revised National Tuberculosis Control Programme (RNTCP) was designed. The large-scale implementation of the RNTCP 1 was started in 1997. The RNTCP was then expanded across India until the entire nation was covered by the RNTCP II in March 2006. RNTCP II was designed to consolidate the gains achieved in RNTCP I, and to initiate services to address TB/HIV, MDR-TB and to extend RNTCP to the private sector.

Objectives of RNTCP:

1. To achieve and maintain a cure rate of at least 85% among newly detected infectious (new sputum smear positive) cases.

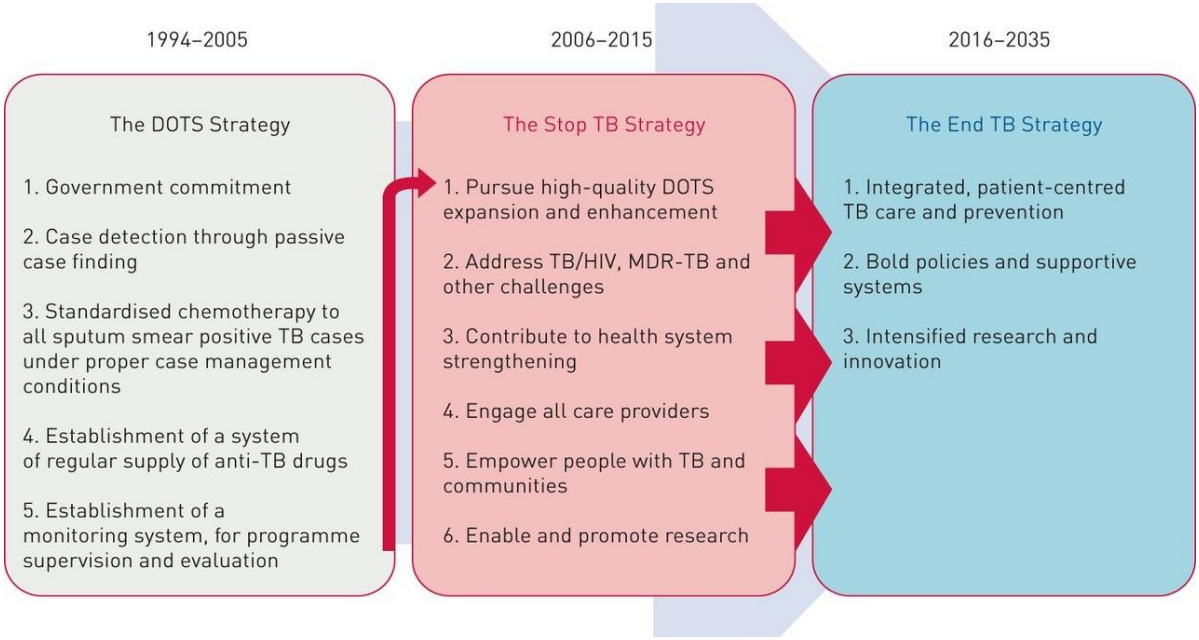
2. To achieve and maintain the detection of at least 70% of such cases in the population.

It emphasizes the augmentation of organizational support at both central and state levels, ensuring robust frameworks and local implementation capabilities. Sputum testing is established as the primary diagnostic method, complemented by advanced techniques like GeneXpert for more accurate detection. A standardized treatment regimen is followed to maintain consistency and effectiveness in patient care. The program also guarantees a regular, uninterrupted supply of drugs, crucial for sustained treatment success. Training, Information, Education, and Communication (IEC) activities, operational research, and involvement of NGOs are prioritized to bolster community engagement and knowledge. An increased budget outlay supports these extensive measures, and the cornerstone of the program remains the Directly Observed Treatment (DOTS) strategy, ensuring patients adhere to their treatment regimen, thereby reducing TB's spread and impact. It was enhanced with HIV/TB collaborative activities from 2001.

RNTCP II, the second phase of India's Revised National Tuberculosis Control Program, introduced significant advancements to address emerging challenges in TB control. A key focus was on combating Multi-Drug Resistant TB (MDR-TB) through the DOTS-Plus strategy, offering specialized treatment and monitoring. To guide these efforts, National Strategic Plans were developed every five years, providing structured approaches for TB control. RNTCP II also paid special attention to paediatric TB, ensuring better diagnostic and treatment options for children. The launch of the Nikshay Portal in 2012 revolutionized TB case tracking and management, enhancing data accuracy and real-time monitoring. Additionally, the establishment of Sub-District TB Units improved access to TB services in rural areas, ensuring that comprehensive TB care reached every corner of the country.

In 2006, WHO released STOP TB STRATEGY with six principal components, to realize the global TB-related MDGs by 2015. In 2014, the World Health assembly approved to end global TB epidemic by END TB STRATEGY. These shifts encouraged our government to rename the TB program as National Tuberculosis Elimination Programme (NTEP) and adopt newer strategy and targets

Figure 4: EVOLUTION OF STRATEGY



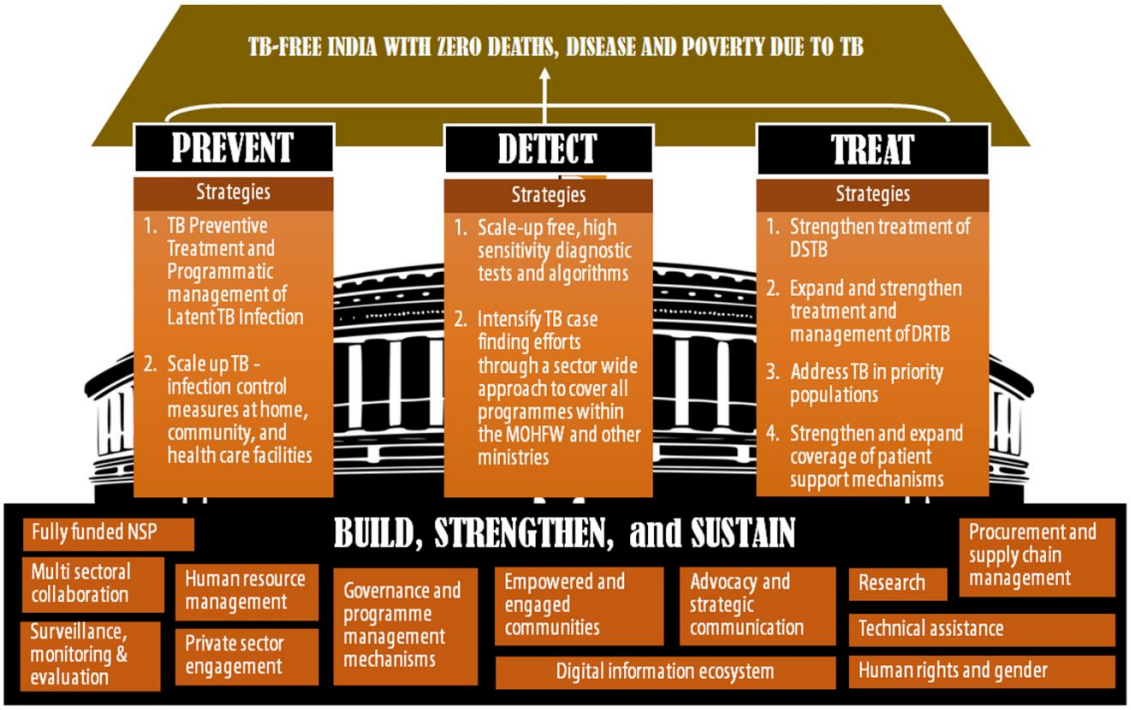
National Tuberculosis Elimination Programme (NTEP)

The National Tuberculosis Elimination Programme (NTEP), formerly the Revised National Tuberculosis Control Programme (RNTCP), is a crucial public health initiative by the Government of India. It organizes and directs anti-tuberculosis efforts nationwide and serves as a flagship component of the National Health Mission (NHM). NTEP provides technical and managerial leadership for TB control activities nationwide.

Goal: To achieve a rapid decline in the burden of TB, morbidity, and mortality while working towards the elimination of TB in India by 2025.

Vision: Achieve a "TB-free India" as per the National Strategic Plan 2017–25.

Figure 5: KEY PILLARS UNDER NSP



Objectives:

1. Build, strengthen, and sustain enabling policies, institutions, collaborations, and capacities to accelerate TB prevention, detection, and treatment.
2. Prevent TB emergence in vulnerable populations.
3. Early identification and prompt diagnosis of TB using high-sensitivity tests for universal access to quality TB care.
4. Ensure equitable access to free, high-quality TB treatment and support services, particularly for vulnerable populations.

AIM AND OBJECTIVES OF THE STUDY

1. To assess the sociodemographic details, previous treatment history and clinical characteristics of T.B patients.
2. To understand the health-seeking behaviour and nutritional status of T.B. patients.
3. To evaluate comorbidities among T.B patients.

REVIEW OF LITERATURE

Tuberculosis (TB) is an infectious disease caused by Mycobacterium tuberculosis (MT) that is characterized by the formation of tubercles in various parts of the body [9]. MT is notably ancient, having persisted for over 70,000 years and currently affecting nearly 2 billion people globally [10]. Annually, there are approximately 10.6 million new TB cases, indicating that about one-third of the world's population harbours the TB bacterium and is at risk of developing active TB disease [11]. Globally in 2022, there were an estimated 1.13 million deaths among HIV-negative people (95% uncertainty interval [UI]: 1.02–1.26 million) and an estimated 167 000 deaths among people with HIV (11).

Because of its infectious nature, intricate immunological response, chronic progression, and the requirement for prolonged treatment, tuberculosis (TB) has long been a significant health challenge. In recent years, the emergence of multi-drug resistant strains and the concurrent TB-HIV epidemic have compounded this challenge, bringing severe social implications. Consequently, the treatment and prevention of TB have remained persistent challenges throughout human history. (12,13).

Ancient times: the first historical records

It has been suggested that the genus Mycobacterium has existed for over 150 million years. Mycobacterium ulcerans, which has caused infections since ancient times, thrives under specific environmental conditions, a factor evident in its global distribution today (14). Three million years ago, an early precursor of Mycobacterium tuberculosis (MT) potentially infected early hominids in East Africa. Around 15,000 to 20,000 years ago, it is believed that the common ancestor of modern strains of MT emerged for the first time (15).

Egyptian mummies dating back to 2400 BC show evidence of skeletal deformities that are typical of tuberculosis. These include characteristic Pott's lesions, which are lesions found on the spine due to TB infection. Similar abnormalities are also depicted in early Egyptian art, indicating that tuberculosis was recognized and observed in ancient Egyptian society. (16)

There is no reported evidence of tuberculosis (TB) lesions found in Egyptian papyri. However, the first written records describing TB date back to approximately 3300 years ago in India and about 2300 years ago in China. These early historical documents provide valuable insights into the early recognition and understanding of tuberculosis in ancient civilizations outside of Egypt. (17)

Written related to tuberculosis (TB) in the context of Hebraism include references to the ancient Hebrew word "schachepheth," which appears in the Biblical books of Deuteronomy and Leviticus to describe symptoms resembling TB. (18)

Additionally, archaeological evidence from the Andean region, particularly from Peruvian mummies, has provided early evidence of TB, including skeletal deformities such as Pott's disease. This suggests that TB was present in South America even before the arrival of the first European colonizers. These findings underscore the antiquity and global presence of tuberculosis across different ancient civilizations and geographical regions. (19)

In Roman times, tuberculosis (TB) was mentioned by Celso, Aretaeus of Cappadocia, and Caelius Aurelianus. However, during this period, there was not a unified understanding that all manifestations of TB shared the same underlying cause. Extrapulmonary manifestations such as scrofula (a form of lymphadenitis), Pott's disease (TB affecting the spine), and TB lupus (cutaneous tuberculosis) were observed and described, but they were not necessarily linked to pulmonary tuberculosis as sharing the same etiology. This lack of recognition of a common etiology for different manifestations of TB persisted until much later in medical history when advancements in microbiology and understanding

of infectious diseases provided clarity on the causative agent, Mycobacterium tuberculosis, and its ability to affect various parts of the body.

According to the Greek physician Galen, who served as the personal physician to Roman Emperor Marcus Aurelius around 174 AD, the symptoms of tuberculosis (TB) included fever, sweating, coughing, and blood-stained sputum. Galen recommended several treatments for TB, including fresh air, milk, and sea voyages, which he believed could be successful in managing the symptoms of the disease. Galen's recommendations reflected the medical knowledge and practices of his time, which focused on balancing bodily humors and environmental factors to treat illnesses like TB. His emphasis on fresh air and the perceived health benefits of sea voyages aligns with early ideas about the therapeutic effects of climate and natural elements on respiratory diseases. [20]

In Byzantine medical history, doctors such as Aetius of Amida, Alexander of Tralles, and Paul of Aegina provided descriptions of both pulmonary and glandular forms of tuberculosis (TB) [24]. Their writings contributed to the understanding of TB's various manifestations during that era. Meanwhile, in the Arabic Empire, Avicenna (Ibn Sina) speculated on the contagious nature of TB. Avicenna, a prominent Persian physician and polymath of the Islamic Golden Age, made significant contributions to medicine, including his observations and hypotheses regarding infectious diseases like tuberculosis. His insights into the contagiousness of TB were notable advancements in understanding the transmission and spread of the disease in medieval times. [21]

Middle Ages and renaissance time: the king's evil and the discovery of extra pulmonary TB

In the Middle Ages, scrofula, a condition characterized by swelling of the cervical lymph nodes (glands in the neck), was indeed considered a clinical manifestation of tuberculosis (TB). This form of TB

became famously known in England and France as the "king's evil." It was believed that individuals afflicted with scrofula could be miraculously healed through the touch of a royal figure, such as a king or queen. This belief was deeply rooted in the concept of the divine right of monarchs and their supposed ability to cure diseases by virtue of their position. The tradition of the royal touch for scrofula persisted for centuries and was practiced across various European monarchies. Although it was based on a belief in the healing powers of royalty rather than scientific understanding, it underscored the significance of TB and its various manifestations in medieval society. [22]

In the Middle Ages, specifically in 1363, the French surgeon Guy de Chauliac proposed a healing intervention for the cure of "king's evil. [23]

Girolamo Fracastoro, an Italian physician, who lived in the sixteenth century, is credited with providing one of the earliest clear definitions regarding the contagious nature of tuberculosis (TB). In his work "De contagione et contagiosis morbis et curatione" ("On Contagion, Contagious Diseases, and Their Treatment"), published in 1546, Fracastoro discussed the concept of contagious diseases and how they can be transmitted from person to person. [24]

Francis Sylvius, in his work "Opera Medica" published in 1679, provided a detailed pathological and anatomical description of tuberculosis (TB). In this seminal work, Sylvius described various aspects of the disease progression, including the formation of tubercles, their development into abscesses, the formation of cavities, and the occurrence of empyema (pus accumulation) in the lungs and other affected areas in consumptive patients. Sylvius' anatomical observations and pathological descriptions were pioneering for their time, offering crucial insights into the nature and progression of tuberculosis. His work contributed significantly to the evolving understanding of TB during the early modern period, laying important groundwork for future medical research and clinical practices related to the disease. [25]

18th to 19th centuries: the infectious theory and isolation of the Koch bacillus

In 1720, Benjamin Marten, an English physician, put forth one of the earliest conjectures about the infectious origin of tuberculosis (TB) in his publication titled "A New Theory of Consumption." Marten's work marked a significant step forward in understanding TB, as he speculated on the possibility that the disease could be transmitted from person to person through infectious agents. Marten's writings demonstrated a remarkable level of epidemiological insight for the early eighteenth century. While his conjectures were speculative and lacked the scientific tools and knowledge available today, they represented a crucial early attempt to move beyond purely symptomatic or anatomical descriptions of TB toward exploring its potential infectious nature. Marten's work contributed to the ongoing discourse and investigation into the causes and transmission of TB, laying the groundwork for later breakthroughs in microbiology and the eventual identification of Mycobacterium tuberculosis as the causative agent of the disease. [26]

During the Industrial Revolution, tuberculosis (TB) spread widely due to crowded and poorly ventilated housing, deprived work conditions in factories, inadequate sanitation, malnutrition, and other social factors. These conditions facilitated the transmission of TB among populations, particularly in urban areas, contributing to its epidemic status during that era. [27]

In the 18th century, tuberculosis (TB) had reached epidemic proportions in Western Europe, with devastating consequences. The disease had a mortality rate that could be as high as 900 deaths per 100,000 inhabitants per year, which was particularly elevated among young people. Because of its significant impact on the younger population, TB earned the grim nickname "the robber of youth." This period marked a time of widespread suffering and social upheaval due to TB, which was exacerbated by factors such as overcrowded urban living conditions, poor nutrition, and lack of effective medical treatments. The high mortality rate among the youth population underscored the

profound societal impact of TB during this era, leading to increased awareness and efforts to combat the disease through public health measures and medical advancements in the centuries that followed.[28] The extreme anemic pallor of people affected by TB was at the origin of the new term "white plague", coined during the 18th century.

In 1838-39, tuberculosis (TB) had a devastating impact on English tradesmen and employees, with up to a third of them dying from the disease. This high mortality rate reflected the challenging living and working conditions faced by the lower socioeconomic classes during the Industrial Revolution. In contrast, the upper class experienced a lower mortality rate, with about a sixth of them succumbing to TB during the same period. This disparity underscores the socioeconomic divide in health outcomes and access to resources, highlighting how TB disproportionately affected the poorer segments of society who were more vulnerable to its spread in crowded and unsanitary urban environments. [28]

One hundred years later, TB was defined as "Captain of All These Men of Death" because of its epidemic proportions in Europe and North America, determining one in four deaths.

In the early 19th century, scientific debates in Europe centered around tuberculosis (phthisis). There were differing theories regarding its Etiology:[27]

1. **Infectious Disease**: In Southern Europe, tuberculosis was seen as infectious, emphasizing its transmission through contact.
2. **Hereditary Theory**: Northern European perspectives suggested tuberculosis could be hereditary, implying a familial predisposition.
3. **Cancer Hypothesis**: Some considered tuberculosis akin to cancer, viewing it as involving abnormal tissue growth.

Debate also revolved around whether scrofula, tubercles, and phthisis were separate diseases or different manifestations of the same illness. These discussions reflected evolving medical understanding and cultural interpretations before Mycobacterium tuberculosis was identified as the cause later in the century.

In 1793, the Scottish pathologist Matthew Baillie coined the term "tubercles" to describe the caseous necrosis or "cheese-like" phthisic abscesses found in tuberculosis. (29)

In 1810, the French physician Gaspard-Laurent Bayle of Vernet described disseminated "miliary" tuberculosis in his work titled "Recherches sur la Phthisie Pulmonaire." Bayle's observations marked a significant advancement in understanding tuberculosis (TB), as he recognized that TB was not solely a disease confined to the lungs but could manifest in a disseminated or generalized form throughout the body. Bayle identified clinical features of tuberculosis beyond pulmonary symptoms, including coughing, difficulty breathing, fever, and the expectoration of purulent material. (30)

In 1819, the French physician Théophile Laennec identified key signs of tuberculosis (TB) such as lung consolidation, pleurisy, and pulmonary cavitation, which are indicative of both pulmonary and extrapulmonary TB. [33] Mycobacterium tuberculosis primarily affects the respiratory tract but can also infect other organs such as the gastrointestinal tract, bones, joints, nervous system, lymph nodes, genitourinary tract, and skin. These infections cause inflammatory infiltration, necrosis, abscesses, fibrosis, tubercle formation, and sometimes calcification.(31) He identified tubercles as the defining features of the initial stage of phthisis. He documented their initial appearance in the lungs in a "miliary" or millet seed-like form, their progression into larger tubercles containing caseous or cheese-like material, their subsequent breakdown into pus, and ultimately their development into cavities and empyema.

Sir Percivall Pott, a British surgeon, recognized the presence of extra-pulmonary tubercles in various organs such as the intestines, liver, meninges, and others. In 1779, he notably defined "Pott's disease" as the collapse of vertebrae and subsequent spinal cord paralysis resulting from tuberculosis infection. His observations expanded the understanding of tuberculosis beyond pulmonary manifestations, highlighting its capacity to affect multiple organ systems and lead to debilitating conditions like spinal deformities.[29]

In 1843, the German physician Philipp Friedrich Hermann Klencke achieved the experimental reproduction of both human and bovine forms of tuberculosis (TB). He induced generalized TB in rabbits by successfully inoculating material from a miliary tubercle into their liver and lungs. This groundbreaking experiment demonstrated the transmissibility and pathogenicity of Mycobacterium tuberculosis, marking a pivotal moment in the scientific understanding of tuberculosis and its infectious nature.[23]

The first successful treatment for tuberculosis (TB) was the introduction of the sanatorium cure, which was first described in 1854 in the doctoral dissertation titled "Tuberculosis is a curable disease" by Hermann Brehmer. Brehmer, originally a botany student who was suffering from TB himself, reported his own recovery after traveling to the Himalayan Mountains. His dissertation advocated for the benefits of rest, fresh air, and a healthy diet in the treatment of TB, laying the foundation for the sanatorium approach.[32]

Villemin proposed that phthisis might be akin to glanders, an infectious disease affecting horses This infectious theory was extensively documented in Villemin's work "Études sur la tuberculose. Preuves rationnelles et expérimentales de sa spécificité et de son inoculabilité," published in 1868.[33] In this work, Villemin presented evidence of TB-like illnesses occurring in various animals, supporting his hypothesis of tuberculosis as an infectious disease with specific characteristics and the ability to be

transmitted through inoculation. The author also observed that densely populated urban areas exhibited a higher prevalence of tuberculosis (TB). Additionally, the author noted that certain regions of the world, such as New Zealand and Australia, appeared not to have experienced TB until the arrival of European pioneers.

Several years later, in 1867, Theodor Albrecht Edwin Klebs was among the early scientists attempting to isolate the tuberculosis (TB) bacillus. He conducted experiments by placing tuberculous material on egg white stored in sterile flasks. During these experiments, the cultures quickly became turbid, and Klebs was able to identify mobile bacilli. Upon inoculating these bacilli into the peritoneal cavity of guinea pigs, he successfully induced the disease, demonstrating the pathogenicity of the isolated bacilli. (34)

The renowned scientist Robert Koch successfully isolated the tubercle bacillus. He utilized the methylene blue staining technique recommended by Paul Ehrlich to identify, isolate, and cultivate the bacillus in animal serum. Koch's meticulous work culminated in reproducing the disease by inoculating the isolated bacillus into laboratory animals. This achievement marked a significant milestone in medical science, solidifying Koch's reputation and laying the foundation for further advancements in tuberculosis research and treatment. (35)

On 24 March 1882, Robert Koch presented his groundbreaking discovery of the tubercle bacillus to the Society of Physiology in Berlin. This pivotal moment marked a milestone in the fight against tuberculosis (TB), as Koch's identification of the bacillus provided a definitive understanding of the causative agent of the disease. This achievement not only revolutionized TB research but also paved the way for the development of diagnostic methods, treatment strategies, and ultimately, efforts to control and eradicate tuberculosis globally. (36)

Following Robert Koch's discovery of the tubercle bacillus in 1882, significant progress was made in combating tuberculosis (TB). The Pirquet and Mantoux tuberculin skin tests were developed for diagnosis, while Albert Calmette and Camille Guérin created the BCG vaccine for prevention. Streptomycin, discovered by Selman Waksman, and other anti-tuberculous drugs revolutionized treatment. Koch's work on TB's infectious nature earned him the Nobel Prize in Medicine in 1905, marking a pivotal moment in TB research and public health efforts. [35]

Today, tuberculosis (TB) remains a significant public health challenge globally. The World Health Organization (WHO) has committed to eradicating Mycobacterium tuberculosis by 2050. Achieving this goal requires a comprehensive strategy focused on improving drug treatments, enhancing diagnostic tools, and implementing effective prevention measures. This combined approach aims to curb TB transmission, ensure early detection and treatment, and ultimately eliminate TB as a major health threat worldwide by the target year of 2050. [37]

History of tuberculosis (TB) in India

The history of tuberculosis (TB) in India dates back to 606 BCE, as documented in the ancient text Sushruta Samhita. India's first TB sanatorium was established near Ajmer in Rajasthan in 1906, followed by the inauguration of the first TB medical dispensary in 1917. By 1925, TB diagnosis using X-rays became feasible. Post-independence, the Indian government initiated several regional and national programs aimed at reducing TB cases. In 1951, with support from WHO and UNICEF, a BCG vaccine production center was established in Guindy, Madras, leading to a nationwide BCG vaccination campaign. [39]

Epidemiology of tuberculosis:

Global scenario:

In 2022, an estimated global total of 10.6 million people were diagnosed with tuberculosis (TB). This equates to approximately 133 incident cases per 100,000 population. Among all incident TB cases, 6.3% occurred in individuals living with HIV. Geographically, the majority of TB cases in 2022 were concentrated in the WHO regions of South-East Asia (46%), Africa (23%), and the Western Pacific (18%). Smaller proportions were reported in the Eastern Mediterranean (8.1%), the Americas (3.1%), and Europe (2.2%). These statistics highlight the global distribution of TB burden and underscore the ongoing public health challenge posed by the disease in various regions.[11]

Indian scenario:

Tuberculosis remains a major public health issue in India, as highlighted by the statistics provided. In 2020, India had the world's largest TB epidemic, accounting for 26% of global incident cases. The country's incidence rate was 192 cases per 100,000 people. India also had significant TB-related mortality, responsible for 38% of global TB deaths among HIV-negative individuals and 34% of total TB deaths when including both HIV-positive and HIV-negative populations. Furthermore, India represented 24% of the global gap between estimated TB cases and the number of cases diagnosed and reported. The estimated incidence of TB in 2023 increased slightly to 27.8 lakh from the previous year's estimate of 27.4 lakh. The mortality due to the infection remained the same at 3.2 lakh as per the data. [38]

Risk factors associated with the development of active TB:

- Immunocompromise
    - Immune senescence of older age
    - Genetic diseases causing immunodeficiency
    - HIV infection
    - Prolonged corticosteroid use
    - Cytoreductive chemotherapy
    - Transplantation
    - Tumor necrosis factor (TNF) antagonists
    - Malnutrition
    - Diabetes
- Tobacco
- Alcohol abuse

To combat the disease burden of TB, its morbidity and mortality, the Government of India started the national health programme, which has undergone many changes according to the drawbacks of each one. The evolution of the programme is as follows:

Evolution of TB Control programme in India (39)

1962: National Tuberculosis Programme (NTP)

1993: Revised National Tuberculosis Control Programme (RNTCP) in population of

2.4 million of 5 states

1995: RNTCP expanded to cover 13 million people

1996: Later expanded to cover 20 million

1997: RNTCP adopted the internationally recommended DOTS (Directly Observed Treatment Short-course)

2006: India adopted the components of STOP TB Strategy

2012-17: National Strategic Plan with a vision of TB Free India

2012: GOI mandates all healthcare providers to notify every TB case diagnosed and/or treated, to local authorities.

2014: Standards for TB Care in India (STCI)

2015: End TB Strategy

2017-2025 National Strategic Plan II

2019: National Tuberculosis Elimination Programme (NTEP)

Complications of tuberculosis:

TB results in morbidity from acute and chronic complications. TB remains in the top 20 causes of morbidity as measured by disability adjusted life years [11]. These complications result from systemic, metabolic, infectious, or structural derangements as a consequence of current or prior TB disease. Comorbid conditions, including HIV, diabetes, and organ transplantation, further complicate TB treatment.

Acute and subacute complications:

- Tuberculosis sepsis and acute respiratory failure
- Paradoxical reaction in tuberculosis sepsis and other forms of tuberculosis
- Complications associated with comorbidities
- Extrapulmonary tuberculosis complications (table 1)
- Metabolic complications
- Complications of human immunodeficiency virus associated tuberculosis

Chronic complications:

Architectural compromise of lung parenchyma or airways

Infectious complications – mycetoma

Other complications:

- **Drug-Resistant TB**:
- **Disseminated TB**

- **HIV Co-Infection**
- **Complications in Pregnancy**: TB infection during pregnancy can increase the risk of complications such as premature birth, low birth weight, or transmission of TB to the baby.
- **Social and Psychological Impact**: TB can have significant social and economic consequences due to stigma, loss of productivity, and the cost of treatment. It can also cause psychological distress, anxiety, and depression in affected individuals.

Treatment of tuberculosis:

Objectives of treatment

1. Achieving rapid killing of TB bacilli to produce rapid improvement in clinical condition, prevent TB-related morbidity and death and prevent further transmission;
2. preventing the emergence or worsening of drug resistance;
3. preventing relapse of disease and achieving long-lasting cure; and
4. optimizing long-term health by ensuring linkage to care for treatment of co-morbidities, and helping mitigate social and economic vulnerability.

Regimen for Drug sensitive cases (40)

Treatment is given in two phases:

1. Intensive phase consists of 8 weeks (56 doses) of isoniazid (H), rifampicin (R), pyrazinamide (Z) and ethambutol (E) given under direct observation in daily dosages as per weight band categories

2. Continuation phase consists of 16 weeks (112 doses) of isoniazid, rifampicin and ethambutol in daily dosages. Only pyrazinamide will be stopped in the continuation phase. The CP needs to be

extended upto 24 weeks in certain forms of TB like CNS TB, Skeletal TB. In disseminated TB or slow response treating physician may extend on case-to-case basis.

Figure 6: Treatment algorithm for MDR TB [41]

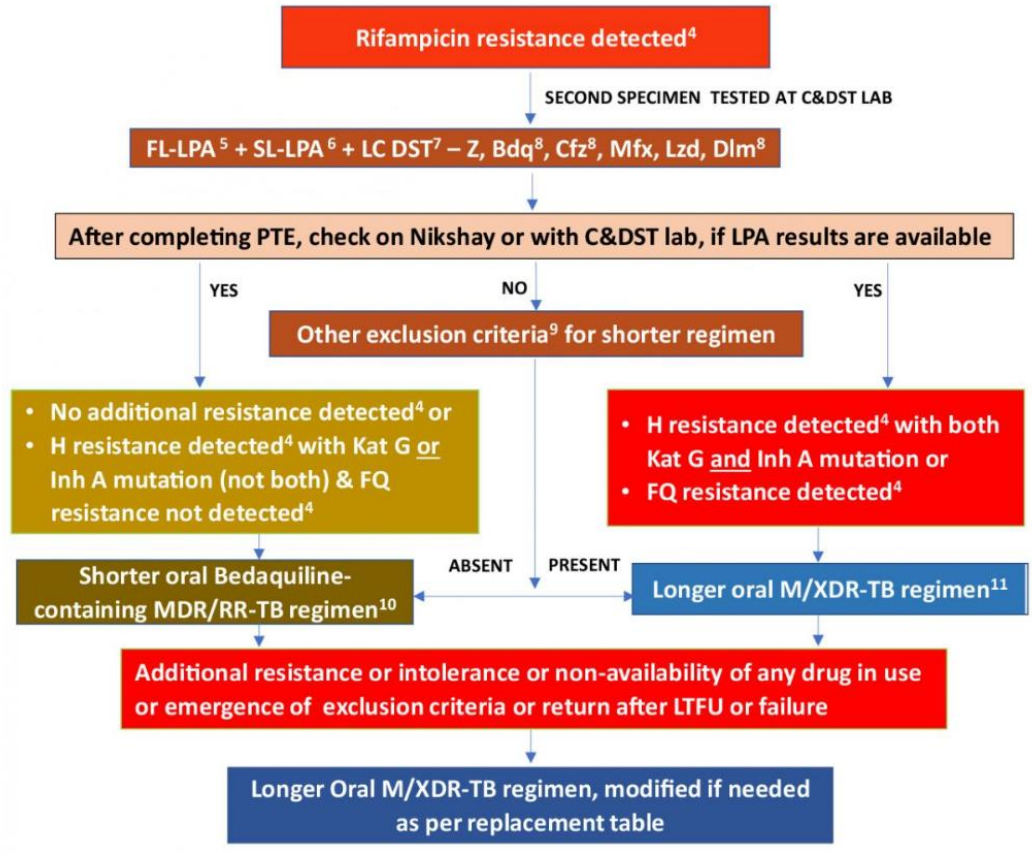


Figure: Treatment Algorithm for MDR/RR-TB; *Source: PMDT Guidelines India, March 2021, p46.*

Related studies:

In a Retrospective analysis done in Delhi by Priyanka Sharma, Madhur Verma, Meenakshi Bhilwar, Himanshu, Neelam Roy, Anita Verma, Geeta Pardeshi et al in 2019 on Epidemiological profile of tuberculosis patients in Delhi, India: A retrospective data analysis from the directly observed treatment short-course (DOTS) found that the majority of cases were new (77.1%) and pulmonary TB (69.2%). The highest disease burden was found in the 20–60-year age group (72.2%) and males (58.6%). Genitourinary TB was present only among females. None of the patients was HIV positive. A significant association was found between the age group of 20–60 years and relapse and loss to follow-up cases *(P* < 0.05). It was concluded that A higher proportion of adult males aged 20–60 years constituted the majority of patients treated in the DOTS center. Focussed interventions can be designed for this age group in future public health policies to reduce disease burden in the total population [(42).]

A cross-sectional study by U. Venkatesh et al in 2018 on Epidemiological profile of multidrug-resistant tuberculosis patients in Gorakhpur Division, Uttar Pradesh, India of 157 MDR-TB patients from Gorakhpur division admitted at DR-TB Center of a tertiary care center found that more than 2/3rd of patients was male and the mean age was 32.15 ± 13.19 years and overcrowding was present in 82.8% of households and ventilation of living room was inadequate in 72.7% of households. About 21.7% had history of contact with TB cases. Among Two-third of the patients practice unhygienic sputum disposal practices at home and at public places it was more than 90%. More than 60% of patients have the history of irregular treatment in intensive phase and 80% in continuation phase. Nearly 68.8% of patients were resistant to isoniazid (H) and rifampicin (R) and 18.5% were resistant to H, R, and S (streptomycin) followed by H, R and E (Ethambutol). Nearly 3.8% of patients were HIV positive and

7% had history of diabetes. 64.3% were under severe thinness category according to the WHO classification [43].

A cross-sectional, descriptive study by Priyanka Tomar et al was conducted on 70 patients above 60 years of age, who attended the outpatient department or those who were admitted in the geriatric ward of BLDE DU, Shri B. M. Patil Medical College, with symptoms suggestive of pulmonary tuberculosis over a period of twenty-four months irrespective of sex found that male predominance was seen with 48% of elderly in age group of 60-65 years presented with typical features like fever, cough, evening rise of temperature while 32% had atypical symptoms like decreased appetite, increased thirst, weight loss and breathlessness. The study concluded that the Importance of sputum examination cannot be undermined in elderly and high degree of suspicion will help reach the diagnosis [44].

In a Cross-Sectional Study conducted by Priyanka Sharma et al at IGMC, Shimla, Himachal Pradesh, focusing on the Clinico-Epidemiological Profile of Tuberculosis Patients in a Tertiary Care Hospital of Northern India, findings reveal significant trends. Among the observed cases, individuals aged between 18 to 59 years comprised 75% of TB cases. Furthermore, 84% of participants hailed from rural areas. Only 18% had undergone previous treatment, and 52% were diagnosed with extrapulmonary TB. Microbiological confirmation was present in 52% of cases, with microscopy being the most common diagnostic method (56%). Notably, extrapulmonary TB was more prevalent in rural settings compared to urban areas. There was a statistically significant difference in the proportion of previously treated patients between pulmonary (22.7%) and extrapulmonary TB (13.5%). The majority of pulmonary TB cases (89.6%) were microbiologically confirmed, contrasting

with 17.3% confirmation among extrapulmonary TB patients. These findings underscore a higher prevalence of extrapulmonary TB cases, particularly in rural areas, within Himachal Pradesh [45].

In a study led by Anita Velingker et al. at the Department of Pulmonary Medicine, Goa Medical College, 1598 tuberculosis cases were analysed for treatment outcomes. Of these, 492 (30.9%) were identified as extrapulmonary TB (EPTB) while 1106 (69.1%) were pulmonary TB (PTB), yielding an EPTB to PTB ratio of 1:2.2. The most prevalent form of EPTB was TB affecting the pleural cavity (39.43%), followed by lymph node and lymphatics involvement (27.6%). Notably, EPTB cases were more common among males than females. Within different age groups, individuals aged 30-50 years exhibited the highest proportion of EPTB cases, regardless of gender. Additionally, 46 (9.34%) of EPTB cases were immunocompromised due to HIV, while 47 (9.55%) had diabetes mellitus [46].

In a 2017 study published by Aneeta et al. at Acharya Shri Chander College of Medical Sciences & Hospital among 230 tuberculosis (TB) patients, 82.6% were diagnosed with pulmonary TB, while 17.4% had extrapulmonary TB. The male-to-female ratio was observed to be 1.7:1. The highest number of patients fell within the age group of 20-40 years. Disseminated TB (30%), abdominal TB (22.5%), and lymphadenitis were identified as the most common forms of extrapulmonary TB. The majority of cases (74.7%) hailed from rural areas, with a history of contact present in 13% of cases. Smoking and alcohol consumption were reported in 38.2% and 16% of patients, respectively. Diabetes was prevalent in 19.1% of patients. Notably, 53% of cases tested positive on the Mantoux test, while 62.7% were smear positive on ZN staining [47].

In a study conducted in 2022 by Singhal et al, extra pulmonary TB (EPTB) formed 29.7% of all TB cases. Among all EPTB cases, pleural TB was found to be the most common form, accounting for27%. The study also revealed that female gender, young age, non-diabetic status, and high BMI were associated with an increased propensity to have EPTB. Interestingly, unlike pulmonary TB, which had increased odds for contracting the disease in diabetic individuals (OR e2.02), there were no increased odds for contracting EPTB in diabetic individuals. However, HIV infection significantly increased the odds for both pulmonary TB and EPTB. The results also showed diagnostic discrepancies between the private and public sectors, along with a low microbiological confirmation rate of 7.1% in EPTB cases (48).

Bhattacharya et al in their study, among 173 TB patients found that the average age was 41.05 years, with a standard deviation of 17.04 years, and there was a notable male-to-female ratio of approximately 4.27:1. A considerable proportion presented with pulmonary TB (43.94%), while extra-pulmonary TB (52.02%) and disseminated TB (4.04%) were also observed. Predominant symptoms included fever (61.27%), cough (54.33%), and breathlessness (32.94%). In the subgroup comprising 83 patients with PTB or disseminated TB, 67.4% tested positive for sputum. Pleural effusion (53.33%), CNS tuberculosis (26.66%), and abdominal tuberculosis (8.88%) were the primary forms of EPTB observed among the 90 patients diagnosed. Regarding comorbidities, they were present in 53.17% of patients, with diabetes mellitus (26.58%) and hypertension (17.34%) being the most common. Notably, comorbid conditions were significantly more prevalent in PTB compared to EPTB cases (51 out of 83 vs. 41 out of 90, $p<0.05$). Moreover, the mean glycated haemoglobin (HbA1c) level was notably higher in PTB patients compared to those with EPTB (8.74 ± 2.04 vs. 7.58 ± 0.29, $p<0.05$)(49).

In an observational descriptive study employing a cross-sectional design, conducted at the Drug-Resistant Tuberculosis Centre of R. G. Kar Medical College in Kolkata, West Bengal, among patients

enrolled for the DR-TB regimen from July 2016 to March 2017, it was observed that out of 159 cases examined, 27% of patients fell within the 21-30 years age category, with males comprising the majority at 68.6%. A significant portion of patients, 56.6%, were classified as underweight (BMI<18.5kg/m2). HIV seropositivity was detected in only 2.5% of cases. Among all cases, 81.1% had a history of taking Anti-Tuberculosis Drugs (ATD), and 34.4% had previously been cured in episodes of treatment. The most common associated comorbidity was diabetes mellitus (DM), affecting 15.7% of patients. Rifampicin resistance was the most prevalent (93.1%), followed by Isoniazid resistance (8.2%). Pallor was observed among a striking 94.3% of patients. Additionally, the majority of patients exhibited bilateral (62.3%) and moderately extensive (57.2%) lesions on chest X-rays[50].

In a cross-sectional study conducted among 81 M.D.R. TB patients in 2008 and published in 2012 by Bhatt G et al. in Ahmedabad, the majority of TB patients were males, predominantly in the age group of 16-45 years. Most patients had primary-level education and resided in overcrowded, poorly ventilated houses. Initially, nearly all patients presented with pulmonary TB. At the initiation of category II treatment, the highest number of patients defaulted due to financial constraints. On average, patients had undergone 2.85 courses of Anti-Tubercular Treatment (ATT) prior to category IV treatment. Over 90% of patients experienced drug side effects, and while indiscriminate spitting was less common, other methods of sputum disposal were unsafe. Resistance to all four drugs (H, R, S & E) was found in more than two-thirds of cases. Smear and culture conversion rates at the three-month follow-up were 62.0% and 58.7%, respectively. HIV positivity was observed in only one patient (1.2%) in the study [51].

In a study published by Lila Adhikari et al in 2022, among 345 MDR TB patients from 2015 to 2019 in Bhutan who were diagnosed with MDR-TB between 2015 and 2019 at NTRL. There were 273 (89.80%) pulmonary and 31 (10.20%) extra pulmonary cases. The average age of patients was 29.72 years (SD 13.83) and ranged from 28 days to 90 years. Among the total cases, 259 (85.20%) were new cases, 24 (7.89%) had a previous history of treatment, and 21 (6.91%) had unknown treatment history. Females (59%) were more than males. 85.20% (n=259) are new cases with no previous history of treatment. Those aged 16−25 years from both genders are affected more (46.05%, n=140) than other age groups [52].

In a retrospective study conducted by Rkia eddabra et al. during 2017-2018 among 211 tuberculosis patients in Laayoune, Morocco, the epidemiological profile of both pulmonary and extrapulmonary tuberculosis cases was investigated. The majority of cases (93.40%) were newly diagnosed, with pulmonary tuberculosis accounting for 63.50% of the total. The highest disease burden was observed in the ≥15-year age group. Men were more frequently affected by pulmonary tuberculosis (70.90%), whereas extrapulmonary tuberculosis was more commonly detected in women (61%). The most prevalent sites of extrapulmonary disease were lymphatic (32.47%), pleural (16.88%), and spinal tuberculosis (15.58%). HIV infection and smoking emerged as significant risk factors affecting host defence against TB infection [53].

In a cross-sectional study published by Melaku Tilahun et al. in Ethiopia among 105 tuberculosis patients from 2014 to 2015, focusing on molecular epidemiology and drug sensitivity, Cultures yielded positive results in 86 out of 105 (82%) newly diagnosed smear-positive pulmonary TB cases. The majority of M. tuberculosis isolates (76.7%) were susceptible to all four drugs tested. However, resistance to at least one of the four drugs was detected in 23.3% of the isolates. The highest proportion

of resistance was observed against isoniazid (9.3%) and ethambutol (7%). Only one case (1.2%) of multidrug-resistant/rifampicin-resistant (MDR/RR) TB was identified [54].

In a retrospective record-based analysis of secondary data on tuberculosis (both pulmonary and extrapulmonary) reported on the NIKSHAY portal between January and December 2022, conducted at an urban health training centre in an urban slum in Mumbai, the total number of drug-sensitive TB cases reported in 2022 was 519, with males constituting 42% and females 58% of the cases. The most affected age group was individuals aged 20-29 years. Pulmonary cases accounted for 66.9% of all reported cases. Additionally, a total of 75 drug-resistant TB cases were reported, out of which 53 were pulmonary and 22 were extrapulmonary [55].

In the study titled "Trends in incidence and mortality of tuberculosis in India over the past three decades: a join point and age–period–cohort analysis", spanning from 1999 to 2019, significant declines in the age-standardized incidence and mortality rates of tuberculosis (TB) were observed in India, dropping from 390.22 to 223.01 and from 121.72 to 36.11 per 100,000 population, respectively. Join point regression analysis highlighted a noteworthy decreasing trend in incidence rates for both males and females, with a more substantial decline noted among females compared to males. Similarly, mortality rates showed a sharper downward trajectory for females. Across all age groups, incidence and mortality rates declined for both genders during this period. The study also revealed an age-related increase in both incidence and mortality rates, whereas the period effect indicated a decrease in rates over time. Furthermore, the cohort effect on TB incidence and mortality decreased from earlier to more recent birth cohorts. While these findings suggest progress in reducing the TB burden in India, particularly among females, challenges remain in achieving the targets set by India's National Strategic Plan 2017–2025. Despite significant reductions in TB incidence and mortality rates over the studied

period, the annual rate of decline falls short of the goals outlined in India's National Tuberculosis Control Programme. Six decades since its launch, TB remains a significant public health concern in India. Strengthening the "Detect–Treat–Prevent–Build" pillars outlined in the National Tuberculosis Elimination Programme (2020) is crucial for achieving a TB-free India as envisioned [56].

In a cross-sectional, observational study analyzing sputum samples from category II treatment failure tuberculosis patients in Kolkata, among 66 cases of category II treatment failure, a significant proportion, 45 (68.2%), were identified as MDR-TB. Male patients accounted for 68.9% of the MDR cases, and 55.6% fell within the economically productive age group. Moreover, a concerning number of patients were malnourished, with 73.3% having a BMI below 18.5. Additionally, a majority of patients (62.2%) belonged to the 'below poverty line' (BPL) category, and 82.2% lived in overcrowded conditions. Furthermore, a substantial portion (82.3%) had a history of past tuberculosis or contact with TB. These findings underscore the multifaceted nature of drug-resistant TB transmission. While biological factors play a role, sociodemographic and economic factors are equally significant contributors to the spread of MDR-TB. Addressing these broader determinants is crucial for effectively combating the spread of drug-resistant tuberculosis [57].

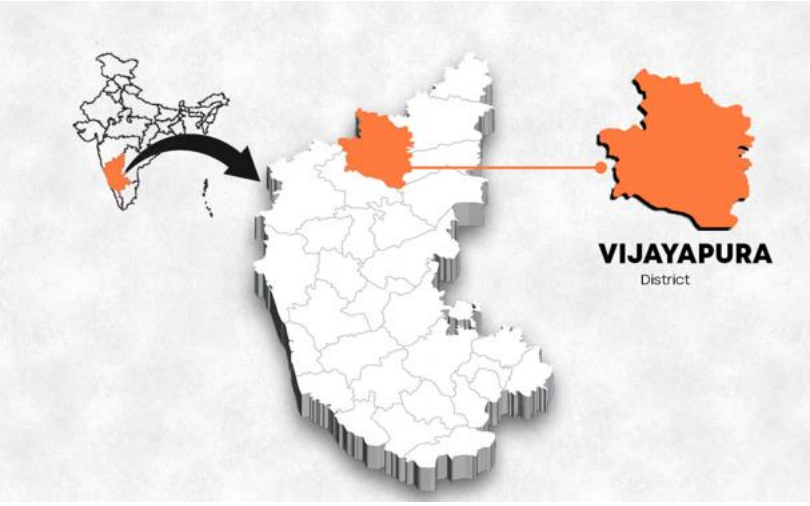
In a hospital-based, descriptive, cross-sectional study conducted among MDR-TB patients at the DR-TB Centre in Agra from March 2016 to March 2017, Out of 234 admitted cases, the majority (48.00%) fell within the age range of 18-50 years, with males representing the predominant gender (58.12%). A considerable portion of patients (61.96%) were underweight, as indicated by a BMI below 18.5kg/m2. HIV seropositivity and MDR-TB were identified in 8.97% of patients each. The study also revealed a high default rate (20.51%) and a cure rate of 43.59%. Diabetes Mellitus emerged as the most common

associated comorbidity, affecting 20.94% of patients. The majority of patients exhibited moderately extensive lesions (52.99%) on chest X-ray. Notably, a significant proportion of MDR-TB cases (96.58%) had a history of previous antituberculosis treatment, suggesting relapse as a major contributor to MDR-TB development. The study underscores the importance of early diagnosis of drug resistance, quality DOTS services, and the rational use of anti-TB drugs to prevent the emergence of MDR-TB as a major public health concern. Emphasizing adequate dosage, duration, and regimen is crucial for successful tuberculosis treatment and the prevention of drug resistance [(58).]

MATERIALS AND METHODS

BACKGROUND DETAILS:

This study was conducted at BLDE (Deemed to be University) Shri B. M. Patil Medical College Hospital & Research Centre, Vijayapura. Vijayapura, a mostly agricultural district, with an overall population of 21,77,331 and literacy rate of 57.46%. District has a high TB Burden, having an average incidence of 130-150 TB cases/month.



Study setting: BLDE (Deemed to be University) Shri B. M. Patil Medical College Hospital & Research Centre, Vijayapura

Study population: patients who are diagnosed positive for tuberculosis, aged above 18 years and took treatment from BLDE (Deemed to be University) Shri B. M. Patil Medical College Hospital & Research Centre, Vijayapura

Study design: Cross-sectional study.

Study duration: January 2023 to December 2023

Sampling method: Convenient sampling was employed, and all diagnosed tuberculosis patients who all were willing to consent and eligible as per inclusion criteria were included in the study. After obtaining ethical clearance from the Institutional Ethical Committee the study was conducted at shri B M PATIL MEDICAL COLLEGE, hospital and research Centre, Vijayapura. The study sample was drawn from the admitted cases.

The purpose and overview of the study was explained at the time of the interview, and interviewers were informed that, their participation was voluntary, their anonymity would be assured, they could withdraw from the study at any point of time and the information that they will be providing would be used solely for the purpose of the study. Confidentiality about data and findings were assured to the participants and their consent was taken.

The TB patients were approached at the hospital during admission. Procedure included 2 parts i.e., interview through semi structured questionnaire and anthropometric measurements.

Interview method: Face-to-face interviews were conducted using semi-structured questionnaires maintaining the privacy and not disturbing the purpose of the visit.

Sample Size

With anticipated incidence of T.B. 36% globally [(11)], the study would require a sample size of 180 patients with 95**%** level of confidence and 7% absolute precision**. (STATULATOR software was used to calculate the sample size.** http://statulator.com/SampleSize/ss1P.html)

Formula used

$$n=\frac{z^2\, p*q}{d^2}$$

Where Z= Z statistic at α level of significance

d^2= Absolute error

P= Proportion rate

q= 100-p

INCLUSION CRITERIA

All diagnosed cases of T.B. admitted at shri B M PATIL MEDICAL COLLEGE, hospital and research Centre, Vijayapura during the study period.

EXCLUSION CRITERIA

1.Patients who are not willing to participate in the study.

2. Patients who are critically ill.

3. Pregnant and lactating women.

- ✓ **Definitions of TB patients:**

I. Case definitions:

- Pulmonary Tuberculosis, Smear-Positive: TB in a patient with at least one smear-positive for acid fast bacilli (AFB) out of the two initial sputum smear examination by direct microscopy.
- Pulmonary Tuberculosis, Smear Negative: A patient with symptoms suggestive of TB with two smear examination negative for AFB, with evidence of pulmonary TB by

microbiological methods (culture positive or by other approved molecular methods) or chest X-ray is classified as havingsmear negative pulmonary tuberculosis.

- Extra Pulmonary Tuberculosis: Tuberculosis in any organ other than lungs (e.g. pleura, lymph nodes, intestine, genitourinary tract, joints and bones, meninges of the brain etc).

STATISTICAL ANALYSIS

The collected data was initially entered into a Microsoft Excel spreadsheet. We cleaned the data carefully and checked for any missing information. Then, we used SPSS Version 26 to analyze the data. Categorical data were summarized with frequencies and percentages and visually represented through diagrams. The Chi-square test was used toexplore associations between categorical variables. A p-value of less than 0.05 was considered statistically significant, and all tests were conducted using a two-tailed approach

INSTRUMENTS USED FOR DATA COLLECTION

The instruments used in our study included a semi structured questionnaire and instruments needed for weight and height measurements. Questionnaire: TB patients were interviewed using semi structured and pretested questionnaire with modifications relevant to local conditions. This questionnaire covered various socio-demographic aspects including Name, age, address, occupation, educational status, religious affiliation, caste, family type, size, housing and sanitary practices. To assess the participants' socio-economic status, the Modified BG Prasad Classification socio-economic status scale (January 2022)50 was used, as shown in Table 3.

Previous treatment history, clinical characteristics, health seeking behaviours and hygienic practices.

STUDY VARIABLES:

Socio-demographic profile of the study participants which includes

- **Age** was recorded in completed years as revealed by the subjects.
- **gender, marital status, religion**.
- Information pertaining to **education, occupation income, Socioeconomic status.**
- **Type of family:**

a. **Nuclear family**: It consists of a married couple and their children while they are still regarded as dependents.

b. **Joint family:** It consists of number of married couple and their children living together in the same household. All men are related by blood and women of household are their wives, unmarried sisters and their family kinsmen.

c. **Three Generation family:** It is a family where representatives of three generation are living together. Young married couple continue to stay with their parents and have their own children as well.

Education:

1. Illiterate: Not able to read, write and understand in any language
2. Primary school: Studied up to 7th standard
3. High school: Studied up to 8th standard to SSLC
4. PUC/Diploma: Studied up to PUC or any diploma
5. Graduate and above: Studied up to graduation and above

Occupation:

1. Housewife: involved only in household chores.
2. Student: doing studies and not employed.
3. Daily labourer: unskilled or manual work on a daily basis

4. Dependent: depends on another person for financial support

5. Employee: works under an organization or employer.

6. Farmer: cultivates land, raises crops and livestock

Socio-Economic status

Modified BG Prasad's classification was used to assess the social class of the study subjects.

Social class	Original classification of 1961 per capita income (Rs/month)	Revised classification for January 2022 (Rs/month)
I (Upper class)	100 and above	8220 and above
II (Upper middleclass)	50-99	4110-8219
III (Middle class)	30-49	2465 – 4109
IV (Lower middleclass)	15-29	1230-2464
V (Lower class)	<15	<1230

Habits:

- **Smoking: Yes/No**

Yes: Person who at the time of the data collection smokes either daily or occasionally for the past one year. (Smoke form – cigarettes, bidis etc.)

No: Person who at the time of the data collection does not smoke either daily or occasionally for the past one year.

- **Alcohol consumption: Yes/No**

Yes: Person who at the time of the data collection drink any alcohol daily or occasionally for the past one year.

No: Person who at the time of the data collection does not drink any alcohol daily or occasionally for the past one year.

Measurement of height:

For the measurement of height, study subjects were made to remove the footwear and stand with heels touching each other and toes apart and head positioned so that the line of vision was perpendicular to the body (Frankfurt line) against the wall. The arms were hung freely by the sides with the head, back, buttock and heels incontact with the wall. A wooden scale was brought down to the topmost point on the head and marking was made on the wall. Measurement was taken using measuring tape in centimeters (cm). Height was recorded to nearest 0.5 cm.

Measurement of weight:

The weight was measured in kilograms (kg) using standardized bathroom weighing machine with the study subject standing erect on centre of platform, lookingstraight ahead with the body weight evenly distributed between both the feet but without footwear, with minimal clothing. The weight was recorded to nearest 0.5 kg.

Body Mass Index (BMI)

In this study, BMI classification proposed by the WHO Western Pacific Regional Office in collaboration with IOTF (International Obesity Task Force) steering committee (2000) for Asian people was used. It is also called as Quetlet Index and was used to assess obesity and is computed by

$$BMI = \text{Weight (in kg)} / \text{Height (in meter)}^2$$

It is classified as BMI <18.5 (Under -weight), 18.5-22.9 (Normal), 23.0-24.9 (At risk obesity), 25.0-29.9 (Obese I) and > 30 (Obese II).

Previous treatment history characteristics of tuberculosis patients

The variables included whether the patient was previously diagnosed with TB, completion of the treatment course for those previously diagnosed, regularity of treatment for those who did not complete the course, reasons for irregular treatment, and whether the patient was previously declared cured of TB. These variables were used to understand the treatment adherence and outcomes among TB patients.

Clinical characteristics of tuberculosis patients

The variables examined included presenting symptoms, presence of BCG scar, history of contact with TB cases, type of TB (pulmonary or extrapulmonary), and specific classification of TB based on the affected body system. Additional variables included available sputum results, hypertension status, creatinine levels, HIV status, presence of diabetes mellitus, presence of chronic obstructive pulmonary disease (COPD), smoking status, and alcohol consumption habits. These variables provided a comprehensive overview of the clinical profile of the TB patients**.**

Distribution of patients according to the site of Extra Pulmonary TB

The specific sites of extrapulmonary TB examined included the abdomen, genito-urinary system, lymph nodes, meningitis, and pleural effusion. Additionally, the classification also considered cases categorized as pulmonary TB and those not available for classification (NA). This provided insight into the prevalence of different extrapulmonary TB sites among the patients.

Housing condition of tuberculosis patients

The variables included the number of rooms in the house, type of house (katcha, pucca, semi-pucca), sharing a bedroom, presence of overcrowding, adequacy of living room ventilation, presence of cross ventilation, indoor air pollution, type of toilet facility, and source of drinking water. These variables provided a comprehensive overview of the living conditions of TB patients.

Health seeking behaviour

It assessed how they were diagnosed (CT scan, sputum, X-ray), who advised them to seek medical help (ASHA worker, MBBS doctor, relative, self, specialized doctor), and where they first sought consultation (clinic, hospital, medical college, PHC).

Hygiene practices of tuberculosis patients

It focused on sputum disposal practices at home and in public (hygienic, unhygienic, no idea), knowledge of cough hygiene (correct, incorrect), facemask usage (yes, no), and handwashing frequency after coughing or sneezing (yes, no).

Results

Table 1: Socio-Demographic Profile of TB Patients

Variable	Frequency	Percentage
Gender		
Female	67	37.2
male	113	62.8
Religion		
Hindu	165	91.7
Muslim	15	8.3
Educational status		
Didn't Attend School	46	25.6
Primary (1-5)	26	14.4
PUC	26	14.4
Secondary (6-10)	56	31.1
Degree Holders	26	14.5
Type Of Family		
3 generation	54	30.0
Joint	42	23.3
Nuclear	84	46.7
Colour Of Ration Card		
Antyodaya anna yojana card	11	6.1
BPL	137	76.1
APL	0	0
NA	26	14.4
Refused	6	3.3
Total	180	100.0

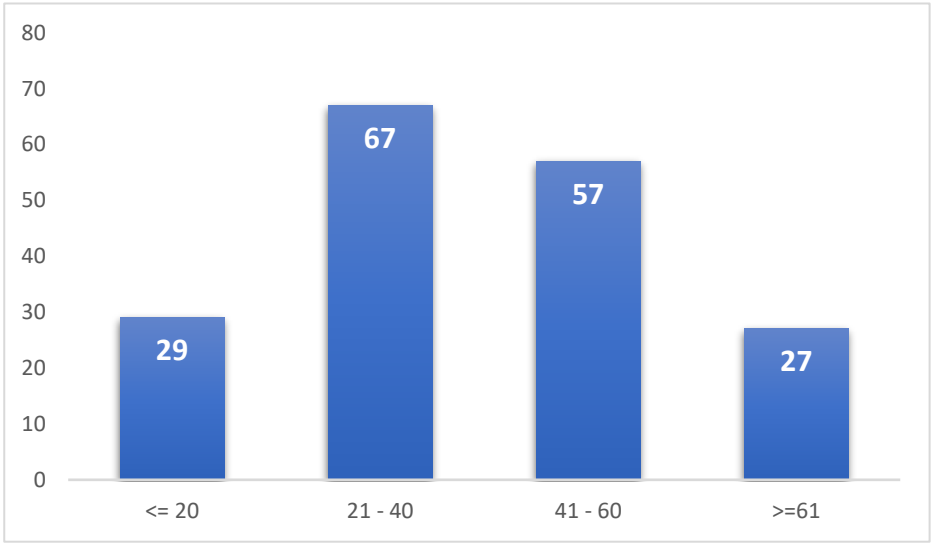
The gender distribution in the study population shows that 63% of the participants are male, while 37% are female. This indicates a greater representation of males compared to females in the sample.

Majority of the participants belonged to Hindu community (91.7%) and rest were from Muslim community.

About three fourth of the participants had some level of education ranging from primary (14.4%), secondary (31.1%) and degree (14.5%) where as one fourth (25.6%) of participants didn't receive any education.

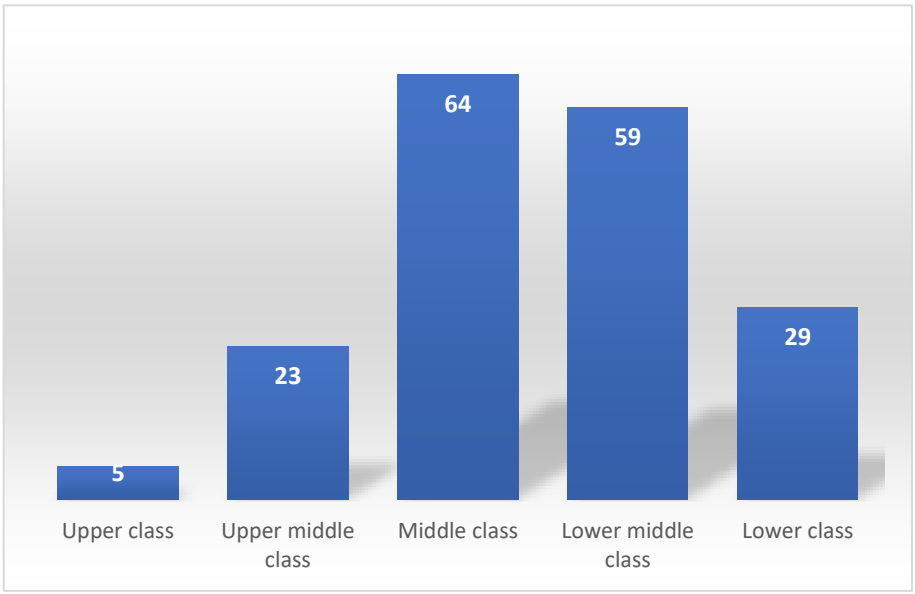
Majority of the participants belonged to nuclear family (46.7%), followed by 3 generation (30%) and joint family (23.3%).

Figure 7: Age category of the study population



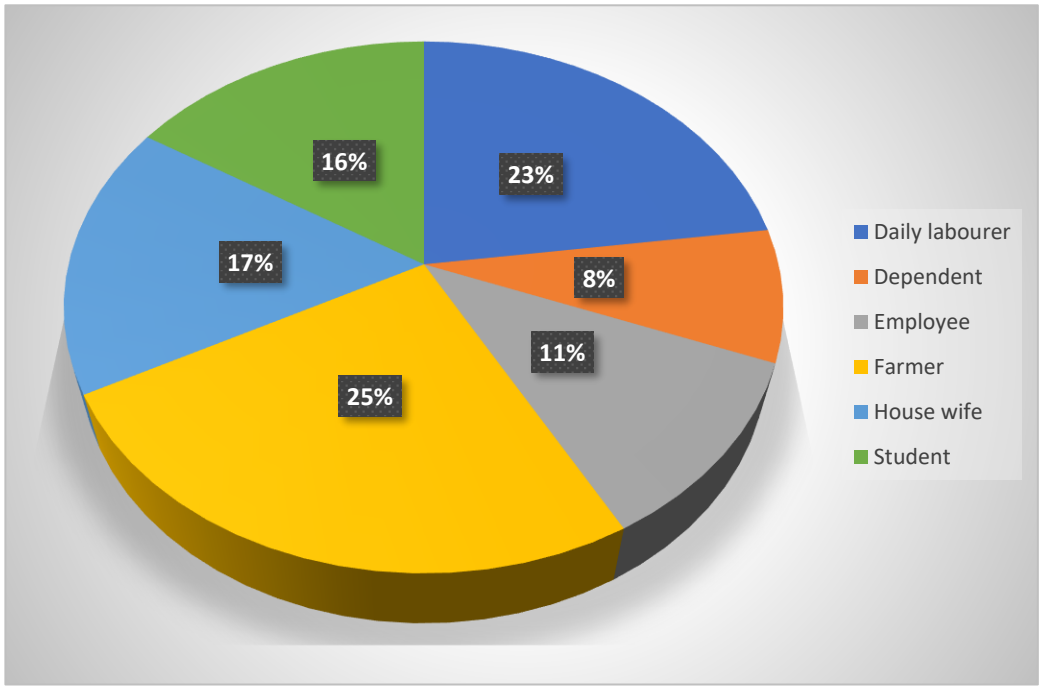
The largest group is aged 21-40 years (37.2%), followed by 41-60 years (31.7%), <= 20 years (16.1%), and >= 61 years (15%). This indicates that TB predominantly affects young to middle-aged adults, but also significantly impacts younger and older age groups. These findings suggest the need for targeted TB interventions across all age ranges, with a focus on the most affected groups

Figure 8: Socio-Economic status of the study population



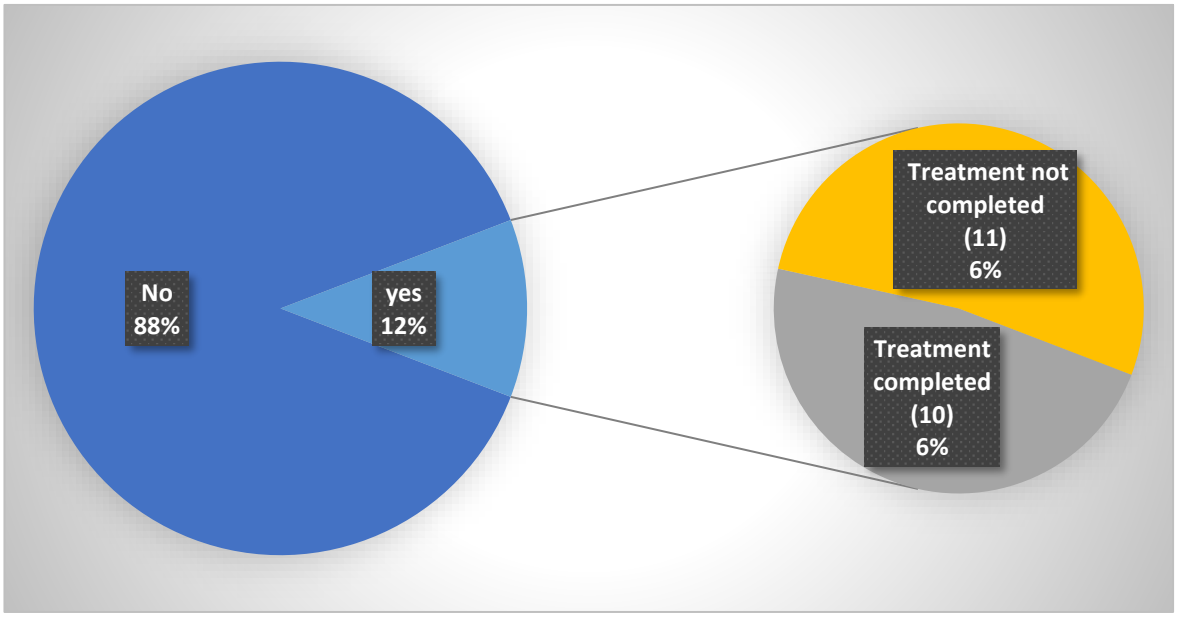
According to modified BG prasad classification of socioeconomic status, majority of the participants belonged to middle class (35.6%) and lower middle class (32.8%), least belonged to upper middle class (2.8%).

Figure 9: Occupation of the study population



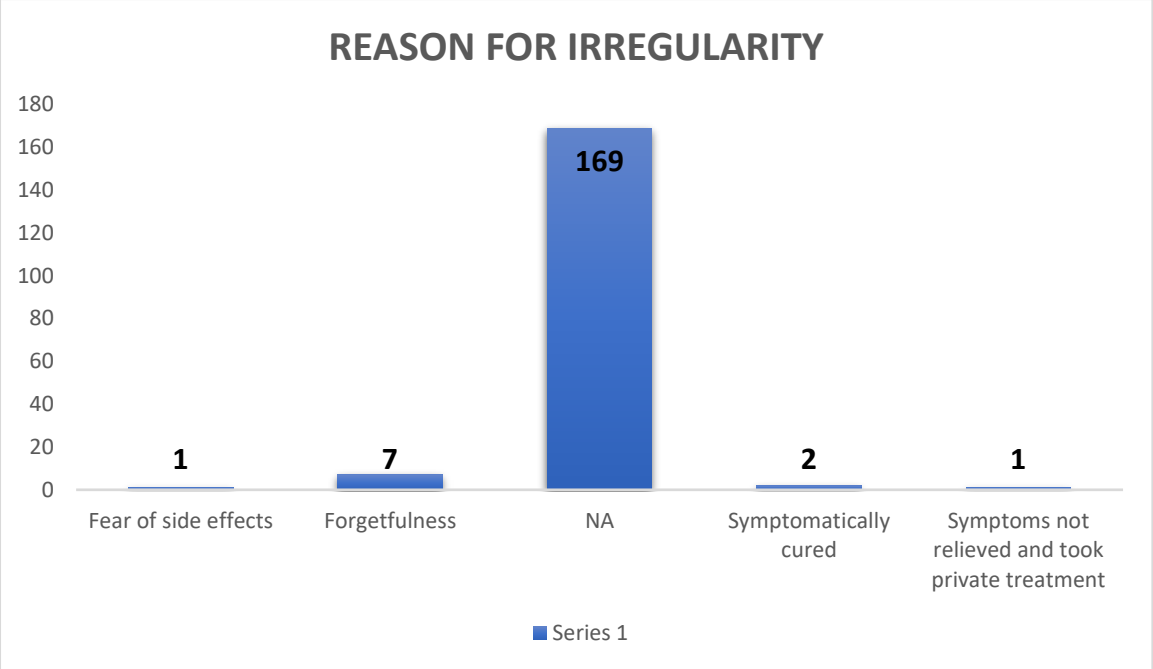
Of the participants, majority were farmers (22.8%), followed by daily labourers (20.6%) and 14% were students. Majority of the participants belonged to nuclear family (46.7%), followed by 3 generation (30%) and joint family (23.3%).

Figure 10: Previous history of TB and completion of treatment



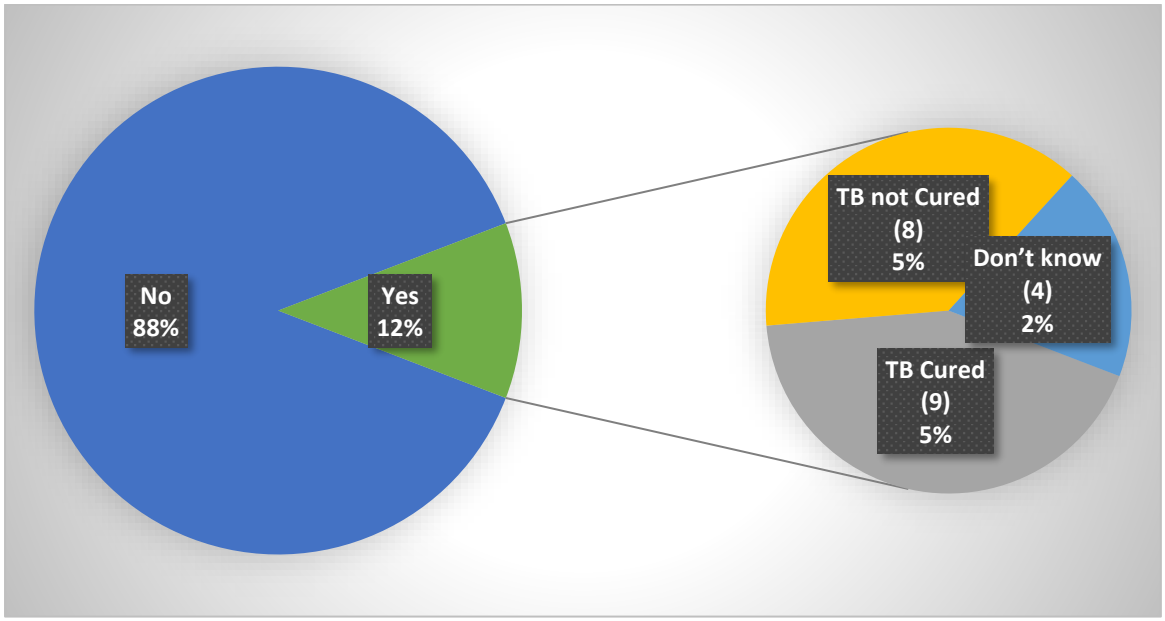
Among the 180 participants, 159 (88.3%) participants were newly diagnosed cases where as 21 cases were previously diagnosed for TB. Among the 21 cases, only 10 had completed the treatment course, whereas 11 cases had irregular treatment.

Figure 11: **Reason for irregularity**



The reasons for irregular treatment varied including forgetfulness (7), symptomatically cured (2), fear of side effects (1), symptoms not relieved and took private treatment (1).

Figure 12: **Previous history of TB and cure of TB**



9 out of 21 patients had previous TB declared cure, 8 cases were not cured and rest did not know the status

Table 2: Clinical characteristics of tuberculosis patients

Characteristics	Frequency	Percentage
History of contact with TB cases		
No	158	87.8
Yes	22	12.2
Classification		
Abdomen	8	4.4
Genito-urinary system	6	3.3
Lymph nodes	25	13.9
Meningitis	16	8.9
NA	7	3.9
Pleural effusion	30	16.7
Pulmonary	88	48.8
Available sputum results		
- VE	2	1.1
+1	14	7.8
+2	15	8.3
+3	18	10.0
Not Available	131	72.8
creatinine		
high	1	0.6
low	5	2.8
NA	170	94.4
normal	4	2.2

12.2% of the participants had history of contact with TB cases, where as 87.8% did not have any history of TB contact.

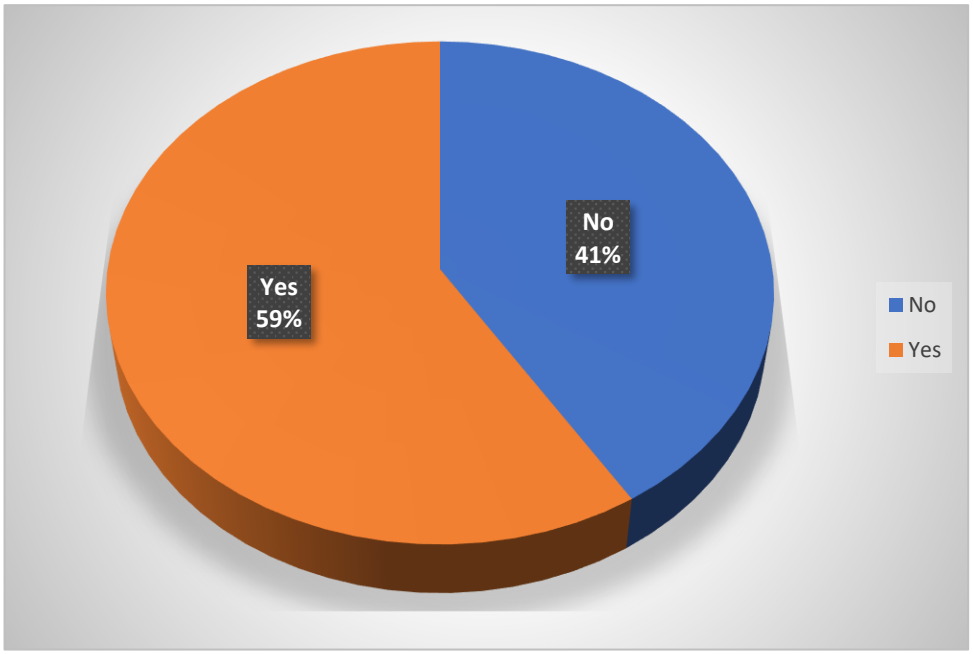
Only one participant had renal failure as evidenced by increased serum creatinine, rest of them had normal renal function.

Table 3: Presenting symptoms of TB patients

Presenting symptoms	Frequency
Cough	95
Expectoration	75
Fever	72
Shortness of breath	47
Anorexia	43
Vomiting	25
Chest pain	13
Hemoptysis	3
Wheezing	1

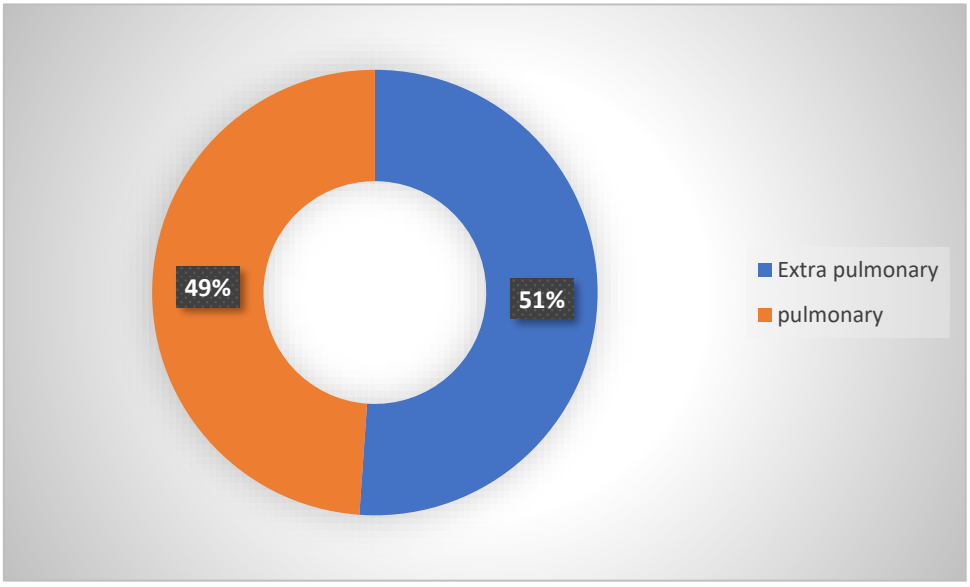
The most common clinical symptom was cough (95 out ofn180) followed by expectoration and fever.

Figure 13: **Presence of BCG scar**



More than half of the participants (58.9%) had been vaccinated as evidenced by BCG scar and 41.1% did not had the same.

Figure 14: **Type of TB**



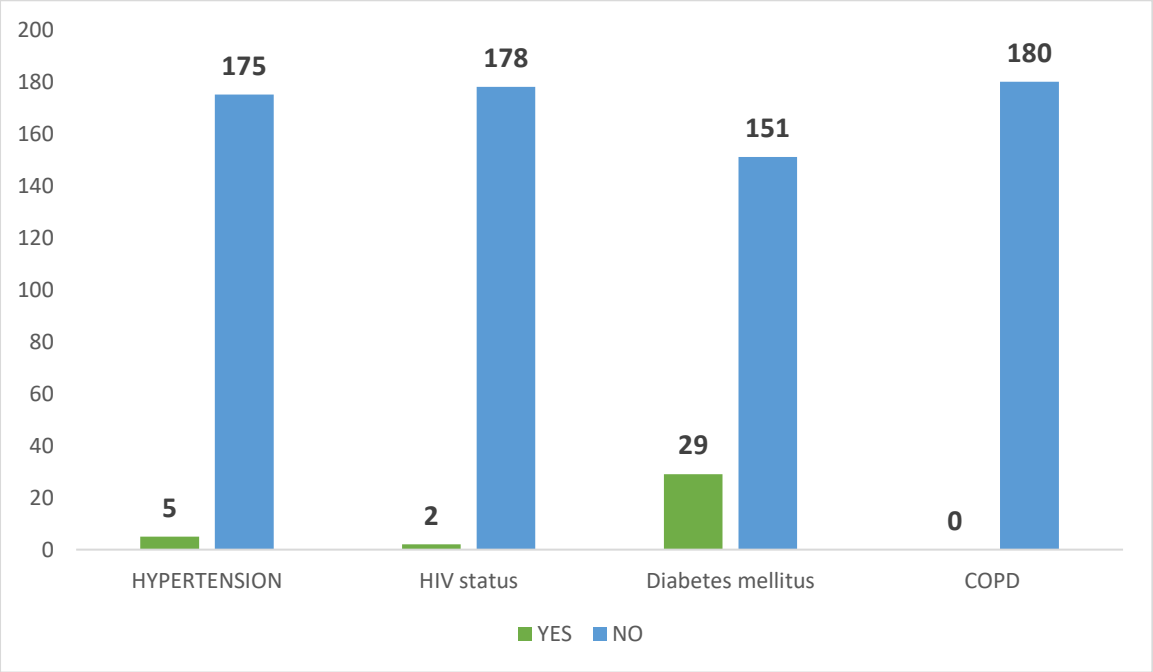
Nearly half of the participants had extrapulmonary TB (51.1%) and rest of them had pulmonary TB.

Table 4: Distribution according to site of extra pulmonary TB

Sites of extrapulmonary TB	Frequency	Percentage
Abdomen	8	4.4
Genito-urinary system	6	3.3
Lymph nodes	25	13.9
Meningitis	16	8.9
NA	7	3.9
Pleural effusion	30	16.7

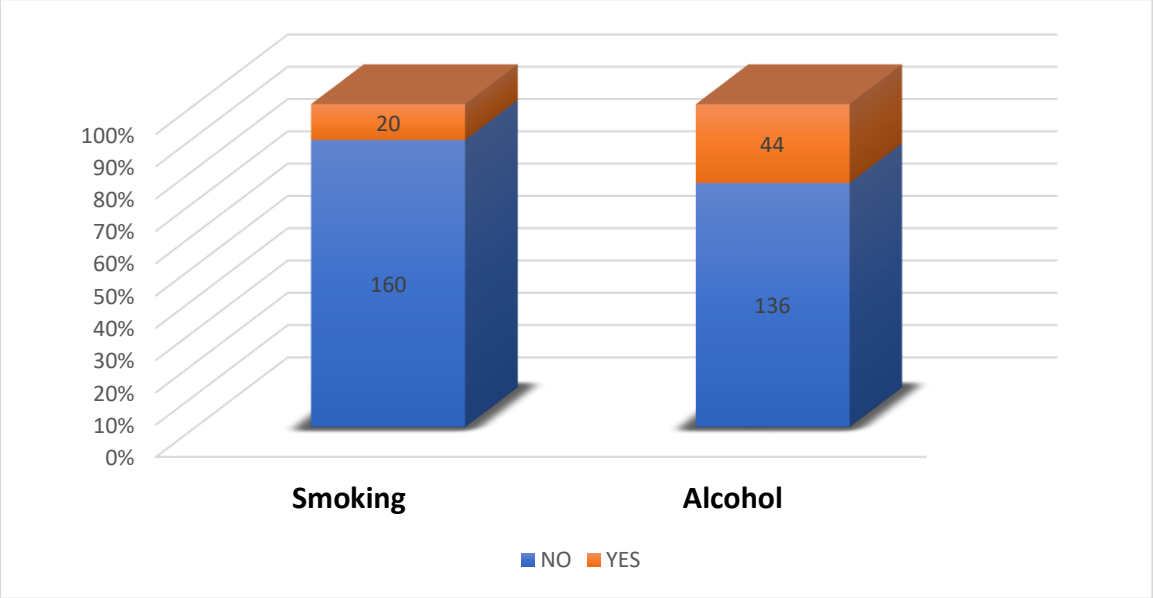
Of the extrapulmonary cases, the predominant sites include: pleural effusion (16.7%), lymph nodes (13.9%), meningitis (8.9%), abdomen (4.4%).

Figure 15: Comorbidities among study population



HIV status was negative in 98.9% and only 2 participants (1.1%) had HIV positive history. Among the participants, 16.1% were diabetic, 2.8% were hypertensive and none of them had COPD.

Figure 16: Habits among study population



Majority were non-smokers (74%), followed by past smokers (15%) and present smokers (11.1%). Similarly, majority were non alcoholics (75.6%), followed by habitual drinkers (12.8%) and social drinkers (11.7%).

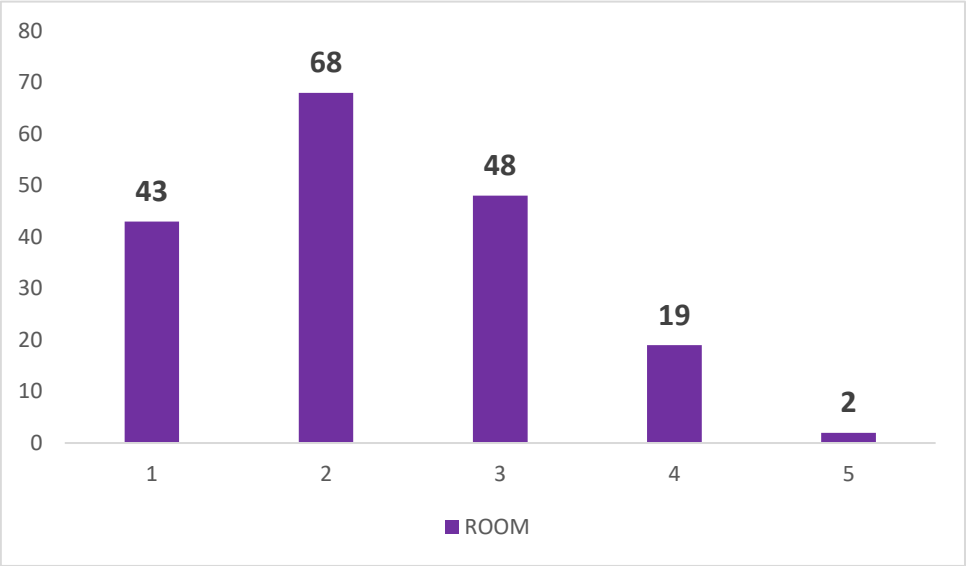
Table 5: Housing condition of tuberculosis patients

Characteristics	Frequency	Percentage
Type of house		
Katcha	12	6.7
pucca	90	50.0
Semi-pucca	78	43.3
Toilet facility		
own flush	99	55.0
public pit	76	42.2
Shared toilet	5	2.8
Source of drinking water		
Bore well	99	55.0
Hand pump	65	36.1
Open well	10	5.6
others	6	3.3

Half of the participants had pucca house and rest of them had katcha (6.7%) and semipucca (43.3%) house.

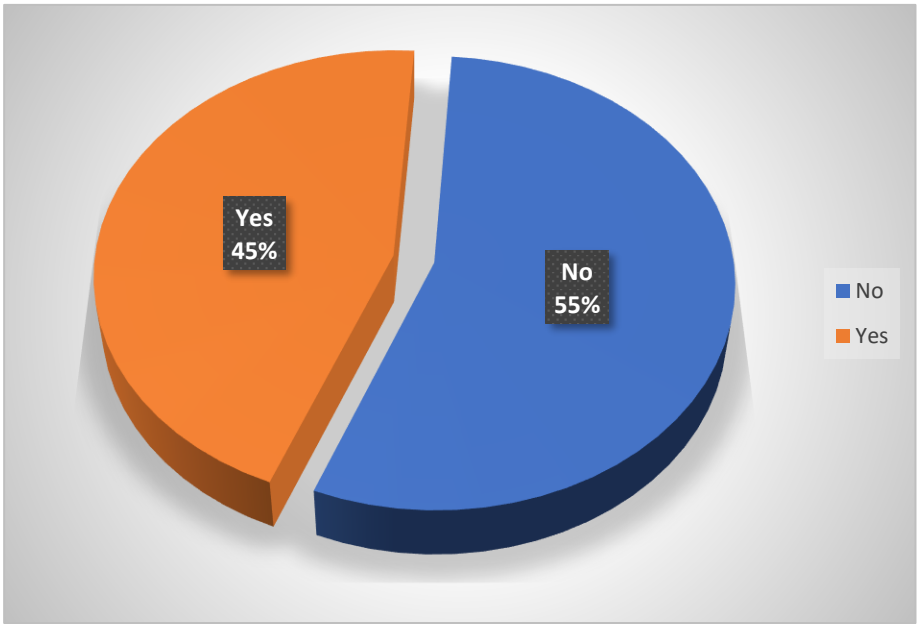
55% of the participants had own toilet flush, where as 42.4% were using public pits and 2.8% shared toilet. 55% were using borewell for drinking water, 36.1% hand pump, 5.6% were using open well.

Figure 17: **Number of rooms among study population**



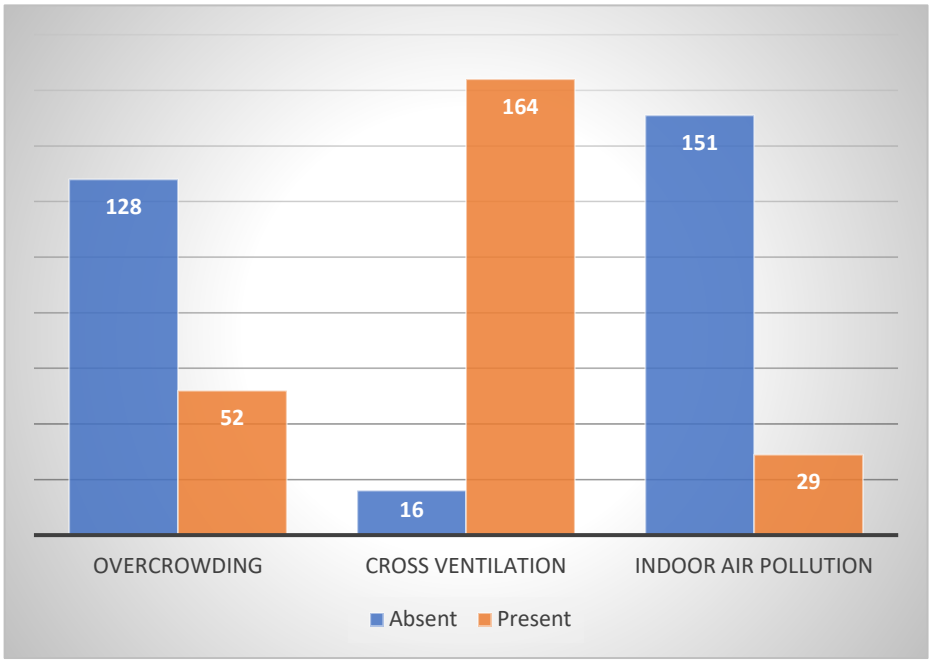
Majority of the participants reported to have two rooms in their house (37.8%) where as 23.9% of participants had only one room

Figure 18: **Sharing of bedroom among study population**



45% of the participants were living in a sharing bedroom

Figure 19: Housing conditions among study population

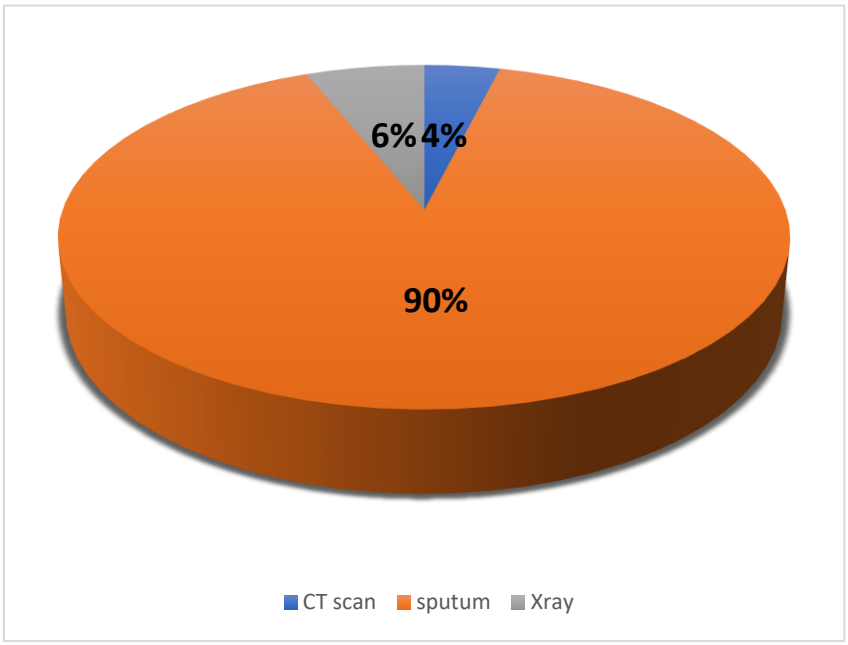


Overcrowding was present in 28.9% of the participants. 9.4% of the participants reported lack of adequate ventilation, cross ventilation was absent in 8.9%..

Table 6: Health seeking behaviour of tuberculosis patients

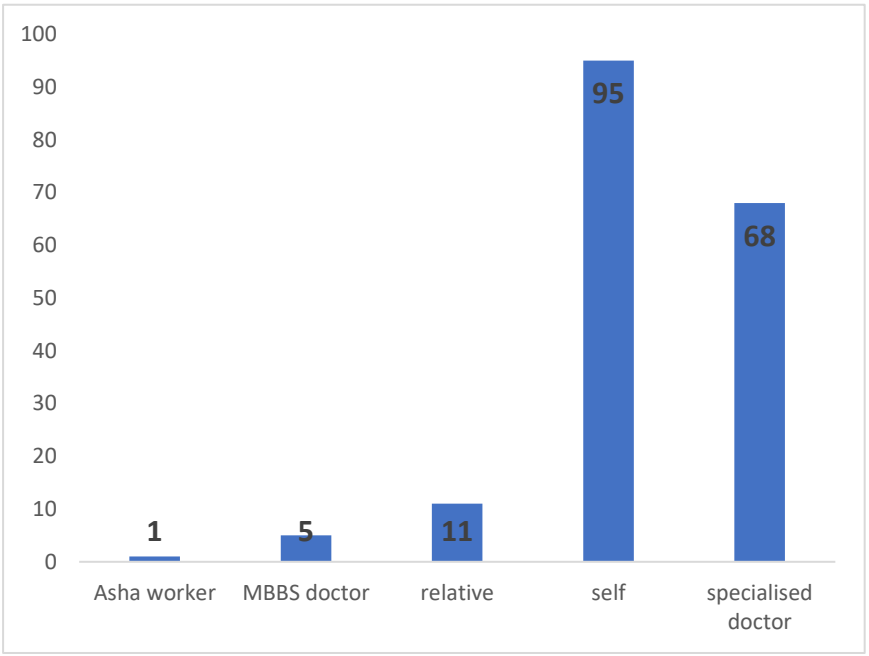
Characteristics	Frequency	Percentage
how was diagnosed		
CT scan	7	3.9
sputum	162	90.0
Xray	11	6.1
Who told to seek medical attention		
Asha worker	1	.6
MBBS doctor	5	2.8
relative	11	6.1
self	95	52.8
specialised doctor	68	37.8
where you took consultation first		
clinic	10	5.6
hospital	85	47.2
medical college	83	46.1
PHC	2	1.1

Figure 20: **How was diagnosed**



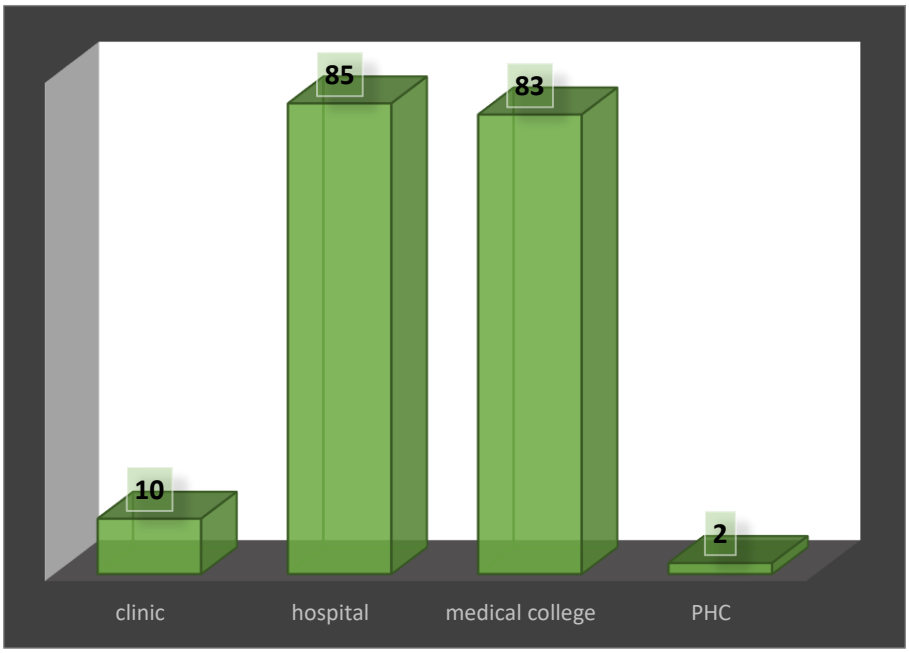
The most commonly diagnosed test was sputum examination (90%), followed by CT scan (3.9%) and x-ray (6.1%).

Figure 21: **Who told to seek medical attention**



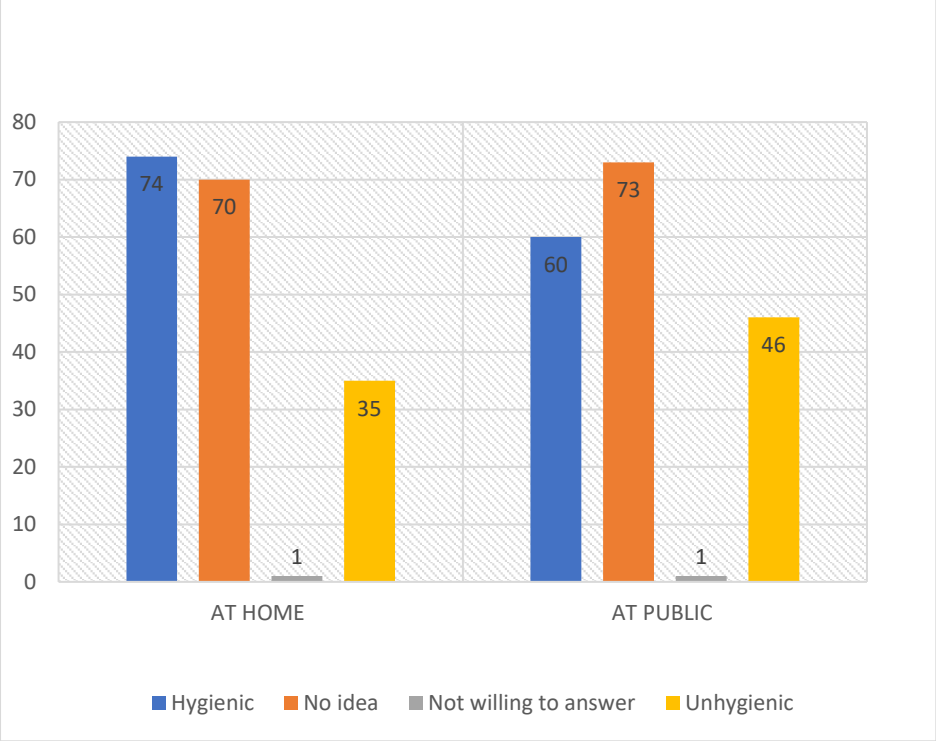
More than half of the patients (52.8%) took medical help by self, where as 37.8% were referred by specialised doctor, 6.1% relatives, 2.8% MBBS doctor and 0.6 by ASHA worker.

Figure 22: **Where you took consultation first**



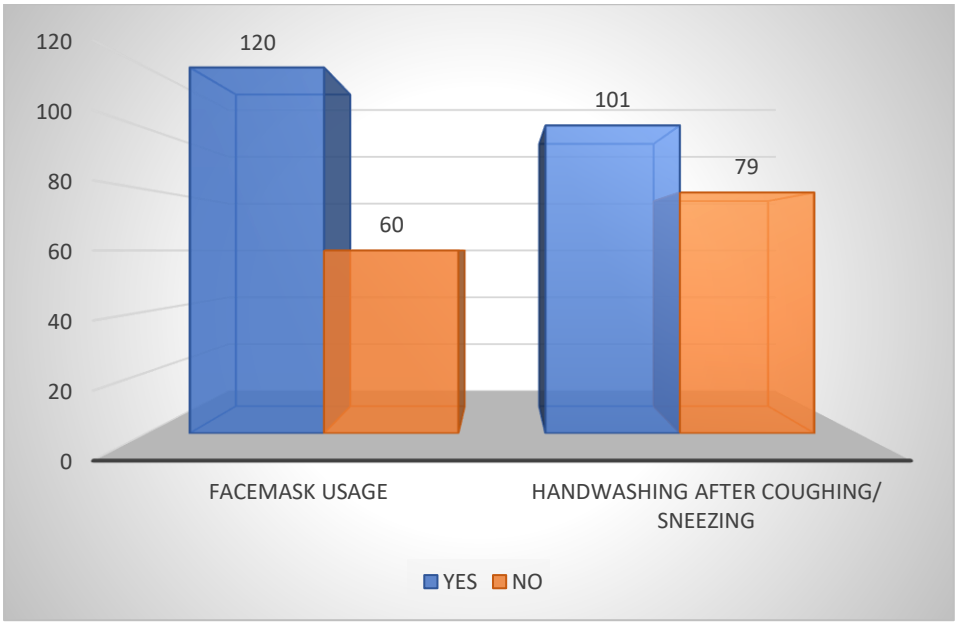
In our study, 47.2% consulted first in hospital followed by 46.2% in medical colleges. Only 1.1 % took consultation in PHC and 5.6% in clinics.

Figure 23: **Sputum disposal practices among study population**



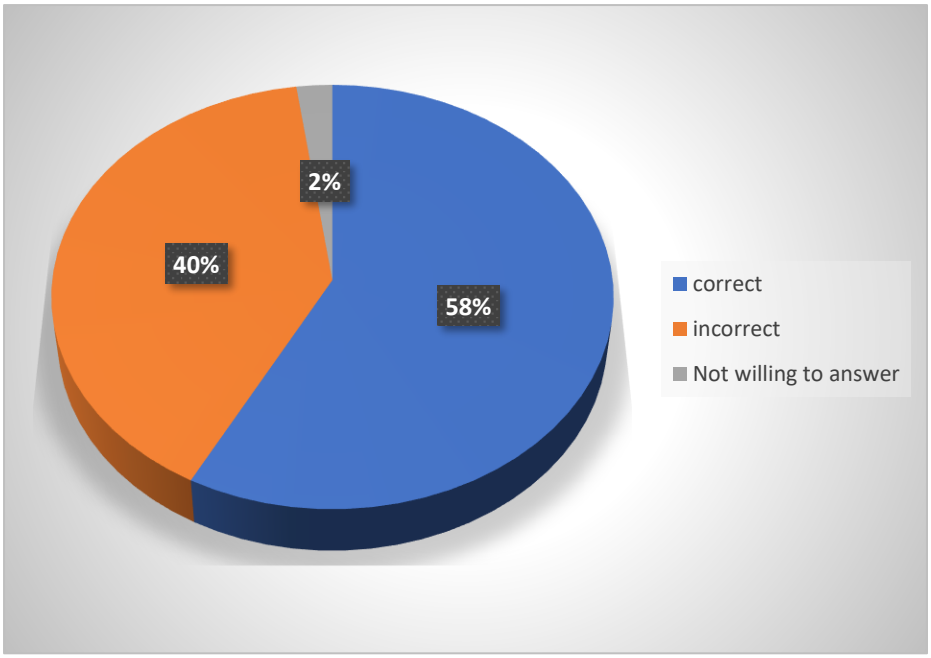
Sputum disposal practices were reported to be hygienic in only 33.3%, was unhygienic in 25.6% and 40.6% participants had no idea about the hygiene.

Figure 24: **Hygiene Practice among study population**



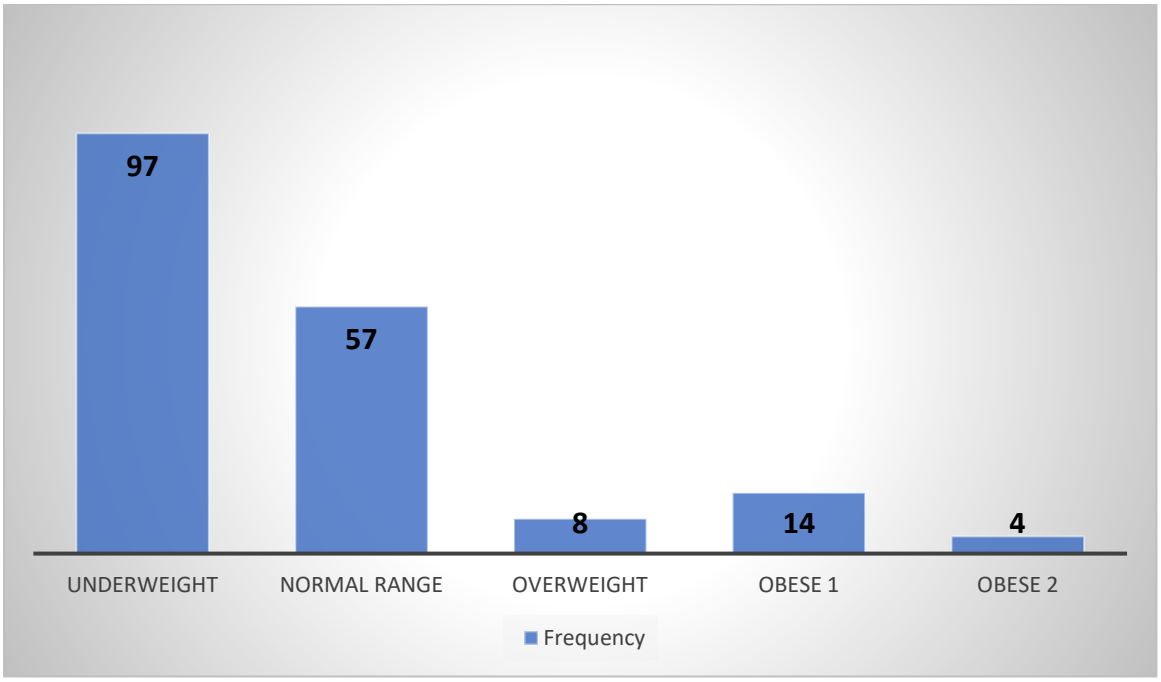
Majority of the participants reported to do handwashing after coughing/sneezing (56.1%). Facemask usage was reported in 66.7% of participants.

Figure 25: **Knowledge about cough hygiene**



57.8% had correct knowledge about cough followed by incorrect in 40% and 2.2% were not willing to answer.

Figure 26: **BMI Category**



The chart shows the frequency distribution of individuals across different BMI categories. It indicates that 97 individuals are underweight, 57 are within the normal range, 8 are overweight, 14 fall into the Obese 1 category, and 4 are in the Obese 2 category. This distribution highlights a significant number of underweight individuals compared to those in the higher BMI categories.

Table 7: Association Of Drug Sensitivity with Gender

			Gender		Total	Chi square value	P value
			Female	Male			
Drug sensitive TB	Absent	Count	2	4	6	0.040	0.841
		%	33.3%	66.7%	100.0%		
	Present	Count	65	109	174		
		%	37.4%	62.6%	100.0%		
Total		Count	67	113	180		
		%	37.2%	62.8%	100.0%		
MDR TB	Absent	Count	65	111	176	0.286	0.593
		%	36.9%	63.1%	100.0%		
	Present	Count	2	2	4		
		%	50.0%	50.0%	100.0%		
Total		Count	67	113	180		
		%	37.2%	62.8%	100.0%		

In our study, out of the 67 female participants, drug sensitive TB was present in 65 participants (97%) and 3% of female participants had MDR TB. And among 113 male participants, 96.5% had drug sensitive TB and 3.5% had MDR TB. No statistically significant association was found between the gender and drug sensitivity/ MDR TB.

Table 8: Association Of Educational Status with Facemask Usage

			Facemask Usage			Chi square value	P value
			No	Yes	Total		
Educational Status	Degree Holders	Count	9	19	28	6.332	0.176
		%	32.1%	67.9%	100.0 %		
	Didn't attend school	Count	22	24	46		
		%	47.8%	52.2%	100.0 %		
	Primary (1-5)	Count	8	18	26		
		%	30.8%	69.2%	100.0 %		
	PUC	Count	6	19	25		
		%	24.0%	76.0%	100.0 %		
	Secondary (6-10)	Count	15	40	55		
		%	27.3%	72.7%	100.0 %		
Total		Count	60	120	180		
		%	33.3%	66.7%	100.0 %		

In our study, 19 out of 28 (67.9%) degree holders use facemask, 24 out of 46 (52%) participants who didn't attend school, 18 out of 26 (69.2%) of participants with primary education, 19 out of 25 (76%) participants with PUC and 40 out of 55 (72.7%) participants with secondary education reported the usage of facemask. There was no statistically significant association between level of education and facemask usage.

Table 9: Association Of Occupation with Facemask Usage

			facemask usage			Chi square value	P value
			no	yes	Total		
Occupation	Daily labourer	Count	15	22	37	7.482	0.279
		%	40.5%	59.5%	100.0%		
	Dependent	Count	6	7	13		
		%	46.2%	53.8%	100.0%		
	Employee	Count	3	15	18		
		%	16.7%	83.3%	100.0%		
	Farmer	Count	16	25	41		
		%	39.0%	61.0%	100.0%		
	House wife	Count	6	21	27		
		%	22.2%	77.8%	100.0%		
	Student	Count	10	16	26		
		%	38.5%	61.5%	100.0%		
	Unemployed	Count	4	14	18		
		%	22.2%	77.8%	100.0%		
Total		Count	60	120	180		
		%	33.3%	66.7%	100.0%		

Face mask usage rates vary by occupation, with employees showing the highest compliance at 83.3%, while dependents have the lowest at 53.8%. Despite these differences, the Chi-square test results (χ^2 = 7.482, p = 0.279) indicate no statistically significant association between occupation and face mask usage.

Table 10: Association Of SES with Facemask Usage

			Facemask usage			Chi square value	P value
			No	Yes	Total		
SES	Upper class	Count	1	4	5	1.387	0.847
		%	20.0%	80.0%	100.0%		
	Upper Middle class	Count	8	15	23		
		%	34.8%	65.2%	100.0%		
	Middle class	Count	24	40	64		
		%	37.5%	62.5%	100.0%		
	Lower middle class	Count	19	40	59		
		%	32.2%	67.8%	100.0%		
	Lower class	Count	8	21	29		
		%	27.6%	72.4%	100.0%		
Total		Count	60	120	180		
		%	33.3%	66.7%	100.0%		

In our study, among the 5 participants in upper class according to modified BJ prasad's classification, 4 participants (80.0%) reported usage of face mask and 1 participant (20%) reported non usage. In the upper middle class, 15 participants (65.2%) reported usage of facemask, in middle class 62.5% reported face mask usage, in lower middle class 67.8% and in lower class 72.4% reported face mask usage. There is no statistically significant association between the socioeconomic class and facemask usage.

Table 11: Association Of Previously Diagnosed for TB with Facemask Usage

Crosstab							
			Facemask usage			Chi square value	P value
			No	Yes	Total		
Previously Diagnosed for TB	No	Count	53	106	159	0.000	1.000
		%	33.3%	66.7%	100.0%		
	Yes	Count	7	14	21		
		%	33.3%	66.7%	100.0%		
Total		Count	60	120	180		
		%	33.3%	66.7%	100.0%		

In our study, 66.7% of participants who were previously diagnosed for TB and equal percentage of participants who were not previously diagnosed for TB reported the usage of facemask. Hence there was no statistically significant association between Previously Diagnosed for TB with Facemask Usage.

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Table 12: Association Of Educational Status with handwashing after coughing/ sneezing

			Handwashing after coughing/ sneezing			Chi square value	P value
			No	Yes	Total		
Educational status of the individual	Degree holders	Count	9	19	28	5.924	0.205
		%	32.1%	67.9%	100.0 %		
	Didn't attend school	Count	25	21	46		
		%	54.3%	45.7%	100.0 %		
	Primary (1-5)	Count	14	12	26		
		%	53.8%	46.2%	100.0 %		
	PUC	Count	11	14	25		
		%	44.0%	56.0%	100.0 %		
	Secondary (6-10)	Count	20	35	55		
		%	36.4%	63.6%	100.0 %		
Total		Count	79	101	180		
		%	43.9%	56.1%	100.0 %		

Overall, 56.1% of the participants practice handwashing, while 43.9% do not. Degree holders have the highest compliance rate at 67.9%, whereas those who didn't attend school have the lowest at 45.7%. Among individuals with primary education, 46.2% wash their hands, while 56.0% of those with PUC education and 63.6% of those with secondary education do so. The Chi-square test results ($\chi^2 = 5.924$, $p = 0.205$) indicate no statistically significant association between educational status and handwashing behaviour after coughing or sneezing.

Table:13 Association of Occupation with handwashing after coughing/ sneezing

			handwashing after coughing/ sneezing		Total	Chi square value	P value
			No	Yes			
Occupation	Daily labourer	Count	19	18	37	10.741	0.097
		%	51.4%	48.6%	100.0%		
	Dependent	Count	9	4	13		
		%	69.2%	30.8%	100.0%		
	Employee	Count	4	14	18		
		%	22.2%	77.8%	100.0%		
	Farmer	Count	18	23	41		
		%	43.9%	56.1%	100.0%		
	House wife	Count	9	18	27		
		%	33.3%	66.7%	100.0%		
	Student	Count	14	12	26		
		%	53.8%	46.2%	100.0%		
	Unemployed	Count	6	12	18		
		%	33.3%	66.7%	100.0%		
Total		Count	79	101	180		
		%	43.9%	56.1%	100.0%		

The study found that 48.6% of daily labourers, 30.8% of dependents, 56% of farmers, 66.7% of house wives, 46.2% of students and 66.7% of unemployed participants do hand washing after coughing / sneezing.

Table 14: Association Of SES with handwashing after coughing/ sneezing

			Handwashing after coughing/ sneezing		Total	Chi square value	P value
			No	Yes			
SES	Upper class	Count	1	4	5	4.020	0.403
		%	20.0%	80.0%	100.0%		
	Upper Middle class	Count	7	16	23		
		%	30.4%	69.6%	100.0%		
	Middle class	Count	28	36	64		
		%	43.8%	56.3%	100.0%		
	Lower middle class	Count	30	29	59		
		%	50.8%	49.2%	100.0%		
	Lower class	Count	13	16	29		
		%	44.8%	55.2%	100.0%		
Total		Count	79	101	180		
		%	43.9%	56.1%	100.0%		

In our study, 80% of the upper class responded yes to handwashing after coughing/ sneezing. 69.6% of upper middle class, 56.3 % middle class, 49.2% lower middle class and 55.2% of lower class reported the same. Hence there was no statistically significant association between socioeconomic classification and handwashing practices after sneezing/coughing.

Table 15: Association Of Previously Diagnosed for TB with handwashing after coughing/ sneezing

			Handwashing after coughing/ sneezing		Total	Chi square value	P value
			No	Yes			
Previously Diagnosed for TB	No	Count	71	88	159	0.324	0.569
		%	44.7%	55.3%	100.0 %		
	Yes	Count	8	13	21		
		%	38.1%	61.9%	100.0 %		
Total		Count	79	101	180		
		%	43.9%	56.1%	100.0 %		

61.9 % of participants with previously diagnosed for TB and 55.3% participants not previously diagnosed for TB reported doing hand washing after coughing.

Table 16: Association Of Smoking with Type of TB

			Type of TB		Total	Chi square value	P value
			Extra pulmonary	Pulmonary			
Smoking	Never	Count	77	56	133	9.513	0.009*
		%	57.9%	42.1%	100.0%		
	Past	Count	8	19	27		
		%	29.6%	70.4%	100.0%		
	Present	Count	7	13	20		
		%	35.0%	65.0%	100.0%		
Total		Count	92	88	180		
		%	51.1%	48.9%	100.0%		

***-Statistically significant**

The crosstab analysis examines the relationship between smoking status and the type of tuberculosis (TB). The results indicate a significant association (Chi-square value: 9.513, p-value: 0.009). Among non-smokers, a majority have extra pulmonary TB (57.9%), while past and current smokers have higher proportions of pulmonary TB (70.4% and 65.0% respectively). Overall, 51.1% of the sample

have extra pulmonary TB and 48.9% have pulmonary TB. This suggests that smoking status is significantly related to the type of TB, with smokers more likely to have pulmonary TB.

Table 17: Association Of Alcohol with Type of TB

			Type of TB			Chi square value	P value
			Extra pulmonary	Pulmonary	Total		
Alcohol	Habitual	Count	7	16	23	10.854	0.004*
		%	30.4%	69.6%	100.0%		
	No	Count	79	57	136		
		%	58.1%	41.9%	100.0%		
	Social	Count	6	15	21		
		%	28.6%	71.4%	100.0%		
Total		Count	92	88	180		
		%	51.1%	48.9%	100.0%		

***-Statistically significant**

In our study, 16 among 23 habitual alcoholics (69.6%),57 out of 136 (41.9%) of non-alcoholics and 15 out of 21 (71.4%) of social drinkers had pulmonary TB. Rest of the participants had extrapulmonary TB. There was statistically significant association between alcohol use and type of TB at p-value <0.05% with majority of the non-alcoholics having extra pulmonary TB and most of the alcoholics having pulmonary TB.

Table 18: Association Of Diabetes Mellitus with Type of TB

			Type of TB		Total	Chi square value	P value
			Extra pulmonary	Pulmonary			
Diabetes mellitus	Absent	Count	84	67	151	7.656	**0.006 ***
		%	55.6%	44.4%	100.0 %		
	Present	Count	8	21	29		
		%	27.6%	72.4%	100.0 %		
Total		Count	92	88	180		
		%	51.1%	48.9%	100.0 %		

***-Statistically significant**

Among the study participants, majority of participants with diabetes mellitus had pulmonary TB (72.4%) and rest (27.6%) had extra pulmonary TB. In contrast majority of participants without the history of diabetes mellitus had extrapulmonary TB (55.6%) and rest (44.4%) had pulmonary TB. Hence it was found that there is statistically significant association between the type of TB and history of diabetes mellitus with majority of diabetics having pulmonary TB (p value 0.006).

Table 19: Association Of Hypertension with Type of TB

			Type of TB		Total	Chi square value	P value
			Extra pulmonary	Pulmonary			
Hypertension	No	Count	89	86	175	0.163	0.687
		%	50.9%	49.1%	100.0%		
	Yes	Count	3	2	5		
		%	60.0%	40.0%	100.0%		
Total		Count	92	88	180		
		%	51.1%	48.9%	100.0%		

When the relationship between hypertension and type of TB were compared, there was no statistically significant association found.

Table 20: Association of HIV status with Type of TB

			Type of TB		Total	Chi square value	P value
			Extra pulmonary	Pulmonary			
HIV status	Negative	Count	91	87	178	0.001	0.975
		%	51.1%	48.9%	100.0%		
	Positive	Count	1	1	2		
		%	50.0%	50.0%	100.0%		
Total		Count	92	88	180		
		%	51.1%	48.9%	100.0%		

In our study, among 2 patients with HIV positive status, 1 patient had pulmonary and 1 had extra pulmonary TB. There was no statistically significant association found between type of TB and HIV status.

Table 21: Association Of Occupation with Type of TB

			Type of TB		Total	Chi square value	P value
			Extra pulmonary	Pulmonary			
Occupation	Daily labourer	Count	15	22	37	9.725	0.137
		%	40.5%	59.5%	100.0%		
	Dependent	Count	7	6	13		
		%	53.8%	46.2%	100.0%		
	Employee	Count	10	8	18		
		%	55.6%	44.4%	100.0%		
	Farmer	Count	18	23	41		
		%	43.9%	56.1%	100.0%		
	House wife	Count	13	14	27		
		%	48.1%	51.9%	100.0%		
	Student	Count	20	6	26		
		%	76.9%	23.1%	100.0%		
	Unemployed	Count	9	9	18		
		%	50.0%	50.0%	100.0%		
Total		Count	92	88	180		
		%	51.1%	48.9%	100.0%		

The Chi-square value of 9.725 with a P value of 0.137 indicates that there is no statistically significant association between the type of TB and occupation.The percentages of TB types within each occupation show variability, with students having a notably higher proportion of extra pulmonary TB (76.9%) compared to pulmonary TB (23.1%), while other occupations have more balanced distributions. The overall distribution of TB types across all occupations is relatively even, with 51.1% of cases being extra pulmonary and 48.9% being pulmonary

Table 22: Association Of BMI Category with Type of TB

			Type of TB		Total	Chi square value	P value
			Extra pulmonary	Pulmonary			
BMI CAT	Normal range	Count	28	29	57	9.840	0.043*
		%	49.1%	50.9%	100.0%		
	Obese 1	Count	11	3	14		
		%	78.6%	21.4%	100.0%		
	Obese 2	Count	4	0	4		
		%	100.0%	0.0%	100.0%		
	Overweight	Count	5	3	8		
		%	62.5%	37.5%	100.0%		
	Underweight	Count	44	53	97		
		%	45.4%	54.6%	100.0%		
Total		Count	92	88	180		
		%	51.1%	48.9%	100.0%		

***-Statistically significant**

In our study, 50.9% of participants with normal BMI, 21.4% obese 1, 37.5% of overweight and 54.6% of underweight participants had pulmonary TB.

Extra pulmonary TB was found in 49.1% of normal BMI participants, 78.6% of obese1, 100% of obese 2, 62.5% overweight and 45.4% underweight participants.

There was statistically significant association found between BMI category and type of TB with majority of underweight participants having pulmonary TB and increased BMI participants having extra pulmonary TB, suggesting the nutritional status related to the type of TB.

Table 23: Association Of educational status with where they took consultation first

			Where you took consultation first				Total	Chi square value	P value
			Clinic	Hospital	Medical college	PHC			
Educational status of the individual	Degree holders	Count	1	19	8	0	28	23.77	0.022 *
		%	3.6%	67.9%	28.6%	0.0%	100.0 %		
	Didn't attend school	Count	2	21	23	0	46		
		%	4.3%	45.7%	50.0%	0.0%	100.0 %		
	Primary (1-5)	Count	0	9	17	0	26		
		%	0.0%	34.6%	65.4%	0.0%	100.0 %		
	PUC	Count	5	8	11	1	25		
		%	20.0%	32.0%	44.0%	4.0%	100.0 %		
	Secondary (6-10)	Count	2	28	24	1	55		
		%	3.6%	50.9%	43.6%	1.8%	100.0 %		
Total		Count	10	85	83	2	180		
		%	5.6%	47.2%	46.1%	1.1%	100.0 %		

***-Statistically significant**

The P-value (0.022) indicates that there is a statistically significant association between the "Educational status of the individual" and where they first sought consultation. It was found that majority of degree holders (67.9%) and secondary level education category (50.9%) took first treatment from private hospitals. Majority of primary education category (65.4%) and about half of illiterates (50%) took first treatment from medical colleges. This suggests that educational status influences the choice of consultation location. In summary, the table provides insights into how the educational status of individuals influences their initial choice of where to seek consultation for health-related issues. It shows varied patterns in healthcare-seeking behaviour based on different levels of educational attainment.

Table 24: Association Of Previously Diagnosed for TB with where you took consultation first

			Where you took consultation first				Total	Chi square value	P value
			Clinic	Hospital	Medical college	PHC			
Previously diagnosed for TB	No	Count	6	75	77	1	159	12.23	0.007*
		%	3.8%	47.2%	48.4%	0.6%	100.0 %		
	Yes	Count	4	10	6	1	21		
		%	19.0%	47.6%	28.6%	4.8%	100.0 %		
Total		Count	10	85	83	2	180		
		%	5.6%	47.2%	46.1%	1.1%	100.0 %		

***-Statistically significant**

Majority of participants with previously diagnosed with TB (47.6%) took treatment from private hospitals, whereas majority without previous history of TB (48.4%) took treatment from medical college. The P-value (0.007) indicate that there is a statistically significant association between the "Previously Diagnosed for TB" status and where individuals first sought consultation. This suggests that the previous TB diagnosis status influences the choice of consultation location.

Table 25: Association Of Completion of treatment course with where you took consultation first

			Where you took consultation first				Total	Chi square value	P value
			Clinic	Hospital	Medical college	PHC			
Completion of treatment course	NA	Count	6	75	77	1	159	16.187	0.013*
		%	3.8%	47.2%	48.4%	0.6%	100.0 %		
	No	Count	2	5	3	1	11		
		%	18.2%	45.5%	27.3%	9.1%	100.0 %		
	Yes	Count	2	5	3	0	10		
		%	20.0%	50.0%	30.0%	0.0%	100.0 %		
Total		Count	10	85	83	2	180		
		%	5.6%	47.2%	46.1%	1.1%	100.0 %		

***-Statistically significant**

In summary, the table shows that there was statistically significant association between the individuals' completion status of the treatment course and their initial choice of where to seek consultation for health-related issues. It was found that 50% of treatment completed individuals took treatment from private hospitals, where as only 45.5% of incompletely treated participants took treatment from the same. This suggests that the completion status of the treatment course influences the choice of consultation location

Table 26: Association Of Previously Diagnosed for TB with BMI Category

			BMI Category					Total	Chi square value	P value
			Normal range	Obese 1	Obese 2	Overweight	Underweight			
Previously Diagnosed for TB	No	Count	55	14	3	7	80	159	9.457	0.051
		%	34.6%	8.8%	1.9%	4.4%	50.3%	100.0%		
	Yes	Count	2	0	1	1	17	21		
		%	9.5%	0.0%	4.8%	4.8%	81.0%	100.0%		
Total		Count	57	14	4	8	97	180		
		%	31.7%	7.8%	2.2%	4.4%	53.9%	100.0%		

***-Statistically significant**

The table shows that among patients previously diagnosed with TB ("Yes" category), the majority are underweight (17 out of 21, or 81.0%). In contrast, among patients not previously diagnosed with TB ("No" category), the majority are within the normal BMI range (55 out of 159, or 34.6%) or underweight (80 out of 159, or 50.3%). Obese categories (Obese 1 and Obese 2) have smaller counts overall, with Obese 1 not represented in the "Yes" category at all. In summary, the table provides insights into the distribution of BMI categories among patients diagnosed with TB, segmented by their previous TB diagnosis status. It highlights significant associations between BMI and TB diagnosis history.

Table 27: Association Of Previously Diagnosed for TB with how was diagnosed

			How was diagnosed			Total	Chi square value	P value
			CT scan	Sputum	X-ray			
Previously Diagnosed for TB	No	Count	6	143	10	159	0.118	0.943
		%	3.8%	89.9%	6.3%	100.0 %		
	Yes	Count	1	19	1	21		
		%	4.8%	90.5%	4.8%	100.0 %		
Total		Count	7	162	11	180		
		%	3.9%	90.0%	6.1%	100.0 %		

The table suggests that among patients previously diagnosed for TB ("Yes" category), the majority were diagnosed using sputum (19 out of 21, or 90.5%). Among patients not previously diagnosed for TB ("No" category), sputum was also the predominant diagnostic method (143 out of 159, or 89.9%). CT scan and x-ray were used less frequently overall, with CT scan being more evenly distributed between the two categories compared to x-ray.

Table 28: Association Of treatment received with how was diagnosed

			How was diagnosed			Total	Chi square value	P value
			CT scan	Sputum	Xray			
Treatment received	Irregular	Count	1	9	1	11	1.073	0.585
		%	9.1%	81.8%	9.1%	100.0 %		
	NA	Count	6	153	10	169		
		%	3.6%	90.5%	5.9%	100.0 %		
Total		Count	7	162	11	180		
		%	3.9%	90.0%	6.1%	100.0 %		

The table suggests that among patients where treatment was irregular, the majority were diagnosed using sputum (9 out of 11, or 81.8%). Among patients where treatment status was not applicable or not specified, also sputum was the predominant diagnostic method (153 out of 169, or 90.5%). CT scan and x-ray were used less frequently overall. No statistically significant association was found between previous treatment received and how was diagnosed.

Table 29: Association Of Hypertension with treatment received

			Treatment received		Total	Chi square value	P value
			Irregular	NA			
Hypertension	No	Count	10	165	175	1.729	0.189
		%	5.7%	94.3%	100.0%		
	Yes	Count	1	4	5		
		%	20.0%	80.0%	100.0%		
Total		Count	11	169	180		
		%	6.1%	93.9%	100.0%		

In our study, there was no statistically significant association found between the treatment received (whether irregular or not applicable) and history of hypertension.

Table 30: Association Of Diabetes mellitus with BMI Category

		BMI Category					Total	Chi square value	P value
		Underweight	Normal range	Overweight	Obese 1	Obese 2			
Diabetes mellitus	Absent	84	46	7	10	4	151	3.409	0.492
		55.6%	30.5%	4.6%	6.6%	2.6%	100.0%		
	Present	13	11	1	4	0	29		
		44.8%	37.9%	3.4%	13.8%	0.0%	100.0%		
Total		97	57	8	14	4	180		
		53.9%	31.7%	4.4%	7.8%	2.2%	100.0%		

The P-value (0.492) indicates that there is no statistically significant association between BMI categories and the presence or absence of diabetes mellitus at the conventional significance level of 0.05. This means that BMI categories do not appear to significantly influence the likelihood of having diabetes mellitus based on this data.

DISCUSSION

Socio-Demographic Characteristics:

Our study found a significant gender disparity among T.B. patients, with 63% of participants being male and 37% being female. This aligns with findings from Priyanka Sharma et al. (2015), who reported that males comprised 58.6% of the T.B. patient population, indicating a persistent male predominance in T.B. incidence across different regions and periods [(59)]. The 2023 WHO Tuberculosis Report further corroborates these findings, noting that T.B. cases are more common among men than women, with adults making up about 90% of new cases each year [(60)] . This gender imbalance may be attributed to various socio-economic, cultural, and biological factors that increase men's susceptibility to T.B. or affect their likelihood of seeking diagnosis and treatment.

Our study found that Hindus comprised 91.7% of the sample, contrasting with Ratnesh et al.'s study where Hindus constituted 55.9%. Conversely, Muslims accounted for 8.3% in our study compared to 44.1% in Ratnesh et al.'s.[13] These discrepancies highlight significant variations in religious representation across studies, potentially influenced by regional demographics.

The age distribution in our study highlights that T.B. predominantly affects young to middle-aged adults, with the highest prevalence observed in the 21-40 years age group (37.2%), followed by the 41-60 years age group (31.7%). This pattern is consistent with the study by Priyanka Sharma et al. (2015), which found the highest disease burden in the 20-60 years age group (72.2%) [(59)]. Similarly, Mohit Bhardwaj et al. reported a majority of patients aged between 40 to 50 years, reinforcing the notion that T.B. primarily impacts adults in their prime working years (3). This trend underscores the significant public health and economic implications of T.B., as it affects the most productive segments of the population.

Education plays a crucial role in health awareness and access to healthcare services. In our study, about three-fourths of the participants had some level of education, ranging from primary (14.4%) to secondary (31.1%) and degree-level (14.5%). Conversely, 25.6% of participants had no formal education. These findings are somewhat similar to those of Venketesh et al. (2016), who found that 24.2% of T.B. patients were illiterate, with a majority having completed primary education (45.9%), followed by secondary (15.3%), and higher secondary education (10.8%) [(63)] . This distribution suggests that while education levels vary, a substantial proportion of T.B. patients possess at least basic literacy, which could potentially facilitate better health communication and adherence to treatment protocols.

The socioeconomic status of T.B. patients is a critical factor influencing disease prevalence and treatment outcomes. In our study, the majority of participants belonged to the middle class (35.6%) and lower middle class (32.8%), with the least belonging to the upper middle class (2.8%). This distribution reflects a significant burden of T.B. among lower socioeconomic groups, consistent with findings from Jethani et al. (2010), where 90.3% of study subjects were from lower socioeconomic status [(64)]. Similarly, Faisal Imam et al. found that 70.43% of T.B. patients belonged to the lower middle class, highlighting the vulnerability of this group to T.B. and related adverse events [(65)].

Another study by Ratnesh et al. (2016) in Bareilly district, Uttar Pradesh, reported that 65.6% of the study population belonged to socioeconomic status class IV according to the modified BG Prasad scale [(66)].

In our study, the majority of participants belonged to nuclear families (46.7%), followed by those from three-generation families (30%) and joint families (23.3%). This distribution contrasts with the findings of Venkatesh et al., where 43.9% of T.B. patients were from joint families, 39.5% from three-generation families, and only 16.6% from nuclear families [(63)].

In our study, the majority of participants were farmers (22.8%), followed by daily laborers (20.6%), and students (14%). This contrasts with Sharma et al.,[1] where housewives (28.2%) and unemployed individuals (20.3%) were predominant, and Venkatesh et al.,[63] which reported the highest proportion of daily laborers (23.6%) and a lower representation of farmers (5.1%).

Clinical characteristics of tuberculosis patients:

In our study, more than half of the participants (58.9%) had a BCG scar, indicating prior vaccination, while 41.1% did not have a BCG scar. This contrasts with the study by Venkatesh et al., where only 28% of participants had a BCG scar.

In our study, sputum results showed that 1.1% were Negative, 7.8% were +1, 8.3% were +2, 10.0% were +3, and 72.8% were not available. These findings contrast with Bhardwaj and Shah's[11] study, where they reported 24.2% negative, 14.5% for both +1 and +3 sputum results, and 18.1% for +2.

Similarly, Sharma et al. observed 24.2% negative sputum results, with 14.5% for both +1 and +3, and 18.1% for +2, indicating some consistency with Bhardwaj and Shah's findings but also differences in distribution. This discrepancy suggests variability in tuberculosis diagnostic outcomes across different studies, possibly influenced by sample characteristics or testing methodologies.

Regarding tuberculosis type, nearly half of our participants had extrapulmonary TB (51.1%), whereas the remainder had pulmonary TB. In contrast, Venkatesh et al. reported a higher prevalence of pulmonary TB (97.5%), with only 2.6% having both pulmonary and other forms of TB.

Our study and Sharma et al. examined the distribution of extrapulmonary tuberculosis (TB) across various sites. While both studies identified common sites such as lymph nodes and pleural effusion, there were notable differences in the frequencies. In our study, pleural effusion (16.7%) and lymph nodes (13.9%) were prominently affected, with lower incidences in the abdomen (4.4%) and genitourinary system (3.3%). Sharma et al. found higher occurrences in lymph nodes (47.2%) and pleural effusion (24.3%), with abdomen (22.9%) and genitourinary system (2.8%) also reported. These variations underscore potential regional or demographic differences in TB manifestations.

HIV prevalence in our study was very low, with only 1.1% of participants being HIV positive, compared to 3.8% in the Venkatesh et al. study. Additionally, Datta et al.,[67] reported an HIV seropositivity rate of 1.9% among MDR-TB cases, which is closer to our findings and highlights the varying prevalence rates in different contexts. Additionally, Bilagi RB et al.[72] reported a 2.65% HIV positivity rate, which further highlights the variability in HIV prevalence across different studies. Diabetes was present in 16.1% of our participants, higher than the 7% reported by Venkatesh et al.

Smoking and alcohol use were also assessed. In our study, the majority were non-smokers (72%), followed by smokers (28%). This finding is comparable to the study by J.B. Singh et al.,[68] which also highlighted smoking status in TB patients. Venkatesh et al. did not report on smoking habits, but they did note that 14.6% of their participants had a history of tobacco chewing. Regarding alcohol use, 75.6% of our participants were non-alcoholics, while 12.8% were habitual drinkers

and 11.7% were social drinkers. In the Venkatesh et al. study, 58.6% of participants did not consume alcohol, 12.7% were habitual drinkers, and 28.7% were social drinkers.

Our study found that the most commonly reported symptoms were cough (52.78%), expectoration (41.67%), and fever (40.00%). Shortness of breath (26.11%) and anorexia (23.89%) were also frequently noted. These results are consistent with the findings of Bhardwaj and Shah [(69)], who reported cough with expectoration (73.33%) and fever (56.67%) as predominant symptoms. This consistency suggests that cough and fever are reliable indicators of respiratory conditions across different settings.

In contrast, J.B. Singh et al.[73] identified cough in 93% of cases, followed by weakness (59%), chest pain (34%), fever (54%), shortness of breath (30%), and haemoptysis (23%). These findings complement our study's observations, emphasizing the prominent role of cough as a primary symptom in respiratory illnesses. However, Bhardwaj and Shah noted a higher prevalence of weight loss and loss of appetite (90%) and breathlessness (76.67%) compared to our findings, indicating potential variations in symptom presentation.

Our study diagnosed smear-negative pulmonary tuberculosis using CT scan in 3.9% of cases, sputum examination in 90.0% of cases, and chest X-ray in 6.1% of cases. This diagnostic approach aligns with recommendations emphasizing the combination of clinical features and radiographic imaging, as highlighted in previous literature [(74)].

The systematic review referenced demonstrates that the combination of clinical parameters and chest X-rays yields a high sensitivity (median 96%) but lower specificity (median 46%) for diagnosing pulmonary tuberculosis. In contrast, CT thorax offers superior specificity (over 80%), even in smear-negative patients with atypical features, such as those with AIDS [(75)].

In our study, BMI distribution showed 53.9% were underweight, 31.7% fell within the normal range, 4.4% were overweight, 7.8% were obese class 1, and 2.2% were obese class 2. Sumit Jethani et al.[70] reported 48.3% as undernourished, 46.7% as normal, and 5.0% as overnourished based on BMI classifications. Venkatesh et al. noted a high prevalence of severe thinness (<16 BMI) at 64.3%, with 35.7% having a BMI of 16 and above, indicating significant nutritional challenges in their study population.

Housing condition of tuberculosis patients:

Our study examined housing conditions, finding that 6.7% lived in katcha houses, 50.0% in pucca houses, and 43.3% in semi-pucca houses. Overcrowding was present in 28.89% of cases, with 91.11% having cross ventilation and 16.11% experiencing indoor air pollution. In contrast, Venkatesh et al. reported higher overcrowding (76.13-87.9%) and lower rates of cross ventilation (25.5%). Their housing types were 49.7% pucca, 29.3% semi-pucca, and 21% katcha.

Hygiene practices of tuberculosis patients:

In our study, hygiene practices varied significantly: 74 participants reported hygienic practices at home, while 35 reported unhygienic practices. Publicly, 60 participants practiced hygiene, with 46 reporting unhygienic practices. Facemask usage was noted in 120 cases, and handwashing after coughing or sneezing was reported by 101 participants. Regarding knowledge of cough hygiene, 104 participants answered correctly, while 72 answered incorrectly. Venkatesh et al. found contrasting results: 66.9% practiced hygienic sputum disposal at home, whereas only 8.3% did so in public places. Facemask usage was reported by 78.3%, and handwashing after coughing or sneezing was observed in 14.6% of cases. Knowledge about cough hygiene was low, with only 12.7% answering correctly.

Venkatesh et al. found that 14.6% of participants reported always washing their hands after coughing or sneezing, while 66.9% did not, and 18.5% did so sometimes. In contrast, our study revealed that the majority of participants reported consistently washing their hands after coughing or sneezing (56.1%). This suggests a higher adherence to hand hygiene practices in our study cohort compared to the findings reported by Venkatesh et al. The variation in handwashing practices between studies may reflect differences in cultural norms, education levels, or public health campaigns promoting hygiene practices.

In our study, we observed a distribution of drug-sensitive TB and MDR TB across gender categories. For drug-sensitive TB, 37.4% of females and 62.6% of males were affected, while for MDR TB, the distribution was 36.9% females and 63.1% males. Statistical analysis using chi-square tests did not show significant differences in TB distribution between genders for both drug-sensitive TB, indicating similar prevalence rates across genders in our study. Comparatively, Sharma et al. reported significant differences in TB distribution across age groups (0-9, 10-19, 20-60, >60 years), with a notable concentration of drug-sensitive TB in the 20-60 age group (68.6%) and MDR TB primarily in the same age group (84.6%). This aligns with our findings of higher proportions of both drug-sensitive TB (68.6%) and MDR TB (84.6%) occurring in adults aged 20-60 years. The statistical significance observed in Sharma et al.'s study underscores age as a critical factor influencing TB epidemiology, particularly the prevalence of drug-resistant strains.

Facemask Usage and Socio-Demographic Factors

Educational Status: In contrast to Zahra Rahimi et al.'s findings highlighting literacy as the primary determinant of mask usage over economic factors, our study did not find a significant association between educational status and facemask usage ($\chi^2 = 6.332$, $p = 0.176$). Nevertheless, individuals with degrees and PUC education showed notably higher rates of facemask usage (67.9% and 76.0%, respectively), hinting at a possible link between higher educational attainment and adherence to preventive measures like wearing facemasks.

Occupation: Similarly, occupation showed no significant association with facemask usage ($\chi^2 = 7.482$, $p = 0.279$). Notably, employees had the highest compliance (83.3%), while daily laborers exhibited lower usage rates (59.5%). This disparity might reflect varying levels of exposure and access to information among different occupational groups.[77]

SES: Analysis of SES also revealed no significant association with facemask usage ($\chi^2 = 1.387$, $p = 0.847$). Despite this, individuals from lower SES categories tended to report higher facemask usage (e.g., 72.4% in lower class), possibly influenced by community norms or public health interventions.

Handwashing Practices and Socio-Demographic Factors

Hand hygiene, specifically handwashing after coughing or sneezing, is crucial for preventing respiratory and other infections.

Educational Status: There was no significant association between educational status and handwashing practices ($\chi^2 = 5.924$, $p = 0.205$). However, degree holders showed higher adherence (67.9%), contrasting with lower rates among those who didn’t attend school (45.7%).

Occupation: Occupational differences also did not significantly affect handwashing practices (χ^2 = 10.741, p = 0.097). Notably, students (46.2%) and dependents (30.8%) exhibited lower rates compared to farmers (56.1%) and housewives (66.7%).

SES: SES did not significantly influence handwashing practices (χ^2 = 4.020, p = 0.403), with varied adherence rates across different SES categories.

Association of Co-morbidities with Type of TB

The study by C. Kolappan and P. G. Gopi [76] revealed a significant association between tobacco smoking and bacillary tuberculosis (TB), reporting a crude odds ratio (OR) of 2.48 (95% CI 1.42 to 4.37, p < 0.001). Similarly, our study found a substantial link between smoking status and TB type (χ^2 = 9.513, p = 0.009), with a notable prevalence of pulmonary TB among both past (70.4%) and current smokers (65.0%). These findings emphasize smoking as a potential risk factor for pulmonary TB, supporting the urgent need for targeted public health interventions to curb smoking rates and thereby reduce the incidence of TB, particularly pulmonary cases, within affected populations.

Alcohol Use: Similarly, alcohol consumption showed a significant association with type of TB (χ^2 = 10.854, p = 0.004). Habitual and social drinkers had higher proportions of pulmonary TB (69.6% and 71.4%, respectively), indicating a possible link between alcohol use and pulmonary TB susceptibility.

Our study identified a significant association between diabetes mellitus and pulmonary tuberculosis (χ^2 = 7.656, p = 0.006), with 72.4% of diabetic individuals having pulmonary TB, indicating diabetes as a potential risk factor. Similarly, a study by Aadne et al. [78] found that 9.7% of TB patients had diabetes, with newly diagnosed cases constituting 34.6%. Despite a high TB treatment success rate (94.0%), patients with diabetes had a markedly higher rate of poor TB

treatment outcomes (26.9% vs. 3.7% for non-diabetics). The adjusted odds of poor outcomes for diabetic patients were 14.8 times higher (95% CI 3.5–62.7). These findings highlight the significant impact of diabetes on TB outcomes.

BMI Category: BMI category showed a significant association with type of TB ($\chi^2 = 9.840$, $p = 0.043$). Underweight individuals predominantly had pulmonary TB (54.6%), while obese individuals tended towards extra-pulmonary TB (78.6% in Obese 1 category).

Healthcare Seeking Behavior and Previous TB Diagnosis

Healthcare Facility Choice: Educational status ($\chi^2 = 23.77$, $p = 0.022$) and previous TB diagnosis ($\chi^2 = 12.23$, $p = 0.007$) significantly influenced where individuals sought initial consultation. Degree holders and those with previous TB tended to choose private hospitals, whereas those with primary education or no prior TB diagnosis preferred medical colleges or public health centers.

Completion of Treatment Course: Completion of TB treatment significantly influenced initial healthcare-seeking behavior ($\chi^2 = 16.187$, $p = 0.013$), with completed treatment individuals more likely to seek care at private hospitals.

Summary

- This cross-sectional study was conducted at BLDE (Deemed to be University) Shri B. M. Patil Medical College Hospital & Research Centre, Vijayapura, from January to December 2023, involving 180 tuberculosis (TB) patients. Data were collected through face-to-face interviews using semi-structured questionnaires, employing convenient sampling of all willing and eligible diagnosed TB patients meeting inclusion criteria after obtaining ethical clearance from the Institutional Ethical Committee.
- Gender distribution showed 63% males and 37% females among participants.
- Age distribution revealed 37.2% aged 21-40 years, 31.7% aged 41-60 years, 16.1% <= 20 years, and 15% >= 61 years.
- Educationally, 14.4% had primary education, 31.1% secondary education, 14.5% were degree holders, and 25.6% were uneducated.
- Socioeconomic backgrounds varied, with 35.6% from middle-class, 32.8% from lower-
- Occupation-wise, 22.8% were farmers, 20.6% daily labourers, and 14% students.
- Family types included 46.7% nuclear families, 30% three-generation families, and 23.3% joint families.
- TB diagnosis showed 88.3% were newly diagnosed, with 11.7% previously diagnosed cases.
- Smoking prevalence was 74% non-smokers, 15% past smokers, and 11.1% current smokers.
- Alcohol use indicated 75.6% non-alcoholics, 12.8% habitual drinkers, and 11.7% social drinkers.
- Housing conditions ranged with 50% in pucca houses, 43.3% in semi-pucca houses, and 6.7% in katcha houses.
- BMI categories included 53.9% underweight, 31.7% normal weight, and 15% overweight or obese.

- Health status showed 98.9% were HIV negative, 1.1% HIV positive; 16.1% had diabetes, and 2.8% were hypertensive.
- Habitual alcoholics showed 69.6% pulmonary TB, non-alcoholics 41.9%, and social drinkers 71.4%, indicating a significant association between alcohol use and pulmonary TB ($p < 0.05$).
- Non-smokers exhibited 57.9% extrapulmonary TB, while past smokers had 70.4% and current smokers 65.0% pulmonary TB, showing a significant association where smokers are more likely to have pulmonary TB ($p = 0.009$).
- There is a significant association between diabetes mellitus and TB type, with a majority of diabetics having pulmonary TB (81.0%, p-value 0.006).
- Significant association was found between BMI categories and TB type, where underweight participants predominantly had pulmonary TB, while those with higher BMI had extrapulmonary TB, suggesting a link between nutritional status and TB type.
- There is a statistically significant association between the educational status of individuals and where they first sought consultation. Degree holders (67.9%) and those with secondary education (50.9%) primarily sought treatment at private hospitals, while primary education holders (65.4%) and illiterates (50%) opted for medical colleges.
- A significant association exists between previous TB diagnosis and treatment location choice, with a majority of previously diagnosed TB patients (47.6%) seeking treatment at private hospitals, compared to those without prior TB history (48.4%) who preferred medical colleges.
- There was a statistically significant association between the completion status of the treatment course and initial treatment location preference. Completers (50%) favoured private hospitals, whereas incomplete treatment cases (45.5%) often chose medical colleges.

- Among previously diagnosed TB patients, there was a significant association between BMI categories and TB history. The majority were underweight (81.0%), highlighting the link between BMI and TB diagnosis history.
- The study's findings underscore the need for targeted health education initiatives aimed at enhancing community awareness of TB symptoms, treatment options, and the importance of accessing appropriate healthcare facilities. Integrated care models that address socioeconomic factors, including housing conditions and nutritional status, alongside medical treatment, are recommended to improve TB management outcomes. Limitations include potential sampling bias due to convenient sampling methods, which may restrict the generalizability of the findings, and reliance on self-reported data, such as smoking and alcohol use, which could introduce recall bias and affect the accuracy of observed associations in the study.

CONCLUSION

This cross-sectional study was conducted at BLDE (Deemed to be University) Shri B. M. Patil Medical College Hospital & Research Centre, Vijayapura, provides a comprehensive analysis of socio-demographic factors and healthcare-seeking behaviours among 180 TB patients. The study targeted TB patients receiving treatment at the hospital between January and December 2023. Convenient sampling was used to include all consenting and eligible TB patients, with ethical clearance obtained from the Institutional Ethical Committee. Participants were informed about the study's purpose, voluntary participation, anonymity, right to withdraw, and confidentiality of their data. Data collection involved face-to-face interviews using a semi-structured questionnaire and anthropometric measurements, ensuring privacy and non-disruption of the patients' hospital activities. Findings revealed significant associations between various factors and TB outcomes. Smoking and alcohol consumption are found to potentially influence the type of TB diagnosed, while diabetes mellitus and BMI categories also correlate with specific types of TB infections. Educational status emerges as a critical determinant influencing healthcare-seeking behaviour, with educated individuals showing a preference for private healthcare facilities for initial consultation. Moreover, patients previously diagnosed with TB tend to revisit specific healthcare settings, underscoring the impact of past health experiences on current treatment choices. These insights emphasize the need for tailored health interventions to enhance TB treatment adherence and healthcare accessibility, particularly in regions with high TB prevalence.

RECOMMENDATIONS

1. Nutritional Support: Implement programs to provide nutritional support to TB patients, especially those who are underweight. This could include meal programs, nutritional supplements, and education on balanced diets.
2. Health Education: Increase health education initiatives focused on TB prevention, treatment adherence, smoking cessation and hygiene practices. Emphasize the importance of completing treatment and following proper respiratory hygiene practices
3. Strengthening Healthcare Access: Improve access to healthcare services, particularly in rural areas, to ensure early diagnosis and treatment. Encourage the use of medical colleges and hospitals for initial consultations, as they provide comprehensive care.
4. Support Systems for Diabetics: Establish specialized support systems for TB patients with diabetes, given their higher prevalence of pulmonary TB. This can include integrated care models that address both TB and diabetes management.
5. Enhanced Screening and Follow-Up: Enhance screening programs for TB, particularly in high-risk populations. Ensure consistent follow-up with previously treated TB patients to monitor for relapse or incomplete treatment.
6. Housing Improvement Programs: Advocate for better housing conditions for TB patients, focusing on reducing overcrowding and improving ventilation. Provide support for constructing pucca houses and adequate sanitation facilities.

STRENGTHS OF THE STUDY

1. Comprehensive Data Collection: The study collected a wide range of data, including socio-demographic details, clinical characteristics, nutritional status, health-seeking behaviour, and hygiene practices, providing a holistic view of TB patients' profiles

2.Use of Standardized Tools: Utilization of standardized tools like the Modified BG Prasad Classification and BMI calculations ensured consistency and accuracy in data measurement and classification

3.Detailed Analysis: The study used detailed statistical analysis to explore associations between various factors, providing valuable insights into the epidemiological profile of TB patients in Vijayapura.

LIMITATIONS OF THE STUDY

1. Cross-Sectional Design: The cross-sectional nature of the study limits the ability to establish causal relationships between variables. Longitudinal studies would be needed to confirm causation.
2. Self-Reporting bias: Some data, such as health-seeking behaviour and hygiene practices, were self-report which can be subject to recall bias and social desirability bias.
3. Generalizability: The study was conducted at a single hospital, which may limit the generalizability of the findings to other regions or healthcare settings.

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ANNEXURE – I

QUESTIONNAIRE

Epidemiological profile of Tuberculosis patients in Vijayapura, North Karnataka: A hospital-based study.

A. Socio-demographic questionnaire

1. Name		
2. Age		
3. Gender		Male Female
4. Religion**:**		Hindu Muslim Christian Others
5. Caste		SC ST OBC General Refused
6. Attended school		Yes No
7. If yes, educational status of the individual		Didn't attend school Illiterate Primary (1-5) Secondary (6-10) PUC Undergraduate Postgraduate

8. Occupation		House wife Daily labourer Farmer Employee Student Dependent
9. Average monthly income of the family		
10. Type of family:		Nuclear Joint Three generation
11. Does your family have ration card		Yes No Refused
12. If yes, color of the card		Green card Yellow card Antyodaya anna yojana card Honorary card Refused

B. **Previous treatment history**

1. Previously Diagnosed for TB	Yes No
2. If yes, then did you complete treatment course	Yes No
3. If No, treatment received was	Regular Irregular Not taken
4. Irregular, then why	Forgetfulness Symptoms not relieved and took private treatment

	Fear of side effects Felt medications were not effective and decided not to take dose Occupation related problems Symptomatically cured
5. Previous TB declared cure	Yes No Don't know

C. Clinical characteristics

1. Presenting symptoms	Cough Expectoration Anorexia Shortness of breath Fever Hemoptysis Chest pain Vomiting Wheezing
2. Presence of BCG scar	Yes No
3. History of contact with TB cases	Yes No
4. Type of TB	Pulmonary Extra pulmonary
5. Classification	Pulmonary Lymph nodes Pleural effusion

	Abdomen Genito-urinary system Meningitis
6. Available sputum results	+1 +2 +3 -Ve
7. Chest radiology features	Mild Koch's lesions Moderate Koch's lesions Extensive Koch's lesion
8. Hypertension	Yes No
9. Creatinine	Normal High Low
10. HIV status	Positive Negative
11. Diabetes mellitus	Present Absent
12. COPD	Present Absent
13. Smoking	Present Absent
14. Alcohol	Habitual Social No

D. Housing condition

No of rooms in the house	
Type of House:	Kutcha Pucca Semi-pucca
Sharing a bedroom	Yes No
Overcrowding	Present Absent
Housing ventilation of living room	Adequate Non adequate
Cross ventilation	Present Absent
Indoor air pollution	Present Absent
Toilet facility	Own flush Shared toilet Public pit
Source of drinking water	Hand pump Open well Bore well

E. Health seeking behaviour and hygiene practices

1. How was diagnosed	Sputum Xray Ct scan
2. Who told to seek medical attention	Self Relative Asha worker MBBS doctor Specialised doctor BAMS or others
3. Where you took consultation first	PHC Clinic Hospital Medical college
4. Sputum disposal practices at home	Hygienic Unhygienic No idea Not willing to answer
5. Sputum disposal practices at public	Hygienic Unhygienic No idea Not willing to answer
6. Knowledge about cough hygiene	Correct Incorrect Not willing to answer
7. Facemask usage	Yes

	No
8. Handwashing after coughing/ sneezing	Yes No

F. Nutritional status of TB patients

1. Height	
2. Weight	

G. Drug sensitive TB and Drug resistant TB

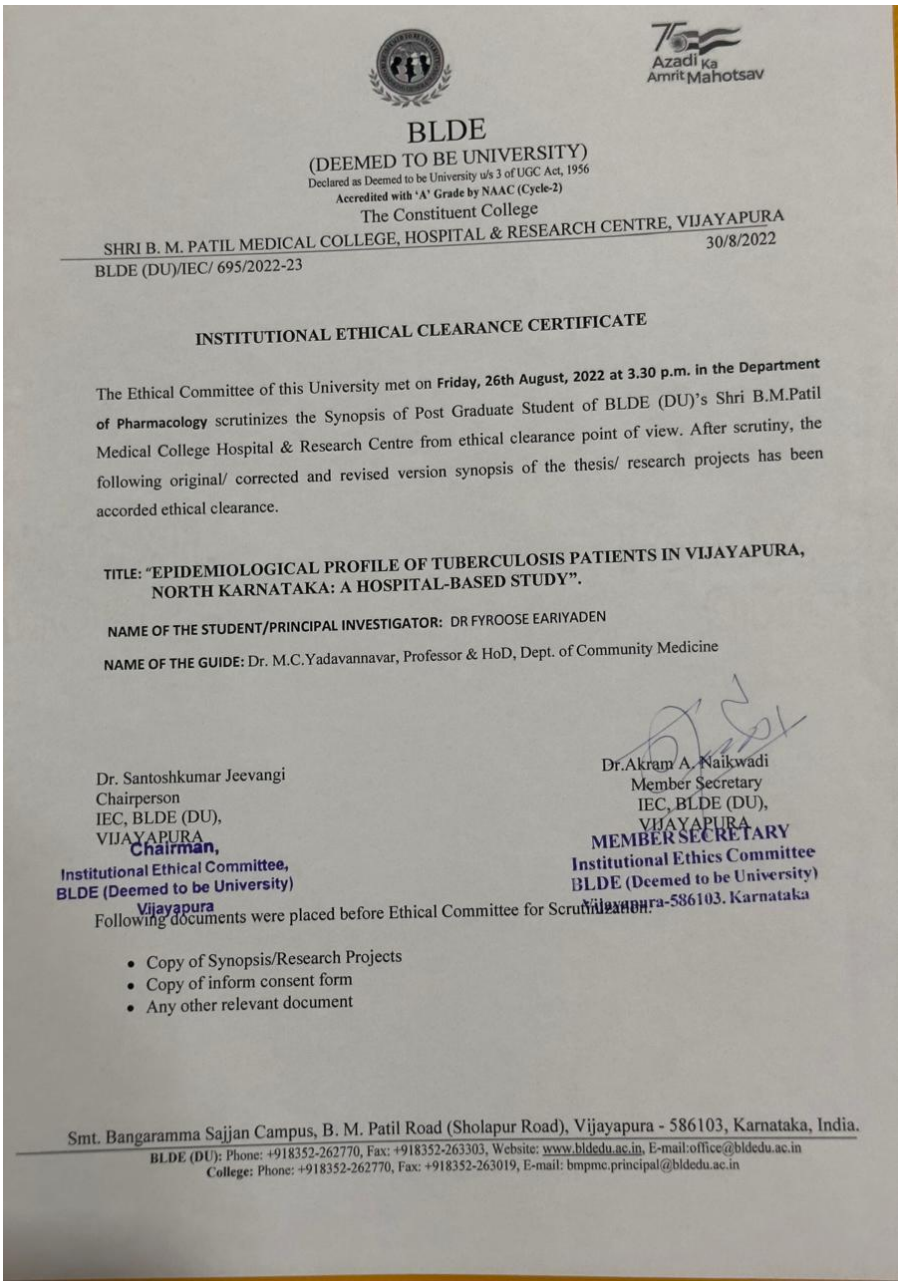
1. Drug sensitive TB	Present Absent
2. Isoniazid mono resistant	Present Absent
3. Rifampicin resistant	Present Absent
4. MDR TB	Present Absent
5. Pre XDR	Present Absent
6. XDR TB	Present Absent

H. Shorter oral, Longer and Modified oral longer bedaquiline containing regimen

1. Shorter oral bedaquiline containing regimen	Present Absent
2. Longer bedaquiline containing regimen	Present Absent
3. Modified oral longer regimen	Present Absent

ANNEXURE – II

ETHICAL CLEARANCE CERTIFICATE



BLDE
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Accredited with 'A' Grade by NAAC (Cycle-2)
The Constituent College
SHRI B. M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE, VIJAYAPURA

BLDE (DU)/IEC/ 695/2022-23 30/8/2022

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this University met on **Friday, 26th August, 2022 at 3.30 p.m. in the Department of Pharmacology** scrutinizes the Synopsis of Post Graduate Student of BLDE (DU)'s Shri B.M.Patil Medical College Hospital & Research Centre from ethical clearance point of view. After scrutiny, the following original/ corrected and revised version synopsis of the thesis/ research projects has been accorded ethical clearance.

TITLE: "EPIDEMIOLOGICAL PROFILE OF TUBERCULOSIS PATIENTS IN VIJAYAPURA, NORTH KARNATAKA: A HOSPITAL-BASED STUDY".

NAME OF THE STUDENT/PRINCIPAL INVESTIGATOR: DR FYROOSE EARIYADEN

NAME OF THE GUIDE: Dr. M.C.Yadavannavar, Professor & HoD, Dept. of Community Medicine

Dr. Santoshkumar Jeevangi
Chairperson
IEC, BLDE (DU),
VIJAYAPURA
Chairman,
Institutional Ethical Committee,
BLDE (Deemed to be University)
Vijayapura

Dr.Akram A. Naikwadi
Member Secretary
IEC, BLDE (DU),
VIJAYAPURA
MEMBER SECRETARY
Institutional Ethics Committee
BLDE (Deemed to be University)
Vijayapura-586103. Karnataka

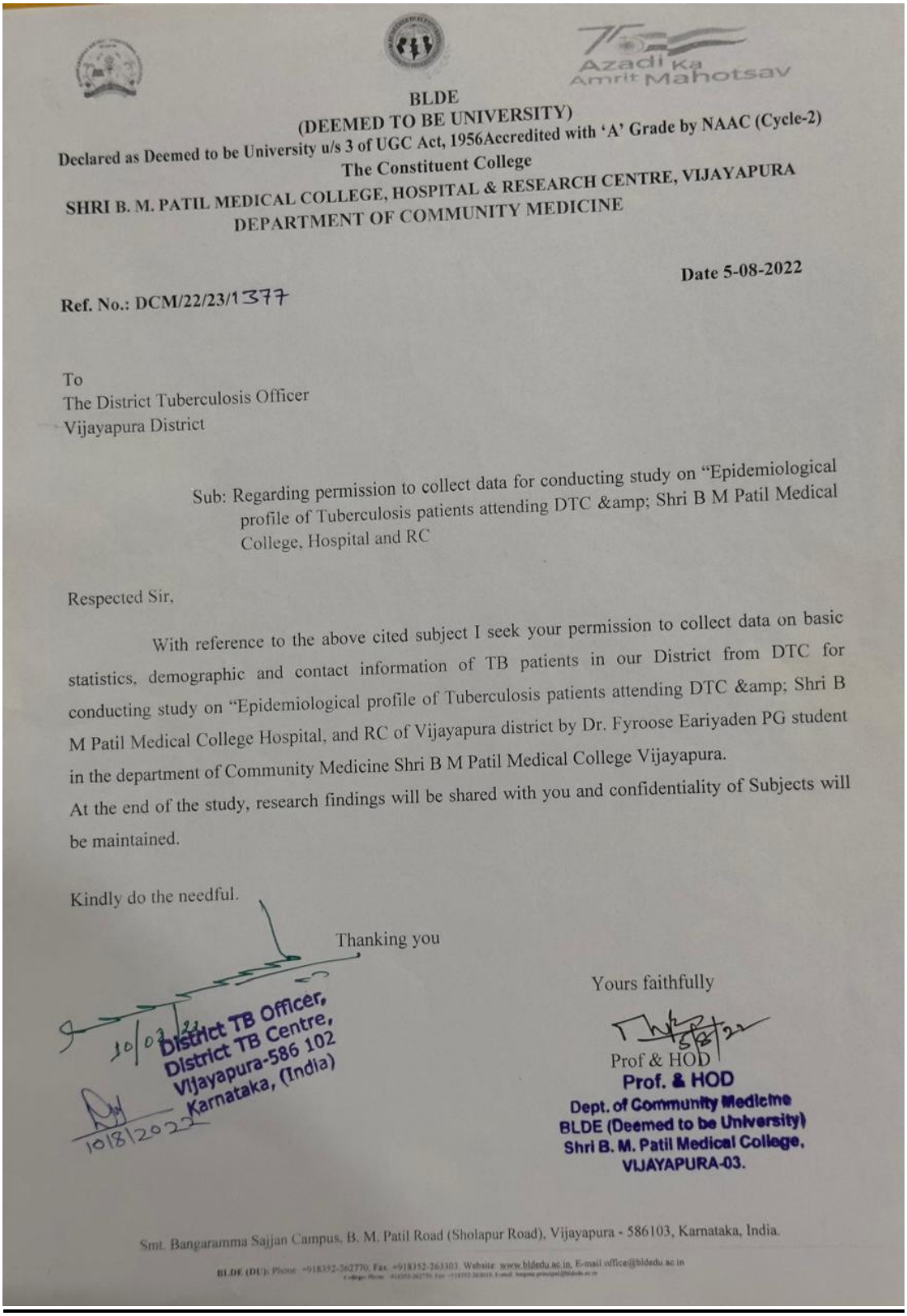
Following documents were placed before Ethical Committee for Scrutinization:

- Copy of Synopsis/Research Projects
- Copy of inform consent form
- Any other relevant document

Smt. Bangaramma Sajjan Campus, B. M. Patil Road (Sholapur Road), Vijayapura - 586103, Karnataka, India.
BLDE (DU): Phone: +918352-262770, Fax: +918352-263303, Website: www.bldedu.ac.in, E-mail:office@bldedu.ac.in
College: Phone: +918352-262770, Fax: +918352-263019, E-mail: bmpmc.principal@bldedu.ac.in

ANNEXURE – III

PERMISSION LETTER



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The Constituent College
SHRI B. M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE, VIJAYAPURA
DEPARTMENT OF COMMUNITY MEDICINE

Azadi Ka Amrit Mahotsav

Ref. No.: DCM/22/23/1377

Date 5-08-2022

To
The District Tuberculosis Officer
Vijayapura District

Sub: Regarding permission to collect data for conducting study on "Epidemiological profile of Tuberculosis patients attending DTC & Shri B M Patil Medical College, Hospital and RC

Respected Sir,

With reference to the above cited subject I seek your permission to collect data on basic statistics, demographic and contact information of TB patients in our District from DTC for conducting study on "Epidemiological profile of Tuberculosis patients attending DTC & Shri B M Patil Medical College Hospital, and RC of Vijayapura district by Dr. Fyroose Eariyaden PG student in the department of Community Medicine Shri B M Patil Medical College Vijayapura.
At the end of the study, research findings will be shared with you and confidentiality of Subjects will be maintained.

Kindly do the needful.

Thanking you

Yours faithfully

10/08/22
District TB Officer,
District TB Centre,
Vijayapura-586 102
Karnataka, (India)
10/8/2022

5/8/22
Prof & HOD
Prof. & HOD
Dept. of Community Medicine
BLDE (Deemed to be University)
Shri B. M. Patil Medical College,
VIJAYAPURA-03.

Smt. Bangaramma Sajjan Campus, B. M. Patil Road (Sholapur Road), Vijayapura - 586103, Karnataka, India.
BLDE (DU): Phone: +918352-262770, Fax: +918352-263303, Website: www.bldedu.ac.in, E-mail: office@bldedu.ac.in

ANNEXURE – IV

FUNDING

GOVERNMENT OF KARNATAKA
HEALTH & FAMILY WELFARE SERVICE
OFFICE OF THE JOINT DIRECTOR (TB), LADY WILLINGDON STATE TB CENTRE, 2nd FLOOR,
AROGYA SOUDHA, 1st CROSS, MAGADI ROAD, BENGALURU-560023

No: LWSTC/NTEP/PPM/64/2022-23 Date: 17/10/2022

Minutes of State OR Committee meeting held on 22nd September 2022 at State TB Office, Arogya Soudha, Bengaluru

The state OR committee meeting was held at the State TB Office, Arogya Soudha, Bengaluru on 22nd September 2022 and the esteemed OR committee members had attended the meeting physically and virtually. The list of OR committee members who were present during the meeting is listed in Annexure 1.

The following are the points and decisions taken during the meeting:

(1) The state had received 25 (twenty-five) post-graduate thesis on the area of tuberculosis from various medical colleges of Karnataka and MPH/PhD thesis from institutes affiliated to medical colleges. The committee had obtained priory approval from Central TB Division (CTD) to fund thesis for non-medical PG courses. However, as per the CTD directives, it was envisaged that the medical college PG thesis should always be prioritised under any circumstances. The OR committee recommended all the thesis for funding. (Annexure 2)
(2) The three multicentric OR studies which were supposed to be undertaken discussed during the last State OR committee meeting were dropped as few administrative issues were foreseen.
(3) The state had received 20 Operational Research Protocols from various medical colleges and one dental college across the state. The protocols were reviewed by internal and external experts. Based on the merits and discussions, the committee selected eight (8) proposals for funding from the programme (Annexure 3). The select Principal and one Co-Investigator shall mandatorily undergo 'State level protocol development workshop' at National TB Institute, Bengaluru from 7th – 11th November 2022.
(4) The three approved protocols which were selected in the previous OR cycles and had not received funding shall we included in the current financial year.

The meeting ended with vote of thanks.

Annexure 1

1. Dr Sharath BN, Chair, State OR Committee, Karnataka
2. Dr Anil S, State TB Officer, Member Secretary
3. Dr Ashok Dorle, Member (Virtual mode)
4. Dr Raveendra Reddy, Member (Virtual mode)
5. Dr Ravichandra, Member (Virtual mode)
6. Dr Ashwini, Member (Virtual mode)
7. Dr Akshay, Member (Virtual mode)
8. Dr Shazia Anjum, Ex-officio member

Joint Director (TB)

2022 – List of PG thesis approved by STF Operational Research committee for NTEP grants

S.No	Name	Topic	Department	College	Year
1	Mr. Melkey Stephen Bunyan	Mental Health Issues of MDR-tuberculosis patients in Belagavi city-A mixed methods study	MPH	JN Medical College, KAHER, Belagavi	2022
2	Mr. Yashraj Abhijit Birari	Prevalence of tuberculosis among transgenders and MSM in Belgaum and their Knowledge, Attitude and Practices on tuberculosis	MPH	JN Medical College, KAHER, Belagavi	2022
3	Dr Manjunatha Vittala Kaligouda	Clinico-epidemiological profile of drug resistance tuberculosis patients attending district drug resistance tuberculosis centre, kalaburagi.	MD, Community Medicine	Gulbarga Institute of Medical Sciences, Kalaburagi	2022
4	Dr Fathma Thottathil Abdul Kalam	Reporting and Notificaiton of tuberculosis cases by the pharmacies in Mangalore Taluk and the Influencing Factors: A mixed methods study	MD, Community Medicine	Yenopoya Medical College, Mangalore	2022
5	Dr Ravi Kumar DK	Assessment of Quality of Life of Tuberculosis patients under DOTS regime-A cross sectional study	MPH	JN Medical College, KAHER, Belagavi	2022
6	Dr Meghana SA	Clinical profile, Comorbidities, and pattern of drug resistance in drug resistant pulmonary Tuberculosis patients visiting tertiary care centre in Chitradurga	MD, Respiratory Medicine	Basaveshwara Medical College and Hospital,Chitradurga	2022
7	Dr Fyroose Eariyaden	Epidemiological profile of tuberculosis patients in Vijayapura, North Karnataka: A hospital-based study	MD, Community Medicine	Sri BM Patil Medical College, Vijayapura	2022
8	Dr Sowmya	A prospective study on treatment outcome among tuberculosis patients with diabetes mellitus	MD, General Medicine	Vijayanagar Institute of Medical Sciences, Ballari	2022
9	Dr Shaik Shoiab	Epidemiology and clinical profile of patients with extra-pulmonary tuberculosis at a tertiary teaching hospital in Dakshina Kannada: A retrospective study	MD, General Medicine	Yenopoya Medical College, Mangalore	2022

Joint Director (TB)
Lady Willingdon State TB Centre
Arogya Soudha, 2nd Floor, 1st Cross,
Magadi Road, Bengaluru - 560 023.

ANNEXURE – V

INFORMED CONSENT FORM

TITLE OF TOPIC: Epidemiological profile of Tuberculosis patients in Vijayapura, North Karnataka: A hospital-based study

GUIDE: Dr. M.C. Yadavannavar

PG STUDENT: Dr. Fyroose Eariyaden

PURPOSE OF RESEARCH

I have been informed that this study will help to assess sociodemographic details, previous treatment history, clinical characteristics and housing environment, and health-seeking behaviour of T.B. patients and to educate them regarding the importance of treatment and the measures to be taken to prevent its spread in the community. The study is intended to interview T.B. patients who are registered in designated microscopic centres in the Vijayapura district.

I have been explained the reason for doing this study and selecting me/my ward as a subject for this study. I have also been given the free choice of either being included or not in the study.

PROCEDURE

I understand that relevant history will be taken and I will undergo a detailed clinical examination and will also be explained the required investigations as per standard protocol.

RISKS AND DISCOMFORTS

I understand that I/my ward may experience some pain and discomfort during the examination or during any intervention. This is mainly the result of my condition and the procedure of this study is not expected to exaggerate these feelings which are associated with the usual course of diagnosis and treatment.

ALTERNATIVES

Even if you decline in participation, you will get the routine line of management.

BENEFITS

I understand that my participation in the study as one of the study subjects will help the researcher to assess sociodemographic details, previous treatment history and clinical characteristics and the housing environment and health-seeking behaviour of T.B. patients.

CONFIDENTIALITY

I understand that medical information produced by this study will become part of this hospital records and will be subjected to the confidentiality and privacy regulation of this hospital Information of a sensitive, personal nature will not be a part of the medical records but will be stored in the investigator's research file and identified only by a code number. The code key connecting name to numbers will be kept in a separate secure location.

If the data are used for publication in the medical literature or for teaching purpose, no names will be used and other identifiers such as photographs and audio or video tapes will be used only with my special written permission. I understand that I may see the photograph and videotapes and hear audio tapes before giving this permission.

REQUEST FOR MORE INFORMATION

I understand that I may ask more questions about the study at any time. Dr. FYROOSE EARIYADEN is available to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during the course of this study, which might influence my continued participation.

If during this study, or later, I wish to discuss my participation in or concerns regarding this study with a person not directly involved, I am aware that the social worker of the hospital is available total with me.

And that a copy of this consent form will be given to me to keep it and for careful reading.

REFUSAL OR WITHDRAWAL OF PARTICIPATION

I understand that my participation is voluntary and I may refuse to participate or may withdraw consent and discontinue participation in the study at any time without prejudice to my present or future care at this hospital.

I also understand that Dr. FYROOSE EARIYADEN will terminate my participation in this study at any time after she has explained the reasons for doing so and has helped arrange for my continued care by my own physician or therapist, if this is appropriate.

INJURY STATEMENT

I understand that in the unlikely event of injury to me/my ward, resulting directly to my participation in this study, if such injury were reported promptly, then medical treatment would be available to me, but no further compensation will be provided.

I understand that by my agreement to participate in this study, I am not waiving any of my legal rights.

I have explained to ----------

the purpose of this research, the procedures required and the possible risks and benefits, to the best of my ability in patient's own language.

Date: (Guide) (Investigator)

STUDY SUBJECT CONSENT STATEMENT

I confirm that Dr. FYROOSE EARIYADEN has explained to me the purpose of this research, the study procedure that I will undergo and the possible discomforts and benefits that I may experience, in my own language.

I have been explained all the above in detail in my own language and I understand the same. Therefore, I agree to give my consent to participate as a subject in this research project

_____ _____

(Participant) (Date)

_____ _____

(Witness to above signature) (Date)

ANNEXURE – VI

PLAGIARISM REPORT

iThenticate

Similarity Report ID: oid:3618:62778650

PAPER NAME	AUTHOR
Tuberculosis (TB)	FYROOSE E

WORD COUNT	CHARACTER COUNT
14923 Words	84390 Characters

PAGE COUNT	FILE SIZE
95 Pages	4.0MB

SUBMISSION DATE	REPORT DATE
Jul 13, 2024 5:30 PM GMT+5:30	Jul 13, 2024 5:32 PM GMT+5:30

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- Quoted material
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- Abstract
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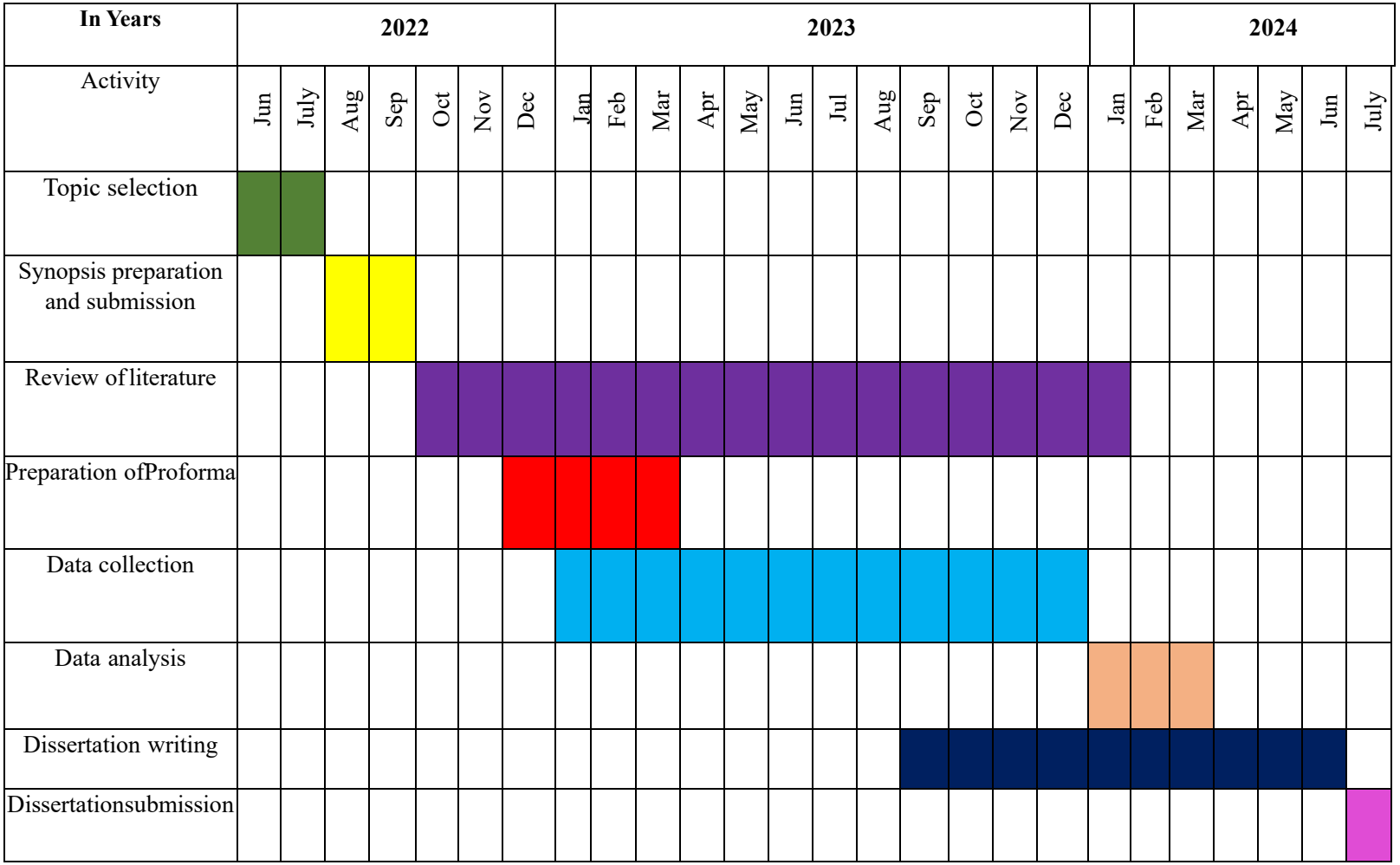
- Small Matches (Less then 14 words)

ANNEXURE – VII

GANTT CHART



ANNEXURE – VIII

DATA COLLECTION

PHOTOGRAPHS