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A Comprehensive Review of Tuberculosis Control And Healthcare Management In "Rural And Urban India OverThe Last 25 Years"

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Abstract : Tuberculosis (TB) remains a significant public health challenge in India, with both rural and urban areas grappling with the burden of the disease over the past 25 years. This review assesses the tuberculosis control efforts and healthcare management strategies implemented in rural and urban India during this period, with a focus on the Revised National Tuberculosis Control Program (RNTCP). The RNTCP, launched in 1997, has played a crucial role in improving TB detection, treatment, and management across the country. Through a network of designated microscopy centers, directly observed treatment, short-course (DOTS), and the adoption of newer diagnostic tools like GeneXpert, the program has significantly enhanced case detection rates and treatment outcomes. In rural areas, challenges such as limited access to healthcare facilities, inadequate infrastructure, and socioeconomic factors have posed hurdles to effective TB control. However, community health workers, trained under RNTCP, have been instrumental in bridging these gaps by facilitating early diagnosis and treatment initiation. Urban India, characterized by high population density and mobility, has faced unique challenges in TB control, including the emergence of drug-resistant strains. To address this, initiatives like the Programmatic Management of Drug-Resistant TB (PMDT) have been integrated into RNTCP, providing specialized care and treatment for drug-resistant TB cases.
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Keywords **- Tuberculosis,Multi-drug resistance, RNTCP, Universal access.**

I. INTRODUCTION

India accounts for over one-fifth of global cases of tuberculosis (TB), the highest incidence of any disease worldwide. Two million of the 9.4 million cases of tuberculosis (TB) that were reported to have happened annually globally in 2009 were believed to have happened in India. Despite being a preventable and curable disease, tuberculosis (TB) remains one of the most common infectious causes of morbidity and mortality. As such, it continues to place a significant financial and health burden on India.[1] One of the earliest diseases affecting humans may have coevolved with humans for many million years: tuberculosis (TB).[DeRiemer, K., Feldman, M. W., Hirsch, A. E., Tsolaki, A. G., & Small, P. M. (2004)].

This time can be conveniently divided into the two stages that follow: TB initiative in the district The Indian government created the District TB Programme in 1961, and the district of Anantapur in the state of Andhra Pradesh housed the first model district TB centre (DTC). By combining TB control programmes with the already-available government health services, this project aimed to reduce the community's tuberculosis (TB) problem as much as possible [Agarwal, S. P., & Chauhan, L. S., 2005]. Even before the Anantapur DTC was founded, it was quickly apparent that the biggest challenge in the fight against tuberculosis was keeping patients on treatment constantly until recovery was achieved, even though case-finding could be done anywhere [Banerji, D., 2012]. 1962 saw the Indian Using this district TB Centre model, the government launched the National TB Control Programme.

First introduced in 1997, the Revised National Tuberculosis Control Programme (RNTCP), which was based on the Directly Observed Treatment Short-course (DOTS) strategy, was gradually extended throughout the entire country.

The extensively used Directly Observed Treatment-Short Course (DOTS) method can be utilised to give the principles of tuberculosis case-finding and treatment [Artha Budi, S. D., & I Putu, D. A. Cek 2020]. It is a management strategy for public health systems that encompasses more than just a clinical approach to patient care. Some of the elements include political

commitment, short-course chemotherapy, patient adherence to treatment, adequate drug supply, strict reporting and recording systems, and case detection through quality-assured [G. K. Sandhu (2011)].
Complete countrywide coverage was achieved in March 2006. Reducing TB-related death, morbidity, and infection transmission is the aim of the TB control programme, which aims to eliminate tuberculosis as a major public health concern in India. The Program's two main objectives were to identify and keep at least 85% of NSP patients cured, as well as to detect at least 70% of the anticipated number of new NSP cases in the community.[Dewan, P., Kumar, A., Satyanarayana, S., Kumar, K. S., & Sachdeva, A. (2012)]

TB(MYCOBACTERIUM TUBERCULOSIS)

,An infectious condition called tuberculosis can infect your lungs or other tissues. Although it usually affects the lungs, it can also damage other organs such as the kidneys, spine, or brain. One of the Latin words meaning "nodule" or something protruding is the source of the word "tuberculosis. "Other names for tuberculosis are TB. Even while not everyone infected with tuberculosis becomes ill, treatment is necessary if you do. You have latent tuberculosis infection (also known as latent TB) or inactive tuberculosis if you have the bacteria but don't show any symptoms. Although TB may appear to be gone, it is actually dormant—that is, sleeping—within your body. If you have active tuberculosis or tuberculosis, you are infected, exhibit symptoms, and can spread the disease to others illness (TB illness).

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HISTORY

India's approach to tuberculosis has evolved throughout time in tandem with technological advancements.[GK Sandhu, 2011]. From the pre-independence era to the post-independence era to the current era with WHO assistance, responses to TB have changed over time. Arthur Lankester conducted the first-ever national research on tuberculosis in 1914.[V. H. Yellappa, 2019],[Bharat Jayram Venkhat, 2021)].
The Indian government launched a number of national and regional initiatives to reduce tuberculosis after independence [GK Sandhu, 2011] The Revised National TB Control Programme (RNTCP) was initiated by the Indian government in 1997. The initiative developed concepts and information on tuberculosis treatment through the use of the WHO-recommended Directly Observed Treatment Short Course (DOTS) approach. The original goal of this organisation was to attain and sustain a TB.

RNTCP:- (Revised National Tuberculosis Control Programme)

Launched in 1997, the Revised National Tuberculosis Control Programme (RNTCP) gradually spread throughout the nation, drawing its model from the globally recognised Directly Observed Treatment Short-course (DOTS) approach. In March 2006, complete countrywide coverage was accomplished. The objective of the TB control programme is to reduce infection transmission and the death and morbidity caused by tuberculosis until tuberculosis is no longer a significant public health issue in India. The Program's two key goals were to detect and treat at least 70% of the estimated NSP cases in the community, as well as to attain and maintain a cure rate of at least 85% among new sputum positive (NSP) patients [Agarwal, S. P., & Chauhan, L. S. (2005)].

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RNTCP Phase 2(2006-2012): progress (through December 2011)

More than 13.8 million patients have started receiving treatment since the program's launch, saving more over 2.5 million lives during the course of the earlier scheme[Agarwal, S. P., & Chauhan, L. S. (2005)].
Since its start, the program has continuously maintained treatment success rates of >85% and NSP case identification rates of 70% following nationwide coverage. The incidence of NSP case discovery in 2011 was 71%, and 87% of patients who received treatment were successful. More than 13,000 Designated Microscopy Centre(DMCs) around the nation offer facilities for sputum smear examination that are quality assured. To offer quality-assured DOT services, a network of more than 4 lakh (0.4 million) DOT providers is available [Sachdeva, K. S., Kumar, A., Dewan, P., Kumar, A., & Satyanarayana, S. (2012)].
The Program has created a Tribal Action Plan which is being implemented with the addition of more TB Units and DMCs in tribal and difficult areas, additional staff, compensation for patient and attendant transportation, and a higher rate of salary for contractual staff. The Program has developed creative public-private mix (PPM) program to engage non-governmental organization (NGOs) and private practitioners to participate in and contribute to national TB control efforts. The delivery of RNTCP services involves more than 3000 NGOs, 30,000 private practitioners, and 150 corporate health institutions. The RNTCP now has 291 medical colleges (private colleges included) participating. which is being implemented with the addition of more TB Units and DMCs in tribal and difficult areas, additional staff, compensation for patient and attendant transportation, and a higher rate of salary for contractual staff. The Program has developed creative public-private mix (PPM) program to engage non-governmental organization (NGOs) and private practitioners to participate in and contribute to national TB control efforts [Lei, X., Liu, Q., Escobar, E., Philogene, J., Zhu, H., Wang, Y., & Tang, S. (2015)]. The delivery of RNTCP services involves more than 3000 NGOs, 30,000 private practitioners, and 150 corporate health institutions.

HIV in addition to TB

Compared to people without HIV, those living in the same country who are HIV-positive and infected with TB have a 20–40 times greater chance of becoming infected with the disease again.In[Lawn, S. D. 2005] TB, the most common HIV-associated opportunistic disease globally, accounts for over 25% of the 2 million AIDS-related deaths in 2008 and is the leading cause of death for those living with HIV infection.[Manosuthi, W., Chottanapand, S., Thongyen, S., Chaovavanich, A., & Sungkanuparph, S. (2006)]. Additionally, by increasing infectivity and lowering the efficacy of HIV treatment, TB hastens the progression of HIV illness.[Dagnra, A. Y., Adjoh, K., Tchaptchet Heunda, S., Patassi, A. A., Sadzo Hetsu, D., Awokou, F., & Tidjani, O. (2011)],[NACO, C. (2009)].

Human immunodeficiency virus (HIV) infection is thought to be present in 4.85% of TB patients [World Health Organization. (2002)].The National Framework of Joint TB/HIV Collaborative Activities was created by the RNTCP and NACP (National AIDS Control Program) and the nation is putting these into practice. Around Testing Centre (ICTC) to RNTCP in 2011 were found to have TB and were put on DOTS. About 44,000 of the 6,00,000 TB patients tested positive for HIV and were given access to HIV care, including co-trimoxazole preventive therapy (CPT) and anti-retroviral therapy (ART). This represents 67% of the TB patients registered in the State implementing the intensified TB-HIV package.

According to drug resistance surveys, the prevalence of multidrug resistant tuberculosis (MDR-TB) is estimated to be 3% in new cases and 12–17% in cases requiring re-treatment. The surveys also show that the incidence of MDR-TB is not rising in the nation. Nevertheless, with an estimated 99,000 incident MDR-TB cases, India has one of the largest MDR-TB burdens in the world [Sandhu, G. K. (2011)].

MDR-TB (multi drug resistance- mycobacterium tuberculosis)

Mycobacterium tuberculosis strains known as MDR-TB strains are resistant to rifampicin and isoniazid, the two most potent anti-TB drugs. The bacteria that cause extensively drug-resistant tuberculosis (XDR-TB) are resistant to second-line injectable anti-TB drugs, any oquinolone, and amikacin, kanamycin, or capreomycin. Multidrug-resistant tuberculosis (MDR-TB) is another name for this kind of tuberculosis. There are tuberculosis (TB) strains that do not respond to the standard six-month course of treatment with first-line anti-TB drugs. Up to two years or longer may pass during therapy when more expensive, less efficient, and hazardous drugs are used. [World Health Organization. (2010)].

The country's prevalence of all kinds of tuberculosis declined from 338 per 100,000 people in 1990 to 249 per 100,000 people in 2009, and tuberculosis mortality reduced from more than 42 per 100,000 people in 1990 to 23 per 100,000 people in 2009, according to the WHO Global TB Report 2010. These WHO estimates for India are based on mathematical modelling and are subject to change annually.

There were an estimated 280,000 TB-related fatalities in the nation in 2009, indicating that TB incidence and mortality are still very high. The majority of TB cases are still initially treated in the private sector, sometimes in an inefficient manner and without sufficient money to cover the high cost of diagnosis and treatment for patients. Before being submitted to the RNTCP, almost 50% of the retreatment patients recorded under the RNTCP were treated in other settings, suggesting inadequate care and possibly increased drug resistance. [Subramani, R., Radhakrishna, S., Frieden, T. R., Kolappan, C., Gopi, P. G., Santha, T., ... & Narayanan, P. R. (2008]. and of the 6,916,658 TB suspects who were referred to RNTCP from the Integrated Counselling and Testing Centre (ICTC) in 2011, 83,887 were diagnosed with TB and placed on DOTS. Out of the six million TB patients, about 44,000 had an HIV test and were provided with HIV care, which included antiretroviral therapy (ART) and co-trimoxazole preventative prophylaxis (CPT). As a percentage of all TB patients registered in the State using the enhanced TB-HIV package, this amounts to 67%.

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MDR-TB strains are strains of Mycobacterium tuberculosis that are resistant to both of the most effective anti-TB medications, isoniazid and rifampicin.Bacteria that cause extensively drug-resistant tuberculosis (XDR-TB) are resistant to amikacin, kanamycin, or capreomycin, as well as to any oquinolone and second-line anti-TB injectable medications. This type of tuberculosis is also known as multidrug-resistant tuberculosis (MDR-TB). Certain types of tuberculosis (TB) do not react to the typical six-month course of therapy with first-line anti-TB medications. Therapy using medications that are more costly, less effective, and more toxic can take up to two years or more [World Health Organization. (2015].

According to the WHO Global TB Report 2010, the country's prevalence of all forms of TB has decreased from 338 per 100,000 people in 1990 to 249 per 100,000 people in 2009, and TB mortality has decreased from more than 42 per 100,000 people in 1990 to 23 per 100,000 people in 2009. These WHO projections for India are subject to revision each year and are based on mathematical modelling.

TB incidence and mortality remain quite high; in 2009, the country had an estimated 280,000 TB-related deaths. A significant majority of TB cases are still first managed in the private sector, frequently ineffectively and without funding for patients' often unaffordable diagnosis and treatment. Nearly 50% of the retreatment cases reported under the RNTCP are treated in other sectors before being submitted to the RNTCP, indicating insufficient care and potential amplified drug resistance [McCarthy, O. R. 2001].

RNTCP'S Goals and objectives during the 12th five year plan (2012-2017)

The goal of the Indian government is to create a "TB-free India" by reducing the disease's burden until it no longer poses a serious threat to the public's health To achieve this vision, the Program has now adopted the new objective of aiming to achieve 'Universal access' for quality diagnosis and treatment for all TB patients in the community [World Health Organization. (2015)]. This calls for maintaining the Program's successes to date and expanding the availability and calibrate of services to all those who have been diagnosed with TB. In particular, the Program wants to accomplish the following goals by the end of 2017: (i) Early detection and treatment of at least 90% of estimated community cases of TB, including HIV-associated TB; (ii) Initial drug-resistant TB screening of all re-treatment smear-positive TB patients and provision of treatment services for MDR-TB patients; (iii) HIV testing and counselling offered to all TB patients, as well as connecting HIV-infected TB patients to HIV care and support; (iv) Successful treatment of at least 90% of all new TB. [Kapoor, S. K., Raman, A. V., Sachdeva, K. S., & Satyanarayana, S. (2012]

The initial phase of tuberculosis control

It was distinguished by the absence of any facilities for diagnostic x-rays,tb control initiatives, or chemotherapy drugs.This period of time roughly corresponds to the mid1990s.
At this time, sanatorium movements started in Europe and quickly spread throughout the world since there was no pharmaceutical or combination of medications that effectively treated tuberculosis. Sanatoria were prevalent because they gave patients the best chance to "wall off" areas of pulmonary tuberculosis (TB) infection by allowing their immune systems to function optimally. High altitude, fresh air, a balanced diet, and rest were the keys to achieving this [Grover, M., Bhagat, N., Sharma, N., & Dhuria, M. (2014]

Activities within the programme required to meet RNTCP (2012-2017) targets

The Government of India has adopted the National Strategic Plan 2012–2017, which calls for "universal access for quality diagnosis and treatment for all TB patients in the community," as part of the country's
12th five-year plan. Significant private sector involvement and the expansion of the Revised National Tuberculosis Control Programme (RNTCP) to include patients who have been diagnosed and receiving treatment under it are two of the plan's primary focal points.In [Satyanarayana, S., Nair, S. A., Chadha, S. S., Shivashankar, R., Sharma, G., Yadav, S., ... & Dewan, P. K. (2011].TB control activities face unique challenges due to different health-seeking patterns of TB patients[Arinaminpathy, N., Batra, D., Khaparde, S., Vualnam, T., Maheshwari, N., Sharma, L., & Dewan, P. (2016)], [Anand, T., Babu, R., Jacob, A. G., Sagili, K., & Chadha, S. S.,2017]
Previous studies have suggested that over 40% of TB patients in India receive treatment in the private health sector, despite the absence of comprehensive data on the disease's impact in this sector [Dieleman, J., Campbell, M., Chapin, A., Eldrenkamp, E., Fan, V. Y., Haakenstad, A., & Murray, C. J. (2017)].
The number of TB patients receiving treatment in the private sector is estimated to be even 2-3 times larger than previously thought based on drug sales statistics[28].The government TB program does not formally control the diagnosis or treatment of tuberculosis among private practitioners in India [Banerjee, S., & Roy Chowdhury, I. (2020].

TUBERCULOSIS CONTROL ACTIVITIES IN INDIA: PRACTICES OF PRIVATE PRACTITIONERS

Due to the public facilities' inability to provide quality-assured healthcare, a sizable, unregulated, urban-focused private health industry has emerged. In India, 85.9% of private health spending goes toward out-of-pocket costs. [Hazarika, I. (2011]
In India's rural and urban areas, private physicians are the most important source of medical are, according to data from the 71st round of the National Sample Survey Office.[Mistry, N., Rangan, S., Dholakia, Y., Lobo, E., Shah, S., & Patil, A. (2016] Treatment for tuberculosis is also dominated by the private sector. For their initial TB treatment, more than half of the patients go to private hospitals, where they are frequently mismanaged.[Pai, M., Minion, J., Steingart, K., & Ramsay, A.2010] It has been discovered that private providers are linked to delayed treatment initiation in TB patient care pathways.[Gaitonde, R., San Sebastian, M., Muraleedharan, V. R., & Hurtig, A. K. (2017)]

Activities within the programme required to meet RNTCP (2012-2017) targets

Priority is still given to the core programme functions, which include ensuring that all
nsuring and improving the quality of diagnostic services, maintaining a reliable supply of drugs for initial treatment, and stepping up state and district supervision and monitoring.
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Tuberculosis control programme from 2018-2023 (upcoming plan for 2025)

According to WHO estimates, India has the greatest TB burden in the world, with 26.9 lakh cases expected to occur in 2019. With a record-breaking 24 lakh cases reported in 2019, the TB surveillance effort in India reaches yet another significant milestone. This is an increase of more than 12% over the previous year. Out of the 24 lakh TB patients, 21.6 lakh cases were incident cases (new and relapse/recurrent).

The Revised National Tuberculosis Control Programme (RNTCP), which was the name of the tuberculosis (TB) control program in India, was renamed the National Tuberculosis Elimination Programme (NTEP) Jan. 1, 2020.
Controlling the TB epidemic is becoming less important to the worldwide public health and TB community, as elimination becomes the new priority. Global progress towards eradicating tuberculosis and its aftermath will be contingent upon India's performance. Established under the Revised National Tuberculosis Control Program (RNTCP), the National Strategic Plan (NSP) 2017–2025. 2025 is the target date for the disease's total eradication.

The National Rural Health Mission (NRHM)'s (health system) needs to be strengthened and aligned further

All diagnostic and therapeutic services are currently incorporated into the general health system under the RNTCP, although oversight and monitoring are still separate from other significant health initiatives [Bronner Murrison, L., Ananthakrishnan, R., Sukumar, S., Augustine, S., Krishnan, N., Pai, M., & Dowdy, D. W. (2016)], [41][Biadglegne, F., Sack, U., & Rodloff, A. C.2014].

Improve TB prevention in cities

Early diagnosis is necessary to stop TB transmission in cities, which calls for widespread private provider involvement and the implementation of enhanced diagnostics at all sites of treatment. [Datta, K., Bhatnagar, T., & Murhekar, M.2010]

The expansion of TB drug resistance diagnosis and treatment

It is expensive to expand MDR-TB services, both in terms of laboratory investment and medicine costs, as well as in terms of patient supervision for 24-27 months (instead of the customary 6-9 months). [Basu, M., Sinha, D., Das, P., Roy, B., Biswas, S., & Chattopadhyay, S.,2013] Investment in public sector laboratory capacity will be a significant undertaking between 2012 and 2017.

Diagnoses of tuberculosis in the private sector

Research has additionally indicated the glaring ignorance of private practitioners (PPs) on the most effective procedures for tuberculosis diagnosis and treatment. [Datta, K., Bhatnagar, T., & Murhekar, M.2010],[Basu, M., Sinha, D., Das, P., Roy, B., Biswas, S., & Chattopadhyay, S.,2013]
In the Hooghly district of West Bengal, out of the 260 randomly selected PPs, just 11% adhered to the RNTCP requirements. Against the conventional diagnostic test—sputum examination—the majority (68%) of them were prescribing chest X-rays for TB diagnosis. Merely 63% of patients in a different Pune research had TB diagnoses made by sputum microscopy.[Bharaswadkar, S., Kanchar, A., Thakur, N., Shah, S., Patnaik, B., Click, E. S., ... & Dewan, P. K. (2014]

Private sector provides treatment for tuberculosis

Treatment in the private sector is fairly diverse when it comes to methods. In a Chennai investigation, 228 private physicians gave prescriptions for 27 distinct regimens, written by 160 of them [Bronner Murrison, L., Ananthakrishnan, R., Sukumar, S., Augustine, S., Krishnan, N., Pai, M., & Dowdy, D. W. (2016)].

Success and failure

Success:-

The initial goal of the RNTCP, which was to reduce case fatalities by 90% and achieve 85% treatment success, has been accomplished.
At least 85% of infectious cases of tuberculosis will be cured with DOTS.
Using high-quality sputum microscopy to detect at least 70% of estimated cases to enhance case-finding efforts.

Failure:-

The burden of tuberculosis (TB) is still quite high; approximately half of cases do not get registered under the RNTCP; paediatric TB is ignored; and tuberculosis costs the US economy $23 billion a year.

One of the top 10 leading causes of death globally is tuberculosis. The high incidence and prevalence of tuberculosis in India have not decreased despite numerous government initiatives. Principal obstacles: Drug resistance, inadequate notice, lack of knowledge, inadequate infrastructure, and general neglect.

Treatment failure of TB, which is defined as a patient who is sputum smear or sputum culture positive at 5 months or later after the initiation of anti TB treatment, 3 is one of the threats to the control of TB.[Harries A, Maher D, Graham S]

Because poor adherence is one of the most significant predictors of treatment failure in prior research, it was taken into account while determining the sample size. We employed a 40% level of poor adherence among patients who did not respond to treatment and a 15% level among patients who did. Johnson JL, Okwera A, Vjecha MJ, et al,1997].

Future direction:-

The goal of the current National Strategic Plan for TB Elimination (NSP 2017–25) is to end tuberculosis (TB) by 2025 by reducing patient out-of-pocket costs and offering dietary support.[Khaparde S.]

As part of a significant mission to eliminate the TB epidemic by 2025, the MoHFW and other development partners of the Health Ministry launched the Tuberculosis (TB) Mukt Bharat Abhiyaan in 2021 under the NSP India 2020–25 for TB Elimination.

Scientists are racing to test newer vaccines and shorter treatment regimens; the government is concentrating on active case finding; entrepreneurs have helped increase testing capacity; and the community at large has stepped up to provide nutritional support to patients.

India has set a target of eliminating tuberculosis by 2025, five years ahead of the global target.

CONCLUSION

The Indian government is working hard to reduce the issues related to tuberculosis by revising its plans and putting them into action nationwide. Despite this, there is still more work to be done to significantly lower the high incidence and prevalence of tuberculosis in India. Factors include a lack of resources and knowledge, inadequate infrastructure, and an increase in drug-resistant infections (MDR and XDR TB). The objective of the TB control programme is to reduce infection transmission and the death and morbidity caused by tuberculosis until tuberculosis is no longer a significant public health issue in India.

REFERENCES

1. World Health Organization. Global Tuberculosis Control. WHO report 2013. Geneva: WHO; 2013.
2. Hirsh, A. E., Tsolaki, A. G., DeRiemer, K., Feldman, M. W., & Small, P. M. (2004). Stable association between strains of Mycobacterium tuberculosis and their human host populations. Proceedings of the National Academy of Sciences, 101(14), 4871-4876.
3. Agarwal, S. P., & Chauhan, L. S. (2005). Tuberculosis control in India. Directorate General of Health Services, Ministry of Health and Family Welfare, New Delhi.
4. Banerji, D. (2012). The World Health Organization and public health research and practice in tuberculosis in India. International Journal of Health Services, 42(2), 341-357.
5. Artha Budi, S. D., & I Putu, D. A. Cek similarity Comprehensive Pulmonary Tuberculosis Control Using the Directly Observed Treatment Short-course Strategy (DOTS).
6. Sandhu, G. K. (2011). Tuberculosis: current situation, challenges and overview of its control programs in India. Journal of global infectious diseases, 3(2), 143.
7. Sachdeva, K. S., Kumar, A., Dewan, P., Kumar, A., & Satyanarayana, S. (2012). New vision for Revised National Tuberculosis Control Programme (RNTCP): universal access-"reaching the un-reached". The Indian journal of medical research, 135(5), 690.
8. Technical and operational guidelines for tuberculosis control, Revised National Tuberculosis Control Programme. New Delhi: Central Tuberculosis Division, Directorate General of Health Services, Ministry of Health & Family Welfare, Government of India;
9. Sachdeva, K. S., Kumar, A., Dewan, P., Kumar, A., & Satyanarayana, S. (2012). New vision for Revised National Tuberculosis Control Programme (RNTCP): universal access-"reaching the un-reached". The Indian journal of medical research, 135(5), 690.
10. Sandhu, G. K. (2011). Tuberculosis: current situation, challenges and overview of its control programs in India. Journal of global infectious diseases, 3(2), 143-150.
11. Yellappa, V. H. (2019). Optimising the involvement of private practitioners in tuberculosis care and control in India.
12. Venkat, B. J. (2021). At the limits of cure (p. 301). Duke University Press.
13. Agarwal, S. P., & Chauhan, L. S. (2005). Tuberculosis control in India. Directorate General of Health Services, Ministry of Health and Family Welfare, New Delhi.

14. Sachdeva, K. S., Kumar, A., Dewan, P., Kumar, A., & Satyanarayana, S. (2012). New vision for Revised National Tuberculosis Control Programme (RNTCP): universal access-"reaching the un-reached". The Indian journal of medical research, 135(5), 690.

15. Lei, X., Liu, Q., Escobar, E., Philogene, J., Zhu, H., Wang, Y., & Tang, S. (2015). Public–private mix for tuberculosis care and control: a systematic review. International Journal of Infectious Diseases, 34, 20-3
16. Lawn, S. D. (2005). Tuberculosis and HIV co-infection. Medicine, 33(5), 112-113.&World Health Organization. (2009). Monograph on integrated monitoring of TB/HIV-a case study in Malawi. Geneva: WHO.

17. Manosuthi, W., Chottanapand, S., Thongyen, S., Chaovavanich, A., & Sungkanuparph, S. (2006). Survival rate and risk factors of mortality among HIV/tuberculosis-coinfected patients with and without antiretroviral therapy. JAIDS Journal of Acquired Immune Deficiency Syndromes, 43(1), 42-46.

18. Dagnra, A. Y., Adjoh, K., Tchaptchet Heunda, S., Patassi, A. A., Sadzo Hetsu, D., Awokou, F., & Tidjani, O. (2011). Prevalence of HIV-TB co-infection and impact of HIV infection on pulmonary tuberculosis outcome in Togo. Bulletin de la Société de pathologie exotique, 104, 342-346.

19. NACO, C. (2009). National framework for joint HIV/TB collaborative activities. New Delhi, National AIDS Control Organization and Central TB Division, Ministry of Health & Family Welfare, Government of India.

20. World Health Organization. (2002). Fact Sheet No 104: Tuberculosis, WHO Fact Sheets. World Health Organization, Geneva.

21. Sandhu, G. K. (2011). Tuberculosis: current situation, challenges and overview of its control programs in India. Journal of global infectious diseases, 3(2), 143.

22. World Health Organization. (2010). Multidrug and extensively drug-resistant TB (M (No. WHO/HTM/TB/2010.3). World Health Organization.

23. Subramani, R., Radhakrishna, S., Frieden, T. R., Kolappan, C., Gopi, P. G., Santha, T., ... & Narayanan, P. R. (2008). Rapid decline in prevalence of pulmonary tuberculosis after DOTS implementation in a rural area of South India. The International Journal of Tuberculosis and Lung Disease, 12(8), 916-920.

24. Sandhu, G. K. (2011). Tuberculosis: current situation, challenges and overview of its control programs in India. Journal of global infectious diseases, 3(2), 143.

25. World Health Organization. (2015). Tuberculosis control: Report of a meeting of national programme managers and partners, New Delhi, India, 10-14 November 2014 (No. SEA-TB-358). World Health Organization.

26. McCarthy, O. R. (2001). The key to the sanatoria. Journal of the Royal Society of Medicine, 94(8), 413-417.
27. World Health Organization. (2015). Tuberculosis control: Report of a meeting of national programme managers and partners, New Delhi, India, 10-14 November 2014 (No. SEA-TB-358). World Health Organization.

28. Kapoor, S. K., Raman, A. V., Sachdeva, K. S., & Satyanarayana, S. (2012). How did the TB patients reach DOTS services in Delhi? A study of patient treatment seeking behavior.

29. Grover, M., Bhagat, N., Sharma, N., & Dhuria, M. (2014). Treatment pathways of extrapulmonary patients diagnosed at a tertiary care hospital in Delhi, India. Lung India: official organ of Indian Chest Society, 31(1), 16.

30. Satyanarayana, S., Nair, S. A., Chadha, S. S., Shivashankar, R., Sharma, G., Yadav, S., ... & Dewan, P. K. (2011). From where are tuberculosis patients accessing treatment in India? Results from a cross-sectional community based survey of 30 districts. PloS one, 6(9), e24160.

31. Arinaminpathy, N., Batra, D., Khaparde, S., Vualnam, T., Maheshwari, N., Sharma, L., ... & Dewan, P. (2016). The number of privately treated tuberculosis cases in India: an estimation from drug sales data. The Lancet Infectious Diseases, 16(11), 1255-1260.

32. Anand, T., Babu, R., Jacob, A. G., Sagili, K., & Chadha, S. S. (2017). Enhancing the role of private practitioners in tuberculosis prevention and care activities in India. Lung India: Official Organ of Indian Chest Society, 34(6), 538.

33. Dieleman, J., Campbell, M., Chapin, A., Eldrenkamp, E., Fan, V. Y., Haakenstad, A., ... & Murray, C. J. (2017). Evolution and patterns of global health financing 1995–2014: development assistance for health, and government, prepaid private, and out-of-pocket health spending in 184 countries. The Lancet, 389(10083), 1981-2004.

34. Banerjee, S., & Roy Chowdhury, I. (2020). Inequities in curative health-care utilization among the adult population (20–59 years) in India: A comparative analysis of NSS 71st (2014) and 75th (2017–18) rounds. PLoS One, 15(11), e0241994.

35. Hazarika, I. (2011). Role of private sector in providing tuberculosis care: evidence from a population-based survey in India. Journal of global infectious diseases, 3(1), 19.

36. Mistry, N., Rangan, S., Dholakia, Y., Lobo, E., Shah, S., & Patil, A. (2016). Durations and delays in care seeking, diagnosis and treatment initiation in uncomplicated pulmonary tuberculosis patients in Mumbai, India. PloS one, 11(3), e0152287.

37. Pai, M., Minion, J., Steingart, K., & Ramsay, A. (2010). New and improved tuberculosis diagnostics: evidence, policy, practice, and impact. Current opinion in pulmonary medicine, 16(3), 271-284.

38. Gaitonde, R., San Sebastian, M., Muraleedharan, V. R., & Hurtig, A. K. (2017). Community action for health in India's National Rural Health Mission: one policy, many paths. Social Science & Medicine, 188, 82-90.

39. Khanna, A., Saha, R., & Ahmad, N. (2023). National TB elimination programme-What has changed. Indian Journal of Medical Microbiology, 42, 103-107.

40. Bronner Murrison, L., Ananthakrishnan, R., Sukumar, S., Augustine, S., Krishnan, N., Pai, M., & Dowdy, D. W. (2016). How do urban Indian private practitioners diagnose and treat tuberculosis? A cross-sectional study in Chennai. PloS one, 11(2), e0149862.

41. Biadglegne, F., Sack, U., & Rodloff, A. C. (2014). Multidrug-resistant tuberculosis in Ethiopia: efforts to expand diagnostic services, treatment and care. Antimicrobial Resistance and Infection Control, 3(1), 1-10.

42. Datta, K., Bhatnagar, T., & Murhekar, M. (2010). Private practitioners' knowledge, attitude and practices about tuberculosis, Hooghly district, India. Indian J Tuberc, 57(4), 199-206.

43. Basu, M., Sinha, D., Das, P., Roy, B., Biswas, S., & Chattopadhyay, S. (2013). Knowledge and practice regarding pulmonary tuberculosis among private practitioners. Ind J Comm Health, 25(4), 403-12.

44. Bharaswadkar, S., Kanchar, A., Thakur, N., Shah, S., Patnaik, B., Click, E. S., ... & Dewan, P. K. (2014). Tuberculosis management practices of private practitioners in Pune municipal corporation, India. PloS one, 9(6), e97993.

45. Bronner Murrison, L., Ananthakrishnan, R., Sukumar, S., Augustine, S., Krishnan, N., Pai, M., & Dowdy, D. W. (2016). How do urban Indian private practitioners diagnose and treat tuberculosis? A cross-sectional study in Chennai. PloS one, 11(2), e01.

46. Harries, A. D., Maher, D., Graham, S., Gilks, C., & Nunn, P. (2004). TB/HIV: a clinical manual (No. Ed. 2, pp. 210-pp). Geneva: World Health Organization.

47. Johnson, J. L., Okwera, A., Vjecha, M. J., Byekwaso, F., Nakibali, J., Nyole, S., ... & Ellner, J. J. (1997). Risk factors for relapse in human immunodeficiency virus type 1 infected adults with pulmonary tuberculosis. The International Journal of Tuberculosis and Lung Disease, 1(5), 446-453.

48. Khaparde, S. D. (2019). The national strategic plan for tuberculosis step toward ending tuberculosis by 2025. Journal of Mahatma Gandhi Institute of Medical Sciences, 24(1), 17-18.