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Original Research Article

A STUDY ON DECLININGTRENDS IN THE INCIDENCE OF PULMONARY TUBERCULOSIS DURING 5 YEARS IN NATIONAL CAPITAL REGION OF DELHI

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Abstract

Background: Pulmonary tuberculosis is still one of the challenging health issues in India in spite of various ongoing health programs. **Objectives:** To find active cases and estimate the incidence of tuberculosis during the last 5 years in rural areas of National Capital Region of Delhi. **Material & Methods:** A cross-sectional study spread over 8046 households covering 23895 populations. The participants were interviewed based on pre-designed interview schedule to select the subjects eligible for sputum collection for CBNAAT test. Other indirect methods like Nominal Group Technique/Key Informant Interviews/Reported Patient-Month, Drug sale and consumption data from Public and Private sectors were also applied for comparing the incidence of disease from the data obtained for the last 5 years. **Results:** Sample collected from 133 subjects for CBNAAT testing. 12 cases were found positive for Mycobacterium Tuberculous bacilli. Using all the direct and indirect sources of data collection in varying proportions, it has been calculated that the average decline of incidence of tuberculosis within last 5 years found to be 30%. **Conclusion:** Active Case finding is animportanttool for notification of tuberculosis.

INTRODUCTION

Pulmonary tuberculosis is one of the major challenges in India although we accomplished numerous impressive achievements in tuberculosis prevention, control and care. Tuberculosis (TB) is a human disease caused by Mycobacterium tuberculosis. It mainly affects the lungs, making pulmonary disease the most common presentation. Other commonly affected organs include the gastrointestinal (GI) tract, the lypho-reticular system, the skin, the central nervous system, the musculoskeletal system, the reproductive system, and the liver. In the past few decades, there has been a concerted global effort to eradicate tuberculosis. This activity reviews the evaluation and management of tuberculosis and highlights the role of interprofessional team members in collaboration to provide well-coordinated care and enhance outcomes for affected patients.The current global TB epidemic should be viewed as basic human rights and ethical issue.[1]

In 2021, an estimated 10.6 million people fell ill with tuberculosis (TB) worldwide i.e. 6 million men, 3.4 million women and 1.2 million children. TB is present in all countries and in all age groups, still it is curable and preventable disease.[2]A total of 1.6 million people died from TB in 2021 (including 187 000 people with HIV). Worldwide, TB is the 13thleading cause of death and the second leading infectious killer after COVID-19 (above HIV/AIDS).[3]TB remains among the 10 leading

156

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causes of death in the world responsible for 1.5 million deaths per year.[4]The WHO estimates that one-third of all cases of Tuberculosis along with close contacts are not diagnosed and remain untreated globally.[5]

Now In developing countries, improved active case finding by using prompt and available diagnostic methods are much effective tool to interrupt transmission of tuberculosis among close contacts.[6]Following initiation of treatment, patients become non-infectious veryquickly within two weeks.[7]

It has been estimated that 66 million lives were saved through diagnosis of Tuberculosis and treatment between 2000 and 2020.One of the health targets of the United Nations Sustainable Development Goals (SDGs) is to end the TB epidemic by the year 2030.

An ambitious goal has been set by Government of India to achieve Ending Tuberculosis by reducing the incidence of new Tuberculosis cases by 80% by the year 2025. National Strategic Plan (NSP 2017-25) is envisioning on TB Free India with zero deaths and zero TB disease and zero TB sufferings. Government of India through National TB Elimination Program (NTEP) has rolled out the National Strategic Plan in order to fast-tracking towards the SDG targets by 2030. Ministry of Health and Family Welfare (MoHFW) developed an initiative "Sub-National Certification of Progress towards TB Free Status" for measuring progress towards ending TB at district and State/UT level.Over the decades, NTEP has screened more than 80 million people for tuberculosis, successfully treated 15 million patients and saved millions of lives. To make the programme more effective, bottom-up approaches, new commitments have been provided for patient-centered services and care. The programme has envisaged newer interventions like Universal mobile network access, Digital payments for social support and nutrition, NikshayPoshanYojna (NPY) via accountable electronic direct benefits transfer (DBT) for all patients diagnosed with tuberculosis. The NTEP offering other newer initiatives like setting of platforms for healthcare delivery services, private practitioners, drug chemists, pharmacists in order to notify inaccessible casesfrom private sectors. In addition, NTEP is scaling approaches towards offering Universal Drug Susceptibility Testing (UDST) for people diagnosed with Tuberculosis. Other expansions reflect emphasizing effectively upon the community as well as incentivizing health care workers. This was approved by the Mission Steering Group of NHM in February 2019.[8]

The problem of TB is attractingissues of lack of political will, access to care, availability of modern diagnostics, supply chain management to ensure a steady drug supply, use of novel technologies such as smartphones to enhance communication between patients and healthcare workers.[9]

Aims and Objectives
1. Active case finding of Tuberculosis
2. To estimate change intrends in incidence of Tuberculosis during the period of last 5 years.

MATERIALS AND METHODS

Study Design: A community based cross- sectional study

Sampling Technique: Multistage Sampling Technique

Study Period: Study was conducted in the month of February 2022for one month.

Study Area: Study was conducted in 5 villages (Jaindapur, Hasanpur,Ghagot,Gehlab, Sarai Khatela&Nagla)*of District Palwal in Haryana state by 5 team members.

*The district Palwal has been included in the National Capital Region of Delhi along with many other districts of UP, Rajasthan and Haryana for the sake of development (https://ncrpb.nic.in>ncrconstituents).

Active Case Finding Efforts

Procedure of conducting the study

For Active Case Finding of Tuberculosis, Multistage sampling technique was used, at first stage Sub-centres were taken as Primary Sampling Units using cluster sampling techniques. There are total 15 Sub-centres considered for conducting this study. In the first stage, these 15 sub-centres were arranged alphabetically and 5 clusters were made sequentially each having 3 sub-centres. In the second stage, from each cluster, one sub-centre was selected using systemic random sampling by lottery method in order to get 5 sub-centres. A survey was conducted in 5 villages of each selected sub-centre of Palwal district for one month. For the survey 5 teams were deployed. Medical officer and Senior Treatment Supervisor were supervising and monitoring the activities of survey. ASHAs were helping in carrying out the survey. At the very outsetten thousand household were targeted. Each team selected a single household randomly by simple random sampling method; it was marked as household No.-1. Then using systemic sampling method, consecutive households were taken till completion of target i.e. 2000 household per team or a maximum duration of data collection for one month, whichever came first.At the end of the session, a total of 8046 households were surveyed by 5 teams. 23895 participants were interviewed based on pre-designed interview schedule to select the participants for sample collection. Among them 133 samples were collected in the provided Falcon tubes from subjects andsamples were carried to "Cartridge Based Nucleic Acid Amplification Test (CBNAAT) testing lab"for detection of Mycobacterium tuberculosis bacilli.12 samples were detected positive for tuberculosis.

Inclusion Criteria

All the family members were included ifcough and/or fever to any member of family.

Exclusion Criteria

Those who were not willing or were not ready to give consent.

Nominal Group Technique (NGT)

i. **NGT- conducted with Private practitioners**

At District Tuberculosis Center (DTC), NGT was conducted with 6 Private practitioners in the presence of District Tuberculosis Officer and WHO consultant. All the six participants had similar attitude saying that 'they dealt with on an average 3-5 patients of tuberculosis at their clinic per month'. They dealt with only Category-A patients. All of them were aware of the ongoing national program for Tuberculosis (National Tuberculosis Elimination Program), testing criteria, H1 schedule, Courses and Regimen of Anti-Tuberculosis Therapy, MDR-TB, UDST, TB with HIV. They referred the patients suspected or diagnosed as having MDR-TB and Extra pulmonary TB to DTC. Peeping into the last 5 years record they noted that they could see about 40-50% reduced number of patients with tuberculosis.

ii. **NGT- conducted with Local Chemists/Pharmacists**

At District Tuberculosis Center (DTC), NGT was conducted with 6 Chemists and one Pharmacist in the presence of District Tuberculosis Officer and WHO consultant. All the six participants local chemists had almost similar thinking. They told that they were not aware with ongoing national programme for Tuberculosis (National Tuberculosis Elimination Programme), testing criteria. But they had an idea about H1 schedule, Courses and Regimen of Anti-Tuberculosis Therapy.They did not have any idea about MDR-TB, UDST, TB with HIV. They do not keep ATT in their medical shops. They send the patients with prescription of tuberculosis to Public sector health facilities.

Key informant interviews (KII) conducted with distributor Chemists

Three KIIs were taken. Both chemists after giving written consent as participants of KII had similar behavior saying that they were not aware about ongoing national program for Tuberculosis (National Tuberculosis Elimination Programme), testing criteria, H1 schedule. They knew about Courses and Regimen of Anti-Tuberculosis Therapy. But were unaware of MDR-TB, UDST, TB with HIV. Usually they sell 5-6 boxes of ATT per month and they noticed 30-40% decline in the sale of ATT comparing the sale during last 5 years. Most of the patients belonged to the same district. No records have been maintained whether patients wereregular customer throughout the course.

One of the chemists dispenses 2000 tablets of ATT (only Forecox)per month and he noticed 15-20% reduced sale in the last 7-8 months. Other chemist dispenses 30-35 boxes per month. He used to sell 50-60 boxes 5 years back. Both have no direct contact with patients. They deal only with retailers on demand. They had only source of information from television.

Drug consumption at Public Sector Health Facility:(Reported Patient-Month 2015 - 2021)

Year	ConsumptionBlisters
2015	13555
2016	15515
2017	16261
2018	10658
2019	12734
2020	17131
2021	10432

When the drug consumption was compared at public sector hospitals during the year 2021 to that of 2015, it was found a decline by 23% [13555 – 10432 / 13555 x 100] by the year 2021.

Patient interviews

In total 21 patients were Interviewed, 11 at health facility and 10 over telephone. Most of the patients were satisfied with their treatments, who were already cured.Among 12 patients who had already completed their treatment course, 9 were cured completely and were leading healthy life. One among the rest 3 patients had complained that he got two times full course of treatment at public sector hospital and thus not cured and still symptomatic.He went back to his native place to Bihar and was taking treatment from Private sector there without undergoing for UDST. He was unaware about UDST. The second one among 3, completed the full course of treatment at this facility only, AFB found to be negative but still was symptomatic with extreme wasting. The third patient was diagnosed with TubercularLymphadenitis by FNAC, got full course of treatment, cured last year but he had recurrence since one month. CBNAAT done, the report was awaited. A total of 9 patients among those who were interviewed, were under treatment. 3 were taking Intensive phase treatment regimen and rest 6 Continuation phase. 9 were asymptomatic and satisfied with the treatment. Rest one was still symptomatic, undergone UDST. About Universal Drug Sensitivity Testing (UDST), only 7 patients were having awareness. Out of total 21, Only 11 of them knew about their HIV status although all of them were negative for HIV.Thus by patient interview both at facility and on telephone, it is concluded that there wasa cure rate of only 75% among those who had already completed their prescribed regimen of treatment. While 88% were satisfied who were undergoing treatment.

RESULTS

For active case finding effort, among 133subjects suspected of having pulmonary tuberculosis based on history, got tested for CBNAAT, 12 samples were detected positive for Mycobacterium tuberculosis. Those positive participants sent to District Tuberculosis Centre (DTC),Palwal and their treatment had been started.

Incidence estimation details

158

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Direct method: Estimation of TB incidence - Field Survey
Participants interviewed: 23895
Eligible candidate tested for CBNAAT:133
CBNAAT done on: 133
Diagnosed positive during survey (a):12
Patients currently already on ATT (b):12
Persons diagnosed positive for MTB within last 365 days (c):08
Total new cases of TB:a + b + c = 32
Incidence of TB:32/23895 x 1000 = 1.33/1000 Or 133/100,000 (Lakh)
Indirect Method
By NGT (Nominal Group Technique), Incidence of Tuberculosis declined by 40-50% viewed by private practitioners at their private OPD clinics during the last 5 years.
By KII (Key informant Interviews)of distributor chemists, there was declined sale of ATT by 30-40%while comparing within the last 5 years. According to local chemists KII, there was declined sale of ATT by 10-20% while comparing within the last 5 years. When Compared the consumption of ATT at Public health sector (Reported Patient-Month) during the year 2021 to that of 2015, the decline was 23%.By taking interviews with the patients, it has been concluded that there is cure rate of Tuberculosis by only 75% among those who have already completed their prescribed regimen of courses and 88% were satisfied who were undergoing treatment. So, averaging all the indirect sources of data collection in varying proportions, it has been calculated that the average decline of incidence of Tuberculosis within last 5 years was:
Calculation by Mean: 45 + 35 + 15 +23 / 4 = 29.5% = say 30%
Calculation by Median:35 + 23 / 2 = 29%

So, incidence declined by (209–133/209 x 100) 36% by direct method and 30% by indirect method within last 5 years. Thus, it is concluded that total incidence of Pulmonary Tuberculosis has been declined by 36 + 30 /2 = 33 per lakh population. [Table 1]
*NNT: This an indicator in NTEP i.e. Total number of sputum samples tested for AFB divided by the number of tests found positive for AFB. It is to be clarified that the higher the value of NNT, better the programme going towards its achievements for the positive outcome. In the table above from 2015 onward till 2021, during 2019 then 2020, 2018, 2021 NNT values are 17.93, 11.20, 10.66 and 9.34 respectively (descending order), the results are showing progressive achievements. While in 2015, 2016 and 2017 NNT shows the achievements were on the same level i.e. 7+, meansachievements not on positive side. [Table 2]
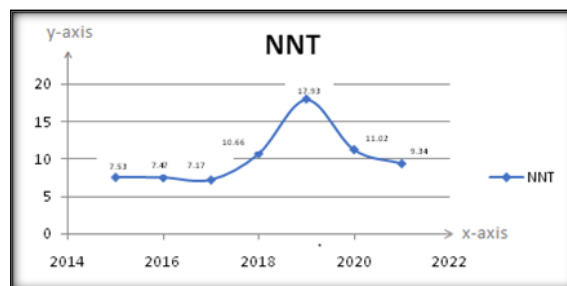

Figure 1:

Source: Civil Surgeon Office Faridabad
Line Diagram showing NNT from 2015 to 2021:
The graph shows a rise in trend from 2017 to 2019 then again decline till 2021 as described in the para above
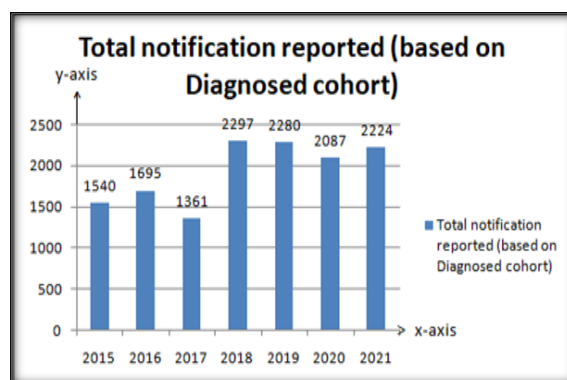

Figure 2: Bar Chart showing Total notification based on Diagnosed Cohort

NNT Limitations:NNT may be missed easily due to;
1. Large sample size (2000 per team), sampling method unable to cover most of the susceptible population group
2. Short study period (one month)
3. Limited manpower (only 2 volunteer per team)
4. Poor accessibility of phone network at certain areas.
Feedback
1. There should be online or virtual awareness campaign to convey messages regarding National Programs to the community.
2. There should be a provision of availability of Anti-Tubercular Therapy full course to private chemists free of cost through National Programs

in order to avoid case load at Public facility aspeople are hesitant to visit public sectors either due to rush or due to social stigma.
3. RMP to be awarded about the full course regimen of ATT.
4. More advertisement needed for community regarding services approved by Govt. of India.

5. More strategies of program to be developed.
6. Personal Prophylactic Equipment (PPE) to be provided to positively diagnosed cases.
7. Nutrition Education to the community to boost up the immunity in order to break the vicious cycle of malnutrition versus chronic infections

Table 1:

TB Score (2021)	% change in NNT from 2015 to 2021	% change in patient-month from 2015 to 2021	Baseline incidence of Tuberculosis in 2015	Baseline incidence of Tuberculosis in 2021	%change in Baseline incidence of Tuberculosis from 2015 to 2021
81% composite	Increase by 27%	Decrease by 23%	209/lakh population	133/lakh population	Decline by 36%

Table 2: Number Needed to Test (NNT*) from 2015 to 2021

Year	NNT
2015	7.53
2016	7.47
2017	7.17
2018	10.66
2019	17.93
2020	11.20
2021	9.34

Table 3: Summary TB score indicators

S. No.	TB score indicators	2018	2019	2020	2021
1	Target achieved in TBNotification(%)	96%	70%	93%	86%
2	TB notified patients tested forUDST(%)	45%	78%	83%	68%
3	No. of Diagnosed MDR patients	57	72	54	118
4	No. of Children(<6yrs) given prophylaxis	8	701	154	453
5	Patients with knownHIV testing(%)	62%	79%	93%	97%
6	No. of PLHIV initiated on TPT	3	2	11	4

Source: Civil Surgeon Office Faridabad

Table 4: NTEP Reports of District Palwal

S. No.	Reports in year	2018	2019	2020	2021
1	Total TB Cases Detected	2595	2769	2357	2669
2	CBNAAT Tested	2524	5238	3540	3905
3	CBNAAT Diagnosed positive	838	1623	1241	1178

Source: Civil Surgeon Office Faridabad

Ethical clearance: A formal approval was taken from institute's Ethics Committee.

DISCUSSION

In the past few decades, there has been a concerted global effort to eradicate TB. These efforts had yielded some positive dividends especially since 2000 when the World Health Organization (WHO, 2017) estimated that the global incidence rate for tuberculosis has fallen by 1.5% every year. Furthermore, mortality arising from tuberculosis has significantly and steadily declined. The World Health Organization (WHO, 2016) reports a 22% drop in global TB mortality from 2000 through 2015.Globally, the cumulative reduction in TB incidence between 2015 and 2020 was 11% per year. This was over half way to the "End TB Strategy" milestone of 20% reduction between 2015 and 2020.[10]The global TB epidemic is on the threshold of decline. The incidence rate per capita was growing during the 1990s but stabilized during the decade 2000–2010 and nowfalling at the rate of

1–2% per year.[11]In 2010the mortality due to TB was 1.4 million, among which the largest number of cases (558,000) were found in South-east Asia. The countries of sub-Saharan Africa and the former Soviet Union showed the most striking increase in caseload during the 1990s, owing to the spread of HIV in Africa.[12]Opportunities, challenges, and change in the era of antiretroviral treatment[13] and to the collapse of health and health care in the Soviet Union, respectively.[14,15]

The approximate decline in incidence of tuberculosis are accounted as- West and Central Europe (4% per year), Western Pacific regions (>2% per year),Americas (2% per year), Southeast Asia (<2% per year) and the Eastern Mediterranean (<1% per year).[16]The burden of disease tuberculosis is carried predominantly by Asian countries. The Southeast Asian and Western Pacific Regions together accounted for 58% of the global total (5.2 million out of 8.8 million cases), mostly

among the inhabitants of India, China, Indonesia, and Bangladesh.Here, this study shows the decline of tuberculosis incidence by various methods direct and indirect by33 per lakh population.

Recommendations

Disease surveillance must be addressed with a sense of priority. Government bodies should continue to support, with financial and technical assistance for the sake of improvement in TB elimination programs in high-burden states/districts/UTs around the nation. This will be helpful to decrease the reservoir of latent TB infection that gives rise to cases.[17]

CONCLUSION

More operational researches are needed in basic sciences for TB diagnosis and care. It should also be combined with a political commitment for providing more financial and manpower to implement successful strategies. Agenda like Indoor Mandatory Screening (IMS) be started and promoted for patients suffering from diseases other than Tuberculosis as well as their attendant entering the premises of hospital. These steps would be helpful for case notification from high risk population and the commitment would hopefully serve the desirable goal of TB elimination.

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161

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