

A Study on Tuberculosis Screening in Urban Households with Pulmonary TB Contacts

Manish Kumar Jain

Professor, Dep. of Respiratory Medicine, A.C.S. Medical College & Hospital,
Velappanchavadi, Chennai

Received: 04-02-2022 / Revised: 25-03-2022 / Accepted: 15-04-2022

Corresponding author: Dr. Manish Kumar Jain,

Conflict of interest: Nil

Abstract

Introduction: Mycobacterium tuberculosis is the causal agent of tuberculosis and pulmonary one is the most prevalent. World Health Organization has suggested that there are issues in the national TB program undertaken by the Government of India. Issues including management related, insufficient funding, only X-ray, low cost treatment, insufficient information, lack of awareness among the population, increased hidden cases, lower treatment standard. It has been found that to increase the efficiency of the programme, there is a need to identify the hidden cases or the contacts of the current cases. The lack of awareness and interest may lead to increase of cases unknowingly. Hence, in this study, the contacts are identified and evaluated for the presence of TB and the reasons behind the failure of their screening have been analyzed.

Aims and Objective: The study is intended to find the reasons behind the inefficient management of TB programme by identifying the household contacts of the patients with pulmonary TB (PTB). Also, the study intends to find out the significance of introducing contact register in the whole management of the household contacts of PTB.

Materials and Methods: The records of the index cases were obtained from Tuberculosis Units and contacts were identified. They were questioned regarding their health status and underwent screening of PTB before and after implementation of contact cards. Then the findings were statistically evaluated and conclusion was drawn.

Results: The study has found that the difference of confirmed cases found in pre and post implementation stage is statistically significant ($p < 0.05$) and the anti-TB treatment given to confirmed cases found from screening programme in pre and post implementation stage, was also statistically significant ($p < 0.05$). The reasons behind the failure to list the contacts and the failure to provide screening to the listed contacts were also evaluated.

Conclusion: The contacts cards should be made integral to the PTB screening programme and regular identification of Household contacts (HHC) must be carried out to increase the coverage of the screening.

Keywords: TB, PTB, screening, smear, pulmonary TB, tuberculosis.

This is an Open Access article that uses a fund-ing model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Mycobacterium tuberculosis is the bacterium that causes the infectious illness tuberculosis (TB). It is transmitted by TB

patients through the air. In one year, one sick person can transmit to 11 or more people. With 26% of all recorded TB cases

worldwide, India continues to struggle with a serious public health issue related to TB. "Integrated, patient-centered tuberculosis (TB) care and prevention" is the first tenet of the World Health Organization's (WHO) End tuberculosis (TB) strategy. Describe the idea of patient-centered care, its justification, and how it changed into people-centered care. Examine the evidence regarding the efficacy of people-centered approaches in treating tuberculosis and highlight the essential areas requiring ongoing assistance for implementation. In order to ensure that people-centered Tuberculosis prevention and care can fully realize their potential, we suggest four areas where improvement in work is required: Getting agreement on nomenclature and standards, advancing research, utilizing and assessing new technology, and fostering national leadership and advocacy are the first four priorities that are required to achieve the prospects of patient-centered care for controlling TB. All those working to eradicate TB should be guided by integrated, people-centered TB care and prevention [1,2,6,7]

In order to stop the spread of resistance and improve the likelihood of a cure, strict adherence to drug-resistant tuberculosis treatment is necessary. Due to the current prolonged prescribed treatment schedules, the maximum daily pill dosage, the serious and frequent drug side effects, and the associated societal and financial costs to patients related to access to care, adhering to multi-drug resistant-TB therapy is extremely difficult. The WHO TB strategy takes a patient-centered approach that focuses on empowering patients to utilize their rights and carry out their obligations with dignity, respect, and dignity while taking into account their values and requirements. Through better adherence to therapy, a patient-centered approach to a systematic treatment of TB that is drug-resistant may increase the likelihood of successful therapeutic outcomes, as well as enhance wellbeing and protection from

financial risk for both patients and society at large [3,4,5,6].

The national tuberculosis program was examined by the Government of India, the World Health Organization (WHO), and the Swedish International Development Agency (SIDA) in 1992. They came to the conclusion that the program had management issues, insufficient funding, excessive dependence on x-ray, treatment at low cost, lack of coordinated information on the outcome of treatment, and low-standard treatment management. As a result, in 1997, the Revised National Tuberculosis Control Program (RNTCP), based on the widely endorsed Directly Observed Treatment Short-course (DOTS) strategy, was introduced. Through a staged extension, the program's coverage of the entire country was attained in March 2006. For the benefit of the underprivileged and vulnerable sections of society, the RNTCP offers free diagnostic and therapeutic services. A considerable majority of Tuberculosis patients who are uneducated and from low economic group rural families were treated and diagnosed from outside the RNTCP/DOTS system and charged for the treatment, according to recent studies, despite the fact that those who needed these services the most did not access or use them. The RNTCP is entering the program's next phase, which involves advocating for the idea of "universal access to TB care." All Infected persons in society should be able to obtain high-quality TB diagnostic and therapeutic services as soon as this concept is put into practice. The RNTCP has embraced the WHO 2010 recommendations for three standard regimens: the new patient regimen, which includes 6 months of rifampicin; the 2HRZE/4HR re-treatment plan using the first-line medications; and the multi-drug resistant (MDR) strategy [7-9].

Contact investigations are a crucial part of TB control programmes and an active case-finding method to boost the diagnosis of tuberculosis (TB). The danger of exposure

is greater for home contacts than for the wider public. There is a lack of knowledge regarding the effectiveness and yield of home contact screening as well as the methods employed in high-incidence countries like India. A retrospective study was conducted on 645 household contacts to assess the success rate of active case discovery among the acquaintances of newly diagnosed smear-positive Tuberculosis patients and the variables linked to a higher success rate. The study concluded that active monitoring among infected persons is a successful method to increase the detection of TB cases. In this study, contacts with abnormal x-rays had a high yield of new TB cases, and it is advised to use chest x-rays in conjunction with a symptom screen [10].

The risk of TB infection and sickness extends to household contacts (HHC) of tuberculosis (TB) patients. The study investigated the reasons why HHC was not evaluated and followed up on, as well as the effectiveness of the "Household Contact Card and Register" for screening HHC in pulmonary TB (PTB) patients for TB. The Health Care Workers (HCW) of the TB Control Program have started adopting the "Household Contact Card and Register" for screening HHC of index PTB patient. HCWs can use the household contact card and register to screen for TB in the homes of PTB patients. It's important to address the causes of contact screening non-compliance [11].

Materials and Methods

Study Design

This prospective study was conducted during the period of one year, under urban setting. The study was conducted in Tuberculosis Units (TU) in the district. The records of the patients were derived from respective TUs and review of respective HHC of PTB patients was carried out during the period of six months, for obtaining data that can be used in pre-implementation phase. Firstly, the initial

screening of HHC of index PTB cases were carried out during the period of six months. After this, the follow up study was conducted for HHC during March 2020. The study derived the details of index cases, type of TB case, sputum smear status. Details regarding HHC, symptoms, treatments were recorded and evaluated.

As part of the implementation stage, Directly Observed Therapy provider assigned serial numbers (Household contact card) to the patients and also extracted information regarding the details of HHC including height and weight. The screening of HHC was done according to the TB guidelines as usually followed by Health workers around the country. HHC who were diagnosed with TB, were provided with required TB treatment. DOT provider enquired HHC about symptoms, history of their contacts, had chest X-ray, provided sputum samples for examination by smear. HHC who were confirmed with no TB, had further investigations according to the protocol.

Inclusion and Exclusion criteria

The patients data was derived from several Tuberculosis Units. Then HHCs were identified and confirmed. The individuals who are not confirmed of pulmonary TB patient contact, were not included. The included participants were confirmed PTB contacts, gave consent to our study and cooperated with us for the whole procedure.

The participants who left in-between the study process, did not cooperate and could not answer our queries confidently were excluded.

After applying inclusion and exclusion criteria, the study finally considered 100 participants.

Ethical approval

The study was conducted according to Declaration of Helsinki (World Medical Association). Informed consents were obtained from the study participants and

each participant was explained about the study procedure in details.

Statistical considerations

The study has used SPSS 25 and excel software for effective statistical analysis. The comparative analysis of HHC regarding their status of the disease before and after the implementation stage, was done by chi-square (χ^2) test. The reasons for absence or failure of HHC screening were evaluated and quantified. The descriptive

measurements were expressed as mean \pm standard deviation. The level of significance for statistical analysis was considered to be $\alpha = 0.05$.

Results

The study has found that the mean age of the participants was 22.52 \pm 5.23 years old. The baseline characteristics of HHC were enquired and evaluated. Table 1 provides the detailed characteristics of HHC.

Table 1: The baseline characteristics of the household contacts of Pulmonary TB patients in our study

Characteristic	N
<i>Gender</i>	
Male	55
Female	45
<i>Age groups</i>	
0-14 years	15
15 and above	85
Body Mass Index	22.1 \pm 0.9
Confirmed diabetes	32
Confirmed HIV reactive	0
<i>History of</i>	
Smoking	46
Alcohol	51
Immunosuppressive drugs	22
TB treatment	3
Current pregnancy	7

The screening data was gathered and evaluated before and after the implementation of HHC card and the screening programme. All the contacts were screened in both the stages and chi-square was conducted for analysis between the pre and post implementation stage. The study has found that the difference of

confirmed cases found in pre and post implementation stage is statistically significant ($p < 0.05$) and the anti-TB treatment given to confirmed cases found from screening programme in pre and post implementation stage, was also statistically significant ($p < 0.05$).

Table 2: Screening data gathered about HHC before and after the implementation of screening (Household card)

Screening data	Pre-implementation stage	Post implementation stage	<i>p</i> -value*
Contacts screened	100	100	
Contacts diagnosed with PTB	35	22	<0.001
Contacts given anti-TB treatment	21	21	<0.001

*Compared between pre and post implementation by using chi-square test

The screening was done by employing physical examination, chest X-ray and blood smear examination. Also the results or findings of the screening have been listed in Table 3.

Table 3: Detailed findings of TB screening of HHC before and after the implementation stage

		Before (n=100)	After (n=100)
Screening methods (done for 100 contacts)	screening by symptoms only	0	0
	symptom screening and chest x-ray findings	5	0
	symptoms screening and smear examination	10	8
	symptoms, chest x-ray, smear examination	85	92
Screening findings		Before (n=35)	After (n=22)
Symptom screening	Likely TB symptoms	33	22
Chest X-Ray	Normal (Negative finding)	31	14
	Positive findings	4	8
Smear examination	Positive finding	35	22
	Negative finding	0	0

HHC considered in our study were asked about the reasons behind the failure of their names as HHC or the reasons behind the failure to screen them even if they were identified. The findings are analyzed and tabulated in Table 4.

Table 4: The reasons found behind the failure of HHC screening earlier

Failure to list HHC	36	
	Due to index patients	
	Uncooperative	2
	Death	1
	Lost to treatment	8
	Transferred to private hospitals	7
	Due to Health care worker	
	Not available	15
	No documentation or too much workload	3
Failure to bring HHC under screening even if they were listed or identified	64	
	Due to HHC	
	Not feeling well	4
	Out of station	13
	Poor awareness	31
	Old age	0
	Health issues	3
	Due to Index cases	
	Not interested	11
	Lost to treatment	2

Discussion

This study's goal is to provide a description of the process of filling out the Tuberculosis (TB) Contact Screening Logbook (TB-CSL). A retrospective analysis of the TB-CSL was done from July 2007 to June 2012. 120 patients were registered in the TB-CSL during the period of study, although 16 of them had TB and were identified there without reporting any contacts. 67 index TB patients were finally tested for household and familial contacts out of the 100 TB patients who had contacts registered. The median number of contacts per patient was 4.5 for these 300 family and household contacts among the 67 index TB patients. 161 of the 300 contacts were reviewed. This study so supports the national programme recommendations for TB contacts in the household and family being implemented in Ethiopia's rural districts. In spite of this awareness, regulations are rarely followed in settings with limited resources. Therefore, it is advised that the implementation of the household and familial TB contact monitoring recommendations for indexed TB cases take place [12].

Those who come into contact with tuberculosis patients run a high chance of contracting the illness. Recently, the use of household contact monitoring has been advocated as a method to improve case detection in nations with large burdens. A cross-sectional study was conducted on 405 patients diagnosed with tuberculosis in March 2019 in Gondar town. The current finding was high when compared to earlier research, but it was low when compared to WHO and Ethiopia's Ministry of Health recommendations (all persons having TB contact should be screened). Household contact TB monitoring practices were influenced by characteristics like educational level, understanding of TB, satisfaction with the quality of the healthcare provided, and health education regarding HIV/AIDS and tuberculosis co-infection provided by HCWs. Therefore, it

is essential to increase home TB contact monitoring and education campaigns regarding the possibility of contracting TB via household contacts [13].

In 2018, more patients than ever before obtained life-saving therapy for tuberculosis (TB), largely because of better diagnosis and detection techniques. Globally, 7.1 million people – up from 6.5 million in 2017 – received TB diagnoses and treatments, helping the globe reach one of the benchmarks for the United Nations political declaration targets on TB. According to the WHO's most recent Global TB Report, 2018 also showed a decline in the number of TB deaths, with 1.6 million compared to 1.7 million in 2017. In recent years, there have been less and fewer new cases of TB. Nevertheless, the impact on low-income and marginalized communities is still significant: almost 10.5 million people contracted TB in 2018 [14].

A cohort study was conducted on 520 household contacts of them 130 contacts were diagnosed as serum positive. Assessing the frequency of tuberculosis (TB) among household members of newly identified sputum smear (SS) positive Blood index cases was the main goal. The examination of TB risk variables in household contacts as well as the assessment of various index case characteristics that influence the disease's transmission to household contacts were secondary goals. A moderate output of cases is produced by household contact monitoring of recently diagnosed TB index patients. This methodology is practical and workable because considerably fewer secondary symptomatic people need to be evaluated in order to get additional yield [15].

Contact investigations are a crucial part of TB control programmes and an active case-finding method to boost the diagnosis of tuberculosis (TB). The danger of exposure is greater for home contacts than for the wider public. A retrospective study was

conducted on newly diagnosed contacts with serum positive with the objective to assess the success rate of active case discovery among the contacts of recently diagnosed smear-positive Tb cases and the variables linked to a higher success rate. Active screening within household contacts is a successful method to increase the detection of TB cases. In this study, contacts with abnormal x-rays had a high yield of new TB cases, and it is advised to use chest x-rays in conjunction with a symptom screen [16].

In this investigation, a cohort prospective study carried out from May 2007 to March 2009 contained 430 open index cases and their 1608 household contacts. A two-year follow-up period was used. AFB positivity in the sputum and suggestive symptoms were used to diagnose all Index cases. Of the 430 contacts, 249 were males and 181 were females with a mean age of 35 and 26 years respectively. Researchers concluded that active household contact investigation is one of the best ways to detect and treat tuberculosis at its earliest stages and the only way to control the disease in high-TB burden areas [17].

Despite greater knowledge and better diagnostic tools, TB still kills 3 million people worldwide each year. Every year, 1.7 million cases reported of tuberculosis are detected in India alone; of these, 0.8 million have sputum that is positive. Treatment of infected patients in the early stages, which stops the infection from spreading, is the fundamental principle of tuberculosis control. According to estimates, roughly 10% of infected individuals experience active disease throughout their lifespan. The primary method for treating infected cases and halting the spread of infection is still chemotherapy, but case-finding is a crucial step in the fight against tuberculosis. Case finding basically refers to the early identification of undetected infection origins. In its ninth report, the WHO expert committee on tuberculosis stated that mass

miniature radiography was still a very costly treatment for TB control even when the prevalence was quite high. However, in locations with sufficient treatment resources, selective case discovery in high-risk groups is crucial. Family members and close friends of tuberculosis patients make up a high-risk group for the disease, hence their examination is crucial for tuberculosis prevention and management [18,19].

The effectiveness of the National TB Control Program (NTP) in Afghanistan in household contact screening from 2011 to 2018 and its use as a gateway to isoniazid preventive therapy (IPT), as well as the completion rates of IPT for children under the age of five, were examined in this observational study. Contact screening was taught to health professionals. Patients with suspected tuberculosis provided sputum for AFB smear microscopy; if they were unable to do so, additional diagnostic procedures were performed. Latent TB infection in children under five was treated, with the exception of those with active TB. With an 80 percent programme success rate in contact screening, Afghanistan has a high yield of TB cases that is over ten times more than the country's incidence rate. In comparison to many other nations, IPT commencement and attainment are likewise high, but they still need to be improved, particularly for completion [20,21].

Conclusion

This current study has highlighted important status of TB screening in the country. The study has concluded that the number of household contacts identified were found to have confirmed PTB after the implementation of screening programme. The treatment provided to the contacts who were diagnosed with PTB were statistically significant which marks the efficiency of the screening programme. This also shows that the screening programme is essential in management of PTB. The reasons due to which the screening programme was not efficiently running have also been found.

The author suggests that there is a need to conduct more studies throughout the country by utilizing the TUs to get the broader picture of TB screening programme. There is a need to formulate TB screening programme which is thought a playing a significant role in eradication and management of TB throughout the country.

References

1. Odone, A., Roberts, B., Dara, M., van den Boom, M., Kluge, H., & McKee, M. People- and patient-centred care for tuberculosis: models of care for tuberculosis. *The International Journal of Tuberculosis and Lung Disease*, 2018;22(2);133–138.
2. https://www.researchgate.net/publication/322758327_People-_and_patient-centred_care_for_tuberculosis_Models_of_care_for_tuberculosis
3. Information, N. C. for B., Pike, U. S. N. L. of M. 8600 R., MD, B., & Usa, 20894. Patient-centred care, social support and adherence to treatment. 2014. In www.ncbi.nlm.nih.gov. World Health Organization. <https://www.ncbi.nlm.nih.gov/books/NBK247419/>
4. Odone, A., Roberts, B., Dara, M., van den Boom, M., Kluge, H., & McKee, M. People- and patient-centred care for tuberculosis: models of care for tuberculosis. *The International Journal of Tuberculosis and Lung Disease*, 2018;22(2):133–138.
5. A PATIENT-CENTRED APPROACH TO TB CARE Guidelines for treatment of drug-susceptible TB and patient care. (N.D.). <https://apps.who.int/iris/bitstream/handle/10665/272467/WHO-CDS-TB-2018.13-eng.pdf>
6. Cocozza, A. M., Linh, N. N., Nathavitharana, R. R., Ahmad, U., Jaramillo, E., Gargioni, G. E. M., & Fox, G. J. An assessment of current tuberculosis patient care and support policies in high-burden countries. *The International Journal of Tuberculosis and Lung Disease*, 2020;24(1):36–42.
7. Verma, R., Khanna, P., & Mehta, B. Revised national tuberculosis control program in India: the need to strengthen. *International Journal of Preventive Medicine*, 2013;4(1):1–5.
8. Vikaspedia Domains. (N.D.). Vikaspedia.in. Retrieved August 5, 2022, from <https://vikaspedia.in/health/nrhm/national-health-programmes-1/communicable-diseases/revised-national-tuberculosis-control-programme>
9. Kavya . (2018, August 21). Revised national tuberculosis control programme (RNTCP) in India. <https://www.slideshare.net/KavyaC8/revised-national-tuberculosis-control-programme-rntcp-in-india>
10. Nair D., Rajshekhar, N., Klinton J. S., Watson B., Velayutham B., Tripathy J. P., Jawahar M. S., & Swaminathan S. Household Contact Screening and Yield of Tuberculosis Cases—A Clinic Based Study in Chennai, South India. *PLOS ONE*. 2016;11(9):e0162090.
11. Velayutham, B., Jayabal, L., Watson, B., Jagadeesan, S., Angamuthu, D., Rebecca, P., Devaleenal, B., Nair, D., Tripathy, S., & Selvaraju, S. Tuberculosis screening in household contacts of pulmonary tuberculosis patients in an urban setting. *PloS One*. 2020;15(10):e0240594.
12. Ramos, J. M., Biru, D., Tesfamariam, A., Reyes, F., & Górgolas, M. Screening for tuberculosis in family and household contacts in a rural area in Ethiopia over a 20-month period. *International Journal of Mycobacteriology*. 2013;2(4):240–243.
13. Shiferaw, D. A., Mekonnen, H. S., & Abate, A. T. House-hold contact tuberculosis screening adherence and associated factors among tuberculosis patients attending at health facilities in Gondar town, northwest, Ethiopia. *BMC Infectious Diseases*, 2019;19(1).
14. Global Tuberculosis Report 2019 - World | Relief Web. (N.D.). Relief web. int. Retrieved August 5, 2022, from

- https://reliefweb.int/report/world/global-tuberculosis-report-2019?gclid=Cj0KCQjw_7KXBhCoARIsAPdPTfhgRs-6hi2pauWCS5zN-Dbpquak_kTAGgRQjmjHf3340MPfvKft3E0EaAjI8EALw_wcB
15. Gupta, M., Saibannavar, A., & Kumar, V. Household symptomatic contact screening of newly diagnosed sputum smears positive tuberculosis patients - An effective case detection tool. *Lung India*, 2016;33(2):159.
 16. Nair D., Rajshekhar N., Klinton J. S., Watson B., Velayutham B., Tripathy J. P., Jawahar M. S., & Swaminathan, S. Household Contact Screening and Yield of Tuberculosis Cases—A Clinic Based Study in Chennai, South India. *PLOS ONE*, 2016;11(9):e0162090.
 17. Singh, J., Sankar, M. M., Kumar, S., Gopinath, K., Singh, N., Mani, K., & Singh, S. Incidence and Prevalence of Tuberculosis among Household Contacts of Pulmonary Tuberculosis Patients in a Peri-Urban Population of South Delhi, India. *PLoS ONE*, 2013;8(7):e69730.
 18. https://www.researchgate.net/publication/45261811_Tuberculosis_Trend_among_Household_Contacts_of_TB_Patients
 19. <https://www.ijcm.org.in/article.asp?issn=0970-0218;year=2004;volume=29;issue=1;spage=44;epage=44;aulast=Dhingra;type=0>
 20. Sayedi, S. M., Seddiq, M. K., Rashidi, M. K., Qader, G., Ikram, N., Melese, M., & Suarez, P. G. Active household contact screening for tuberculosis and provision of isoniazid preventive therapy to under-five children in Afghanistan. *PLOS ONE*, 2020; 15(10):e0240031.
 21. Restrepo L. E. D. L. P., Ávila J. L. B., Moreno K. S. H., Noriega L. G. E., Castellan, Ángela M. A., & Pérez, F. A. T. Pelvic Ring Fracture as a Potential Risk of Death in Politraumatic Patients. *Journal of Medical Research and Health Sciences*, 2021;4(9):1446–1450.