



REVIEW ARTICLE

A PUBLIC-PRIVATE MIX INTERVENTION TO ENHANCE TUBERCULOSIS CASE FINDING IN
RESOURCE CONSTRAINED INDUSTRIAL SETTINGS

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Glossary of abbreviations

CHM- Community Health Motivator
DMC- Designated Microscopy Centre
DOTS- Directly observed treatment short
course
DOT- Directly observed treatment
ESI- Employee's State Insurance
IBM- International Business Machines
Corporation
NGO- Non Governmental Organization
RNTCP- Revised National Tuberculosis
Control Programme
SDGs- Sustainable Development Goals
SPSS- Statistical Package for the Social
Sciences
TB- Tuberculosis
WHO- World Health Organization

ABSTRACT

Background: The disease Tuberculosis tends to concentrate among the poorest, the marginalized and the most vulnerable populations such as those residing in the slums, migrant labour class, and industrial workers. Being one of the top ten causes of deaths worldwide, Tuberculosis is the biggest public health challenge of the present times. Continuous disease surveillance and monitoring comprehensively help in the approach for Tuberculosis management. Under one such operational research, assessing the treatment seeking patients of a Directly Observed Treatment Centre of a hospital of an industrially dominated area, it was revealed that 41 patient were diagnosed and initiated on TB treatment by Designated Microscopy Centre (DMC), the Tuberculosis diagnostic laboratory of another Health Centre, 5 kilometers apart. In fact active case finding was zero at this hospital. Distant DMC was significant impediment for follow up sputum microscopy and contact screening. As a result many tubercular patients went missing and the public health system had difficulty in capturing these cases. This was proving a major hindrance in tuberculosis management in this industrial township.

Objectives: (1) To enhance active case finding in the hospital (2) To enhance active and passive case finding in the community.

Methods: A DMC in the public health hospital was started, Medical staff was sensitized and community mobilization initiated by roping in an NGO in "Sputum pick up and transport scheme" of the Public Sector, in 7 slum areas, for prompt diagnosis of TB.

Results: Active and passive case finding rose from zero to 52 and 20 respectively in the year 2015 and it was 204 and 56 cases respectively in 2016. Slide positivity rate was 8.2% in 2015 with 6 New Smear Positive cases and two positive follow up cases whereas it was 8.8% in 2016 with 18 new and 16 follow up positive cases. 15 out of 179 Presumptive cases found by active search, four suspected follow up cases and 6 out of 56 Passive cases were positive for TB.

Conclusions: Public private partnership increases active and passive case finding in industrially dominated area by minimizing the challenges of loss of working hours, absenteeism from work and cost of travelling. The strengths of the private and public sector thus can go hand in hand for tackling the constraints of the resources of an area.

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INTRODUCTION

Tuberculosis, also known as Rajayakshama in Ayurveda, an Indian system of medicine, is a persistent public health threat worldwide. This science of Ayurveda attributes it to the mineral starvation of body tissues (Ranade, 1999).

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Globally tuberculosis remains one of the top 10 causes of death. Presently the TB epidemic is larger than that previously estimated. This is attributed to greater surveillance in the field of TB. In 2015 there were an estimated 10.4 million new (incident) cases worldwide, of which 5.9 million (56%) were among men, 3.5 million (34%) among women and 1.0 million (10%) among women (World Health Organization, 2016). Weak immune system is one of the factors in the early establishment of the disease. Tuberculosis surfaces more in the

poverty prone regions. The disease tends to concentrate among the marginalized and the most vulnerable groups. Six countries (India, Indonesia, China, Nigeria, Pakistan and South Africa) accounted for about 60% of the new cases worldwide. India accounts for more than one quarter of the world's TB cases and deaths (World Health Organization, 2015). TB treatment averted 49 million deaths globally between 2000 and 2015 but important diagnostic and treatment gaps still persist. Certain areas lack the TB treatment facilities and other lack the diagnostic facilities. Moreover the access to TB preventive treatment needs to be expanded. Tuberculosis could be eliminated if specific action is taken. This in turn depends on the gap analysis done on frequent intervals in the identified regions to assess the progress of the implementation of National Tuberculosis control programmes. The gaps identified in the preventive, diagnostic and curative aspects can thereafter be covered under the ambits of the control programme of an area. Sustainable Development Goals (SDGs) for 2030 aim for ending the global TB epidemic (UNDP, 2015). The WHO End TB Strategy 2014 calls for 90% reduction in TB deaths and 80% reduction in TB incidence by 2030 as compared to 2015 (WHO, 2015). This calls for joint and combined efforts of all the stakeholders dealing with Tuberculosis, be it in private or public sector.

Guidance on TB control in vulnerable and hard to reach populations involves specific interventions for prompt diagnosis and complete treatment. This also focuses on the factors to be considered during developing the health education and awareness programmes for these vulnerable groups (European Centre for Disease Prevention and Control, 2016). The understanding of the barriers and the facilitators to the uptake of tuberculosis diagnostic and treatment services by hard- to- reach populations, is of utmost importance in TB epidemiology⁷. Understanding of the population dynamics of the industrial areas assumes significance for the control of this communicable disease. Emergence of drug resistance in tuberculosis treatment is another emerging challenge. Improved case management, enhancing active and passive case finding in hard- to- reach areas, directly observed treatment short course (DOTS) strategy and good cooperation between services help to facilitate the reach of the tuberculosis control programmes to the hard- to- reach populations (Heuvelings, 2017). Regular advocacy and social mobilization camps under the Revised National Tuberculosis Control Programme (RNTCP) in India are a lead in this direction. Assessment of felt needs of patients taking anti- tubercular treatment is often lacking in such camps and also during the regular TB monitoring and surveillance.

This lacuna assumes a larger proportion in populations such as slums, industrial areas and marginalized inhabitations. The success of public- private mix intervention in TB control depends upon the orientation of the staff of Private and Public sector, improving the referral and information system through practical tools, adequate supervision and monitoring of Private stakeholder, and provision of free anti- TB drugs to the patients of the area (Lonnroth, 2004). Solan, a mid-hill region of Himachal Pradesh has witnessed a fast growth of industrialization and migrant population inhabitations throughout the district. The risk of the import of infection from other states looms the district. Incomplete treatment compliance due to the fear of loss of working hours amongst the industry workers, poor living and sanitation conditions of the slums, unhygienic work environment of the factories and

industries has added up to the burden of tubercular cases in the region. During one meticulous TB monitoring by the district Programme officials, it was observed that an industrial area, highly dominated by slums and marginalized population inhabitations, was lacking the TB diagnostic services in the public sector. Although a DMC was functional in the lone public health Hospital present in this identified area, the diagnostics and the treatment aspects, which were further evaluated during this monitoring, further revealed the poor knowledge amongst the staff involved in delivering the programme guidelines. Confidence building measures and treatment compliance initiatives were lacking in the practice of the health personnel of this public hospital. Serving the huge population of the catchment area of the hospital, especially for diagnosing tuberculosis was a great challenge for the existing health system. Henceforth the following public- private mix intervention model was proposed for the control of TB in the region with the objectives of

- To enhance active case finding in the hospital
- To enhance active and passive case finding in the community.

MATERIALS AND METHODS

Study area: Barotiwala, an industrial region of Solan having a public hospital i.e. Employee's State Insurance hospital Barotiwala was selected purposively as this hospital was functioning as a DOT Centre for the area but did not have the Designated Microscopic Centre. Moreover this hospital was the only one public health hospital of this industrially dominated area. **Study period:** The study was conducted between 1st January 2015 and 31st December 2016. **Study population:** (a) The medical and paramedical staff of the hospital and (b) households of selected 7 slum areas (the retrospective two year epidemiological secondary data analysis of DOT Centre of the institute was made the basis for the selection choice of the slum areas)

Study design: This was a Cross- sectional study with descriptive epidemiology.

A Designated Microscopy Centre in the public health hospital was started with a trained laboratory technician in January 2015. Medical staff was sensitized with the RNTCP training modules by conducting 3 rounds of training session one each in January, February and March 2015. The training sessions were supervised by the district health officials and the RNTCP resource personal. Thereafter the community mobilization intervention was initiated. in 7 slum areas. Sputum collection was started by roping in an NGO in the "Sputum pick up and transport scheme" under District RNTCP cell for the year 2015. Four Community health Motivators (CHMs) of the NGO were trained by the district RNTCP Trainer, to identify the patients compatible with the symptoms of TB. . Training was also imparted for organizing awareness camps in the identified slums. 6 Information, education and communication camps were organized in the selected areas. These IEC camps also elaborated the importance of symptom based suspicion for the disease and the role of diagnostics in earliest establishment of the disease in a suspected case. The training imparted to the CHMs also included the promotion of Yoga and physical exercises for increasing the resistance and healing power of the individuals taking anti- tubercular treatment. The trained CHMs and the hospital physicians were advocated with the

beneficial effects of physical exercises in tubercular patients. It also implicitly delivered the dos and the don'ts of the diet to be followed during the tuberculosis treatment, even in the resource constrained settings taking into account the poor income of the resident populations. The bidirectional relation of Tuberculosis with malnutrition was thoroughly explained especially to the CHMs that the disease leads to malnutrition and the malnutrition in turn leads to the development of Tuberculosis. The CHMs also made people aware about the ill effects of smoking and ambient air pollution especially in the young and elderly age groups. The myths about the disease were also cleared amongst the masses. Various social taboos associated with the disease were discussed at various platforms such as group meetings conducted by the CHMs. The patients who were initiated on Anti-tubercular treatment, were frequently visited by the CHMs at their respective residential areas. Contact screening was done by these workers so as to further cut the chain of transmission.

Study tools: (a) The RNTCP clinical algorithm of TB diagnosis and (b) a pre-tested interviewer administered questionnaire for history taking were used in the study.

Tuberculosis Control Programme the approval of the Chief Medical Officer of the district was obtained.

Data statistics and analysis: The data was collected regarding the general characteristics of the staff of the hospital and their training status and knowledge about the RNTCP and its diagnostic and treatment guidelines. Retrospective two years data of the DOTS patients of this DOT Centre was analyzed. The data was analyzed in IBM SPSS Statistics version 21 and Microsoft Excel 2010 software. Pearson's Chi-Square (χ^2) test was done to ascertain the statistical significance. The p-values of lesser than 0.05 were considered significant.

RESULTS

Table 1 shows the training status of the staff present in the ESI hospital Barotiwala. Prior to the opening of the DMC in the hospital, only one doctor had undergone the RNTCP modular training. One pharmacist and one Female Health worker had received only the spot training for being the DOT providers of this DOT Centre. Post intervention (after opening of the DMC) two doctors, the Pharmacist, Female Health Worker and the

Table 1. Training status of the staff of the Public Hospital

S.No	Staff	Modular training status (T-trained, UT-untrained)	
		Pre-intervention	Post-intervention
1	Doctor	T	T
2	Doctor	UT	T
3	Doctor	UT	T
4	Pharmacist	UT	T
5	Female Health Worker	UT	T
6	Laboratory Technician	UT	T

Table 2. Socio-Demographic profile of tuberculosis categories at the DOT Centre ESI Hospital Barotiwala, for the years 2014 and 2015

Socio-demographic factors	No of cases of Cat- I, n=30 (%)	No of cases of Cat- II, n=11 (%)	Total No. n=41 (%)
Age (years)			
< 15	1 (3.33)	0 (0)	1
15- 44	24 (80)	2 (18.2)	26
45- 64	4 (13.33)	8 (72.7)	12
65 and above	1 (3.33)	1 (9.1)	2
p- value	0.000		
Gender			
Male	25 (83.33)	8 (72.7)	33
Female	5 (16.66)	3 (27.3)	8
p- value	0.392		
TB category			
Pulmonary	26 (86.67)	9 (81.8)	35
Extra pulmonary	4 (13.33)	2 (18.2)	6
p- value	0.329		
Initial body weight (Kgs)			
<45	22 (73.33)	8 (72.7)	30
45 and above	8 (26.66)	3 (27.3)	11
p- value	0.941		

The spot and morning sputum specimen were collected from the presumptive TB cases residing in the slums, during the community visits made by the CHMs. All the collected samples were transported by the worker to the newly opened DMC at ESI Hospital Barotiwala, for prompt diagnosis.

Human subject protection: Prior to the study a written informed consent was taken from the staff of the hospital. The verbal informed consent was obtained by the CHMs from the slum inhabitants. Voluntary participation was ensured throughout the intervention period. As this model was proposed to enhance the functioning of the Revised National

newly recruited laboratory technician were trained under modular training of RNTCP. Operational research to assess the needs of the treatment seeking patients of a DOT Centre of the ESI hospital of this industrially dominated area, by secondary data analysis of two years and interview with medical service providers of the hospital, revealed that 41 DOTS patients taking treatment from this hospital, were in fact diagnosed and initiated on TB treatment by Designated Microscopy Centre (DMC) of another Health Centre, five kilometers apart and that active case finding during this period was zero at this hospital. Table 2 shows that out of total 41 DOTs patients, 33 (80.48%) were males and 8 (19.5%) were females. The distribution of cases of both the categories amongst different age groups was

found to be statistically significant with 26 (63.4%) patients falling under the age group of 15 to 44 years. 35 (85.3%) patients were having pulmonary tuberculosis.

Table 3. Description of TB indicators in pre and post intervention period

Indicators	Year		
	2014 (pre intervention)	2015 (post intervention)	2016 (post intervention)
Active case finding	0	52	204
Passive case finding	0	20	56
Slide positivity rate (%)	0	8.2	8.8
New smear positive cases	0	6	18
Follow up positive cases	0	2	16

Table 3 shows that active and passive case finding rose from zero to 52 and 20 respectively in the year 2015 whereas it was 204 and 56 cases respectively in 2016. Slide positivity rate was 8.2% in 2015 with 6 New Smear Positive cases and two positive follow up cases whereas it was 8.8% in 2016 with 18 new and 16 follow up positive cases. Out of 179 Presumptive cases found by active search by the NGO in 2015, 15 were positive cases. All four suspected follow up cases were also found positive. 56 persons from these slum areas reported to the hospital on their own throughout the year out of which 6 were found new smear positive for tuberculosis. This was the result of the intensive awareness camps organized by the NGO in the slum areas.

DISCUSSION

The abatement of tuberculosis involves the active role of many stakeholders and a holistic approach of promotive, preventive and curative science. Samal, in a systematic review done in 2015, documented the role of Ayurvedic science in the management of tuberculosis (Samal, 2016). The benefits of physical exercises in the uplifting the morale of the tubercular patients and increasing the treatment compliance are inbuilt components of this alternative system of Indian Medicine. Both private and public key partners have succeeded in enhancing the case finding and diagnosis in many parts of the world. We conducted this study to implement and evaluate the private- public mix intervention in the management of tuberculosis in a setting which was highly dominated with migrant, slum and marginalized inhabitants and was lacking the TB diagnostic services. Similarly Newell JN et al. documented in 2004 that the combination of strengths of the public sector and the NGOs gives a high rate of case notification (Newell, 2004). Arora VK et al. also documented that Public- private mix project funded by RNTCP achieved improved case detection (Arora, 2003). Our study also highlighted the enrollment of the NGO in a monetary scheme of RNTCP and its effect on the enhanced case finding. The present study also showed that the acceptance of the locally available NGO of the area was a welcoming step by the inhabitants when they were briefed about the signs and symptoms of TB in a comprehensive and simple to understand language. The present study documented that the distant DMC for the Public hospital, was a significant impediment for follow up sputum microscopy and contact screening.

This diagnostic gap was a challenge not only for the patients but also for the treating physicians of the hospital. Golub JE et al., had also documented in their study that the health care system delays are hindrance in prompt diagnosis of TB (Golub,

2005). Our study showed the Provisioning of a comprehensive approach for preventing, diagnosing and treating Tb at this hospital by adopting a multipronged strategy. Community intervention by involving an NGO for strengthening the TB diagnostics and conducting information, education and communication camps amongst the masses was an important pillar of our study. Similarly Kumar et al., in 2002 had also documented the role of educating the private stakeholders about the importance of sputum microscopy (Kumar, 2005). Ambe G et al., in a study conducted in a metropolitan city of India, in 2003, found 2145 new smear positive cases which was an increment of 40% above the 5397 cases detected by RNTCP facilities in the same year (Ambe, 2005).

The present study also showed that 24 New smear positive cases were detected in post intervention period of public-private mix model of TB case finding activities in the facility where the case finding activities were zero. This study also documented the importance of awareness camps in enhancing the passive case finding from the slum areas, where poverty and poor living conditions were quiet imminent. The increase in knowledge amongst the residents of the slums, about tuberculosis, as a result of the present intervention also contributed in patients themselves reporting to the hospital with presumptive signs of the disease. Similar findings were also reported by Chakaya JM et al in a study conducted in the urban slums of Kenya (Chakaya, 2005). Also it was found in our study that the trainings imparted to the doctors of the hospital under RNTCP guidelines improved the active case finding in the hospital where it was zero earlier. The doctors also had more ease while dealing with tubercular patients with access to new diagnostic centre, very much within the hospital premises. Suleiman BA et al had also reported in their study the role of the doctors in management of tuberculosis and had evaluated that the doctors following the national guidelines contributed more in the management of tuberculosis (Suleiman, 2003).

Conclusion

Public- private partnership increases active and passive case finding in slums of resource constrained industrially dominated area by minimizing the challenges of loss of working hours, absenteeism from work, cost of travelling, time delay in reporting and increasing the knowledge, attitude and practice amongst the masses about prevention, diagnosis and treatment of Tuberculosis, by adopting a holistic approach. The study also inferred that the meticulous TB monitoring under the National TB control programmes, eliciting gaps in TB diagnostics, can have such public private mix initiatives for achieving the programme goals by utilizing the inbuilt strengths of the programmes such as the Sputum pick up and transportation scheme.

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