

## ESTIMATING PROVIDER COST FOR TREATING PATIENTS WITH TUBERCULOSIS UNDER REVISED NATIONAL TUBERCULOSIS CONTROL PROGRAMME (RNTCP)

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### Summary

**Background:** The Indian tuberculosis control programme is the second largest health programme in the world. Sustaining this programme in India will require continued financial support, particularly for drugs and contractual personnel. In addition, the costs for diagnosis, supervision and salaries for regular programme personnel need to be sustained.

**Objective:** To measure unit provider cost for treating patients with tuberculosis.

**Methods:** All government health facilities situated in one tuberculosis unit (TU) of Tiruvallur district were visited in order to evaluate daily practice of TB diagnosis and treatment. We interviewed administrators in these health facilities to gather data on modalities for diagnosis, treatment and monitoring of tuberculosis patients. In addition, relevant financial records from all health facilities were scrutinised for data collection. The cost analysis was done for diagnosis, treatment and monitoring of TB patients treated under DOTS programme in the year 2002. For this study only the recurrent cost (not the capital cost) is considered, even though the programme puts in a lot of investment at the preparatory stage of the programme e.g. upgrading of labs and drugs stores, microscopes, motorcycles etc. Cost incurred on smear microscopy, chest X-ray and drugs were classified as direct cost. Indirect cost is calculated based on proportion of staff time for TB care delivery and for supervision of TB services. The exchange rate at the time study was 1\$=Rs 46.

**Results:** Unit cost for smear microscopy was estimated to be Rs 10/-; for radiography Rs 25/-; and drug cost for Category I Rs 392/-; Category I with extension Rs 495/-; Category II Rs 729/-; Category II with extension Rs 832/- and Category III Rs 277/-. Including other recurrent expenditures like salary, materials, and maintenance, the overall unit provider cost to treat a TB patient was Rs 1587/- for Category I, Rs 1924/- for Category II and Rs 1417/- Category III.

**Conclusion:** TB inflicts considerable economic burden on the overall health system. This information is vital for policy makers and planners to allocate adequate budget to the programme. [*Indian J Tuberc* 2006; 53:12-17]

**Key words:** Unit provider cost, DOTS

## INTRODUCTION

The Revised National Tuberculosis Control Programme (RNTCP) of India is the second largest programme in the world and it is integrated with primary health care services<sup>1</sup>. India has an extensive network of primary health centres (PHCs) and they are involved in all the public health programmes such as immunization, reproductive and child health programme, school health programme, tuberculosis and malaria control etc., in addition to treatment of minor ailments.

Information on the cost of providing health services is essential for good planning and management that leads to an efficient use of limited resources<sup>2</sup>. However literature on cost analysis of health services in developing countries is scarce.

Various studies have reported the economic burden posed by tuberculosis on TB patients and the nation<sup>3-4</sup>. However unit cost incurred for providing care by the governmental health care system, which includes costs of diagnostic tests, drugs and service costs, has not been evaluated. In this study, we have attempted to estimate unit cost in providing care to TB patients.

## MATERIAL AND METHODS

### Setting

Tamil Nadu has 29 districts each covering populations ranging from 1.5 to 4.5 million. The District TB Centre (DTC) is situated at the district headquarters, with a District TB Officer (DTO) as the overall manager of the TB programme in

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the district. At the sub-district level, there is one TB Unit for every 500,000 population and designated microscopy centres (DMC) for every 100,000 population. Within a district, there are General Hospitals (GHs) at the district and taluk levels, block primary health centres each catering to 100,000 – 150,000 population, with 2-3 Primary Health Centres (PHC) within the catchment area of a block PHC. The PHC, the basic health unit caters to rural populations of about 30,000. Within the administrative control of the PHCs, there are sub-centres which cover a population of 5,000, and these are the most peripheral units of the governmental health delivery system in rural areas.

India's Revised National Tuberculosis Control Programme (RNTCP), an adoption of the internationally recommended Directly Observed Treatment Short course (DOTS) strategy, focuses on providing free quality sputum smear microscopy for diagnosis as well as quality drugs for treatment free of cost. This strategy also provides decentralized treatment services close to patients' residence under direct observation with the help of government health workers and community volunteers.

### ***Study area***

This study was conducted in a Tuberculosis Unit, covering a population of 580,000, of a rural district of Tamil Nadu (Tiruvallur), where RNTCP has been in place since May 1999. In 2002 the case detection was 84%, conversion rate 87%, treatment success was 75% and default rate was 15%.

### ***Study design***

### ***Data collection***

All the government health facilities, including sub-centres, situated in this TB Unit were visited and all records pertaining to the TB programme were examined. The following information was collected: staff salary, costs incurred for reagents, drugs, maintenance, stationery and fuel etc. Based

on the information collected, the following costs were estimated:

- personnel cost, including supervision and monitoring;
- cost of a drug regimen;
- cost of a sputum smear examination; and
- cost of a chest X-ray.

From these, we estimated the total cost for management of a tuberculosis patient

A profile of the government health facilities available, including microscopy centres, and the list of health personnel involved in health care, was collected. Out-patient attendance data of the year 2002, number of chest symptomatics identified, number of sputum microscopy examinations performed and number of TB patients diagnosed and started on treatment in the above area, was collected.

Information on the various activities of the health staff was collected. This included the time spent on various field activities by the staff. On the basis of proportion of time spent on TB patients for diagnosis and treatment, staff costs were determined.

Medical officer screens all persons attending Outpatient Department and selects the TB suspects. For each TB suspect identified, he spends 5 minutes for eliciting history of complaints and for ordering of 3 sputum examinations. During 2<sup>nd</sup> visit he spends 10-15 minutes to scrutinize the smear results and for eliciting history of previous Anti TB Treatment, categorization, health education and for starting treatment card. If patients default 2-4 hours are spent for visiting patients' house. For weekly review all patients started on RNTCP regimen 1 hour is spent. Every month 4-5 hours are spent for preparation of monthly programme management report and quarterly report. Laboratory Technician spends 30% of his time for TB work.

### ***Type of cost calculated***

Only financial costs were considered, including costs associated with tuberculosis services and those costs which vary with output levels.

Variable costs shared or joint costs were calculated using proportional time allocation (proportion of staff time). Capital costs were not included in this study.

**Following definitions were used to calculate the costs**

**Cost:** The value of resources used to produce something, including a specific health service or a set of services

**Total cost:** Total cost is sum of direct and indirect costs.

Costs incurred on smear microscopy, chest X-ray and drugs were classified as direct cost. Indirect cost was calculated based on proportion of staff time for TB care delivery and for supervision of TB services. The prevailing exchange rate at the time of study was 1\$=Rs 46.

**Unit Cost:** A unit cost is a simple average or the cost per unit of outcome (i.e. is an indicator of efficiency). The basic calculation of a unit cost is average cost per patient treated:

$$\text{Unit Cost} = \frac{\text{Total cost for tuberculosis services}}{\text{Total tuberculosis patients registered for treatment}}$$

**RESULTS**

The profile of health facilities, the staff pattern and the case finding activities of the TB control programme are described in Table 1. There were 15 Primary Health Centres, 2 Government Hospitals, 12 centres offering microscopy facilities and 120 treatment centres. The health personnel available for tuberculosis treatment in this area were 48 Medical Officers (MOs), 12 Laboratory Technicians (LTs), 117 Health Visitors (HV)/ Staff Nurse/ Health Assistant/Multipurpose Health Supervisor, 102 Multi-Purpose Health Worker, 1 Senior Treatment Supervisors (STS) and 1 Senior Tuberculosis Laboratory Supervisor (STLS).

In the year 2002, number of chest symptomatics examined were 5717 and 892 TB patients were detected. For these patients the unit cost was estimated, including cost for follow-up sputum microscopy.

The unit costs for tests done for TB diagnosis, anti TB treatment drug boxes and staff salary are given in Table 2. The unit cost for sputum smear microscopy was Rs 10/- and for radiography Rs 25/-. The cost of drugs for category I Rs 392/-; category I with extension Rs 495; category II Rs 729/-; category II with extension Rs 832/- and

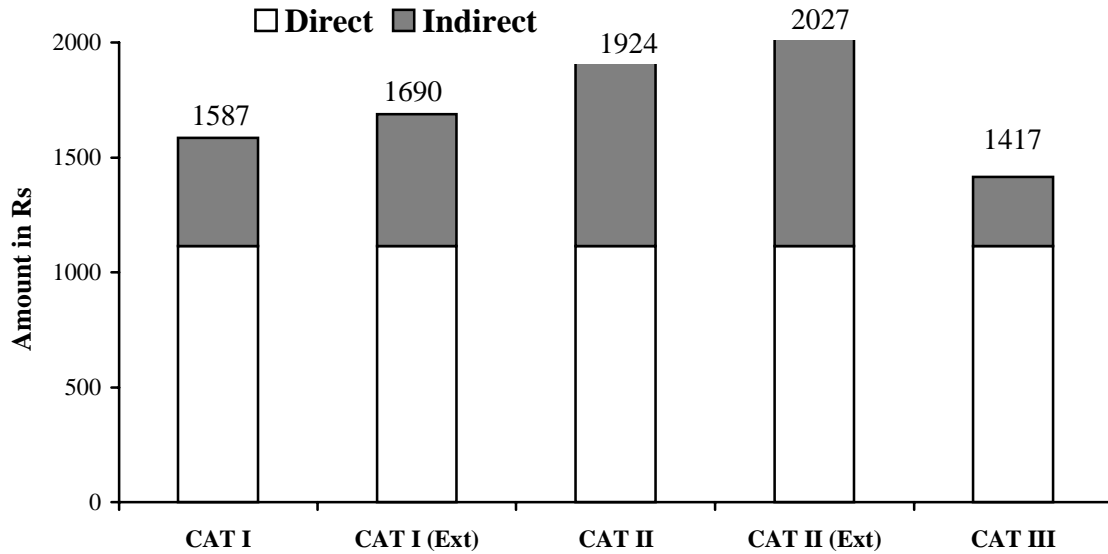
**Table 1:** Profile of health system and tuberculosis case finding in one TU of Tiruvallur district of Tamil Nadu

<b>Health facilities</b>	
PHCs	15
Government Hospitals	2
Microscopy centres	12
Treatment centres	120
<b>Health personnel</b>	
Medical Officers	48
LTs	12
HV/Staff nurses/Health assistants/Multipurpose health supervisors	117
Multi purpose health workers	102
Anganwadi workers	1 047
STS	1
STLS	1
<b>Case finding</b>	
Total outpatients	625696
Chest symptomatics	5717 (1%)
Tuberculosis Patients	892 (0.1%)

category III Rs 277/-.

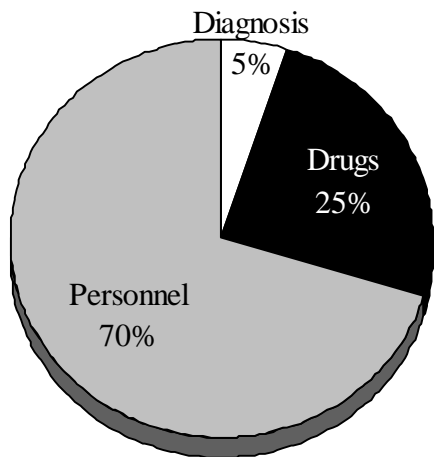
The proportion of time spent for TB services by different health personnel ranges from 100% for personnel working in the district TB centre to <10% for health visitors working in the field. Laboratory

technicians spend 30% of their working time for TB services. Cost for personnel for complete treatment of a patient was estimated as follows: Medical Officer Rs 116/-, Laboratory Technician Rs 54/-, STS Rs 129/-, STLS Rs 183/-, Health visitor Rs 187/-, Supporting staffs (Nurse, Pharmacist, Assistant,



**Fig. 1:** Unit provider cost ( direct and indirect ) to treat a tuberculosis patient under RNTCP.

**Table 2:** Unit cost for tests, drugs and personnel for tuberculosis treatment in one TU of Tiruvallur district of Tamil Nadu



**Fig. 2:** The proportion of cost spent for diagnosis, drugs and personnel to treat a TB patient

Cost	Rs
For one smear examination	10
one radiograph	25
For regimen	
Category I	392
Category I (with extension)	495
Category II	729
Category II (with extension)	832
Category III	277
For personnel	
Medical Officer	116
Laboratory Technician	54
Health visitor	187
Supporting staff	161
DTC	284
STS	129
STLS	183

Menial staff, Watchman) Rs 161/- and for all the DTC staff together (MO, HV, Pharmacist, Radiographer, Assistant, Hospital worker, Sanitary worker, Lab Technician and Driver) Rs 284/-.

Thus, the overall (direct and indirect) unit provider cost to treat a TB patient was Rs 1587/- (Rs 1114 + Rs 473) for category I, Rs 1924/- (Rs 1114 + Rs 810) for category II and Rs 1417/- (Rs 1114 + Rs 303) category III (Figure 1). Of the overall unit provider cost, about 70% was spent on personnel, 25% on drugs and 5% on diagnosis (Figure 2).

## DISCUSSION

The main finding of the present study is that the overall unit provider cost per patient treated under national TB control programme in this area ranged from Rs.1400/- (\$30) to Rs.2000/- (\$43) according to the category of treatment. For this calculation, the costs of the drugs and investigations and the salaries of staff (shared costs) were included. Similar findings were reported in a WHO report from India in 2004 on cost and cost effectiveness of public private mix, which found that the average cost per patient successfully treated to be around US\$30-40 when only public sector costs were considered<sup>5</sup>. However, this figure was considered to be low by international standards. Similarly in an earlier study conducted prior to RNTCP implementation, the cost of health services provided at PHC to diagnose a TB patient was Rs 1350/-<sup>2</sup>.

Of the overall unit provider cost of Rs 1400/- (\$30), around 70% of the costs were spent on personnel salaries etc and around 25% on drugs. Similarly, a study from Thailand showed that even though the costs of drugs used in 3 short – course regimens were lower than the cost of the standard regimen, from the provider perspective, the total provider costs were 'the highest due to the highest routine service costs as a cost of providing care is not limited only to drug costs but also includes other services costs<sup>6</sup>. One of the ways of reducing costs for curative care suggested in an earlier report was to substitute the better-paid medical officers by lower paid paramedical staff as the TB control programme is integrated with the primary health care service and is decentralized up to the community (WHO

document)<sup>8</sup>. But in our study, we observed that the cost spent on personnel was distributed among various group of workers and this suggestion may not be applicable to the existing set up.

Cure of infectious TB patients is, currently, the best form of prevention. The DOTS strategy has shown to increase the successful treatment outcomes of TB treatment from below 50% to over 80%. Ravindra Dholakia reported that if the Indian government spent even \$200 million per year on effective DOTS implementation, the tangible benefit to Indian economy would be worth at least \$750 million per year<sup>4</sup>.

Our estimates demonstrate that the adoption of DOTS by the TB control programme is cost effective as DOTS achieves the lowest cost per person treated compared to the estimated costs reported earlier<sup>2</sup> and the greatest effectiveness with regards to lives saved and relapses avoided. In particular, avoiding relapse has potentially important public health implications, due to the reduction of cases of TB with subsequent reduction of provider cost associated with relapse. One of the major benefits of effective treatment is the prevention of further transmission. A study done in Indonesia showed that every dollar invested on TB control can give a return of at least \$55 over 20 years<sup>7</sup>. The World Bank has hailed DOTS as “one of the most cost effective interventions available”<sup>8</sup>. Country studies in the early 1990s from Malawi, Mozambique and Tanzania showed the cost of TB interventions ranging from \$19-52 per life saved. However drug costs were up to four times higher at that time. Today the DOTS drug package can be purchased for as little as \$10<sup>9</sup>. This means that investing in TB control will immediately save lives,. Over time, TB control will also “turn a profit” as it reduces the disease burden on society.

In 1997, we undertook a study to measure the socio economic impact of TB on patients and their families<sup>3</sup>. Based on the findings of the study, projections were made on economic burden caused by TB in India. It was estimated to be more than Rs 13000/-crores (\$3 billion) per year including loss of wages incurred by patients an account of TB. The patients spent more than Rs 645/- crores (\$180 million) on private TB care<sup>10</sup>. With the DOTS strategy, more patients are getting

diagnosed early, sputum conversion occurs early and 8 out of 10 patients started on treatment are cured by 6-months<sup>8</sup>. This means that the number of workdays lost will be reduced, which will reduce the economic burden to the country.

### Limitations of the study

The costs have been estimated only for out patient care and do not include cost incurred for inpatient care. Another major limitation of this study was that capital costs were not included in estimation of the cost. We have not included the expenditure for incentives provided and the time cost for the community volunteers by the programme, as this has not been the practice in the study area. Thus, ours may be an under estimate.

### CONCLUSION

**To conclude, the provider cost is considerable for management of TB patients and inflicts considerable economic burden on the overall health system. The overall unit provider cost per patient treated under national TB control programme in the study area ranged from Rs1400/- to 2000/- (US \$ 31-44) according to the category of treatment. The cost for drugs is about 25% and the cost of personnel around 70%. The policy makers and planners must accord TB control a high priority and allocate adequate resources, both human and financial, to ensure effective implementation of the DOTS strategy. This will prevent deaths due to TB, promote economic development, reduce ill health and enhance the quality of life of people in India.**

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