Original Article

COSTS TO PATIENTS WITH TUBERCULOSIS TREATED UNDER DOTS PROGRAMME

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Summary

Background: The economic burden of TB in India is enormous as TB perpetuates and exacerbates poverty. Revised National Tuberculosis Control Programme (RNTCP) based on DOTS strategy is currently being implemented in India. The purpose of this study is to estimate the costs incurred by tuberculosis patients treated under RNTCP in a district in Tamilnadu where services are decentralized for diagnosis and treatment.

***Method*:** In all, 455 patients registered under RNTCP between June and December 2000, in Tiruvallur district were interviewed to collect the following information: Demographic, socio-economic characteristics of patients, expenditure incurred due to illness and effect of illness on employment. Based on the data collected, various costs (direct medical, non-medical, indirect and total costs incurred on account of tuberculosis before and during treatment) were estimated. In addition Standard of Living Index (SLI) was calculated for patients.

***Results*:** Of 455 patients, 62% had low SLI. The median direct, indirect and total costs for 343 patients who successfully completed treatment were as follows: pre treatment direct costs were Rs 340, during treatment direct costs Rs 100; more than 50% of patients did not incur any indirect costs in both pre treatment and during treatment periods and overall total costs were Rs 1398. About 12% of patients lost more than 60 workdays and after completing treatment, 88% returned to work.

***Conclusion*:** For patients registered under RNTCP in Tiruvallur district in Tamilnadu, the findings that the total patient costs were Rs 1398/- and also the patients returned to work early establishes the economic benefits to patients treated under DOTS and lend support to rapid expansion of DOTS programme, particularly in low-income countries.

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***Key words*:** Patient cost, Economic impact, Tuberculosis, DOTS

BACKGROUND

Worldwide, tuberculosis affects the most productive age group[1]. On an average, 3-4 months of work time are lost if an adult has tuberculosis, resulting in a loss of about 20-30% of annual household income[2]. An average of 15 years of income is lost if an individual dies of the disease. Thus, tuberculosis causes enormous social and economic disruption and hampers the development of the country[3]. Besides, projections from our earlier studies conducted prior to the implementation of Revised National Tuberculosis Control Programme (RNTCP) in south India indicate that despite being offered free diagnosis and treatment by government, the projected out of pocket expenditure incurred by tuberculosis patients annually was more than US$ 3 billion[4].

Directly Observed Treatment Short course (DOTS) strategy is one of the largest public health programmes found to be beneficial in the world. This strategy has been successful in reducing death rates and increasing cure rates in India[4,5]. Since evidence supporting this has mainly come from cost effective analysis (excluding patient costs) against historical controls[6-12], there is a need to carry out studies on patient costs[13]. One of the key components of RNTCP (DOTS) is that each dose of anti–tuberculosis drugs should be administered to patients under the supervision of a DOT provider, either from the community or the health system. The selection of DOT centre is according to patient's convenience (closer to patient's residence), so that patients do not lose wages or incur transportation charges for treatment in the programme[14].

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Earlier studies had shown that patients quite often 'shop around' for diagnosis before they were started on treatment under programme[2]. The health care delivery system in India consists of a complex arrangement of government, private and non-governmental organisation (NGO) centres. It was observed that 48% of patients with chest symptoms in rural areas had preferred private health care facilities first. Socio-economic factors such as literacy and family income significantly influenced the care-seeking behaviour and patients switched from private to government providers, invariably due to financial constraints[15].

Therefore, we undertook a study to estimate the direct, indirect and total (diagnosis and treatment) costs to patients on account of tuberculosis treated in DOTS programme in Tiruvallur district of Tamilnadu. In this paper, we present the results of our study estimating the various costs incurred by patients on account of TB.

METHOD

RNTCP (DOTS programme)

In RNTCP, diagnosis is primarily by sputum microscopy, treatment is directly observed with standardized regimens (3 categories), and uniform recording and reporting systems are used. Diagnosis and treatment are free of cost to the patients[14, 16].

Study area and study population

This study was conducted in Velliyur TB unit of Tiruvallur district (5,80,000 rural population), of Tamilnadu. The main occupation was agriculture. Patients registered between July and December 2000 formed the study population.

Data collection

A semi–structured and pre–tested (used previously)[2] schedule was used for data collection and patients were interviewed at two time–points: one at the end of intensive phase of treatment and the second on completion of treatment. Trained field investigators conducted the interviews after obtaining informed consent at the patient's residence.

The data collected during the first interview were demographic, socio economic, employment, assets of the patient and family. Expenditure incurred due to illness, effect of illness on employment (workdays lost and loss of income) from onset of symptoms to diagnosis and during treatment up to IP based on 3 months recall memory. During the second interview, data was collected on expenditure incurred due to illness, effect of illness on employment, and workdays lost during their illness (during CP up to end of treatment)

During the interviews, information collected was cross–checked with patients' prescription slips and hospital discharge summaries wherever available. Indirect costs were calculated only for employed patients and not for unemployed patients since the time lost on account of non-labour activities is difficult to assess in financial terms. Based on the data collected, various costs (direct, indirect, medical, non-medical and total) and standard of living index (SLI) were calculated for all patients.

Costs assessed

Direct costs

Consultation fees and money spent on investigations and drugs were classified as medical expenditure. Money spent on travel, lodging, special food and expenditure incurred for persons accompanying the patient were classified as non-medical expenditure.

Indirect costs

Indirect costs were classified as loss of wages due to illness, decreased earning ability due to illness, or long term disability that necessitated change in type of work.

Total cost

Total cost includes the expenditure incurred pre treatment and during treatment under direct and indirect costs. The cost was calculated in terms of

Indian rupees and US dollars (exchange rate during study period the study: $1 US= Rs. 45).

Total treatment cost was calculated for only those patients who completed treatment successfully. Patients with treatment outcomes such as defaulted, migrated, transferred out and died were not available and hence excluded. Patients who had failed and were on re-treatment were not considered for this analysis.

Data was also collected on money borrowed on account of illness from all patients.

Assessment of Standard of Living Index (SLI)

SLI was calculated based on the definitions used in the National Family Health Survey (NFHS-I)[15]. The factors considered were type of house, availability and type of toilet facility, main fuel used for cooking, source of drinking water, availability of separate room for cooking, ownership of house, ownership of land, ownership of livestock and ownership of other durable goods. Scoring system was used to classify the patients into 3 groups (scores 0-14 for a low SLI, 15-24 for a medium SLI and 25-67 for a high SLI).

Data Management and statistical methods used

To ensure accuracy, two independent data entry operators keyed all records twice. Data were checked for errors and analysed using the SPSS. In univariate analysis, categorical variables were compared. As the distribution of costs was positively skewed, median costs were used.

RESULTS

Study population

During the study period, 467 tuberculosis patients were registered and 97% (455) were interviewed first at the end of IP (12 could not be interviewed; because of inadequate addresses or migration). Attempts were made to visit all these patients at the end of treatment; 343 had completed treatment, 69 defaulted; 9 failed to treatment and 26 died. Hence the treatment cost analysis was done only for those who had successfully completed treatment.

Profile of the study population

The demographic and socio-economic characteristics (age, sex, family size, education, occupation and low SLI) of the study population are described in Table 1. The female patients formed one fourth of the study population. The median age

Table 1: Demographic and socio-economic characteristics of patients on RNTCP south India from 2000

	Number	%
Age (years)		
15–54	324	71
55+	131	29
Sex		
Male	331	73
Family size		
4+	295	65
Education		
Illiterate	197	43
Occupation		
Employed	358	79
Unemployed*	97	21
@Poverty		
Below poverty line	281	62
Standard of living Index		
Low	296	62
Medium	140	33
High	19	5
Total patients	455	100

Patients who could read and write were considered as literate in this study.
*Unemployed, student, retired, housewife
@Poverty line:[31] per capita income per month ≤Rs 335.46

Table 2: Costs (direct, indirect and total) incurred by TB patients registered under RNTCP

	Pre treatment cost (Rs)			During treatment cost (Rs)		
	Direct	**Indirect**	**Total**	**Direct**	**Indirect**	**Total**
Mean	874	951	1762	227	825	1014
Median	340	0	600	100	0	316
Range	0–15710	0–27375	0–30360	0–2000	0–13100	0–13712
Number	455	358	358	343	271	271

Indirect and total costs were calculated for only employed patients

was 45 years and 62% of the patients belonged to low SLI or below poverty line.

Costs assessment

Figure 1 gives the various costs estimated and also the population studied for estimation of costs. Direct cost: pretreatment direct cost was calculated for all patients (n = 455) and during treatment direct cost was calculated for those who had completed treatment (n = 343). Indirect cost: pretreatment indirect cost was calculated only for all employed patients (n = 358) and during treatment indirect cost was calculated for those who had completed treatment and employed (n = 271). Total cost: which includes direct (pre and during treatment) and indirect (pre and during treatment) (n = 271).

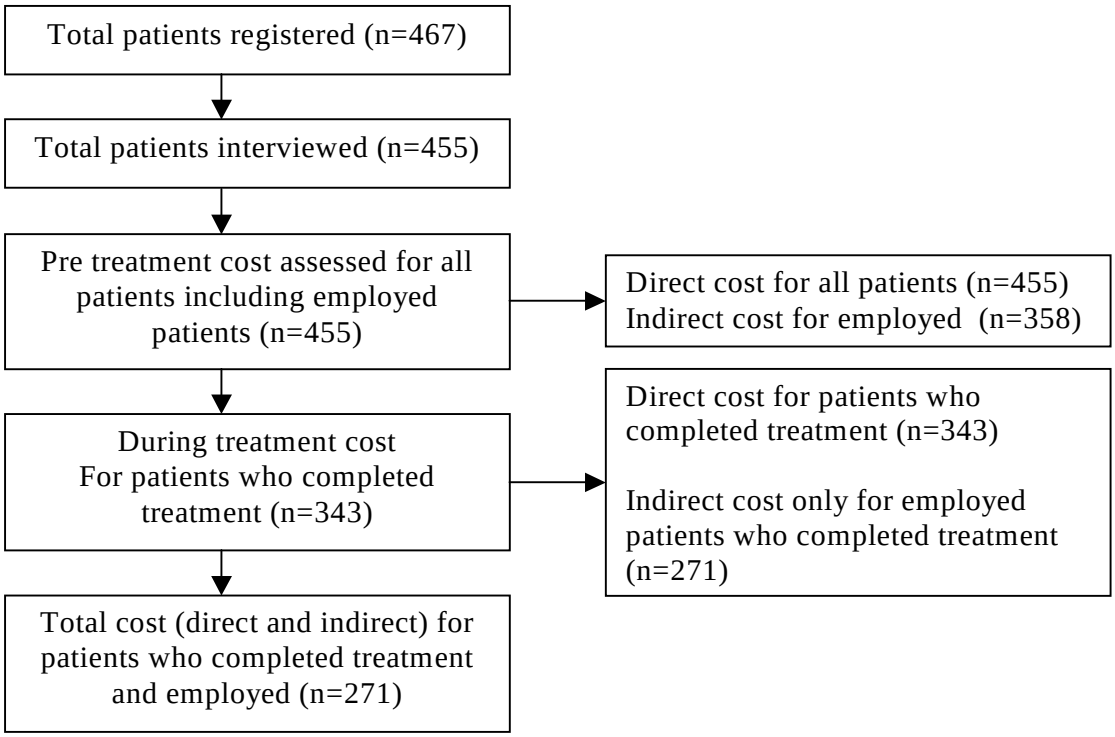


Figure 1: Study population for costs assessment

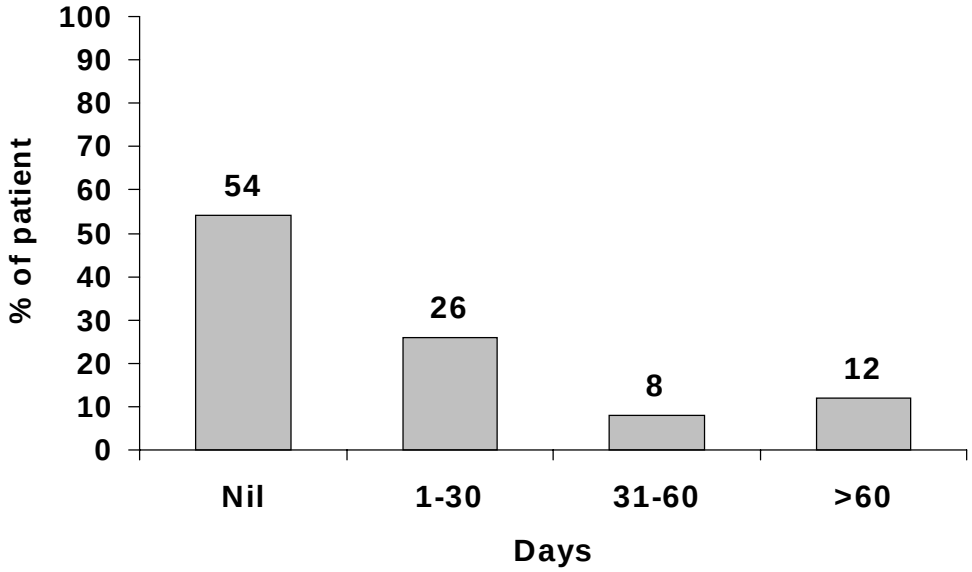


Figure 2: Proportion of tuberculosis patients in relation to loss of workdays during treatment

Direct costs

For patients registered under the programme, the median pre-treatment direct cost was Rs 340 and the median direct cost during treatment was Rs 100 (Table 2).

Pre-treatment cost (Medical and non-medical)

Medical: The median pre–treatment direct medical cost for doctor's consultation was Rs 10 (range Rs 0–5500) and no expenditure for investigations and medicines in more than 50% of patients (range 0-4000).

Non-Medical: The median direct non–medical cost for travel was Rs 34 (range Rs 0–1932). More than half the patients did not incur any cost either for accommodation (range Rs 0–4200) or for special food (range Rs 0–1200).

During treatment cost

None of the patients incurred any medical cost during treatment. More than half the patients did not incur costs for transportation (range Rs 0–372) during treatment. The median cost of special food was Rs 100 (range Rs 0–2000).

Indirect costs

Indirect cost was calculated for 358 employed patients at the time of first interview and 271 employed patients at the time of second interview. Pre–treatment indirect cost was nil in 59% of patients. During treatment, the indirect cost was nil in more than 50% of patients (Rs 0–13,100) (Table 2).

Workdays lost during treatment

Fifty four percent of working patients did not lose workdays on account of illness. It was observed that 26% of patients lost less than 30 days of work. During treatment total workdays lost exceeded 60 days in 12% of patients. (Figure 2) At the end of treatment, 88% of patients returned to work.

Total costs

Pre–treatment total costs (direct and indirect) was Rs 600, costs during treatment was

Table 3: Distribution of patients according to rupees spent for TB

Cost (in Rs)	Direct		Indirect		Total	
	No.	%	No.	%	No.	%
≤1000	186	69	178	66	117	43
1001–2000	46	17	26	10	45	17
2001–3000	20	7	25	9	31	11
>3000	19	7	42	15	78	29

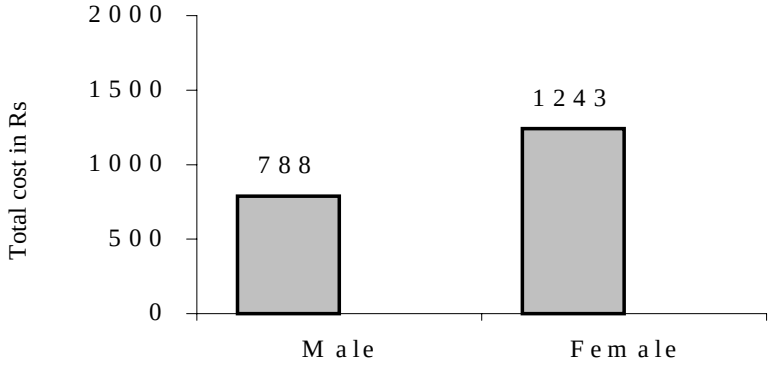


Figure 3: Comparison of total costs incurred by female and male tuberculosis patients

Rs 316 and total cost to patients was Rs 1398 (US$ 30).

Table 3 compares direct, indirect and total costs. The direct cost was more than Rs 1000 in 31%, indirect cost was more than Rs 1000 in 34% of patients and the total cost was more than Rs 3000 in 29% of patients.

Figure 3 compares the overall total costs for male (Rs 788) and female (Rs 1243) patients.

Proportion of total cost in relation to annual family income

The proportion of total cost in relation to annual family income was computed for all patients. Among patients whose income was below the poverty line, this proportion was 19% and among patients whose income was above the poverty line, it was 10% respectively (Fig. 4).

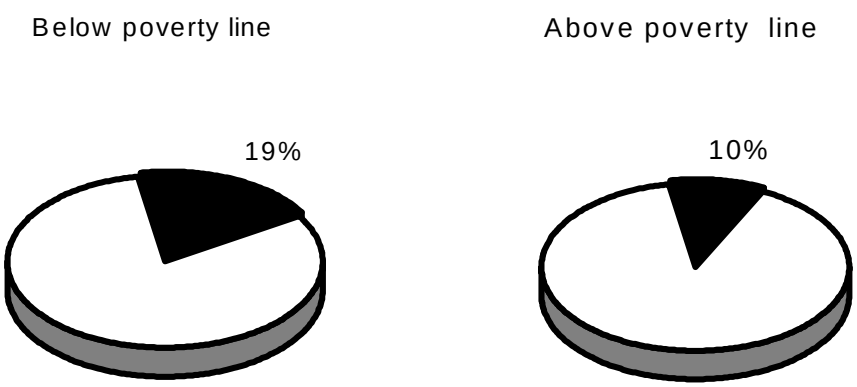
Debts incurred on account of illness

Of the total of 455 patients, 324 (71%) had borrowed money on account of TB and 50% of patients had borrowed more than Rs 2000 to meet their expenses.

DISCUSSION

This study has assessed the potential economic benefits of DOTS to patients treated under RNTCP in rural areas. The total cost for patients, from the onset of symptoms till completion of treatment, was Rs 1398 in DOTS programme. This is a saving of Rs 4588 to patients when compared with an earlier study of pre-RNTCP era[2]. If it is extrapolated to the whole country, for the estimated 14 million cases, the saving will be about 434 million US$. These results strongly suggest that DOTS programme is cost saving for patients and thus lends support for advocacy for universal DOTS in India.

One of the goals of RNTCP is that patient



Poverty line: Rs. $\leq$335.46 per capita per month [31]

Figure 4. Proportion of total costs incurred on account of TB in relation to annual family income among patients with income below and above the poverty line

should not lose wages or incur expenditure for travel. Extra efforts were, therefore, made to provide decentralized services for diagnosis and treatment closer to patient's residence[14]. Our findings confirm that travel costs for treatment were definitely lower. This refutes the findings reported earlier that patients taking DOT might incur increased costs[17]. The DOTS patients had the advantage of uninterrupted drug supply since their drugs for the entire period were available in a box. In addition, treatment was given under supervision with prompt defaulter retrieval action. This had resulted in good treatment outcomes compared to treatment outcomes in the era prior to RNTCP[18].

The DOTS patients reported significantly lower indirect costs (work absenteeism) compared to our previous study (done in pre-DOTS era) Rs.1776 *vs* Rs 3934. The loss of workdays exceeding 60 was observed in 12% of patients and this observation is contrary to that observed in Zambia (31%)[19]. This could be probably due to provision of decentralized diagnostic and treatment services. This study provides evidence that DOTS strategy is helping patients to return to work early. In our series, as 54% of patients did not lose workdays on account of illness, this will contribute to the overall economic and social development of the country and in alleviation of poverty.

In the current series, the direct pre-treatment cost incurred by DOTS patients was Rs 300; this was much less compared to the pre-treatment direct cost incurred by patients in a rural area which was Rs 550[2]. Similar observations have been reported by others[20-21]. The total pre–treatment cost was higher compared to total during treatment cost. This implies that patients spent considerable time shopping for diagnosis, probably due to lack of awareness on TB and free services. Similar findings like majority of patients making 3 or more visits to private practitioners for TB diagnosis, thus depleting financial resources have been reported earlier[22-23]. It was observed that patients spent more when they first consulted a private practitioner than a government provider (Rs 446/, Rs 151/)[24]. These findings emphasize the importance of educating the community on TB and on availability of free services. Building partnerships with the private sector is a must for reducing the expenditure on "shopping" for diagnosis.

The direct costs among female patients, in our series, were observed to be higher than among males. Similar findings were reported earlier[25]. This observation was probably due to the fact that women patients aged more than 45 years found treatment services less convenient for taking DOT as they quite often needed someone to accompany them to go to DOT centre[26]. In India, the parents of young women of marriageable age also find it a problem either to

reveal the diagnosis or to send them to a nearby DOT centre[27]. This finding reinforces the need to organize special support groups in the community for tuberculosis patients, especially for female patients.

In this series, nearly two thirds of the patients registered under programme had low SLI (poor socio economic strata). In our series, 19% of annual income was spent on TB by patients below poverty line. This finding is in conformity with a report from Thailand[28] which had shown that patients below the poverty line spent more than 15% of the annual income on TB resulting in further impoverishment and, hence, provides compelling justification for the rapid expansion of DOTS, especially in low–income countries. This finding also draws attention to the contribution tuberculosis control makes to alleviation of poverty by reducing the economic burden that the disease inflicts on the poor[29-30].

CONCLUSION

For the first time, this paper on economic evaluation of DOTS strategy, confirms that the DOTS strategy saved costs, achieved effective cure, saved lives, reduced disability and decreased work absenteeism for TB patients, especially among the poor, enabling them to return to work at the earliest, thus increasing their productivity. This information is vital for programme managers, health administrators, potential donors and policy–makers for promoting the DOTS strategy.

Limitations of the study

Since the findings of this study are based on interview of patients, it is likely that patients had difficulty in recalling information regarding expenses incurred a few months ago. We tried to minimize bias in patients recall by interviewing 90% of the patients within two months from the date of registration. The study included patients who were being treated as outpatients at rural government health facilities, and not hospitalized patients or those seeking treatment for tuberculosis from the private sector. Therefore, the estimated costs in this study may be lower than the actual costs.

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