ORIGINAL RESEARCH ARTICLE

Expenditure Incurred by Patients of Pulmonary & Extrapulmonary Tuberculosis Under Revised National Tuberculosis Control Programme in District Tuberculosis Center, Jammu

Anuradha Kalotra[1], Dinesh Kumar[2], Ravi Kumar[3], Arvind K Yadav[4], Kiran Bala[5], Bhavna Sahni[6*]

[1,5]Government Medical College, Jammu, J&K, India
[2]All India Institutional of Medical Sciences, Vijaypur, Jammu, J&K, India
[3]Government Medical College, Kathua, Jammu, J&K ,India
[4]Akal University, Bathinda, Punjab, India
[6]ASCOMS and Hospital, Sidhra, Jammu, J&K, India

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ABSTRACT

Background: Tuberculosis (TB) patients suffer enormously due to huge cost on diagnosis and treatment. This study aims to assess the total expenditure and its predictors among patients of TB.

Methodology: A longitudinal study was conducted among TB Patients registered in first quarter of 2018 at District Tuberculosis Center, Jammu. Data was collected by interviewing the patients and their attendants. Statistical significance of median expenditure between patients of pulmonary and extrapulmonary TB in relation to various predictors was assessed using nonparametric tests followed by Multiple Linear Regression.

Results: Total median cost, median direct and indirect cost incurred by a TB patient were recorded as USD 489.55, USD 246.55 and USD 229.5 respectively. Treatment costs were slightly higher in patients of pulmonary TB in comparison to extrapulmonary TB ($p>0.05$). On bivariate analysis, upper class, previously treated patients, Category 2 patients, with chronic illnesses, with guardians and who were employed expended significantly higher amounts on their treatment, but on multivariate analysis, only formal employment, current earning and being reimbursed significantly predicted the total cost ($p < .001$, adjusted R square = 0.56).

Conclusion: Huge direct costs incurred by patients is a matter of great concern, more so as the Indian government has made all diagnostics and treatment free since the inception of the RNTCP.

Keywords: Tuberculosis, Health Expenditures, Hospital costs, Health Care costs, Cost of Illness, Out of Pocket Expenditure, Expenditures, Indirect

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***Correspondence:** Dr. Bhavna Sahni (Email: bhavnasahni@gmail.com)

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INTRODUCTION

Tuberculosis is both a curable and preventable public health problem worldwide. As per WHO Global Report 2018, there were an estimated 10.0 million incident TB cases worldwide, of which 5.7 million (57%) were among men, 3.2 million (32%) among women and 1.1 million (11%) among children.[1,2,3] WHO's latest Global TB Report emphasizes that the world must hasten its pace to reach the Sustainable Development Goal of ending TB by 2030.[4]

Global TB strategy endeavors to culminate the global TB epidemic, with targets to reduce TB deaths by 95% and to cut new cases by 90% between 2015 and 2035. It has set provisional targets for 2020, 2025, and 2030.[5,6,7,8]

India accounts for one fourth of the global incident TB cases annually. The Government of India has various social support schemes directed to combat TB Central & State levels. "Targeted Public Distribution System" and providing extra rations for the duration of treatment is one such example.[9]

In many regions of the world, tuberculosis is still a growing problem. The enormous burden of undiagnosed TB leads to much suffering and destitution which in turn helps to sustain transmission.[10,11] TB and poverty are correlated, for either poverty may lead to TB which in turn may induce poverty.[12] It is estimated that for one dollar invested in TB, the return is 43 dollars.[13]

Economic hardships faced by the population are a stark reality for programs like Revised National Tuberculosis Control Programme (RNTCP) where services and diagnosis are offered for free in Government institutions. In addition to this, GOI (Govt. of India) has introduced measures of financial protection in RNTCP in the form of monetary incentives to TB patients for nutritional supplementation.[14] The ambitious program Ayushman Bharat- National Health Protection Scheme of GOI aimed at cutting huge Out of pocket expenditures is another step in preventing poor and under-privileged falling in poverty trap.

The WHO estimates that on an average, TB patient loses three to four months of work-time, and up to 30% of annual household earnings[14] thereby pushing families into penury. Literature suggests that if the economic burden due to TB is greater than 10% of annual household income, it is catastrophic for the household. Accordingly, the END TB strategy calls for zero catastrophic costs on account of TB by 2035.[15]

The monetary impact of TB is measured in relation to direct and indirect costs.[16]Available studies have attempted to measure cost on cross-sectional basis which fail to adequately describe the financial hardships faced by the patients and their families.

Many researchers in India have tried to estimate the cost of TB diagnosis and treatment using diverse methods. However, very few studies have evaluated and compared the total expenditure incurred till treatment completion by pulmonary and extrapulmonary tuberculosis patients using any validated WHO tool.

In view of the above, we thought it pertinent to study the subject using standardized tools and a longitudinal approach, on patients seeking treatment under RNTCP programmatic conditions. We intend to share the evidence thus generated with the RNTCP program managers for mitigation of economic woes which a patient with TB undergoes.

The objective of the present study was to examine the predictors of and the total costs (direct and indirect) incurred by patients of pulmonary and extrapulmonary tuberculosis on care seeking, diagnosis and treatment of TB under RNTCP in District Tuberculosis Center, Jammu.

METHODOLOGY

The present longitudinal study was conducted to assess costs incurred on the diagnosis and treatment of TB patients registered with District Tuberculosis Centre (DTC) Jammu in 1st quarter of 2018.On an average, DTC caters to 150-200 patients in one quarter. All patients who were likely to complete TB treatment in 6-8 months i.e., Category I and Category II patients were the potential participants for the study. These patients presented to DTC Jammu either directly or they were referred from CD hospital and other health institutions of the state. Final treatment costs were calculated only for the patients who completed treatment successfully. Patients with current treatment outcomes such as defaulted, migrated, relocated and deceased were not available and hence excluded. The study began after obtaining permission from Institutional Ethical Committee, GMC Jammu vide letter no. IEC/2018/663 dated 21.12.2018.

Data collection: After seeking oral consent, patients were briefed about the purpose of the study. Each participant was subjected to in person interview by the investigator using a standardized questionnaire. The questionnaire designed by KNCV Tuberculosis Foundation, the World Health Organization (WHO) and the Japan Anti-Tuberculosis Association (JATA) was used for this purpose.[17] The questionnaire included direct medical costs, direct non-medical costs, and indirect costs incurred by the patients for TB care. The tool also included questions eliciting other chronic illnesses, level of education, occupation, income, household ownership, reimbursement, insurance etc. Interviews were conducted maintaining complete privacy and questions were translated into local languages (Urdu, Dogri and Hindi) according to patient preferences. Refusal rates were low (only 3 patients refused to participate in the survey) as interviews were conducted at a time convenient to the

participant or while patients were waiting to receive drugs.

At first visit, all the information concerning expenditure made till date was recorded. This included all expenses made after the patients started experiencing symptoms suggestive of TB. All participants/designees were trained to record all expenditures made thereafter till the completion of treatment including expenses on travel, accommodation, investigations and food etc. The participants were handed over a diary containing details of expenses to be recorded. The investigator kept weekly telephonic contact with all the patients to ensure completeness of information sought. Further, all patients were contacted at least monthly at their homes or in a RNTCP facility to retrieve the diary and on each contact, it was ensured that the diary was complete in all respects. Such occasions were also be used to reinforce compliance to treatment.

Categories of costs: Direct medical costs included costs incurred for hospital registration, private consultation, radiography, laboratory tests or other procedures at private clinics, and non-TB laboratory tests, non-TB medication (multivitamins, antibiotics, cough syrups and others) as TB tests and drugs are offered free of charge in all DOTS centers.

Direct non-medical costs included costs for travel, food, and accommodation (including that of an accompanying member) to attend health facility/ DOT visits.

Indirect costs included patient's and accompanying member's loss of wages and time lost to receive care. Includes travel time for return trips to clinics/hospital, waiting time and time for consultation with a physician, paramedic, DOT provider, hospitalization, and absenteeism from work.

The total costs incurred were inclusive of direct medical, direct non-medical and indirect costs.

Cost calculations: For estimation of indirect costs, we employed the human capital approach. Patients totaled the time wasted in sickness, medical consultation, hospitalization, drug procurement and travel. The total calculated time in hours was converted to days (8 h = 1 day). In case of unemployed patients, total calculated time lost in days was multiplied by a daily wage rate prevalent in the year 2018, acquired from labour offices (USD5.42 = 325 Indian Rupees [INR]) and for those formally employed, daily rates were computed from their total monthly remuneration. In case the patients were self-employed, the average monthly earning reported by them was used.

All expenses were documented in Indian rupees and converted into USD based on the currency exchange rates in March 2018 (USD 1 equaled INR 65).

In April 2018, the National TB Program (NTP), introduced a direct benefit transfer (DBT) scheme wherein a financial assistance of USD 7.69 (INR 500) was proposed every month for sustenance of nutritional requirements of TB patients [18]. But in the present study, none of the patients reported receiving this benefit.

Statistical analyses: The collected cost data was entered in MS Excel and Kolmogorov-Smirnov test was used to check normality. As the distribution of expenditure was right skewed, patient costs were reported using median and interquartile range (IQR). Data regarding total costs (direct and indirect) were collected in Indian rupees but converted in US dollars using prevailing currency exchange rates. The positively skewed cost data became log normal upon log transformation to base 10. Hence, all the statistical tests were done with the lognormal data and interpreted on back transforming to its anti-log. The statistical significance of sub group differences in median expenditure between patients of pulmonary and extrapulmonary TB was assessed separately using nonparametric tests (Mann–Whitney U test, Kruskal Wallis test and Wilcoxon signed-rank test). All assumptions for the regression model were ensured and log-transformed linear stepwise regression analysis was employed to identify the socio-demographic, economic, clinical and care-seeking predictors of total expenditure on TB treatment. For all statistical tests, significance was ascertained at $p < 0.05$. Statistical analyses were performed using SPSS, version 23 (IBM corp, USA).

RESULTS

Nearly 80% of the study participants were in the age group of 20-60 yrs. Males out- numbered female in the ratio of 1.8: 1. Males were older than females by approximately 7.5 years (39.9 years versus 32. 4 years). Majority of patients were Hindus, were accompanied by a guardian and had no history of hospitalization and three- fourths (75.6%) of the participants belonged to urban areas. Almost half of the patients were educated up to secondary level. The ratio of Pulmonary TB to extra-pulmonary TB patients was 2.5:1. Nearly two third (66.14%) of the participants belonged to upper middle class using BG Prasad's Scale (2019)[19] and an equal proportion underwent treatment for 6 months and in the hospital respectively. One third were previously treated and 40% suffered from other chronic illnesses and an equal proportion also received reimbursement (Table 1).

It is evident from table 2 that males documented higher median expenditure in both pulmonary and extra pulmonary cases of tuberculosis, but the difference was not statistically significant. Highest expenditure was reported in the age group of 41-50 years and 51-60 years in patients of pulmonary and extrapulmonary TB respectively. Patients belonging to Lower Middle and Lower socio- economic classes recounted the highest cost of treatment in both TB categories. Previously treated patients, those with longer treatment, patients with history of chronic ill-

nesses and who were accompanied by guardian(s) reported higher costs which were significant only in case of pulmonary TB. Those with history of hospitalization and who were reimbursed reported higher median cost which was significant in cases of extrapulmonary TB. Patients who were formally employed conveyed higher expenditure which was statistically significant for both TB categories.

Table1: Distribution of pulmonary and extrapulmonary TB patients according to socio-demographic, economic, clinical and treatment-seeking characteristics

Patient characteristics	Pulmonary (n= 91) (%)	Extra Pulmonary (n=36) (%)	Total (n=127) (%)
Gender			
Male	62 (68.1)	21 (58.3)	83 (65.35)
Female	29 (31.9)	15 (41.7)	44 (34.64)
Age (years)			
<20	9 (9.9)	5 (13.9)	14(11.02)
20-30	22 (24.2)	16 (44.4)	38(34.59)
31-40	17 (18.7)	6 (16.7)	23(18.11)
41-50	15 (16.5)	6 (16.7)	21(16.53)
51-60	16 (17.6)	2 (5.6)	18 (14.17)
>60	12 (13.2)	1 (2.8)	13(10.23)
Religion			
Hindu	80 (87.9)	31 (86.1)	111 (87.4)
Muslim	5 (5.5)	4 (11.1)	9 (7.1)
Sikh/ Christian	6(6.6)	1(2.8)	7(5.5)
Socio Economic Status			
Upper Class	8 (8.8)	4 (11.1)	12 (9.44)
Upper Middle	59 (64.8)	25 (69.4)	84 (66.14)
Middle	17 (18.7)	5 (13.9)	22(17.32)
Lower Middle and Lower	7 (7.7)	2 (5.6)	9(7.08)
Residence			
Urban	72 (79.1)	24 (66.7)	96(75.59)
Rural	19 (20.9)	12 (33.3)	31 (24.40)
Education			
Illiterate	10 (11)	1 (2.8)	11 (8.7)
Primary	17 (18.7)	6 (16.7)	23 (18.1)
Secondary	38 (41.8)	20 (55.6)	58 (45.7)
Graduate/more	26 (28.6)	9 (25)	35 (27.6)
Duration of Treatment			
6 Months	56 (61.5)	35 (97.2)	91 (71.65)
>6 Months	35 (38.5)	1 (2.8)	36 (28.35)
Previous Treatment			
Yes	36 (39.6)	1 (2.8)	37(29.14)
No	55 (60.4)	35 (97.2)	90 (70.86)
Place of Treatment			
Hospital	61 (67)	25 (69.4)	86 (67.71)
UHC/PHC	30 (33)	11 (30.6)	41 (32.28)
Guardian			
Yes	85 (93.4)	31 (86.1)	116 (91.33)
No	6 (6.6)	5 (13.9)	11 (8.67)
History Of Hospitalization			
Yes	12 (13.2)	8 (22.2)	20 (15.74)
No	79 (86.8)	28 (77.8)	107 (84.25)
Other Chronic Illness			
Yes	43 (47.3)	7 (19.4)	50 (39.37)
No	48 (52.7)	29 (80.6)	77 (60.63)
Employment			
Yes, Formal Work	17 (18.7)	9 (25.0)	26 (20.5)
No, Informal Work	59(64.8)	22(61.1)	81(63.8)
Students/Retired/unemployed	15(16.5)	5(13.9)	20(15.7)
Reimbursed			
Yes	38 (41.8)	14 (38.9)	52 (40.94)
No	53 (58.2)	22 (61.1)	75 (59.05)

UHC Urban Health Centre, PHC- Primary Health Centre

Table 2: Median expenditure incurred in pulmonary and extrapulmonary TB patients according to socio-demographic, economic, clinical and treatment-seeking characteristics

Patient characteristics	Pulmonary (median USD)	p-value	Extra Pulmonary (median USD)	p-value
Gender				
Male	534.48	0.226*	498.28	0.727*
Female	455.84		480.11	
Age(years)				
<20	307.72	0.000#	325.32	0.223#
20-30	396.47		509.06	
31-40	572.57		448.94	
41-50	619.79		486.80	
51-60	611.09		623.45	
>60	513.25		523.39	
Religion				
Hindu	490.98	0.628#	482.48	0.330#
Muslim	489.55		426.33	
Sikh/Christian	544.26		-	
Socio Economic Status				
Upper Class	884.05	0.061#	644.75	0.773#
Upper Middle	480.58		479.07	
Middle	475.03		519.84	
Lower Middle and Lower	658.84		1113.77	
Residence				
Urban	476.12	0.099*	488.68	0.655*
Rural	658.84		481.30	
Duration Of Treatment				
6 Months	433.20	0.000*	480.11	0.444*
>6 Months	649.20		564.56	
Previous Treatment				
Yes	654.02	0.000*	564.56	0.444*
No	425.17		480.11	
Place Of Treatment				
Hospital	486.62	0.648*	480.11	0.813*
UHC/PHC	534.34		517.91	
Guardian				
Yes	528.37	0.016*	482.48	0.697*
No	368.07		385.16	
History of Hospitalization				
Yes	519.49	0.824*	553.22	0.033*
No	489.55		453.05	
Other Chronic Illness				
Yes	572.57	0.000*	523.39	0.065*
No	406.81		433.67	
Education				
Illiterate	692.37	0.123#	-	0.829#
Primary	470.33		486.80	
Secondary	473.16		456.37	
Graduate/more	635.23		472.43	
Employment				
Yes, Formal Work	554.61	0.000#	590.59	0.020#
No, Informal Work	498.13		481.30	
Students/Retired/unemployed	307.72		325.32	
Earning				
Before TB	323.08	0.000$	315.38	0.002$
Now	307.69		284.61	
Reimbursed				
No	486.62	0.652*	432.12	0.021*
Yes	530.24		541.24	

* Mann–Whitney U test, # Kruskal Wallis test, $Wilcoxon signed rank test

As seen in Table 3, total median cost incurred by a TB patient was recorded as USD 489.55 (Rs 31,820). A patient had to spend USD 246.55 (Rs 16,025) as median direct cost for the treatment of TB i.e., approximately half of total cost incurred while the average indirect cost for the treatment of TB was USD 229.5 (Rs 14,916). However, the median direct, indirect and total costs were slightly higher in patients of pulmonary TB in comparison to extrapulmonary TB but the differences were not statistically significant.

Table 3: Median Direct and Indirect costs (in US Dollars) incurred by 127 patients of Tuberculosis

Costs In USD	Pulmonary (n=91) Median (IQR)	Extra Pulmonary (n=36) Median (IQR)	p - value*	Total (n=127) Median (IQR)
Direct Cost				
Medical	100.61 (77, 124)	92.10 (75, 118)	0.389	100.07 (77, 123)
Non -Medical	142.86(111, 209)	147.30 (122, 188)	0.617	145.92 (115, 196)
Total Direct	249.96 (194, 318)	235.00 (209, 315)	0.868	246.55 (199, 317)
Indirect Cost	245.38 (184, 448)	223.71 (165, 271)	0.200	229.49 (180, 329)
Total (Direct + Indirect)	495.35 (395, 681)	481.30 (375, 562)	0.404	489.55 (380, 639)

IQR-Inter Quartile Range, * Mann–Whitney U test

Table 4: Predictors of total cost in patients of Pulmonary and Extrapulmonary TB on treatment in DTC Jammu from January to March 2018

Patient characteristics	Median cost (USD)	p-Value	Unadjusted coefficient (95% CI)	p- value	Adjusted coefficient (95% CI)	p- value
Gender						
Male	523.39	0.246	0.016 (-0.050-0.081)	0.632	0.008 (-0.052 – 0.069)	0.781
Female	463.09		ref		ref	
Age (years)[a]			0.460 (0.327-0.593)	0.000*	0.151 (-0.072 - -0.374)	0.183
Religion						
Hindu	486.63	0.499	ref		ref	
Muslim	472.43		0.019(-0.103 - 0.141)	0.759	-0.035 (-0.126 – 0.055)	0.441
Sikh/Christian	547.67		0.069(-0.068 - 0.206)	0.323	-0.011 (-0.109 – 0.086)	0.817
Socioeconomic Status						
Upper Class	843.05	0.041*	ref		ref	
Upper Middle	479.59		-0.176(-0.280 - -0.072)	0.001*	-0.057 (-0.161 – 0.046)	0.275
Middle	490.33		-0.170(-0.292 - -0.049)	0.006*	0.023 (-0.118 – 0.164)	0.746
Lower Middle and Lower	658.84		-0.088(-0.237- 0.061)	0.246	0.138(-0.037 – 0.313)	0.12
Residence						
Urban	478.15	0.337	ref	0.734	ref	0.574
Rural	529.77		0.013(0.060 -0.085)		0.016(-0.041 – 0.074)	
Duration Of Treatment						
6 Months	470.33	0.000*	ref	0.001*	ref	0.767
>6 Months	647.5		0.111(0.045-0.178)		-0.038(-0.295 – 0.218)	
Previous Treatment						
Yes	649.2	0.000*	0.115(0.049 - 0.180)	0.001*	0.110 -0.149 – 0.368)	0.403
No	463.09		ref		ref	
Place Of Treatment						
Hospital	481.3	0.691	0.007(0.060 - 0.074)	0.83	0.023 (-0.031 – 0.078)	0.397
UHC/PHC	527.83		ref		ref	
Guardian						
Yes	498.21	0.014*	0.109(-0.001 - 0.218)	0.051	0.024(-0.065 – 0.114)	0.591
No	385.17		ref		ref	
History of Hospitalization						
Yes	541.37	0.451	0.013(-0.072 - 0.099)	0.757	0.044 (-0.021 – 0.108)	0.185
No	480.12		ref		ref	
Other Chronic Illness						
Yes	563.55	0.000*	0.150(0.092 – 0.208)	0.000*	0.016 (-0.060 – 0.092)	0.68
No	412.8		ref		ref	
Education						
Illiterate	681.32	0.091	0.038 (-0.081 - 0.157)	0.527	-0.017 (-0.140 – 0.106)	0.785
Primary	480.12		-0.065(-0.158 - 0.027)	0.164	-0.074 (-0.172 – 0.023)	0.134
Secondary	473.16		-0.080(-0.154 - - 0.006)	0.034*	0.000 (-0.063 – 0.062)	0.994
Graduate/more	564.56		ref		ref	
Employment						
Yes, Formal Work	572.6	0.000*	0.284 (0.192 - 0.376)	0.000*	0.152 (0.053 – 0.251)	0.003*
No, Informal Work	491.12		0.175 (0.098 - 0.253)	0.000*	0.031 (-0.043 – 0.105)	0.404
Students/Retired/unemployed	315.96		ref		ref	
Earning						
Before TB			0.454 (0.300 - 0.609)	0.000*	-0.704 (-1.901 – 0.493)	0.246
Now			0.411 (0.266 - 0.557)	0.000*	1.358 (0.138 – 2.579)	0.030*
Reimbursed						
Yes	530.24	0.439	0.018 (-0.045 - 0.082)	0.57	0.232 (0.147 - 0.317)	0.000*
No	480.12		ref		ref	

[a] variable treated as continuous, and log transformed, *statistically significant at p<0.05

A multiple regression was run to predict the total cost of treatment in patients of TB as seen in Table 4. Variables such as formal employment, current earning and being reimbursed significantly predicted the total cost, F (22,104) = 8.39, p < .001, R square = 0.64, adjusted R square = 0.56.

Discussion

Universal Health Coverage, Sustainable Health Goals and Agenda for TB control post 2015 (End TB Strategy 2030) have given impetus to financial protection as an important means to achieve the broader goals envisaged as 90-90-90 and zero catastrophic expenditure by 2020 of Health for All and control of TB by 2030.[1] The present study attempts to measure the cost borne by a patient on account of suffering from tuberculosis.

In our study we observed predominance of male TB participants; participants belonging to middle class; residing in urban areas and suffering from pulmonary TB. These socio-demographic attributes broadly match with TB patients studied by other authors in India[13,14,15] thereby allowing us to generalize our results. However, few authors have reported their studies with preponderance of female's participants.[15]

Most authors have reported huge expenditure borne by TB patients within and outside India.[13,14,15] The expenditure is as high as or even more than the individual annual income earned by the participants.

Males, patients hailing from rural households and patients on Cat II had expended higher amounts on their treatment in our study. We could not retrieve any studies citing cost comparisons for gender in India, therefore it is difficult to comment on the relative costs incurred as far as gender is concerned. However, higher costs expended by TB patients from rural household can be explained by higher travelling cost for the patients and their attendants plus extra cost on food and accommodation. Similarly, since Cat II treatment as such is of longer duration, therefore absolute costs are expected to be higher.

A study done by K R John et al observed that total mean cost per person was $ 562.66 which is close to our findings.[20] Another systematic review done by M Siapka et al in lower middle- income countries reported $527.10 as median cost for 6 months of treatment which is in agreement with our findings.[21] A study by Kik SV et al in Netherlands reported that total mean cost was 353 Euros which is again high and corroborates with the observations in our study.[22] Also, the average cost was USD 401.90 per patient in Malaysia and USD 592 in Nigeria which is in tune with our findings.[23,24] Another cost analysis in India reiterated huge direct costs and indirect costs which corroborates with our findings.[25]

However, in Brazil, cost per completed treatment was US$ 336 in DOT facilities.[26] The mean cost to patients for pulmonary and extrapulmonary TB treatment was US$ 108.4 and US$ 328.0 respectively in 2010 in Yemen which is lower than our estimates.[27] The mean total cost for Pulmonary tuberculosis treatment in Pune in 2015 was found to be $85.4, Extra pulmonary was $164.9 and Pulmonary and Extra pulmonary was $228.3 respectively which is almost half than our estimated costs.[28] In another systematic review of thirteen studies, mean total cost incurred by patients being treated for TB in a public health facility was $ 235.00 and the mean direct cost was 45.5% of the total cost which is totally in agreement with our findings.[29]

The total cost of treating a new smear-positive pulmonary TB patient in Iran was USD 1,409 which was split into direct and indirect costs (USD 1,226.00 and USD 183.00) respectively but these figures were three times more than our median costs.[30]

Limitations

In the present study, the authors banked on self-reported costs. Lengthy questionnaire may have led to interviewer fatigue. Recall bias and reporting bias which arise due to estimation of expenditure after finishing treatment are intrinsic to such costing studies and are inevitable, but may have definitely led to under estimation of expenses. Recall bias, especially concerning indirect medical costs can hardly be evaded due to the protracted treatment regimes. Also, patients' estimation of travel, lodging and added nutrition costs may also not be precise. But, given that the study participants mainly comprised of the urban residents, the median income estimates are anticipated to be greater. We also had to contend with a small sample size for the study due to lack of time and other resources.

Strengths: The present study is perhaps the first and the only study in our region to assess direct and indirect costs incurred by patients of pulmonary and extrapulmonary tuberculosis separately, on care seeking, diagnosis and treatment of TB under RNTCP. Another strength of our study lies in longitudinal measurement of cost. The prospective nature of investigations undertaken by us does add to the precision of estimates as we reported the actual costs incurred by patients for the entire 6– 8-month period of treatment. Although, the present study involved patients who were being treated on outpatient basis, we ensured recording of information about any costs of hospitalization for all TB patients to make sure that our estimates are accurate.

Conclusion & Recommendations

Huge direct costs incurred by patients studied by us was a matter of great concern more so as GOI had made all diagnostics and treatment free since the inception of the RNTCP programme.[2] One of the possible explanations for this could be undue expenditure

on foods and drugs (which is not considered essential for treatment of TB such as vitamin and mineral supplements) borne by patients. Many patients interviewed revealed that they increased their diet manifold after being diagnosed with TB either on their own or after being advised by the doctor. An overwhelming majority of patients in our sample were indeed prescribed multivitamins and other non-TB drugs. These results back the expansion of population-based treatment models to reduce the appalling treatment expenses in India. However, additional research is vital to identify the factors which promote such high expenditure.

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