ECONOMIC AND SOCIAL BARRIERS FACED BY PATIENTS IN ACCESSING TREATMENT FOR DRUG RESISTANT TUBERCULOSIS IN LAHORE

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Abstract

Background: Tuberculosis is a contagion further emerging drug resistance and its progression has endangered the enforcement of end tuberculosis strategy. Socio-economic barriers are also important especially in developing countries. The study aimed to determine the socio-demographic characteristics and difficulties in getting long and short-term treatment for drug-resistant tuberculosis.

Methods: This case control study was undertaken in tertiary care settings of Lahore, Pakistan during July 2020 to March 2022. After taking Informed Consent data was collected on pre-designed questionnaires. Demographic characteristics, histories, economic status and social issues to get medicine from health facility were noted.

Results: A total of 131 patients consisting of 71(54.2%) male and 60 (45.8%) female having an overall mean age as 35.08±15.25 and BMI 18.43±3.51 were included. Proportion of married patients was 62.6%, illiterate 35.9%, 33.6% had to travel >25 KM to reach hospital and 21.4% were severely underweight patients. Most of the patients were having poor economic status where only 53.2% had a facility of semi-furnished houses, only 50.4% had own vehicle to access health facilities and the same proportion of patients are living below the line of poverty. Only few patients showed lack of confidence on healthcare staff during acquisition of drugs.

Conclusion: Long travelling, low economic status, unavailability of personal vehicle are the major issues of drug resistant TB patients. Few patients reported average to poor attitude of the supporting staff. Around 10% of patients also shown their concerns about insufficient social support.

Introduction

Tuberculosis (TB) is contagion and its burden varied region to region. Pandemic of COVID-19 created hurdles in calculating the most probable incidence of TB. Thus the World Health Organization (WHO) had to rely on the data provided by middle and low-income countries which seems to unreliable. Estimates show around 10.6 million new TB cases were diagnosed during 2021 with incidence of 134/100000 people. [1] Geographical distribution of TB cases presented most of the highest 45% in South-East Asia, 23% in Africa and 18% in Western Pacific. Pakistan is at 5th amongst eight highest TB burden countries carrying 5.8% global load alone after India, Indonesia, China and Philippines. [2]

End TB strategy was enforced by WHO with target of 20% reduction in number of cases in 2020 as compared to 2015. The incidence of TB was found to be increased in five out of six WHO regions during 2020 reflected shortfall in TB case detection. [3] Definite diagnosis on the basis of microbiological evidence and prompt treatment of TB are the essentials of TB control program to control the disease.[4]

Owing the global burden of TB, Sustainable Development Goals (SDGs) to End TB were launched by WHO in 2016. Aims of SDGs were to reduce the mortality of TB by 95% and incidence by 90% till 2035. Further goals included to improve diagnostic facilities, therapeutic rehearses, development and implementation of preventive measures by research oriented education.[5] Considering the efforts of prior research and medical practitioners, around 74 million lives are estimated to be saved from TB around the globe during 21st century till 2021. [6]

Efforts to control the TB are continued but drug resistant (DR) TB and multidrug resistant TB are also playing their role to disrupt the determinations due to number of reasons.[7] Being slow growing organism *Mycobacterium tuberculosis* (MTB) requires longer duration of treatment for eradication from patients.[8] Anti TB drugs are also limited and require to be used in combinations with heavy doses discourage the patients at certain level. In category II patients, DR patients and MDR patients, few injectable are required to be given along oral drugs further force the patients to default from treatment.[7] Effective treatment on the other hand is dependent on early diagnosis and recognition of DR TB, promptness and adherence to treatment regime, vigorous finding of contacts for prophylactic treatment and screening of high TB risk groups.[4]

Emerging MDR TB further progression in extensively drug resistant (XDR) TB[9] attributing in non-adherence to treatment, poor management and lower therapeutic outcomes.[10]Global data shows that less than 50% MDR TB patients complete their treatment successfully[10], while few of the reasons have been already mentioned above.

Socio-demography of DR TB patients and scarce availability of public treatment sites especially in developing and under developed regions are other issues which are not discussed comprehensively. Key issues like how much distance a DR TB patient travels to get medicine? What is the income of patient or households? What are the social barriers to get medicine? And how they are treated by the staff in hospitals? Are minutely discussed in literature. Therefore present primary data set was extracted from a study with objectives to observe the treatment outcomes of MDR TB patients taking long term and short term treatment regimens at programmed management of drug resistant TB (PMDT) site in a tertiary care hospital of Lahore, Pakistan to address its secondary objective.

Present study is aimed to determine the socio-demographic characteristics and difficulties in getting long-term and short-term treatment for DR TB. It is hypothesized that the drug resistant TB patients are suffering from financial constraints and socially deprived either taking long or short treatment for TB.

Methods

This is a case control study and was undertaken in Health Research Institute (HRI), National Institutes of Health (NIH), TB Research Centre King Edward Medical University Lahore Pakistan during July 2020 to March 2022.

Participants: All the adult pulmonary TB patients of both genders and found rifampicin resistant by testing on GeneXpert MTB Rif/Assay (Basic requirement to register the patients at PMDT site for DR TB Treatment) with or without history of Anti TB Treatment (ATT) were included in present study.

Exclusion criteria: All the patients unable to produce sputum sample and previously tested by bronchial or gastric washings or having unknown history of ATT were excluded from present study.

Methods of data measurements and variables: After taking Informed Consent data was collected in terms of demographic characteristics like age, gender, BMI, education, marital status, livelihood, and distance to travel for PMDT site were noted. Histories like existence of TB and DR TB contact, smoking or any other addiction and chronic illness were also noted. Economic status of the patients was also observed followed by questions regarding social issues to get medicine from PMDT site were noted.
Bias was controlled by using uniformed questionnaire and data was collected by well-trained data collectors. A sample size of 136 patients was statistically calculated. A non-probability convenient sampling technique was used to enroll the patients. Data was extracted from prior project aimed to observe the treatment outcomes in DR TB patients on short term or long term treatment regimens.

Method of data analysis: Data was entered and analysed by using statistical package for social studies (SPSS). Categorical variables like gender, livelihood, histories and issues were reported in frequency and percentages while quantitative variables like age, traveling distance and BMI were reported as mean± standard deviation (SD). Chi-square test was applied to observe the differences in short term and long term treatment groups and p-value <0.05 is considered as significant.

Ethics approval and consent to participate: Pre-requisite ethical approval for the research was acquired from Ethical Review Committee of King Edward Medical University Lahore on July 04, 2020 through letter No. 439/RC/KEMU. An informed written consent was taken from each patient. All patients read the purpose statement, brief insights of the study and gave their volunteer consent for participation. This is non-monetary funded work supported by HRI-NIH TB Research Centre.

Results
Participants: Initially a total of 136 (68 in each group) MDR TB patients were registered for follow up, five of which lost to follow up. A total of 131 patients i.e. 66 patients were successfully followed up in long term treatment group and 65 in short term treatment.

Characteristics of participants: Overall mean age of patients remained to be 35.08±15.25, BMI 18.43±3.51 and approximate distance for each patient to reach the PMDT site remained as 49.85±37.51 KM. Group wise distribution is presented in Table 1. Gender distribution of 131 patients consisted of 71(54.2%) male and 60 (45.8%) female (Table 2) with female to male ratio of 1:1.8 in this study. Most of the (62.6%) patients were married, illiteracy remained to be 35.9% and only 26.7% of the DR TB patients have passed high school or above.

Table 1: Characteristics of DR TB Patients

Characteristics	Category				Overall n = 131	
	Short Term (9-11 Months) n = 66		Long Term (18-24 months) n = 65			
	Mean	SD	Mean	SD	Mean	SD
Age	37.06	15.64	33.06	14.70	35.08	15.25
Approximate Distance to PMDT Site	45.26	39.96	54.51	34.53	49.85	37.51
BMI	18.04	3.32	18.84	3.68	18.43	3.51

Table 2: Demographic Characteristics of DR TB Patients

Characteristics		Category					
		Short Term (9-11 Months) n = 66		Long Term (18-24 months) n = 65		Overall n = 131	
		n	%*	n	%*	n	%**
Gender	Male	33	46.5	38	53.5	71	54.2
	Female	33	55.0	27	45.0	60	45.8
Marital Status	Married	46	56.1	36	43.9	82	62.6
	Unmarried	20	40.8	29	59.2	49	37.4
Education	Illiterate	17	36.2	30	63.8	47	35.9
	Primary	18	69.2	8	30.8	26	19.8
	Middle	12	52.2	11	47.8	23	17.6
	High	18	60.0	12	40.0	30	22.9
	Higher Above	1	20.0	4	80.0	5	3.8
District	Gujranwala	19	48.7	20	51.3	39	29.8
	Hafizabad	2	22.2	7	77.8	9	6.9
	Lahore	27	61.4	17	38.6	44	33.6
	Nankana	5	50.0	5	50.0	10	7.6
	Narowal	0	0.0	1	100.0	1	0.8
	Pakpattan	1	100.0	0	0.0	1	0.8
	Sheikhupura	12	44.4	15	55.6	27	20.6
Distance Range	Upto 25 KM	27	61.4	17	38.6	44	33.6
	26-50 KM	9	39.1	14	60.9	23	17.6
	51-75 KM	24	54.5	20	45.5	44	33.6
	76 KM and Above	6	30.0	14	70.0	20	15.2
BMI findings	Severely Underweight	13	46.4	15	53.6	28	21.4
	Underweight	33	67.3	16	32.7	49	37.4
	Normal	16	35.6	29	64.4	45	34.4
	Overweight	4	50.0	4	50.0	8	6.1
	Moderately Obese	0	0.0	1	100.0	1	0.8

%* = Row Percentage   % = Column Percentage**

Demographic characteristics: Most of 33.6% patients visited the tertiary care settings from District Lahore followed by 29.8% from Gujranwala. Around 33.6% patients had to travel a distance of up to 25 KM to reach the health facility while a considerable 15.2% proportion of patients had to travel more than 75 KM one sided distance to reach the health facility as presented in table 2.

Anthropometric findings: Similarly 21.4% and 37.4% patients were categorized as severely underweight and underweight on the basis of BMI. Detailed demography is presented in Table 2.

Historical outcomes: Diseases related histories were also noted and history of TB contact was established among 63.4% patients while 24.4% patients had history of MDR TB contact similarly 69.2% patients had a prior history of ATT while 38.9% patients had history of smoking. Fisher's exact chi-square test was applied to observe any difference among short and long treatment groups which remained insignificant (p-value > 0.05) however higher differences in history of MDR TB contact and History of TB treatment was observed among both groups as depicted in Table 3.

Table 3: Disease Related Historic Background of DR TB patients

Historic Background	Category							
	Short Term (9-11 Months) n = 66		Long Term (18-24 months) n = 65		Overall n = 131		p-value§
	n	%*	n	%*	n	%**	
History of TB contact	38	45.8	45	54.2	83	63.4	0.114
History of MDR-TB Contact	12	37.5	20	62.5	32	24.4	0.070
History of TB Treatment	50	55.6	40	44.4	90	69.2	0.074
History of smoking	23	45.1	28	54.9	51	38.9	0.216
History of Diabetes	18	56.2	14	43.8	32	24.4	0.288
History of any other chronic illness	0	0.0	3	100.0	3	2.3	0.119

%* = Row Percentage   **%** = Column Percentage** **§ = Fisher's Exact Chi-square test**

Table 4: Economic Status of DR TB Patients

Economic Parameters		Category					
		Short Term (9-11 Months) n = 66		Long Term (18-24 months) n = 65		Overall n = 131	
		n	%*	n	%*	n	%**
Nature of Job	Business	1	25.0	3	75.0	4	3.1
	Employee	19	59.4	13	40.6	32	24.8
	Labor	1	50.0	1	50.0	2	1.6
	Other	45	49.5	46	50.5	91	70.5
Nature of residence	Furnished	31	64.6	17	35.4	48	38.1
	Semi-furnished	31	46.3	36	53.7	67	53.2
	Non Furnished	3	27.3	8	72.7	11	8.7
Nature of personnel vehicle	Car	0	0.0	0	0.0	0	0.0
	Motorcycle	34	54.0	29	46.0	63	50.4
	Cycle	18	42.9	24	57.1	42	33.6
	Others	11	55.0	9	45.0	20	16.0
Total approximate income of households (in Pak Rupees)$	<10000	28	43.1	37	56.9	65	50.4
	10001-20000	29	61.7	18	38.3	47	36.4
	20001-35000	9	60.0	6	40.0	15	11.6
	35001-50000	0	0.0	2	100.0	2	1.6

$ = AT the time of study rate of a USD was around 150-160 rupees which now became as around 300 rupees/USD though income of general people remained same in Pakistani rupees.

Table 5: Social Perception of Patients for Receiving Medicine and Social Support

Social perception questions		Category					
		Short Term (9-11 Months) n = 66		Long Term (18-24 months) n = 65		Overall n = 131	
		n	%*	n	%*	n	%**
What was the attitude of the health care workers in the MDR clinic?	Good	61	92.4	60	92.3	121	92.4
	Average	3	4.5	4	6.2	7	5.3
	Poor	2	3.0	1	1.5	3	2.3
Do you feel any body rude from the staff?	Yes	4	6.1	5	7.7	9	6.9
	No	62	93.9	60	92.3	122	93.1
If yes, from whom?	Physician	0	0.0	0	0.0	0	0.0
	Psychiatrist	1	1.5	0	0.0	1	0.8
	Pharmacist	1	1.5	1	1.5	2	1.5
	Supporting Staff	2	3.0	4	6.2	6	4.6

	None	62	93.9	60	92.3	122	93.1
Do you receive medicine whenever required?	Yes	66	100.0	63	96.9	129	98.5
	No	0	0.0	2	3.1	2	1.5
Do you receive social support from PMDT site?	Yes	66	100.0	63	96.9	129	98.5
	No	0	0.0	2	3.1	2	1.5
If yes, are you satisfied from social support?	Yes	59	89.4	57	90.5	116	89.9
	No	7	10.6	6	9.5	13	10.1
If you do not receive social support, do you know about this facility?	Yes	0	0.0	2	100.0	2	100.0

Outcomes of Economic barriers: Economic status of DR TB patients was analyzed to evaluate first part of main objective of this study and considered few important parameters. Overall low impact of economic status was found. Only 24.8% of the patients had jobs while many (70.5%) in other category were involved in various part time works. Most of the women were house wives some of which were working as low paid labour in other houses and males in this class were also doing the labor works like sanitary and wiring etc. Similarly most of 53.2% were living in semi-furnished houses, only 50.4% had motorcycle as vehicle in their homes and 50.4% had very low house hold income as <10000 a month as shown in Table 4.

Outcomes of Social barriers: Perception of patients regarding attitude of staff was analyzed to evaluate second part of main objective in this study. Attitude of hospital staff remained good in 92.4% cases and 4.6% patients had complaints from supporting staff of PMDT while 0.8% and 1.5% patients had issues with psychiatrist and pharmacist respectively. Similarly 1.5% patients reported issues to get medicine in a single visit and 98.5% were receiving the social support while 10.1% were not satisfied with the social support they receive from program rest of the statistics are presented in Table 5.

Discussion
Presently 54.2% were male patients and 45.8% were females making female to male ratio of 1:1.8 and overall mean age of patients remained to be 35.08±15.25 years. Findings are comparable with a recent study which presented a mean age of MDR TB patients as 36.65±11.75 years with a range of 16 o 58 years.[11] Similarly, El-Hamdouni presented mean age of 35.5±13.3 years[12] is also concomitant to present findings. Another study had presented 65% and 89% MDR TB patients in the age range of 31-60 years and 15-69 years respectively.[13]

Overall BMI of the patients remained to be 18.43±3.51 while 21.4% and 37.4% patients were categorized as severely underweight and underweight on the basis of BMI classification in this study. Severe underweight is considered the individuals having BMI 16.5kg/m^2, thus consists various health risks including compromised immune function, abdominal issues, respiratory disease, osteoporosis and cancer etc. Further higher risks of mitigated mortality during chemotherapy or other medical interventions.[14] Another study has also reported the findings concomitant to present results.[11] Findings are alarming as a study reported 73% of drug resistant patients consisting BMI <18.5 kg/m^{2}and posed it as mortality risk lowering the rate of treatment success as compared to the BMI ><18.5 kg/m^2.[15]An Ethiopian study has already considered a significant association of drug resistant TB treatment outcome with BMI.[16]

Histories of drug resistant TB patients also contained a major impact in considering the treatment options as well as treatment outcomes. Present data shows that histories like TB & MDR contact and smoking pose a lesser chances of patients to be selected in short term treatment regimen while histories of previous TB treatment, diabetes had greater chances to be selected for short term treatment. A study has already indicated around 23% futility in treatment outcomes of drug resistant TB patients suggesting a cohort investigation to understand the prospective reasons of poor outcomes.[17]

According to a report of the healthcare economist in 2018, only a fraction of drug resistant TB patients are diagnosed while additional 9 billion US$ are required for research and development upon drug

resistant TB patients. Thus by 2030, this investment may pose to lessen 8.4 million TB cases and 1.4 million mortalities. Further chances to productivity gains are estimated to be 181 billion US$ and reduction in TB treatments costs as 5.3 billion US$. [18] Poor economic situation of drug resistant TB patients may also result in deprived treatment outcomes as presented in this study. Social perception of patients regarding acquisition of treatment, social support and attitudes of staff was not previously reported which is very important part of the treatment. Improvements in this section may result in better adherence of drug resistant TB patients to the treatment.

Limitations
This study was undertaken at a tertiary care settings of province Punjab, while the work requires to be undertaken at all PMDT sites of Pakistan to differentiate the impact in various geographical locations and this is future prospect of this study

Conclusion
Long travelling, low economic status, unavailability of personal vehicle, inappropriate jobs and poor living standards are the major issues of drug resistant TB patients. Few patients reported average to poor attitude of the healthcare staff most of which had complaints about supporting staff. Around 10% patients also shown their concerns about insufficient social support. Overall, this study could inform the development of targeted interventions to improve the management and treatment of DR TB.

What is already known about this topic:
Various aspects of the issues of drug resistant TB patients are well known as;
➢ Inadequate treatment options
➢ Long chemotherapeutic duration associated with significant toxicity
➢ Poor physical and mental health of drug resistant TB patients

this study adds:
➢ Present study first time reported long travelling distance as a barrier in treatment of DR TB patients.
➢ Present study also reported attitude of healthcare staff with DR TB patients causing stigma in accessing treatment.
➢ Present study also provided insights on social support of patients not much highlighted previously.

Competing interests
The authors declare no competing interests.

Authors' contributions
All the authors have comprehensive contribution in write up and preparation of final manuscript starting from conceptualization, data collection, writing, literature search and review.

Acknowledgements

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