Original Research Article

Evaluation of Treatment Outcome Among MDR-TB Patients in Respect to Their Diabetic Status

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Abstract

Diabetes mellitus is an established risk factor of tuberculosis. Failure of the tubercular treatment outcome is higher among patients who are simultaneously suffering from diabetes. This study aims to observe the treatment outcome of the multi drug resistant tuberculosis patients in respect to their diabetic status. This cross sectional study has been conducted in a tertiary level hospital specialized for the diseases of the chest, during the period of January to December of the year 2019. Ethical approval for the research work has been acquired and informed written consent from the patients has been taken prior conducting the study and data collection. Face to face interview and review of medical records has been undertaken to collect data. Collected data has been analyzed with IBM SPSS software. Among 200 respondents, 53.0% patients showed to have early treatment response whereas, 47.0% had delayed treatment response. Among them, 80 patients were diabetic, where, 82.5.0% showed to have delayed response to the treatment and only 17.5% had early response to the treatment. Out of 120 non-diabetic respondents 77.5% had early response to the treatment and 22.5% had delayed response to the treatment. The treatment outcome of an MDR-TB patient found to be dependent on patient's gender, age, marital status, monthly family income, history of previous TB treatment and also diabetic status (p<0.05). According to this study, diabetic MDR-TB patients are on increased risk of responding late to the treatments than the non-diabetic MDR-TB patients.
Keywords: MDR-TB, Diabetic.

INTRODUCTION

Multidrug Resistant Tuberculosis (MDR-TB) and Extensively Drug Resistant Tuberculosis (XDR-TB) are questing growing concern, where the former type is resistant to at least isoniazid and rifampicin, and the latter one is resistant to fluoroquinolone class and second line injectable anti-TB drugs [1]. Additionally, among the multidrug resistant tuberculosis cases, nearly 9.5% cases are extensively drug resistant tuberculosis presented with additional drug resistance [2]. Diabetes mellitus is an established risk factor of tuberculosis [3–6]. As reported by World Health Organization (WHO), among the eight most diabetes overburdened countries, burden of tuberculosis is also highest among them [7]. Failure of the tubercular treatment outcome is higher among patients who are concomitantly suffering from diabetes [8]. As per the estimation, nearly more than 230 million

people worldwide are currently suffering from diabetes, which is projected to rise up to 552 million people by the year 2030 [9]. Prevalence rate of tuberculosis among diabetic patients found to be 4.16% in Asia [10]. The prevalence of diabetes mellitus is increasing day by day here [11,12]. Simultaneous suffering from diabetes and tubercular infection may increase the prevalence of MDR-TB in our country. Several studies have observed that, there is 2.1 to 8.8 times greater risk of developing MDR-TB among diabetic-TB patients [3,13–19]. Moreover, in our country, the case detection rate of MDR-TB is low which heightens the risk of fast transmission of MDR-TB in community level thus, the national TB-prevention and control attempt can be greatly hindered [21,22]. Furthermore, the treatment costs associated with MDR-TB is very high [23]. Treatment outcome among MDR-TB patients are poor in terms of increased hospital stay, loss of productivity and revenue generation [24]. Death rates accounted by MDR-TB is also high, as reported that, during the year of 2013, MDR-TB associated global mortality was 210,000 [21]. Treatment failure and number of deaths are even higher in diabetic TB patients than the non-diabetic patients [25]. It takes longer period to get a negative sputum culture in pulmonary TB cases with diabetes thus the treatment outcome among diabetic patients are poor than the TB patients who are non-diabetic [26].

In such ground, it is imperative to evaluate the treatment outcome among MDR-TB patients who are co-morbid with diabetes- data regarding which are very rare. Therefore, the present study attempted to observe the treatment outcome among MDR-TB patients in respect to their diabetic status.

METHODOLOGY
Subjects and methods: The present study has been conducted in a tertiary level hospital which is a specialized institute for diseases of the chest, during the year of 2019. Prior conducting the study, ethical approval has been taken from the concerning authority. Diagnosed cases of drug resistant tuberculosis who met the study selection criteria, have been taken under study after getting their informed written consent.

Data Collection and Analysis: A semi-structured questionnaire has been developed and with the method of face to face interview and review of the medical records, data has been collected regarding their sociodemographic profile, tubercular treatment history and diabetic status. Data was analyzed with SPSS (IBM Software-Statistical package for Social Science), version 22.

Treatment outcome of MDR-TB patients: During hospitalization of the patients, smear microscopy was done weekly. Early response of treatment outcome was defined as, when the patient was smear negative for at least two consecutive tests one week apart and clinically improving, and if they were smear negative for three or more consecutive sputum culture taken $\geq$ 30 days apart after the intensive phase of treatment. Delayed response of treatment outcome was defined as, if the patient was smear negative for at least two consecutive tests one week apart and when and if three or more consecutive sputum culture negative reports are coming $\geq$ 60 days apart.

Diabetic Status: The glycemic status of the patients was assessed by daily FBS measurement. HbA1C measurements have been collected from the medical records of the patients.

RESULT
Among the 200 study respondents who was under MDR-TB treatment, majority of them showed to have early treatment response that is, 106 (53,0%), whereas, 94 (47.0%) had delayed treatment response. Among them, out of 127 male respondent 52.8% of them had delayed response and 47.2% had early response of treatment outcome of MDR TB. Out of 73 female respondent, 64.4% had early response of treatment outcome of MDR TB and 35.6% had delayed treatment response. In relation to the age, it has been observed that, 56.6% of the patients with 31-60 years of age had delayed response. In comparison to the marital status of the respondents showed that, out of 150 married respondent majority of them (51.3%) had delayed response and 48.7% had early response. Among the 40 unmarried respondents, 72.5% of them had early response and 27.5% had delayed response. By educational qualification, patients with delayed treatment response, majority (48.0%) of them had studied up to the level SSC. Occupational status of the respondents showed that, out of 93 respondents, 75(37.5%) respondent had delayed response treatment outcome of MDR TB who were businessman, 52(25.5%) had delayed response who were day laborer. The association between treatment outcome of MDR TB and occupation was shown in the following table. Monthly family income of the respondents showed that, respondents with lower income trend to have early treatment response compared to the respondents with comparatively higher income. Among these socio-demographic variables, gender, age, marital status and monthly family income was statistically significantly associated with the treatment outcome of the MDR-TB patients (p<0.05) (Table I).

Table I: Treatment Outcome of the MDR-TB Patients According to their Socio-demographic Background

	Early response n₁=106 (53.0%)		Delayed response n₂=94 (47.0%)		
	Frequency	**Percentage**	**Frequency**	**Percentage**	**p value**
Gender					
Male	60	47.2%	67	52.8%	0.027
Female	47	64.4%	26	35.6%	
Age (in years)					
Below 30	51	71.8%	20	28.2%	0.001
31-60	46	43.3%	60	56.6%	
Above 60	10	43.5%	13	56.5%	
Marital status					
Married	73	48.7%	77	51.3%	0.035
Unmarried	29	72.5%	11	27.5%	
Divorced	1	50.0%	1	50.0%	
Widowed	4	50.0%	4	50.0%	
Educational status					
No formal education	27	60.0%	18	40.0%	0.507
Primary passed	16	64.0%	9	36.0%	
SSC passed	39	52.0%	36	48.0%	
HSC passed	14	45.2%	17	54.8%	
Graduated	11	45.8%	13	54.2%	
Occupational status					
Unemployed	3	50.0%	3	50.0%	0.549
Service	24	52.2%	22	47.8%	
Business	24	47.1%	27	52.9%	
Day laborer	13.1	13.1%	17	18.3%	
Retired	37.5	37.5%	5	62.5%	
Monthly family income (in taka)					
3000-15000	57	62.6%	34	37.4%	0.000
15001-30000	47	53.4%	41	46.6%	
30001-40000	2	22.2%	7	77.8%	
40001-50000	1	10.0%	9	90.0%	
50001-60000	0	0.0%	2	100.0%	
p value reached from chi-square test					

Among the respondents, MDR-TB was diagnosed among 125 of the previously treated TB cases whereas, 75 cases were among newly diagnosed TB cases. MDR-TB among previously treated TB cases showed to have delayed response to treatment in higher percentage (54.4%) and among the newly diagnosed cases early response to the treatment was higher in percentage (66.7%) ($p<0.05$). Among the previously treated cases, most of the patients had the history of suffering for 1 to 10 years among whom, 52.6% cases showed to have delayed response to the treatment and 47.4% had early response to the treatment outcome. Record of hospital stay showed that, the mean of the hospital stay day was significantly higher among delayed response group (74.73±24.85) than the early response group (37.06±15.01) (p=0.001) (Table II)

Table II: Treatment Outcome of the MDR-TB Patients According to their Medical History Regarding Tubercular Infection

	Early response n₁=106 (53.0%)		Delayed response n₂=94 (47.0%)		
	Frequency	**Percentage**	**Frequency**	**Percentage**	**p value**
MDR-TB among previously treated or newly diagnosed TB cases					
Among previously treated TB cases	56	45.9%	68	54.4%	0.004 [a]
Among newly diagnosed TB cases	50	66.7%	25	33.3%	
Duration of suffering from tuberculosis (in years)					
1-10	55	47.4%	61	52.6%	0.414 [a]
11-20	1	16.7%	5	83.3%	
More than 20 years	1	33.3%	2	66.7%	
Average hospital stay (in days)					
Mean ± SD	37.06±15.01		74.73±24.9		0.001 [b]
[a] p value reached from chi-square test					
[b] p value reached from student's t-test					

Among the respondents, 80 patients were diabetic and 120 patients were non-diabetic. Out of the diabetic patients 82.5.0% had delayed response to treatment and 17.5% had early response to treatment outcome of MDR TB. Out of the non-diabetic respondents 77.5% had early response to treatment and 22.5% had delayed response to treatment. This association of diabetic status with the treatment outcome was strongly significant (p<0.001). Although, the duration of diabetes didn't found to be associated with the treatment outcome among the respondents. (p>0.05) (Table III).

Table III: Treatment Outcome of the MDR-TB Patients According to their Diabetic Status

	Early response n_1=106 (53.0%)		Delayed response n_2=94 (47.0%)		
	Frequency	Percentage	Frequency	Percentage	p value
Presence of diabetes mellitus					
Yes	14	17.5%	66	82.5%	0.000
No	93	77.5%	27	22.5%	
Duration of diabetes mellitus (in years)					
1-6	12	20.0%	48	80.0%	0.761
7-13	2	12.5%	14	87.5%	
14-20	0	0.0%	4	100.0%	
p value reached from chi-square test					

DISCUSSION

Multi Drug Resistant Tuberculosis patients require to be supervised closely for their treatment outcome and to evaluate the impact for other comorbid conditions. The present study depicted early and delayed response to TB treatment among MDR-TB patients and compared them in relation to their background factors. Various studies have observed the treatment outcome of MDR-TB in terms of their mortality rate, treatment success rate and other factors. This study found that treatment outcome in terms of early and delayed response was dependent on patient's gender, age, marital status, monthly family income, history of previous TB treatment and diabetic status (p<0.05).

In this study, it has been observed that, among male participants, patients with delayed response was higher in percentage than patients who responded early (52.8% vs 47.2%). While in female participants, patients with early response was higher in percentage than patients with delayed response (64.4% vs 35.6%). The age group of below 30 years showed to response early than any other age group. Unmarried patients showed to have early response much higher in proportion. Also, among the poor income group of respondents, the early response of treatment was higher in proportion. In the study by Kang *et al.,* TB patients aged less than 40 years found to have significantly higher rate of treatment success [27].

This study showed that, MDR-TB among patients with newly diagnosed TB cases responded earlier than the previously treated TB cases. Diabetes mellitus showed to effect the treatment outcome among patients. Most of the diabetic-MDR-TB patients showed to have delayed treatment response (82.5%) (p<0.05).

DM impacts the disease process as well as treatment outcome among TB patients [26].

Additionally, studies have found significant association between DM an MDR-TB [13,28]. Dooley *et al.,* observed from their study that, diabetic TB patients had 2.0 times higher odds of mortality than non-diabetic TB patients, they also found that, time for sputum culture conversion was prolonged in patients with diabetes than patients without diabetes (median of 49 days vs 39 days) [25]. The study by Kang *et al.,* also found that, diabetic-MDR-TB cases showed to have significantly lower treatment success rate than non-diabetic-MDR-TB cases (36.0 vs. 47.2%, p<0.05) [27].

CONCLUSION

This study finding observed that, the treatment outcome of an MDR-TB patient is dependent on his/her gender, age, marital status, monthly family income, history of previous TB treatment and diabetic status. According to this study, diabetic patients are on increased risk of delayed treatment response than non-diabetic ones. Thus, close monitoring of the glycemic status is essential during proceeding for the treatment outcome of these patients.

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