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Factors associated with multidrug resistant tuberculosis in Rajshahi division, Bangladesh: A cross sectional study

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ABSTRACT

Tuberculosis is considered as social problem due to its communicability. Several socio-economic and behavioral factors are associated with tuberculosis which may turn into multidrug resistant tuberculosis (MDR-TB) in some favorable contexts. The objective of the study was to determine the associated factors of MDR-TB among adult TB patients in Rajshahi division, Bangladesh. It was a cross sectional study from June 2014 to October 2018 in different facilities of Rajshahi division. Socio-economic, demographic and behavioral variables were collected through face to face interview. Chi-square test and binary logistic regression were used in this study. Out of 410 respondents, 48.8% was MDR-TB and 51.2% was drug susceptible TB. This study revealed that family size, income, expenditure, diabetes and religion were significantly associated with MDR-TB. Binary logistic regression model demonstrated that large family size (≥5 members) had more chance to get MDR-TB [AOR= 0.591, CI: 0.388-0.900, p<0.05] than their counterpart. Higher income group had less chance to get MDR-TB than less income groups. Non-Muslims were more likely to get MDR-TB than Muslim [AOR=0.421; CI: 0.179-0.986, p<0.05]. In this study, income, expenditure, large family size and religion were found as risk factors for developing MDR-TB. These findings can be considered to reduce MDR-TB in Bangladesh.

Keywords: *Cross-sectional study, MDR-TB, socio-economic and socio-behavioral factors*

INTRODUCTION

Globally about 1.2 million tuberculosis (TB) related deaths were estimated in 2019 among HIV negative people (WHO Global TB report 2020). Along with mortality, the complex form of tuberculosis is multidrug resistant tuberculosis (MDR-TB) which is recognized as global challenge. The end TB strategy mentioned as public health crisis due to low detection and low cure rate worldwide (WHO 2015). The term MDR-TB is defined as the TB bacilli is resistant to at least two anti-TB drugs particularly isoniazid (INH) and rifampicin (Kibriti et al., 2019). Globally 10.4 million new cases and 125000 MDR-TB cases were enrolled and in Bangladesh, 209438 new and 880 MDR-TB cases were enrolled in 2015. Near about 4.3 million gap between notified and estimated number of incident cases and only around 20% MDR-TB cases were detected and enrolled from estimated cases worldwide as well as in Bangladesh (NTP Bangladesh annual report., 2016 and WHO 2016). Bangladesh rank sixth among 22 high TB burden countries in the world those countries contributed 82% of global burden of TB. With this burden, MDR-TB is an additional challenge for TB control program due to its diagnostic complexity, longer treatment period, more adverse drug reaction, higher cost of treatment and less patient's compliance (National PMDT guidelines, 2013). Poorly administered directly observed treatment (DOT), poor quality and combination of drugs and poor knowledge on regularity of treatment are the main causes of developing MDR-TB (National PMDT guidelines, 2013). Another technical cause is wrong treatment followed by wrong diagnosis which can lead to develop MDR-TB, called "amplifier effect of chemotherapy" (National PMDT guidelines, 2013). In addition, as the drug susceptible pulmonary TB cases are the main source of MDR-TB, a significant number of patients develop MDR-TB through direct contact with MDR-TB cases particularly when undetected or untreated cases are available in the community. Bangladesh first

drug resistance survey in 2010-2011 showed that 1.4% of MDR-TB were found among new cases and 28.5% were among re-treated cases (National PMDT guidelines, 2013). However, the socio-economic, socio-demographic and socio-cultural factors are linked to develop TB which may turn into MDR-TB in certain context such as poor adherence (Rajeswari et al., 1999). Poor knowledge of the patient due to lack of information, education and stigma hindering in adhere to treatment (Wen et al., 2010, Chowdhur et al., 2015 and Rana et al., 2015). On the other hand, community people deliberately ignoring and avoiding TB patients due to poor knowledge on infectiousness and non-infectiousness. TB patient become non-infectious within two weeks of proper treatment with appropriate anti-TB drugs (National guidelines, 2013). But people are ignoring them throughout the full course of treatment and even after recovery. TB patient like to consume anti-TB drugs without disclose the name of disease to others, even they hiding from family members to avoid social threat as well as ignorance. Even a few number of patients are being divorced due to TB. So, patient may face treatment interruption if he/she failed to tackle secured environment to consume anti-TB drugs; and thus developing MDR-TB. Alternatively, society is also threatened by a TB patient. Because, TB is an infectious disease that spread from a diseased person to healthy person through inhalation of droplets containing TB bacilli called *Mycobacterium tuberculosis*. More than two billion people are infected with TB who have the chance of developing the disease. Such vulnerable peoples are mostly in Africa and South-East Asia region including Bangladesh. A patient spread TB to others through coughing, sneezing, laughing or pitting (National guidelines, 2013). It is noted that after being infected with TB bacilli, 90% people do not progress to TB disease due to their better immunity. The causes of developing TB are mainly depending on degree of exposure to infectious cases and favorable environment of reactivation such as poor immunity. However, smoking, poor immunity, age,

gender, income, education, living area, low BMI and other social factors were associated with developing the TB disease (National guidelines, Mandol et al., 2014 and Khan et al., 2006). So, proper health education, information and effective DOT can benefits of both patient and the society at its incipient stage and can prevent developing MDR-TB. Another study mentioned that TB is a social disease which can infer a barometer of social welfare (Gupta et al., 2002). Studies revealed that male are more prone to develop TB than female due to higher degree/frequency of exposure to affected persons in work place, market place, social gathering (Khurram et al., 2009 and Neyrolles et al., 2009). TB is called a disease of the poverty. A study also declared that the highest rate of TB cases was found in poorest section of the society (Zaman K. 2010). Poverty, population density and malnutrition are common problem in Bangladesh which facilitates the favorable environment for developing TB and MDR-TB (BDHS 2011). Low BMI (<18 kg/m^2) has effect on reactivation of latent TB into active TB disease. Study found that TB was more prevalent among those who had low BMI (Leung et al., 2007). Now-a-days, diabetes is a growing concern in Bangladesh which causing is a risk factor for reactivation of disease and also affect treatment response. They have more chance of developing MDR due to poor response effect. Several studies demonstrated that two to three times higher risk of developing TB disease among diabetic patients (National TB/Diabetes guidelines, 2014). Even they can affect of each other such as TB can also worsen the glycaemic control in diabetic people (WHO 2019). Similarly, cigarette smoking is also increasing around two to three time's higher risk of developing active TB disease from latent TB infection (WHO 2019 and American Thoracic Society, 2009). In Bangladesh, smoking control is also a challenging area of TB control program. The government of Bangladesh is implementing National Tuberculosis Control Program (NTP) with different approaches. NTP developed several guidelines and collaboration among multiple

NGO partners, civil societies, private sectors, defense and other govt. program such as NASP. For focusing of MDR-TB, NTP developed a special program named programmatic management of drug resistant TB (PMDT). MDR-TB patients are getting free diagnostic and treatment services from Chest Diseases Hospital (CDH), Rajshahi which is the oldest and biggest regional government hospital for MDR-TB management where patients are coming from more than sixteen districts of north-west region of Bangladesh. After completion of four months intensive phase at hospital, MDR-TB patients are moving to community to continue treatment under PMDT. NTP strives to maintain its quality of diagnosis, treatment, patient support, coverage of programs, coordination, cost-effectiveness, monitoring of progress, timely reporting and other areas. In spite of GO-NGO efforts, there are multiple challenging areas to control MDR-TB in Bangladesh. There is a need for reviewing and identifying different causal and confounding factors of developing or reactivating of both drug susceptible and MDR-TB and need to identify the risk factors on developing MDR-TB. However, to the best of our knowledge, there was no such study conducted among MDR-TB patients in this region. Therefore, the aim of the study was to investigate the factors associated with MDR-TB among adult TB patients in Rajshahi division, Bangladesh.

METHODS

A cross sectional study was conducted from June 2014 to October 2018, and data was collected from 410 TB patients from CDH Rajshahi and different facilities of Rajshahi division. The exclusion criteria were the age below 15 years and not willing to participate. Among the participants, 200 MDR-TB and 210 non-MDR-TB patients were selected from CDH and different sub-district level facilities in Rajshahi division respectively. There were 50 beds in

CDH for MDR-TB patients, and on an average 10-30 new patients were available during each data collection period. On the other hand, 0-5 patients were available at sub-district level facilities during each visit for data collection. A semi-structured questionnaire was developed to collect information on socioeconomic, demographic, and behavioral factors from each selected subject. Patients were interviewed by first author through face to face interview with prior informed verbal consent. A written approval was taken from Line Director TB/Leprosy, DGHS and verbal consent was also taken from CDH authority and sub-district level authorities to perform data collection.

Outcome variable

The outcome variable of this study was TB patient category (i) MDR-TB and (ii) Non-MDR-TB. This classification was done on the basis of diagnostic confirmation by sputum microscopy, culture and drug susceptibility testing.

Sample size determination

Appropriate mathematical formula was used to calculate sample size and sample criteria was selected following previous study (Rana et al., 2015). 95% confidence interval for calculating sample size was considered. The formula provided that 410 sample was sufficient for our study.

Statistical analysis

Statistical package for social sciences (SPSS) version 23.0 (IBM) was used for data analysis. Data editing and coding was done accordingly. Chi-square test was utilized to find the association between dependent and independent factors and binary logistic regress model was used to find the effect of independent variables on dependent variable. The p value <0.05 was regarded as statistically significant in this study.

RESULTS

A total of 410 TB patients were considered in this study among them 66.6% and 33.4% were male and female respectively. The age range of patients was <20 years, 20-30, 31-40, 41-50 and >50 years with mean age for MDR-TB was 40 years and for drug susceptible TB was 42 years respectively. The MDR-TB patients were 48.78%, among them 48.4% and 49.6% were male and female respectively. The Chi-square test demonstrated that the association between gender and MDR-TB status was not significant ($p>0.05$). More than 46% and 65% Muslim and non-Muslim TB patients developed MDR-TB, and the association between religion and MDR TB status was significant ($p<0.05$). Among the patients, 80.7% was married, and among them 48.9% developed MDR while 48.1% unmarried patients got MDR-TB. The association between marital status and MDR TB status was not significant ($p>0.05$). More than 31% patients had ≥5 family members. Of them, 57.7% developed MDR whereas 44.6% patient developed MDR who had ≤4 family members than indicates a significant effects of large family members on developing MDR-TB ($p<0.05$). Among respondents 51.7% patients were forty and below years of age who developed more MDR than their counterpart. Less educated patients has more chance of developing MDR than higher educated patients. In our study, 44.4% was illiterate to primary and 29.0% was high school level education who developed MDR-TB. Among the participants, 51.2% was less income group (BDT. 3000-10000 per month) and among them, about 60% developed MDR whereas 24.8% was high income group (BDT. 12000+ per month). Of them, only less than 24% developed MDR-TB which was significant ($p<0.001$). According to expenditure, higher expenditure were required for MDR-TB than drug susceptible or non-MDR TB. In our study, 43.9%, 35.9% and 20.2% patient expensed BDT. 1000-4000, 4001-6000 and more than 6000 per month due to TB respectively. Among MDR-TB, 60.2% patients family

expense was more than BDT.6000 and 53.7% expensed between BDT.4001-6000 per month than their counter part ($p<0.001$). Among the patients, 20.7% had diabetes and of them, 54.1% developed MDR-TB while non-diabetic patients had less chance of developing MDR (47.4%) than their counterpart ($p<0.001$). Among the participants, 45.8% was smoker who developed MDR-TB and according to occupation, 21.2% agriculture, 13.4% physical workers, 13.4% business, 10.9% service holder and 26.3% was housewife, 10.5% student and 4.2% other workers. Of them, more MDR developed among physical worker (54.5%), businessman (58.2%), service holder (51.1%) and housewife (58.2%) respectively ($p>0.05$) (Table1).

Binary logistic regression shows that Non-Muslims were more likely to get MDR-TB than Muslim [AOR=0.421, CI: 0.179-0.986, p=0.046], highest income group had less chance to get MDR-TB than lowest [AOR=2.583, CI: 1.207-5.527, p=0.015] and middle [AOR=4.136, CI: 2.133-8.021, p=0.001] income groups. The patient who expensed more due to TB was more likely to get MDR-TB than who expensed less amount (BDT. 1000-2000/month) [AOR=0.209, CI: 0.080-0.545, p=0.001] and BDT 2001- 4000 [AOR=0.344, CI:0.167-0.711, p<001]. It was found that the large family size (≥5 members) had more chance to get MDR-TB [AOR= 0.591, CI: 0.388-0.900, p= 0.014] than their counterpart. (Table 2).

Among the MDR-TB cases, 99.5% was pulmonary positive and 0.5% was extra-pulmonary. Pulmonary negative TB cases normally does not spread MDR-TB and in our study, it was also 0.0%. However, among non-MDR-TB cases, 65.2% pulmonary positive, 10.5% pulmonary negative and 24.3% was extra-pulmonary. (Table 3).

Among the pulmonary positive cases, 47.3%, 36.9% and 15.8% expensed BDT 1000-4000, 4001-6000 and taka more than 6000 per month respectively. More than 40% was non-MDR-TB among pulmonary positive cases. The costs associated with TB diagnosis, travel and others was

increased among non-MDR-TB patients due to significant number of pulmonary negative and extra-pulmonary cases. Among pulmonary negative cases, 50% patient expensed BDT 4001-6000 and 13.6% expensed more than 6000 per month. Among extra-pulmonary cases, 19.2%, 23.1% and 51.9% patients expensed BDT 2001-4000, 4001-6000 and more than 6000 per month. (Table 4).

DISCUSSION

In our study, about two-third were male patients who faces the consequences of TB. It indicates the level of exposure of male to infectious cases in work place, market place or social gathering. In Bangladesh, females are normally involved in house hold activities particularly in rural areas, they are less exposed to infectious cases due to their less movement. But illiteracy, poor housing condition, poor immunity, overcrowding and contact with husbands and other family members who may spread TB, female become at risk of having the disease. On the other hand, female cases may be under reported due to socio-economic and socio-cultural norms including poverty, ignorance and lack of awareness or unavailability of services in nearest place which is creating obstacle for women to get services than men. The WHO global report also shows higher prevalence of TB among male globally (WHO Global TB report 2020). Our study shows that more than 75% was married and Muslim. Bangladesh is a Muslim dominant country where more than 85% are Muslim and they are almost homogeneously distributed all over the country. So, higher prevalence of Muslim patients were logical. In Bangladesh, married women usually share their beds with husband who may carry the disease agent, married women often working in poor hygienic condition, facing disparity in taking food or getting service, getting steroids (i.e. oral pills) which may hampers immunity thus causing reactivation of TB disease than unmarried. We found higher prevalence of TB among married women. The other study in Bangladesh also

found higher prevalence of MDR-TB among married women (Nasima et al., 2017). Surprisingly among non-Muslim, the prevalence of MDR-TB was higher than drug susceptible or non-MDR-TB. This may give us an important clues to conduct further research to know why and how non-Muslims are more prone to develop MDR-TB. However, the other study conducted in Bangladesh also shows similar result (Banu et al., 2017). In our study, one third of families had five to more than five members. Of them, prevalence of MDR-TB was higher than non-MDR-TB that indicates overcrowding is a contributing factors for developing MDR-TB. A study conducted in Bangladesh validated our findings with almost similar results (Flora et al., 2013). According to age group, young ages are more prone to develop MDR-TB than old age group. In our study, more than 55% MDR-TB patient's age was less than forty years. Several studies validated our findings (Nasima et al. 2017, Banu et al., 2017). This productive age group needs special attention to prevent maximum economic loss by the disease. The chance of acquiring the disease may be due to more exposed to infectious cases in work place. Surprisingly, in spite of their better immune status, they are facing drug resistance. On the other hand, drug susceptible TB was more prevalent among old age group. This may due to repeated exposure, duration of exposure, reactivation in certain context and gradual impairment of immune status. However, a study suggested that young are expected to have quick solution and they may discontinue treatment or irregularity of treatment immediately after few days when they feel good (Bhanu Prakash, 2010). Further study is required to know the other causal and confounding factors linked to young age group. Two-third of our respondents were below college level education and even a significant portion of respondents were illiterate indicates poor knowledge, poor education impacts on developing MDR-TB. In our study, more than fifty percent respondents answered that their monthly family income was less than Bangladeshi taka (BDT.) 10000.00

(USD.119) and they expensed more than BDT. 4000 per month due to disease. Though the diagnosis and treatment is free of cost for both types of patients under national tuberculosis control program (NTP), they are still facing catastrophic costs particularly for travel, consultation with doctor in private chamber and food. In Bangladesh, the diagnosis through bacterial culture and drug susceptibility testing (DST), follow up tests and proper treatment of MDR-TB following WHO regimen is not available in all districts. The patients from more than sixteen districts are coming to Chest Disease Hospital (CDH), Rajshahi to get services. Hence, the distance increasing the costs of MDR-TB patients. On the other hand, non-MDR-TB diagnosis and follow up tests and treatment is available in almost all districts even within sub-district and community level. But they faces costs due to travel for repeated doctors' consultation in private chamber with payment and costs for other ancillary diagnostic tests particularly among smear negative and extra-pulmonary TB cases. "The End TB Strategy" sets some targets for up to year 2035. One of the targets is no any catastrophic costs for TB affected families due to TB (WHO 2015). So, to achieve the End TB targets, we need to review the existing financial support and system. Like TB disease, diabetes is also associated with social, demographic and behavioral factors (Chowdhury et al., 2016). In our study, MDR-TB patients has the opportunity to know their diabetes status from CDH, but non-MDR-TB patients had no such opportunity. So, most of the non-MDR-TB patient did not know their diabetes status. Only a few portion of respondents knew their diabetes status by their own costs. However, in our study, nearly one-fourth of patients had diabetes and of them, MDR-TB patients were higher than non-MDR-TB indicates the association between diabetes and MDR-TB. Different studies also shows similar result (National TB/Diabetes guidelines, 2014 and Banu et al., 2017). Smoking is a known risk factor for reactivation of TB disease from latent TB infection due to hampers the body's immunity

(American Thoracic Society, 2009). Study found that two to three times higher risk of developing TB among smoker than their counter parts (National TB/Diabetes guidelines, 2014). Subsequently they may develop MDR-TB as the effect of continuous exposure to smoking and or frequent contact with infectious cases. In our study, we also found higher prevalence of MDR-TB among smoker than non-smoker. According to occupation, physical workers, businessman, housewife and service holders had more chance to get MDR-TB than their counter part. The certain occupation that accumulates people to work in a team/groups had the higher chance of developing MDR-TB. Similar results also found in different research conducted in Bangladesh (Flora et al., 2013 and Rifat et al., 2014). The diagnosis of MDR-TB must be with checking the resistant status by Gene Xpert or by culture or both. Hence, it is not possible to diagnose MDR-TB among pulmonary negative cases. In our study, we did not get any MDR-TB among pulmonary negative cases. Subsequently, we found less than 1% extra-pulmonary MDR-TB particularly among recurrent extra-pulmonary cases who were tested for MDR-TB. This findings may also indicate that extra-pulmonary MDR-TB is not adequately being detected particularly due to ignorance and extended treatment duration by doctor without knowing resistant status. In our study, the term pulmonary negative means that sputum smear examination was negative but the sign and symptoms were highly suggestive of TB mostly with x-ray findings. This is actually the initial challenge for detecting drug susceptible TB which is depending on laboratory skills, quality of sputum, quality of microscope, reagent etc. So, alternative tools such as X-ray and professional skills to evaluate the patient's clinical condition is highly recommended with sputum tests.

Strength and limitation of the study

Our study was conducted with primary data collected directly from patients without any bias. Each respondent was properly motivated with purpose and their freedom. All legal approval was taken from concerned authorities. However, we had some limitations such as scarcity of patients, we excluded child MDR-TB due to very low number in study area, and we did not check HIV/AIDS status.

CONCLUSTIONS

Several factors were associated with developing MDR-TB. Of them, age, gender, family members, income, expenditure, religion, diabetes, smoking were significantly associated with MDR-TB. To ensure equity, more financial support are required for both type of patient. Periodic diabetes checking and control, control of tobacco use, quality DOT and reduction of stigma, improvement of treatment adherence through advocacy, communication and social mobilization (ACSM) are suggested for both type of TB patient. Early detection of maximum MDR-TB and infection control measures at home and facility level can prevent MDR-TB transmission. A community based special program or linking with maternal health program can be effective in increasing female case detection.

Ethics statement

Ethical approval (No:49/320/IAMEBBC/IBSC) for this study was taken from the Institutional Animal, Medical Ethics, Biosafety and Biosecurity Committee (IAMEBBC), Institute of

Biological Sciences, University of Rajshahi, Bangladesh. The purpose of the study was discussed with respondents and taken written consent.

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Competing interest

All authors declared that they have no conflict of interest.

Authors' contributions

MAS, ZAS and MGH developed the study concept, analysis and interpret data and drafted the manuscript. TA and KH critically reviewed the manuscript. MAS and ZAS will take full responsibility of this study. All authors had approved the final version of the manuscript.

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Table 1: Association between socio-demographic and socio-economic variables and type of diseases

Variables	Frequency	Do you have MDR-TB?		χ^2	p- value
		Yes	No		
Gender					
Male	273 (66.6%)	132 (48.4%)	141(51.6%)	0.060	0.806
Female	137 (33.4%)	68 (49.6%)	69 (50.4%)		
Religion					
Muslim	366 (89.3%)	171 (46.7%)	195 (53.3%)	5.788	0.016
Non-Muslim	44 (10.7%)	29 (65.9%)	15 (34.1%)		
Marital status					
Married	331 (80.7%)	162 (48.9%)	169 (51.1%)	0.018	0.893
Unmarried	79 (19.3%)	38 (48.1%)	41 (51.9%)		
Number of family members					
≤4	280 (68.3%)	125 (44.6%)	155 (55.4%)	6.051	0.014
≥5	130 (31.7%)	75 (57.7%)	55 (42.3%)		
Age in years					
<20	41 (10.0%)	18 (43.9%)	23 (56.1%)	4.837	0.304
20-30	106 (25.8%)	60 (56.6%)	46 (43.4%)		
31-40	65 (15.8%)	34 (52.3%)	31 (47.7%)		
41-50	87 (21.2%)	38 (43.7%)	49 (56.3%)		
>50	111 (27.1%)	50 (45.0%)	61 (55.0%)		
Education					
Illiterate	64 (15.6%)	33 (51.6%)	31 (48.4%)	1.979	0.740
Primary	118 (28.8%)	59 (50.0%)	59 (50.0%)		
High school	119 (29.0%)	61 (51.3%)	58 (48.7%)		
College	75 (18.3%)	32 (42.7%)	43 (57.3%)		
University	34 (8.3%)	15 (44.1%)	19 (55.9%)		
Monthly income in BDT					

3000-5000	84 (20.5%)	38 (45.2%)	46 (54.8%)	24.660	0.001
5001-10000	126 (30.7%)	83 (65.9%)	43 (34.1%)		
10001-12000	98 (23.9%)	33 (33.7%)	65 (66.3%)		
12000+	102 (24.8%)	46 (45.1%)	56 (54.9%)		
Excess expenditure in BDT due to TB					
1000-2000	48 (11.7%)	17 (35.4%)	31 (64.6%)	12.52	0.006
2001-4000	132 (32.1%)	54 (40.9%)	78 (59.1%)		
4001-6000	147 (35.9%)	79 (53.7%)	68 (46.3%)		
6000+	83(20.2%)	50 (60.2%)	33 (39.8%)		
Diabetes status					
Yes	85 (20.7%)	46 (54.1%)	39 (45.9%)	88.841	0.001
No	325 (79.3%)	154 (47.4%)	171 (52.6%)		
Smoking status					
Yes	188 (45.8%)	97 (51.6%)	91 (48.4%)	1.101	0.294
No	222 (54.2%)	103 (46.4%)	119 (53.6%)		
Occupation					
Agriculture	87 (21.2%)	37 (42.5%)	50 (57.5%)	10.768	0.096
Physical worker	55 (13.4%)	30 (54.5%)	25 (45.5%)		
Business	55 (13.4%)	32 (58.2%)	23 (41.8%)		
Service	45 (10.9%)	23 (51.1%)	22 (48.9%)		
Housewife	108 (26.3%)	57 (52.8%)	51 (47.2%)		
Student	43 (10.5%)	13 (30.2%)	30 (69.8%)		
Others	17 (4.2%)	8 (47.1%)	9 (52.9%)		

Table 2: Effect of selected socio-economic, demographic and behavior factors on multi-drug resistant tuberculosis

	B	SE	Wald	p-value	AOR	95% CI	
						Lower	Upper
Religion							
Muslim vs non-Muslim	-0.866	0.435	3.972	0.046	0.421	0.179	0.986
Income							
3000-5000 vs 13000+	0.949	0.388	5.974	0.015	2.583	1.207	5.527
5001-10000 vs 13000+	1.420	0.338	17.656	0.000	4.136	2.133	8.021
10001-12000 vs 13000+	-0.220	0.329	0.447	0.504	0.802	0.421	1.530
Expenditure due to TB							
1000-2000 vs 6000+	-1.565	0.489	10.260	0.001	0.209	0.080	0.545
2001-4000 vs 6000+	-1.066	0.370	8.298	0.004	0.344	0.167	0.711
4001-6000 vs 6000+	-0.551	0.333	2.738	0.098	0.576	0.300	1.107
Diabetes status							
Diabetes vs no diabetes	-0.270	0.244	1.219	0.270	0.764	0.473	1.233
Number of family members							
≤4 vs ≥5	-0.525	0.214	6.002	0.014	0.591	0.388	0.900

N.B.: B, Regression Co-efficient; SE, Standard Error; AOR, Adjusted Odds Ratio, CI, Confidence Interval

Table 3: Type of disease according to category

Category	Pulmonary positive N (%)	Pulmonary negative N (%)	Extra-pulmonary N (%)
MDR-TB	199 (99.5%)	0 (0.0%)	1 (0.5%)
Non-MDR-TB	137 (65.2%)	22 (10.5%)	51 (24.3%)
Total	336 (81.9%)	22 (5.4%)	52 (12.7%)

Table 4: Monthly family expenditure due to TB according to type of diseases

Expenditure due to TB in BDT	**Type of disease**			Total
	Pulmonary positive N (%)	Pulmonary negative N (%)	Extra-pulmonary N (%)	
1000-2000	43 (89.6%)	2 (4.2%)	3 (6.2)	48
2001-4000	116 (87.9%)	6 (4.5%)	10 (7.6%)	132
4001-6000	124 (84.3%)	11 (7.5%)	12 (8.2%)	147
6000+	53 (63.9%)	3 (3.6%)	27 (32.5%)	83
Total	336 (81.9%)	22 (5.4%)	52 (12.7%)	410