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Descriptive Epidemiology of Multidrug Resistance Tuberculosis (MDR-TB) in Bangladesh

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Abstract

Background: The number of reported MDR-TB cases has been increasing in recent years. **Objectives:** To describe the epidemiological profile of MDR-TB cases in Bangladesh. **Design:** This was a descriptive cross-sectional study. **Settings:** The study was conducted among the multi drug resistant tuberculosis patient admitted in the National Institute of Diseases of the Chest and Hospital (NIDCH) Dhaka, Bangladesh. **Samples:** 148 confirmed cases of MDR-TB. **Materials and Methods:** Hospital admitted MRD-TB cases were randomly chosen from the above mentioned hospital. Semi-structured and pretested questionnaire were introduced by researcher. Clinical and treatment data *i.e.* duration of TB drug intake, report of sputum, X-ray and blood test etc. were extracted from the hospital record. **Results:** Study found, majority of the participants (56.1%) were in the age group of 16 - 30 years. 64.2% of the study subjects were married. Majority of the participants education were whether under primary or primary level. 24.3% participant's family member and 14.5% of neighbor were having TB. Most common comorbidity were diabetes, pulmonary infection, hearing loss, psychiatric symptoms, chest pain, joint pain etc. 63.5% respondent had high degree of AFB for sputum positivity and more than 98% had positive finding in X-ray chest. On an average ESR was low and also few cases of extremely low ESR were found. 71.6% were under twenty four months regimen. **Conclusion:** We can conclude that, many possible factors for MDR-TB. There is an urgent need for

further study to confirm the exact factors in Bangladesh and address those immediately.

Keywords

1. Introduction

Tuberculosis (TB) is one of the leading causes of death worldwide [1]. It has been reported that, about 9 million people have developed tuberculosis and another 1.5 million people died due to TB across the globe in 2013 [2]. The number of reported MDR-TB cases has been increasing in recent years [3]. And it is estimated that incidence of MDR-TB is at least five times higher than the reported. In 2010, there were an estimated 13.7 million chronic active cases, 8.8 million new cases, and 1.5 million deaths occurred, mostly in developing countries [4] [5]. WHO has identified 27 high burden countries for MDR-TB, where Bangladesh is the sixth in rank [6] [7]. Four of those high burdened countries, including Bangladesh, belong to the South-East Asian region. In Bangladesh, MDR-TB is becoming an emerging public health problem [8].

According to the recent drug-resistant survey (DRS), 1.4% of new cases and 29% of the retreatment cases in Bangladesh have MDR-TB [9]. Although the rate of MDR-TB is still relatively low, owing to the overall high TB burden in Bangladesh. However, the number of MDR-TB cases were quite high in 2013, which is 2100 new TB cases and 2600 previously treated TB cases [4]. Multi-drug-resistant tuberculosis (MDR-TB) is defined as tuberculosis that is resistant to at least one of Isoniazid (INH) or Rifampicin (RMP), the two most powerful first-line drugs for TB treatment [10]. MDR-TB cannot be treated with first-line anti-TB drugs and needs a longer treatment period with stronger second-line drugs [11]. MDR-TB has been described as a man-made problem resulting from the use of inadequate drug regimen that selects drug resistant tubercle bacilli, with several factors being linked to propagate its emergence [12] [13]. For example, previous history of TB treatment has been documented as an important risk factors that predicts emergence of MDR-TB [14]. When a patient resistant to one drug and takes a combination of two drugs including the one to which s/he is resistant, drug resistance to the second drug will emerge. Similarly, if a patient is resistant to two drugs, and takes those two drugs and a third drug only, then resistance to the third drug will emerge and so on; therefore a combination of poor compliance and poor medical supervision may result in MDR-TB [15]. All those information have been identified by developed country where laboratory investigations are up to the mark and hospital facilities are well established. However, the pattern of MRD-TB and its factors never have been identified among Bangladeshi population. That's why we aimed to identify the pattern and current status of MRD-TB among Bangladeshi population through this study.

2. Methodology

This descriptive cross sectional study was conducted among the multi drug resistant tuberculosis patient admitted in the National Institute of Diseases of the Chest and Hospital (NIDCH) Dhaka, Bangladesh. This is the largest and highest level chest hospital of Bangladesh where referred patients come from all corner of the country. We recruited 148 hospital admitted MRD tuberculosis cases randomly from the above mentioned hospital. Semi-structured and pretested questionnaire were introduced to collect the data. Clinical and treatment data *i.e.* duration of TB drug intake, report of sputum, X-ray and blood test etc. were extracted from the hospital record. Those laboratory investigations were performed prior to the hospital admission and before start of MRD-TB treatment. Treatment category was done according to national TB control guideline of Bangladesh [16]. After collection, data were cleaned, coded and analyzed by the statistical software package IBM PASW Statistics version 23.0. Descriptive statistics were done to analyze the quantitative data. This study was approved by the ethical review committee of the department of public health, North South University (NSU). Informed written consent was obtained from the all participants before data collection.

3. Results

This hospital based descriptive type of cross sectional study was conducted in National Institute of Diseases of the Chest and Hospital (NIDCH) in Dhaka with a sample size of 148. A pre-tested modified interviewer administrated semi-structured questionnaires were used to collect the information regarding socio-demographic factors, lifestyle factors, and clinical data. Out of a total of 148 respondents, female participants accounted 52.7%. The age distribution of the participants showed majority of the participants (56.1%) were in the age group of 16 - 30 years. Married participants constituted 64.2% of the study subjects and illiterates constituted 18.9%. The proportion of subjects, who have completed primary education, under primary level, secondary school, higher secondary, undergraduate and graduate was 22.3%, 39.9%, 8.8%, 4.1%, 4.7% and 1.4% respectively. 73% had no smoking history and 93.9% had never consumed alcohol. Majority (58.1%) of the participants had four to five members in their family, and most of them had one child (45.3%) (Table 1).

Table 2 shows that, 24.3% participant's family member were also having TB. In terms of neighbor, 14.5% were also having TB. Most of the participants (48.6%) didn't have diabetes, whereas 39.9% participant never tested diabetes and 11.5% participants had diabetes. That means, nearly everyone from the participants (89.2%) didn't have diabetes or never tested before. 43.9% participants never tested pulmonary disease and 44.6% participants didn't have pulmonary disease of any type. Among the other diseases, 7.4% participants had hearing loss, 6.1% participants had psychiatric problem, 5.4% participants had chest pain, 2.7% participants had joint pain and 2% participants had eye disease.

Table 1. Baseline characteristics of the study participants.

Characteristics	Response	Number	Percent
Sex	Male	70	47.3
	Female	78	52.7
Age group (Years)	5 - 15	5	3.4
	16 - 30	83	56.1
	31 - 40	30	20.3
	41 - 55	21	14.2
	56 - 65	9	6.1
Marital Status	Single	38	25.7
	Married	95	64.2
	Divorced	12	8.1
	Widowed	3	2.0
Education of patient	Under Primary	59	39.9
	Primary	33	22.3
	Secondary school	13	8.8
	Higher Secondary	6	4.1
	Undergraduate	7	4.7
	Graduate	2	1.4
	Illiterate	28	18.9
Education of Patients spouse	Under Primary	25	16.9
	Primary	36	24.3
	Secondary school	14	9.5
	Higher Secondary	4	2.7
	Undergraduate	6	4.1
	Graduate	1	0.7
	Illiterate	24	16.2
History of Smoking	Occasionally	17	11.5
	Regularly	23	15.5
	Never	108	73.0
History of Alcohol Consumption	Occasionally	5	3.4
	Regularly	4	2.7
	Never	139	93.9
Family member	One-Three	10	6.8
	Four-Five	86	58.1
	Six-Seven	44	29.7
	More than Seven	8	5.4
Number of children	None	48	32.4
	One	67	45.3
	Two	27	18.2
	Three	6	4.1

Table 2. Distribution of disease related factors of MDR TB.

Characteristics	Response	Number	Percent
Family member having history of TB	Yes	36	24.3
	No	112	75.7
	Total	**148**	**100.0**
Neighbor having history of TB	Yes	21	14.2
	No	127	85.8
	Total	**148**	**100.0**
Having diabetic	Yes	17	11.5
	No	72	48.6
	Never tested	59	39.9
	Total	**148**	**100.0**
Having pulmonary disease	Yes	17	11.5
	No	66	44.6
	Never tested	65	43.9
	Total	**148**	**100.0**
Other diseases	No disease	104	70.3
	Hearing loss	11	7.4
	Joint Pain	4	2.7
	Chest pain	8	5.4
	Kidney diseases	1	0.7
	Lung diseases	1	0.7
	Eye problems	3	2.0
	Gastric	3	2.0
	Heart diseases	4	2.7
	Psychiatric diseases	9	6.1
	Total	**148**	**100.0**

Table 3 shows that, majority of the patients (71.6%) were taking TB drug of twenty four months (category III) regimen, 14.9% respondent were taking six months (category I) regimen and 13.5% respondent were taking eight months (category II). Regarding sputum test results, 63.5% respondents had high degree of sputum positivity (three plus) before treatment start, 18.9% respondent had moderate degree (two plus) and 16.2% had mild degree sputum positivity (one plus), only 2 cases had sputum test negative. X-ray chest of 98.6% patients shown positive findings, whereas only 2 cases found nothing in x-ray. 25% participants have found mildly raised ESR level (21 - 40 mm), 23% participants had moderately raised ESR level (41 - 60 mm), and 20.3% participants had severely raised ESR (60 - 100 mm). Most of the (60.1%) participant's hemoglobin level was 11 - 20 gm/dl, 31.1% participant's hemoglobin level was moderately low (6 - 10 gm/dl) and 6.8% participant's hemoglobin level was extremely low (0 - 5 gm/dl).

Table 3. Tuberculosis treatment and investigation related factors of MDR TB.

Characteristics	Response	Number	Percent
Intake of anti-TB drug regimen	6 month (CAT I)	22	14.9
	8 month (CAT II)	20	13.5
	24 month (CAT III)	106	71.6
	Total	**148**	**100.0**
Acid Fast Bacilli (AFB) in sputum	1+ (Rare)	24	16.2
	2+ (Few)	28	18.9
	3+ (Moderate)	94	63.5
	Negative	2	1.4
	Total	**148**	**100.0**
Finding in X-Ray chest	Positive	146	98.6
	Negative	2	1.4
	Total	**148**	**100.0**
ESR	5 - 10 mm	16	10.8
	11 - 20 mm	25	16.9
	21 - 40 mm	37	25.0
	41 - 60 mm	34	23.0
	60 - 100 mm	30	20.3
	Above 100 mm	6	4.1
	Total	**148**	**100.0**
Hemoglobin	0 - 5 gm/dl	10	6.8
	6 - 10 gm/dl	46	31.1
	11 - 20 gm/dl	89	60.1
	>20 gm/dl	3	2.0
	Total	**148**	**100.0**

Table 4 shows the qualitative part of the study where different factors for developing MDR-TB and participant's knowledge related to MDR-TB were shortly described. It was found that a good number of the participants (77%) were taking anti-TB drugs regularly. Whereas 23% participants didn't take medication regularly. 56.8% participants said doctor were giving them proper advice during anti-TB treatment course. 61.5% participants said that health worker visit their house regularly during anti-TB treatment course. Majority (60.8%) of the participants took their drugs on appropriate time. Most (62.8%) of the participants said they knew the consequence of missed dose of anti-TB drug. More than half (57.4%) of the respondents responded they didn't have general knowledge about anti-TB drugs. Majority (89.2%) of the participants aware of TB drug intake. Most (83.8%) of the participants knew that the treatment can be taken free of cost from government. A good number (82.4%) of the participants knew where

Table 4. Knowledge and practice related factors of MDR TB treatment.

Characteristics	Response	Number	Percent
Take TB drugs regularly	Yes	114	77.0
	No	34	23.0
Doctor provide proper advice during treatment	Yes	84	56.8
	No	64	43.2
Health worker visit house regularly	Yes	91	61.5
	No	57	38.5
Take anti-TB drugs at appropriate time	Yes	90	60.8
	No	58	39.2
Person knows the consequence of missing dose	Yes	93	62.8
	No	55	37.2
General knowledge about drugs	Yes	63	42.6
	No	85	57.4
Perception of TB drug intake	Yes	132	89.2
	No	16	10.8
Patient knows that treatment cost is free	Yes	124	83.8
	No	24	16.2
Patient knows that where to get the drugs	Yes	122	82.4
	No	26	17.6
TV/Radio in house	Yes	110	74.3
	No	38	25.7
Watch/hear TB related program	Yes	72	48.6
	No	38	25.7

to get the anti-TB drugs. Most (74.3%) of the participants said they have either TV or radio in their house. Whereas 25.7% participants didn't have any TV or radio in their house. 48.6% participants said they either watched or heard TB related program. It seems overall knowledge among the MDR-TB patients was reasonably good but still lot of areas for improvement.

4. Discussion

Our study found that majority of the MDR-TB patients were adult. A recent study published in Ethiopia found the similar results [17]. In our study, most of the MDR-TB patients were married. A recently published paper from Somalia by Ali M.K. *et al.* found that married people have more success of TB treatment compared to unmarried people [18]. As we had only one group of participants, we did not see the association of MDR-TB with other factors. But we can assume that not only marital status but also general education and level of awareness is very important determinants for good outcome of any drugs regimen, and especially in the case of a longer duration treatment like tuberculosis. Majority of our

participants education were either primary or under primary or even illiterate, that is another valuable determinants for compliance of anti-TB treatment. Previous study found strong association of treatment outcome with education [18] [19]. Not only patient's education, their spouse's also important contributing factors for treatment of TB. We again assume that, one of the important factors for MDR-TB of our patients was low education.

In our study, majority of the participants had large family, which might be one of the important factors of MDR-TB. Several recent studies have found that population structure and family size is an important factors for drug resistance [20] [21], even rate of TB infection is high among densely populated family [21]. And chance of repeated infection and co-infection also higher among the densely populated family [22]. Our study found that 24.3% family members and 14.2% neighbor were having tuberculosis, which are extremely important factors for MDR tuberculosis. Several previous studies indicated about those contributing factors among other social determinants [23] [24].

In this study, majority (71.6%) of the patients were taking the regimen of 24 months and almost equal percentage were taking 6 months and 8 months regimen. Very recently, DR-TB Working Group of the International Union Against Tuberculosis and Lung Disease (The Union), in collaboration with RESIST-TB has launched an online survey to Union members around the world. Survey results showed the diversity in treatment roll-out: 36% respondents stated that their country is using the 9-month regimen for MDR-TB treatment; 41% are using bedaquiline and delamanid, but not the 9-month regimen; 28% are using both; and 22% of respondents indicated that their country does not currently offer either of these treatment options. Recent report of WHO recommended longer duration of MDR-TB regimens and the monitoring of therapeutic response using culture, along with many regimens for treating MDR-TB [25]. Since the present study was confined only to MDR-TB cases and there was no comparison group, definite conclusion regarding the risk factors may not be drawn but we could mention the proportion of some factors are higher among MDR-TB cases in our study.

5. Conclusion

Based on the findings from this present study, it is recommended to increase awareness among the family members of TB patients regarding the treatment regimen and duration of treatment. Strengthen the patient's supervision during continuous phase of anti-TB treatment might help to reduce the MDR-TB. Use of incentives, enhancing contact tracing, and increasing awareness regarding sputum disposal practices are also recommended for effective control of MDR-TB.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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