

Factors Associated with Tuberculosis: A Case Control Study in Rajshahi City, Bangladesh

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Abstract

Tuberculosis (TB) is a major public health problem in Bangladesh since long. Though various measures have been taken, morbidity and mortality due to TB are still high for some socio economic conditions prevailing in this country. The purpose of this study was to investigate the associated factors of TB. It was a case-control study. Study data were collected from January'2017 to July'2017. The sample consisted of 268 TB patients (case) and 268 close contacts (who did not get TB) of TB patients (control). Most of the non TB close contacts persons were TB patient's siblings living in same location in Rajshahi city, Bangladesh. Chi-square test and binary logistic regression model were used to determine the risk factors of TB. Out of the total samples, approximately 76% were above 26 years of age from case and control groups. 58.6% and 41.4% were male and female in case group, 65.3% and 34.7% were male and female in control group respectively. Through marital status, 12.7% and 87.3% unmarried and ever married in case group, 11.6% and 88.4% unmarried and ever married in control group respectively. More than 42% TB patients were under nourished while only 10.1% their close contacts were under nourished. Logistic regression provided that under nourished individuals were 8.253 times more risk for getting TB [(AOR=8.253; 95% CI: 4.251-16.019, $p < 0.01$)] than over nourished. It was noted that uneducated were more likely for getting TB than secondary and higher educated adults [AOR=1.864; 95% CI: 1.148-3.026, $p < 0.05$] and primary educated adults were 1.532 times higher for getting TB than Secondary and higher educated adults [AOR=1.532; 95% CI: 1.051-2.234, $p < 0.05$]. This study strongly recommended advocacy communication and social mobilization and social safety net program for nutritional life led and education level will be increased.

Keywords: Tuberculosis, Rajshahi city, Chi square test and Binary logistic regression.

AMS Classification: 62P10.

1. Introduction

Tuberculosis (TB) is a major public health problem in Bangladesh still its ranking 7th among the 30 high TB burden countries (WHO, 2018). In the world a lots of bacterial disease diminished by vaccination (Rana, et al. 2018). To reduce morbidity, mortality until it is no longer a public health problem. It was reported that mortality rate for the same year was 45 per 100,000 population. As per global TB incidence and mortality is planned to be reviewed after having the final results from 2015/2016 survey. Moreover, the prevalence survey also shows that only 17.5% of the total Pulmonary Bacteriologically Confirmed (PBC) cases (52 out of 291) are detected through Microscopy by symptom screening and around 19% (56 out of 291) PBC cases from symptom negative participants. It also gives impression that about 90% of the total bacteriologically confirmed cases can be detected through Chest X-Ray (264 out of 291) (DF, 2018). According to recent statistics the total TB patients at Rajshahi were 632 in 2015. Among them the new pulmonary bacteriologically cases were 198, old cases 20, the pulmonary clinically diagnosis new treatment history unknown cases 101, old cases 07, the new extra pulmonary cases were 289, old case 11 and all retreatment cases were 06. The new PBC CNR for Rajshahi city was 27.77 and all form of CNR 67.12 in 2015, (DGHS, 2018). In Rajshahi city a very few study were conducted such as knowledge assessment like non-medical university students, industrial none study were conducted about TB (Rana, et al. 2017). However most of the case control study were conducted in other population such as low cure rate of tuberculosis (Men, et al. 2010). Inadequate TB case finding, van'tHoog (2013) reported that prevalence and predisposing factors for TB, Alemu (2015) association between household socioeconomic position and prevalent tuberculosis, Boccia (2011) factors affecting treatment outcomes for pulmonary tuberculosis (Babalik, 2013) . Prevalence and risk factors for adult pulmonary tuberculosis, Dhanaraj (2015) reported that an epidemiological study of tuberculosis patient, Dnyaneshwar (2015)) patient and provider-level risk factors associated with default from tuberculosis treatment, Finlay (2012) determinants of multidrug-resistant tuberculosis (Hirpa, 2013). HIV and Intestinal parasitic infections rate in active pulmonary tuberculosis patients, Hailu (2015) reported that housing and tuberculosis, Khan (2013) tuberculosis in HIV-Infected and uninfected (Kaforou, 2013). Factors associated with occurrence of tuberculosis among adult people living with HIV after antiretroviral treatment initiation (Kibret, 2013). Environmental risk was the factors and social determinants of pulmonary tuberculosis (Khaliq, 2015). Surveyed was conducted on socio economic status and biomedical risk factors in migrants and native tuberculosis patients (Pittalis, 2017). Special attention should be paid in Rajshahi city people considering their potential influence on the family and their contribution to the nation's workforce in near future in a particular nation. Due to their unique role in near future in the society, it is important to investigate the factors of TB. Considering the TB infection which is very necessary to analyze. Association between the infection on TB among Rajshahi city people and socio-economic and demographic factors. Therefore, the aim of this study was to identify the associated factors of TB among adults in Rajshahi city Bangladesh.

2. Materials and Methodology

2.1 Study Population

The total area of the District is 2,425.37 sq.km. Rajshahi District is bounded by Naogaon District on the north, West Bengal of India, the Padma and Kushtia District on the south, Natore District on the east and Chapainawabganj District on the west. The region is very nearest of Barind tract,

Diara and Char lands. Rajshahi town (City Corporation) stands on the bank of the river Padma. The area of the Rajshahi City Corporation is 96.72 sq km (BBS, 2011).

2.2 Design and study population

It was a case-control study. The sample consisted of 268 TB patients and 268 non TB individuals who were close contact to TB patients. This Study was based on the completely good clinical procedures.

2.3 Sampling technique

Multi-stage random sampling was used in this study; firstly, identified TB patients from 845 registered TB cases who were took treatment from different TB identification laboratories/DOTs center such as CDH, CDC, Tillotoma, RIC, PSTC and Brac etc. Secondly, in this study randomly selected 300 TB patients. Thirdly, in this study randomly selected 300 close contact relative of TB patients at Rajshahi city, Bangladesh. Finally, in this study 268 TB patient and 268 non TB close contact were participated in this study. Almost 32 TB patients and 32 non TB close contact relatives did not agreed to provide data.

2.4 Data collection

The following type of information was collected for the study (i) General ID, (ii) Demographic characteristics, (iii) Socio-demographic characteristics, (iv) Investigated factors of TB. The questionnaires were drafted in English and then translated into Bangla, the mother language of Bangladesh. The translations were reviewed by experts and volunteers, and a pilot study was conducted to validate the questionnaire. We also modified the questionnaire based on the results of the pre-test exercise to make it easier to understand and to answer.

2.5 Questionnaire

The original questionnaire was prepared in English; it was translated to Bengali the mother language of Bangladeshi for easy understanding of the subjects. The original and translated questionnaires were reviewed by ten professional experts and volunteers, and a pilot study was conducted to validate the questionnaire. We also modified the questionnaire based on the results of the piloting to make it easier to comprehend and answer. There were four different parts in questionnaire such as (i) information about TB, (ii) general, (iii) demographic characteristics and (iv) socio-economic characteristics. In these questionnaires translations were reviewed by experts and volunteers, and a pilot study was conducted to validate the questionnaire also modified the questionnaire based on the results of the pre-test exercise to make it easier to understand and to answer.

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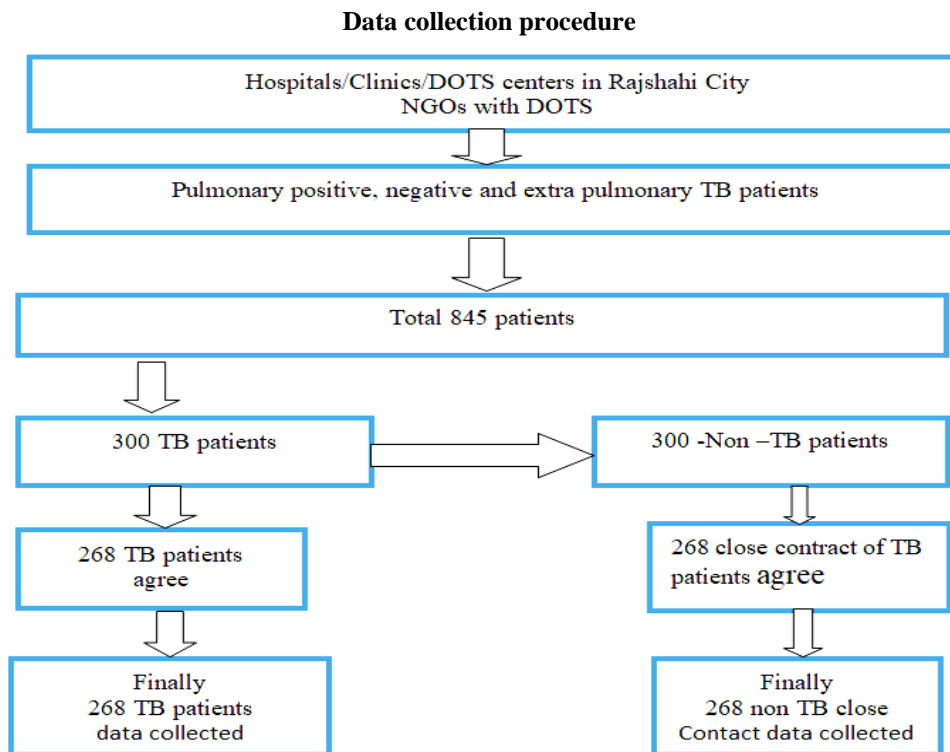


Figure 1: Data collection procedure for case and control study

2.6 Outcome variables

The outcome variable considered as presumptive TB refers to a patient who presents with signs and symptoms of suggestive TB before we known as a TB suspect. A bacteriologically confirmed TB case is one from whom a biological specimen is positive by smear microscopy, chest x-ray or FNAC. The control group is defined as the group in an experiment or study that does not receive treatment by the researchers or any institute and is then used as a benchmark to measure how the other tested subjects do.

2.7 Independent variables

Study included theoretically pertinent socio-economic and demographic factors as independent variables. We classified age into three groups: a younger group (< 25 years), and 26-40 years an older age group (≥ 41 years). Gender was categorized as male or female. Weight in kilogram divided into three categorized as ≤ 40 KG, 41-50 KG and ≥ 51 KG. Height in centimeter divided into two group such as ≤ 155 CM and ≥ 156 CM. Education was classified based on the formal education system in Bangladesh: no education (0 years), primary education (1–5 years), secondary and higher (6 years or more).

2.8 Statistical analyses

Data were cross-checked for consistency before final data entry using Microsoft Excel. Descriptive analyses were conducted to determine the socio- economic and demographic factors for TB of the respondents. Demographic differences regarding infection of TB were assessed by χ^2 analyses; significance for all analyses was set at $p < 0.05$. Chi-square test was used to find the association between two factors. Analyses were performed using statistical package for social sciences (SPSS version 22 IBM).

2.9 Ethical Approach

In this study to maintain strict confidentiality for all information and data of all respondents were very sensitive issue for their personal and family life and as well as society. Ethical approval for this study was given by the Ethical Committee of the Institute of Biological Sciences (IBSc) of the University of Rajshahi (RU). We also received written consent from all the subjects. Technical and ethical issues were strictly maintained regarding social sensitivity.

3. Results

In this study, was investigated the risk factors among TB patients and their close contacts. Table 1 shows the socio-economic and demographic profile of the subjects. Out of the total samples, number of TB patients and close contact were equal (268), approximately 76% were above 26 years of age from each groups. Among them, 58.6% and 41.4% were male and female in case group, 65.3% and 34.7% were male and female in control group. Through marital status 12.7% and 87.3% unmarried and ever married in case group, 11.6% and 88.4% unmarried and ever married in control group respectively. As per body mass index (kg/m^2) 42.5% and 48.9% and 8.6% were under nutrition, normal nutrition and over nutrition in the case group and 10.1%, 73.9% and 16.0% were under nutrition, normal nutrition and over nutrition in the control group respectively. By subject's education, 21.3%, 44.7% and 34.0% were no educated, primary educated and secondary or higher educated in case group, 15.3%, 39.2% and 45.5% were no educated, primary educated and secondary or higher educated in control group respectively. By father's education, 21.3%, 44.7% and 34.0% were no educated, primary educated and secondary or higher educated in case group, 15.3%, 39.2% and 45.5% were no educated, primary educated and secondary or higher educated in control group respectively. Among respondents, by mother's education, 49.6%, 46.3% and 4.1% were no educated, primary educated and secondary or higher educated in case group, 53.0%, 42.2% and 4.8% were no educated, primary educated and secondary or higher educated in control group, respectively (Table 1).

Table 1: Frequency distribution of TB patients and their close contact

Variables	Case Group 268 (100%)	Control Group 268 (100%)
Age in years:		
≤25	63(23.5)	63(23.5)
26-40	106(39.6)	123(45.9)
≥41	99(36.9)	82(30.6)
Gender:		
Male	157(58.6)	175(65.3)
Female	111(41.4)	93(34.7)
Marital status:		
Unmarried	34(12.7)	31(11.6)
Ever married	234(87.3)	237(88.4)

Variables	Case Group268 (100%)	Control Group268 (100%)
Body mass index (kg/m²):		
Under nutrition	114(42.5)	27(10.1)
Normal nutrition	131(48.9)	198(73.9)
Over nutrition	22(8.6)	43(16.0)
Respondents education:		
No education	57(21.3)	41(15.3)
Primary	120(44.7)	105(39.2)
Secondary and higher	91(34.0)	22(45.5)
Fathers education:		
No education	103(38.4)	107(39.9)
Primary	128(47.8)	126(47.0)
Secondary and higher	37(13.8)	35(13.1)
Mothers education:		
No education	133(49.6)	142(53.0)
Primary	124(46.3)	113(42.2)
Secondary and higher	11(4.1)	13(4.8)
Respondents occupation:		
Business	40(14.9)	58(21.6)
Labors	66(24.6)	69(25.7)
Rickshaw, farmer& others	162(60.5)	141(52.6)

In table 2 shows that most of the subjects were 80% undernourished infected with TB than their counterparts (control) groups it's was statistically significant ($p < 0.01$). Among the 58.2% no educated respondents were infected with TB than their counterparts and control groups it's was statistically significant ($p < 0.05$).

Table 2: Association between socio-economic and demographic factors and infected with TB

Variables	Infected with TB			
	Case268, (100%)	Control 268, (100%)	χ^2 -value	p-value
Age in years:				
≤25	63(50.0)	63(50.0)	2.859	0.239
26-40	106(46.3)	123(53.7)		
≥41	99(54.7)	82(45.3)		
Gender:				
Male	157(47.3)	175(52.7)	2.564	0.109
Female	111(54.4)	93(45.6)		
Marital status:				
Unmarried	34(52.3)	31(47.7)	0.158	0.691
Ever married	234(49.7)	237(50.3)		
Body mass index (kg/m²):				
Under nutrition	114(80.9)	27(19.1)	73.665	0.001
Normal nutrition	131(39.8)	198(60.2)		
Over nutrition	22(33.8)	43(66.2)		
Education:				
No education	57(58.2)	41(41.8)	8.124	0.017
Primary	120(53.3)	105(46.7)		
Secondary and higher	91(42.7)	122(57.3)		
Fathers education:				
No education	103(49.0)	107(51.0)	0.147	0.929
Primary	128(50.4)	126(49.6)		
Secondary and higher	37(51.4)	35(48.6)		
Mothers education:			0.972	0.615

Variables	Infected with TB		χ^2 -value	p-value
	Case 268, (100%)	Control 268, (100%)		
No education	133(48.4)	142(51.6)	4.828	0.089
Primary	124(52.3)	113(47.7)		
Secondary and higher	11(45.8)	13(54.2)		
Respondents' occupation:				
Business	40(40.8)	58(59.2)		
Labors	66(48.9)	69(51.1)		
Rickshaw, farmer and others	162(53.5)	141(46.5)		

Those factors were statistically significant in chi-square test in this study considered as independent variables in the binary logistic regression model. Table 3 represents the binary logistic regression analysis the factors effects on infected with TB among the subjects. Undernourished subjects 8.253 (AOR= 8.253; 95%, CI: 4.251-16.019, $p < 0.01$), times were more likely to get TB compared to healthy and over nourished respondents. Uneducated subjects was more likely to get TB than secondary and higher educated (AOR= 1.864; 95%, CI: 1.148-3.026, $p < 0.05$), it was also found that primary educated adults 1.532 times higher chance to get TB than secondary and high (AOR= 1.532; 95%, CI: 1.051-2.234, $p < 0.05$) (Table 3).

Table 3: Effects of socio-economic and demographic factors on infection with TB

Variables	95% C.I.		AOR	p-value
	Lower	Upper		
Body mass index (kg/m²):				
Under nutrition	4.251	16.019	8.253	0.001
Normal nutrition	0.745	2.279	1.303	0.353
Over nutrition ^K				
Education:				
No education	1.148	3.026	1.864	0.012
Primary	1.051	2.234	1.532	0.027
Secondary and higher ^K				

NB: AOR= Adjusted odd ratio; CI= Confidence interval

4. Discussion

This study investigated risk factors of infection with TB and types of TB among TB patients and their close contacts. Some socio economic and demographic factors were used to identify the underlying the mechanism. Study observed that most of the undernourished respondents (80%) were infected with TB than their counterparts and control groups. Malnutrition is a wide term which refers to both under nutrition and over nutrition. Individuals are undernourished if their diet does not provide them with adequate calories and protein for maintenance of growth or if they cannot fully utilize the food they eat due to illness. Even if people eat enough food, they will become undernourished if the foods lack adequate amounts of micronutrients to meet the daily nutritional demand. There are a number of adult TB patients suffering from profound under nutrition in the world especially in developing countries. Under nutrition plays vital role in causation of about one quarter of all new TB cases globally such as in Addis Ababa, Ethiopia (Dargie, 2016). Illiterate respondents were more (58.2%) infected with TB than their counterparts and control groups. Poor hygiene is common among illiterate people. Similar results were found in *Saharia* tribe in central India (Muniyandi, 2015).

4.1 Strength of the study

The main strength of this study may be it was the first time we attempt to consider different groups of people in Rajshahi, Bangladesh for analyzing to investigate their general knowledge and risk factors for TB. Secondly, standardized questionnaire formats were carefully developed to ascertain accurate information from the participants and a pilot study was conducted to validate the questionnaires. As per findings of the pilot study, the questionnaires were reviewed by a ten professional experts and were finalized. Moreover, the interviews were conducted by the researcher himself. Thirdly, appropriate statistical tools and techniques were used to find the associations and effects of selected socio-economic, demographic and anthropometric factors on lacking of general knowledge of TB and development of TB. Fourthly, this study measured the variables through several indicators which were considered by several previous studies (Hoa et al., 2003; Sreeramareddy et al., 2013; Navio et al., 2002; Thu et al., 2012). To the best of my knowledge this type of study has not been conducted yet in Bangladesh. Lastly, the study can be applied for whole Bangladesh because characteristics of students, industrial labors and female sex workers are almost the same all over Bangladesh.

4.2 Limitations of this study

In this study, primary data was used to find association and effect of selected independent variables on knowledge and development of TB; however this study had some limitations. Firstly, the cross-sectional study on knowledge of TB and case-control study on risk factors of TB among TB patients and their close contacts did not allow us to establish any definitive casual relationship between knowledge of TB, the selected variables and the risk factors of TB. Secondly, this study used quantitative survey to elicit subjects' knowledge regarding TB. For development of culture-sensitive communication strategies, qualitative studies are necessary. However, these approaches couldn't be done due to time and resource constraints. Thirdly, the idea of knowledge has several definitions which were difficult to measure, especially using questionnaire. So, there might be some lacking in getting actual level of knowledge. In the case-control study, people living in the households and neighbors other than the TB patients and their close contacts were not included in this study for time and resource constraints. Fourthly, In Bangladesh 64 districts and 11 City Corporation but this study only considered Rajshahi City Corporation. Finally, in this study, only sputum for AFB, chest x-ray and FNAC were done to diagnose TB. Other expensive tests such as CT-guided FNAC, USG-guided FNAC, MT test etc. could not be performed for lacking of fund.

5. Conclusion

This study, established that 80% TB patients were suffering under nutrition so, they infected with TB. Those subjects who were uneducated and primary level of educated mostly infected with TB. This study strongly recommended advocacy communication and social mobilization and social safety net program for nutritional life led and education level will be increased.

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