

Assessment of Knowledge Regarding Tuberculosis among Industrial Labors of Rajshahi District, Bangladesh: A Cross-sectional Study

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Citation: Rana, MM, Islam, MR, Rahman, MM, Zaman, TK, Bharati P and Hossain G. 2018. Assessment of Knowledge Regarding Tuberculosis among Industrial Labors of Rajshahi District, Bangladesh: A Cross-sectional Study. Human Biology Review, 7 (2), 155-171.

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ABSTRACT

Background: Tuberculosis (TB) is one of the major public health problems in Bangladesh. Still, it remains a big challenge in different areas, especially in TB diagnosis. **Aims and Objectives:** The aim of this study was to determine the good knowledge regarding TB which was measured by a composite index and its association with different socio-economic and demographic factors among industrial laborers in Rajshahi district, Bangladesh. **Materials and Methods:** A cross-sectional study was performed among 1,225 industrial laborers from 75 different industries in Rajshahi district, Bangladesh. Knowledge regarding TB was the outcome of interest in this study, which was assessed through 11 different questions. **Results:** This study revealed that 30.4% respondents had a poor knowledge regarding TB. Logistic regression model demonstrated that good knowledge regarding TB was especially found among laborers who were doing the job in silk industries, young adults, and female, educated, non-smokers, living in poor families and living without their partners (separated). Laborers who had been suffering from non-communicable diseases were more likely to have a good TB knowledge compared with their counterparts. **Conclusion:** This study found that there is a huge gap in TB knowledge among industrial laborers in Rajshahi district. It was noted that some modifiable factors were associated with TB knowledge. These factors can be considered to increase TB knowledge among industrial laborers in Bangladesh.

KEYWORDS: Tuberculosis knowledge, Industrial laborers, Socio-economic factors, Composite Index, Logistic regression model.

INTRODUCTION

Tuberculosis, an infectious disease, is of significant public health concern around the world. The South-East Asia region bears the major brunt of the global TB burden harboring 38% of the world's TB cases (Tiwari et al., 2007). Within this region, Bangladesh is one of 22 'high TB-burden' countries. In 2014, there were 187,005 new cases of TB in Bangladesh and it was the leading cause of death, accounting for 81,000 fatalities (WHO, 2016). The country began to implement Directly Observed Chemotherapy, Short Course (DOTS) strategy in 1993. By the end of 2004, DOTS coverage was 99% (WHO, 2016). While the treatment success rate was fairly high through DOTS strategy at 85%, however, less than half (44%) of the cases were detected, resulting in a larger number of untreated carriers who spread the disease still further in this country.

One of the major public health problems in controlling the TB burden is the poor awareness and knowledge of the population on TB (Shargie and Lindtjorn, 2007). Low level of knowledge on TB can lead to complications and worse health outcomes increasing the transmission and delaying health-seeking behavior, lack of adherence, resulting in multi-drug resistance, treatment failure, and disease complication and death (WHO, 2015). The industrial sector bears a heavy load of TB burden. In Bangladesh, workers in a variety of industry are particularly susceptible to TB due to their exposure to multiple risk factors such as their living conditions, working environment, and their migrant lifestyles. In many workplaces, employees operate in closed spaces and unprotected environments, which carry a high risk of the disease spreading from those having active TB to other employees working in close proximity. Studies already found that TB was found to be common among the industrial workers in Bangladesh (WHO, 2015).

Until now, several studies from low-and-middle-income countries have been performed to assess the knowledge on TB and shown an association between poor knowledge, attitudes and practices regarding TB among general population (Huang et al.,2012; Diallo et al., 2009), among pre-university students (Reddy et al.,2014; Orrett et al.,2001), high and secondary school students (Naidoo et al., 2013; Tanimowo et al., 1999), medical students, among the health care workers and nursing and midwifery students (Montagna et al., 2014; Behnaz et al., 2014; Laurenti et al., 2013; Zhao et al., 2013; Akin et al., 2011; Smolovic et al., 2012; Muñoz et al., 2011; Khandoker et al., 2011). In recent years special concern has been paid to the association between knowledge on TB among the industrial workers. Only a few studies have been carried out in this regard. However, most of these studies were carried out in developed country settings Behnaz et al., 2014; Laurenti et al., 2013; Zhao et al., 2013; Akin et al., 2011; Smolovic et al., 2012; Muñoz et al., 2011; Khandoker et al., 2011). Moreover, methodological issues related to the measurement of knowledge of TB have not been adequately addressed in previous studies. The complexity of measuring knowledge lies in its multidimensional aspects. Most studies in this area have mainly focused on one or two indicators to measure knowledge of TB.

In Bangladesh, few studies had been conducted to assess knowledge on TB. A study conducted in some selected areas in northern Bangladesh found that knowledge, attitude and practice towards leprosy and TB was low among the general population (Croft and Croft, 1999). Recently a study was conducted to assess the knowledge about the prevention and control of TB among the labors working in different industries in six city corporations;

Dhaka, Chittagong, Rangpur, Barisal, Khulna and Sylhet in Bangladesh (Islam et al., 2015). However, industrial labors were selected from industries which were located under urban and rural TB program operational areas. Since these industries were located under TB program operational areas, therefore, it is possible that workers from these industries were more conscious about TB. Therefore it does not reflect the actual scenario of knowledge regarding TB on industrial workers. Moreover, that study did not consider the industries from Rajshahi, which is the second largest divisional district of Bangladesh.

Based on these considerations, the aimed to determine the good tuberculosis knowledge which was measured by a composite index and its association with different socio-economic and demographic factors among industrial labors in Rajshahi district, Bangladesh.

MATERIALS AND METHODS

Design and study population

This cross-sectional study was conducted in Rajshahi district, Bangladesh. The total area of the Rajshahi district is 2,425.37sq.km, and it lies between 24°07' to 24°43' north latitudes and between 88°17' to 88°58' east longitudes (BBS, 2011). The sample population included labors working in different industries in Rajshahi district, Bangladesh. There are various kinds of industries in Rajshahi district and labors come from the different parts of this country. Among these industries, participants were selected from 75 different industries namely garments factories, Jute mills, spinners factories, Sugar Mills, Silk factories, Chemicals factories, and Shoe industries, and in Rajshahi district 80,030 permanent industries there were 3,19,876 permanent industrial labors. There are several reasons why we select the labors from different industries in Rajshahi district (BBS, 2013). First, this area was not considered in the previous study; second, Rajshahi is identified as the fast-growing industrial sector. Finally, Rajshahi district shares a border with India and according to the WHO; India is the first ranking in high burden countries of TB.

Sample size determination

Since our target population is known (3, 19,876 labors), the following formula was used for determining sample size: $n = N / (1 + Nd^2)$, where n = required sample size, N = population size (3, 19,876), d = marginal error (0.05) (Rana et al., 2015). The formula provided that the minimum sample size was estimated to be 400 for this study. However, since we had sufficiently of time to collect the data and also in order to provide a more accurate estimate of the population value, we further increased our sample size to 1250.

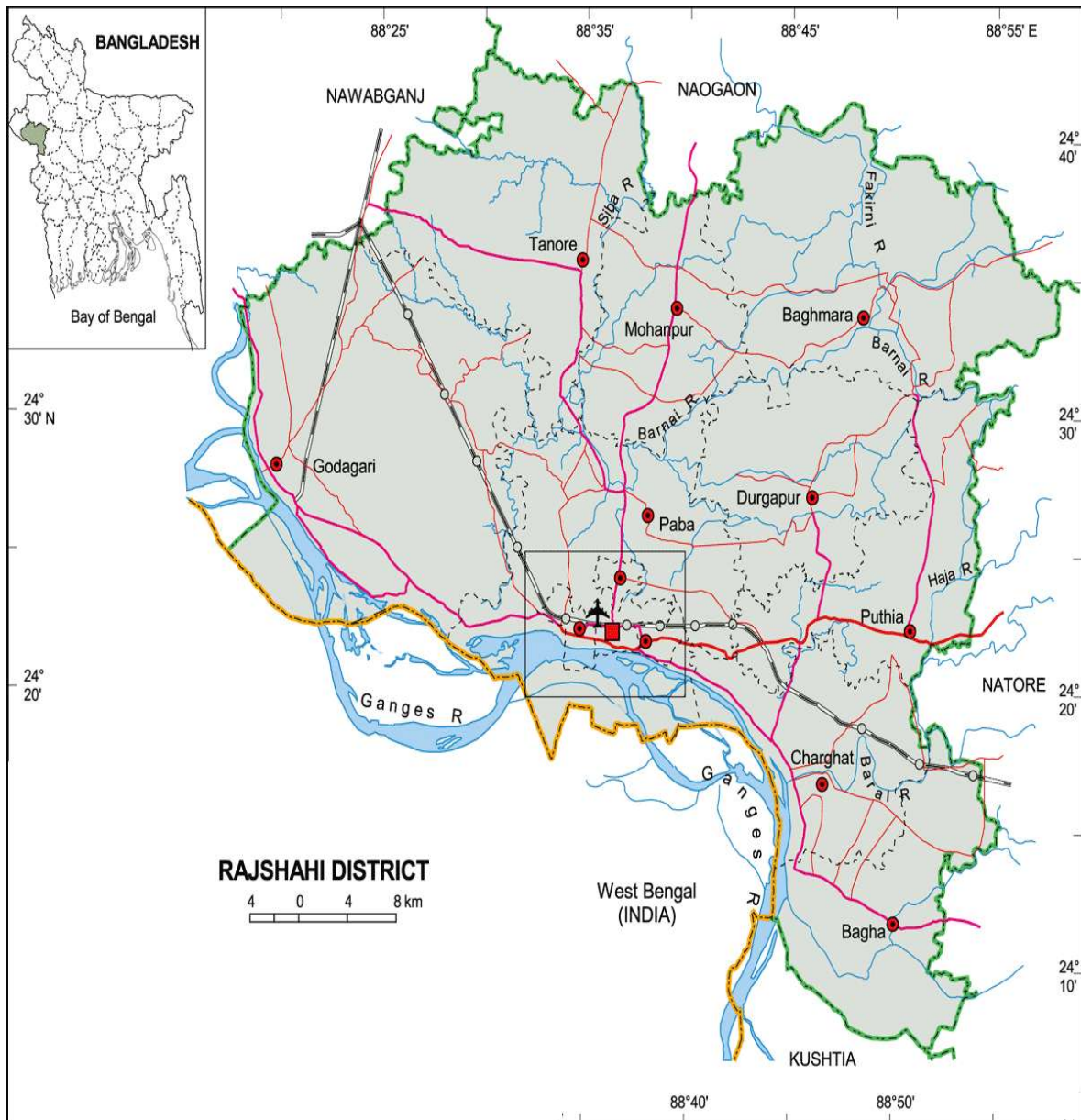


Figure1: Map showing the location of the study area of Rajshahi District, Bangladesh

Before sampling, lists of industries were got from the Rajshahi Chamber of Commerce. A two-stage sampling approach was adopted to select the industrial labors from Rajshahi district. In the first stage out of 80,030 industries (Jute, sugar, shoe, and silk) of Rajshahi district 75 industries were randomly selected. In the second stage, 1250 labors were selected using random sampling with proportional allocation to a size of the industry. Unfortunately, 25 selected labors did not agree to provide their information, finally, 1225 labors were successfully interviewed.

Data collection

The following type of information was collected for the study: (i) socio-demographic characteristics and (ii) knowledge about TB. All data were collected from July 2015 to January 2016 using a semi-structured questionnaire. 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. Two fully trained and experienced field researchers conducted the interview. The survey team was trained to interview the labors. Field researcher performances were strictly monitored. They were accompanied by project supervisor during initial industry visits to ensure correct administration of survey questionnaires.

Outcome variables:

The dependent variable in our study is knowledge about TB, which was assessed through 11 different questions, namely: i) Do you know which part of the body is most affected by TB? (ii) Do you know what type of disease TB is? (iii) Do you know which germ causes TB? (iv) Do you know about latent TB? v) Do you know who most affected by TB? vi) Do you know about the sign and symptom of TB? vii) Do you know about vaccine of TB? viii) Do you know how to transmission TB? ix) Do you know how diagnosed TB? x) Do you know TB is curable? xi) Do you know the treatment cost of TB? The participant's knowledge was scored using a system adopted from previous studies (Gilpin et al., 2011). Each correct response was awarded 1 point, while incorrect or 'don't know' answers received no marks (Syed et al., 2016).

Independent variables

We included theoretically pertinent socioeconomic and demographic factors as independent variables. We classified age into two groups: a younger group (< 40 years), and an older age group (\geq 40 years). Education was classified based on the formal education system in Bangladesh: Illiterate (0 years), primary education (1–5 years), secondary and higher (6 years or more). Place of residence was categorized as rural or urban. Gender was categorized as male or female. Respondents monthly income was categorized as <10000 BDT or \geq 10000 BDT. Marital status was categorized as single or separated or married. Smoking status as yes or no and whether the respondents suffering from any kind of disease as yes or no.

Ethical Approach

This study protocol was reviewed and approved by the ethical committee of Institute of Biological Science (IBSc) University of Rajshahi, Bangladesh. Prior to the survey, the authority of the industries was contacted by the researcher through written communication explaining the importance of assessing the knowledge regarding tuberculosis among industrial labors. Permission was got to allow an investigator to carry out the survey. A similar letter explaining the condition and seeking consent was circulated among the participants to inform them about the objectives of the study and informed of their right to decline. Written informed consent was obtained from the authority of the industries and from the participants.

Statistical analyses

Data were cross-checked for consistency before final data entry using Microsoft Excel. One person entered the data and then cross-checked it with the principal investigator of the study. Chi-square test and Fisher's exact test (if the cell frequency less than 5) were used to find the association between two factors. Binary logistic regression was utilized in this study to find the effect of socio-economic and demographic factors on the level of knowledge about TB among industrial labors. The multicollinearity of the variables was checked by examining the variance inflation factors (VIFs), which was <2.0 (Syed et al., 2016). We estimated the adjusted odds ratio (AOR) to assess the strength of the associations and used the 95% CI for significance testing.

The knowledge index was constructed using the sums of weighted binary input variables, where the maximum and minimum values were chosen for each underlying indicator. The performance of each indicator was expressed using a unit-free index between 0 and 1 (which allows the different indices to be added together) in accordance with the construction method of the Human Development Index (UNDP, 2005).

Knowledge index= (Actual value-minimum value)/ (Maximum value-minimum value)

The scores were obtained then recorded as tertiles with the categories labeled as poor=0-3, moderate=4-6, and good=7-11, knowledge about TB (Ling et al., 2011). The coefficients of Cronbach's alpha was used to assess the internal reliability of the knowledge index. Cronbach's alpha for these 11 sub-questions was 0.84, suggesting a high internal consistency (Moya et al., 2014). Significance for all analyses was set at $p < 0.05$. Analyses were performed using statistical package for social sciences (SPSS version 22 IBM).

RESULTS

Table 1 also shows percentage distribution of knowledge regarding TB among industrial labors. It was observed that (34.6%) industrials labors had good knowledge regarding TB then followed by moderate (34.9%) and poor (30.4%) knowledge about TB (Table1).

Table 1: Level of Knowledge

| Level of Knowledge | Total scoring | N (%) |
|--------------------|---------------|-------------|
| Poor | 0-3 | 373 (30.4%) |
| Moderate | 4-6 | 428 (34.9%) |
| Good | 7-11 | 424 (34.6%) |

Table 2 shows the socio-economic and demographic about good knowledge about TB related characteristics of the respondents. A total of 1225 individuals were included in this study. From the total sample population, approximately 54% were below 40 years of age and 70% were male. By education, 25.5% were uneducated, 41.0% were primary educated and the remaining 33.5% had secondary or higher level of education. Approximately 71.1% workers were lived in rural areas and a major portion respondent's 77.6 % monthly income was below 10,000 BDT. The Chi-square test showed that type of industries, labors' service age, age, gender, marital status, education, and type of residence, smoking habit, and diseases suffering status and family income were significantly associated factors with the level of good knowledge regarding TB among industrial labors in Rajshahi district, Bangladesh (Table 2).

Those factors were statistically significant in this study considered as independent variables in the binary logistic regression model. Table 3 represents the binary logistic regression analysis of the factors associated with the good knowledge regarding TB among the industrial labors. Labors from Jute (Adjusted odds ratio, AOR=0.355; 95% confidence interval, CI: 0.149-0.844, $p < 0.05$), Sugar (AOR =0.173; 95% CI: 0.048-0.624, $p < 0.05$ and Shoe (AOR=0.138; 95% CI: 0.054-0.352, $p < 0.05$) industry were less likely to had a good level of TB knowledge compared to Silk industry labors. Compared with female and separated respondents, male and single respondents were (AOR=0.399; 95% CI: 0.255-0.626, $p < 0.05$) and (AOR=0.373; 95% CI: 0.164-0.850, $p < 0.05$) times less likely to have a good knowledge about TB.

Table 2: Socio-economic and demographic characteristics according to knowledge of TB among industrial labor

| Characteristics N (%) | Knowledge regarding TB | | | p-value |
|--|------------------------|--------------------|----------------|---------|
| | Poor, N (%) | Moderate, N (%) | Good, N (%) | |
| Type of industries: | | | | 0.001 |
| Jute, 918(74.9) | 292(31.8) | 280(30.5) | 346(37.7) | |
| Sugar, 21(1.7) | 03(14.3) | 09(42.9) | 09(42.9) | |
| Shoe, 247(20.2) | 78(31.6) | 131(53) | 38(15.4) | |
| Silk, 39 (3.2) | 00(0) | 8(20.5) | 31(79.5) | |
| Service age in years: | | | | 0.004 |
| <15 years, 756(61.7) | 205(27.1) | 272(36) | 279(36.9) | |
| ≥15 years, 469(38.3) | 168(35.8) | 156(33.3) | 145(30.9) | |
| Age in years: | | | | 0.032 |
| <40 years, 665(54.3) | 182(27.4) | 247(37.1) | 236(35.5) | |
| ≥40 years, 560(45.7) | 191(34.1) | 181(32.3) | 188(33.6) | |
| Gender: | | | | 0.001 |
| Male, 857 (70.0) | 331(38.6) | 314(36.6) | 212(24.7) | |
| Female, 368 (30.0) | 42(11.4) | 114(31) | 212(57.6) | |
| Marital status: | | | | 0.001 |
| Single, 131 (10.7) | 47(35.9) | 61(46.6) | 23(17.6) | |
| Married, 1021 (83.3) | 320(31.3) | 351(34.4) | 350(34.3) | |
| Separated, 73 (6.0) | 6(8.2) | 16(21.9) | 51(69.9) | |
| Educational status: | | | | 0.001 |
| Illiterate, 313 (25.5) | 132(42.2) | 116(37.1) | 65(20.8) | |
| Primary, 502 (41.0) | 107(21.3) | 169(33.7) | 226(45) | |
| Secondary & higher, 410 (33.5) | 134(32.7) | 143(34.9) | 133(32.4) | |
| Religion: | | | | 0.059 |
| Muslim, 1177 (96.1) | 364(30.9) | 404(34.3) | 409(34.7) | |
| Non-Muslim, 48 (3.9) | 9(18.8) | 24(50) | 15(31.2) | |
| Residence: | | | | 0.001 |
| Rural, 871(71.1) | 329(37.8) | 309(35.5) | 233(26.8) | |
| Urban, 354 (28.9) | 44(12.4) | 119(33.6) | 191(54) | |
| Smoking status: | | | | 0.001 |
| Yes, 418 (34.1) | 163(39) | 166(39.7) | 89(21.3) | |
| No, 807 (65.9) | 210(26) | 262(32.5) | 335(41.5) | |
| Diseases suffering status: | | | | 0.001 |
| Yes, 203 (16.6) | 75(36.9) | 85(41.9) | 43(21.2) | |
| No, 1022 (83.4) | 298(29.2) | 343(33.6) | 381(37.3) | |
| Monthly family income in BDT: | | | | 0.001 |
| <10,000, 951 (77.6) | 322(33.9) | 363(38.2) | 266(28) | |
| ≥10,000, 274 (22.4) | 51(18.6) | 65(23.7) | 158(57.7) | |

Table 3: Effect of socio-economic and demographic factors on the level of knowledge about TB

| Variables | AOR | 95% CI for AOR | | p-value |
|--------------------------------------|-------|----------------|--------|---------|
| | | Lower | Upper | |
| Type of industries: | | | | |
| Jute | 0.355 | 0.149 | 0.844 | 0.001 |
| Sugar | 0.173 | 0.048 | 0.624 | 0.019 |
| Shoe | 0.138 | 0.054 | 0.352 | 0.007 |
| Silk ^R | | | | |
| Services age in years: | | | | |
| <15 Age in years | 0.748 | 0.490 | 1.142 | 0.178 |
| ≥15Age in Years ^R | | | | |
| Age in years: | | | | |
| <40 Age in years | 1.543 | 1.030 | 2.313 | 0.036 |
| ≥40 Age in years ^R | | | | |
| Gender: | | | | |
| Male | 0.399 | 0.255 | 0.626 | 0.001 |
| Female ^R | | | | |
| Marital status: | | | | |
| Single | 0.373 | 0.164 | 0.850 | 0.019 |
| Married | 0.642 | 0.349 | 1.181 | 0.154 |
| Separated ^R | | | | |
| Educational status: | | | | |
| Illiterate | 0.570 | 0.388 | 0.836 | 0.004 |
| Primary | 1.160 | 0.834 | 01.616 | 0.378 |
| Secondary & higher ^R | | | | |
| Religion: | | | | |
| Muslim | 1.910 | 0.936 | 3.895 | 0.075 |
| Non-Muslim ^R | | | | |
| Residence: | | | | |
| Rural | 1.035 | 0.669 | 1.601 | 0.876 |
| Urban ^R | | | | |
| Smoking status: | | | | |
| No | 1.476 | 1.077 | 2.024 | 0.016 |
| Yes ^R | | | | |
| Diseases suffering status: | | | | |
| Communicable | 1.816 | 1.228 | 2.685 | 0.003 |
| Non- communicable ^R | | | | |
| Monthly family income in BDT: | | | | |
| <10,000 | 0.430 | 0.314 | 0.588 | 0.001 |
| ≥10,000 ^R | | | | |

Respondents aged < 40 age in years were more likely to have good level of TB knowledge as against respondents who were aged ≥ 40 years. Uneducated respondents and respondents whose monthly income was <10,000 BDT were less likely to have a good level of TB

knowledge compared with their counterparts. Respondents who were smokers (AOR=1.476; 95% CI: 1.077-2.024, $p<0.05$) and those who had been suffering from any NCDs (AOR= 1.816; 95% CI: 1.228-2.685, $p<0.05$) were more likely to have a good level of TB knowledge compared with their counterparts.

DISCUSSION

The obtained level of TB knowledge among labors working at different industries in Rajshahi district was poor than those reported in other studies conducted among different subgroup of the population such as secondary school student in Ethiopia 55.1% (Kidane et al., 2015), among the general adult population in Malawi 50.1% (Feldacker et al., 2012) And Uganda 40.0%, (Wynne et al., 2012) among primary school children in Malawi 90.0% (Kamble S, 2012), and among the relatives of TB patients (Freitas et al., 2015). However, this poor knowledge was consistent with another study conducted in Bangladesh (Agho et al., 2014). The poor knowledge about TB among the industrial labors indicates that the TB control program needs to consider screening, advocacy, communication, and social mobilization to these most risk groups. Our study found that younger respondents (< 40 years) had a good TB knowledge as compared to the older respondents (≥ 40 years). Our results were consistent with previous other studies (Esmael et al., 2013; Naini et al., 2012). The possible explanation is that most of the younger respondents in our study had secondary and higher level of education. An additional analysis was run to support this hypothesis and found that the proportion of secondary and higher level of education was higher among the younger respondents as compared with the older (≥ 40 years) respondents. This study also demonstrated that labors who were smokers had a good knowledge about TB. This is expected because studies have unequivocally documented consistent evidence that smoking is associated with an increased risk of TB (Den et al., 2005; Ukwaja et al., 2013). Therefore those who had smoke maybe they were more aware of the adverse effects of smoking towards TB. This study found a good knowledge about TB was generally lower among illiterate respondents and higher among respondents with secondary or higher levels of education. Our findings were consistent with studies (Mweemba et al., 2008; Mushtaq et al., 2010), which concluded that high rates of illiteracy and low educational status, were common among TB patients. Thus this finding highlights the need for TB health education program among illiterate industrial labors. The present study found that female respondents had a good knowledge about TB than male. This gender difference may indicate the culture and lifestyles in Bangladesh. In recent years, the Government of Bangladesh, under the

Ministry of Health and Family Welfare, Directorate General of Health Services (DGHS) are conducting different programs on TB through television and radio to aware the people at all level. In Bangladesh, women usually stay at home in this country and they are more prone to enjoy TV compared to male. Therefore, it is believed that women receive sufficient information regarding TB. This study showed a poor knowledge regarding TB among labors whose monthly income was >10,000 BDT. These findings are consistent with national household surveys conducted in the Philippines, Pakistan, and India among the general population (Hoa et al., 2003; Sreeramareddy et al., 2013; Navio et al., 2002), which indicated that higher knowledge about TB was observed among poor respondents. Results of our study showed that unmarried respondents were less likely to have good TB knowledge. A study in the Philippines reported similar results (Navio et al., 2002). This report represents the first analysis of the knowledge of respondents regarding TB of industrial labors in Bangladeshi. There were two major findings. First, poor level of knowledge 34.6% of TB was noted among study participants. Second, respondents who were smokers, aged < 40 years, and suffering from any types of communicable disease were more likely to have a good knowledge regarding TB. On the other hand Industrial workers from Jute, Sugar, and Shoe Industries, male respondents, respondents who were single, uneducated and monthly income <10,000 BDT were less likely to had a good knowledge regarding TB.

The main strength of this study is that it is the first to analyze the knowledge of TB among the industrial labor in Bangladesh. The standardized questionnaire format was carefully developed to ascertain accurate information from the participants, the interviewers were trained, and the fieldwork was monitored by the principal investigator of this project. The data contained information on potential confounding factors, with a low proportion of missing information. The study can be generalized to other types of industrial labors in Bangladesh because industrial labors from all sectors have similar level of characteristics in Bangladesh.

Limitations of this study First, the cross-sectional observational design did not allow us to establish any definitive temporal associations for identifying between knowledge of TB and various socio-economic, demographic and health behavior related characteristics. Further longitudinal research is needed to fully tease apart this complex relationship and understand the underlying mechanisms. Second, this study used the only quantitative survey to elicit workers' 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. We should consider this point in our future studies. Finally, the idea of knowledge, which has several definitions; so, it is difficult to measure, especially using the questionnaire. However, this study measured the knowledge variables through several indicators which were considered by several of the previous studies (Hoa et al., 2003; Sreeramareddy et al., 2013; Navio et al., 2002; Thu et al., 2012). This study found a low level of good knowledge 34.6% on TB among study the participants. From multivariate analyses, respondents who were smokers, aged <40 years, and suffering from any types of communicable disease were more likely to had a good TB knowledge. On the other hand industrial workers from Jute, Sugar, and Shoe Industries, male respondents, respondents who were single, uneducated and monthly income <10,000 BDT were less likely to had a good knowledge regarding TB. To increase knowledge about TB among the industrial labors in Bangladesh these important socio-economic and demographic factors need to be considered.

Conclusion:

This study found a huge gap in knowledge 34.6% about TB among the study participants. From multivariate analyses, respondents who were smokers, aged <40 years, and suffering from any types of communicable disease were more likely to had good knowledge regarding TB. On the other hand industrial workers from Jute, Sugar, and Shoe Industries, male respondents, respondents who were single, uneducated and monthly income <10,000 BDT were less likely to had a good knowledge regarding TB. To increase knowledge of TB among the industrial labors in Bangladesh these important socio-economic and demographic factors need to be considered. Respondent's education and advocacy, communication and social mobilization programm could play an important role for increase knowledge regarding tuberculosis. Government of Bangladesh and donor agency should take proper initiative regarding this issue.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the authority of industrials Labors' of different industry of Rajshahi, Bangladesh for giving permission to acquire data from industrial labors. Also thanks to Md. Reazul Karim, Sheik Moinuddin, Md.Abul Basar and Himanshu Karmaker for their help to collect data from industries.

Conflict of Interest: None to declare.

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