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The Impact of Socio-Economic and Demographic Status of Children Contacts with Pulmonary Tuberculosis

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Abstract Original Research Article

Background: Tuberculosis in Bangladesh is a significant health problem. Bangladesh ranked 6th in that list among the world's 22 largest TB burden nations. It is estimated that around 880 fresh instances of TB and 176 fatalities of TB happen daily in Bangladesh. ***Objective:*** This study was carried out to measure the impact of socio-economic and demographic status of the children contacts with pulmonary tuberculosis. ***Method:*** This was a prospective observational study. This study was conducted in the department of Pediatrics, Shaheed Suhrawardy Medical College and Hospital, Dhaka for duration of three (3) years, from July 2015 to July 2018. About 384 population under 12 years children who were close contacted with adult open pulmonary tuberculosis patients, were taken as study sample. ***Results:*** This study was found the majority of tuberculosis patients stayed in urban slum in comparison to LTBI and healthy contact (81.25% vs. 30.77% vs. 39.26%). Malnutrition was one of the contributing factors in current study population and more than 90% of tuberculosis patients were severe underweight in this study.

Keywords: Tuberculosis, Prospective observational study, LTBI.

INTRODUCTION

Tuberculosis (TB) is a transmissible bacterial infection from the atmosphere induced by Mycobacterium Tuberculosis. An individual with smear-positive pulmonary tuberculosis (PTB) is the most significant cause of disease. This disease is accountable for region-by-region morbidity and mortality. It mostly infects lungs by inhaling droplet particles that contain virulent human strains, but can also infect any portion of the body, such as intestines, genitourinary bodies, lymph nodes, nervous system, bone and joints.

Tuberculosis is an ancient illness. Tuberculous lesion was discovered in Neolithic man's vertebrate in Europe and on Egyptian mummies as early as 3700BC.Today TB was the world's largest transmissible illness [1]. An ancient human illness is cancer induced by a complicated group of microorganisms, Mycobacterium tuberculosis, Mycobacterium bovis and Mycobacterium africanum [2]. The terms used to refer to tuberculosis throughout history are Lung Sickness, Phthisis, Consumption, Scrofula, White Plague, King's evil.

M-infected one-third of the world's population. New infections and tuberculosis happen at a rate of one per second. The estimates of the global disease burden created by TB in 2011 are as follows, according to the WHO: 8.7 million incidents of tuberculosis; incident rate of 125 instances per 100,000 population; 12 million common cases of tuberculosis; 1 million fatalities among HIV-negative individuals and an extra 0.43 million fatalities among HIV-positive individuals. Regional Asia accounts for 59% of TB instances (39% for South-East Asia and 20% for the West Pacific), 26% for the African area, 7% for the Eastern Mediterranean area, 5% for the European area and 3% for the American area [3].

TB is a major HIV-positive people murderer in 2015, 35% of HIV fatalities were caused by TB. 10.4 million individuals became sick with TB in 2015, and

1.8 million died of the disease (including 0.4 million individuals with HIV).Over 95% of TB deaths occur in low- and middle-income countries. Globally in 2015, an estimated 480 000 people developed multidrug-resistant TB (MDR-TB). TB incidence has fallen by an average of 1.5% per year since 2000. This needs to accelerate to a 4–5% annual decline to reach the 2020 milestones of the "End TB Strategy". Ending the TB epidemic by 2030 is among the health targets of the newly adopted Sustainable Development Goals [4].

Tuberculosis in Bangladesh is a significant health problem. Bangladesh ranked 6th in that list among the world's 22 largest TB burden nations. It is estimated that around 880 fresh instances of TB and 176 fatalities of TB happen daily in Bangladesh. In Bangladesh, the estimated prevalence of all forms of TB and incidence rate was 425 and 225 respectively per 1,00,000 per year. Bangladesh's mortality rate was 51 per 1, 00,000 annually.

In 2007, Bangladesh was ranked sixth on the list of 22 highest TB burden countries [5].

- Estimated Incidence Rate 225/year/100,000
- Estimated Prevalence Rate 411/year/100,000
- Estimated Mortality Rate 45/year/100,000

M. tuberculosis is a large non-motile, obligate aerobic bacterium, thus it can only survive in an oxygen-containing environment. Threads length are 2-4 m and width 0.2-0.5 µm [19]. The cell envelope is composed by a core of three macromolecules (peptidoglycan, arabinogalactan and mycolic acids), covalently linked to each other and a lipopolysaccharide (lipoarabinomannan), which is thought to be anchored to the plasma membrane [6].

In compare to other bacteria M. bacterium divides slowly. E. coli divide roughly every 20 minutes, whereas M. bacterium divide 16-20 hours between each cell division [7].

M. tuberculosis infection occurs through inhaling an aerosol droplet that is generated when patient with PTB coughs, talks, sneezes, spits and sings. For M. bovis, it can be transmitted through drinking of raw milk that may infect the tonsils presenting as scrofula (cervical lymphadenitis), or the intestinal tract, causing abdominal TB [8].

In case of PTB, once the organism enters the alveolar region, alveolar macrophages engulf and control multiplication of bacillus in most of the exposed individuals. This primary infection leads to an active disease in about 10% of individuals only. In the remaining 90% of cases, individuals remain asymptomatic and non-infectious, i.e. latent infection stage. However, in some circumstances where the immune response is weakened, reactivation of latent infection can result [9]. M.'s only reservoir, practically. Patients with lung TB with chronic respiratory diseases such as cough and sputum manufacturing are tuberculosis that adds to the spread of TB infection. Aerosols are solid or liquid particles in a gas, with a size from 0.001 to over100 µm. A single sneeze can release 40 000 droplets, and a cough about 3000 droplet nuclei, the same number as talking for 5 minutes. When they come in contact with air they dry rapidly and become very light particles that still contain live bacilli, and remain suspended for a long time [10].

The specific lymphocytes are central to TB immunity. Their fundamental role is demonstrated in studies of HIV-infected individuals. These have a reduced number of specific circulating lymphocytes, in particular CD4 lymphocytes, which diminish as their disease develops. This is why they are more likely to develop TB following infection [10]. Once a person develops the disease, PTB, there will be several suggestive clinical features, especially 2 weeks' or above duration of cough, sputum production and weight loss are important for the diagnosis of PTB. Others respiratory symptoms like chest pain, haemoptysis, breathlessness and/or constitutional symptoms like fever, night sweats, tiredness, loss of appetite can also occur [11].

The diagnosis of TB in children relies on a careful history and a thorough physical examination. The most common symptoms are cough, fever, wheezing and failure to gain weight [12]. Clinical symptoms are usually meager, crepitation and wheezes over the affected lung field are the most common. Signs and symptoms of extra pulmonary TB are referred to the involved organ.

In the context of Bangladesh, the incidence rate of all forms of TB for all age groups was 225/100,000 population in 2012, while the prevalence rate was 411/100,000 population [20]. On the other hand MOHFWB [20] stated in their National Guidelines for the Management of Tuberculosis in Children, NTP report that in 2010 total 4,236 cases occurred in children among the 158,252 newly reported cases of TB which was 2.7% of the total detected cases. This is most likely due to poor detection throughout the country. Moreover, study conducted by Tahmeed *et al.*, in Madhupurupazilla in the Tangail district during 2008-2009, showed an incidence of childhood TB of 52 per 100,000 among all eligible children 0-14 years of age [13].

Although this does not represent national incidence of child TB, this figure indicates that there is a gap between NTP-reported child TB and actual disease burden in the community. The NTP in 2007 and Damien Foundation in 2009 reported detection rates of

only 9 and 8.6 per 100,0000, under14 year old children respectively [21, 22]. When somebody in the family or other close persons have lung TB it might spread to others. TB is spread before the sick person has started treatment and some weeks after. The people living in the same household are most at risk to get TB. Small children, young adults, elderly and people having weak immune system develop more easily TB illness [14].

The risk for developing TB disease following infection with M. tuberculosis is mainly determined by the following factors.

- Household or close contact with a smear positive or culture positive pulmonary TB
- Age < 5 years: The risk of developing TB disease is highest in very young children, who is immune immature.
- Severe malnutrition or other immunosuppressive conditions like measles in the previous 3 months, whooping cough, HIV infection, being on drugs like steroids, immunosuppressive agents.
- The time since exposure or infection: The vast majority of children who develop TB disease do so within the first year after Mycobacterium tuberculosis exposure or infection.

Currently, the World Health Organization (WHO) and the International Union against Tuberculosis and Lung Disease (IUATLD) and NTP, Bangladesh recommend that all children under 5 years of age who are in household contact with a sputum smear positive index case, should be actively traced and screened for tuberculosis [15]. Six months of isoniazid (INH) is recommended as preventive chemotherapy once active tuberculosis has been excluded, because with good adherence, 6 months of INH monotherapy has proven efficacy to prevent tuberculosis in children infected with a susceptible strain of M. tuberculosis [16].

But in case of 5-12 years children those are closely contacts with open case of pulmonary tuberculosis, decision should be taken whether INH prophylaxis is needed to strictly control tuberculosis. Current study was designed to investigate justification of INH preventive chemotherapy among the children age above 5 years who were contacted with adult open pulmonary tuberculosis, as well as the effectiveness of INH prophylaxis among the children age under 5 years. It is one of the former study in Bangladesh regarding this issue.

OBJECTIVE

To determine the impact of socio-economic and demographic status of children contacts with pulmonary tuberculosis.

METHODOLOGY

Study Design: It was a prospective observational study.

Place of Study: The research was carried out in the Pediatrics Department, ShaheedSuhrawardy Medical College and Hospital, Dhaka.

Duration of Study: This research lasted from July 2015 to July 2018 for three (3) years.

Study Population: The study population of this research was kids under the age of 12 close to adult patients with open pulmonary tuberculosis.

Sample size: The following formula was used to determine the sample size of this research in a group: n= z2pq / d2, where, n= required sample size; z= standard normal deviation generally set at 1.96, which corresponds to 95 percent of the confidence interval; p= percentage in the target population expected to have specific features, there was no sensible estimate so50 percent (.50) used in this research; For this research, the complete sample size was 384.

Sampling Criteria

Inclusion Criterion:

- Under 12 years children close contacts with adult open pulmonary tuberculosis patients.

Exclusion Criteria

- Children close contacted with non-open case of pulmonary tuberculosis
- Those were not willing to enroll in the study

Sampling Technique:

In order to reach the participants, purposeful sampling technique was used. Patients with open case of lung tuberculosis (Index case) who attended Shaheed Suhrawardy Medical College Hospital's DOTS Corner were tracked and then recognized as the final participants to their contact kids.

Data Collection Method

Data of tubercular cases was collected through questionnaire, examination and laboratory investigations of children of household contacts.

Data Collection Instruments and Tools

A pre-tested English-language semi-structured questionnaire was used to obtain data that included the identification of the respondent, socio-demographic information, private information linked to heigine, information linked to disease, clinical examinations, radiographic surveys and information linked to diagnosis.

Data Collection Technique

Face-to-face interview gathered the identity of the respondent, socio-demographic information and

clinical history. Trained doctors conducted physical exams. History, clinical examination and drug data for laboratory invistigation have been registered.

Grouping of the Respondents: Identified contactedchildren under 12 years were grouped in three subsets as following-

- Group-1: Under 5 years contact children taking INH prophylaxis,
- Group-2: Under 5 years Contact children not taking INH prophylaxis,
- Group-3: 5-12 years contact children not taking INH prophylaxis.

Data Processing and Analysis

After collection, all the data was checked for completeness and consistencies by the investigators. Complete and consistent data were entered into the Statistical Package for Social Science (SPSS) for windows version 17, and analyzed. Normality of data was done by Kolmogorov-smirnov test. Descriptive statistics were used to describe the population by age, sex, educational, disease related factors etc. and were presented as frequency and percentage. Statistical significance was calculated by doing Chi-square test and independent t-test. All of the rates were calculated at the 95% confidence interval level. A binary logistic regression was done to detect OR (odds ratio) and 95% confidence interval. A p-value <0.05 level was considered as the level of statistical significance.

RESULTS AND OBSERVATIONS

A total of 384 kids were hired into the research after meeting the inclusion criteria for adult open pulmonary tuberculosis. The hospital record of patients with tuberculosis was performed including patient demographic information, sputum smear outcome, chest X radiograph, and symptom length. To finish a structured questionnaire, all topics were needed. A child contact data was provided by the parent or caregiver of the child.

Table-1: Socio-demographic characteristics of study participants (n=384)

Variables	Frequency (*n*)	Percentage (%)
Gender		
Boy	190	49.5
Girl	194	50.5
Age group		
≤5 years	148	38.5
>5 years	236	61.5
Age (years)	**Mean±sd= 6.27±3.08**	
Age of TB patients# (n=32)		
≤5 years	20/384	13.5
>5 years	12/384	5.1
Religion		
Muslim	376	97.9
Hinduism	8	2.1
Use of Sanitary Latrine		
Yes	158	41.1
No	226	58.9
Residence		
Urban	172	44.8
Urban slum	162	42.2
Rural	50	13.0
Socioeconomic status		
Poor	126	32.81
Middle class	130	33.85
Upper class	128	33.33

#Here sample, n=384 except # where n=32.

Boy and girl participants were nearly equivalent in number in this research (49.5 percent vs. 50.5 percent) which represented a male - female ratio as 1:1.02 in this table demonstrates. All respondents ' general mean±sd age was 6.27±3.08 years within 1 month to 12 years. Most of the participants (61.5 percent) were over 5 years of age. Within the age group, among the children aged less than or 5 years 13.5% were diagnosed as having TB whereas this prevalence was 5.1% among the children aged above 5 years. Almost all the respondents (97.9%) were Muslim except resting 2.1% Hindu. Less than half of the respondents (41.1%) were used sanitary latrine, whereas majority (58.9%) weren't. Most of the respondents (44.8) were living in urban area, whereas 42.2% in urban slum area and resting 13.0% were in rural area. In this study, socioeconomic status was evaluated by principal component analysis. In three groups, the

frequency was more likely in the same amount namely poor (32.81), middle class (33.85%) and upper class (33.33 %).

Table-2: Distribution of the Respondents by Educational Status (n=384)

Educational status	Frequency	Percent
No education	120	31.3
Incomplete primary education	42	10.9
Primary education	196	51.0
Incomplete secondary education	10	2.6
Continuing Secondary education	16	4.2
Total	**384**	**100.0**

This table shows that 51.0% had primary education which was followed by 31.3% had no education, 10.9 %had incomplete primary education.

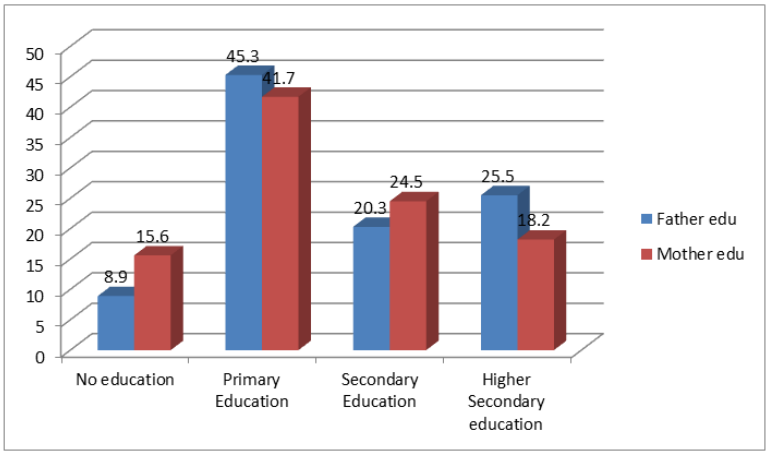

Fig-1: Distribution of the respondents by their father and mother's Educational Status in a bar diagram (n=384)

Table-3: Distribution of the Respondents by their Occupation (n=384)

Occupation of respondent	Frequency	Percent
Student	116	30.2
Working	206	53.6
Not able to work	62	16.1
Total	**384**	**100.0**

Table-4: Distribution of the Respondents by INH Chemotherapy

INH Chemotherapy Taking	Frequency (*n*)	Percentage (%)
Taken INH aged ≤5 years child	78	20.3
Taken INH aged 6-12 years child	0	0

In this study, INH chemotherapy was taken by 20.3% of the children aged below 5 years.

Table-5: Distribution of the Respondents by the reasons of Not Providing INH to Their Children (*n*=306)

Reasons of Not Providing INH to Their Children	Frequency (*n*)	Percentage (%)
Lack of counseling	216	70.6
Forgotten	24	7.9
Economic problem	2	0.6
Religious belief	4	1.3
Unwilling/Uncooperative	44	14.4
Others	16	5.2
Total	**306**	**100.0**

Lack of counseling (56.3%) was the main reason for the non-adherence (not providing) INH to the children followed by Unwilling/Uncooperative (11.5%) and Forgotten (6.3%).

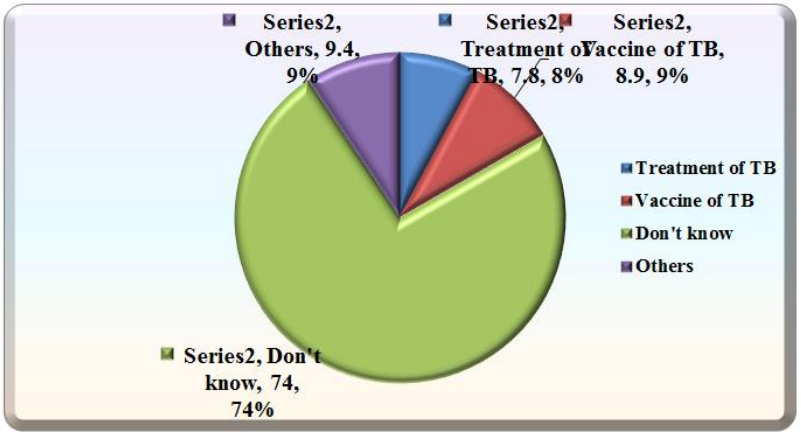

Fig-2: Distribution of the Respondents According to the Knowledge Regarding INH (n=384)

Almost three in every four (74.0%) respondents who were not receiving INH didn't have any knowledge regarding INH, whereas only 8.9% mentioned INH as vaccine of TB and 7.8% mentioned as treatment of TB.

Table-6: Distribution of the Respondents According to the Symptoms of TB (n=384)

Children Had Having Symptom of TB	Frequency (*n*)	Percentage (%)
Yes	80	20.8
No	304	79.2
Total	**384**	**100.0**

This table depicts the symptoms of TB in participant children. About 20.8% study sample were suffered from symptoms of tuberculosis.

Table-7: Symptom/sign of TB (*n*=80)

Symptom of TB	Frequency (*n*)	Percentage (%)
Fever	42	52.5
Cough	32	40.0
Weight loss	18	22.5
Loss of appetite	20	25.0
Malnutrition	30	37.5

Malnutrition: Moderate to severe underweight (According to weight for age)

Multiple responses analysis found that fever was the most common symptom (52.5%) followed by cough (40.0%), malnutrition (37.5%). loss of appetite (25.0%) and weight loss (22.5%).

Table-8: TB according to the location of residence in different age groups

Location of residence	TB	Non-TB	Chi-square value	*p*-value
≤5 years				
Urban	4 (20.0)	64 (50.0)		
Urban slum	16 (80.0)	44 (34.4)	16.28	<0.001**
Rural	0 (0.0)	20 (15.6)		
>5 years				
Urban	2 (16.7)	102 (45.5)		
Urban slum	10 (83.3)	92 (41.1)	22.24	0.014*
Rural	0 (0.0)	30 (13.4)		

Chi-square test was done to measure the level of significance. Star (*) mark represents significant difference.

This table shows that TB according to the location of residence in different age groups. Within the age group ≤5 years, a highly significant difference (p, <0.001) was found between TB and non-TB patients. Most of the participants resided in urban slum (80%) in ≤ 5 years age group. In consideration of > 5 years, there were also more patients of tubercular group resided in urban slum than non-TB group (83.3% vs. 41.1%) and it was also it was significant difference (p= 0.014).

Table-9: Association of TB according to socioeconomic status (n=384)

Socioeconomic status	Tuberculosis	Healthy contact	Chi-square value	p value
Poor	18 (56.3)	108 (30.7)		0.001**
Middle class	12 (37.5)	118 (33.5)	34.54	
Upper class	2 (6.3)	126 (35.8)		
Total	32 (100.0)	352 (100.0)		

** High significance

This table shows socio-economic status of participants. Socioeconomic status was calculated by principle component analysis (PCA) into three groups- poor, middle and upper class. More than half of the TB cases were found in poor socioeconomic status (56.3%). In healthy contact they were near about equally distributed. This association was found statistically highly significant (p value 0.001).

Table-10: Distribution of respondents by weight for age (n=384)

Weight for age	Frequency	Percentage
Severe underweight	207	53.9
Moderate underweight	23	6.0
Mild underweight	42	10.9
Normal weight	104	27.1
Obese	8	2.1
Total	384	100.0

This table shows that distribution of respondents by weight for age. Here, more than half of the respondents were severe underweight (severe malnutrition) 53.9% which was followed by normal weight (27.1%), mild underweight (10.9%), moderate underweight (6.0%) and only 2.1% obese.

Table-11: Association of respondent's demographic variables with tuberculosis

Variables	Categories, n (%)	Group		Chi-square value	p-value
		Healthy contact, n (%)	TB and LTBI, n (%)		
Location of residence	Urban(172)	148 (86.0)	24 (14.0)	13.44	0.001**
	Urban slum(162)	128 (79.0)	34 (21.0)		
	Rural (50)	50(100)	-		
Use of sanitary latrine	Yes (158)	140 (88.6)	18(11.4)	2.88	0.089
	No (226)	186 (82.3)	40 (17.7)		
Drinking water	Tube-well(16)	16(100)	-	12.25	0.007**
	Deep tube well(30)	28(93.3)	2(6.7)		
	Supply water(326)	270(82.8)	56(17.2)		
	Pond (12)	12(100)	-		
Utensil washing water	Tube-well(12)	12(100)	-	13.20	0.004**
	Deep tube well(20)	18(90)	2(10)		
	Supply water(328)	272(82.8)	56(17.2)		
	Pond (24)	24(100)	-		
Water for cooking	Tube-well(16)	16(100)	-	15.91	0.001**
	Deep tube well(18)	16(88.9)	2(11.1)		
	Supply water(322)	266(82.6)	56(17.4)		
	Pond (28)	28(100)	-		
Refrigerator access	Yes(94)	82(87.2)	12(12.8)	0.531	0.466
	No(290)	244(84.1)	46(15.9)		
Amenities and technologies	Low (115)	103(89.6)	12(10.4)	4.458	0.108
	Moderate(230)	188(81.7)	42(18.3)		
	High(39)	35(89.7)	4(10.3)		

Table-12: Association of location of residence and malnutrition with TB

Variables	Categories, n(%)	Group			Chi-square value	p-value
		Healthy control, n(%)	LTBI, n(%)	TB, n(%)		
Location of residence	Urban(172)	148 (45.40)	18(69.23)	6 (18.75)	30.273	<0.0001***
	Urban slum(162)	128 (39.26)	8(30.77)	26 (81.25)		
	Rural (50)	50(15.34)	-	-		
Weight for age	Severe underweight (207)	161(49.39)	16(61.54)	30(93.75)	27.617	0.001**
	Moderate underweight (23)	21(6.44)	2(7.69)	2(6.25)		
	Mild underweight (42)	42(12.88)	-	-		
	Normal weight (104)	94(28.83)	8(30.77)	-		
	Obese(8)	8(2.4)	-	-		

**highly significant; ***very highly significant

The table shows that association of location of residence and malnutrition in three groups, healthy contacts, LTBI and TB. Location of residence, weight for age was found as significant factor. The majority of tuberculosis patients stayed in urban slum in comparison to LTBI and healthy contact (81.25% vs. 30.77% vs. 39.26%) and it was very highly significant. Urban slum is an area of highly populated, congested and lacking of hygienic environment which contribute to develop TB. At the same time, more than 90% of tuberculosis patients were severe underweight (severe malnutrition), about 61.54% of LTBI and 49.39% of healthy contact had severe underweight (severe malnutrition). In severe malnutrition children are lacking of a good immune status, disease protective power and proper nutritional status. All these condition leading the child more prone to develop tuberculosis.

DISCUSSION

Tuberculosis is one of the leading causes of mortality and morbidity across all age groups throughout the world, especially in developing countries. The infection is almost exclusively transmitted through air from patients with pulmonary disease. Therefore, proximity and persistence of contact are major determinants of the risk of transmission of infection, and those living within the same household are at higher risk than casual contacts. Among household contacts, those who are very young and those with absolute or relative immunodeficiency states are at increased risk of acquiring infection from the index case. So, it is important to give preventive prophylactic treatment especially by Isoniazid to their contacts.

In this study, location of residence was found a significant factor in comparison of tubuercular patients and healthy contacts. Regarding location of residence when tubercular group included both TB and LTBI Patients, the respondents of tubercular group mostly residing in urban (41.38%), urban-slum (58.62%) and nobody in rural area whether in healthy contact they were residing in 3 area. At the same time, the majority of tuberculosis patients stayed in urban slum in comparison to LTBI and healthy contact (81.25% vs. 30.77% vs. 39.26%). Urban slum is an area of highly populated, congested and lacking of hygienic environment which contribute to develop TB. Urban and urban–slum areas in Bangladesh are highly populated area which correspond the cause effect. These findings are compatible with other studies. According to the recently completed national TB prevalence survey in Bangladesh, the prevalence of new case TB was estimated to be 79.4 per 100,000 in urban slum and the prevalence rate for urban area was 51.1 per 100,000. Banu *et al.,* 2013 also reported high prevalence of TB in densely populated urban slums in Bangladesh and the prevalence of new PTB cases was estimated to be 253/100,000 [23].

Here, drinking water, utensil washing water and water for cooking was found as significant factor in developing tuberculosis. In all type of water using in tubercular group used mainly supply water (96.55%). Water is not contaminated by tuberculosis but without purifying supply water use may be a source of water borne diseases which will causes suppression of immune response and make the individual more prone to other diseases like tuberculosis. There also recorded mother education was a significant risk factor. Here, more higher educated was detected in healthy contact than tubercular group (19.63% vs. 10.34%). Mother education is an important factor for children treatment purpose and also for adherence.

In current study, there also was recorded that weight for age as significant factor in tuberculosis patients. More than 90% of tuberculosis patients were severe underweight (severe malnutrition), about 61.54% of LTBI and 49.39% of healthy contact had severe underweight. In severe underweight children are lacking of a good immune status, disease protective power and proper nutritional status. All these condition leading the child more prone to develop tuberculosis. There are several studies is one of the contributing factor of developing TB. Chisti *et al*., 2014 observed that TB was common in severely malnourished Bangladeshi children [17]. Malnutrition is also highly prevalent in children living in tuberculosis endemic countries and contributes to 2.2 million deaths in children under 5 years of age globally [18].

CONCLUSION

There was a good adherence for the completion of INH chemoprophylaxis by the children aged under 5 years those who were contacted with adult TB cases, though participation rate was not up to the satisfactory mark which need to be focused more. In this study, location of residence was found a significant factor in comparison of tubuercular patients and healthy contacts. There also found the majority of tuberculosis patients stayed in urban slum in comparison to LTBI and healthy contact (81.25% vs. 30.77% vs. 39.26%). Malnutrition was one of the contributing factors in current study population and more than 90% of tuberculosis patients were severe underweight in this study.

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