Knowledge and practices on tuberculosis infection control among nurses at a specialized hospital in Bangladesh

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ABSTRACT

Tuberculosis (TB) is infectious disease which represents a major health problem among the health care professionals especially in nurses around the world. This study was aimed to determine the levels of TB-related knowledge and practices of nurses in Bangladesh, and their associated socio-demographic factors. A descriptive correlational study design was used. A total of 112 nurses were selected randomly from National Institute of Diseases of the Chest and Hospital (NIDCH), Mohakhali, Dhaka. Data were collected from January to February, 2020. A 20- item Knowledge on TB Questionnaire (KTBQ) was used to measure the nurse's level of knowledge on TB. A 17-item Practice on Tuberculosis Questionnaire (PTBQ) was used to assess the level of nurses' practice on TB infection control. Descriptive statistics such as frequencies, percentages, mean, and standard deviation were used to describe the sample characteristics. Inferential statistics such as Pearson correlation test, one way of ANOVA, and t-test were used to examine the relationship between the variables. Data revealed that nurses had low level of knowledge (Mean=15.68 SD=2.26) and practice (Mean=47.91 SD=3.29) on TB infection control. There was statistically significant correlation between length of service and higher education level with practice on TB control. Nurses obtained low level of knowledge and practice on TB infection control. Higher education and more experienced nurses are required in practicing TB infection control.

INTRODUCTION

Tuberculosis (TB) is an infectious disease which represents a major health problem among the health care professionals especially in nurses around the world (Anita et al., 2017). It is caused by *Mycobacterium tuberculosis* (Sunita & Rajesh, 2016). A person affected by TB demonstrates coughs, sneezes, spits, laughs, or talks. Health care providers mainly nurses are affected by TB infection during providing nursing care closely with infected patients (Khondoker et al., 2011). TB is the sixth leading cause of death globally and approximately 2 billion people are infected by TB which estimated the highest rate of mortality (Stop TB Partnership 2015). TB infection control is an emerging health issue among the health care providers especially among the nurses.

In Bangladesh, TB is a significant cause of death and morbidity (Karim et al., 2013). According to the Bangladesh National Tuberculosis Drug Resistance Survey 2010-2011, the researchers found 1.4% of newly diagnosed cases and 29% of retreated cases to be infected with MDR-TB strains.

Health care workers face a higher risk of acquiring tuberculosis infection compared to the general population which increased at risk of TB among nurses (Khondoker et al., 2011). Implementation and adherence to infection prevention control measures in hospital settings reduces occupational-associated TB infections (Kanyina et al., 2017). It is

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well established that health care workers are at higher risk of developing TB infection (Baussano et al., 2011; Naidoo & Jinabhai, 2016).

According to ICDDR,B (2014) the prevalence rate of latent tuberculosis infection among nurses was reported as 45% in male and 61% were female (n=105) who were working in a Chest Disease Hospital. Previous study showed that health care workers are in fact three times more likely to acquire TB than the general population (Joshi et al., 2013).

Chest disease hospitals primarily admit TB patients, and healthcare workers especially nurses from these hospitals are at the most vulnerable of TB infection from their daily exposure with these patients. Nurses are infected during their routine nursing services particularly those with smear-positive patients and in settings with inadequate use of TB infection control measures (Sharma et al., 2017).

Although prevalence of TB infection among healthcare workers has been estimated to be 54% (range 33% to 79%) in selected low- and middle-income countries, very few data exist on prevalence among healthcare workers in Bangladesh (ICDDRB, 2014).

There is a huge gap between nurses' knowledge and practice about TB infection control (Hamid et al., 2016). Previous study showed that nurses in Bangladesh had an insufficient knowledge to control TB infection (Hamid et al., 2016). However, nurses' practice about the TB infection control program was at the low level. Another similar study found that nurses have a very low level of knowledge regarding TB infection control protocol due to lack of education and training (Islam et al., 2017).

Based on the literature review it is assumed that nurses of many countries had insufficient knowledge about TB infection control. Knowledge and practice regarding TB infection is very essential for health care providers especially for nurses to reduce its incidence and morbidity rate. Therefore, the present study was conducted to know the level of knowledge and practices regarding tuberculosis infection control among the nurses at a specialized hospital in Bangladesh.

METHODS

Study Design

A descriptive correlational study design was used to assess the knowledge and practice about tuberculosis infection control among the nurses. The study was conducted from July 2019 to June 2020 at National Institute of Diseases of the Chest and Hospital (NIDCH), Mohakhali, Dhaka, Bangladesh.

Study Participants

All senior staff nurses working at National Institute of Diseases of the Chest and Hospital (NIDCH) were the participants in this study. The hospital was a 670 bedded specialized TB hospital and more than 500 nurses were working. The participants who met the following criteria were included in this study: (1) Nurses who have more than 2 years of service experience in study setting, (2) Those who are on duty in the morning shift and (3) Those who are willingly participate in this study. A total of 112 nurses were participated in this study. The participants were selected randomly.

Sampling

The sample size was estimated by using G- power analysis. Researcher used level of significance (α) of 0.05, expected power of 0.80 (1- β) and medium effect size of 0.3 (γ). The calculated sample size was 84. In order to compromise the attrition rate, 20% more sample were added (Burns & Grove, 2013). Therefore, total sample size in this study was 112.

Instruments

An interviewing questionnaire was used to collect data. A total 37 structure questionnaire regarding TB infection control was developed by the research team, based on literature review. The instrument was divided into three parts. Part 1 is related to demographic questionnaire, part 2 is on nurses' knowledge on TB infection control related questionnaire and part 3 is related to nurses' practice on TB infection control questionnaire.

Socio-demographic Questionnaire: This part is designed to measure the socio-demographic characteristics of nurses. The questionnaire includes age, gender, marital status, religion, highest level of educational attained in nursing, family member infected tuberculosis, total working experience as a registered nurse, duration of working experience in TB hospital, currently working on what type of ward and have previously completed continuing education course on TB infection control of the respondents.

Nurses knowledge on TB infection control questionnaire: A 20 items of nurses' knowledge on TB infection control questionnaire with Yes/No/Don't know response was used to assess the level of nurses' knowledge on TB infection control. Nurses knowledge score was ranged from 0-20 which was converted into percentage. Zero point was given for incorrect answer and '1' for correct answer. High score indicate high knowledge on TB infection control among the nurses

Nurses practice on TB infection control questionnaire: A 17 items questionnaire which was used to assess the level of nurses' practice regarding TB infection. The nurses were asked to answer the question on 3 point Likert scale which will be ranged for '1' means never performed to '3' always performed. This questionnaire is developed by the researcher based on the literature review. The score rose from 15-45 and converted into percentage. Higher score indicates higher level of practice.

The reliability of the questionnaire was tested for internal consistency by Cronbach's alpha coefficient at list 0.7. Reliability of knowledge questionnaire yielded at 0.70 and 0.70 was yielded for practice questionnaire. The original instrument was developed in English. The English version was translated into a Bangla version and then translated back into English

Data collection

Prior to data collection, the study was approved from National Institute of Advanced Nursing Education and Research (NIANER) and Bangabandhu Sheikh Mujib Medical University (BSMMU). The researcher then obtained permission from the Director of NIDCH. The researcher communicated with the Nursing Superintendent and respected ward in-charge to meet with the nurses respectively. The researcher explained study objective, methods, benefit and procedure of data collection clearly to the nurses. The nurses, who were agreed to participate in the study voluntarily, were asked to pick up the questionnaire. The researcher kept the questionnaire on the desk near to the nurses' duty station. Participants were asked to pick up the questionnaire (along with consent form) from the desk voluntarily and they were instructed to drop the completed questionnaire into the research boxes which were kept near to the duty station. Nurses were instructed to drop the complete questionnaire into research box within two weeks from the approval of data collection. At the end of first week, researcher reminded to the participants. It took about 20 minutes to complete the questionnaire. Researcher preserves the data confidentially in researcher file cabinet for 3 years, and would be destroyed after publication of research in a scientific journal.

Data analysis

All data were entered into SPSS program (version 21.0). Descriptive statistics such as frequencies, percentages, mean, and standard deviation were used to describe the sample characteristics and inferential statistics: Pearson correlation, one way of ANOVA, chi-square, and t-test were used to examine the relationship between the variables.

RESULTS

The socio-demographic characteristics of nurses demonstrated that among 112 participants, the mean age was 38.11 (SD = 8.77) years. Majority of the participants (93.75%) were married. The large number of participants (74.11%) were Muslim. Half of the participants held diploma degree. Only few (2.68%) of the participants infected by TB. More than half of the participants (65.18%) working experience was less than 9.17 years. Among the participants 36.6% were working at surgery ward, besides this only 17.9% at medicine ward (Table 1).

Table 1: Demographic characteristics of the respondents (N =112)

Variable	Category	N	%
Age in Years	23-34	41	36.6
	35-45	54	48.2
	46-57	17	15.2
Gender	Male	9	8.0
	Female	103	92.0
Marital status	Single	7	6.25
	Other	105	93.75
Religion	Islam	83	74.11
	Hindu	21	18.75
	Christian	8	7.14
Highest education level	Diploma	56	50.0
	BSN	27	24.11
	MPH/MSN	29	25.89
Family member infected TB	Self	3	2.68
	None	109	97.32
Length of service in year	< 11.36 Years	70	62.5
	> 11.36 Years	42	37.5
Working experience at TB hospital in year	< 9.17 Years	73	65.18
	> 9.17 Years	39	34.82
Working ward	Medicine	20	17.9
	Surgery	41	36.6
	MDR	26	23.2
	ICU	25	22.3
Training received on TB infection control	Yes	43	38.4
	No	69	61.6

Nurses knowledge on TB infection control

Nurses knowledge was analyzed by using frequency, percentage, mean and SD (Table 2). According to the findings the mean score of knowledge was calculated on 17.46 (SD=2.33) out of maximum of 20 points. This indicates that participants had low level of knowledge about TB infection control. Majority of the respondents answered correctly regarding the items "Pulmonary Tuberculosis is a Sexual Transmitted Diseases" (98.2%), "An Immunocompromised health care worker is at risk of acquiring tuberculosis infection" (98.2%) and "Patients with suspected TB should be isolated from other patients" (98.2%). About the item "Overcrowding is an environmental factor in tuberculosis infection", 97.3% gave correct answer. However, "Oral contraception mostly advised during tuberculosis treatment" gave highest incorrect answer (36.6%) and 63.4% gave correct answer.

Most of the participants had adequate knowledge on: 1) Pulmonary Tuberculosis is a Sexual Transmitted Diseases (STD) disease (98.2%), 2) An Immunocompromised health care worker is at risk of acquiring tuberculosis infection (98.2%), 3) Patients with suspected TB should be isolated from other patients (98.2%), 4) Overcrowding is an environmental factor in tuberculosis infection (97.3%) and Proper ventilation can prevent the transmission of TB (97.3%)

In contrast some of the participants had inadequate knowledge on: 1) Oral contraception mostly advised during tuberculosis treatment (36.6%), 2) Tuberculosis infection spread by breastfeeding (28.6%), 3) Diarrhoea is a general symptom of pulmonary tuberculosis infection (28.6%), 4) Pulmonary tuberculosis is a water borne disease (19.6%) and One can chance TB infection during blood transfusion (19.6%).

Table 2: Distribution of Knowledge among the Participants (N=112)

Items	Correct Knowledge		Incorrect Knowledge		M±SD
	N	%	N	%	
Pulmonary Tuberculosis is a Sexual Transmitted Diseases (STD) disease	110	98.2	2	1.8	.98±.13
Virus is a causative agent of tuberculosis	89	74.5	23	20.5	.79±.41
Tuberculosis germ can be killed by sunlight	105	93.8	7	6.3	.94±.24
Too close with TB patients have chance for TB infection	99	88.4	13	11.6	.88±.32
Overcrowding is an environmental factor in tuberculosis infection	109	97.3	3	2.7	.97±.16
Proper ventilation can prevent the transmission of TB	108	96.4	4	3.6	.96±.19
Malnourished and poor people are at severe	103	92.0	9	8.0	.92±.27

risk for TB infection					
One can chance TB infection during blood transfusion	90	80.4	22	19.6	.80±.40
HIV/AIDS positive patients are easily infected with TB	100	89.3	12	10.7	.89±.31
Delay in treatment of TB infection can be fatal	95	84.8	17	15.2	.85±.36
Diarrhoea is a general symptom of pulmonary tuberculosis infection	80	71.4	32	28.6	.71±.45
Most of the human organs cab be affected by tuberculosis infection	96	85.7	16	14.3	.86±.35
High protein diet has to be advised for tuberculosis patients	107	95.5	5	4.5	.96±.21
Items	Correct Knowledge		Incorrect Knowledge		M±SD
	N	%	N	%	
Oral contraception mostly advised during tuberculosis treatment	71	63.4	41	36.6	.63±.48
Pulmonary tuberculosis is a water borne disease	90	80.4	22	19.6	.80±.40
Tuberculosis infection spread by breastfeeding	80	71.4	32	28.6	.71±.45
N95 mask protective against the spread of pulmonary tuberculosis infection	104	92.9	8	7.1	.93±.26
An Immunocompromised health care worker is at risk of acquiring tuberculosis infection	110	98.2	2	1.8	.98±.13
Pulmonary tuberculosis spread by shaking hand	99	88.4	13	11.6	.88±.32
Patients with suspected TB should be isolated from other patients	110	98.2	2	1.8	.98±.13
The total mean of knowledge					**17.46±2.33**

Table 3: Distribution of practice on TB infection control (N=112)

Variables	Never		Sometimes		Always		Mean±SD
	N	%	N	%	N	%	
I usually wear N95 respirator when caring for patient with TB infection or and working on TB samples	3	2.7	36	32.1	73	65.2	2.63±.53
I request sputum tests for a patient when I suspect active TB	3	2.7	7	6.3	102	91.1	2.88±.39
I put the patient with active TB in the isolation room	4	3.6	12	10.7	96	85.7	2.82±.46
I open windows when possible in TB patient's room to increase natural ventilation	5	4.5	7	6.3	100	89.3	2.85±.46
I encourage the non TB patients to use mask when they go to X-ray center, pathology department etc.	3	2.7	28	25.0	81	72.3	2.70±.51
I instruct patient and attendant about respiratory hygiene and cough etiquette	1	.9	20	17.9	91	81.3	2.80±.42
Variables	Never		Sometimes		Always		Mean±SD
	N	%	N	%	N	%	
I use Personal Protective Equipment (PPE) during invasive procedure (eg- IT tube, aspiration, drainage)	5	4.5	14	12.5	93	83.0	2.79±.51
I provide sputum cup with lid to the patients	4	3.6	9	8.0	99	88.4	2.85±.44

I collect sputum specimen in well-ventilated area	7	6.3	17	15.2	88	78.6	2.72±.57
I discard all waste generated from a pulmonary tuberculosis patient in a closed bin	3	2.7	12	10.7	97	86.6	2.84±.43
I remove N95 mask appropriately (not touching the inner part) for reuse	6	5.4	25	22.3	81	72.3	2.67±.57
I find out the TB and MDR-TB patients admitted in the ward	2	1.8	9	8.0	101	90.2	2.88±.37
I ensure ventilation of my ward including nurses duty station	1	.9	9	8.0	102	91.1	2.90±.32
I ensure the infectious TB patients to always use a surgical mask	9	8.0	11	9.8	92	82.1	2.74±.59
I use the separate devices such as oxygen cannula/mask, micromist etc. for every individual patient	-	-	7	6.3	105	93.8	2.94±.24
I follow the sputum collection procedures and explain to the patients to follow them during sputum collection	-	-	5	4.5	107	95.5	2.96±.20
I explain to TB patients why it is important to keep windows open	1	.9	4	3.6	107	95.5	2.95±.26
The total mean of practice							**47.91±3.29**

Table 4: Relationship between socio- demographic characteristics and practice on TB infection control

Variable	Category	N	%	Mean± SD	F/t/r	P
Age in Years	23-34	41	36.6	2.84±.13	.316	.73
	35-45	54	48.2	2.81±.21		
	46-57	17	15.2	2.79±.23		
Gender	Male	9	8.0		2.36	-1.29
	Female	103	92.0			
Marital status	Single	7	6.25	2.78±.15	-.51	.60
	Other	105	93.75	2.88±.19		
Religion	Islam	83	74.11	2.81±.19	.129	.87
	Hindu	21	18.75	2.84±.20		
	Christian	8	7.14	2.81±.16		
Highest education level	Diploma	56	50.0	2.77±.22	3.94	.02
	BSN	27	24.11	2.88±.09		
	MPH/MSN	29	25.89	2.86±.18		
Family member infected TB	Self	3	2.68	2.63±.59	-1.746	.08
Family member infected TB	Self	3	2.68	2.63±.59	-1.746	.08
Length of service in year	< 11.36 Years	70	62.5	2.81±.17	-.458	.64
	> 11.36 Years	42	37.5	2.83±.21		
Working experience at TB hospital in year	< 9.17 Years	73	65.18	2.86±.20	-1.17	.24
	> 9.17 Years	39	34.82	2.85±.17		
Working ward	Medicine	20	17.9		.48	.69
	Surgery	41	36.6			
	MDR	26	23.2			
	ICU	25	22.3			
Training received on TB infection control	Yes	43	38.4		.79	.59
	No	69	61.6			
Knowledge					.317	.001

Practice on TB infection control among the nurses

The study demonstrated that the mean score of nurses practice on TB infection was 47.91 (SD =3.29), which ranged from 17-51 (Table 3). The results revealed that the participants had high level of practice (69.6%). However most of the participants (99.5%) "Follow the sputum collection procedures and explain to the patients to follow them during sputum collection" and "explain to TB patients why it is important to keep windows open". But 8% participants did not "ensure the infectious TB patients to always use a surgical mask".

The relationship between socio-demographic characteristics and practice of TB infection control among the participants were observed (Table 4). There is a significant relationship between knowledge and practice. The result showed that the mean score of knowledge was 17.46 (SD=2.33) out of maximum of 20 points which indicated low level of knowledge on TB infection control among the nurses. It also indicates that majority of nurses had a low to moderate level of knowledge on TB infection control. Another result showed that the mean of practice was 2.82 (SD= 0.19) out of maximum of 3 points. It means that nurses obtained higher level of practice regarding TB infection control.

DISCUSSION

The current study showed that maximum participants working experience in TB hospital is less than 10 years. These results were inconsistent with the prior study conducted in Malaysia, Nigeria, Pakistan and Ethiopia (Shrestha et al., 2017; Patrick & Akande, 2020; Muslim Shah, 2018; Gizaw et al., 2015).

The present study examined the level of knowledge and practice among nurses regarding tuberculosis infection control. This study found low level of knowledge. This finding is inconsistent with the previous study conducted in India, Malaysia, Pakistan and Nigeria those study results showed that majority of the participants had adequate knowledge regarding TB infection practice. (Ramlan et al., 2020; Shrestha et al., 2017; Muslim Shah, 2018; Gizaw et al., 2015). Result might be due to continuing education program on TB infection control. The good knowledge was also explained by the dissemination of guideline on prevention and management of tuberculosis for health care workers to healthcare facilities.

The results of the present study are quite consistent with the prior study in Ethiopia (Gizaw et al., 2015). In Ethiopia most of the participants had inadequate knowledge due to lack of training, less working experience.

Majority of the participants answered correctly toward the following items. 1) Pulmonary tuberculosis is a sexual transmitted disease. 2) Virus is a causative agent of tuberculosis. 3) An immunocompromised health care worker is at risk of acquiring tuberculosis infection. 4) Patients with suspected TB should be isolated from other patients. 5) Overcrowding is an environmental factor in tuberculosis infection. These results were differed for a previous study conducted in Ethiopia, Nigeria, South Africa and Southern Mozambique (Gizan et al., 2015; Ekuma &. Oridota, 2016; Engelbrecht et al., 2016; Noe et al., 2017). Those situations found mostly to high level of nurses' knowledge on TB infection control.

The practices of TB infection control in the present study is low, the mean score of practice was 47.91 (SD=3.29). Respondents have a low level of practice. This result is dissimilar with the study of Malaysia and North-West Ethiopia in which about 60% and 63.3% of the health care workers were reported to have a good practice of TB infection control, respectively (Farhanah et al., 2015; Temesgen & Demissie, 2014). However, if compared to the study in West Ethiopia, the percentage of good practice (38.0%) is much lower (Tamir et al., 2016).

There is significant relationship found between socio-demographic characteristics and practice of TB infection control. In this study, there was a significant relationship between higher education, length of service and practice. Nurses who had higher education and more working experience had a good practice to TB infection control. It indicted that participants who had higher

education degree had better infection control practice than those who had low education degree. Similar results were found the prior study conducted in Malaysia (Ramlan et al., 2020). In Malaysia a descriptive study was carried out to examine the level of knowledge and practice among the nurses on TB infection control. Result found that highly educated nurses had a good practice regarding TB infection control.

CONCLUSION

The study found that the level of knowledge and practice of tuberculosis infection was insufficient among the nurses. There was significant relationship between higher education and practice and between length of service and practice. TB infection control education program may be designed in hospital to increase the knowledge and practice level on TB infection. However, the present findings would contribute to develop strategy to enhance nurses' knowledge and practice on TB infection control. In-service training program may be developed to enhance the knowledge and practice among the nurses

Recommendations

Increase nurses knowledge and practice on TB infection control by proper education and training. Ensure sufficient PPE and a comfort accommodation for both patients and nurses. TB infection control program should be arranged in root and tertiary level. Further interventional study on TB infection control may be conducted among the nurses. The study findings act as baseline information for higher authority for initiation to improve the level of nurses' knowledge and practice regarding TB infection control in hospital.

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