

Knowledge and practice of formal physicians regarding control and prevention of TB in light of national guidelines

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List of acronyms

AOR	Adjusted Odds Ratio
CI	Confidence Interval
DOTS	Directly Observed Treatment, Short-course
GoB	Government of Bangladesh
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
NGO	Non-governmental Organization
NTP	National Tuberculosis Programme
PI	Principal Investigator
PPM	Public Private Mix
RED	Research and Evaluation Division
SPSS	Statistical Package for Social Science
TB	Tuberculosis
WHO	World Health Organization

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Abstract

The study explored the current knowledge and practice of interns and general physicians regarding control and prevention of tuberculosis in light of national guidelines. The study was conducted on 13 public and seven private medical college hospitals to collect information from intern physicians, and the general physicians who were practicing in a half kilometer radius of each medical college. A total of 1474 intern physicians and 539 general physicians participated in the study. It was a self-administered survey. About three-fourth of physicians (75%) had knowledge about community based TB control programme. However, Only 36% reported that they knew details about the programme. Despite majority (90-96%) had comprehensive knowledge on TB as a major public health problem in Bangladesh but, many of them (70%) did not express their intention to become involved in TB control. Because 92% did not know that the main vision of TB control programme (TB would no more as a public health problems). The knowledge score was constructed on 17 knowledge variables regarding basic and clinical aspects of TB. 61% of intern physicians had adequate knowledge (mean scores ≥ 10.82) unlike among general physicians where as it was 44%, ($p < 0.0001$). The logistic regression depicts that physicians were more likely to be knowledgeable when they were aware of national guidelines for TB control (AOR 2.16, 95% CI: 1.36, 3.44), when physician had access to more sources of TB information (AOR 1.43, 95% CI: 1.10, 2.36), more duration of TB information sharing (>6 hours) (AOR 3.10, 95% CI: 2.37, .07). We also found, male physicians were less knowledgeable than that of female physician (AOR 0.77, 95% CI: 0.63, 0.95). The majority of physicians treated TB suspects with antibiotics (40-6%), and only advised for further tests (39-44%). Majority of interns and general physicians did not follow the NTP guideline of three mandatory visits of patients to health facilities for follow up during treatment period. Still significant proportion of physicians (37-50%) did not refer TB patients and suspects for further investigations and services to the nearest DOTS corner. Majority would not ask for X-ray for further investigation when they got two negative results out of three sputum examinations. One-third of physicians (39%) perceived that medical curriculum was not sufficient for practicing TB (39%). A great majority of physicians (75%) confessed that they sought TB information beyond classroom. In conclusion, they seriously lacked knowledge regarding its clinical aspect of TB management in light of national guidelines. Most of them did not know the details activities of TB control programmes, and did not follow the national guidelines in managing TB patients. Activities of National TB programme should be visible more. Guidelines should be incorporated in the final year medical curriculum. Appropriate tools, protocols and customized training packages need to be developed for intern and general physicians.

Executive summary

Bangladesh is one of the highest TB burdened countries. World Health Organization (WHO) ranks Bangladesh 6th among 22 'high tuberculosis burden' countries. The overall sputum smear positive is estimated to be 79.4 per 100,000 adult populations and everyday 188 people die of TB in Bangladesh. The National TB Programme (NTP) of government of Bangladesh (GoB), in collaboration with different non-governmental organizations (NGO) implements the community-based TB control programme. Recently, under Public-Private Mix (PPM) approach the NTP focused on formal healthcare providers in Bangladesh. The quality of diagnosis and treatment of TB patients has been shown to be poor in several countries among the formal healthcare providers. Strong public-private partnership and collaborations across the health sector is needed to expand and improve the Directly Observed Treatment, Short Course (DOTS) services. According to WHO, the involvement of all health-care providers in tuberculosis (TB) control is recommended as an essential component of the Stop TB Strategy. Information about the knowledge and practice of physicians is a prerequisite to establishing a functioning Public Private Mix (PPM)-DOTS system. However, there was a lack of solid data on TB and its case management practice by physicians in Bangladesh. The purpose of the study is therefore to assess the knowledge and practice of interns (in hospital settings) and general physicians (in urban settings) towards control and prevention of TB in light of national guidelines. Intern physicians are the future practicing doctors in their society. It is also hoped that information obtained from this survey could serve as a basis for future physician education programs.

Methods

The study was conducted on 13 public and seven private medical college hospitals and data obtained from intern physicians (fresh graduate). In addition, the general physicians obtained in half kilometer radius of each medical college were also retained. To find out the general physicians we applied a mapping survey. Structured and semi-structured questionnaires were used to obtain information. A total of 1474 intern physicians and 539 general physicians participated in the study. It was a self-administered survey.

Findings

1. There was a gap between the mean age of intern (25 years) and general physician (35 years). Majority of interns (60%) and general physicians (74%) graduated from public medical colleges. Expectedly the median income was higher among general physician (Tk. 30,000) compared to intern physician (Tk. 10,000) (Table 1).
2. Three-fourth of physicians (74%) had knowledge about community based TB control programme (Annex 1). However, Only 36% reported that they knew the details activities of the programme. Despite they had comprehensive knowledge (90-96%) on TB as a major public health problem in Bangladesh (Table 2), however, 92% did not know the main vision of TB control programme (TB would no more as a public health problem) (Annex 1). We also found that many of physicians (70%) did not express their intention to become involved in TB control (Annex 2). A great majority of physicians (75%) confessed that they sought TB information beyond the class room and in professional practice (Annex 2). They also perceived that medical curriculum was not sufficient for practicing TB (39%) (Annex 1).
3. The basic knowledge like the main suggestive symptom of TB (prolonged cough) (83-85%), free policy of sputum test (90%), free TB medicine provision (89-91%),

standard duration of TB treatment (83-88%) and awareness of re-infection (88-89%) was highly comprehensive with few exceptions like main transmitting route of TB (air borne) (40-49%) (Table 2). Further, knowledge on sputum test as the most reliable means for detecting Pulmonary TB (70-74%), three consecutive sputum examinations required for detecting PTB (74-79%), knowledge about meaning of DOTS (65-73%), and knowledge on intensive and continuous phase in TB treatment (73-79%) was fair.

4. But, the clinical knowledge like the meaning of treatment failure (37-48%), treatment regimen for new case patients (19-27%), duration of 'continuous phase in retreatment cases' (20-34%), and knowledge of streptomycin medicine essential in 'intensive period of retreatment' (28-45%) was poor in light of national guidelines (Table 2).
5. The knowledge score was constructed on 17 knowledge variables on basic and clinical aspects of TB. 61% of intern physicians had adequate knowledge (mean score ≥ 10.82) unlike among general physicians where as it was 44% (Table 2). The logistic regression depicts (Table 4) that the physicians were more likely to be knowledgeable when they were aware of national guidelines for TB control (AOR 2.16, 95% CI: 1.36, 3.44), when physician had access to more sources of TB information (AOR 1.43, 95%CI: 1.10, 2.36), more duration of TB information sharing (>6 hours) (AOR 3.10, 95% CI: 2.37,.07). Further, male physicians were less knowledgeable than that of female physician (AOR 0.77, 95% CI: 0.63, 0.95).
6. The average TB patients in last one month they attended was higher among intern physician attended (3.5) than that of general physician (2.2) (Table 5). An insignificant proportion had initiated TB treatment (<2%). The majority of physicians treated TB suspects with antibiotics (40-6%), and only advised for further tests (39-44%). Majority of interns and general physicians (60-64%) did not follow the NTP guideline of three mandatory visits of patients to health facilities for follow up during treatment period. Still significant proportion of physicians (37-50%) did not refer TB patients and suspects for further investigations and services to the nearest DOTS corner. However, majority of physicians (86-87%) asked for taking sputum test when they suspected TB. Those who had knowledge on community-based TB programme, asked more for sputum test (90%) compared to those who did not have (78%), (AOR : 2.28, 95%CI:1.68, 3.10) (Table 6). Majority did not ask for X-rays for further investigations when they got two negative results out of three sputum examinations (Table 7). The length of duration of TB information sharing had positive impact on taking correct decision (asking for X-ray examination) (AOR 1.85, 95%CI: 1.42,2.41).

Conclusion

The less awareness of details activities of TB programme, lack of knowledge regarding clinical aspects of TB management, and insufficiency of curriculum for TB information were the main areas of weakness. On the other hand, less intention to become involved in TB control programme, irrational use of antibiotics in suspected cases, referring TB suspects to elsewhere rather having the nearest facility, and in some regards practice was not followed in light of national guidelines could act as threats for implementing effective TB control. However, the physicians were aware of national guidelines, sought information from different sources whenever they needed in professional life, and they understood the magnitude of TB problem in Bangladesh can be considered as an opportunity for NTP to work together for strengthening PPM approach. So there is an

enormous potential for improving TB control through strong partnership between the public-public and public-private. Physicians must be encouraged to improve knowledge in light of NTP guidelines for diagnosis and treatment. Guidelines should be incorporated in the final year medical curriculum. Appropriate tools, protocols and customized training packages need to be developed for intern and general physicians.

Programme Implications

1. Availability of a copy of the 'National guidelines for TB control' in every unit of medical college hospital should be ensured and intern physicians should be encouraged to follow the guidelines. Through the guidelines the physicians will be informed the detail activities of TB control programme.
2. Medical curriculum should be revisited and standard TB information should be incorporated into curriculum in final year in light of guidelines. Further studies are needed to assess the baseline knowledge of newly qualified doctors /final years students to determine the curriculum needs of medical colleges.
3. Distribution of guidelines among general physicians through implementing partners could be established and physicians should be motivated to follow it properly.
4. Various awareness programs like orientation, workshops, TB symposiums, TB debates must be arranged frequently so that every intern physician is aware of TB information in light of national guidelines before completing internship. The 'World TB Day' could be observed in every medical college, and intern physicians' participation can be ensured. The physicians should be introduced with the universal slogan "*joto din basbo, jokkha ke ukhbo*" to motivate to become involved in TB control programme.
5. Increase the activities of DOTS corner in medical college hospital and it must be visible. A mechanism of linking to intern physician should be developed.

Introduction

Over one-third of the global population are infected with *Mycobacterium tuberculosis* (TB) (WHO 2008), and they may turn into active TB cases at any time of their life cycle. Despite the availability of affordable and effective treatments, there were 8.8 million new cases of TB and an estimated 1.1 million deaths from TB globally (WHO 2011). In fact, the increase in the incidence of TB in developing countries and its re-emergence in the developed world had led the World Health Organization (WHO) to declare TB as a 'Global emergency' in 1993. Bangladesh is one of the highest TB burden countries. WHO ranks Bangladesh 6th among the 22 'high TB burden' countries (WHO 2009, WHO 2010). The overall sputum smear positive is estimated at 79.4 per 100,000 adult populations in Bangladesh (WHO 2010). Everyday around 188 people die of TB here (WHO 2012).

The National TB programme of government of Bangladesh (GoB), in collaboration with different non-governmental organizations (NGO) including BRAC (one of the largest NGOs in the world), is implementing a community-based TB control programme using the Directly Observed Treatment Short-course (DOTS) strategy over the country with 100% coverage of country areas (NTP 2005). Bangladesh has achieved the WHO set criteria (70% case detection rate and 85% treatment success) in recent years (BRAC 2012).

Ensuring better management, according to WHO, the involvement of all health-care providers in tuberculosis (TB) control is recommended as an essential component of the Stop TB Strategy (WHO 2010, stop TB). Strong partnership between public and private and collaborations across the health sector (both private and public) is needed to expand and improve the DOTS services. Awareness of DOTS is very essential among all kinds of providers in all level of healthcare sectors (including private and public) to sustain the achievement in controlling TB. The breadth of knowledge among the physicians about the diagnosis and treatment has been identified as the cornerstone in effective control of TB, as a major proportion of the population consults doctors in the private sector initially (Khan and Malik 2003). Studies conducted in many high prevalent settings had clearly shown that the knowledge and practices among many general and family physicians do not conform to WHO guidelines or expectations (Hong *et al.* 1995). A recent study in Baltimore, for example, showed that private physicians were significantly more likely to make errors in treating patients with active TB than health department providers (Rao *et al.* 2000). It is equally important for all health care personnel to be conversant and equipped with several basic aspects of tuberculosis. The provider's lack of knowledge led to incorrect advice being given to patients (Dador 2008). Provider's inadequate skills, and their non conformity to TB guidelines, also affected quality of services (Sanchez-Perez, Reyes-Guillen *et al.* 2008). In addition, providers' positive attitudes towards patients and to service provision contributed to completion of treatment (Jill Alison 2007). The significant TB suspects in Bangladesh are not properly diagnosed in informal private sector (Islam *et al.* 2009).

The Bangladesh National Control Programme showed considerable interest in exploring policy options to address this problem. Consequently, the NTP and Non-Governmental Organization (NGO) partners developed a public-private mix (PPM) model or effective involvement of medical practitioners in TB control. One of the components of PPM approach, the TB orientation programme has been started recently for healthcare providers in medical college hospitals and practicing physicians. Yet to be covered all medical colleges including intern physicians and practicing physicians over the county. So that intern physicians as well as practicing physicians will be able to play an important role in

referring TB patients to appropriate places for proper TB treatment. It is the foremost requirement that the clinicians should be aware of the basic concepts and modification in the guidelines and recent advances/expansions of the programme.

Rationale

Medical interns and general physicians are at the front line with regards to the diagnosis of TB. Appropriate knowledge and practice among the providers is crucial for early diagnosis, treatment and follow up of TB cases. This is pivotal component for a successful TB control program and prevention of drug resistance. Therefore, skillful and adequately trained providers would facilitate identifying TB cases. A lack of awareness of national TB control guidelines, and the educational background of private practitioners affect the standard management of TB patients. Nevertheless, there is limited data about current knowledge and practice of TB among intern doctors and general physicians in light of national guidelines for TB control. Information about the knowledge and practice of physicians is a prerequisite to establishing a functioning PPM-DOTS system. It is also hoped that information obtained from this survey could serve as a basis for future physician education and programmes.

General objective

To explore the knowledge and practice of formal physicians regarding control and prevention of TB in light of national TB guidelines.

Specific object

- to explore the knowledge and awareness of national TB programme and national guidelines for TB control
- to investigate both basic and clinical aspect of TB knowledge and its associated factors
- to investigate the current practice towards TB
- and to recommends for the ways of strengthening PPM

Methods

Settings

This cross-sectional survey was mainly an institutional based survey conducted in 13 public and seven private medical colleges across major cities in Bangladesh. These medical colleges have facilities for diagnosis of TB and treatment through DOTS corners. The activities of DOTS corner was run by BRAC in these medical colleges. The intern doctors (fresh graduate and main frontline health providers) of these medical colleges play an important role in referring TB suspects and patients to the nearest DOTS corner. The study also included the general physicians who were practicing neighborhood chambers of medical colleges within half km. A general practitioner or physician is a medical practitioner who treats acute and chronic illnesses and provides preventive care and health education to patients.

Sampling size, sampling and population

Initially, the list of intern doctors was collected from each individual medical college. A total of 2,650 intern physicians were requested to participate in the study as volunteers through head of medical college authority. In response to request, 60% (1474/2450) participated in the study. Again, we went to 598 general physicians (they were practicing in half kilometer radius of each medical college) of whom 539 actively participated. The response rate was 88%.

Tools development

The standardized questionnaires (structured and semi-structured) were developed for collecting information from interns and general physicians. All the questionnaires were pre-tested among intern and general physicians outside our sample for ascertaining consistency, appropriateness of languages, sequencing of questions, and to have an insight into the field operation procedures. The final questionnaire was modified and updated on the basis of results of field-testing. We collected information on the following variables:

- a. Background of providers
- b. knowledge on national TB programme and guidelines,
- c. basic knowledge as well as clinical aspect of TB diagnosis and treatment in light of national guidelines,
- d. practices related to TB management

Data collection

An official written permission was taken before starting data collection in each medical college. Before data collection, all intern doctors were requested by higher authority to attend a classroom on a specific date for answering the questions on questionnaires. It was totally voluntary. Around 60% of interns presented on requested date. Before collecting data, a brief lecture was given explaining the purpose and objectives of the survey. They agreed to provide information. The Data collection technique was self-administered and they were requested to answer the questions without discussing with each other. Data privacy and showing was maintained strictly. Skilled interviewers were recruited and a three-day intensive training was given to conduct the session. Research investigators were present during the sessions. All participants were allowed 45 minutes to answer the

questionnaires. A mapping survey was done to list of general physician who were practicing in half kilometer radius of each medical college. They were briefed regarding the purpose and objective of the study. We provided them with questionnaires and returned the questionnaires on the same day.

Data analysis

Data entry and cleaning was done at the Dhaka head office under the supervision of the principal investigator. The data analysis was done using SPSS (version 16.0). Mean was used for measuring age, knowledge scores, etc. Univariate (frequency), bi-variate (cross-tabulation) and multi-variate (logistic regression) analyses were done. Multiple responses were considered during analysis. TB knowledge was determined by a score based on the answers given to questions. One point was given for the question if the responses were completely correct. Chi-square and logistic regressions with corresponding 95% confidence intervals were calculated to assess statistical significance of the results obtained. All statistical significance tests were 2-sided.

Ethical considerations and confidentiality

All participants to this survey are voluntary. The informed consent was taken from each participant after explaining the objectives of the survey by the investigators. All answered questionnaires were kept securely with access only to principal investigators. Name and other specific particulars of the participants , which will lead to their identification, were not included in the survey.

Results

There was a significant gap between the mean age of intern (25 years) and general physician (35 years). Both intern and general physicians graduated from public medical colleges with more prevalently general physicians (74% vs. 60%). Median income was higher among general physician (Tk. 30000) compared to intern physicians (Tk. 10000).

Table 1. Basic characteristics of physician by types (%)

	Intern physician			General physician		
	Male	Female	All	Male	Female	All
Mean age, years ($\pm$ SD)	25.4 (2.25)	24.9 (1.03)	25.2 (1.79)	35.4 (9.23)	31.3 (5.80)	34.5 (8.73)
Nature of medical college						
Government	63.8	55.3	59.7	75.3	71.6	74.4
Non-government	36.2	44.7	40.3	24.7	28.4	25.6
Median income (in Tk.)	10,000	10,000	10,000	30,000	30,000	30,000
N	770	704	1474	405	134	539

A vast majority of interns (96%) and practicing physicians (90%) were aware of TB as a major public health problem in Bangladesh (Table 2). However, a very small proportion (22-26%) knew that Bangladesh attained sixth position among 22 high TB burden countries. Knowledge about the main suggestive symptom of TB (prolonged cough) (83-85%), free policy of sputum test (90%) and TB treatment (89-91%), standard duration of TB treatment (83-88%) and re-infection (88-89%) were comprehensive except main transmitting route of TB (air borne) (40-49%).

Further, the knowledge on sputum test as most reliable for detecting PTB (70-74%), three consecutive sputum examinations required for detecting PTB (74-79%), intensive and continuous phase of TB treatment in DOTS (73-79%) were fair (Table 2).

However, the knowledge about the meaning of treatment failure (37-48%), about the treatment regimen for new cases patients (19-27%), five months for 'continuous phase' in retreatment cases (20-34%), streptomycin as additional drugs in 'intensive period of retreatment' (28-45%) was poor (Table 2).

The mean knowledge score was differed by intern (11) and general physicians (10) ($p < 0.0001$). 61% of intern physicians had adequate knowledge (mean score ≥ 10.82) where as it was 44% among general physicians (Table 2).

Table 2. Basic knowledge of TB by intern and practicing physicians (%)

Knowledge variables	Intern physician			Practicing physician			Chi (95%CI) C vs. f	p-value
	Male a	Female b	All c	Male d	Female e	All f		
Aware of TB as a public health problem in Bangladesh [1]	95.7	97.2	96.4	88.6	92.5	89.6	35.9,35.5	0.0001
Knew about the six position of Bangladesh among 22 TB burdened countries [2]	22.6	28.8	25.6	23.0	20.1	22.3	0.3, 20.2	0.129
Aware of NTP guidelines for TB control	94.5	93.9	94.2	91.6	90.3	91.3	1.4,32.4	0.034
Knew about the meaning of DOTS*	73.2	73.4	73.3	64.2	66.4	64.7	24.2,32.2	0.0001
Knew about the main suggestive symptom of PTB (prolonged cough)[3]	84.5	84.8	84.7	83.7	81.3	83.1	0.0,13.3	0.725
Knew about the main transmitting route (air borne) of TB [4]	50.3	46.7	48.5	38.5	44.8	40.1	10.8,11.9	0.001
Knew about free policy of sputum test [5]	89.6	93.0	91.3	89.9	90.3	90.0	0.1,7.0	0.379
Knew about the most reliable test for detecting PTB** (sputum test) [6]	68.8	72.1	70.4	74.8	72.4	74.2	0.4,19.2	0.091
Knew about three consecutive sputum tests required for detecting PTB [7]	94.5	96.9	94.2	91.6	90.3	91.3	1.4,31.5	0.034
Knew about free policy of TB treatment [8]	76.9	81.8	79.3	74.6	70.1	73.5	6.0,9.7	0.006
Knew about the standard duration (six months) of TB treatment for new cases [9]	88.4	89.8	89.1	90.6	93.3	91.3	0.2,19.0	0.152
Aware of re-infection [10]	88.7	86.8	87.8	82.0	85.1	82.7	7.6,9.8	0.003
Knew about the meaning of treatment failure [11]	87.7	91.1	89.3	87.9	88.1	87.9	0.0,12.9	0.394
Knew about two phases (intensive and continuous phase) in DOTS [12]	41.1	48.5	48.3	34.8	44.8	37.3	19.1,19.3	0.0001
	77.4	80.0	78.6	71.4	79.1	73.3	6.2,6.7	0.011

(Table 2 continued----)

(-----continued Table 2)

Knew about the correct regimen for new cases in intensive phases [13]	27.1	27.0	27.1	17.5	22.4	18.7	14.5,14.7	0.0001
Knew about five months for continuous phase in retreatment cases [14]	32.1	37.0	34.4	17.3	28.4	20.0	38.2,38.8	0.0001
Knew about the resistance to isoniazide and rifampicine (multi-drug resistance) [15]	64.7	67.9	66.2	47.7	44.0	46.8	62.5,63.5	0.0001
Knew that TB suspects would be patients (when at least two sputum tests became positive) [16]	47.8	48.2	48.0	48.1	48.5	49.0	1.0,1.0	0.697
Knowledge about streptomycine as additional drugs in intensive period of retreatment [17]	45.3	45.1	45.2	24.4	36.6	27.5	51.3,52.1	0.0001
Mean knowledge scores	10.9	11.3	11.1	9.9	10.5	10.1	2.7,20.5	***0.0001
Adequate knowledge (mean ≥ 10.8203)	60.1	61.8	60.9	40.7	53.7	44.0	45.9,46.7	0.0001
N	770	705	1475	405	134	539		

*Directly Observed Treatment< Short Course, **Pulmonary Tuberculosis, ***t-test

In overall knowledge was significantly higher when who were aware of national TB guidelines (58%)(Table 3). Adequate knowledge was observed among those who received TB lecture (59%), who were female physicians (61%), who received TB information through orientation and conference(65-69%), when the duration of TB information sharing was > 6 hours (75%), and when someone had access to more number of TB information sources (71%). There was a significant knowledge gap between interns (61%) and general physicians (44%).

Table 3. Knowledge scores of physicians by different variables (%)

	Knowledge scores*		All	Chi (95%)	p-value
	Inadequate	Adequate			
All	43.6	56.4	2015		
Received TB information					
Yes	42.4	57.6	1862	11.0,12.1	0.001
No	58.2	48.8	153		
Way of TB information receiving					
Lecture	41.1	58.9	1444	2.3,11.1	0.024
Seminar	39.8	60.2	1095	5.9,9.7	0.006
Orientation	35.1	64.9	239	3.6,9.9	0.014
Conference	30.6	69.4	291	18.7,21.1	0.001

(Table 3 continued-----)

(---continued Table 3)

Number of TB information ways					
Four	28.8	71.2	73		
Three	31.0	69.0	174	20.2,43.7	0.0001
Two	38.5	61.5	654		
One	47.7	52.3	947		
Total duration of TB information					
More than 6 hours	25.2	74.8	528		
5-6 hours	38.6	61.4	176	22.4, 37.3	0.0001
3-4 hours	45.3	54.7	499		
1-2 hours	55.2	44.8	660		
Sex					
Male	46.6	53.4	1176	9.7,10.7	0.001
Female	39.5	60.5	839		
Types of physician					
Intern	39.0	61.0	1474	46.1,46.9	0.0001
Practicing	56.0	44.0	539		
Heard about national guidelines					
Yes	41.6	58.4	1882	46.8,47.6	0.0001
No	72.2	27.8	133		
Saw the guideline					
Yes	40.8	59.2	1584	24.1,24.5	0.0001
No	54.1	45.9	431		
Had knowledge about community-based TB programmes					
Yes	41.8	58.2	1487	5.8,9.4	0.006
No	48.7	51.3	528		

The logistic regression depicts (Table 4) that they were more likely to be knowledgeable when they were aware of national guidelines for TB control (AOR 2.16, 95% CI: 1.36, 3.44), when physician had access to four sources of TB information (AOR 1.43, 95%CI: 1.10, 2.36), more duration of TB information sharing (>6 hours) (AOR 3.10, 95% CI: 2.37,.07), and intern physicians (AOR 1.76, 95% CI: 1.41, 2.21). Further, male physicians were less knowledgeable than that of female physician (AOR 0.77, 95% CI: 0.63, 0.95).

Table 4. Factors associated with adequate knowledge scores among Physician

	Crude OR	95% (CI)	Adjusted OR	95% CI
Received TB information				
Yes	1.86	1.33,2.60	1.72	1.65,1.83*
No	ref		ref	
Way of TB information receiving				
lecture				
Yes	1.29	1.03,1.60	1.05	0.77,1.44
No	ref		ref	
Seminar				
Yes	1.30	1.10,1.70	0.92	0.68,1.24
No	ref		ref	

(Table 4 continued----

(---continued Table 4)

Orientation				
Yes	1.42	1.10, 1.89	1.18	0.85,1.62
No	ref		ref	
Conference				
Yes	1.83	1.40, 2.39	1.23	0.90,1.68
No	ref		ref	
Number of ways				
Four	2.26	1.34,3.81	1.43	1.10, 2.36*
Three	2.02	1.43,2.86	1.33	0.81,2.19
Two	1.46	1.19,1.78	1.27	0.93,1.74
One	ref		ref	
Total duration				
More than 6 hours	3.70	2.85, 4.70	3.10	2.37,4.07*
5-6 hours	1.95	1.40,2.71	1.75	1.23,2.49*
3-4 hours	1.49	1.20,1.90	1.37	1.10,1.75*
1-2 hours	ref		ref	
Sex				
Male	0.75	0.62,0.89	0.77	0.63,0.95*
Female	ref		ref	
Types of physician				
Intern	1.99	1.63,2.43	1.76	1.41,2.21*
Practicing	ref		ref	
Aware of national guidelines for TB control				
Yes	3.64	2.47,5.38	2.16	1.36,3.44*
No	ref		ref	
Heard about community-based BRAC TB programmes				
Yes	1.32	1.1,1.61	1.29	1.02, 1.62*
No	ref		ref	

*significance at 5% level

Practice towards TB by physician

Intern physician consulted more TB patients (3.5) than general physician (2.2) (Table 5). An insignificant proportion had initiated TB treatment (<2%). The majority of physicians treated TB suspects with antibiotics (40-6%), and only advised for further tests (39-44%). Majority of interns and general physicians (60-64%) did not follow the NTP guideline of three mandatory visits of patients to health facilities for follow up during treatment period. Still significant proportion of physicians (37-50%) did not refer TB patients and suspects for further investigations and services to the nearest DOTS corner.

Table 5. Practice of physician towards tuberculosis (%)

Practice variables	Intern physician			Practicing physician			Chi (95%CI) C vs. f	p-value*
	Male a	Female b	All c	Male d	Female e	All f		
Average TB patient attended in last month (in number)	3.5 (4.64)	3.4 (4.32)	3.5 (4.5)	2.3(4.20)	1.9 (3.12)	2.2 (3.96)	2.4,14.8	0.0001
Treatment initiated	0.6	2.5	0.9	1.1	1.5	2.2	3.3, 6.7	0.016
You usually refer TB patients and TB suspects patients for further seeking care								
National Chest Hospital	29.5	26.8	28.2	38.5	26.9	35.6	9.8,10.8	0.001
Divisional hospital	11.4	10.2	10.9	10.4	9.0	10.0		0.59
District hospital	13.9	15.1	14.5	32.3	23.1	30.0	62.6,63.6	0.0001
Nearest DOTS	63.4	65.5	64.4	45.4	64.2	50.1	33.5,33.9	0.0001
You usually asked TB patients for following up during treatment period								
Two times	10.0	12.8	11.3	9.4	11.2	9.8	6.2,25.3	0.014
Three times	36.8	36.1	36.4	39.8	41.8	40.3		
Four times	7.7	8.8	8.2	9.4	8.2	9.1		
Every month	19.9	20.5	20.1	14.1	13.4	13.9		
No comment	25.7	21.9	23.9	27.4	25.4	26.9		
Nature of treatment with TB patients and suspects								
Treated with antibiotics for cough	9.7	11.6	10.7	7.7	6.6	7.4	1.8,12.3	0.031
Treated with antibiotics and advised for test	46.4	44.7	45.6	40.0	38.8	39.7	2.8,11.1	0.02
Only advised for further test	38.2	40.3	39.2	44.4	43.3	44.2	1.1,13.9	0.045
No answer	11.6	10.1	10.9	10.9	14.9	11.9	0.86,3.2	0.523
N	770	705	1475	405	134	539		

However, majority of physicians (86-87%) asked for taking sputum test when they suspected TB. Those who had knowledge on community-based TB programme, asked more for sputum test (90%) compared to those who did not have (78%), (AOR : 2.28, 95%CI:1.68, 3.10) (Table 6). Majority (36%) did not ask for X-rays when they got negative results in two sputum examinations (Table 7). The length of duration of TB information sharing had positive impact on asking for X-rays (appropriate decision) (AOR 1.85, 95%CI: 1.42,2.41).

Table 6. Factors associated with prescribing sputum test for TB diagnosis

Variables	Sputum test for TB diagnosis			
	Prescribed	Not prescribed	Crude OR (95% CI)	Adjusted OR (95% CI)
Received TB information	87.6 (1632)	12.4 (231)	2.03 (1.34,3.05)	1.89 (1.25, 2.88)*
Yes	77.6 (118)	22.4 (34)	ref	
No				
Ways of TB information receiving				
Lecture : Yes	89.5 (1292)	10.5 (152)	1.97 (1.47,2.65)	1.65 (1.02,2.67)*
No	81.1 (340)	18.9 (79)	ref	ref
Seminar: Yes	88.8 (972)	11.2 (123)	1.29 (0.98,1.71)	0.99 (0.62,1.58)
No	85.9 (660)	14.1 (108)	ref	ref
Orientation: Yes	89.5 (214)	10.8 (25)	1.24 (0.80, 1.92)	1.06 (0.65,1.76)
No	87.3 (1418)	12.7 (206)	ref	ref
Conference: Yes	92.4 (269)	7.6 (22)	1.87(1.18,2.96)	1.44 (0.86,2.39)
No	86.7 (1363)	13.3 (209)	ref	ref
Number of ways				
Four	93.2 (68)	6.8 (5)	2.51 (0.99,6.35)	1.32 (0.93, 1.25)
Three	92.0 (160)	8.0 (14)	2.11 (1.19,3.75)	1.02 (0.44,2.37)
Two	91.4 (598)	8.6 (56)	1.97 (1.43,2.74)	1.38 (0.84,2.28)
One	84.4 (799)	15.6 (148)	ref	ref
Duration of TB information sharing				
More than 6 hours	91.7 (484)	8.3 (44)	2.13 (1.47,3.10)	1.94 (1.29,2.92)*
5-6 hours	92.0 (162)	8.0 (16)	2.24 (1.25,4.01)	2.21 (1.19, 3.97)*
3-4 hours	86.8 (433)	13.2 (66)	1.27 (0.91,1.76)	1.16 (0.82,1.66)
1-2 hours	83.8 (553)	16.2 (107)	ref	ref
Sex				
Male	87.1 (1024)	12.9 (152)	1.04 (0.80, 1.36)	1.00 (0.74,1.35)
Female	86.5 (726)	13.5 (113)	ref	ref
Types of Physician				
Intern	87.2 (1285)	12.8 (189)	1.10 (0.82,1.47)	0.95 (0.68,1.32)
Practicing	86.1 (464)	13.9 (75)	ref	ref
Heard about national guidelines				
Yes	88.2 (1659)	11.8 (223)	3.43 (2.32,501)	1.56 (0.90, 2.5)
No	68.4 (91)	31.6 (42)	ref	ref
Had knowledge about community-based TB programmes				
Yes	90.1 (1340)	9.9 (147)	2.62 (2.01, 3.42)	2.28 (1.68,3.10)*
No	77.7 (410)	22.3 (118)	ref	ref

*5% level of significance

Table 7. Factors associated with taking decision for X-ray for further investigation when two sputum tests negative

Variables	X-ray for further investigation if to sputum test negative			
	Appropriate Decision	Not appropriate Decision	Crude OR (95% CI)	Adjusted OR (95% CI)
Received TB information				
Yes	64.6 (1203)	35.4 (660)	1.33 (0.94,1.84)	1.16 (0.86,1.66)
No	57.9 (88)	42.1(64)	ref	
Way of TB information receiving				
Lecture: Yes	66.8 (965)	33.2(479)	1.53(1.23,1.91)	1.40 (1.04,1.89)*
No	56.8 (238)	43.2 (181)	ref	ref
Seminar: Yes	65.7 (719)	34.3 (376)	1.12 (0.92,1.36)	0.94 (0.71, 1.25)
No	63.0 (484)	37.0(284)	ref	ref
Orientation: Yes	67.4(161)	32.6(78)	1.15(0.86,1.53)	1.06 (078,1.45)
No	64.2(1042)	35.8(582)	ref	ref
Conference: Yes	64.3 (187)	35.7 (104)	1.10 (0.74,1.23)	0.74 (0.55, 0.99)
No	64.6 (1016)	35.4 (556)	ref	re
Number of ways				
Four	64.4 (47)	35.6 (26)	1.11 (0.68, 1.83)	0.97 (0.57, 1.63)
Three	71.8 (125)	28.2 (49)	1.58 (1.11, 2.25)	1.37 (0.8, 2.11)
Two	67.6 (442)	32.4 (212)	1.29 (1.05,1.59)	1.08 (0.80,1.45)
One	61.8 (585)	38.2 (362)	ref	ref
Duration of lectures				
More than 6 hours	70.1(370)	29.9 (158)	1.78 (1.39,2.26)	1.85 (1.42,2.41)*
5-6 hours	70.5 (124)	29.5 (52)	1.81 (1.26,2.60)	1.99 (1.37,2.89)*
3-4 hours	66.9 (334)	33.1(165)	1.54(1.21,1.956)	1.57 (1.22, 2.01)*
1-2 hours	56.8 (375)	43.2 (285)	ref	ref
Sex				
Male	62.8 (738)	37.2 (438)	0.87 (0.72,1.04)	0.84 (0.69, 1.03)
Female	65.9 (553)	34.1 (286)	ref	ref
Types of physician				
Intern	64.2(946)	35.8(528)	1.00(0.82,1.23)	0.88 (0.70, 1.11)
Practicing	64.0(345)	36.0 (194)	ref	ref
Awareness of national guidelines				
Yes	65.0(1224)	35.0(658)	1.83(1.29,2.61)	1.33 (0.86,2.0)
No	50.4 (67)	49.6 (66.0)	ref	ref
Had knowledge about community-based TB programmes				
Yes	65.3(971)	34.7 (516)	1.22 (0.99,1.50)	1.22 (0.97,1.53)
No	60.6 (320)	39.4 (208)	ref	ref

Discussion

In Bangladesh, the role of formal physicians in tuberculosis control has been taken with great emphasis as increasing number of patients are being managed public and private settings. Information about the knowledge and practice of physicians is a prerequisite to establishing a functioning Public Private Mix DOTS system (PPMDS). This study explored about the current situation of knowledge and practice towards TB among interns and general physician in light of national guidelines for TB control, and tried to discern weak areas, and food for thought for strengthening PPM approach. TB information obtained from this survey could also serve as a basis for future physician education and training programs. Both type of providers had good basic knowledge about TB but, they seriously lacked knowledge regarding its clinical management aspects. Many of them referred patients to distance facilities despite having nearby DOTS corner. The physicians treated TB suspects and patients with antibiotics. In some regards they also did not follow the national guidelines while managing TB. Though they understood the magnitude of TB problem in Bangladesh, however, the formal doctors did not express their intention to become involved in TB control. Longer duration of sharing information on TB (through lecture, orientation, conference, etc.), and awareness of national guidelines for TB control had positive impact on increasing knowledge and appropriate practice towards TB. The implications of findings are discussed below.

The study found that physicians lacked knowledge about the detail activities of community based TB programme, they also lacked about the main vision of the national TB programme and physicians did not express their intention to be involved in TB control. All indicate that there is a huge gap between NTP and healthcare providers both in private and public settings in Bangladesh. This can be a barrier for developing an effective PPM model. However, successful engagement of academics and clinicians in TB programme might eventually facilitate increased case detection and decreased discontinuation of treatment.

Our study physicians had to seek TB information beyond class room in practical life. This indicates the current medical curriculum is not sufficient for TB control. Improvement of medical curriculum in light of national guidelines is the top priority of NTP. In addition, the national guidelines could be distributed among the intern physicians through proper channels and among general physicians through implementing partners.

Surprisingly, the physicians had limited knowledge on TB as being an air-borne disease. The situation was the worst among the general physician. Though such limitation was observed among general population (ref), however, it was not expected among formal physicians. This indicates they would not be able to provide proper guidance to patients for preventing TB germ in community.

Knowledge on standard duration of TB treatment, about the main suggestive symptom of TB, free policy of sputum test and free TB medicine provision, was very comprehensive. Similar knowledge was to be found among the general population in Bangladesh (Ahsan *et al.* 2004). Such basic information is the main component of IEC (Information Education and Communication) and these always being delivered on mass media as continuous basis. Such campaign could play an important role for improving basic aspect of TB information.

However, knowledge on the meaning of treatment failure, treatment regimen for new cases patients, duration of continuous phase in retreatment cases and knowledge of streptomycin medicine in intensive period of retreatment was poor. The reason for such a poor response could be because of non-acquaintance of the clinician with the national TB treatment guidelines. Actually, TB treatment is initiated in hospital by DOTS Corner under the national guidelines (Khan and Islam 2010), and NGOs' physicians are in community level though community-based TB control programme. However, the lack of knowledge is a serious concern because if the clinicians practice in a private set-up, it will seriously reflect in terms of outcomes (rise in number of defaulter/treatment failure, emergence of drug resistance) of the disease.

Overall knowledge among intern physician was better than that of general physician. Since they were graduated freshly and they had access to current TB information through seminar, lecture, and orientation, from their teacher (in academic environment). The study also found that the longer duration of lecture, seminar, orientation, etc. was related to perceiving more knowledge. The general physicians have limited access to TB information. In India, it was also observed that doctors in public sector had better knowledge than private sectors (Vandan 2009). NTP thus should focus on general physician with great emphasis for effective TB control.

Very insignificant number of physicians prescribed TB medicines or started TB treatment in the study. This is a good sign for NTP. Many physicians in developing countries started TB treatment without following guidelines (Shah *et al.* 2003, Khan *et al.* 2003). The study found that many of them were not aware of correct regimen. This is very common in other countries among formal physicians (Yimer *et al.* 2012). Further, significant providers did not refer TB patients and suspects for further seeking to the nearest DOTS corner rather seeming they referred to distant facilities. This can delay the diagnosis and harass the patients. A lack of awareness about DOTS corner among general physicians may be common. When they left medical college, that time, DOTS corners were not established (Khan and Islam 2010). However, the activities of DOTS corner should be visible more in hospital and among general physicians.

The majority TB patients and suspects were treated with antibiotics by physicians while attending them. Use of anti-biotic is very common practice (Ahmed and Islam 2012). The antibiotics should be used rationally in TB patients. If physician does not have adequate knowledge on antibiotics, there is chance to produce adverse reaction of TB medicines. Even, it masks the TB symptoms for a while in TB suspects and hampers the diagnosis of TB. The majority of interns and general physicians did not follow the NTP guideline of three compulsory visits to health facilities for follow up during treatment period. So there is chance to losing patients and information about the true outcomes of treatment the outcomes of treatment. We found that referring TB suspects for sputum test was very common practice among both general and intern physicians. We also found that awareness of national guidelines for TB control, and community-based TB programme influenced more to refer for sputum test. However, the study explored that majority of physicians could not take appropriate decisions (should go for X-ray further) when they got negative results in two sputum examinations. This indicates there is gap between national guidelines and practice. This shortage of knowledge could hamper the proper diagnosis as well as effective TB control.

Though our physicians had knowledge about the national guidelines, but they did not have adequate knowledge and practice towards TB in light of guidelines. In Pakistan, the physicians had no knowledge about guidelines and the practice wrongly (Shah *et al.* 2003). May be, our physicians could not understand the importance of national guidelines for TB control.

The main limitation of this study is that the responses of the providers were not validated by observations of their practice pattern.

The less awareness of details activities of TB programme, lack of knowledge regarding clinical aspects of TB management, and insufficiency of curriculum for TB information were the main areas of weakness. On the other hand, less intention to become involved in TB control programme, irrational use of antibiotics in suspected cases, referring TB suspects to elsewhere rather having the nearest facility, and in some regards practice was not followed in light of national guidelines could act as threats for implementing effective TB control. However, the physicians were aware of national guidelines, sought information from different sources whenever they needed in professional life, and they understood the magnitude of TB problem in Bangladesh can be considered as an opportunity for NTP to work together for strengthening PPM approach. So there is an enormous potential for improving TB control through strong partnership between the public-public and public-private. Physicians must be encouraged to improve knowledge in light of NTP guidelines for diagnosis and treatment. Guidelines should be incorporated in the final year medical curriculum. Appropriate tools, protocols and customized training packages need to be developed for intern and general physicians.

Programme Implications

The 'National guidelines for TB control' must be available in every unit of respective medical colleges. This is to ensure that every intern physician has access to the national guidelines when they need. The smooth distribution of guidelines among general physicians through implementing partners could be established and physicians should be motivated to adhere to it. Medical curriculum should be revisited; revised and standard TB information and knowledge practices should be incorporated into final year curriculum in light of guidelines. Various awareness programs like orientation, workshops, TB symposiums, TB debates must be arranged frequently so that every intern physician is aware of TB information in light of national guidelines before completing internship. The 'World TB Day' could be observed in various medical colleges, and intern physicians' participation could be ensured. A gradual increase in the activities of DOTS corner in medical college hospitals must be projected more and their portfolio of activities should be made visible. A mechanism of linking to intern physician should also be developed.

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Annex

Table 1. Knowledge about National guidelines and TB control programme by intern and general physicians (%)

	Intern physician	General physician	All	95% CI	P-value
Awareness of National guidelines for TB control	94.2	91.3	93.4	1.4,33.2	0.034
Vision of National TB control (TB would no more as a public health problem)	7.3	8.5	7.6	0.4,1.7	0.365
Knowledge about community based TB programme	73.3	75.3	73.8	0.3,2.8	0.649
Knowledge about details of the programme	35.1	39.5	36.3	0.56,3.9	0.069
Current medical college curriculum is not sufficient for TB management	37.7	41.4	38.7	0.5,9.3	0.133
N	174	539	2015		

Table2. Attitudes towards TB by intern and general physicians (%)

	Intern Physician	General Physician	All	95%CI	P-value
Had to Seek additional information on TB beyond the class room	73.1	78.5	74.5	0.5,3.2	0.08
Provided no answer regarding their intention to become involved in TB control	69.8	71.6	70.3	0.1,5.9	0.438
N	1474	539	2015		

Table 3. Perceived barriers towards TB and most useful media for building awareness of TB by intern and general physicians (%)

	Intern physician	General Physician	All	95% CI	p-value
Barriers to TB control programme					
Lack of Knowledge about TB	74.5	66.4	72.5	12.2,15.2	0.0001
People are afraid of TB	46.7	52.9	48.4	2.4,15.1	0.014
Fear of social isolation	36.9	27.5	34.4	13.8,17.5	0.0001
Most useful media for building awareness					
Television	79.1	81.8	79.8	0.5,6.7	0.171
Radio	29.1	36.9	31.2	8.1,15.7	0.001
Print	18.4	20.6	19.0	0.7,2.4	0.26
N	1474	539	2015		