Knowledge and practice on tuberculosis infection control among health care workers in Nay Pyi Taw, Myanmar

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Abstract

Introduction: Poor knowledge and inadequate practice on TB infection control (TBIC) can increase the risk of TB transmission among those directly responsible for TB, TB health care workers (TB HCWs), and general health care workers (General HCWs). The study aimed to compare the knowledge and practice on TBIC between these two groups and determine the predictors for the low level of knowledge and practice.

Methods: A cross-sectional study was conducted in Nay Pyi Taw, Myanmar, from September 2019 to January 2020. HCWs assigned for TB, multi-drug resistant TB (MDR-TB) care, diagnostic and prevention activities were included as TB HCWs, and those working at the general hospitals not directly responsible for TB patients were recruited as general HCWs. A total of 260 TB HCWs and 500 general HCWs were invited. Knowledge and practice on TB infection control among health care workers were assessed using the structured questionnaire. Participants were categorized as having low knowledge if their knowledge scores were below the mean score and likewise for practice.

Results: Knowledge and practice scores were significantly higher among TB HCWs. With a maximum possible score of 10 for knowledge questions, the mean (SD) score of TB HCWs and general HCWs were 9.31 (0.987) and 7.35 (2.40), respectively, the p value of t-test 0.0095. With a maximum possible score of 7 for practice items, the mean (SD) score of TB HCWs and general HCWs were 4.718 (1.17) and 3.136 (1.441), respectively, the p value of t-test 0.036. Being ward staff and over 30 years old TB HCWs were the predictors of low knowledge. The predictors of poor practice were doctor, nurse, receptionist, ward staff, and those who had not been trained in TBIC.

Conclusion: More TBIC programme should be enhanced among health care workers, especially in risk groups, whose knowledge and practice were poor.

Keywords: Infection control, health care worker, tuberculosis

1. Introduction

Tuberculosis (TB), an infectious disease caused by *Mycobacterium tuberculosis*, can transmit from one person to another via the air [1]. In 2017, sixty-five countries reported that a total of 9,299 health care workers were with TB. Myanmar is one of high TB burden countries, and nearly 90% of TB cases are pulmonary TB, and 41% of them are bacteriologically confirmed cases [2].

The risk of coming into contact with infectious diseases, including TB is higher among people who work or dwell in hospitals, shelters, and correctional facilities [3]. Being health care workers (HCWs) increase the risk for active TB regardless of whether he or she directly contact with TB patients [4]. In diminishing the risk of occupationally acquired TB, it is vital to reduce the concentration of infectious droplet nuclei in the environment and the exposure of susceptible individuals to that aerosol [3, 5 – 7].

TB infection control (TBIC) composes of three portions: administrative control, environmental control, and personal protective measure. The first prioritized administrative control contains triage of people with TB signs and symptoms, manage the patients to flow rapidly, and initiation of effective treatment punctually. Environmental control is attained by natural ventilation or using a special ventilation system to maximize airflow rate, or by using germicidal ultraviolet (GUV) to disinfect the air. Poor knowledge and inadequate practice on TBIC [8] can increase the risk of TB transmission among those directly responsible for TB, TB health care workers (TB HCW), and general health care workers (general HCW).

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TB services in Myanmar are delivered at the TB clinics under the department of public health. TB Program staff such as team leader, TB coordinator, and basic health staff are assigned at the clinics for the diagnosis, patients' enrollment, follow up care, directly observed treatment (DOT), contact tracing, and TB drug injection. However, some proportion of presumptive TB patients visit the outpatient department at the general hospitals. As a limited resource country like Myanmar, it has the challenge of utilizing the expensive TB infection control commodities at all health care facilities. However, simple measures, which are parts of the standard TBIC, are recommended to apply at all the general hospitals and TB health care facilities. TBIC materials such as GUV, fan, and N95 mask are specially supplied to the multi-drug resistant TB treatment initiation centers.

Myanmar National TB Programme (NTP) has rolled out the TB infection prevention and control guidelines in line with WHO recommendation since 2015 [9, 10]. Assessment of knowledge and practice among HCWs can provide useful information about the gaps in implementing TB infection control measures in the real situation. The studies in high TB prevalence countries have reported that age, length of service, and the training [11] were associated with the level of knowledge and practice of TBIC [12, 13]. However, little is known about the HCWs' knowledge and practice on TBIC and how it is different between TB HCW and general HCW. It is also not known HCWs with what specific background should be targeted. Therefore, this study aimed to compare the knowledge and practice on TBIC between general HCWs and TB HCWs and determine the predictors for the low level of knowledge and practice.

2. Methods

2.1 Ethics approval

The study protocol was approved by the Institutional Ethics Committee of Faculty of Medicine, Prince of Songkla University, Hat Yai, Thailand (62-263-18-1) and Institutional Review Board (1), Ministry of Health and Sports, Myanmar (2019-010). All participating health care workers provided informed written consent.

2.2 Study design and setting

A cross-sectional study was conducted in Nay Pyi Taw, Myanmar, from September 2019 to January 2020. This is also a part of the study that measured the prevalence of latent TB infection among general and TB HCWs. As of January 2019, there were 23 hospitals in Nay Pyi Taw, and only two hospitals have TB services. Depending on the presence of TB service, we selected two hospitals, and all of the HCWs who work at the TB facilities and the general hospitals were invited to join the study. However, HCWs who took leave or absent during the study period and not willing to participate in the study were excluded.

2.3 Study participants

HCWs assigned for TB/MDR-TB care, diagnostic, and prevention activities were defined as TB HCWs, and those working at the general hospitals not directly responsible for TB patients were termed as general HCWs. There were 260 eligible TB HCWs, which included team leader, nurses, TB coordinators, TB clinic staff, and basic health staff. General HCWs included doctors, nurses, pharmacists, technicians, administrative staff, and ward staff at the general hospitals, and the total eligible numbers were 500 in this group.

2.4 Questionnaire preparation

The questionnaire was adapted from WHO's TB infection control and practice and related literature [9, 14, 15]. It was modified into local context under the consensus of TB technical experts. The questionnaire was prepared in English and then translated to the local language (Myanmar) and finally reverse translated to English by an independent translator to make sure that the contents were not distorted. A pre-test was done in 5% of HCWs in the study area, which was not included in the actual study. Analysis of internal consistency revealed Kuder Richardson's value of 0.72. There were three domains in knowledge and practice assessment: administrative, environmental, and personal protective domain. Knowledge questions consisted of 6 items from the administrative domain, two items each from the environmental and personal protective domain. Practice questions composed of 3 administrative items, 2 environmental items, and 2 personal protective items. Knowledge about TBIC was measured using 10 questions, each with two possible answers. The score "1" was given to the corrected response and "0" for the wrong one, and the range of total score was 0 to 10. Similarly, for the practice and so the range of overall score was 0 to 7.

2.5 Data collection

Three interviewers were trained and supervised by the principal investigator on how to conduct face to face interviews using a structured questionnaire and how to check the information completeness. The potential study subjects were informed about the study and asked to give informed consent. The consent subjects were then interviewed. Each interview session took around 15 minutes.

2.6 Variables and measurement

The dependent variables were knowledge and practice on TB infection control. The main independent variable was general versus TB HCW, and others included background characteristics (age, gender, level
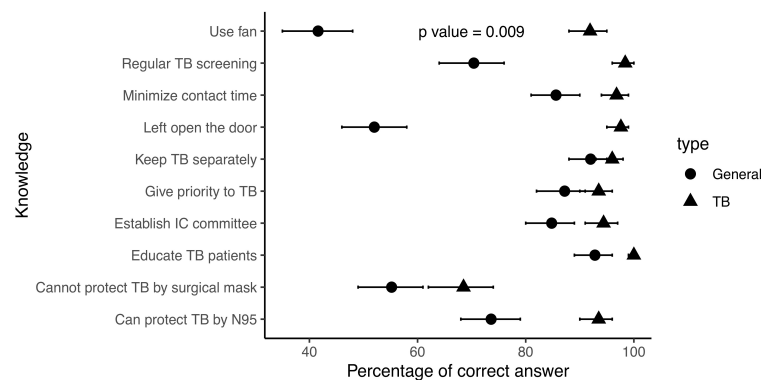
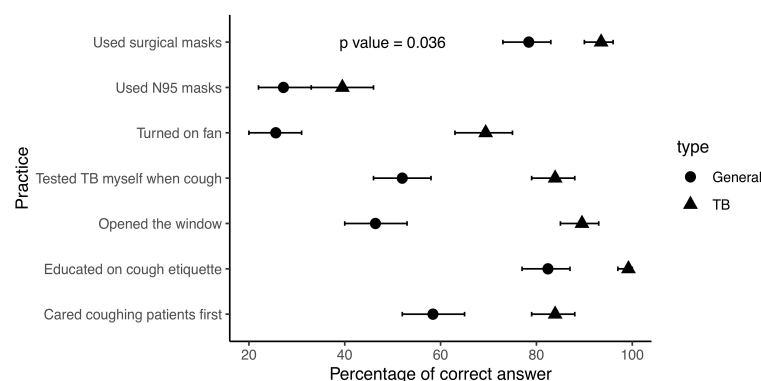**Figure 1**: Knowledge on TBIC among general HCWs and TB HCWs.

Figure 2: Practice on TBIC among general HCWs and TB HCWs.

of education, had taken IC training) as potential confounders. The mean scores of knowledge and practice questions were equivalent to 83% and 60% of the full score. Participants were categorized as having low knowledge if their knowledge scores were below the mean score and likewise for practice.

2.7 Statistical analysis

All the data were entered twice using EpiData and analyzed using R software (version 3.6.2). The characteristics of health care workers were presented with frequencies and percentages. Statistical significance of the difference in knowledge and practice of TBIC between two groups of HCWs was assessed by the p-value of the two-sample t-test. Validation on combining odds ratios of each independent variable among general and TB HCWs strata was performed by using the Mantel-Haenszel method. If the homogeneity test was significant, strata specific measures of the association were implied. Predictors for low knowledge and poor practice on TBIC were analysed using multivariable logistic regression with variables showing $P < 0.20$ in the univariate analysis included as potential confounders. The model with the lowest AIC value was chosen, and the main independent variable was also imported into the model if it was not included in the selected one.

3. Results

3.1 Background characteristics of health care workers

Of 500 eligible general HCWs and 260 TB HCWs, 250 and 248 joined the study, response rates of 50%, and 95%, respectively. Table 1 compares the background characteristics of both groups. TB HCWs were younger, more educated, and had shorter service experience, a narrower spectrum of the profession, and higher exposure to TB.

3.2 Knowledge of TB infection control measures and predictors of low knowledge

With a maximum possible score of 10 for knowledge questions, the mean (SD) score of TB HCWs and general HCWs were 9.31 (0.987) and 7.35 (2.40), respectively, the p-value of t-test 0.0095.

Fig. 1 presents the percentages of HCWs who provided correct answers to each knowledge question. TB HCWs got a consistently higher score for all items. Moreover, in all aspects of knowledge questions, the proportion of TB HCWs who gave correct answers was over 80% except for the protection of TB infection by using the surgical mask. For general HCWs, only 5 items in knowledge questions were above 80%. There is a huge score gap in 4 items of knowledge

Table 1. Background characteristics of health care workers.

Variable	General HCW n (%)	TB HCW n (%)	P value
Total	250	248	
Age			< 0.001
20–29	124 (49.6)	203 (81.9)	
30+	126 (50.4)	45 (18.1)	
Gender			0.617
Female	194 (77.6)	198 (79.8)	
Male	56 (22.4)	50 (20.2)	
Education level			< 0.001
Graduated	154 (61.6)	236 (95.2)	
Not graduated	96 (38.4)	12 (4.8)	
Profession			< 0.001
Admin staff	38 (15.2)	0 (0)	
Basic Health staff	0 (0)	226 (91.1)	
Doctor	10 (4)	2 (0.8)	
Nurse	130 (52)	20 (8.1)	
Receptionist	8 (3.2)	0 (0)	
Ward staff	64 (25.6)	0 (0)	
Total service years			< 0.001
< 10	166 (66.4)	224 (90.3)	
10+	84 (33.6)	24 (9.7)	
Exposure to TB suspects			< 0.001
No	180 (72)	36 (14.5)	
Yes	70 (28)	212 (85.5)	
Exposure to TB patients			< 0.001
No	178 (71.2)	56 (22.6)	
Yes	72 (28.8)	192 (77.4)	
Exposure to MDR TB patients			0.876
No	198 (79.2)	194 (78.2)	
Yes	52 (20.8)	54 (21.8)	
Had taken IC training			< 0.001
No	244 (97.6)	138 (55.6)	
Yes	6 (2.4)	110 (44.4)	

questions: (1) Use fan to reduce TB transmission (2) Regular TB screening by HCW is one of TB control (3) Left open the door when TB suspects or confirmed is in the room and (4) Can protect HCW from TB by N95 mask. Nevertheless, both groups got a low score on the fact "Cannot protect HCW from TB by using the surgical mask."

Considering that having low knowledge is a risk for TB infection, logistic regression results in Table 2 reveal that the risk groups were general HCWs and older age group of TB HCWs. Regarding the professions, the risk of low knowledge was higher among the ward staff compared with admin staff. It should be noted that those directly exposed to TB patients got a low risk of having poor knowledge.

3.3 Practice on TB infection control measures and predictors of poor practice

With a maximum possible score of 7 for practice items, the mean (SD) score of TB HCWs and general HCWs were 4.718 (1.17) and 3.136 (1.441), respectively, the p-value of t-test, 0.036.

Fig. 2 provides a comparison of practice on TB infection control between two groups. Generally, the practice score of TB HCWs was higher than that of general HCWs. The proportion of HCWs who practiced TBIC was more than 80%, excluding usage of fan and N95 mask whenever treating TB patients. The proportion of general HCWs who educated TB patients on cough etiquette was 80%, which was the highest one among 7 practice questions. The practice with the lowest score in both groups was "Used N95 mask whenever contacted with TB patients or specimens."

Considering that having poor practice is also a risk for TB infection, logistic regression results in Table 3 show that the risk groups were doctor, nurse, receptionist, ward staff, and HCWs who had not been trained for TBIC. However, the likelihood of having poor practice was not significantly different between general HCWs and TB HCWs.

4. Discussion

This study reveals that general HCWs had poorer knowledge of TBIC than TB HCWs, but their practices were not statistically significantly different. In addition, predictors for poor knowledge included ward staff and the older age group of TB HCWs. On the other hand, predictors for poor practice were doctors,

Table 2. Predictors of low knowledge (below mean score) on TB infection control using logistic regression.

Variable	crude OR (95%CI)	adj. OR (95%CI)	P value
Type: TB HCW vs General HCW	0.12 (0.07,0.2)	0.1 (0.02,0.6)	0.012*
Profession: ref.=Admin staff			
Basic Health staff	0.21 (0.09,0.48)	3.14 (0.53,18.7)	0.21
Doctor	2.17 (0.58,8.13)	2.63 (0.66,10.43)	0.169
Nurse	0.96 (0.45,2.06)	1.43 (0.63,3.24)	0.386
Receptionist	2.17 (0.46,10.16)	2.04 (0.43,9.65)	0.37
Ward staff	5.54 (2.31,13.28)	7.29 (2.93,18.16)	< 0.001*
Exposure to TB patients: Yes vs No	0.24 (0.16,0.37)	0.39 (0.22,0.67)	0.001*
Age 30+: type TB HCW	4.55 (1.82, 11.34)	6.32 (2.06,19.35)	0.001*
Had taken IC training: Yes vs No	0.2 (0.1,0.39)	0.59 (0.25,1.38)	0.224

*P value < 0.05

Table 3. Predictors of poor practice (below mean score) on TB infection control using logistic regression.

Variable	crude OR (95%CI)	adj. OR (95%CI)	P value
Type: TB HCW vs General HCW	0.12 (0.08,0.19)	0.63 (0.16,2.54)	0.519
Education level: Not graduated vs Graduated	2.89 (1.87,4.48)	0.38 (0.14,1.04)	0.061
Profession: ref.=Admin staff			
Basic Health staff	0.5 (0.22,1.11)	2.53 (0.48,13.33)	0.273
Doctor	14 (2.61,75.2)	30.33 (3.39,271.65)	0.002*
Nurse	2.88 (1.31,6.34)	5.3 (1.94,14.54)	0.001*
Receptionist	8.4 (1.45,48.61)	17.47 (2.12,143.95)	0.008*
Ward staff	10 (3.93,25.45)	16.89 (4.57,62.43)	<0.001*
Exposure to TB suspects: Yes vs No	0.23 (0.15,0.33)	0.37 (0.13,1.06)	0.064
Exposure to TB patients: Yes vs No	0.32 (0.22,0.46)	2.14 (0.73,6.27)	0.166
Exposure to MDR TB: Yes vs No	0.67 (0.42,1.06)	0.54 (0.26,1.12)	0.098
Had taken IC training: Yes vs No	0.14 (0.07,0.26)	0.38 (0.18,0.8)	0.011*

*P value < 0.05

nurses, receptionists, and ward staff. IC training has no impact on TBIC knowledge but positive effect on practice.

This study highlights the level of knowledge and practice on TBIC among health care workers in Myanmar. A comparison between two groups shows that general HCWs got lower scores in each knowledge and practice question. This may have some more explanation. As Myanmar National TB Program is a vertical program, TB-related training and supplies were mostly offered to TB staff. Therefore, TB HCWs had more chance of getting TB-related new knowledge. Accordingly, TBIC knowledge and practice should be enhanced among health care workers at the hospitals.

It was found that older age was significantly associated with low knowledge among the TB HCWs group. It is consistent with the finding from the previous study in Vietnam [12]. In addition, being ward staff was also associated with poor knowledge. However, the study did not find the association between background education level and poor knowledge after adjustment for other potential confounders. Another finding was that HCWs who exposed to TB patients were less likely to have low knowledge. It means a person who worked on TB had more knowledge of TB infection control measures. Another study also found that attending the training or workshop was associated with a high score of knowledge [12, 13], but the find-ing in our study did not support this association.

According to this study, the targeted groups to improve TBIC practice were doctors, nurses, receptionists, and ward staff. Moreover, health care workers who got training on TBIC practiced more on infection prevention measures than the untrained. This finding was consistent with the study conducted in Nigeria [13]. The practice of using N95 in both groups was not satisfactory. NTP expects the HCW to use against MDRTB only, but this kind of expensive mask was overused for any TB symptoms. According to standard IC guidelines, however, it could be said that there were limited N95 masks among health care workers.

This study has some limitations. It might have a respondent bias because of the high percentage (>50%) of non-responders among general health care workers. Measuring the practice with a structured questionnaire may yield answers biased toward expectation.

5. Conclusion

This study highlights that general health care workers get a lower score in each of the knowledge and practice items than the TB HCWs. More TBIC programme should be enhanced among health care workers, especially in the risk groups, whose knowledge and practice were poor.

Acknowledgment

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