

## Occupational Risk to Tuberculosis Disease among Health Care Workers in an Emergency Department Hospital

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### ABSTRACT

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Tuberculosis is known as an occupational hazard for healthcare workers especially in countries with high cases of tuberculosis (TB). There is an increase incidence of tuberculosis among Ministry of Health Workers in Malaysia. The objective of this study is to identify the main risk factor to tuberculosis among health care workers in an Emergency Department of Hospital XYZ. Currently there is no specific tuberculosis prevention program in this health care facility. Employees are usually given a longer sick leave and it will have a huge impact on the department operations. It will also involve an increase in morbidity and mortality cases. This is quantitative and qualitative study where the data is obtained through observation, questionnaires and interviews. The result findings was based on the observation, questionnaires and interviews and was analysed using Risk Assessment Matrix (HIRARC) to find out what are the main factor that caused tuberculosis infection among health care workers. Through the data obtained the main risk factor is the failure to wear PPE while working followed by other factors such as environmental control and administrative control as there is currently no screening done against all health care workers. It has been proven in this study that the main risk factors are PPE usage and followed by other risk factors such as environmental control and administrative control which causes them to tend to get tuberculosis infection.

#### Keywords:

Tuberculosis, health care workers,  
occupational hazard, HIRARC

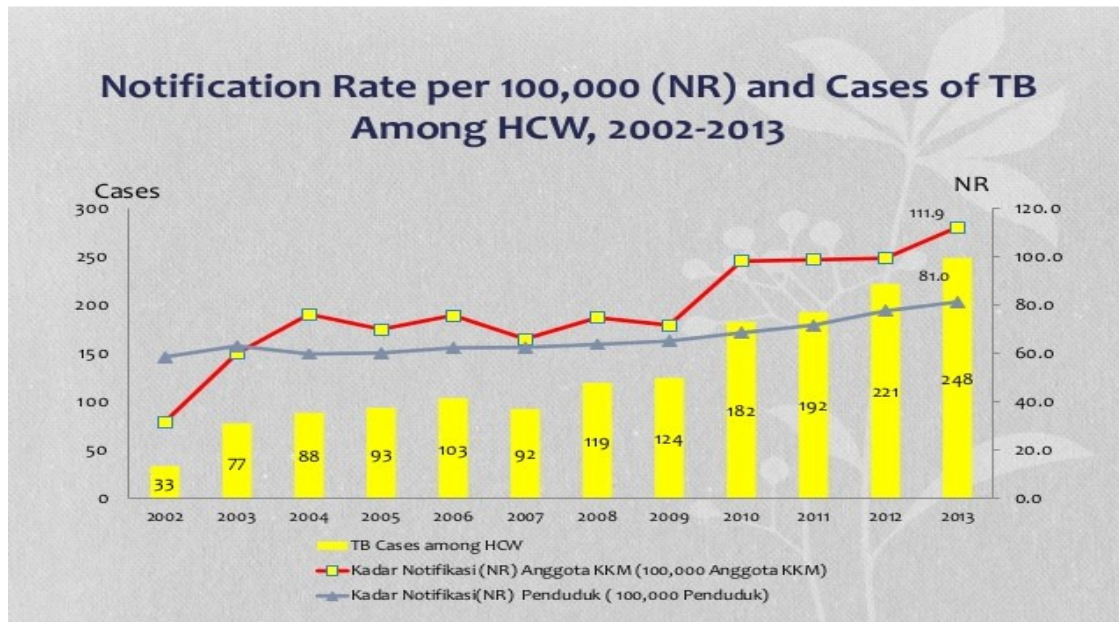
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## 1. Introduction

The XYZ Hospital has more than 54 different departments and units. Tuberculosis is a known occupational hazard for healthcare workers especially in countries with high cases of tuberculosis and is the second most frequent cause of death due to an infectious agent. More than 90 percent of global tuberculosis cases and deaths occur in developing world. 75 percent of cases are in the age 15-54 years [1, 4, 5]. Increasing trend of tuberculosis among health care workers has been observed based on studies performed in developing countries while studies in industrialized countries have shown low incidence among their health care workers [6]. There is an increase incidence of tuberculosis cases among Ministry of Health workers in Malaysia (Fig. 1) [2].

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**Fig. 1.** Health Care Workers in Malaysia infected by Tuberculosis from year 2002 to year 2003

In Malaysia there is no specific Tuberculosis prevention programs in health care facilities [3]. Current Tuberculosis program emphasizes more on case detection and treatment but less emphasis on prevention and not all departments have environmental controls, using correct personal protective equipment, and administrative controls.

## 2. Methods

### *Sampling & Study Design*

The study was conducted quantitatively and qualitatively among health care workers in the emergency department of XYZ Hospital. This study is aimed to identify the risk factors for tuberculosis infections when they are in the department. In addition, this study also tries to identify the main risk factors through Hazard Identification, Risk Assessment, and Risk Control (HIRARC) to health workers exposed to tuberculosis infections. Data was collected randomly from the month of May to August 2017 and to make it easier to calculate the sample Krejcie & Morgan Table was used to facilitate the calculation. A total of 150 samples were taken to obtain data from all staff consisting of various occupations in the health care department.

### *Data Collection*

Observations were done for 4 months to see what is the risk factors and then distributing the questionnaires to questions about risk assessment about tuberculosis risk to the health care workers. Furthermore, the data was further clarified by interviews to several hospital staff supervisors and head of departments

### Data Analysis

After the data is obtained through Observation, Questionnaire, and Interview, it was qualitatively analysed using Hazard Analysis, Risk Assessment, and Risk Control (HIRARC) by looking at the severity and likelihood of the risk factors. In addition, the data is analysed by using Microsoft Excel to see the percentage of responses for the questionnaires.

### 3. Results and Discussion

The purpose of this study is to determine the risk factors that cause tuberculosis infections among health care workers as well as to use the result as a guide in suggesting ways to reduce the problem. Observations were performed on a month to month basis in each zones and shifts. The major risk factors for tuberculosis infections were found to be the use of incomplete personal protective equipment and the extensive 3ply surgical mask abuses. It was observed that in every zone there have about 5 to 10, 2 to 3 people did not use a complete PPE (Fig. 2).



Fig. 2. Observation results

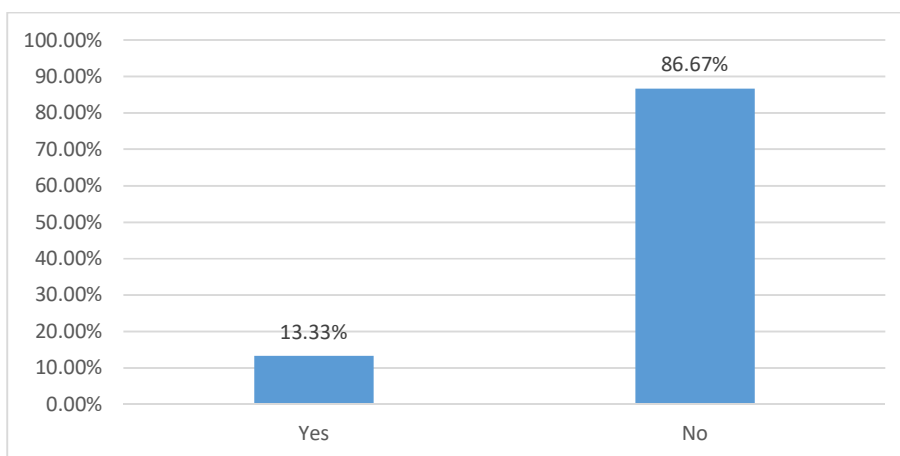
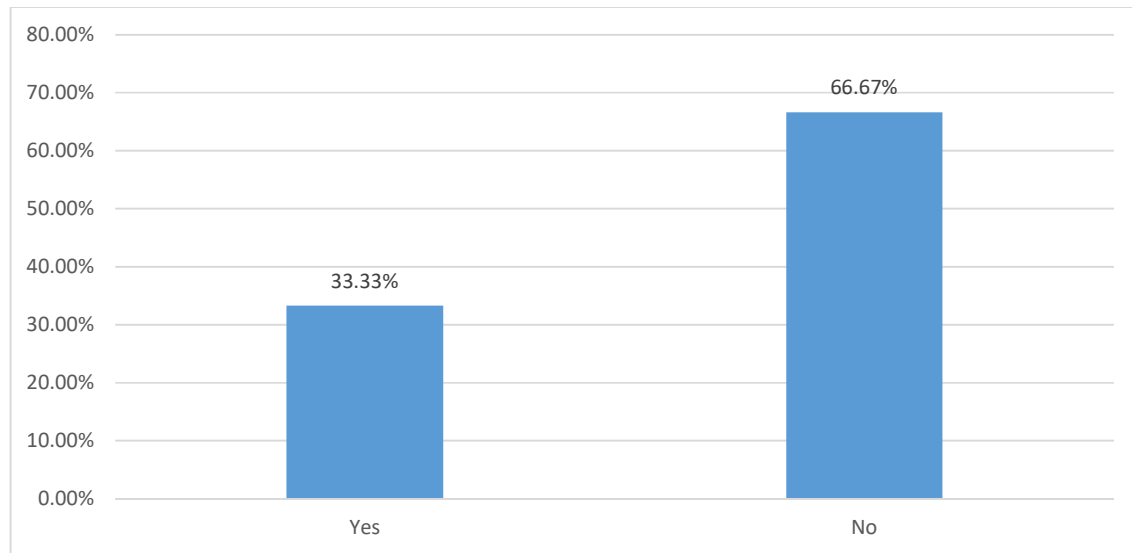


Fig. 3. Number of respondents diagnosed with positive TB



**Fig. 4.** Positive Mantoux test

In addition, 50 people have positive Mantoux Tuberculin skin test results shown in Fig. 4. This shows that they are exposed to bacterial tuberculosis and are only waiting for the germs to be active.

From the risk assessment questionnaires on PPE, environmental control and administrative, it was found that the main problem was caused by improper use of PPE ie masks besides other risk problems such as misuse of 3ply mask, ventilation room not provided with HEPA filter and ultraviolet light, no small BCG vaccination, and some other factors such as departmental negligence which they didn't provide a program test to detect those who have an early infection.

Medical history also plays an important role in the spread of tuberculosis bacteria. It was found that some of the health care workers have medical problems of which 40 people have diabetic disease. This disease can weaken the body defence system [7].

Interviews were conducted to 20 people from the head of department to the lower rank workers. All of them are health care workers working in the emergency department of Hospital XYZ. This interviews were conducted one-to-one by asking the questions to the participants. In addition, discussion techniques are also conducted to answer interview questions and for the respondents to share their views on tuberculosis problems among health care workers. It was found that most infections are caused from their own workplace due to their own failure to use proper personal protective equipment. The risk to get infected depends on the individual itself in which one can be less resistant if they have BCG vaccination and has no other risk factors such as HIV, Immunosuppressed, transplant, diabetic, hepatitis, lung cancer and ESRF [7]. In addition, workplace risk factors also play important roles because the risk of infection is very high if they do not wear appropriate masks and when there are improper ventilation conditions without screening filters.

In the interview they also point out that the main risk factor in the department is the use of improper PPE (Personal Protective Equipment) such as using surgical mask rather than using the right mask which is N95 mask[8]. Other factors include the lack of Mantoux tuberculosis skin test, no BCG vaccination and the establishment of guidelines for isolation room for suspected TB patients. All data obtained from the observation, questionnaires and interviews are analysed using Hazard Identification, Risk Analysis and Risk Control (HIRARC) analysis to assess the severity and probability

to find the major risk factors that cause tuberculosis infections among Health Care Workers. Further assessment is made using the Risk Matrix to assess the severity of the risks (Fig. 5).

No	HAZARD IDENTIFICATION			RISK ASSESSMENT				RISK CONTROL
	Activities	Hazard	Consequences	Current Risk Control	Likelihood	Severity	Risk Level	RECOMMENDED CONTROL MEASURE
1.	Receiving patient (Triage Counter)	Exposure to known & unknown bacteria, fungal & viruses	a) Sick Fatality b)	a) Competency Proper PPE to be worn b)	5	4	20	- NIL
2.	Taking blood sample (Green Zone)	Exposure to known & unknown bacteria, fungal & viruses	a) Sick Fatal b)	a) Competency Proper PPE to be worn b)	5	4	20	- NIL  57

Fig. 5. HIRARC analysis

Through this Risk Assessment Matrix table it can be seen that the existing risk control is dependent on the staff itself where the use of improper PPE is very widespread in every zone. Every failure to use PPE and proper mask will increase the severity and likelihood that infections can occur in every zone in the hospital

#### 4. Conclusion

It has been proven that the main risk factor is improper use of PPE followed by other risk factors such as environmental control and administrative control which causes the health care workers to tend to get TB infections. Management involvement plays an important role in implementing changes to prevent disease from spreading directly to other members and other patients. Non-compliance in the use of PPE and the proper use of the right PPE such as N95 is a major factor contributing to tuberculosis infection in HCW and can be improved with training, Continuing Medical Education (CME) and development of "Safe Operation Procedure".

In ensuring the safety and health of employees and employers the involvement and cooperation from everyone should be important to obtain the optimal level of safety and health of workers.

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