**TITLE PAGE**

**Title:** Prevalence of Tuberculosis and Its Effect on Intention to Leave in Nursing Career: a Thai Nurse Cohort Study

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**ABSTRACT**

**Background**: The spread of tuberculosis (TB) is a major health problem that needs to be monitored. Health care workers (HCWs) who perform the services patients in hospital are high risk of *Mycobacterium tuberculosis* infection especially among nurses who spend a majority of time with patients.

**Objective**: To determine TB infection rate and relationship between TB and ITL in nursing career.

**Methods**: This study utilized data from the baseline survey of the Thai Nurse Cohort Study (TNCS) database. It was a mailed survey conducted in September 2009 involving a total of 18,756 respondents who were then become members of the Cohort. The primary outcomes of this study were tuberculosis (TB) infection in nurses during operation that reported by registered nurses (RNs) and reporting intention to leave (ITL) a nursing career within 1-2 years. Effects of tuberculosis were quantified by prevalence rate, odd ratio (OR) and its 95% CI using multiple logistic regression.

**Results**: Among a total of 18,756, there were 16,470 had work in nursing career, xx.x% were female, with a mean age of xx ± xx years old. The rate of TB infection during the operation that reported by RNs and its 95% confidence interval (CI) was xx.x% (xx.x% to xx.x%). Factors that associated with ITL, presented as odds ratio (OR) and 95%CI, included TB (OR = x.xx, 95%CI: x.xx to x.xx; p-value < 0.xxx), female (OR = x.xx, 95%CI: x.xx to x.xx; p-value = 0.xxx), age ≥ 40 (OR = x.xx; 95%CI: x.xx to x.xx; p-value < 0.xxx), and workplace in Northeast (OR = x.xx, 95%CI: x.xx to x.xx; p-value = 0.xxx).

**Conclusions**: The rate of tuberculosis (TB) infection is high in female and duration of work more than 10 years. TB infection associated with intention to leave (ITL) in nursing career.

**Key words**: tuberculosis, intention to leave, prevalence, factors, nurse, cohort study.

**INTRODUCTION**

Tuberculosis (TB) remains a major global health problem that needs to be monitored.[1](#_ENREF_1) The World Health Organization (WHO) reported about 9 million people in 2011 fell ill with TB and more than 1 million died from TB. Thailand is one of the 22 countries in the world with the highest TB infection. Prevalence of TB in Thailand nearly 130,000 cases with populations 64 million.[2](#_ENREF_2)[3](#_ENREF_3) Especially among health care workers who spend a majority of time with TB patients.[4](#_ENREF_4)

Health care workers (HCWs) who perform the services patients in hospital are high risk of *Mycobacterium tuberculosis* infection particular in many low and middle-income countries.[5](#_ENREF_5)[6](#_ENREF_6)

Especially among nurses who spend a majority of time with patients. Several studies have reported on the TB infection in HCWs. The Study of TB risk among nursing professionals from Central Brazil founded that 69.5% of 128 nursing professionals infected TB.[7](#_ENREF_7) The Study of TB among HCWs at King Chulalongkorn memorial hospital from 3,959 HCWs. The study founded that TB incidence rate was 188 per 100,000 person-years. The occupation of highest risk was nurse, RR=2.4 (95%CI: 0.9 to 9.1).[8](#_ENREF_8) Such studies made aware of the issue of the spread of disease to HCWs and become to health problems which may affect the work. Both thought to have moved to the other side or even retired due to environment in workplace or poor health and unable to continue operations.

Intention to leave (ITL) in nursing career come from several causes. Both coworkers, environment in workplace or even health problems that result could not continue to operate.

These problems make the shortage of medical personnel. However, have no reported studies about effect of TB on ITL in nursing career.

It can be seen that the spread of tuberculosis in HCWs especially in nursing career. Impact on many aspects of the problems mentioned above should be monitored and managed to prevent. Studies on the prevalence of TB and Its effect on intention to leave in nursing career in this time used data from Thai Nurse Cohort Study (TNCS). The large sample size and spread across the country like this can make the population aware of the broad range of contexts, location or work area, and much more that are not in the earlier study. It can reflect a problem and solutions in a large sample survey of nursing across the country to be held in the future.

**MATERIALS AND METHODS**

***Study design***

This paper is part of the Thai Nurse Cohort Study (TNCs). The TNCs was planned as a 20-year longitudinal cohort study. In 2009 the base-line survey was performed. A random sample of registered nurses (RNs) who held nursing licenses granted by Thailand Nursing and Midwifery Council (TNMC) as of 2008 were surveyed by mailed-questionnaires and the respondents were enrolled as cohort members. The first wave of the study was carried out as a cross-sectional survey. The sampling method was stratified random sampling with probability proportional to size of nurses in each 10-year age intervals. This paper involved a total of 18,756 members of the cohort then excluded those nurses who did not work in nursing career.

***Study outcome***

Primary outcome was TB infection during the operation during the operation that reported by nurse. Values of the variable are 0 means no infection and 1 means infection.

Secondary outcome was reporting intention to leave (ITL) a nursing career within 1-2 years. Values of the variable are 0 means no ITL and 1 means ITL in nursing career within 1-2 years.

***Statistical analysis***

Demographic characteristics of the respondent, nurses who worked in nursing career were included in the analysis. These characteristics were described using frequency and percentage for categorical data such as sex, age group, group of duration of work, region, workplace, marital status, ITL in nursing career, and TB infection. To describe continuous data such as age and duration of work using mean, standard deviation, median, minimum, and maximum.

Prevalence rate of TB infection was calculated using the number of nurses who reported TB infection during operation as the numerator and total number of nurse who responded to the questionnaire and work in nursing career as the denominator. The 95% confidence interval (CI) of the rate was computed based on normal approximation to binomial distribution.

ITL rate was calculated using the number of nurses who reported ITL in nursing career within 1-2 years as the numerator and the total number of nurses who responded to the questionnaire and work in nursing career as the denominator. The 95% confidence interval (CI) of the rate was computed based on normal approximation to binomial distribution. To investigate factors that affect ITL, odds ratios (ORs) and their 95% confidence intervals (95%CIs) were estimated using multiple logistic regression for survey sampling. This analysis was adjusted for baseline variables that were considered biologically and sociologically relevant or which showing a univariate relationship with outcomes such as sex, age, duration of work, region, workplace, marital status, current illnesses such as musculoskeletal disorder (MSD), neurological illnesses, cardiovascular diseases, etc.

All analyses were performed by using STATA version 12.0 (StataCorp, College Station, TX). All test statistics were two-sided and a p-value of less than 0.05 was considered statistical significant. This project was approved by the Human Research and Ethics Committees of the Ministry of Public Health of Thailand.

**RESULTS**

A total of 142,699 RNs who held nursing licenses and were listed in TNMC database in 2008 were the population of this study. From the 18,756 RNs who randomly selected, responded to the survey, and agreed to participated as members of the TNCS 2,286 were excluded for this paper due to currently not involved in nursing career 1,709 RNs and missing data on current working status and/or TB infection and/or intention to leave 577 RNs, hence 16,797 RNs were included in the analysis for aim 1 and 16,470 for aim 2 (Fig. 1).

**TB infection and ITL nursing career among registered nurses in Thailand**

Excluded missing data on intention to leave (n = 327)

Excluded (n = 1,959)

* currently not involved in nursing career (n = 1,709)
* missing data on current working status and/or TB infection (n = 250)

Cohort members

(n = 18,756)

Currently in nursing career

(n = 16,797)

TB-

(n = 15,882)

TB+

(n = 588)

Uncertain

5,083 (32%)

Intention

to leave

2,192 (13.8%)

Not to leave

8,607 (54.19%)

Uncertain

200 (34%)

Intention

to leave

77 (13.1%)

Not to leave

311 (52.9%)

Aim 1

TB-

(n = 10,919)

TB+

(n = 401)

Currently in nursing career

(n = 16,470)

Aim 2

Practical

nurses

(n = 11,320)

Administrative

nurses

(n = 4,434)

Academic or research nurses

(n = 1,043)

TB-

(n = 4,277)

TB+

(n = 157)

TB-

(n = 1,008)

TB+

(n = 35)

**Figure 1** Intention to leave nursing career

***Demographic Characteristics***

Of the 16,797 RNs, almost all of them xx.x% were female with a mean age of xx.x±x.x years old (ranged: xx-xx) (Table 1). They were mainly married (xx.x%), currently employed in nursing care services (xx.x%), and worked in North (xx.x%).

**Table 1.** Characteristics of the sample divided by type of workplace **(n = 16,797)**

| **Characteristics** | **Total****n (%)** | **Types of workplace** |
| --- | --- | --- |
| **Hospitals****n (%)** | **Health Centers****n (%)** | **Others****n (%)** |
| **Gender** |  |  |  |  |
| Male  | x.x | x.x | x.x | x.x |
| Female  | xx.x | xx.x | xx.x | xx.x |
| **Age of samples (years)** |  |  |  |  |
| < 30 | xx.x | xx.x | x.x | x.x |
| 30 – 39 | xx.x | xx.x | xx.x | xx.x |
| 40 – 49 | xx.x | xx.x | xx.x | xx.x |
| 50 – 59 | xx.x | xx.x | xx.x | xx.x |
| 60 or greater | x.x | x.x | x.x | x.x |
| Mean ± SD | xx.x ± x.x | xx.x ± x.x | xx.x ± x.x | xx.x ± x.x |
| Median (Min : Max)  | xx.x - xx.x | xx.x - xx.x | xx.x - xx.x | xx.x - xx.x |
| **Duration of work (years)** |  |  |  |  |
| <= 5 | xx.x | xx.x | x.x | x.x |
| 6 – 10 | xx.x | xx.x | xx.x | xx.x |
| > 10 | xx.x | xx.x | xx.x | xx.x |
| Mean ± SD | xx.x ± x.x | xx.x ± x.x | xx.x ± x.x | xx.x ± x.x |
| Median (Min : Max)  | xx.x - xx.x | xx.x - xx.x | xx.x - xx.x | xx.x - xx.x |
| **Highest education attainment** |  |  |  |  |
| Bachelor’s degree | xx.x | xx.x | xx.x | xx.x |
| Master’s degree | xx.x | xx.x | x.x | xx.x |
| Doctoral degree | x.x | x.x | - | x.x |
| Others  | x.x  | x.x | x.x | x.x |
| **Marital status** |  |  |  |  |
|  Single | xx.x | xx.x | xx.x | xx.x |
| Married | xx.x | xx.x | xx.x | xx.x |
| Divorced/ Widowed | x.x | x.x | x.x | xx.x |
| **Regions** |  |  |  |  |
| Bangkok | xx.x | xx.x | xx.x | xx.x |
| North  | xx.x | xx.x | xx.x | xx.x |
| Northeast | xx.x | xx.x | xx.x | xx.x |
| Central | xx.x | xx,x | xx.x | xx.x |
| South  | xx.x | xx.x | xx.x | xx.x |
| **Working status** |  |  |  |  |
| Government officers | xx.x | xx.x | xx.x | xx.x |
| Government employees | x.x | x.x | x.x | x.x |
| State enterprises employees  | x.x | x.x | x.x | x.x |
| Private employees  | x.x | x.x | x.x | xx.x |
| Business owners | x.x | x.xx | x.x | x.x |
| Others  | x.x | x.x | x.x | xx.x |

***Rate of Tuberculosis***

Rate of TB infection was xx.x% (95% CI: xx.x – xx.x; p-value=0.xxx) (Table 2). Found a high TB rate of female nurses xx.x% (95% CI: xx.x – xx.x; p-value=0.xxx), aged more than 40 years xx.x% (95% CI: xx.x – xx.x; p-value=0.xxx) and worked in the hospital xx.x% (95% CI: xx.x – xx.x; p-value=0.xxx).

**Table 2.** Rates of Tuberculosis (TB) infection and their 95% confidence intervals (CI)

| **Variables** | **Number** | **Tuberculosis (TB) infection** |
| --- | --- | --- |
| **% TB** | **95% CI** | **p-value\*** |
| **Gender** | xxx | xx.x | xx.x - xx.x | 0.xxx |
|  Male | xxx | xx.x | xx.x - xx.x |  |
|  Female | xxx | xx.x | xx.x - xx.x |  |
| **Age of samples (years)** | xxx | xx.x | xx.x - xx.x | 0.xxx |
| < 30 | xxx | xx.x | xx.x - xx.x |  |
| 30 – 39 | xxx | xx.x | xx.x - xx.x |  |
| 40 – 49 | xxx | xx.x | xx.x - xx.x |  |
| 50 – 59 | xxx | xx.x | xx.x - xx.x |  |
| 60 or greater | xxx | xx.x | xx.x - xx.x |  |
| **Duration of work (years)** | xxx | xx.x | xx.x - xx.x | 0.xxx |
| <= 5 | xxx | xx.x | xx.x - xx.x |  |
| 6 – 10 | xxx | xx.x | xx.x - xx.x |  |
| > 10 | xxx | xx.x | xx.x - xx.x |  |
| **Highest education attainment** | xxx | xx.x | xx.x - xx.x | 0.xxx |
| Bachelor’s degree | xxx | xx.x | xx.x - xx.x |  |
| Master’s degree | xxx | xx.x | xx.x - xx.x |  |
| Doctoral degree | xxx | xx.x | xx.x - xx.x |  |
| Others  | xxx | xx.x | xx.x - xx.x |  |
| **Marital status** | xxx | xx.x | xx.x - xx.x | 0.xxx |
|  Single | xxx | xx.x | xx.x - xx.x |  |
| Married | xxx | xx.x | xx.x - xx.x |  |
| Divorced/ Widowed | xxx | xx.x | xx.x - xx.x |  |
| **Regions** | xxx | xx.x | xx.x - xx.x | 0.xxx |
| Bangkok | xxx | xx.x | xx.x - xx.x |  |
| North  | xxx | xx.x | xx.x - xx.x |  |
| Northeast | xxx | xx.x | xx.x - xx.x |  |
| Central | xxx | xx.x | xx.x - xx.x |  |
| South  | xxx | xx.x | xx.x - xx.x |  |
| **Worplace** | xxx | xx.x | xx.x - xx.x | 0.xxx |
| Government officers | xxx | xx.x | xx.x - xx.x |  |
| Government employees | xxx | xx.x | xx.x - xx.x |  |
| State enterprises employees  | xxx | xx.x | xx.x - xx.x |  |
| Private employees  | xxx | xx.x | xx.x - xx.x |  |
| Business owners | xxx | xx.x | xx.x - xx.x |  |
| Others  | xxx | xx.x | xx.x - xx.x |  |

\* p-value of chi-square test compares the difference in the prevalence of TB in each variable.

***Factors associated with ITL***

Among a total of 16,470 had work in nursing career. Factors that associated with ITL, presented as odds ratio (OR) and 95%CI (Table 3). Found that TB (OR = x.xx, 95%CI: x.xx to x.xx; p-value < 0.xxx), female (OR = x.xx, 95%CI: x.xx to x.xx; p-value = 0.xxx), age ≥ 40 (OR = x.xx; 95%CI: x.xx to x.xx; p-value < 0.xxx), and workplace in Northeast (OR = x.xx, 95%CI: x.xx to x.xx; p-value = 0.xxx).

**Table 3.** Odds ratios (ORs) of TB with ITL and their 95% confidence intervals for each factor adjusted for all other factors presented in the table using logistic regression

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Factors** | **Number** | **% TB** | **Crude OR** | **Adj. OR** | **95%CI** | **p-value** |
| **Gender** |  |  |  |  |  | 0.xxx |
| Male  | xxx  | xx.x  | 1  | 1  |  |  |
| Female  | xxx | xx.x | x.xx | x.xx | x.xx – x.xx |  |
| **Age (years)** |  |  |  |  |  | 0.xxx |
| 20 - 29 | xxx  | xx.x  | 1 | 1 |  |  |
| 30 – 39 | xxx | xx.x | x.xx | x.xx | x.xx – x.xx |  |
| 40 – 49 | xxx  | xx.x  | x.xx  | x.xx  | x.xx – x.xx |  |
| 50 – 54 | xxx  | xx.x  | x.xx  | x.xx  | x.xx – x.xx |  |
| 60 or greater | xxx  | xx.x  | x.xx  | x.xx  | x.xx – x.xx |  |
| **Marital status** |  |  |  |  |  | 0.xxx |
| Single | xxx  | xx.x  | 1 | 1 |  |  |
| Married | xxx  | xx.x  | x.xx  | x.xx  | x.xx – x.xx |  |
| Divorced/ Widowed | xxx  | xx.x  | x.xx  | x.xx  | x.xx – x.xx |  |
| **Region** |  |  |  |  |  |  |
| Bangkok | xxx  | xx.x  | 1 | 1 |  | 0.xxx |
| North  | xxx  | xx.x  | x.xx  | x.xx  | x.xx – x.xx |  |
| Northeast | xxx  | xx.x  | x.xx  | x.xx  | x.xx – x.xx |  |
| Central | xxx  | xx.x  | x.xx  | x.xx  | x.xx – x.xx |  |
| South  | xxx  | xx.x  | x.xx  | x.xx  | x.xx – x.xx |  |
| **Working place** |  |  |  |  |  |  |
| Hospital | xxx  | xx.x  | 1 | 1 |  | 0.xxx |
| Health centers | xxx  | xx.x  | x.xx  | x.xx  | x.xx – x.xx |  |
| Others  | xxx  | xx.x  | x.xx  | x.xx  | x.xx – x.xx |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Factors** |  | **Odds ratio**  | **95%CI** | **p-value** |
| ??? |  | x.xx | x.xx – x.xx | 0.xxx |
| ??? |  | x.xx | x.xx – x.xx | 0.xxx |
| ??? | x.xx | x.xx – x.xx | 0.xxx |
| ??? |  | x.xx54α10.5020 | x.xx – x.xx | 0.xxx |
|  | 3 |  |  |  |

**Fig. 2** Relationship between TB and ITL in nursing career, presented as odds ratio adjusted for gender, marital status, job type, current working status, workplace, and working area, using multiple logistic regression

**DISCUSSIONS**

XXX

***Strength of the study***

<To be written>

***Limitation of the study***

* *Can selection bias distort the findings?*
* *Can information bias distort the findings?*
* *Can confounding bias distort the findings?*

***Conclusions***

The rate of tuberculosis (TB) infection is high in female and duration of work more than 10 years. TB infection associated with intention to leave (ITL) in nursing career.

***Recommendations***

<to be written>

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