

## Prevalence and Risk Factors of Latent Tuberculosis Infection among Incarcerated Persons: A Cross-Sectional Study in Kedah Year 2024

Mohd Fakhree Saad<sup>1</sup>, Nurul Asyikin Abdullah<sup>2</sup>, Hanisah Ahmad<sup>2</sup>, Shareh Azizan Shareh Ali<sup>2</sup>, Arvindran Alaga<sup>3</sup>

<sup>1</sup>Kedah State Health Department

<sup>2</sup>Kota Setar District Health Department

<sup>3</sup>Sultanah Bahiyah Hospital

\*Corresponding author: [Mohdfakhree@moh.gov.my](mailto:Mohdfakhree@moh.gov.my)

### Introduction

Tuberculosis (TB) remains a major public health challenge, particularly in confined settings such as prisons, where the transmission risk of *Mycobacterium tuberculosis* (MTB) is amplified. Latent TB infection (LTBI) is an important indicator for future progression to active TB, especially among incarcerated persons who are at higher risk of progression compared to the general population (1). Therefore, this study aims to determine the prevalence and risk factors of LTBI, including age groups, comorbidities, and behavioural risk factors. Identifying these factors can help prioritize targeted TB screening. Such an approach supports cost-effective strategies to reduce TB-related morbidity and mortality among incarcerated individuals (2).

### Method

The study design was a cross-sectional study conducted from April 21st to April 30th, 2024. It was part of the Annual TB screening special program at Kota Setar X Prison in Kedah. The minimum sample size was 335 for the prevalence study (3). The inclusion criteria comprised male individuals housed in Blocks 1 to 4 (out of 16 blocks). Exclusion criteria included persons with active TB currently on treatment, those presenting with TB symptoms or positive sputum Acid-Fast Bacilli (AFB) or Rapid Molecular tests, or MTB Culture, and persons living with HIV. The independent variables examined in this study were age, Malaysian citizenship status, history of smoking, and the presence of comorbidities such as lung diseases, hypertension and diabetes (determined by history taking). The dependent variable was Latent Tuberculosis Infection (LTBI), diagnosed as a Tuberculin Skin Test (TST) positive result of  $\geq 10$  mm. Statistical analysis was performed using SPSS version 24.0. Logistic regression was employed, and variables with a p-value of less than 0.05 were considered statistically significant. A total of 3022 incarcerated persons were housed in Kota Setar X Prison. Blocks 1 to 4 were chosen randomly out of 16 blocks. History taking and physical examination were conducted on all 589 participants; 87 had missing data. Thus, the final sample comprised 502 participants (Figure 1).

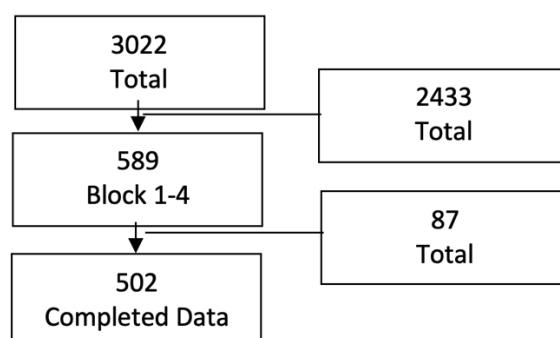


Figure 1. Participant selection

**Result**

The majority of incarcerated persons were in the age group of 36 to 50 years old, followed by those aged 21 to 35 years and 51 to 65 years. The proportion of smokers was 76.7%, while individuals with lung diseases accounted for 4.9%, hypertension for 7.9%, and diabetes for 6.4%. Overall, the prevalence of LTBI among incarcerated persons in this study was 68.5%. This finding is almost identical to that reported from other prisons in Malaysia, at 68.2% (3). Compared to the general population, the prevalence was approximately 3 to 6 times higher (3).

**Table 1.** Chi-square analysis of sociodemographic and co-morbidities

Categorical Data	LTBI		X2 (df)	p
	+ve	-ve		
Age Category				
• 21-35	98	72	15.95 (2)	0.001
• 36-50	178	69		
• 51-65	68	17		
Malaysian Citizen				
• Yes	300	136	0.12 (1)	0.727
• No				
Diabetes				
• Yes	27	5	3.98 (1)	0.046
• No	317	153		
Hypertension				
• Yes	25	15	0.40 (1)	0.839
• No	319	205		
Lung Diseases				
• Yes	20	5	1.60 (1)	0.205
• No	324	153		
Smoking				
• Yes	265	120	0.07 (1)	0.789
• No	79	38		

**Table 2.** Logistic regression of age & diabetes in predicting LTBI among incarcerated Persons

Variables	AOR	95% CI lower	95% CI upper	P
Age Category				
• 21-35	1.00			
• 36-50	1.86	1.23	2.82	0.003
• 51-65	2.59	1.35	4.96	0.004
Diabetes				
• No	1.00			
• Yes	1.69	0.60	4.77	0.319

**Discussion**

A significant predictor of LTBI was age 35 years and above, with LTBI showing an increasing trend with age. This may be attributed to increased co-morbidities and prolonged exposure among older incarcerated persons due to longer sentences or multiple incarcerations in the past (3). The current logistic regression model explained only 5.5% of the variance. Important factors that should be explored in future research include history of TB exposure, previous admission to hospital or other prisons, and duration of incarceration (4). The limitations of this study included biased sampling, the use of self-reported diabetes and lung disease instead of objective measures, and reliance on the TST, whereas IGRA may offer more specificity in LTBI detection (4). In conclusion, age over 35 years significantly increases the risk of LTBI among incarcerated persons. Therefore, targeted screening and preventive treatment in this group may enhance TB control efforts in prison.

**Keywords:** Latent tuberculosis, prison, LTBI

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