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TB death in Melaka Tengah 2018-2022 : a retrospective causal comparative study

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INTRODUCTION

- There is a 25% increment in the TB mortality rate in Malaysia from 2015 (5.5 per 100,000 populations) to 2021 (7.9 per 100,000 populations).
- Since the World Health Organization (WHO) defined TB deaths as the number of TB patients who died during treatment, irrespective of the causes, most studies have examined the factors of all-cause mortality as a surrogate marker to the attributable causes of TB death.
- Furthermore, in Malaysia, National Vital Registry was used by WHO to estimate the TB mortality, rather than using the findings from the TB mortality meetings done to determine the cause of death of TB patients (direct and indirect causes).

❖ **Direct TB death** - **the death occured in conjunction with the diagnosis of TB, and caused by TB.**
❖ **Indirect TB death** - **the death among TB patients that is not due to TB.**

- Such classification is essential to address the importance in determining the associated factors of both TB deaths, as it may help to identify the targeted intervention approach to reduce the mortality due to TB infection in the future.
- There were limited studies which described the factors of TB death, and none of it had explained about the factors of direct TB death.

RESEARCH OBJECTIVE

This study was carried out to determine the population difference between direct and indirect TB deaths in Melaka Tengah district, Melaka.

METHODOLOGY

Retrospective causal comparative study

All TB death from 2018-2022 (until April '22) which were discussed in the TB mortality audit in were included

Study design | Study population | Analysis | Instrument

IBM SPSS Vr 26 was used to analyse the data up to the multiple logistic regression. Odds ratio was used to determine the effect size

The case- based national registry, MyTB was used as a data source

RESULTS

From the analysis, 93 (57.4%) deaths were indirect TB death, and 69 (42.6%) were direct TB death.
Figure below shows that TB death in Melaka Tengah, which showed high numbers and Case Fatality Rate (CFR) in year 2018, declined during the pre-pandemic and pandemic COVID-19 era (2019 and 2020) before climbing back in year 2021.

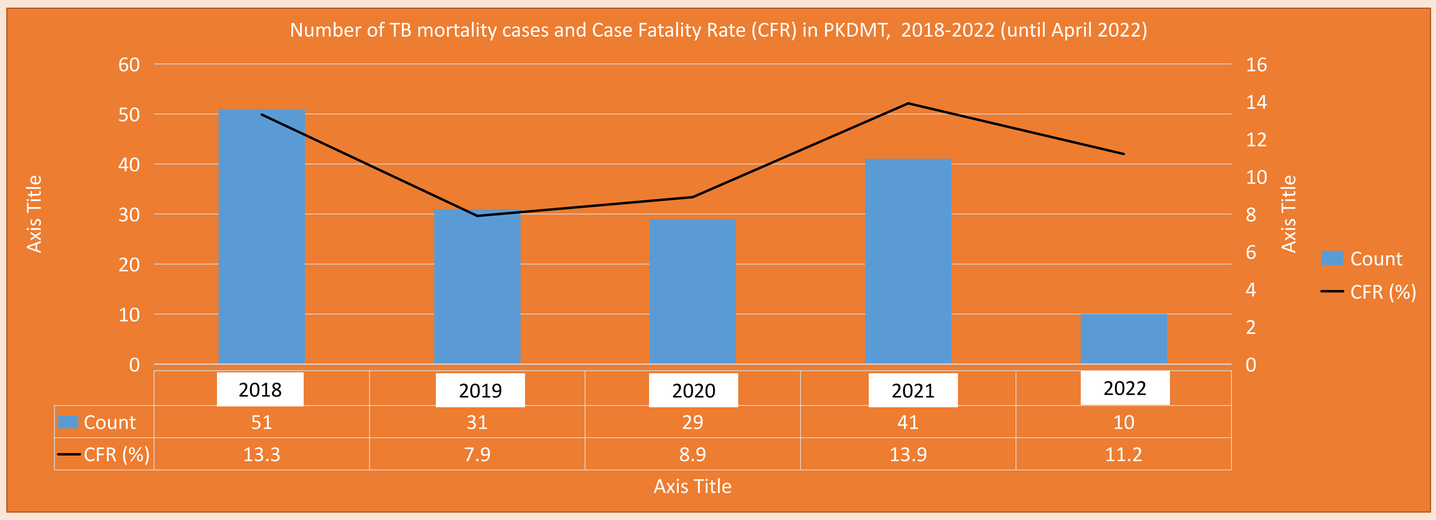

Table 1 and 2 show the **univariable analysis** for categorical and continuous data. It concludes that there are **statistically significant difference** of the **age range, citizenship, level of education and duration of treatment** between the direct and indirect TB death. However, family income, co-morbidities, anatomical location of TB and HIV status **do no**t affect the outcomes.
After examining and testing all factors that may affect TB death by controlling confounding factors through multivariate analysis, multiple logistic regression showed patients **aged 15-24, 25-34, and 35-44 years old** had **6 times (p-value=0.014, 95% CI: 1.446- 25.676), 9 times (p-value<0.001, 95% CI: 2.834- 34.450) and 3 times higher odds (p-value=0.019, 95% CI: 1.221- 9.065),** respectively to die from TB compared to those aged more than 65 years old.
With **1 month increment of treatment duration** may **reduce** the odds of direct TB death by 30% (p-value=0.001, 95% CI: 0.562- 0.872). There were no multicollinearities between variables in the model. The model predicted 15- 20% of the outcome (Cox & Snell R^2= 0.150, Nagelkerke R^2= 0.201). Besides, the model correctly predicted 70% of the outcome (overall percentage of classification table= 69.1%), and the model had a good fit (χ^2= 26.271, p<0.001).

TABLE 1: Univariable analysis of categorical data

Risk factors	Categories	Direct TB death	Indirect TB death	χ2	df	p-value
		Frequency	Frequency			
Age range	15-24 y.o	7	4	12.759	5	**0.026**
	25-34 y.o	15	8			
	35-44 y.o	16	17			
	45-54 y.o	8	12			
	55-64 y.o	12	20			
	≥65 y.o	11	32			
Citizenship	Malaysian	58	90	8.113	1	**0.004**
	Non- malaysian	11	3			
Level of education	Not schooling	11	5	16.506	6	**0.011**
	Primary school	8	27			
	Form 1/2/3	14	23			
	Form 4/5	27	34			
	Form 6/ Certificate/ Diploma	4	3			
	Degree	1	1			
	Master/ PhD	4	0			

TABLE 2 : Univariable analysis of continuous data

Risk factors	Direct TB death		Indirect TB death		Mann- Whitney U test	p-value
	Median	IQR	Median	IQR		
Duration of treatment	0	1	0	2	2528.0	**0.007**

TABLE 3: Multiple logistic regression

Risk factors	Categories	Odds ratio (OR)	p-value	95% Confidence Interval	
				Lower	Upper
Age range	≥65 y.o	1	1		
	15-24 y.o	6.092	**0.014**	1.446	25.676
	25-34 y.o	9.881	**0.000**	2.834	34.450
	35-44 y.o	3.327	**0.019**	1.221	9.065
	45-54 y.o	2.479	0.126	0.774	7.942
	55-64 y.o	2.010	0.178	0.728	5.546
Duration of treatment		0.700	0.001	0.562	0.872

DISCUSSIONS & CONCLUSION

A study to estimate the TB burden in adolescents and young adults in 2012, estimated 1.78 million young people aged 10-24 years old were infected with TB worldwide[1]. The significant numbers of TB incidence among these age groups may reflect the high mortality rate among them. This idea is supported by the theory that young adults are more prone to develop infectious form of TB as they have more social contacts outside of the household and the age between 12- 24 years old had showed a transient increase in the risk of disease progression compared to children and older adults[2]. Besides, retrospective analysis of a 5 year- data in a county in Kenya, revealed 77% (449/585) of the all- cause TB death occured within 3 months of starting treatment[3], almost similar to this study findings which showed significant reduction in the odd of direct TB death with 1 month increment of treatment duration.

PUBLIC HEALTH SIGNIFICANCE & RECOMMENDATIONS

❖ The TB incidence and mortality are projected to increase by 5-15% over the next 5 years due to the impact from COVID-19 pandemic, differed by settings[4]. Vulnerable groups such as people living with HIV (PLHIV) and diabetic patients will be affected more by the pandemic resulting in increased mortality rate among them. More studies are needed to investigate the magnitude of impact COVID-19 pandemic brings on the TB burden. Thus, it would be good if the subsequent studies could address the significance of difference in TB mortality trend between pre- COVID-19 pandemic and post- COVID-19 pandemic era, so as to give ideas on the impact of this pandemic.
❖ As this was a retrospective causal comparative study, the whole cases of TB death which occured from the year 2018-2022 and discussed in the TB mortality meeting were included in this study, rather than carrying out a random sampling, to increase the power of the study. However, if resources permit, a prospective cohort study would be better to determine the risk factors of TB death, in term of hierarchy of evidence.
❖ Besides, the underlying causes of death among young population should be investigated to further tackle the preventable causes of death among young population in Melaka.
❖ It is important to determine the risk factors of direct TB death for further planning of the targetted approach intervention to reduce TB mortality, and further making our ways to achieve the End TB Strategy.
❖ An intervention to ensure compliance and completion of TB treatment especially in young TB patients is suggested to reduce the direct TB death.

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