

# Nutritional related factors and its association with delayed sputum smear conversion among Pulmonary Tuberculosis Patients in Kota Kinabalu, Malaysia

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## Introduction

- Tuberculosis (TB) control system aims to control disease spread, and the most effective way to prevent transmission is to cure patients with smear-positive pulmonary TB (PTB), which is highly contagious.
- Conversion of sputum smear indicates the patient's response to therapy and the TB treatment program's efficiency.
- This study aims to determine nutritional-related factors contributing to the delayed conversion of sputum smears at the end of the intensive TB therapy phase.

## Method

- This cross-sectional study was carried out on patients with smear positive PTB patients treated in the five TB treatment centers in Kota Kinabalu, Sabah, Malaysia, from June 2019 to February 2020.
- Logistic regression models were used to assess the association of sociodemographic characteristics, clinical variables, nutritional status, and dietary intake with the delayed conversion of sputum smear.

## Results

- Thirty-five (13.9%) patients were identified as having delayed sputum conversion.

Variable	Crude		Adjusted	
	OR <sup>1</sup>	95% CI <sup>2</sup>	OR <sup>1</sup>	95% CI <sup>2</sup>
1) Age >50 years old	2.31	1.10-4.82	-	-
2) No BCG scar	2.57	1.25-5.31	-	-
3) Low/normal Total Protein	2.09	1.01-4.34	-	-
4) Insufficient intake of iron	2.32	1.06-5.07	-	-
5) Insufficient intake of energy	3.45	1.20-6.83	-	-
5) Insufficient intake of vitamin B2	1.96	0.87-4.40	-	-
6) Pusat Rawatan 1 Manggatal	6.55	1.46-29.34	10.20	3.31-31.46
7) No DOTS	10.55	3.14-35.50	17.21	3.02-98.05
8) Far advanced chest X-ray	4.24	1.35-13.36	7.46	1.31-42.59
9) High TWC	4.15	1.74-9.91	6.05	1.99-18.42
10) High Urea	3.13	1.18-8.26	7.74	2.06-29.12
11) Anaemia	5.71	2.39-13.64	6.26	1.67-23.48
12) Insufficient intake of vitamin A	1.01	1.00-1.01	1.01	1.00-1.01
13) Insufficient intake of vitamin C	1.03	1.00-1.05	1.03	1.00-1.06

<sup>1</sup>OR= odds ratio; <sup>2</sup>95% CI= 95% confidence interval

## Conclusion

- To improve the sputum smear conversion rate, we need to increase the percentage of DOTS supervisors and early detection of PTB to prevent advanced PTB during diagnosis.
- Future studies should evaluate the mechanisms in which high urea is associated with delayed sputum conversion.
- Nonetheless, TB patients of rural residence warrant special attention. Nutritional referral and support for those who are needed may be beneficial.

## Discussion

### Significant results in multivariate analysis:

- **PR1 Manggatal (aOR: 10.20, 95% CI:3.30-31.46)** : PR1 Manggatal covered the majority of PTB patients in the suburban area (North of K.Kinabalu) in which the majority of them have low socioeconomic status.
- **No directly observed therapy, short-course (DOTS) supervisor (aOR: 17.21, 95% CI:3.02-98.05)**: No DOTS-will affect the compliance and adherence to the TB medication.
- **Advanced Chest X-ray finding (aOR: 7.46, 95% CI: 1.31-42.59)**: Cavity and extensive disease harbour a higher bacterial load that prolonged the clearance of the bacteria.
- **High total white cell (TWC) (aOR: 6.05, 95% CI:1.99-18.42)**: WBC is a biomarker of systemic inflammation, and it corresponds to the severity of the disease but may vary significantly between patients. The more severe or advanced the TB disease, the more time is needed to clear the bacteria from the patient's lungs.
- **High urea (aOR: 7.74, 95% CI: 2.06-29.12)**: High in urea are a sign of kidney disease that will influence the human immune system.
- **Anemia (aOR: 6.26, 95% CI:1.67-23.478)**: There a study found the role of Iron ions in Fenton's reaction is also vital for our antibody. Iron deficiency among patients impairs the immunity of host T - cells, which is mediated by interfering with effector cell activity
- **low vitamin A intake (aOR: 1.01, 95% CI:1.00-1.01) and low vitamin C intake (aOR: 1.03, 95% CI:1.00-1.06)**: Reduced micronutrient intake, especially intake of vitamins and minerals such as vitamins A and C have been associated with an impaired immune response. These conditions happened due to the immune system's response to infection