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Spatio-Temporal Dynamics of Tuberculosis Clusters in Indonesia

Dyah Wulan Sumekar Rengganis Wardani, Endro Prasetyo Wahono¹

Department of Public Health, Faculty of Medicine, University of Lampung, ¹Department of Civil Engineering, Faculty of Engineering, University of Lampung, Bandar Lampung, Indonesia

Abstract

Context: Stratification of social determinants leads to clustering of low socioeconomic communities, which then leads to spatio-temporal tuberculosis (TB) clusters. While previous studies have investigated spatio-temporal TB clusters, few have reported on the dynamics of them and the characteristics of social determinants. **Aims:** To investigate the spatio-temporal dynamics of TB clusters in Bandar Lampung, Indonesia, from 2015 to 2016, and to identify the characteristics of population density and percentage of poverty of the clusters. **Settings and Design:** A cross-sectional study was performed to analyze the spatio-temporal dynamics of TB clusters. The sample consisted of 705 TB patients (2015) and 1134 TB patients (2016), registered in 30 community health centers in Bandar Lampung, Indonesia. **Subjects and Methods:** Geographical coordinates of the TB patients' residence were collected using Geographical Positioning System. Secondary data, consisting of population density and the percentage of poverty, were obtained from the subdistrict office in the region under investigation. **Statistical Analysis:** Data were analyzed with space-time permutation model using SaTScan software. **Results:** Spatio-temporal dynamics of TB clusters were found in 2015 and 2016, including the number of significant clusters, TB cases within the clusters, as well as locations and sizes of the clusters. All the clusters were found to have similar social determinant characteristics: medium-high population density and low-medium percentage of poverty. **Conclusions:** TB control programs in countries with a high TB burden and low social determinants should consider the spatio-temporal dynamics of the TB cluster and its social determinant characteristics for a better TB's intervention.

Keywords: Cluster, dynamics, spatio-temporal, tuberculosis

INTRODUCTION

Tuberculosis (TB) is strongly correlated with low social determinants, such as education, occupation, income, as well as social class. Previous reviews have stated that low social determinants directly, or through risk factors (i.e., poor housing conditions, poor food security, and poor healthcare access), influence the risk of contracting TB.^[1,2] Research on TB and social determinants has also reported similar findings, including studies conducted in Indonesia, which found that low social determinants, poor housing conditions, and poor food security were correlated with TB transmission, TB incidence, and sputum conversion delay.^[3-5] These findings reinforce the need to provide social protection, alleviate poverty, and address other determinants of TB under the policy and system of a TB control program.^[1,2,6]

Furthermore, stratification of social determinants leads to clustering of low social determinant communities.^[1,2] Due

to their condition, TB patients tend to be clustered in low socioeconomic communities. Clustering refers to the significant aggregation of disease events based on spatial and/or temporal parameters (space-time). This includes information, such as cluster location, cluster size, and the number of disease cases inside the cluster.^[7] Studies conducted in Vitoria, Brazil; Antananarivo, Madagascar; Bandar Lampung, Indonesia; and Hermosillo, Mexico, have reported that clustered TB incidence is located in low social determinant areas.^[8-11]

Significant TB clusters based on time and location (spatio-temporal TB) provide information about where vulnerable people live; they also provide an indication


Address for correspondence: Dr. Dyah Wulan Sumekar Rengganis Wardani, Jl. Soemantri Brojonegoro No. 1, Bandar Lampung 35145, Indonesia. E-mail: dyah.wulan@fk.unila.ac.id

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