MODEL DINAMIK SEITR DALAM PENINGKATAN STRATEGI PENGENDALIAN PENYEBARAN TUBERKULOSIS DENGAN IMPLEMENTASI DOTS DI KOTA MEDAN

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ABSTRAk

Perkembangan matematika berperan penting dalam memecahkan masalah di berbagai bidang, termasuk kesehatan. Salah satunya memodelkan penyebaran penyakit seperti *TB*. *TB* (Tuberkulosis) masih menjadi masalah kesehatan global yang signifikan, terutama di negara berkembang seperti Indonesia. Penelitian ini bertujuan untuk memodelkan penyebaran *TB* menggunakan model matematika *SEITR* (Susceptible, Exposed, Infected, Treated, Recovered) dengan implementasi strategi *DOTS* (Directly Observed Treatment, Short-course) di Kota Medan. Prosedur penelitian mencakup pengembangan model *SEITR*, analisis kestabilan sistem menggunakan titik ekuilibrium dan bilangan reproduksi dasar (R_0), serta simulasi numerik dengan *software Matlab* 2021a. Hasil penelitian menunjukkan dua titik ekuilibrium: bebas penyakit dan endemik. Titik ekuilibrium bebas penyakit stabil jika $R_0 < 1$, sedangkan titik ekuilibrium endemik stabil jika $R_0 > 1$. Parameter laju pengobatan (γ) dan peluang infeksi (β) sangat mempengaruhi dinamika populasi, dengan pengobatan *DOTS* efektif dalam mengurangi penyebaran infeksi *TB*. Penelitian ini memberikan wawasan tentang pentingnya strategi pengendalian seperti *DOTS* dalam menekan laju penyebaran *TB* dan mengurangi jumlah penderita *TB* aktif di Kota Medan.

Kata kunci: Tuberkulosis, Model SEITR, DOTS, Analisis Kestabilan, MATLAB, Penyebaran Penyakit.

DYNAMIC MODEL OF SEITR FOR ENHANCING TUBERCULOSIS CONTROL STRATEGIES WITH DOTS IMPLEMENTATION IN MEDAN CITY

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ABSTRACT

The development of mathematics plays a crucial role in solving problems in various fields, including health. One of these applications is modeling the spread of diseases such as *TB*. *Tuberculosis* (*TB*) remains a significant global health issue, especially in developing countries like Indonesia. This study aims to model the spread of *TB* using the *SEITR* (Susceptible, Exposed, Infected, Treated, Recovered) mathematical model with the implementation of the *DOTS* (Directly Observed Treatment, Short-course) strategy in Medan City. The research procedure includes developing the *SEITR* model, analyzing the system's stability using equilibrium points and the basic reproduction number (R_0), and conducting numerical simulations with *MATLAB* 2021a *software*. The results show two equilibrium points: disease-free and endemic. The disease-free equilibrium point is stable if $R_0 < 1$, while the endemic equilibrium point is stable if $R_0 > 1$. The treatment rate (γ) and infection probability (β) parameters significantly affect population dynamics, with *DOTS* treatment effectively reducing the spread of *TB* infection. This study provides insights into the importance of control strategies such as *DOTS* in curbing the spread of *TB* and reducing the number of active *TB* cases in Medan City.

Keywords: Tuberculosis, SEITR Model, DOTS, Stability Analysis, MATLAB, Disease Spread.