Analisis Penyebaran COVID-19 Menggunakan Model SI dengan Laju Infeksi Non-Linier = Analysis of the Spread of COVID-19 using SI Model with Non Linear Infection Rate

Devy Saphira Adiniko, author

Abstrak

COVID-19 merupakan suatu rangkaian penyakit pernapasan akut yang ditularkan oleh virus SARS-CoV-2. Virus ini menyerang saluran pernapasan, sistem kardiovaskular dan juga sistem kekebalan tubuh. Virus ini pertama kali diidentifikasi pada Desember 2019 di Wuhan, Provinsi Hubei, Cina. Sejak saat itu, penyakit ini telah menyebar dan menyebabkan wabah epidemi di seluruh dunia. Dalam skripsi ini, dianalisa model penyebaran penyakit COVID-19 menggunakan model SI sederhana dengan laju infeksi non-linier. Pendekatan model menggunakan sistem persamaan diferensial dimana populasi manusia dikategorikan ke dalam dua kompartemen berdasarkan status kesehatannya yaitu populasi individu rentan dan populasi individu terinfeksi. Kajian analitik dan numerik terhadap model dilakukan untuk menentukan eksistensi serta kriteria kestabilan titik keseimbangan dan basic reproduction number. Dari hasil kajian dapat disimpulkan bahwa untuk mengurangi penyebaran COVID-19, tidak cukup dengan hanya memperhatikan laju transmisi virus dan laju kesembuhan, namun juga harus memperhatikan koefisien non-linier terkait perilaku masyarakat yang dapat memicu adanya penyakit dalam suatu populasi.
.....COVID-19 is a series of infectious acute respiratory diseases caused by SARS-CoV-2 virus. This virus attacks the respiratory system, cardiovascular system and also immune system. This virus was first identified in December 2019 in Wuhan, Hubei Province, China. Since then, this disease has spread and caused an epidemic throughout the world. In this study, a mathematical model of the spread of COVID-19 disease is analyzed using a simple SI model with a non-linear infection rate. The model is approached using a system of differential equations in which the human population is categorized into two compartments based on their health status, namely susceptible population and infected population. Analytical and numerical studies of the model were conducted to determine the existence and the stability criteria of equilibrium points and basic reproduction number. From the results of the study, it can be concluded that to reduce the spread of COVID-19, it is not enough to only pay attention to the rate of virus transmission and recovery rate, but also to pay attention to non-linear coefficient associated with people’s behavior that can trigger the spread of the disease in a population.