ABSTRAK

Penelitian ini membahas model penyebaran penyakit Pneumonia dengan pengobatan dan vaksinasi sebagai upaya pengendalian penyakit. Populasi dibagi menjadi lima kelompok, yaitu rentan (S), *carrier* (C), terinfeksi (I), sembuh (R), dan tervaksinasi (V). Dari pembagian tersebut dibentuk model SCIRV berupa sistem persamaan diferensial nonlinear. Perilaku model dianalisis melalui kestabilan titik ekuilibrium bebas penyakit dan titik ekuilibrium endemik dengan menggunakan bilangan reproduksi efektif (R_e) dan kriteria Routh-Hurwitz. Hasil analisis menunjukkan bahwa titik ekuilibrium bebas penyakit stabil asimtotik apabila $R_e < 1$, sedangkan titik ekuilibrium endemik stabil asimtotik apabila $R_e > 1$ dan syarat lainnya terpenuhi. Untuk mengetahui parameter yang paling memengaruhi penyebaran penyakit, dilakukan analisis sensitivitas terhadap R_e. Selanjutnya, dilakukan simulasi numerik menggunakan *software Python* untuk menggambarkan perilaku model.

Kata kunci: *Pneumonia, model SCIRV, titik ekuilibrium, bilangan reproduksi efektif, analisis sensitivitas*

ABSTRACT

This study discusses the model of the spread of Pneumonia disease with treatment and vaccination as an effort to control the disease. The population is divided into five groups, namely susceptible (S), *carrier* (C), infected (I), recovered (R), and vaccinated (V). From this division, the SCIRV model is formed in the form of a system of nonlinear differential equations. The behavioral model is explained through the stability of the disease-free equilibrium point and the endemic equilibrium point using effective reproduction (R_e) and the Routh-Hurwitz criterion. The analysis results show that the disease-free equilibrium point is asymptotically stable if $R_e < 1$, while the endemic equilibrium point is asymptotically stable if $R_e > 1$ and other conditions are met. To determine the parameters that most influence the spread of the disease, a sensitivity analysis was performed on R_e. Next, a numerical simulation was carried out using *Python software* to describe the behavioral model.

Keywords: *Pneumonia, SCIRV model, equilibrium point, sensitivity analysis, effective reproduction number*