

**Abstract Type : Poster**

**Abstract Submission No. : PO-1389**

## **Mathematical Modeling and Numerical Simulations of Diabetes Mellitus without Genetic Factors using Treatments**

**Rifaldy Fajar**, Prihantini Jupri

Department of Mathematics and Computational Biology, Yogyakarta State University, Indonesia

**Case Study:** Diabetes Mellitus is a chronic disease caused by inherited and/or acquired deficiency in the production of insulin by the pancreas, or by the ineffectiveness of the insulin produced. Diabetes mellitus is known by Mother of Disease because this disease is the essence of other diseases such as hypertension, stroke, cardiac disease, and blindness. This paper will discuss Diabetes Mellitus mathematics modeling and simulations without genetic factors using SEIT form. The analysis technique involves the equilibrium point determining the model, basic reproduction number ( $R_0$ ) determining, and the stability around the equilibrium point analysis. After that, the simulations use MAPLE based on the parameter values which are related in Mathematics modeling that represent the conditions each subpopulation class. Simulation at free equilibrium point  $P_0 = (N, E, I, T)$  shows that  $N$  will be stable at point  $N(t) = 757.5$ .  $E$ ,  $I$ , and  $T$  will be stable at point  $E(t) = 0$ ,  $I(t) = 0$  and  $T(t) = 0$ . Simulation at endemic equilibrium point  $P_1 = (N^*, E^*, I^*, T^*)$  shows that the population in each subpopulation will always be present in the population, the point  $N^*$  will show the balance of point  $N_0^*$  and the point  $E^*$ ,  $I^*$ ,  $T^*$  will be stable at point  $E^*(t) = 0.5$ ,  $I^*(t) = 0.8$  and  $E^*(t) = 200$ . The mathematical model of diabetes mellitus disease without genetic factors with treatment has two equilibrium points ie free of disease  $P_0 = (A/\mu, 0, 0, 0)$  and endemic  $P_1 = (N^*, E^*, I^*, T^*)$ . In addition, the basic reproduction number obtained and the results of numerical simulation.