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THE SIR MODEL SIMULATION: THE EFFECTIVENESS OF COVID-19 VACCINATION STRATEGIES IN MALAYSIA

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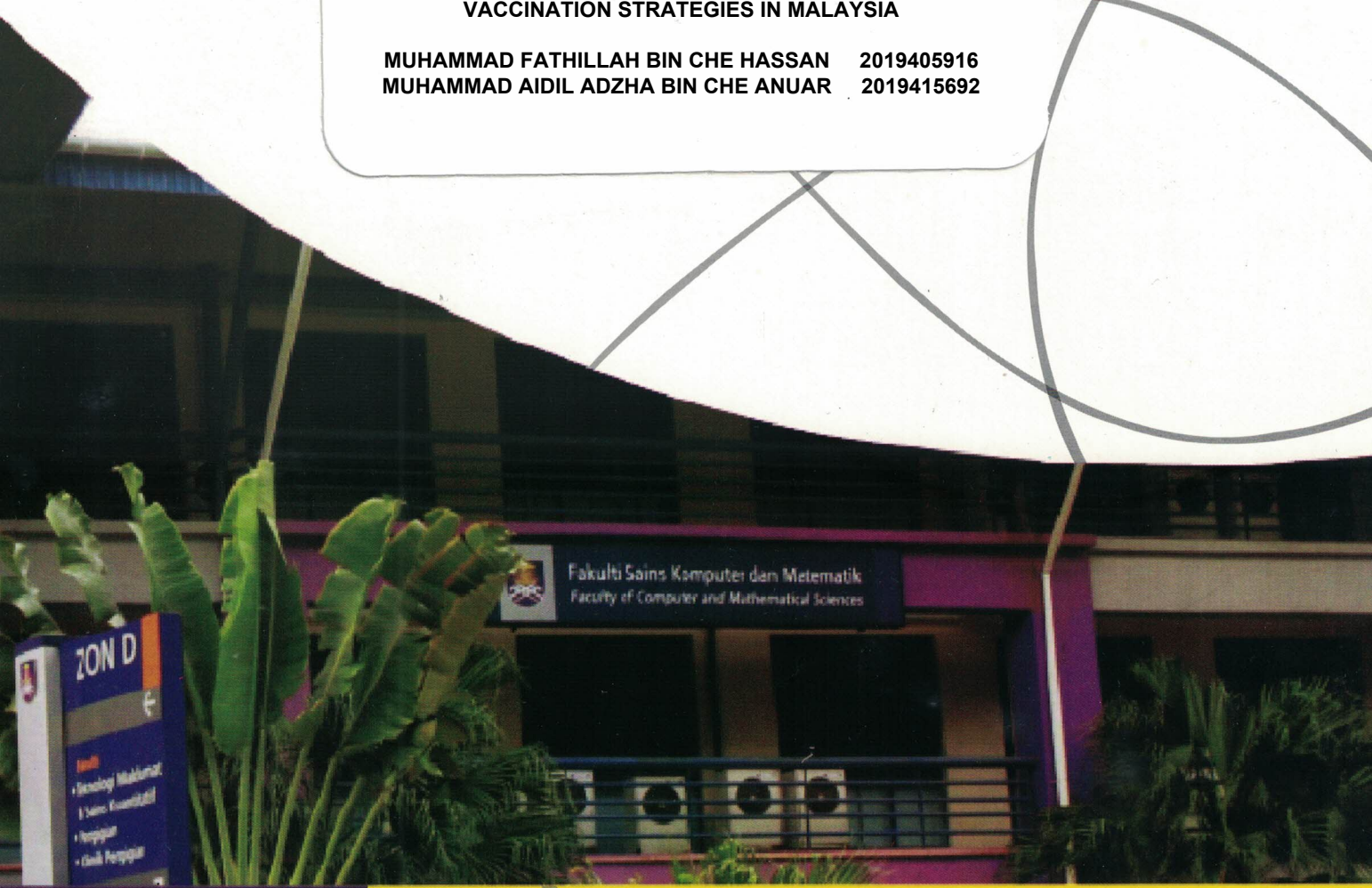

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ABSTRACT

Covid-19 is a new coronavirus disease that was labeled a pandemic by the World Health Organization (WHO) in March 2020. SIR Model is a versatile compartmental mathematical tool that may be used to simulate any pandemic dynamic, including the current Covid-19 outbreak. In the conventional SIR model, the total population (N) is divided into three categories: susceptible(S), infected(I), and recovered(R). So, this research focused on finding the basic reproductive number, R_o of Covid-19 by using the Next Generation Matrix. R_o is greater than 1 means viruses begin to spread the population and R_o less than 1 means disease is about to vanish from the population. It is also analyze and compare the transmission of Covid-19 with and without vaccination. To apply this, the data from government websites is used to find the total number of cases and recover. With the help of mathematical software such as Maple to find the result of the graph. From the result produce from Maple, it can be observed that the slope of with vaccination is bigger than the slope of without vaccination. It clearly shows the comparison between them. The findings improved by having vaccination and then transmission rate low is good to decrease virus Covid-19 from infection.

1 INTRODUCTION

1.1 Research Backgroud

According to Wong et al. (2021) stated that Covid-19 as known as novel coronavirus disease caused by the SARS-Cov-2 was declared by the World Health Organization (WHO) as a pandemic on March 11, 2020, since the epidemic began in Wuhan, China . As on April 14, 2020, cases reported rose above 3 millions with a death rate of over 200 000 around the globe. Due to Covid-19 disease spread, many countries are taking action to prevent the virus from spreading by implementing large-scale public health and social measures (PHSM), restriction movement order and Lockdown.

As in Malaysia, the government has taken action by implementing a PHSM called Movement Control Order (MCO) to the whole country under the Prevention and Control of Infectious Disease Act 1988 on Mac 16, 2020. During this period, mass gathering for cultural purposes, religion and sport are banned. While in the educational system, all sectors are closed and start a new normal education via online learning.

Onward, many health facilities have started to do research in finding vaccines to fight the Covid-19 which have been approved by WHO such as Pfizer, Sinovac, Astrazeneca, Johnson and Johnson and Moderna vaccine. As in Malaysia the immunization Programme Initiated started on February 24, 2021. Government has taken this step to cope with the Covid-19 to form herd immunity in which 80% of the population has taken the vaccine.

In this study, a well known Susceptible Infectious Recovered (SIR) model was adopted from (Moghadas et al., 2021). SIR is a flexible compartmental mathematical tool that may be used to model any pandemic dynamic, such as the present Covid-19 epidemic. The SIR model is simple to learn and has straightforward meanings, and it helps us understand the dynamics of pandemics with any unique characteristics. The overall population (N) is split into three divisions in the typical SIR model. The Susceptible (S) is the percentage of the entire population