The transmission dynamic of the COVID 19 outbreak: A predictive dashboard

Muhammad Fahmi Bin Ahmad Zuber, Norhayati Rosli & Noryanti Muhammad*

[a] Centre for Mathematical Sciences, College of Computing, Universiti Malaysia Pahang, Kuantan, Pahang Darul Makmur, Gambang, 26300, Malaysia

[b] Centre of Excellence for Data Science & Artificial Intelligence, Universiti Malaysia, Pahang Lebuhraya Tun Razak, Kuantan, Pahang Darul Makmur, Gambang, 26300, Malaysia

ABSTRACT

COVID 19 outbreak gives a great impact worldwide. The disaster of this pandemic has resulted in a large number of human lives being lost. As all countries implemented quarantine and social distancing, the great lockdown all over the world lead to multiple crises including health, economy, financial, and collapse in industrial and educational activities. Movement Control Order (MCO) and social distancing which have been implemented as control measures in Malaysia also affected many sectors. The landscape now has successfully reduced the number of infected people. However, from the economic point of view, the Retail Group Malaysia (RGM) has projected the country's retail industry suffers a negative growth rate for the first time in 22 years. If the epidemic continues, society will reach an impasse, a time when the lockdown will become more than some of them can tolerate. As recognized by the World Health Organization (WHO), modelling the outbreak based on the prior input data is more appropriate than the 'risk of bias' for decision-makers. Thus, this research is conducted to model the outbreak of the disease using the susceptible-infected-recovery-death (SIRD) compartmental model accompanying with the varying infection rate due to changes in MCO measures. The model assumes under the unavailability of the vaccine, recovered people can be reinfected. The epidemic parameters and reproduction numbers are estimated and fitted from the transmission model to the actual data using the Monte Carlo Markov Chain (MCMC) of Metropolis-Hasting. The model is solved using a numerical algorithm of the Runge-Kutta method. The predictive dashboard of a graphical user interface (GUI) is developed, hence monitoring and predicting the outbreak under the control measures of the two different types of MCO scenarios (which are called constant and alternate scenarios) can be performed. GUI for the dynamic transmission of the COVID 19 provides insight for the future outbreak, hence may help the respective stakeholders to propose the best policy of a new norm for all sectors. From the GUI, we can see that, when no or loose MCO is implemented or compliance of the public to the COVID 19 standard operating procedure (SOP), the infected case will increase rapidly up to 7.5 million. With strict MCO regulation or public obedient to the SOP, the infected case will decrease rapidly, but even after a long period of strict regulation, once the quarantine is stopped, the infected case will rise again. An alternative MCO scenario is suggested where a cyclic pattern of strict and loose MCO regulation is upheld, and it shows to flatten the curve while allow periods of less restricted lifestyle. This can be one of the alternatives to balance the life and livelihood.

KEYWORDS

COVID 19; Modelling; Monte Carlo Markov Chain; Reproduction number; Runge-Kutta

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