= Since $R_0 > 1$, therefore the disease will persist

BEFORE OUTBREAK

Theorem: if $R_0 > 1$, then P^* is globally asymptotically stable with respect to the interior of Ω. Considering natural carrier rate which is 25% .Therefore,

$$S^* = \frac{\lambda + \varpi C}{\beta + \mu}$$

$$= \frac{14{,}624{,}414 + 3{,}656{,}104}{0.25 + 0.02}$$

$$= 67{,}705{,}622$$

$$R_0 = \frac{1}{S^*} * \frac{\lambda}{\mu}$$

$$= \frac{1}{67{,}705{,}622} * \frac{14{,}624{,}414}{0.02}$$

$$= 10.800000325 \approx 11 > 1$$

Since R0 > 1, therefore the disease will persist therefore; it is observed from the threshold that during the outbreaks that $R_0 = 44$ when natural carrier and vaccination rate are 25%. Also, when carrier and vaccination rate are increased to 60%, and $R_0 = 38$ when carrier rate is finally increased to 90%, $R_0 = 35$ when there is no outbreak, $R_0 = 11$ therefore, these indicate that carrier negative effect is mostly observed during outbreak.

NUMERICAL SIMULATION

Numerical simulation of this model is carried out. The key parameters were used to investigate the meningitis transmission dynamics as well as the insignificance impact of vaccination on the meningitis transmission from the data collected during 2017 epidemic outbreak. Based on the graph obtained, it can be observed that the vaccination rates keep increasing while the susceptible population decreases.

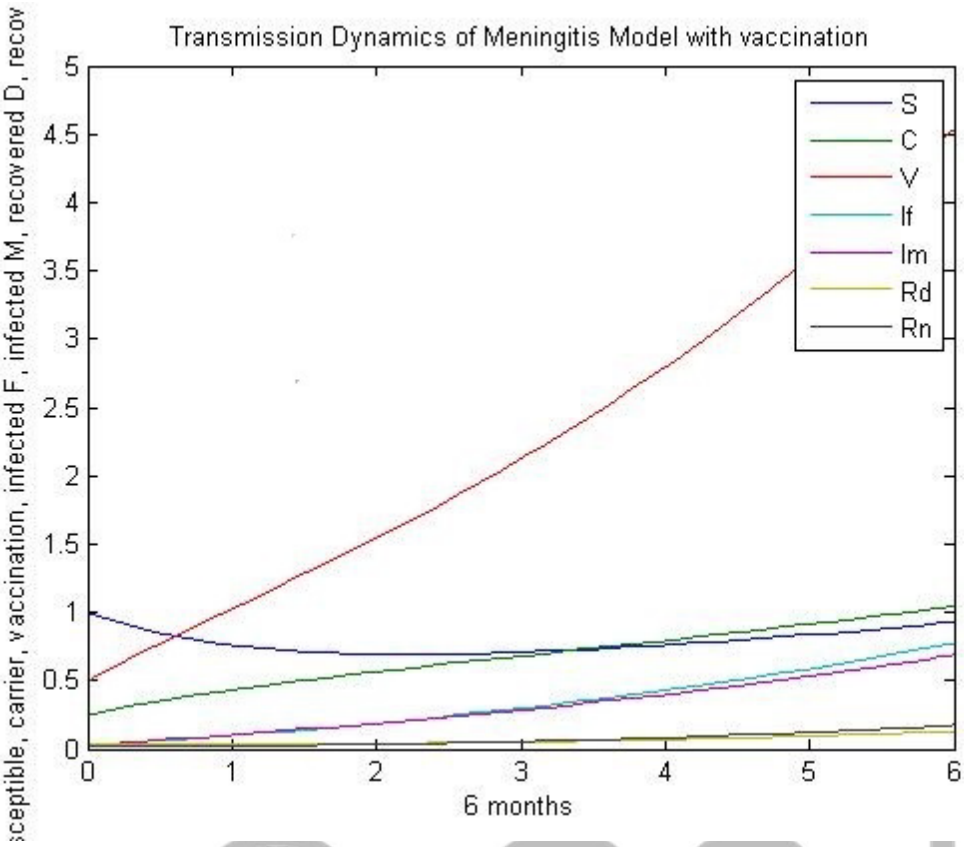

Figure .2: Graphical representation of Meningitis Transmission Dynamics with 50 percent Vaccination

CONCLUSION

Since all the Eigen- values are negatives it implies that the disease free equilibrium point is locally asymptotically unstable with $R_0 > 1$. Means that each infected individual infect more than one individual such that there is expectation of the disease spread out. Also the significance impact of vaccination is negative during outbreak than when no outbreak. In this study, the significance impact of vaccination is modelled on the transmission dynamics of meningitis infections and found negative. The analysis of the Endemic equilibrium state of the model, using the threshold value, R_0 threshold value (R_0) is investigated as 44, 39and 35 by adjusting the rate of carrier from natural carrier rate of $25\%, 60\%$ and 90% and vaccination respectively during outbreak. But obtained value of $R_0 = 11$, whose are far greater than 1 shows the significance impact of vaccination is negative on meningitis transmission dynamics.

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