Dhirubhai Ambani
Institute of Information and Communication Technology
Gandhinagar

Special Lecture
on
Mathematical Modelling of Infectious Diseases: Epidemic Models with Treatment

Prof. Mini Ghosh
School of Mathematics and Computer Application,
Thapar Univeristy, Patiala

Abstract:

Infectious diseases affect both animals and humans and cause significant financial losses and loss of lives every year around the world. For developing nations like India the losses are all the more critical because they affect economic growth (i.e. loss of animals and labor).

Mathematical models have become important tools in analyzing the spread and control of infectious diseases. The modelling helps in analyzing control strategies, efficiency analysis, and development of new effective drugs. Our research concen- trates on epidemic models that can contribute to the design and analysis of epi- demiological surveys, suggesting crucial data that should be collected, identifying trends and making general forecast. Our aim is to research the factors which are important and influence the transmission of infectious diseases. Once the factors are identified, they are incorporated in the model.

Our research has focused on the study of epidemic models with some constraints, e.g. limited resource for treatment. We aim for the model development with con- straints because developing nations like India have limited resources to control any infectious disease. In our research, we have tried to understand the effect of the capacity of treatment on the transmission of the diseases. We have assumed that treatment rate is proportional to the number of infectives below the capacity and is a constant when the number of infectives is greater than the capacity. Unlike classical epidemic models, we have found that there exist two endemic equilibria even when $R0 < 1$. Furthermore, under some conditions, both the disease free equi-librium and one of the two endemic equilibria are asymptotically stable, i.e., the model has bi-stable equilibria which complicates the criteria for success of treat- ment. Therefore, disease eradication not only depends on R0 but also some other parameters which need to be investigated for the success of treatment. My proposed talk briefly introduces mathematical modelling of infectious dis- eases, presents the important issues in modelling and analysis, and reports on our research results in the area of mathematical modelling of infectious diseases.