International J. of Math. Sci. & Engg. Appls. (IJMSEA)
ISSN 0973-9424, Vol. 7 No. III (May, 2013), pp. 335-341

ON GLOBAL STABILITY OF SIRS MODEL WITH VERTICAL TRANSMISSION

B. SINGH[1], S. JAIN[2], R. KHANDELWAL[3], S. PORWAL[4] AND G. UJJAINKAR[5]

[1,3,4,5] School of Studies in Mathematics,
Vikram University, Ujjain (M.P.), India
E-mail: [1] bijendrasingh@yahoo.com, [3] rakhikhandelwal@gmail.com,
[4] sneha2007porwal@yahoo.co.in, [5] gajendra_ujjainkar@yahoo.co.in
[2] Govt. College, Kalapipal, Distt. Shajapur (M.P.), India
E-mail: jsuman53@gmail.com

Abstract

Korobeinikov and Wake [13] introduce a family of Lyapunov functions for threecompartmental epidemiological models, which appear to be useful for more sophisticated models. Global stability of the endemic equilibrium states of the SIR, $SIRS$ and SIS models with standard incidence and constant population has been established. In this paper we present the $SIRS$ model with simple mass action incidence and varying population size. There are some infectious diseases which have permanent immunity and some of them do not. In the latter case, the removed population again becomes susceptible. We have studied both the cases. The basic reproduction number $\Re_0$ is obtained. Local stability of the disease-free equilibrium state is discussed. If $\Re_0 < 1$, the infection-free equilibrium state E_0 is locally stable; if $\Re_0 = 1$, E_0 is stable and if $\Re_0 > 1$, E_0 is unstable. The Global stability of thedisease-free equilibrium state and the endemic equilibrium state is proved by constructing a Lyapunov function. Numerical analysis and graphical presentation is provided to help better understanding.

Key Words : *Direct Lyapunov method, Lypaunov functions, Epidemiological models, Equilibria, stability.*

AMS Subject Classification : 92D30.

© http: //www.ascent-journals.com