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MODELLING VERTICAL TRANSMISSION OF HEPATITIS B VIRUS UNDER TREATMENT AND ALCOHOLIC HABITS

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Abstract. This paper proposes model of HBV transmission vertically under treatment and alcoholic habits. In this model, the effects of vaccination to new-born, vaccination to carrier mother and alcoholic habits in male on spread of HBV are studied. The alcoholic habits results in acute or sub-acute liver failure and hence are categorized under hepatitis infection. The sexual transmission makes population to be carrier. The carrier female results in to vertical transmission. So, to control spread of disease, vaccination is advocated at the carrier stage and new-born. In this paper, the transmission dynamics of HBV is studied. Mathematical model of non-linear differential equations for the proposed problem is established. Total population is divided in to nineteen compartments viz. susceptible under-age, susceptible female, susceptible non-alcoholic male, susceptible alcoholic male, Exposed under-age, Exposed female, Exposed non-alcoholic male, Exposed alcoholic male ,Infected under-age, Infected female, Infected non-alcoholic male, Infected alcoholic male, Carrier under-age, Carrier female, Carrier non-alcoholic male, Carrier alcoholic male, vaccinated individuals, recovered under-aged and recovered adults. The next generation matrix method is used to find the reproduction number R_0.The sensitivity analysis of basic reproduction number R_0 indicates that alcoholic habits in adults should be controlled. Awareness programs for vaccination of under-aged and carrier mother should be conducted to control disease spread.

Keywords. HBV, Vertical transmission, Mathematical model, Alcoholic habits, Vaccination, Stability analysis

1 Introduction

Hepatitis B (HBV) is a major threat globally. Worldwide 7,80,000 people [7] die each year due to acute HBV. India is also facing major public health threat. Wide