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GLOBAL ANALYSIS OF SEIRS EPIDEMIC MODEL WITH BILINEAR INCIDENCE RATE : AN APPLICATION TO COVID-19 PANDEMIC IN MOROCCO

Yassine Babrhou [1], Brahim El Boukari[2], Ali El Mfadel[3,*] and Ahmed Kajouni[4]

[1,2,3,4] Laboratory of Applied Mathematics and Scientific Computing, Sultan Moulay Slimane University, Beni Mellal, Morocco.

email: babrhouyassine@gmail.com.fr[1], elboukaribrahim@yahoo.fr[2], a.elmfadel@usms.ma[3], kajjouni@gmail.com[4]

Abstract. In this paper, we investigate the SEIRS epidemic model incorporating a bilinear incidence rate. We perform a comprehensive analysis to examine the dynamic behavior of the model. Additionally, we calculate the basic reproductive number R_0 to determine whether the disease will spread or die out within the population. We demonstrate the global stability of both the disease-free equilibrium and the endemic equilibrium by employing suitable Lyapunov functions and LaSalle's invariance principle. Finally, we present numerical simulations for the COVID-19 pandemic in Morocco, applying the developed model.

Keywords. COVID 19, Global stability, SEIRS model.

Subject classification(2020): 34D23, 92D30.

1 Introduction

Infectious diseases are caused by micro-organisms, these are microscopic organisms, such as bacteria, viruses, fungi, or parasites. They can sometimes be caught from other people, the environment, from animal contact, or from insect bites. Depending on the type of infection, there are many ways that infectious diseases can spread. Fortunately, in most cases, there are simple ways to prevent infection. Through the development of technology and science, in the past few years there has been a lot of research focused on the transmission of such diseases and how to control them in society. Therefore in order to manage and predict for prospective planning, differential equations are one of the most effective mathematical tools available. These techniques can be applied to the conversion of physical or biological ideas into mathematical formulas. Studying and analyzing equations resulting from biological