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# Mathematical Study of a Modified SEIR Model for the Novel SARS-Cov-2 Coronavirus

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**Abstract:** In this paper, a modified SEIR mathematical model for the coronavirus infected disease-2019 (COVID-19) has studied. We named this model the SEIQRC model and analyzed the stability mathematically. A qualitative analysis of the local and global stability of equilibrium points is carried out. It is shown that the disease-free equilibrium is globally asymptotically stable when the basic reproduction number $\mathcal{R}_0 \leq 1$ and the disease-persistence equilibrium is globally asymptotically stable when $\mathcal{R}_0 > 1$.

**Keywords:** *COVID-19; coronavirus; SEIQRC model; local and global stability; direct Lyapunov method; Lasalle's invariance principle.*

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## 1 Introduction

The novel Coronavirus was detected in China and a few months later it spreaded in the countries all over the world. Covid-19 contamination can be transmitted to a person from a contaminated person, a contaminated dry surface, through the nose or mouth. In March 2020, the World Health Organization declared the Covid-19 a global pandemic. For today, the novel Coronavirus caused tens of thousands of deaths and a few million cases of infections. It can be classified as the third highly pathogenic human Coronavirus appearing in the past two decades. Since its appearance, several scientific researchers have been interested in studies of various problems related to this novel Coronavirus [2, 7, 13].

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