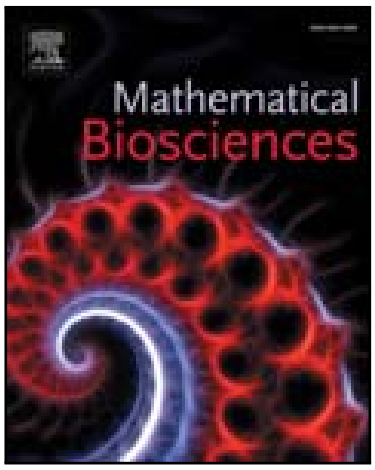

A mathematical model for malaria transmission with asymptomatic carriers and two age groups in the human population

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A mathematical model for malaria transmission with asymptomatic carriers and two age groups in the human population.

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Abstract

In this paper a conceptual mathematical model of malaria transmission proposed in a previous paper has been analyzed in a deeper detail. Among its key epidemiological features of this model, two-age-classes (child and adult) and asymptomatic carriers have been included. The extra mortality of mosquitoes due to the use of long-lasting treated mosquito nets (LLINs) and Indoor Residual Spraying (IRS) has been included too. By taking advantage of the natural double time scale of the parasite and the human populations, it has been possible to provide interesting threshold results. In particular it has been shown that key parameters can be identified such that below a threshold level, built on these parameters, the epidemic tends to extinction, while above another threshold level it tends to a nontrivial endemic state, for which an interval estimate has been provided. Numerical simulations confirm the analytical results.

Keywords: Malaria, Nonlinear ODE models, Qualitative analysis, Numerical simulations
MSC codes [2010]: 92D30, 92D25, 34D05, 34D15, 34D23

1. Introduction

Malaria is a serious parasitic disease in less developed countries causing an high mortality. It is estimated that nearly 300 to 400 million malaria cases occur worldwide, out of which 1.5 to 2 million die every year. Five species of *Plasmodium* can infect humans among which *P.falciparum* is the most common and causes the most severe malarial infection. The female anopheles mosquito is the primary vector of malarial parasite. Thanks to the improvement of diagnostic methods it is now known that the prevalence of asymptomatic malaria is higher than previously thought [1, 2]. An asymptomatic malaria case can be defined as the case of a human individual who harbors the parasite capable of transmitting the disease, but without exhibiting

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