

## **Co-infection of Malaria and COVID-19: A Systematic Review**

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**Background:** Malaria is amongst the deadliest infectious diseases in the world, having been responsible for 405,000 deaths in 2018. The COVID-19 pandemic has posed major challenges to efforts at malaria control, as individuals now remain at risk for both of these infections. Furthermore, individuals residing in malaria-endemic settings have remained at a heightened vulnerability due to the potential co-infection of malaria and COVID-19. Despite the enormity of the potential risk that this poses, characteristics of malaria-COVID-19 co-infection are not currently well understood.

**Objective:** To describe the risk factors and clinical characteristics of malaria-COVID-19 co-infection by systematically reviewing the literature.

**Methods:** Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, searches were conducted in PubMed, Scopus, ScienceDirect, CINAHL, Medline, and Proquest (Coronavirus Research Database). Original research articles that were in English, and that included patients infected with both COVID-19 and malaria, were eligible. Methodological quality of studies was assessed using the Johanna Briggs Institute's critical appraisal tools.

**Results:** Searches generated a total of 2883 articles, and of those, a total of 6 studies were eligible for this review. The most frequently reported symptoms for patients were fever, abnormal breathing patterns, abdominal pain, and headache. Average duration of symptoms was 20.4 days. Risk factors for co-infection were recent travel, pregnancy, past history of malaria, and having comorbidities. There were no reported deaths, though there was a reported instance of nephrotic syndrome, and another of terminated pregnancy. In all 6 studies, symptoms did not subside for patients until they were correctly diagnosed, and provided antimalarial treatment.

**Conclusion:** As symptoms were resolved for patients in all studies after the appropriate provision of antimalarial treatment, it is critical that hospitalized individuals with flu-like symptoms in malaria-endemic settings be tested for both COVID-19 and malaria, thereby allowing for a proper diagnosis. This is especially pertinent for pregnant women, who appear to be at an elevated risk for severe complications. Lastly, considering the small number of studies eligible for this review, there is a clear need for more, high quality studies to be conducted in order to further evaluate the risk factors and clinical characteristics of malaria-COVID-19 co-infection.