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Review Article

Potential Influence of Parasitic Diseases as Protective Agents from Infection with Pandemic COVID-19

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ABSTRACT

Parasitic diseases can affect infection with COVID-19 obviously, as protective agents, or by reducing severity of this viral infection. This current review mentions the common symptoms between human parasites and symptoms of COVID-19, and explains the mechanism actions of parasites, which may prevent or reduce severity of this viral infection. Pre-existing parasitic infections provide prohibition against pathogenicity of COVID-19, by altering the balance of gut microbiota that can vary the immune response to this virus infection.

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which cause coronavirus disease 2019 (COVID-19), was recorded as the first time in China, in Wuhan City 2019 (1, 2). This viral infection was stated by WHO as a pandemic, because of its globally spread. The fast transmission of this infection, and the absence of screening instruments, made researchers depending on other criteria, included clinical features, and rapid effective measures in order to decrease the number of COVID-19 deaths (3). Primarily this infection spreads by respiratory droplets, and the most common clinical manifestations are cough, fever, rhinorrhea, diarrhea, chest pain, dyspnea, and myalgia (4), while in critical cases, it may cause multiorgan inability, then dying (5). Regarding to the laboratory examinations , the infection is confirmed by making screening with RT-PCR(6), elevation of liver enzymes concentrations, ferritin lactate dehydrogenase, elevation in the levels of D-dimer, and C-reactive protein may be indicators of disease severity (7), sometimes blood tests may showing leucopenia, thrombocytopenia, and lymphocytopenia (8).

Parasites infect nearly 2 billion people annually (9), it have the same mechanisms of causing disease with different microorganisms, similar processes of inflammation, and inducing of immune or allergic reactions. Clinical manifestations of parasitic infections could be characterized by fever, dyspnea, and cough, so it can't be distinguished easily from other diseases of respiratory system, and most commonly influenza (10). Parasitic infections effect the immune system, and damage tissue , in spite of that

immunomodulation results from parasites could also keep from damaging tissue by inflammatory processes reduction (11).

Similarity of symptoms between parasitic infections and COVID-19

COVID-19 symptoms could be similar to other diseases caused by parasites (Figure 1) (12), such as parasitic pneumonia result from migration of parasitic larva through the lung (13), other symptoms like fever, cough, dyspnea, fast breathing, and Löffler's syndrome in severe cases. Another similarity to this viral infection, those parasites of GIT can make GIT disorders, like abdominal pain, diarrhea, vomiting, and nausea. Metazoan parasites such Ancylostoma, Ascaris, Enterobius, Trichuris, and Schistosoma, also protozoal parasites like Giardia, Entamoeba, Cryptosporidium, and Toxoplasma, are considered the major pathogens which cause global intestinal parasitic disease (14, 9).

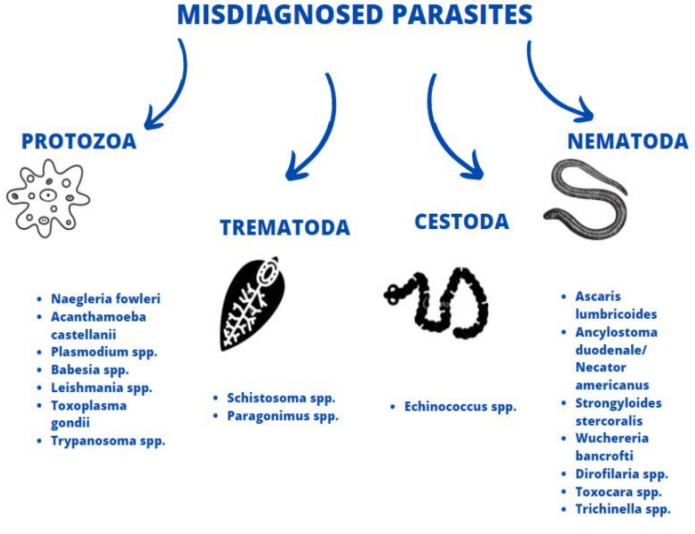

Figure 1. Parasites with similar symptoms to COVID-19 (12)

Potential role of parasitic infections in protection against COVID-19 or decrease its severity

Persistent or chronic parasitic infections, make direct modulation of immune responses of the host, and were confirmed to change clinical manifestations of other infections (15, 16), and these parasitic infections could change immune response of human to this viral infection . The virulence of severe COVID-19 is connected with activation of immunity (17), and the absence of parasitic infection may increase hazard of COVID-19 riskiness (18).

Therefore parasites may have potential role to decrease severity of COVID-19 (19), through modulation response of systemic immunity. Old parasitic infections are connected with activation of macrophages ,T helper-2 (TH2), and type 2 innate lymphoid cells (ILC2), all of their activities are accompanied with inducing cytokines like interleukins 4,5,13 and improve responses of eosinophils, beside IgE (20). During parasitic infections TH2 immune responses accompanied with activation response of regulatory T cells (Tregs) that considered very important to keep parasitic persistence, that in turn affect the response to other infections (15, 16, 19). While severe COVID-19 is linked with increasing hyper inflammation (20).

So, persistent parasite control Treg response and TH2 response, and may counterbalance overactive TH1 responses, that was founded in severe COVID-19, as well as, parasite control changes of gut microbiota ,and may modulate immune response of the host (18). Thus, infections of the parasites can affect pathogenicity by immediate modification in the immune system, and through balancing microbiota (15, 16, 18). Another study has shown that GIT metazoan can acts as protectors versus viral infections of the lungs by action together with microbiota through inducing of type I interferon signaling (21), and several studies have been recorded the antagonistic relation of infection with COVID-19 and between parasitic infection (22, 23, 24). Influence of parasitic infections on COVID-19 especially those related with helminths, may decrease occurrence and death-rate of COVID-19 (25, 26), while co-parasitic infection with intestinal parasites could reduce severity of this virus (27). (Figure 2) (28).

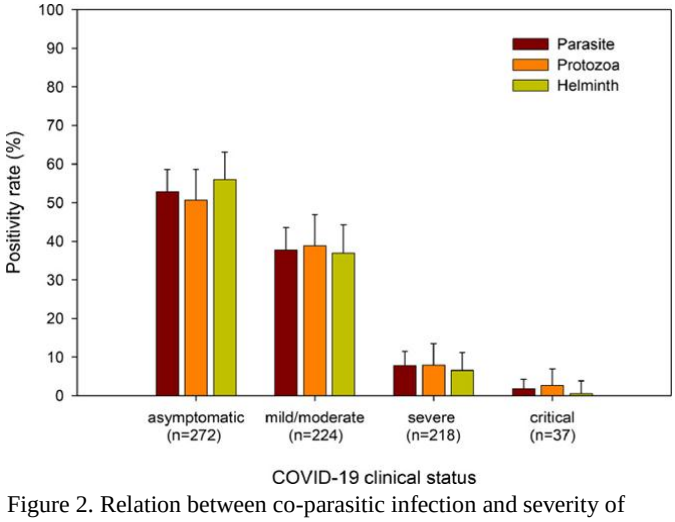

Figure 2. Relation between co-parasitic infection and severity of COVID-19 (28).

Conclusion

It is obvious there is a considerable counteractive relation between parasitic incidence and COVID19 severity, suggesting that parasitic infection, with protozoa and/or helminths, may play a potential role as protective agents versus COVID-19, or reducing severity progression of this viral infection.

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