Correspondence

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Human babesiosis, an infectious disease caused by protozoa: transmission, pathogenesis, symptoms, diagnosis, and treatment –correspondent

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Dear Editor,

Babesiosis is caused by microscopic parasites that target red blood cells and are spread by certain ticks. The two areas of the country where tick-borne transmission is most common are the Northeast and upper Midwest, and the warm months are usually when it peaks. Although many Babesia infected people may not show symptoms, those who do can receive successful therapy. Babesiosis can be prevented by taking simple measures to reduce tick exposure[1]. Five Babesia species have been determined to be zoonotic worldwide. The epidemiology of human babesiosis is often complex and unclear due to the diversity of different Babesia species. The primary cause of human transmission of Babesia species in Europe is *Ixodes ricinus*. The prevalence and range of this tick suggest that human babesiosis could manifest itself wherever in Europe. The three bacteria, *B. divergens*, *B. venatorum* (EU1), and *B. microti*, were blamed for the clinically significant 39 recorded human cases in Europe. Regrettably, a formal identification of the Babesia species is not always possible. On the European continent, bovine *B. divergens* babesiosis is very common, and human cases have been reported in many nations. One human case, which happened in the Canary Islands, has been linked to *B. divergens* among EU abroad territories. Human babesiosis occurs primarily in the USA outside of Europe. *B. microti*, *B. duncani* n sp., and MO1-type B. sp. are pathogenic organisms. Additional cases of unidentified Babesia or *B. microti* have been recorded from India, Mexico, Japan, Taiwan, and Africa[2]. Babesia is not contagious and can only be passed from one person to another by a blood transfusion that has been tainted or by congenital transmission from an infected person to a fetus during pregnancy or birth. According to the Centers for Disease Control and Prevention, *B. microti* has emerged as one of the most prevalent parasites transmitted by blood transfusion in the United States, despite the fact that bloodborne transmission only accounts for a small proportion of babesiosis cases. The bite of an infected tick is how all other human cases of babesiosis are spread[3]. The majority of babesiosis's clinical symptoms and complications, including hemolytic anemia, jaundice from unconjugated hyperbilirubinemia, hemoglobinemia, hemoglobinuria, and renal failure from acute tubular necrosis, are linked to erythrocyte lysis, which occurs when the parasite invades red blood cells in the human body. When immune cells come into contact with the glycosylphosphatidylinositol anchors of the babesial proteins, which are either formed on the surface of the pathogen or the surface of infected erythrocytes, they may trigger the release of proinflammatory cytokines. When these cytokines are produced in excess, they can injure cells in addition to perhaps killing parasites by causing the creation of downstream mediators (such as nitric oxide). Humans develop immunity against Babesia parasites based on cellular and humoral mechanisms, albeit the majority of the research indicates that the latter is of only marginal importance. Only when the parasites have entered the bloodstream but have not yet turned intracellular do antibodies play a significant role. As a result, T cells, namely the CD4 + T helper cell subset, are important for the establishment of Babesia parasite resistance. Furthermore, nonspecific responses by natural killer cells and macrophages are particularly important in preventing babesial infection[4]. After coming into touch with the parasite that causes the disease, symptoms of babesiosis appear 1–8 weeks later. You may occasionally have no symptoms. Body aches, chills, fatigue, fever, headache, loss of appetite, and sweating may be among them if you do. You also can acquire a disorder called hemolytic anemia in which your red blood cells die quicker than your body can generate new ones. This might cause confusion, dark urine, dizziness, and other symptoms such as a heart murmur, rapid heartbeat, spleen and liver swelling, an extremely pale complexion, weakness, and jaundice-like yellowing of the eyes, lips, and skin[5]. Babesiosis can be challenging to identify. Babesia parasites can be found in the early stages by microscopically testing a blood sample. Blood smear microscopy diagnosis takes a lot of time and knowledge. Smears might need to be repeated over a few days if there is a very low level of parasitemia in the blood, especially early in the course of the illness. Your doctor can perform additional tests if you or your doctor suspects babesiosis. On the blood sample, they might request an indirect fluorescent antibody test. The blood sample may also be subjected to molecular diagnostics, such as polymerase chain reaction[6]. Babesiosis is treated with a number of

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medications, including quinine with clindamycin and atovaquone plus azithromycin. Treatment is normally not necessary for asymptomatic patients, although it may be for those who have a persistently high fever, quickly rising parasitemia, or a declining hematocrit. In patients with mild to moderate babesiosis, quinine with clindamycin is equally effective as the combination of atovaquone and azithromycin given for 7–10 days, with fewer side effects. Atovaquone is given orally in doses of 750 mg every 12 h to adults, while azithromycin is given orally in doses of 500–1000 mg the first day, followed by 250–1000 mg every day. Atovaquone 20 mg/kg orally twice daily for children over 5 kg is prescribed, along with 10 mg/kg of azithromycin orally once, followed by 5 mg/kg once daily for 7–10 days. It is also possible to administer 300–600 mg IV four times per day for 7–10 days together with clindamycin 600 mg orally three times per day. The recommended dosage for children is clindamycin 7–14 mg/kg orally three times daily along with quinine 10 mg/kg orally. For really sick patients, quinine combined with clindamycin is seen to be the gold standard of therapy. Quinine recipients must be properly watched for any negative side effects. In critically ill patients with high (>10% of erythrocytes) parasitemia, exchange transfusion has been used[7]. We discussed about human babesiosis, an infectious condition spread by ticks and caused by Babesia protozoa: the name and characteristics of the infectious agent, symptoms, pathogenesis, diagnosis, and treatment.

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M.R.I.: conceptualization, writing-original draft preparation; S. A.: writing and editing. All authors have reviewed and approved the final version of the manuscript prior to submission.

Conflicts of interest disclosure

The authors declare no conflict of interest, financial, or otherwise.

Data availability statement

All data used to support the findings of this study are included in the article.

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