Health Unit for interviewing case-patients and assisting with this investigation. We acknowledge the work of various laboratory staff at the Royal Darwin Hospital, who tested specimens and provided the results that contributed to the quality of this report. We thank the Australian Medical Assistance Team managed by the National Critical Care and Trauma Centre and staff at the Howard Springs International Quarantine Centre for their collaboration and the safe management of these international arrivals during quarantine. We thank Qantas Airways for repatriating persons home to Australia and their cooperation and valuable contribution to this investigation.

This work was supported by the Medical Research Future Fund (MRF9200006).

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Strongyloides Hyperinfection Syndrome among COVID-19 Patients Treated with Corticosteroids

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DOI: https://doi.org/10.3201/eid2807.220198

Widespread use of corticosteroids for COVID-19 treatment has led to Strongyloides reactivation and severe disease in patients from endemic areas. We describe a US patient with COVID-19 and Strongyloides hyperinfection syndrome and review other reported cases. Our findings highlight the need for Strongyloides screening and treatment in high-risk populations.

Strongyloidiasis is caused by the soil-transmitted helminth *Strongyloides stercoralis* and affects ≈613.8 million persons worldwide (1). *S. stercoralis* infections can be asymptomatic or chronic or can cause life-threatening larva dissemination, especially in immunocompromised patients (2). Among COVID-19 patients, dexamethasone is the standard treatment for persons requiring supplemental oxygen, but among persons from *Strongyloides*-
endemic areas, exposure to corticosteroids can cause life-threatening *S. stercoralis* hyperinfection (3). We describe a case of *Strongyloides* hyperinfection syndrome in a COVID-19 patient and review other reported cases.

A 63-year-old man, who was originally from Cambodia, was admitted to a hospital in Central Valley, California, USA, for a 4-day history of fever, cough, and respiratory distress. His medical history included diabetes mellitus and alcohol use disorder. Admission laboratory testing showed a leukocyte count of 8,500 cells/μL (absolute lymphocyte count 660 cells/μL, reference range 800–4,800 cells/μL) and absolute eosinophil count of 0 cells/μL (reference range 0–800 cells/μL). A nasopharyngeal swab sample tested SARS-CoV-2–positive by PCR. Chest radiographs showed patchy bilateral airspace consolidations. By day 5 of hospitalization, the patient’s respiratory failure worsened, and he required supplemental oxygen via high-flow nasal cannula. Chest computed tomography imaging showed multifocal bilateral airspace opacities. The patient received intravenous dexamethasone (6 mg/d for 10 d); during the first 5 days of treatment, he also received baricitinib (10 mg 1×/d) and remdesivir (100 mg/d). The patient’s respiratory status improved, and he was discharged to a skilled nursing facility.

The patient returned to the hospital 6 days later with respiratory failure and altered mental status. He was febrile (temperature 39°C) and hypoxic and required intubation. Blood tests revealed a leukocyte of 5,300 cells/μL (absolute lymphocyte count 1,000 cells/μL) and absolute eosinophil count of 100 cells/μL. Blood and sputum cultures were positive for methicillin-sensitive *Staphylococcus aureus*, and we initiated intravenous cefazolin (2 g every 8 h for 10 d). The patient transiently improved, but then fever developed and persisted. After 10 days of broad-spectrum antimicrobial drug therapy, the patient’s blood cultures were negative. Echocardiography, magnetic resonance imaging, and computed tomography scans did not identify a focus of infection.

Subsequent respiratory culture was positive for extended spectrum β-lactamase *Escherichia coli*. The patient continued to have encephalopathy, and we recommended a lumbar puncture, but the procedure was not performed because of his hemodynamic instability. We changed the patient’s therapy to intravenous meropenem (2 g every 8 h), but his condition did not improve. He was eventually transitioned to comfort care and died.

*S. stercoralis* parasites are endemic in tropical and subtropical regions, but data on strongyloidiasis prevalence is likely underreported, even in endemic areas (1). Patients can develop chronic *S. stercoralis* infection, but an immunocompetent host’s immune system can regulate infection by controlling adult worm population density in the intestines. However, when a host becomes immunocompromised, larval migration to organs can increase during the autoinfection cycle, causing *Strongyloides* hyperinfection syndrome. Exposure to corticosteroids, human T-cell leukemia virus type 1 co-infection, and solid organ transplantation can increase risk for *Strongyloides* hyperinfection syndrome (2). Dexamethasone is the standard treatment for COVID-19 patients who require oxygen therapy; other immunosuppressive agents, including interleukin-6 inhibitors such as tocilizumab, are also commonly used.

Other strongyloidiasis cases have been reported in COVID-19 patients (4–9) (Table 1). *Strongyloides* hyperinfection syndrome can cause signs and symptoms similar to those of severe COVID-19, including fever, chills, dyspnea, gastrointestinal symptoms, and rash. These vague symptoms can cause missed or delayed strongyloidiasis diagnosis,
Anakira; methylprednisolone 80 mg tapered over 1 month

Sputum culture positive for larvae; positive Strongyloides IgG serology

Stool microscopy positive for rhabditiform larvae; serology positive at 1:640

Bronchoalveolar fluid positive for larvae

Positive ELISA IgG serology, 2.27†

Positive ELISA IgG serology, 2.47†

Positive serologic test; RT-PCR positive for S. stercoralis in fecal samples

Ivermectin and albendazole × 2 wk

Ivermectin × 2 d

Ivermectin × 2 d

Initial eosinopenia (0 cells/mL), elevated to 2,670 cells/mL after steroid exposure, decreased after ivermectin

Elevated to 5,540 cells/µL after steroid exposure, rapid decrease after ivermectin

Unremarkable

Unremarkable

Eosinopenia before treatment, no further report

Eosinopenia before treatment, no further report

Eosinophil pattern

Strongyloides

Treatment

Diagnosis

COVID-19 treatment

Country of origin

Reporting country

Patient age, y/sex

Ref no.

59/M

United States

68/M

Ecuador

53/M

India

69/M

Spain

44/M

Spain

74/F

Spain

59/M

Italy

69/M

Colombia

Bolivia

Honduras

Belgium

Ecuador

Central India

Ecuador

Southern Italy

Ecuador

Tocilizumab × 1 d and methylprednisolone × 8 d

Methylprednisolone 60 mg intravenous 2×/d × 5 d

Methylprednisolone

Bronchoalveolar fluid

Dexamethasone

Dexamethasone

†Normal value <1.01.

†All patients recovered. Ref, reference; RT-PCR, reverse transcription PCR.

Table 1. Characteristics of previously reported Strongyloides infections in patients with SARS-CoV-2 pneumonia*

In conclusion, Strongyloides hyperinfection cases are rising in certain COVID-19 patients. Standardized protocols for Strongyloides screening and treatment are needed, especially for patients from endemic countries. To prevent this complication, clinicians should consider Strongyloides screening in COVID-19 patients from endemic areas who require corticosteroid treatment.

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Mental Health Conditions and Severe COVID-19 Outcomes after Hospitalization, United States

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DOI: http://doi.org/10.3201/eid2807.220720

Among 664,956 hospitalized COVID-19 patients during March 2020–July 2021 in the United States, select mental health conditions (i.e., anxiety, depression, bipolar, schizophrenia) were associated with increased risk for same-hospital readmission and longer length of stay. Anxiety was also associated with increased risk for intensive care unit admission, invasive mechanical ventilation, and death.

Persons with mental health conditions (MHCs) might be at higher risk for severe COVID-19 outcomes after hospitalization because of poor access to care and a higher incidence of underlying conditions. Most studies have been limited by small samples or aggregation of MHCs, which can conceal differences in risk (1,2). Previous studies also have not examined length of stay (LOS) and readmission as outcomes. We examined patient records from a large, US-based electronic database to determine whether select MHCs were associated with severe COVID-19 outcomes, increased LOS, and same-hospital readmission.

The Premier Healthcare Database Special COVID-19 Release (accessed October 1, 2021) contained discharge data from >900 hospitals, representing ≈20% of annual admissions in the United States. (3). We identified patients hospitalized with COVID-19 and discharged during March 1, 2020–July 31, 2021, by using discharge codes from the International Classification of Diseases, 10th Revision, Clinical Modification (B97.29 for March 2020–April 2020 or U07.1 for April 2020–July 2021). MHCs of interest were anxiety, depression, bipolar disorder, and schizophrenia (identified from encounters from January 2019 through the index COVID-19 admission). Because patients could have multiple MHC diagnoses, categories were not mutually exclusive. Outcomes were intensive care unit (ICU) admission, invasive mechanical ventilation (IMV), 30-day same-hospital readmission...