



Case Report

SARS-CoV-2 and *Orientia tsutsugamushi* co-infection in a young teen, Nepal: Significant burden in limited-resource countries in Asia?

Anup Bastola^{1,a}, Ranjit Sah^{2,3,a*}, Sagar K. Rajbhandari¹, Runa Jha³, Zareena Fathah⁴, Bimal S. Chalise¹, Bikesh Shrestha¹, Rajesh K. Shah¹, Pujan Balla¹, Richa Nepal¹, Bipin Adhikari^{5,6}, Ali A. Rabaan⁷, Kuldeep Dhama⁸ and Alfonso J. Rodriguez-Morales^{9,10}

¹Sukraraj Tropical and Infectious Disease Hospital, Teku, Kathmandu, Nepal; ²Department of Microbiology, Institute of Medicine, Tribhuvan University Teaching Hospital, Kathmandu, Nepal; ³National Public Health Laboratory, Kathmandu, Nepal; ⁴King's College London, London, United Kingdom; ⁵Nepal Community Health and Development Centre, Kathmandu, Nepal; ⁶Centre for Tropical Medicine and Global Health, Nuffield Department of Medicine, University of Oxford, Oxford, United Kingdom; ⁷Johns Hopkins Aramco Healthcare, Dhahran, Saudi Arabia; ⁸Division of Pathology, ICAR-Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh, India; ⁹Grupo de Investigación Biomedicina, Faculty of Medicine, Fundación Universitaria Autónoma de las Américas, Pereira, Risaralda, Colombia; ¹⁰School of Medicine, Universidad Privada Franz Tamayo, Cochabamba, Bolivia

^aBoth authors contributed equally to this article

*Corresponding authors: ranjitsah57@gmail.com

Abstract

Scrub typhus is caused by *Orientia tsutsugamushi*, transmitted through bites of infected chiggers (larval mites). During the coronavirus disease 2019 (COVID-19) pandemic, reports of co-infections with endemic pathogens are increasing around the world. Disease with similar clinical presentation may mask other disease diagnosis and increase the morbidity and mortality of the patients. We report co-infection between severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and *O. tsutsugamushi* in a patient in Nepal presenting with fever, headache, retro-orbital pain, generalized body ache, and knee joints pain with a history of dry cough and dyspnea at night. Since scrub typhus is prevalent and considerate as one of the public health consents in Asian countries and the possible overlapping clinical manifestation with other infections including COVID-19, a further investigation required to determine the burden of SARS-CoV-2 and *O. tsutsugamushi* co-infection in scrub typhus-endemic countries in Asia.

Keywords: Scrub typhus, *Orientia tsutsugamushi*, SARS-CoV-2, COVID-19, coinfection

Introduction

Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has posed huge concerns while spreading to more than 225 countries affecting nearly 150 million people, with 3.2 million deaths (April 26, 2021). In Nepal, the first case was detected on January 23, 2020, and as of April 26, 2021, a total of 300,119 cases were identified [1]. Overlapping with the ongoing COVID-19 pandemic, Nepal is also facing seasonal vector-borne diseases. Heavy rain and a humid climate provide suitable conditions for disease vectors, including chiggers. The most common vector-borne diseases in Nepal are dengue, malaria, and scrub typhus [2]. Scrub typhus, a disease caused by an obligate



intracellular bacterium, *Orientia tsutsugamushi*, is transmitted by chigger mite bites and emerged in Nepal following a massive earthquake in 2015 [3]. Disease appears following rainfall from July with activity reported until November. In the current scenario, COVID-19 could overlap with one or more vector-borne conditions. We describe a case of co-infection with COVID-19 and scrub typhus in Nepal.

Case

A fourteen-year-old female resident of Pyutar-4 Lalitpur district, Bagmati province, Nepal, presented at the tertiary care Sujraraj Tropical and infectious Disease Hospital in Lalitpur on June 26, 2020. The patient complained of a fever for one week with a maximum temperature of 38.8°C. The illness was associated with headache, retro-orbital pain, generalized body ache, and knee joint pain. She also had a history of dry cough and dyspnea at night. She was examined in the outpatient department. On clinical evaluation, her temperature was 38.3°C. No other relevant clinical findings were found. Laboratory tests were conducted including a SARS-CoV-2 RT-PCR test, from a nasopharyngeal swab, which was positive (Table 1). The patient was admitted for isolation upon the positive SARS-CoV-2 RT-PCR result on June 28, 2020.

On admission, the patient mentioned a history of dry cough and sore throat. The patient had no other chronic diseases nor any habit of substance abuse. The patient has not visited any place following government-imposed lockdown. The patient had four family members who had also not visited any other location during the lockdown. Her father, who works in waste management in Kathmandu, visited her while the patient was ill. On clinical examination, there was no pallor, icterus, cyanosis, clubbing and oedema. The body temperature was 36.5°C, blood pressure was 108/72 mmHg, pulse of 112 bpm and saturation in room air of 95%. The remaining systemic examination was unremarkable.

Table 1. Clinical laboratory results for the 14-year-old girl with possible SARS-CoV-2 and scrub typhus co-infection, Nepal

Laboratory finding	June 26, 2020	June 29, 2020
Blood analysis		
Leukocyte count, × 10 ⁹ cells/L	3.15	6.40
Neutrophil, %	46.00	27.00
Lymphocytes, %	53.00	63.00
Monocytes, %	1.00	7.00
Eosinophils, %	ND	3.00
Platelet count/mL	152,000	144,000
Hemoglobin level, g/dL	10.7	10.5
Random blood sugar, mg/dL	117	140
Creatinine, mg/dL	0.4	0.5
Na, mmol/L	141	ND
K, mEq/L	4	ND
C-reactive protein, mg/L	14	Negative
Direct Bilirubin, mg/dL	ND	1.2
Total Bilirubin, mg/dL	ND	0.2
ALT, IU/L	ND	150
AST, IU/L	ND	161
Urinalysis		
Albumin	Not present	ND
Sugar	Not present	ND
Cast	Not present	ND
Pus cells	2-3 per field	ND
Red blood cells	0-2 per field	ND
Real-time RT-PCR for SARS-CoV-2	Positive	Positive
DENV serological tests		
IgM antibodies	ND	Negative
IgG antibodies	ND	Negative
NS1 Antigen	ND	Negative
Scrub typhus serological tests		
IgM antibodies	ND	Positive
IgG antibodies	ND	Positive

ALT: alanine aminotransferase, AST: aspartate aminotransferase, DENV: dengue virus, MAT: microscopic agglutination test, ND: not determined, RT-PCR: reverse transcription PCR.

Follow-up laboratory investigations on June 29, 2020 suggested leukocytopenia, thrombocytopenia and elevated transaminases. As these signs are commonly seen in scrub typhus infection and are less common in milder forms of COVID-19 infection, scrub typhus was investigated. A rapid diagnostic test for scrub typhus (Diagnostic NIC, Vancouver, Canada) returned positive for IgG and IgM antibodies against *O. tsutsugamushi*. Serological tests for dengue (Diagnostic NIC, Vancouver, Canada) were negative (**Table 1**).

The chest X-rays and computed tomography (CT)-scan of the patient were normal, except for the finding of dextrocardia, giving the idea of lack of evolution of severe COVID-19 manifestations. Investigation of patient's residential area found a landscape with vegetation, serving as a suitable habitat for both mice and chiggers.

Discussion

COVID-19 is an ongoing pandemic affecting nations worldwide [5]. COVID-19 presents with many non-specific symptoms such as fever (83–99%), cough (59–82%), fatigue (44–70%), anorexia (40–84%), shortness of breath (31–40%) and myalgias (11–35%), that may overlap with vector-borne diseases, such as dengue and scrub typhus [5-8]. There are other less common symptoms which have also been reported such as sore throat, nasal congestion, headache, diarrhea, nausea and vomiting. Anosmia and ageusia have also been described in high frequency [7,9]. The reported case presented with fever, headache, retro-orbital pain, generalized myalgia, joint pain, cough, dyspnea and sore throat. Symptoms presented in this case overlapped both with the COVID-19 and scrub typhus. Severe headache, myalgia, retroorbital pain are common with scrub typhus, and cough and dyspnea are seen among COVID-19 patients. No cases of COVID-19 and scrub typhus have been reported in the literature.

This case highlights the importance of differential diagnoses in endemic areas with conditions such as scrub typhus and the possibility of co-infection with this and other tropical pathogens [10]. In coming days, these incidences may rise as scrub typhus activity approaches peak activity from August, coinciding with continual COVID-19 spread within the community, making it difficult for clinicians to recognize and differentiate these two diseases. The ongoing COVID-19 pandemic and continual spread within the country, along with other vector-borne conditions, including scrub typhus, may lead to difficulties for clinicians to make precise diagnoses. Clinicians must also consider and evaluate other vector-borne diseases along with COVID-19, including scrub typhus, in endemic areas, or travelers coming from the endemic areas.

Scrub typhus is considered one of the emerging public health issues in Asian countries [11]. Although scrub typhus is mainly limited to the Asia Pacific region, one million cases are reported annually, and nearly one billion people are at risk of getting infected [12]. Based on overlapping clinical manifestations, it is possible that the occurrence of scrub typhus is overshadowed by COVID-19 in several Asian countries where the disease is endemic, especially in Nepal [13]. COVID-19 closely mimics other diseases having acute febrile illnesses such as dengue fever, scrub typhus, leptospirosis, and malaria [11,14]. The rapid spread of SARS CoV-2 infections in several tropical countries has resulted in a diagnostic challenge for detecting acute febrile illnesses. To differentiate scrub typhus from COVID-19, clinicians can investigate the presence of eschar, a classic pathognomonic sign, and the most vital indicator for diagnosing scrub typhus [14].

Conclusions

We reported a possible COVID-19 and scrub typhus co-infection in a young teen in Nepal. Although the patient was diagnosed for scrub typhus by a rapid diagnostic test with single spot reading only, this highlights the important for the clinicians to evaluate the possible co-infections of COVID-19 with other endemic tropical infections in particular in limited-resource countries in Asia.

Declarations

Ethics approval

Not applicable for case report.

Patient's consent

Informed written consent was taken from the patient to publish this case report and related evidence.

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Conflict of interest

Authors declare no conflict of interest.

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