Telehealth Outpatient Monitoring of a SARS-CoV-2 Familial Cluster Infection in Peru: Adapting to a Healthcare Crisis

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ABSTRACT

The coronavirus disease 2019 (COVID-19) epidemic is evolving in Latin America despite implementation of government measures. We report a familial cluster in Lima, Peru, with confirmed severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection. Two young and two middle-aged adults with a wide range of COVID-19 manifestations experienced successful management under telehealth outpatient monitoring. Telehealth monitoring was scheduled as suggested by Peruvian Ministry of Health Guidelines and was performed by a designated physician who assessed the patients and prescribed treatment.

On May 14, 2020, a 25-year-old male, who worked treating COVID-19 patients, reported constitutional symptoms and tested positive for SARS-CoV-2. Clinical improvement was achieved with azithromycin and ivermectin therapy. He had been in contact with his parents (Cases 2 and 3) and his sister (Case 4). Cases 2 and 3 developed moderate pulmonary compromise requiring oxygen supplementation and pharmacological therapy, including corticosteroids and anticoagulation, under home medical assessment and telehealth monitoring. Case 4 developed mild symptoms and periorbital rash, an atypical dermatological finding.

To our knowledge this represents the first report of a familial cluster with COVID-19 that was successfully managed under scheduled telehealth outpatient monitoring in Latin America.

Key Words: SARS-CoV-2, COVID-19, case report, telemedicine, telehealth, teleconsultation, telehealth monitoring

INTRODUCTION

An outbreak of coronavirus disease 2019 (COVID-19) due to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has spread worldwide.[1] Latin America has been affected since March 2020,[2] with Peru reporting its first case in Lima on March 6, 2020. Since then, the epidemic has continued to evolve despite implementation of government measures.[3]

Telehealth monitoring has gained terrain in the medical field.[4] It can empower health systems to avoid cross-infection of COVID-19 and ensure adequate monitoring of affected patients.[4,5] In Peru, telehealth monitoring of COVID-19 patients was proposed by the Ministry of Health and has been used as a scheduled approach, according to the severity or the presence of risk factors.[6]

To date, there is no specific treatment against SARS-CoV-2. Various treatment modalities are being tested at different stages of illness, such as: antivirals, prophylaxis of thromboembolic complications, glucocorticoids, convalescent

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plasma, immunomodulatory agents and ivermectin.[7-9] Some antibiotics with potential in-vitro effects are also being given for the bacterial complications of COVID-19.[10,11]

In this case report, we described the clinical course and outcome of a SARS-CoV-2 familial cluster. Two young and two middle-aged adults diagnosed with COVID-19 were living in a four-bedroom flat with two shared toilets and eating meals together daily in a common dining room, they were treated using telehealth monitoring, provided by a private healthcare facility in Lima, Peru. After an initial in-home medical evaluation, telehealth monitoring by phone call (every 24 or 48 hours) was scheduled according to Peruvian Ministry of Health guidelines.[6] Telehealth monitoring was performed by a designated physician from the private the health facility who assessed the patients and prescribed treatment. Laboratory tests were performed in their home by an affiliated laboratory and results were directly sent to the treating physician. Oxygen saturation was measured with a fingertip oximeter prescribed by the health facility. Medications and supplemental oxygen were provided daily by a home-visitor nurse according to medication schedule.

This case report aimed to highlight the importance of telemedicine that can allow in-home management of selected COVID-19 patients and a real-time analysis of their medical situation to avoid unnecessary overload of the health care systems.

CASE 1

A 25-year-old male worked as a hospitalist and treated patients with COVID-19 using personal protective equipment (PPE) (N95 respirator and eye protection) without isolating himself from his family. He was overweight (BMI: 29) and was taking amlodipine for hypertension. He reported having diarrhea, headache, malaise and new-onset persistent hiccups on May 14, 2020 and was a COVID-19 suspect case. The next day, initial in-home evaluation and physical examination showed normal vital signs and physical findings. Outpatient management under telehealth monitoring was then scheduled through phone communication with the patient every 24 hours. Patient was placed under isolation and was given azithromycin 500 mg for five days and ivermectin (0.6%) 50 drops for 2 days. A positive real-time reverse-transcription-polymerase chain reaction (RT-PCR) SARS-CoV-2 test of nasopharyngeal swab was obtained four days later.

On May 18th, the patient presented with mild dyspnea and peripheral oxygen saturation went down to 93%. He also reported myalgias, especially of the left hemithorax and legs, headaches, dry cough and watery diarrhea. Due to clinical worsening, laboratory investigations were obtained at home, which showed normal levels of hemoglobin (14.5 g/dL), leukocytes (6.50 × 10^9/L), bands (0%), platelets (210.0 × 10^9/L), ferritin (230 ng/mL), fibrinogen (302 mg/dL), and D-dimer (0.2 μg/ml). Acetaminophen was added for pain. Two days after, on May 20th, the patient reported a significant improvement in symptoms and his peripheral oxygen saturation went up to 96%. Telehealth monitoring was spaced with phone call monitoring every 72 hours and patient was discharged after four days with sustained improvement. By May 30th, serology by solid-phase immunochromatographic assay showed IgG-positive results.

CASE 2

A 55-year-old male with class I obesity, father of cases 1 and 4, had been working as a primary care health worker in an outpatient clinic with PPE (N95 respirator and eye protection). On May 20th, the patient experienced fever (38.5°C) accompanied with diarrhea, malaise, headaches, anosmia and myalgia. He was tested twice (May 16th and May 23th) for COVID-19 using serology by solid-phase immunochromatographic assay and both showed negative results (Figure 1). However, after home medical assessment and previous exposure risk, the patient was categorized as a COVID-19 suspected case and a five-day course of oral azithromycin 500 mg per day plus two days of oral ivermectin 0.6% 6mg/mL (50 drops per day) was initiated with daily telehealth monitoring follow up.

By May 26th, the patient had new onset palpitations, persistent mild dyspnea and a fluctuating peripheral oxygen saturation (90% to 93%). Four days later, an outpatient chest CT scan showed multiple ground glass opacities with interstitial and multifocal consolidated lesions, indicating a CO-RADS 5 classification. There was very high level of suspicion for pulmonary involvement due to COVID-19. They decided to add a seven-day course of oral amoxicillin and clavulanic acid (1 gr twice-daily).[12] By that time, RT-PCR was positive for SARS-CoV-2, and he had normal hemoglobin (14 g/dL), elevated leukocytes (15.14 × 10^9/L), bands: 0%, normal platelets (281.0 × 10^9/L), normal random glucose (128 mg/dL), elevated ferritin (598.70 ng/mL), elevated fibrinogen (421 mg/dL), normal D-dimer (0.33 μg/mL).

On June 4th, the patient reported persistent dyspnea and a five-day course of oral corticosteroids (prednisone 50 mg BID), a seven-day course of levofloxacin (750 mg/day) and prophylactic low-molecular-weight heparin (LMWH) (60 mg/day) were added. The next days, clinical improvement was gradually achieved with less dyspnea, sporadic dry cough and increased oxygenation. The patient was discharged on June 15th with continuous improvement.

CASE 3

A 56-year-old female, husband of Case 2 and mother of Cases 1 and 4, presented with symptoms 10 days after her husband. She had a previous history of Hashimoto's disease-induced hypothyroidism and rheumatoid arthritis.

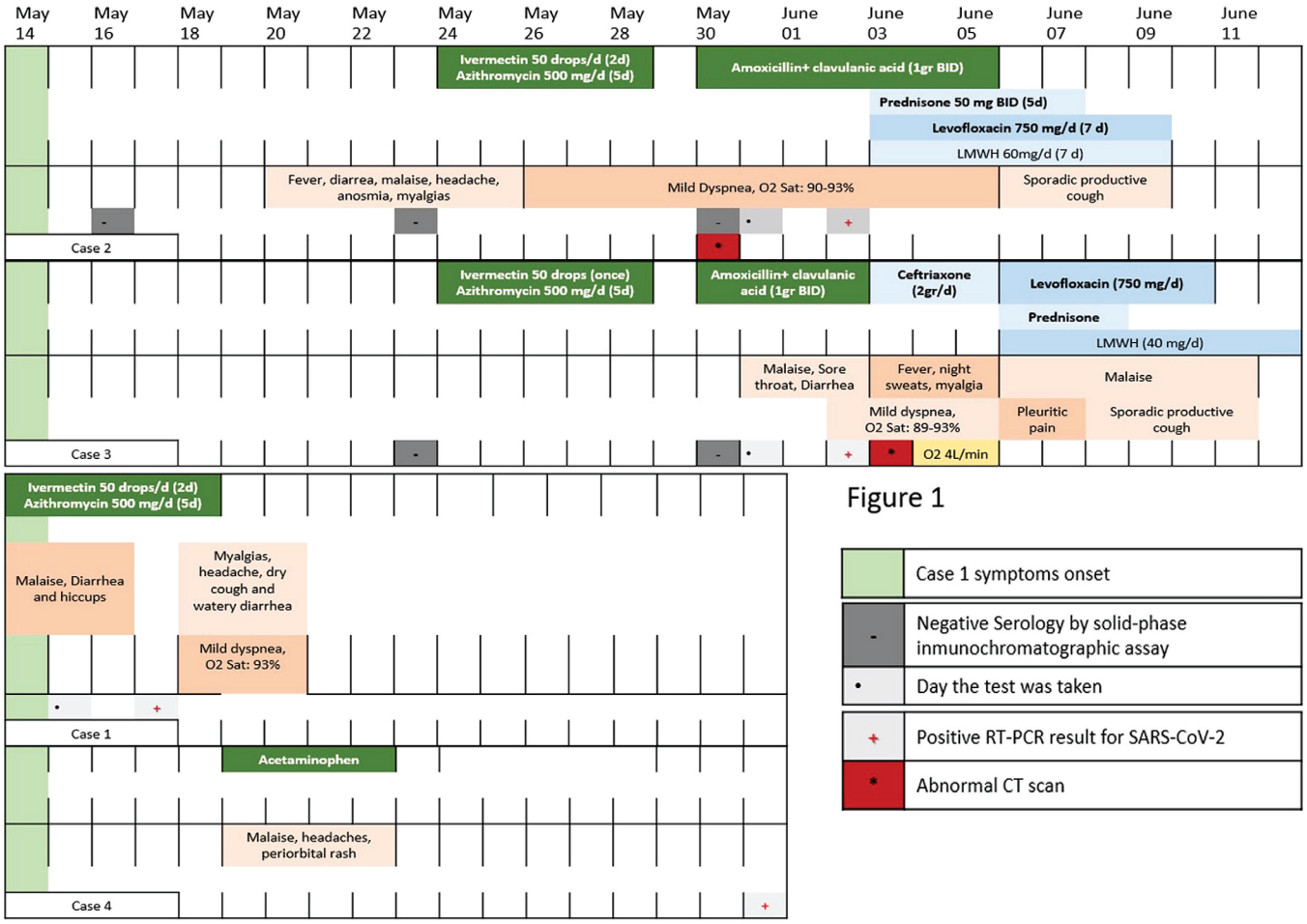

Figure 1. Timeline of symptoms, diagnostic tests and treatment of family members.

She had stayed at home and only had contact with her family. A week before the onset of symptoms, she received prophylactic oral ivermectin 0.6%, 6mg (50 drops) and azithromycin (500 mg/day for five days), as prescribed by the telemedicine physician during the home visit for Case 2, and a day before symptoms amoxicillin and clavulanic Acid (1 gr twice-daily) was added due to a baseline oxygen saturation of 95–96% at rest.

On May 31st, the patient started experiencing myalgias, sore throat, malaise and diarrhea. That same day, patient turned out positive for RT-PCR test for SARS-CoV-2 (Figure 1). On June 2nd, the patient experienced fever (38.5°C), mild dyspnea, night sweats, headache and pleuritic pain with oxygen saturation of 93%. Amoxicillin was shifted to ceftriaxone (2 gr daily) for three more days, after which fever lysed but oxygen saturation continued dropping to 89% and supplementary O_2 through a nasal cannula at 4 L/min was started.

Five days after initial symptoms, a CT scan showed subpleural ground glass opacities and consolidations in both inferior pulmonary lobes, indicating a CO-RADS 5 classification (Figure 2). The patient was started on prophylactic subcutaneous LMWH (40 mg/day for 7 days), oral corticosteroids (prednisone 75 mg/day for 3 days) and Levofloxacin (750 mg/day for 5 days). Laboratory tests showed normal hemoglobin (13.7 g/dL), leukocytes (7.54 × 10^9/L), platelets (500 × 10^9/L), D-dimer: (0.49 µg/mL) as well as elevated ferritin (636 ng/mL) and fibrinogen (511 mg/dL).

Clinical improvement began on June 12th, 13 days after initial manifestations, with increased oxygen saturation, fever and cough cessation, and disappearance of crepitus. Due to consistent improvement, she was discharged on June 16th.

CASE 4

A 24-year-old female, sister of Case 1, who had been working from home and had no significant medical history, presented with malaise, headaches and a new onset of bilateral non-pruritic periorbital rash on May 19th (Figure 3). She was diagnosed as a suspected case and had a positive RT-PCR test result by May 31st. Her symptoms resolved after 4 days of symptomatic treatment with acetaminophen. The rash disappeared gradually by May 24th with no specific treatment.

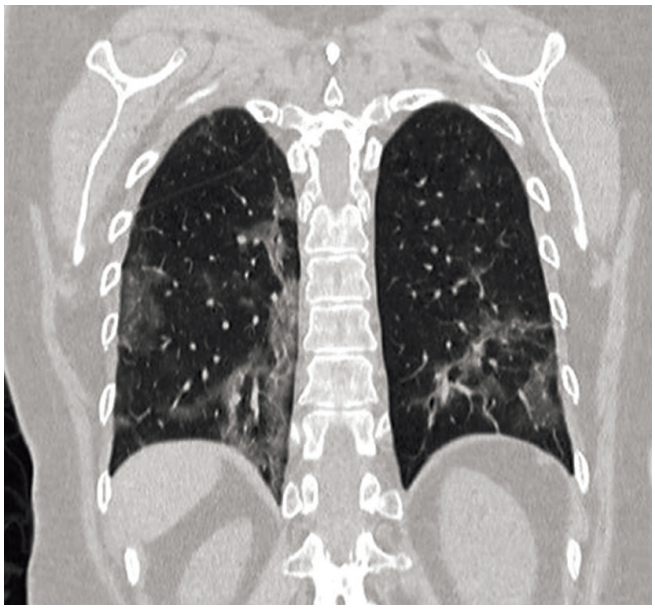

Figure 2. Chest CT scan shows subpleural ground glass opacities and consolidations predominantly in both inferior pulmonary lobes, indicating a CO-RADS 5 classification: indicating a very high level of suspicion for pulmonary involvement of COVID-19.

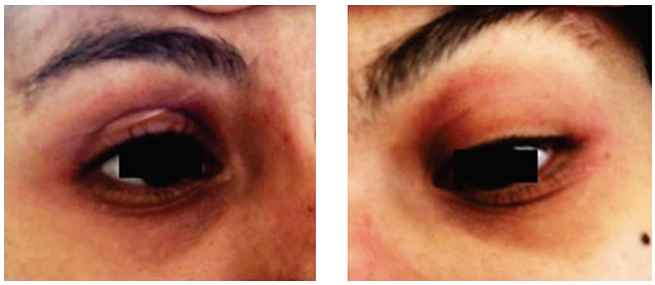

Figure 3. Bilateral non-pruritic periorbital rash presentation in Case 4.

DISCUSSION

After analyzing the timeline of this family cluster, there is a high probability that the initial infectious source was Case 1, since he was the first symptomatic member. Even though it is much more likely that viral transmission to the rest of the family cluster happened during oligo-symptomatic stage of COVID-19, it could have occurred during the asymptomatic stage. On the other hand, there is a possibility that Case 2 was in fact the infectious source for Case 3 and 4, since Case 1 was placed under in-home isolation. If this was the case, implementing home preventive isolation of health workers (by limiting the access of the individual to shared spaces of the household) and promoting safe prevention practices, such as frequent hand hygiene, frequent cleaning and disinfection of high-touch surfaces and ensuring adequate ventilation, may be effective in preventing transmission during SARS-CoV-2 incubation.[13,14]

In COVID-19, almost 80% of patients have mild symptoms and do not require medical intervention or hospitalization.[1] In these cases, outpatient management, including telehealth and home medical visits, is useful and safe, as shown by its effectiveness during previous outbreaks such as SARS, Middle East Respiratory Syndrome (MERS), and influenza A H1N1.[15] In this familial cluster, telehealth monitoring was able to help determine whether the patient's symptoms could be managed at home or an in-home medical evaluation was necessary to decide further management. In an already overwhelmed healthcare system, this approach may be promising because it reduces health workers' workload, use of PPE, exposure of healthcare workers to the virus and waiting times at emergency departments.[16]

The Peruvian Ministry of Health guidelines for the management of COVID-19 recommend that a COVID-19 suspected or confirmed case, with or without risk factors, should be monitored daily for 14 days or according to medical indication depending on improvement.[6] Furthermore, telehealth monitoring is suggested after an initial in-person evaluation that may be repeated afterwards based on clinical progression.[6] In the cases presented, telehealth monitoring was scheduled daily or every two days based on this recommendation and considering the initial in-person medical evaluation.

The telehealth monitoring approach has also been used in special populations such as pregnant women. A study conducted in New York reflected the importance of telehealth monitoring in COVID-19 obstetric patients using phone call or videoconference. Patients were instructed to measure their temperature and oxygen saturation daily.[17] In the reported familial cluster, patients were also provided with an oximeter which allowed a better, more objective assessment and a subsequent directed treatment.

A study conducted in China showed that a two-way communication between the home-quarantined patients with a multidisciplinary team of health workers using a smartphone app can facilitate management of patients, and optimize health human resources.[18] This approach could also be implemented by the Peruvian Ministry of Health to develop an integrated and readily available network of telehealth monitoring that may include diverse technological resources.

In our study, three of the cases received a combined treatment with ivermectin and azithromycin based on risk factors and age. Ivermectin has shown promising results in reducing in-vitro activity of SARS-CoV-2 RNA in infected Vero/hSLAM cells.[9] Thus, it has been included in Peruvian Ministry of Health guidelines.[6] However, controlled clinical trials are needed to assess the true efficacy of ivermectin against SARS-CoV-2. Aside from the use of azithromycin in bacterial pneumonia, it has been described to have antiviral properties; however, more conclusive studies are necessary.[10]

Post-exposure prophylaxis with potential antiviral drugs that are administered before symptoms or shortly after its onset are under investigation since its usage may reduce disease severity and viral shedding.[19] In Case 3, ivermectin and azithromycin were prescribed prophylactically, but did not seem to have the expected effect. Other therapeutic measures taken, including corticosteroid administration and prophylactic anticoagulation with low-molecular-weight heparin in Cases 2 and 3, could have improved oxygenation and lessened pulmonary compromise.[8,20]

Clinical manifestations of COVID-19 are multi-systemic, affecting respiratory, gastrointestinal, nervous and other systems.[14] Skin manifestations may be related to a lymphocytic-like vasculitis or thrombosis in the micro-vasculature, and have also been reported in patients with confirmed or suspected COVID-19.[21,22] In our study, Case 4 presented with a periorbital rash together with constitutional symptoms and may be part of the spectrum of the disease. However, the appearance of this rash seems more likely associated to a vascular origin such as livedo, which is primarily seen in elderly or severely compromised patients with COVID-19.[22]

Due to limitations in the Peruvian healthcare system in obtaining a control RT-PCR SARS-CoV-2, our patients were advised to discontinue infection control precautions on a symptom-based strategy.[23]

In conclusion, this study presented four members of the same family cluster with diverse COVID-19 symptoms, ranging from dermatologic, gastrointestinal and respiratory manifestations. They received scheduled telehealth monitoring that provided real-time assessment and medical management during the active phase of the infection until discharge with a successful outcome. To our knowledge, this represents the first report of a familial cluster with COVID-19 that was successfully managed under scheduled telehealth outpatient monitoring in Latin America.

Conflict of interest and compliance with ethics guidelines

Authors declare that they have no conflict of interest. An informed consent was obtained by the clinic from all patients that were included in the study as a part of routine procedure.

Statement of Authorship

All authors designed the study, collected and interpreted the clinical information, participated in the writing of the manuscript and approved the final version submitted.

Author Disclosure

All authors declare no conflicts of interest.

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