



# Pediatrician, watch out for corona-phobia

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## Abstract

The current outbreak of COVID-19 raging globally is taking a heavy toll on the adult population, with a rapidly growing number of newly infected and critically ill patients. However, to date, mortality rate among children is low as they mostly suffer from a mild disease. Yet, other more routinely encountered childhood diseases do not stand still and continue to be the main share of pediatricians' everyday challenges. Here we describe a case series of routinely seen pediatric diseases with delayed diagnosis due to different aspects of what we call "Corona-phobia". These cases were easily collected within a 1-week period which implies that this is a more widespread phenomenon.

In conclusion, this raises the possibility that measures taken to mitigate this pandemic may be more damaging to children overall than the virus itself. We believe that pediatricians as well as policy makers should take this important aspect into consideration.

## What is Known:

- COVID-19 manifests as a mild disease in most children; however, children are an important reservoir and may become spreaders of the disease.
- Social distancing and isolation are important tools in mitigating COVID-19 transmission.

## What is New:

- This case series describes 7 cases with delayed diagnosis of every-day pediatric diseases that were not caused by COVID-19 but were highly influenced by different aspects of "Corona-phobia."
- Our objective is to highlight the possibility that measures taken to mitigate this pandemic may lead to a substantial delay in the diagnosis of other non-COVID-1-related diseases.

**Keywords** Corona virus · COVID-19 · Pediatric · Children · Corona-phobia

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## Abbreviations

AAP	American Academy of Pediatrics
COVID 19	Coronavirus disease 2019
ENT	Ear nose and throat
ER	Emergency room
MRI	Magnetic resonance imaging
PICU	Pediatric intensive care unit
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2

## Introduction

Novel coronavirus disease (COVID-19) which was first detected in December 2019 has so far infected more than ten million people around the globe [1]. COVID-19 wreaked havoc globally as the world watched countries closing their gates, restricting commerce, and inflicting a lockdown public policy in an attempt to rein in the outbreak. The virus has taken a high toll on the adult population, with an overall fatality rate estimated at 2% with a median age centered on the 6th and 7th decades of life [2, 3].

However, a different picture is painted in the pediatric community. In the first large study from China describing COVID-19 in children, an analysis of over 2000 cases showed only 0.6% of patients suffered from acute respiratory distress syndrome or multiorgan failure [4]. Current larger studies and systemic reviews reveal a milder clinical course than adults, a low pediatric intensive care unit admission rate, and a low mortality rate [5, 6]. Data collected so far indicates a significant percent of asymptomatic carriers among children [4, 6, 7]. Nevertheless, while morbidity is presumed to be low in the pediatric population, children can be an important reservoir for spreading the virus and therefore may put their elderly relatives and neighbors at risk. Another emerging and not yet completely understood issue is the newly reported multi-system inflammatory syndrome in children (MIS-C) which has an overlapping presentation with Kawasaki disease and other inflammatory syndromes and is a growing concern regarding complications and fatalities in children [8–10].

As in many other countries, measures to mitigate transmission in Israel included, among many others, a policy switch in medical services to favor telemedicine and video consultations. The public was instructed to refrain from coming to local clinics unless no other option was available [11]. However, other every-day pediatric diseases needing medical attention have not subsided, and the policy of quarantine as well as reducing in-person visits, may lead to a substantial delay in the diagnosis of other non-COVID-19 related diseases [12, 13], and therefore to pose an equally important threat as the epidemic itself.

In this article, we report 7 cases with a delayed diagnosis of a disease, other than COVID-19, in the shadow of the raging

epidemic. We aim to emphasize that while safety measures are important in the pediatric population, excessive or exaggerated steps or their misguided implementation may lead to harming children even more than COVID-19.

## Methods

Patients were collected from 4 different medical centers in Israel via an Internet-based hospital practicing physicians' forum. Patients and their families were interviewed regarding the thought and decision-making process leading them to seek medical attention and eventually hospitalization.

A waiver was given from our institutional Helsinki committee for this case series collection.

## Patient description

### Case 1

A 14-year-old previously healthy female contacted her primary care physician by phone due to a high-grade fever and malaise for 3 days. She was told not to come in for an examination because of her fever in case it was COVID-19-related as she was stable and was not suffering from any respiratory symptoms. On the 4th day of fever, she contacted her doctor again, now with additional nausea, pallor, and fatigue, this time actively asking to be examined in person, but was again instructed to stay home. On the 5th day, abdominal pain appeared in the periumbilical area and in the right lower quadrant. After pleading to see any available physician, she was briefly examined by a pediatrician she was unfamiliar to and was diagnosed with a viral infection. She was then reprimanded for arriving to the clinic with a fever and was told not to revisit the clinic until it subsided. On day 6 of fever, after abdominal pain worsened, she presented to a local emergency room (ER) and was diagnosed with appendicitis and a peri-appendicular abscess needing drainage. She required a prolonged hospitalization (a total of 18 days) and broad-spectrum antibiotic treatment.

### Case 2

The parents of a 14-year-old male called to consult their primary care pediatrician due to fever, vomiting, and abdominal pain. Suspecting acute appendicitis, he was referred to the ER, but his parents feared COVID-19 exposure and chose to stay home. The family was contacted by their pediatrician one day later and was urged to refer to the ER if pain persisted again explaining the diagnosis of appendicitis in mind; however, the family did not heed his advice. On the 3rd day of symptoms, an abdominal ultrasound was performed in a local clinic

without any pathologic findings. Though both fever and abdominal pain persisted, parents were reluctant to visit the ER as they feared contracting COVID-19; and he presented back to his pediatrician on the 6th day when signs of peritonitis were evident upon physical examination. He was again referred to the ER where a second ultrasound showed a 20-mm inflamed appendix without signs of an abscess. On abdominal laparoscopy, an auto amputated gangrenous appendix was found within an ineffective peri-appendicular abscess formation. Post-appendectomy he was treated with antibiotics and discharged after 5 days.

### Case 3

The parents of a 2-year-old female telephonically reported to their primary care physician of a one-day high-grade fever, vomiting, and watery diarrhea. The parents were instructed to administer oral fluids but struggled to do so due to consistent vomiting. Two days later, the parents contacted her primary physician again and reported persisting symptoms along with a lack of oral intake. The primary care physician stated she preferred to avoid an ER referral due to the current COVID-19 situation, and the child was referred to a local urgent care clinic instead, only provided that she was unable to further maintain fluid intake. Upon arrival at the emergency clinic, she was examined and quickly discharged without any laboratory studies or treatment. On the 5th day of symptoms, parents contacted her doctor again and she was prescribed azithromycin over the phone. On day 6 of symptoms, she was finally referred to the ER after having reported lethargy and oliguria. Upon arrival, she was found to be suffering from severe hyponatremic dehydration; laboratory investigation also revealed an acute kidney injury and elevated inflammatory markers. Stool culture was positive for *Salmonella group D*. The child was treated with intravenous fluids and antibiotics with a clinical improvement.

### Case 4

A 3-year-old previously healthy male suffered from mild nasal congestion without fever during self-initiated quarantine due to his parents' fear of the COVID-19 health crisis. After a few days in quarantine, he developed fever, headache, and vomiting, without a rash. His parents did not contact his primary care physician because they feared to be forced to take their son to the local ER and be diagnosed with COVID-19. After 5 days of fever, he became lethargic; his mental status deteriorated, and a new strabismus appeared. He was then taken to the ER where he had positive meningeal signs upon admission. A computed tomography was done and a lumbar puncture was performed. Cerebrospinal fluid analysis was consistent with bacterial meningitis and culture was positive for *Neisseria meningitidis type B*. He was treated with 7 days

of ceftriaxone with gradual clinical improvement. Upon discharge, strabismus was still present.

### Case 5

A 10-year-old female suffered from polyuria and nocturia, polydipsia, and weight loss over the course of 2 weeks. Her parents were worried but were afraid to visit the local clinic for examination. Her parents contacted emergency medical services after vomiting and weakness appeared and were instructed to contact their primary care physician. Nevertheless, they stayed home for 2 more days. When tachypnea developed, her parents called emergency medical services again and she was finally taken to the ER. Upon admission, she had a serum glucose level of 500 mg/dl and metabolic acidosis with a PH of 6.9. She was diagnosed with severe diabetic ketoacidosis and admitted to the pediatric intensive care unit (PICU). She was discharged after 4 days in good medical condition.

### Case 6

The parents of a 4-day-old female called their primary care physician due to tachypnea. Upon telephonically interviewing the parents, they were told that if there were no signs of dyspnea and the baby feeds well, they should stay home. The parents remained concerned about her tachypnea but continued to refrain from visiting the clinic due to the COVID-19 outbreak. On the 6th day of symptoms, they called to report her respiratory rate was more than 100 breaths per minute and she was referred to the ER. Upon admission, the patient was diagnosed with severe heart failure due to hypertensive cardiomyopathy and she was hospitalized in the PICU, intubated, and required inotropic support. During her almost one-month long hospitalization, she was later diagnosed with renal artery occlusion and ischemia of her left kidney that were attributed as the cause of her hypertensive crisis.

### Case 7

A 16-year-old male with a history of recurrent middle ear infections presented to a local ear nose and throat (ENT) specialist with right ear pain after partial antibiotic treatment. Physical examination raised suspicion regarding a polyp in the right middle ear and an enlarged cervical lymph node was noted. He was referred to the ENT ward in a local hospital for further evaluation, but his father was anxious to do so due to fear of contracting COVID-19 in a hospital setting, so they waited. After a few more days, he developed headaches, vomiting, and imbalance. His parents called his primary physician, but with intention of reducing ER checkups, they were instructed to refer to the ER only if fever appeared. Nonetheless, due to his increasing pain, he referred to the

ER where hypertension was first noted. Next, a right arm paresis, ataxia, synkinesis, and right horizontal nystagmus appeared. MRI showed a large cerebellar abscess and a large cholesteatoma of the right ear. The abscess was surgically drained, and he continued to be treated antibiologically while improving neurologically.

## Discussion

Herein we report 7 cases which were easily collected within a one-week period through a communication network of practicing hospital pediatricians in Israel. These cases present a variety of pediatric diseases; some are the very bread and butter of our profession. Although a practicing physician might encounter these pathologies quite often; in current times, we suspect the global settings and what we term as “Corona-phobia” bring about these patients in a more serious condition until diagnosis is made and proper treatment is given.

We believe that there are four main contributors for the extreme condition of the patients reported here:

Firstly—the objective circumstances of reduced availability of community medical services during quarantine. Israel was very quick to declare a national quarantine even before COVID-19 incidence began to grow, also reducing means of public transportation. With the public unable to easily mobilize and with the Ministry of Health instructions to stay home and refrain from public places, it became difficult for families to reach local clinics or other medical facilities. Additionally, specific regulations were issued conditioning all in-person clinic visits by a preliminary phone or on-line triage determining if the visit is necessary. In two of our cases (cases 3 and 7) described above, those phone calls resulted in avoidance to refer to the ER, and parents were instructed to start antibiotic treatment or to only refer to the ER in specific circumstances although some alarming signs were already present.

Secondly—the fear of parents (or any other care giver) of entering a medical facility. From interviews conducted in the cases reported above, it became evident that many parents were terrified of entering any medical facility. Some feared of being infected with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) when visiting a public place, while others may have feared the unpleasant diagnosis of COVID-19 for their child’s current disease. In some of these cases, parents decided actively to avoid calling their primary care fearing that a recommendation to refer to the ER would follow. Moreover, even after direct referral to the ER, some decided to stay home.

Thirdly—doctors’ fear for their own health. Older practicing physicians are at a higher risk, and reports of morbidity as well as mortality of physicians fighting COVID-19 have appeared from all over the world [14]. Some physicians have

chosen or were instructed to stay clear of the “war zone” and to concentrate on a community-based (and therefore telemedicine based) practice during these times. Sadly, doctors who choose to stay in the front line may fear for their own health or the health of other patients in their medical facility if they feel appropriate protection measures are not available to them, and suitable isolation of suspected patients may not take place in community clinics. In the first case described above, it seems the doctor was frightened and reprimanded the patient and her mother for coming to the clinic when the child was displaying what she referred to as viral symptoms. Consequently, an incomplete examination took place, leading to a missed appendicitis. While doctors’ fear is a completely understandable human response, medical directors must consider how to better protect their medical staff and implement suitable policies, while at the same time allowing for comprehensive evaluation for those requiring it.

Fourthly—the change in working policy of medical staff in community-based clinics. Doctors have been instructed to contact patients by phone and to switch to a more telemedicine-based practice (e.g. voice and video input as well as different appliances that are used today in order to assist in the implementation of remote physical examination) in order to minimize risk for their patients and themselves. This approach has been taken worldwide to more accurately locate patients with symptoms compatible with COVID-19 and to tailor their medical care according to severity of symptoms [15, 16]. In the adult population, it may also allow for early detection of routinely faced conditions that need medical attention such as myocardial infarction or heart failure, arrhythmia, and sepsis. However, one must bear in mind that pediatric telemedicine might be of a trickier nature; children often struggle to describe their symptoms accurately, and pediatricians rely on observation and a complete physical examination in making a diagnosis. This clearly is not possible or difficult in the setting of telemedicine, mostly when done over the phone without video input as described in our cases. With that in mind, the American Academy of Pediatrics (AAP) has recommended that telehealth services as well as acute care centers, which are not linked to the child’s medical file, should not treat infants younger than 2 years of age [17].

Telemedicine has not been thoroughly assessed in pediatric care. Some studies conducted in pediatric telemedicine show an increased rate of antibiotic treatment and care recommendations inconsistent with up to date guidelines [18]. Studies conducted in adult patients similarly show a higher incidence of inappropriate pharmacological treatment [19], a guideline adherence rate of less than 60% and even the provision of a wrong diagnosis or no diagnosis at all in more than 23% of cases [20]. In 2 of our 7 cases, the initial assessment made over the phone by clinicians was incomplete or led to missing important warning signs. In our opinion, using telemedicine to substantially reduce in person medical consultations in the COVID-19 era should be done with caution while using video

**Table 1** Summary of all cases

Case number	Age	Sex	Difficulties	Final diagnosis	PICU admission
1	14 years	Female	Telemedicine Incomplete examination	Appendicitis with a peri-appendicular abscess	No
2	14 years	Male	Parental fear	Appendicitis with a peri-appendicular abscess	No
3	2 years	Female	Telemedicine Minimal evaluation at urgent care clinic	Dysentery Severe hyponatremic dehydration	No
4	3 years	Male	Parental fear	Acute kidney injury Meningococcal meningitis Strabismus	No
5	10 years	Female	Parental fear	Severe diabetic ketoacidosis	Yes
6	4 days	Female	Telemedicine Parental fear	Severe heart failure Cardiomyopathy	Yes
7	16 years	Male	Telemedicine Parental fear	Cholesteatoma Cerebellar abscess	No

when possible and taking into serious consideration parental concerns raised during the evaluation. Many phone applications (such as Skype and WhatsApp) are now widely available in the age of smartphones, are easily accessible by both pediatricians and patients and may assist in supplying live video input without the need for complex technical preparation for every telemedicine consult.

One important pediatric population not represented in the cases above is chronically ill children receiving routine ambulatory care. This population is usually followed up frequently, sometimes on a weekly basis, and require frequent treatment. The American Society of Clinical Oncology defines the risk of postponing treatment in cases of curable tumor as higher than the risk of infection with COVID-19 [21]; nevertheless, one might wonder if a time might come when such treatments will be postponed due to lack of medical staff or available beds.

Keeping in mind the current circumstances, we would like to offer a few key recommendations for the practice of telemedicine in the pediatric population aimed to reduce the risk of misdiagnosing or the risk of medical complications due to delayed diagnosis and treatment:

- An effort should be made to allow all telemedicine visits to be accompanied with video input to allow for a more comprehensive evaluation. If possible, distance-technologies should be employed when feasible.
- The use of telemedicine in children less than 2 years of age should be undertaken with caution in accordance with previous AAP recommendations [17].
- Even in this time of isolation and quarantine, parental concern for the child's well-being or an explicit request to be physically evaluated should be seriously taken to consideration.
- Physicians should provide parents with specific instructions as how to monitor the child at home, what are the alarming signs to look for and when to recontact or to

bring the child to a medical evaluation. Parents of infants can be referred to common recommendations found online including lists of alarming signs in several medical sites [22, 23]. It is vital to verbally emphasize the importance of using emergency services such as the ER even in current times if the child is showing worrisome signs or the parents would do so in any other time before the arrival of COVID-19.

- A physician-initiated follow-up should be carried out in cases in which an ER referral or instructions regarding alarming signs requiring an in-person visit were given during a telemedicine session the following day.

In conclusion, we have encountered alarming cases of delayed diagnosis sometimes leading to unnecessary complications due to the different aspects of “Corona-phobia” within a short time period (Table 1). The ease of which these cases were found in a short period and from multiple centers makes it likely that this phenomenon is widespread. We believe a balance must be achieved between prudent steps designed to mitigate COVID-19 transmission including isolation and social distancing and the safe care of children requiring medical evaluation and treatment. All medical care givers dealing with pediatric population should take extra caution not to miss important medical conditions due to the safety measures taken.

**Authors' contributions** Conceptualization was made by EB and CRD. Data was collected by CRD, IK, OS, AI, AY, ID, GGS and EB and all helped to analyze it and draw conclusions. First draft was written by CRD with input from all authors, all authors reviewed and commented on previous versions of the manuscript.

### Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflicts of interest.

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