Post-discharge telephonic follow-up of pediatric patients affected by SARS-CoV2 infection: a safe and feasible way to monitor children after hospitalization. The experience of a single Italian Pediatric COVID Center.

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Abstract

Background

In early January 2020, a novel type of Coronavirus was identified in a patient affected by pneumonia of unknown origin. The virus will be named SARS-CoV-2 and the disease COVID-19 a month later by the International Committee on Virus Taxonomy.

Italy is one of the first countries in the world affected by the COVID-19 pandemic, with 1.2% of all patients represented by children. Although the infection in children is often non severe and in the majority of cases does not require long term hospitalization, it is burdened with social issues and managing difficulties.

To our knowledge there is no literature on telephonic follow up in pediatric patients with positive rhino-pharyngeal swab for SARS-CoV-2 after discharge.

Materials and Methods

We monitored through a telephonic follow-up, using a specific survey, 19 children aged between 8 months and 15 years, hospitalized in the “Ospedale Pediatrico Bambino Gesù” COVID Center with positive rhino-pharyngeal swab at discharge. We checked if any symptoms occurred at home until recovery, defined as two consecutive negative rhino-pharyngeal swabs.

Results

During the follow up 7 patients had mild and self-limited symptoms related to SARS-CoV-2 infection, while 2 patients were re-hospitalized, 1 patient had Multisystem Inflammatory Syndrome in Children (MIS-C), the other patient had an increase in troponin a D-dimers.

We didn't miss any patient during the follow up.

Conclusion

We demonstrated that daily telephonic follow up is safe in pediatric patients discharged with positive swab, it allows to avoid long term hospitalization and to promptly re-hospitalize children with major complication such as MIS-C.

Introduction

In early January 2020, a novel type of Coronavirus (CoV) was identified in a patient affected by pneumonia of unknown origin [1]. The virus was named novel coronavirus (2019-nCoV) [2] to differentiate it from the Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV) [3] and the Middle East Respiratory Syndrome Coronavirus (MERS-CoV) [4]. This virus rapidly spread worldwide, forcing the

World Health Organization (WHO) to declare the outbreak as a pandemic on 11th March, naming the disease COVID-19 (Coronavirus Disease 2019) [7, 8] and the virus SARS-CoV-2 by the International Committee on Virus Taxonomy on the same day.

Italy was among the first countries in the world to be affected by the COVID-19 outbreak, with 1.2% of all patients represented by children [9-13, 14]. According to the Italian Istituto Superiore di Sanità (ISS), the estimated overall lethality in Italian patients was 14%. Specifically in the pediatric setting the lethality was 0.2% between the age of 0 and 9 years, and no deaths have been reported in older children, confirming that the mortality remains low and no specific risk factor could be identified [16].

To detect this novel Coronavirus, molecular-based approaches are the first line of methods to confirm suspected cases. Nucleic acid testing is the main technique for laboratory diagnosis. Other methods such as virus antigen or serological antibody testing are also valuable assays with a short turnaround time for the detection of novel coronavirus infection. [17]. The sensitivity and specificity of rhino-pharyngeal swabs for the diagnosis of COVID-19 is not well known. It seems to be very specific, but moderately sensible (perhaps between 63-78%), so a negative test does not rule out with confidence the possibility of a SARS-CoV-2 infection. The Real Time-PCR analysis of BAL fluid is the most accurate, but it is difficult to perform on the not seriously ill patients. The nasal swabs have a higher sensitivity than the pharyngeal. [18]

Based on the global interest and concern about COVID-19 several studies have reviewed symptoms and characteristics of adults with SARS-CoV-2 infection [19]. Given the lower incidence in pediatric patients, there are fewer studies in this cohort. [20-24]

Children mainly acquire SARS-CoV-2 infection from their family members but seem to experience less severe COVID-19 than adults, presenting mild symptoms, if any, good prognosis, and recovering within 1 to 2 weeks after disease onset [25]. Frequent clinical manifestations include fever, dry cough, and fatigue accompanied by other upper respiratory symptoms, such as nasal congestion and runny nose, pneumonia, dyspnea, headache and arthralgia. Moreover, the main gastrointestinal symptoms are nausea, vomiting and diarrhea. [25] An important complication of the SARS-CoV-2 infection is the Multisystem inflammatory syndrome in children (MIS-C), whose clinical presentation includes fever and the involvement of two or more organs, associated to laboratory evidence of inflammation. MIS-C has some similarities with Kawasaki Disease and secondary hemophagocytic lymphohistiocytosis macrophage activation syndrome [26-28].

To our knowledge there are currently no studies on post-discharge management and follow-up of pediatric patients affected by SARS-CoV-2 infection.

The aim of our study is to describe our experience of a telephonic follow-up model, which can allow an early and safe discharge of the patients while keeping them under close clinical monitoring.

Materials And Methods

65 children aged between 10 days and 17 years and 4 months old were admitted for SARS-CoV-2 infection, confirmed by positive PCR on rhino-pharyngeal swab, at Bambino Gesù Pediatric Hospital COVID center, from 16th March to 3rd July. Among these, 19 patients were discharged after remission of symptoms, still presenting a positive SARS-CoV-2 rhino-pharyngeal swab. The patients' conditions after discharge have been monitored with a telephonic follow-up through 2 calls per day using a specific survey, in order to check if new symptoms appeared and if the rhino-pharyngeal swab was performed [Table 1]. This procedure was taken forward until two consecutive negative swabs were achieved. Two consecutive rhino-pharyngeal swabs 24 hours apart were necessary in order to increase the sensitivity of the test. These rhino-pharyngeal swabs were performed weekly.

Our cohort consisted of 19 children aged between 8 months and 15 years and 8 months old. Among these, 13 patients were male and 6 female. In our cohort 2 patients were under the age of 12 months, 3 were aged between 1 and 5, 10 between 5 and 12, and 4 were older than 12 years old.

Three of our patients presented comorbidities: 1 patient was affected by Angelmann syndrome, 1 patient had Congenital Arthrogryposis, 1 patient had Kikuchi Syndrome.

16 of the 19 patients were symptomatic at admission: 14 had a fever, 8 patients had cough, 3 diarrhea, 3 myalgia, 2 headache, 1 anosmia, 1 conjunctivitis and 1 had dyspnea. 5 of these patients had interstitial lung involvement.

We also observed the lymphocytes value at the hospital admission, 2 patients out of 19 had lymphopenia.

The stool test for SARS-CoV-2 was performed in all our patients during the hospitalization, and was tested positive in 8 patients.

The average length of hospitalization for our cohort was approximately 8 days, with a range between 5 to 14 days. The time of the hospitalization was in several cases influenced by non-clinical factors, including familiar and social issues [Table 2].

Results

In our cohort 7 out of 19 patients presented symptoms related to SARS-CoV-2 infection during home follow-up, most of these symptoms were mild and rapidly healed. 2 patients presented facial rash, 1 patient had fever, 1 patient lower limbs myalgia, 1 patient pharyngodynia and conjunctivitis, 1 patient headache and abdominal pain. The onset of cold sore was also reported in a patient. Two patients were re-hospitalized for complications related to SARS-CoV-2 infection: one patient who was 13 years and 6 months old presented with MIS-C, the other patient was 9 years and 6 months old and he had an increase in D-dimers and troponins 28 days after discharge. In both patients the SARS-CoV-2 stool test was positive.

Through the telephonic follow-up of our cohort, we monitored the amount of time the rhino-pharyngeal swab took to become negative: the average of viral shedding was 43,5 days, with values between 17 and 62 days [Table 3].

We compared these data with the ones collected by De Ioris et al and Hongmei Xu et al, and we observed that in our cohort the rhino-pharyngeal swab took a longer time to become negative. Moreover, we did not observe a correlation between the lymphocytes levels and the amount of time the swab took to become negative. [29-30]

Discussion

There is a little experience on the follow up of pediatric patients with SARS-CoV-2 infection [26].

Furthermore, at our knowledge there is no literature on the telephonic follow-up in pediatric patients with positive rhino-pharyngeal swab after discharge. Although the SARS-CoV-2 infection in the pediatric population is most of the time non severe and often asymptomatic and a low-percentage of children is affected ($\approx 1,2\%$), children's infection is burdened with social issues and management difficulties, due to the need of familial or parental assistance during the hospitalization.

Our experience demonstrates that an early hospital discharge is possible and safe in pediatric patients affected by SARS-CoV-2 infection. The parents felt more supervised and reassured through the daily conversation with the doctors of the pediatric COVID center.

Furthermore, our experience highlights the importance of the telephonic follow-up in ensuring a decreased length of the hospitalization, which is a benefit both for families and the hospital. In particular, briefer hospitalizations enable a greater receptivity of the hospital during Pandemic phases and allow to reduce the costs related to the hospitalization as described by Peong Gang Park et al. [31]

In addition, with this close follow up it is possible to identify at an early stage late complications related to the SARS-CoV-2 infection. Specifically MIS-C represents a severe complication related to SARS-CoV-2 infection in children, a strict follow-up of infected patients could help the early detection of this problem.

The biggest drawback of our study is the limited number of patients. Future studies could be necessary to assess the appropriate timing of calls, based on the age of the patient and the presence of comorbidity. A larger sample could also allow to statistically correlate the patients' outcome with the presence of specific factors present at the time of diagnosis.

Abbreviations

- MIS-C (Multisystem Inflammatory Syndrome in Children)

Declarations

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Conflicts of interest/Competing interests: The authors have no conflicts of interest to declare that are relevant to the content of this article.

Ethics approval: The article was approved by the Scientific Department of Bambino Gesù IRCCS Pediatric Hospital, Rome Italy, in view of the retrospective nature of the study and all the procedures being performed were part of the routine care.

Consent to participate N/a

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Code availability: N/A

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Tables

Table 1

Post-discharge telephonic survey
Doctor introduces himself (Full Name, Qualification)
Which have been the general clinical conditions of the child in the last 12 hours?
Has he had hyperpyrexia in the last 12 hours? If yes, which was his temperature?
Has he had dyspnea in the last 12 hours?
Has he coughed in the last 12 hours?
Has he had a sore throat in the last 12 hours?
Has he had rhinitis in the last 12 hours?
Has he had diarrhea or abdominal pain in the last 12 hours?
Has he had a headache in the last 12 hours?
Has he had arthralgia in the last 12 hours?
Has he manifested other symptoms in the last 12 hours?
Has he had another rhino-pharyngeal swab done? If so, which was the result?

Table 2

Table 3

Main features of patients during hospitalization					
	age < 12 months	1 y> age < 5y	5y > age < 12y	age > 12y	No. patients
No.	2	3	10	4	19
F	0	3	1	2	6
M	2	0	9	2	13
Median age in mo. $\pm$STD	8 $\pm$ 0	29,7 $\pm$ 15,6	103,7 $\pm$ 23,7	173,2 $\pm$ 14,5	96,5 $\pm$57,4
Comorbidity	0	0	2	1	3
Median days of hospitalization $\pm$STD	7	10,7 $\pm$ 4,7	8 $\pm$ 2,4	12 $\pm$ 7,5	9,1 $\pm$4,2
Positive rectal swab	2	3	2	1	8
Clinical features at admission					
Symptomatic	2	3	7	4	16
Asymptomatic	0	0	3	0	3
Anosmia/dysgeusia	0	0	0	1	1
Conjunctivitis	0	0	1	0	1
Cough	1	2	2	3	8
Dyspnea	0	0	0	1	1
Diarrhea	1	0	2	0	3
Fever	1	2	7	4	14
Myalgia	0	0	3	0	3
Headache	0	0	2	0	2
No. of lymphocytes at onset	3500 $\pm$ 537	4573 $\pm$ 2420	2201 $\pm$ 821	1493 $\pm$ 546	2560 $\pm$ 1542
Chest imaging	0	1	2	2	5
Interstitial abnormalities	0	1	2	2	5

Local patchy shadowing	0	0	0	0	0
Inpatient therapy	0	1	2	2	5
Oxygen	0	0	1	0	1
Antibiotic	0	1	2	2	5
Hydroxychloroquine	0	1	0	2	3
Steroid	0	1	0	0	1

Main features of patients during the telephonic follow-up			
	<i>Post-discharge F-U</i>	<i>Re-hospitalized during F-U</i>	<i>No. patient</i>
No.	17	2	19
F	5	1	6
M	12	1	13
Median age in months +STD	91,5 +58	140 +33,9	96,5 +57,4
Age < 12 months	2	0	2
1 y> age < 5y	3	0	3
5y > age < 12y	9	1	10
Age > 12y	3	1	4
Comorbidity	2	1	3
Positive rectal swab	6	2	8
Interstitial abnormalities	4	1	5
Inpatient therapy	5	0	5
Oxygen	1	0	1
Antibiotic	5	0	5
Hydroxychloroquine	3	0	3
Steroid	1	0	1
Days of post-discharge swab negativisation	31,2 +8,5	45 +24	43,5 +13,4
Recurrence of symptoms			
Symptomatic	6	1	7
No. of days of occurrence +STD	5,8 +4,5	25	8,5 +8,3
Asymptomatic	11	1	12
Anosmia/dysgeusia	0	0	0
Sore throat	1	0	1
Conjunctivitis	0	0	0

<i>Cough</i>	<i>1</i>	<i>0</i>	<i>1</i>
<i>Dyspnea</i>	<i>0</i>	<i>0</i>	<i>0</i>
<i>Abdominal pain</i>	<i>1</i>	<i>0</i>	<i>1</i>
<i>Vomiting</i>	<i>0</i>	<i>1</i>	<i>1</i>
<i>Diarrhea</i>	<i>0</i>	<i>0</i>	<i>0</i>
<i>Fever</i>	<i>0</i>	<i>1</i>	<i>1</i>
<i>Myalgia</i>	<i>1</i>	<i>0</i>	<i>1</i>
<i>Headache</i>	<i>1</i>	<i>0</i>	<i>1</i>
<i>Other</i>	<i>1</i>	<i>1</i>	<i>2</i>