

Changes in the frequency and clinical features of acute rheumatic fever in the COVID-19 era: a retrospective analysis from a single center

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SUMMARY

OBJECTIVE: Coronavirus disease 2019 (COVID-19) pandemic resulted in significant changes in the frequency of many diseases. In this study, we aimed to investigate the changes in the frequency and clinical features of acute rheumatic fever (ARF) in this period and determine the effect of health measures taken against COVID-19 on this change.

METHODS: The cases with initial attack of ARF between January 2016 and March 2022 in Ataturk University, Division of Pediatric Cardiology, were determined from the clinic's database, and case per month ratios were calculated for each period, retrospectively. Also the frequency of the clinical manifestations was compared among patients before and during the outbreak.

RESULTS: Frequency of the major clinical manifestations among patients before and during the outbreak was similar. On average, the number of cases reported per month in the years 2016, 2017, 2018, and 2019 are, respectively, 1.75, 2, 2.25, and 2.58. In the first 3 months of 2020, the average number of cases reported per month was 3.67. After the advent of the pandemic, in the period from April to December 2020 and from January to September 2021, an average of 0.56 and 0.22 cases were reported per month, respectively. The frequency of clinical features between patients diagnosed before and during the outbreak was similar.

CONCLUSIONS: Our results indicated an important decrease in frequency of ARF, but no change in the clinical features of the disease during the COVID-19 pandemic. It is thought that this is the result of health measures taken for COVID-19. Children with an increased risk of acute rheumatic fever should be encouraged in terms of wearing mask, social distance, and cleaning, especially during the seasons when upper respiratory tract infections are common. Thus, a permanent decrease in the incidence of ARF and its recurrences may be achieved.

KEYWORDS: Acute rheumatic fever. COVID-19. Children. Frequency. Mask.

INTRODUCTION

The World Health Organization declared the novel coronavirus (COVID-19) outbreak a pandemic in March 2020¹. The disease affected all over the world and resulted in apparent changes in human behaviors. Wearing masks and complying with social distancing rules are behaviors that are generally accepted and implemented against the outbreak. Studies pointed out that the use of facial protective equipment reduces the frequency of COVID-19 infections^{2,3}.

With the onset of the epidemic, between April 2020 and September 2021, face-to-face education was suspended in schools in our country. While the Ministry of Health made the use of masks mandatory in schools, it encouraged the strict execution of the measures taken due to COVID-19 (e.g., cancellation of collective activities, control of cleaning practices, and continuity of the educational activities with printed materials and oral presentations). Schools resumed education in September 2021. In the COVID-19 era, the frequency of a rare clinical condition, such as multisystem inflammatory

syndrome in children, increased significantly⁴. A recent study indicates a significant decrease in the frequency of pediatric rheumatic diseases⁵. Also influenza activity declined substantially in 2020 because of the measures taken for COVID-19⁶. Results of this study indicated that public health measures taken for COVID-19 are effective in reducing the spread of viral respiratory diseases⁶. To the best of our knowledge, there is no study investigating the changes in the frequency and clinical features of upper respiratory tract infections (URTIs) caused by group A beta hemolytic streptococcus (GABHS) that may result in, during COVID-19 period, acute rheumatic fever (ARF) in susceptible individuals. ARF is still one of the most important health problems in developing countries⁷. Our country is also among the countries that reported moderate-high on incidence and prevalence of ARF⁷⁻¹⁰. In this study, we aimed to investigate the changes in the frequency and clinical features of ARF during the COVID-19 pandemic and determine the possible effect of the measures taken against the COVID-19 pandemic on this change.

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METHODS

The study was performed in Ataturk University School of Medicine, Division of Pediatric Cardiology. The database in which echocardiographic data and diagnoses of all patients admitted to the pediatric cardiology outpatient clinic were entered was scanned.

The database was searched for the cases who had been diagnosed as having first attack of ARF between January 1, 2016 and March 31, 2022. The clinical features of the patients were derived from medical recordings, retrospectively.

For the diagnosis of ARF, the last guideline about Jones criteria, published by the American Heart Association in 2015⁷, was used, and the criteria recommended for societies with medium-high prevalence were taken into account. Only patients with first attack of ARF were included, and patients with recurrences were not.

Patients who were diagnosed before April 1, 2020 were included into Group 1 (before the outbreak) and between April 1, 2020 and September 30, 2021 to Group 2 (during the outbreak). Frequency of clinical features was compared between the two groups. As the schools were opened again, the two cases diagnosed after September 30, 2021 were not included in this analysis. The case numbers for each year were determined, and the changes in case numbers during this period were evaluated. To depict the changes better, case number per month ratio was calculated for time periods before and during the outbreak. Data were expressed as total number and number per month.

The study commenced following receipt of approval from the Republic of Turkey, Ministry of Health COVID-19 Scientific Research Assessment Commission, and Ataturk University Medical Faculty Ethical Committee.

Statistical analysis

The data were transferred to Statistical Package for the Social Sciences pocket program (IBM SPSS Statistics version 20). Chi-square analysis was used for comparison of frequencies of the major manifestations and Student's t-test (Mann-Whitney U test) for comparison of median values between groups. A $p < 0.05$ was considered significant.

RESULTS

During the study period, a total of 125 cases were diagnosed as having ARF. As they had previous attacks of ARF, three patients were excluded from the study. As two cases diagnosed after school reopening, clinical features of only the 120 patients diagnosed before and during the outbreak are used in comparisons and results are given in Table 1. Only one patient from Group 1 had severe carditis. In remaining patients, carditis was mild. The frequency of clinical features between groups was similar. In Group 1, 41 (36.2%) patients had clinical and 58 (51.3%) had silent carditis. In Group 2, same values were 1 (14.2%) and 5 (71.4%), respectively ($p=0.398$). In Group 1, 67 (59.2%) patients had endocarditis in one valve, and 32 (28.3%) in two valves. In Group 2, same values were 4 (57.1%) and 5 (28.5%), respectively ($p=1.000$).

Case numbers by years is shown in Figure 1. After the first case of COVID-19 was diagnosed in Turkey (March 2020), the case numbers of ARF decreased apparently in our clinic. On average, the number of cases reported per month in the years 2016, 2017, 2018, and 2019 are, respectively, 1.75, 2, 2.25, and 2.58. In the first 3 months of 2020, the average number of cases reported per month was 3.67. After the advent of the pandemic, in the period from April to December of 2020 and

Table 1. Clinical features of the patients with the diagnosis of first attack of acute rheumatic fever between January 1, 2016 and September 30, 2021 (n=120).

	Group 1* (n=113)	Group 2† (n=7)	p
	Median (IQR)	Median (IQR)	
Age (year, median)	12 (4)	11.5 (5)	0.578
	n (%)	n (%)	
Gender (male/female)	51/62	4/3	0.701
Major clinical features			
Carditis	99 (87.6)	6 (85.7)	1.000
Joint involvement (polyarthritis, monoarthritis, polyarthralgia)	64 (56.6)	4 (57.1)	1.000
Chorea	47 (41.6)	3 (42.9)	1.000
Patients with active inflammation	70 (61.9)	4 (57.1)	1.000

*Patients who were diagnosed before April 1, 2020 (before the outbreak); †Patients who were diagnosed between April 1, 2020 and September 30, 2021 (during the outbreak).

from January to September 2021, an average of 0.56 and 0.22 cases were reported per month, respectively. Between September 30, 2021 and March 31, 2022, only two patients (0.33 cases per month) were diagnosed as having first attack of ARF.

DISCUSSION

The COVID-19 disease is caused by a novel coronavirus named as severe acute respiratory syndrome coronavirus (SARS-CoV-2)¹¹. After the first case, seen in December 2019, the disease has spread all over the world and the event is declared as a pandemic in March 2020¹. Especially in the early period of the pandemic, there were deaths at a rate that could paralyze the current healthcare system even in the developed countries, and very strict measures were taken all over the world. While international travel has been cancelled, countries have introduced travel restrictions within themselves. Collective events were canceled and, from time to time, during the peak periods of the epidemic, full closure measures were applied for temporary periods. Schools have been suspended since the beginning of the pandemic in our country and were largely remained closed until September 30, 2021. In the meantime, broadcasts were

made emphasizing the importance of using personal protective masks, complying with social distance rules and personal hygiene rules in the fight against the disease. With the widespread use of vaccines, some countries have relaxed measures. However, the new peaks that emerged with the new variants led to the tightening of the measures again.

Although vaccines have been shown to provide a significant protection, a significant reduction in the need for hospitalization and intensive care, and a significant reduction in mortality rates^{11,12}, uncertainty about permanent immunity¹³ has increased the importance of personal protection measures, which are sloganized as mask, distance, and cleaning. These measures seem to keep their place in our lives for a long time.

ARF is a nonsuppurative complication of tonsillopharyngitis due to group A beta hemolytic streptococci (GABHS). Signs of the disease appear after a latent period of 2–4 weeks following an infection in the susceptible host⁷. Improvement of hygiene conditions in developed countries has significantly reduced the frequency of the disease. On the other hand, the frequency of first attack of ARF and recurrences are still high in developing countries and in handicapped regions of developed countries where health conditions are not good¹⁴. Recurrences

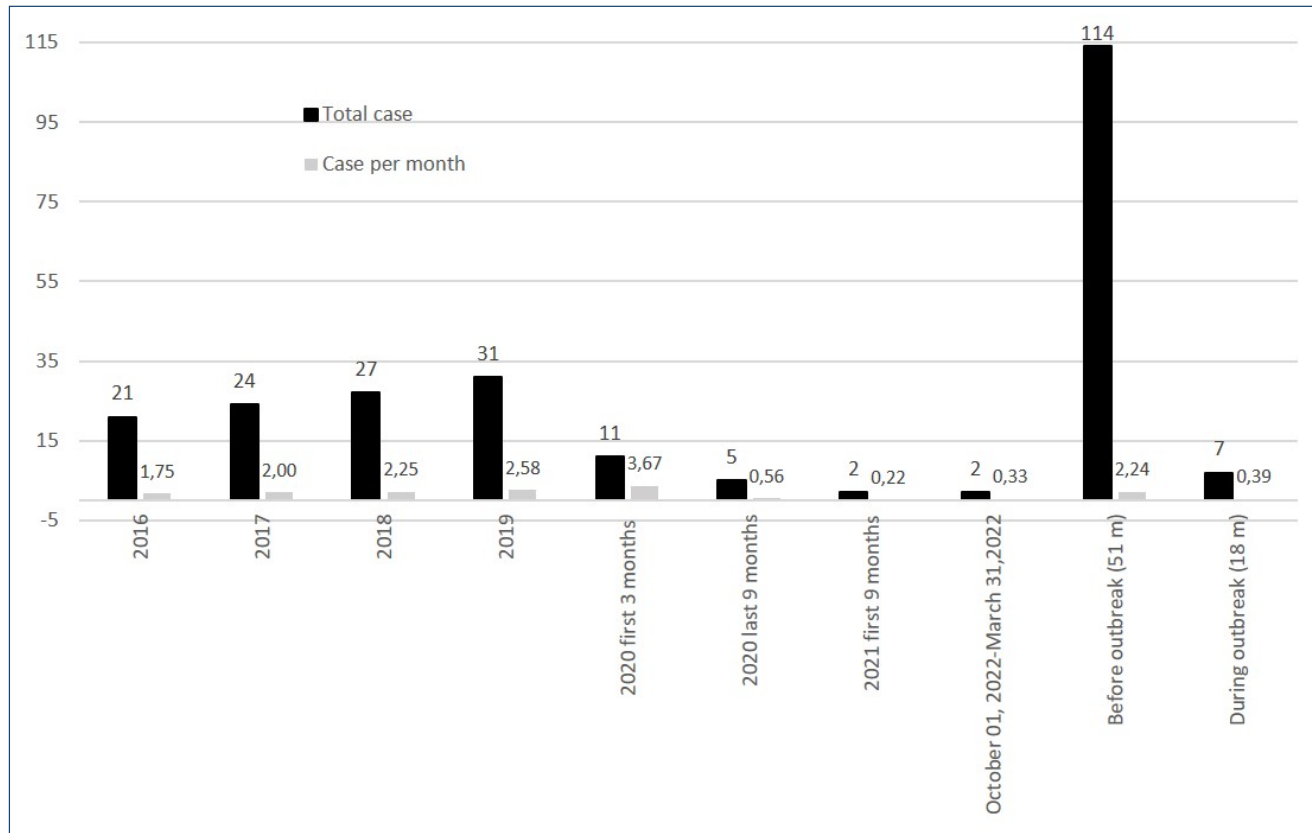


Figure 1. Case numbers and cases per month before and during the outbreak. There is a significant decrease in the number of patients with first acute rheumatic fever attack during the COVID-19 outbreak.

of new GABHS tonsillopharyngitis in children with previous rheumatic carditis are closely related to the development of chronic rheumatic heart disease (RHD). For this reason, long-acting penicillin prophylaxis is applied in patients who have had ARF⁷. Compliance with prophylaxis is the most important issue in this regard. Apart from poor compliance with prophylaxis, general economic situation and crowded living environment are seen as the most effective risk factors on ARF recurrences and RHD¹⁴. The disease is most common in children aged 5–15 years. The fact that this group is school-age children is important in terms of our study results. Primordial prevention reduces community-based risk factors to prevent the occurrence of a disease¹⁵. ARF is attributable to social determinants of health, including quality of housing, level of household occupancy, and access to health hardware including washing facilities^{14,16}. Evidence on the impact of “washing people” and “reducing the negative effects of overcrowding,” two of the nine Healthy Living Practices¹⁷, on reducing streptococcal infections at the community level, is classified as “strong¹⁵.” We believe that the increased prevalence of these two practices in our society due to the COVID-19 pandemic and schools being closed caused a decrease in the frequency of tonsillopharyngitis due to GABHS, and as a result, a significant decrease in the frequency of ARF occurred. After reopening of schools, only two children admitted with first attack ARF in 6 months. Although the class sizes were not changed, the measures against COVID-19 infection continued. We think that the low frequency after schools reopening is related to these measures. We will see in future how the frequency of ARF will be affected with full normalization.

Study limitations

- It is a fact that there has been a decrease in hospital admissions due to the fear of COVID-19 contamination during the pandemic process. This may have

caused patients with relatively faint signs of ARF not to be diagnosed.

- It is possible that patients have applied to other centers. However, this probability is low, as our center was the only pediatric cardiology center unit in Erzurum city center and eight nearby provinces during the pandemic.

CONCLUSIONS

Our results are important in terms of showing the significant decrease in the frequency of ARF during the COVID-19 pandemic. It was thought that the lack of a rapid increase in the number of cases despite the reopening of the schools may be related to the fact that wearing masks is still compulsory in schools and the educations and controls on hygiene continues.

Depending on these results we offer; for children with an increased risk of first attack ARF, permanent measures should be taken in terms of mask, social distance, and cleaning in schools, especially during the seasons when URTIs are common. Thus, a permanent decrease in the incidence of ARF can be achieved. In addition to benzathine penicillin prophylaxis, mask, distance, and cleaning rules should be made permanent for children with previous ARF and their families for preventing ARF recurrences in order to reduce chronic results of the disease.

AUTHORS' CONTRIBUTIONS

FL: Conceptualization, Data curation, Formal analysis, Investigation, Project administration, Resources, Validation, Visualization, Writing – review & editing.
NC: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

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