

1 **Comparison of ambulance usage characteristics in children between the pre-pandemic**  
2 **and pandemic periods in Turkey**

3 **Abstract:**

4 Aim: A pandemic is an epidemic of an infectious disease that has spread across a large  
5 region of the world and affects many people. In this study, it was aimed to evaluate the impact  
6 of the coronavirus disease 2019 (COVID-19) pandemic on ambulance use by pediatric  
7 patients in ....., Turkey.

8 Materials and Methods: This retrospective study was conducted in the spring-summer  
9 of 2019 and 2020. The electronic medical records of pediatric patients who were transported  
10 to the hospital by ambulance were analyzed.

11 Results: It was determined that 49.6% of the 23,201 patients included in the study  
12 were transported during the pandemic period. Male gender was higher in both the pandemic  
13 and pre-pandemic periods, there was no difference in terms of average age. The rate of  
14 forensic cases and refugee patients increased, while that of emergency patients decreased.  
15 Both the arrival at the scene time and intervention time were prolonged. Medical cause was  
16 the most common cause of emergency calls in both years, however, it increased significantly  
17 in 2020. The decrease in cases of traffic accidents, suicides, and other accidents was  
18 statistically significant. In the pandemic period, total rate of COVID-19 infection and  
19 suspicion was 29.7%. Most of the patients had been referred to a public hospital.

20 Conclusion: It was found that most of the ambulances were used for transporting  
21 patients with minor illnesses that did not require immediate medical attention.

22 **Key words:** Ambulance, child, COVID-19 pandemic, pediatric emergency medicine

24 **What is already known about this topic?** There are many studies showing the use of  
25 ambulance in pediatric patients during the pre-pandemic period. However, there are no studies  
26 showing the effect of the pandemic.

27 **What does this article add?** In the pandemic period, medical cause was the most common  
28 cause of emergency calls. The decrease in cases of traffic accidents, suicides, and other  
29 accidents was significant. Most of transporting pediatric patients did not require immediate  
30 medical attention during pandemic.

31

## 32 INTRODUCTION

33 A pandemic is an infectious disease that has spread across a large region of the world.  
34 A pandemic affects social life as well as medical interventions in society. Nowadays,  
35 infectious agents can spread rapidly to many parts of the world due to fast transportation and  
36 travel opportunities. Various epidemics such as smallpox and tuberculosis have occurred in  
37 the past. The World Health Organization declared a new pandemic of 2019 coronavirus  
38 disease (COVID-19) on 11 March 2020. (1) Hand hygiene, wearing facemasks, self-  
39 quarantine, social distancing, and the cleaning of surfaces are important to manage the  
40 outbreak. The strategy of home isolation of cases carries with it social and economic costs.  
41 Reducing epidemic peak lead to control of infectious disease outbreak. This provides more  
42 time for organizing healthcare and developing vaccines and treatment.

43 The first confirmed case in Turkey was detected on 11 March 2020, which was the  
44 same that day that the pandemic was declared. On 16 March 2020, educational institutions,  
45 and day care centers closed across the country. In addition, a curfew was imposed for those  
46 under 20 years of age, from 3 April to 10 June 2020. The curfew for adults was held on  
47 weekends, starting on 10–12 April 2020. The normalization process started in June. (2) In  
48 keeping with the policy of ‘stay at home’ to prevent the spread of COVID–19, a restriction  
49 was made for hospital outpatient visits. However, easy access to the Pediatric Emergency  
50 Department was provided.

51           Emergency calls in Turkey are a public service, and anyone can request an ambulance  
52 for free. Due to the health policies of the country, suspected or confirmed COVID-19 patients  
53 were transported to the hospital by ambulance and isolated so that they would not infect other  
54 people around them. Ambulances can be classified as ground, air, and sea ambulances.  
55 Emergency aid ambulances are vehicles that have a team, and technical and medical  
56 equipment that can make the necessary emergency medical intervention at the scene and in  
57 the ambulance. (3) During the current pandemic, emergency medical services have faced  
58 unprecedented challenges when transporting highly infectious patients in enclosed spaces.  
59 The smallness of the patient cabin in ambulances, insufficient ventilation, and the air  
60 conditioning system are risk factors in terms of infection transmission. The disease  
61 transmission risk for medical crew members of the ambulance may be higher than for in-  
62 hospital healthcare providers. There Have been studies examining the advantages of air and  
63 ground ambulances in the transportation of trauma patients. (4) Although the contact time  
64 with the patient is shortened in air ambulances, there is more close contact in the closed  
65 environment. Being unprepared is not an option and thoughtful detailed planning is key.

66           In this study, it was aimed to evaluate the impact of the COVID-19 pandemic on  
67 emergency medical services used by pediatric patients in ....., Turkey.

68

## 69 **MATERIALS AND METHODS**

70           This study was a retrospective, observational comparative study, which was conducted  
71 at ..... Electronic medical records of patients aged <18 years old, who were  
72 transported by ground ambulance, were examined between 1 May and 31 July 2020, and  
73 compared with those in the same period of the previous year. The exclusion criteria for this  
74 study were patients being >18 years of age and using private ambulances. Sociodemographic  
75 and clinical information of the patients, triage status, presence of forensic case, emergency

76 call date, reason for calling an ambulance, arrival and intervention times were recorded.  
77 Arrival times were measured from the time of receiving an emergency call to the time that an  
78 ambulance arrived at the patient's location. The intervention time consisted of the time from  
79 the arrival of the teams at the scene until the patient was taken to the ambulance. Ethics  
80 committee approval was obtained from the ..... Clinical Research Ethics Committee-1 under  
81 number E1-20-1160.

82 **Statistical analysis:** All data were analyzed using IBM SPSS Statistics for Windows 20.0.  
83 (Armonk, NY: IBM Corp). To summarize the baseline demographic and clinical features, the  
84 descriptive statistics of the patients were analyzed. Data were expressed as the mean  $\pm$   
85 standard deviation for the quantitative variables or number and percentage for the categorical  
86 variables. Categorical variables were compared using the chi square test. Median values and  
87 ranges were used for ordinal scaled or quantitative parameters. The student t test was used to  
88 compare the normally distributed variables of the 2 groups. The Mann-Whitney U test was  
89 used to compare quantitative or ordinary scaled variables. To analyze the proportions  
90 accurately, the chi square or Fisher exact tests was used. Each of these tests was 2-sided. P  
91  $<0.05$  was considered statistically significant.

92

## 93 **RESULTS**

94 During the study period, a total of 23,201 patients were transported by ambulance,  
95 comprising 50.4% in 2019 and 49.6% in 2020. Demographical characteristics of the patients  
96 are shown in Table 1. Male gender was higher during both the pandemic and pre-pandemic  
97 periods, while there was no difference in terms of average age. The rate of refugee patients  
98 increased from 3.5% in 2019 to 9.3% in 2020 ( $P=0.000$ ), and the increase in Syrian and Iraqi  
99 refugee children was remarkable. There was a statistically significant decrease between the

100 pre-pandemic and pandemic periods in terms of forensic case frequency ( $P = 0.000$ ). The  
101 number of emergency patients, called red tag, tended to decrease ( $P = 0.001$ ).

102         Emergency call, arrival at the scene, and intervention times are shown in Table 2. The  
103 frequency of emergency calls tended to decrease in March and increase in June. There were  
104 more calls in the evenings and nighttime, and on weekends in 2020 than the previous year.  
105 Both the arrival at scene times and intervention times were prolonged ( $P = 0.000$ ).

106         Medical cause was the most common cause of emergency calls in both years;  
107 however, it increased significantly in 2020 ( $P = 0.000$ ). The reduction in traffic accidents and  
108 other accidents was statistically significant ( $P = 0.000$ ) (Table-3). Although there was a  
109 numerical decrease in injuries, it was not statistically significant. The decrease in suicide  
110 cases in 2020 was also statistically significant ( $P = 0.001$ ).

111         The final symptoms and system involvement of the patients after intervention is  
112 shown in Table 4. In the 2020 pandemic period, the total rate of COVID-19 infection and  
113 suspicion was 29.7%. It affected all systems significantly, except for the hematological  
114 system. The effects on the systems were all in a decreasing trend.

115         The health centers where the patients were referred to comprised 64.7% Public  
116 Hospitals and 15.5% University Hospitals in 2019, respectively, and 71.5% and 12.7% in  
117 2020. .... Hospital was the hospital with the highest number of patients in both the  
118 pandemic and pre-pandemic periods (3442 patients (29.9%) in 2020, 1556 patients (13.3%) in  
119 2019).

120

## 121 **DISCUSSION**

122         In this study, whether there was any difference in the use of ground ambulances for  
123 pediatric patients during the pandemic period was evaluated. In addition to similarity in the  
124 total number during the pandemic period, there were significant differences in the

125 demographic information, diagnosis, and call characteristics of the patients. It was seen that  
126 the parents brought their children to the hospital despite the fear of infection during the  
127 pandemic.

128 The mean age of the patients was similar to the pre-pandemic period. This can be  
129 explained by the fact that COVID-19 infection can be seen at any age. The increasing number  
130 of cases on Saturday and Sunday may have been due to the parents having a curfew on the  
131 weekends.

132 According to the January 2019 data in Turkey, there were around 3.5 million Syrian  
133 and 142 thousand Iraqi refugees. The proportion of children under the age of 18 was about  
134 half of the population, for both Syrian and Iraqi refugees. (5) Due to war, poverty, and  
135 household dynamics, the living standards of the refugees were decreasing. (6) In their study  
136 about refugees, Budak et al. reported that they are a group who are not aware of the  
137 seriousness of the pandemic, who do not have enough information about the pandemic, and  
138 do not have access to personal protective equipment (such as masks or gloves). (7) In the  
139 current study, the increased frequency of ambulance usage by refugees during the pandemic  
140 may have been due to unhygienic and crowded living conditions.

141 Forensic cases in the pediatric age group generally consist of poisoning, trauma, and  
142 suicide. (8) The decreased number of forensic cases in the current study can be explained by  
143 the decrease in traffic accidents and suicide cases. The decrease in suicide cases during the  
144 pandemic period may have been due to different reasons. School closure may have caused the  
145 elimination of poor school success, which may be one of the reasons for suicidal tendency. In  
146 addition, the opportunity to spend more time with their families because of the curfew may  
147 have contributed positively. A significant increase in unintentional home accidents was  
148 reported in children during the school holidays when they spent so much time at home. (9)

149 However, there was a significant decrease in the number of poisoning cases observed in the  
150 study. This situation can be explained by the presence of the parents at home.

151 The ambulance response time was affected by incorrect address notification, distance  
152 to the patient, weather and climate changes, closed roads, and traffic density. (10) In the  
153 pandemic period, there has been a significant increase in the arrival times of ambulances at  
154 the scene. In fact, it would be expected that the reduced traffic density due to the part-time  
155 work program and the curfew would shorten this period. The transport team should don  
156 appropriate personal protective equipment outside of the home of the patient before transport.  
157 (11) The prolongation of the intervention time during the pandemic period can be explained  
158 by infection protection methods. In Turkey, when there is an emergency call by phone, a  
159 conversation takes place about COVID-19 infection and the ambulance team is alerted  
160 accordingly. First at the scene, a person from the ambulance team goes to the scene and  
161 performs pre-triage. If the patient has a suspicion of COVID-19 infection, the other members  
162 of the team perform intervention after wearing personal protective equipment. Therefore, it  
163 takes time for the team to start intervention for the patient.

164 It has been reported that pediatric patients are most often transported due to breathing  
165 difficulties, trauma, and seizure. (11–14) In studies conducted in Turkey regarding the use of  
166 pediatric ambulances in the pre-pandemic period, the most common symptoms have been  
167 trauma, fever, convulsion, and poisoning. (15,16) Katayama et al. reported that child traffic  
168 accident rates have decreased during the pandemic period. (17) It was found that traffic  
169 accidents and other accidents decreased during the pandemic period when compared to the  
170 pre-pandemic period. The fact that all of the training activities were suspended, and curfews  
171 were implemented may have been effective in this decrease. The absence of a significant  
172 decrease in the number of injuries can be explained by domestic accidents.

173           During the pandemic period, 29.7% of all of the patients in this study were infected  
174 with COVID-19. The respiratory and gastrointestinal system are frequently affected in  
175 COVID-19. (18) In the current study, the absence of an increase in symptoms in these systems  
176 can be explained by the evaluation of these patients in the suspicion of COVID-19 group. The  
177 rate of fever seemed to have decreased, since the fever symptom is generally considered in the  
178 suspected or diagnosed disease group. Since the follow-up and treatment of hematology  
179 patients continued during the pandemic period, they did not require ambulance transfer.

180           Among the hospitals where the patients were referred to, the rate of University  
181 Hospitals decreased, while the rate of Public Hospitals increased. Among the Public  
182 Hospitals, the health center that accepted the most patients was XXX Hospital. This situation  
183 can be explained by the physical suitability of City Hospitals and it being a Pandemic  
184 Hospital.

185

### 186 **Limitations**

187           This study was a retrospective, observational study, and there could be some unknown  
188 confounding factors due to the study type. The final diagnoses and prognoses in-hospital were  
189 unknown. The characteristics of other accidents were not given in detail. Therefore, the  
190 frequency of possible domestic accidents could not be determined.

191

### 192 **Conclusion**

193           The impact of the COVID-19 pandemic on the emergency medical service system was  
194 assessed, and it was found that most of the ambulances have been used for transporting  
195 patients with minor illnesses that did not require immediate medical attention. In other words,  
196 ambulances were used as transportation vehicles during the pandemic period. Future studies  
197 may include in-ambulance interventions and hospital procedures.

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249 **Table 1:** Demographical characteristics of the patients.

		<b>2019</b> <b>(n = 11704)</b>	<b>2020</b> <b>(n = 11497)</b>	<b>P-</b> <b>value</b>
Gender	Male	6522 (55.7%)	6237 (54.2%)	<b>0.024</b> <sup>a</sup>
	Female	5182 (44.3%)	5260 (45.8%)	
Age (years)	All	<b>9.4 ± 6.3</b>	<b>9.4 ± 6.2</b>	0.469 <sup>b</sup>
Mean ± standard deviation	Male	9.3 ± 6.2	9.2 ± 6.1	0.600 <sup>b</sup>
	Female	9.5 ± 6.4	9.7 ± 6.3	0.128 <sup>b</sup>
		<b>P-</b> <b>value</b>	<b>0.017</b> <sup>b</sup>	<b>0.000</b> <sup>b</sup>
Nation (Republic of Turkey)		11,296 (96.5%)	10430 (90.7%)	<b>0.000</b> <sup>a</sup>
Forensic case (yes)		2040 (17.4%)	1270 (11.0%)	<b>0.000</b> <sup>a</sup>
Triage (red tag)		726 (6.2%)	599 (5.2%)	<b>0.001</b> <sup>a</sup>

250

251 **Table 2:** Emergency call, arrival at scene, and intervention times.

		<b>2019</b> <b>(n = 11704)</b>	<b>2020</b> <b>(n = 11497)</b>	<b>P-value</b>
Month	May	4141 (35.4%)	3718 (32.3%)	<b>0.000</b> <sup>a</sup>
	June	3648 (31.2%)	3812 (33.2%)	<b>0.001</b> <sup>a</sup>
	July	3915 (33.5%)	3967 (34.5%)	0.093 <sup>a</sup>
Day	Weekdays	8772 (74.9%)	7984 (69.4%)	<b>0.000</b> <sup>a</sup>
	Weekend	2932 (25.1%)	3513 (30.6%)	
Hour	00:00–07:59	1741 (14.9%)	2046 (17.8%)	<b>0.000</b> <sup>a</sup>
	08:00–15:59	4817 (41.2%)	4169 (36.3%)	<b>0.000</b> <sup>a</sup>
	16:00–23:59	5146 (44.0%)	5282 (45.9%)	<b>0.003</b> <sup>a</sup>
<b>Arrival at scene time (s) mean ± SD</b>		398.25 ± 520.29	464.09 ± 479.27	<b>0.000</b> <sup>b</sup>
<b>Intervention time (s) mean ± SD</b>		831.16 ± 1219.46	907.47 ± 735.55	<b>0.000</b> <sup>b</sup>

252

253 **Table 3:** Comparison of emergency call causes.

		<b>2019</b> <b>(n = 11704)</b>	<b>2020</b> <b>(n = 11497)</b>	<b>P-value<sup>a</sup></b>
<b>Call causes</b>	Medical	5342 (45.6%)	8618 (75.0%)	<b>0.000</b>
	Traffic accidents	1494 (12.8%)	877 (7.6%)	<b>0.000</b>
	Injuries	327 (2.8%)	278 (2.4%)	0.083
	Suicides	132 (1.1%)	60 (0.5%)	<b>0.000</b>
	Other accidents	1842 (15.7%)	1378 (12.0%)	<b>0.000</b>
	Other causes	2567 (21.9%)	265 (2.3%)	<b>0.000</b>

254

255 **Table 4:** Comparison of final symptoms/affected systems.

<b>Symptoms/diagnosis</b>	<b>2019 (n = 11704)</b>	<b>2020 (n = 11497)</b>	<b>P-value<sup>a</sup></b>
<b>Suspected infection of COVID-19</b>	-	1867 (16.2%)	-
<b>Infected with COVID-19</b>	-	1554 (13.5%)	-
<b>Fever</b>	750 (6.4%)	357 (3.1%)	<b>0.000</b>
<b>Respiratory system</b>	912 (7.8%)	400 (3.5%)	<b>0.000</b>
<b>Cardiovascular system</b>	713 (6.1%)	372 (3.2%)	<b>0.000</b>
<b>Gastrointestinal system</b>	1042 (8.9%)	866 (7.5%)	<b>0.000</b>
<b>Neurological system</b>	774 (6.6%)	568 (4.9%)	<b>0.000</b>
<b>Hematological system</b>	145 (1.2%)	143 (1.2%)	0.973
<b>Psychiatric causes</b>	717 (6.1%)	457 (4.0%)	<b>0.000</b>
<b>Traumatic causes</b>	4585 (39.2%)	3306 (28.8%)	<b>0.000</b>
<b>Poisoning</b>	450 (3.8%)	300 (2.6%)	<b>0.000</b>
<b>Other causes</b>	1548 (13.2%)	1266 (11.0%)	<b>0.000</b>
<b>Arrest</b>	68 (0.6%)	41 (0.4%)	<b>0.012</b>

256