Comparison of Ambulance Usage Characteristics in Children Between the Pre-Pandemic and Pandemic Periods in Turkey

Türkiye'de Pandemi Öncesi ve Pandemi Dönemi Arasında Çocukların Ambulans Kullanım Özelliklerinin Karşılaştırılması

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ABSTRACT

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

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

Results: It was determined that 49.6% of the 23.201 patients included in the study were transported during the pandemic period. Male gender was higher in both the pandemic and pre-pandemic periods, there was no difference in terms of average age. The rate of forensic cases and refugee patients increased, while that of emergency patients decreased. Both the arrival at the scene time and intervention time were prolonged. Medical cause was the most common cause of emergency calls in both years, however, it increased significantly in 2020. The decrease in cases of traffic accidents, suicides, and other accidents was statistically significant. In the pandemic period, total rate of COVID-19 infection and suspicion was 29.7%. Most of the patients had been referred to a public hospital.

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

Key Words: Ambulance, Child, COVID-19 pandemic, Pediatric emergency medicine

ÖZ

Amaç: Pandemi, dünyanın geniş bir bölgesine yayılan ve birçok insanı etkileyen bulaşıcı hastalık salgınıdır. Bu çalışmada, Türkiye'nin Ankara ilinde, 2019 koronavirüs hastalığı (COVİD-19) pandemisinin çocuk hastaların ambulans kullanımına etkisinin değerlendirilmesi amaçlanmıştır.

Gereç ve Yöntemler: Bu retrospektif çalışmada 2019 ve 2020 yıllarının bahar-yaz aylarında ambulans ile hastaneye nakledilen çocuk hastaların elektronik tıbbi kayıtları incelendi.

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Ethics Committee Approval / *Etik Kurul Onayı*: This study was conducted in accordance with the Helsinki Declaration Principles. Ethics committee approval was obtained from the Ankara City Hospital Clinical Research Ethics Committee-1 under number E1-20-1160.

Contribution of the Authors / Yazarların katkısı*: *SARI E: Constructing the hypothesis or idea of research and/or article, Organizing, supervising the course of progress and taking the responsibility of the research/study, Taking responsibility in logical interpretation and conclusion of the results, Taking responsibility in necessary literature review for the study, Reviewing the article before submission scientifically besides spelling and grammar. ***SAN I:*** Constructing the hypothesis or idea of research and/or article, Planning methodology to reach the Conclusions, Organizing, supervising the course of progress and taking the responsibility of the research/study, Taking responsibility in logical interpretation and conclusion of the results, Taking responsibility in necessary literature review for the study, Reviewing the article before submission scientifically besides spelling and grammar. ***BEKGÖZ B:*** Constructing the hypothesis or idea of research and/or article, Planning methodology to reach the Conclusions, Organizing, supervising the course of progress and taking the responsibility of the research/study, Taking responsibility in patient follow-up, collection of relevant biological materials, data management and reporting, execution of the experiments, Taking responsibility in logical interpretation and conclusion of the results, Taking responsibility in necessary literature review for the study, Taking responsibility in the writing of the whole or important parts of the study, Reviewing the article before submission scientifically besides spelling and grammar. ***AKCA H:*** Constructing the hypothesis or idea of research and/or article, Planning methodology to reach the Conclusions, Organizing, supervising the course of progress and taking the responsibility of the research/study, Taking responsibility in patient follow-up, collection of relevant biological materials, data management and reporting, execution of the experiments, Taking responsibility in logical interpretation and conclusion of the results, Taking responsibility in necessary literature review for the study, Taking responsibility in the writing of the whole or important parts of the study, Reviewing the article before submission scientifically besides spelling and grammar.

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Bulgular: Çalışmaya alınan 23201 hastanın %49.6'sının pandemi döneminde nakledildiği belirlendi. Erkek cinsiyet hem pandemi hem de pandemi öncesi dönemlerde daha yüksekti, yaş ortalamaları açısından fark yoktu. Pandemi döneminde adli vaka ve mülteci hasta oranı artarken, acil hasta oranı azaldı. Hem olay yerine gelme süresi hem de müdahale süresi uzadı. Medikal nedenler her iki yılda da en sık acil çağrı nedeniydi, ancak 2020'de önemli ölçüde arttı. Trafik kazası, özkıyım ve diğer kaza vakalarındaki azalma istatistiksel olarak anlamlıydı. Pandemi döneminde toplam kesin ve şüpheli COVİD-19 enfeksiyonu oranı %29.7'di. Hastaların çoğu devlet hastanesine sevk edildi.

Sonuç: Pandemi döneminde ambulansların çoğunun acil tıbbi müdahale gerektirmeyen hafif hastalığı olan hastaları taşımak için kullanıldığı tespit edildi.

Anahtar Sözcükler: Ambulans, COVİD-19 pandemisi, Çocuk, Çocuk Acil Tıp

INTRODUCTION

A pandemic is an epidemic of an infectious disease that spread over countries or continents. An epidemic anywhere in the world is now a threat to all countries due to easier transportation. Throughout human history, there have been several pandemics of plague, cholera, and influenza. On 11 March 2020, the World Health Organization announced the spread of coronavirus disease 2019 (COVID-19) as a pandemic (1). Non-pharmaceutical interventions against COVID-19 including but not limited to social distancing, hand hygiene, wearing of face masks and self-quarantine were used to control the spread of the disease all over the world. This helps decrease the risk of health services being overwhelmed and provides more time for a vaccine and treatment to be developed (2).

The first confirmed case in Turkey was detected on 11 March 2020, which was the same day that the pandemic was declared. On 16 March 2020, educational institutions, and day care centers were closed across the country. In addition, a curfew was imposed for those under 20 years of age, from 3 April to 10 June 2020. The curfew for adults was held on weekends, starting on 10–12 April 2020. The normalization process started in June (1). In accordance with the policy of 'stay at home' to prevent the spread of COVID-19, a restriction was made for hospital outpatient visits. However, easy access to the Pediatric Emergency Department was provided.

Emergency calls in Turkey are a public service, and anyone can request an ambulance for free. Due to the health policies of the country, suspected or confirmed COVID-19 patients were transported to the hospital by ambulance and isolated so that they would not infect other people around them. Emergency aid ambulances are vehicles that have a team, and technical and medical equipment that can make the necessary emergency medical intervention at the scene and in the ambulance (3). During the current pandemic, emergency medical services have faced unprecedented challenges when transporting highly infectious patients in enclosed spaces. The smallness of the patient cabin in ambulances, insufficient ventilation, and the air conditioning system are risk factors in terms of infection transmission. There have been studies examining the advantages of air and ground ambulances in the transportation of trauma patients (4). Although the contact time with the patient is shortened in air ambulances, there is closer contact in the closed environment. Being unprepared is not an option and thoughtful detailed planning is key.

In this study, we aimed to evaluate the impact of the COVID-19 pandemic on emergency medical services used by pediatric patients in Ankara Province, Turkey.

MATERIALS and METHODS

This study was a retrospective, observational comparative study, which was conducted at Ankara the capital city of Turkey Emergency Medical Services. Electronic medical records of patients aged <18 years old, who were transported by ground ambulance, were examined between 1 May and 31 July 2020, and compared with those in the same period of the previous year. The exclusion criteria for this study were patients being >18 years of age and using private ambulances. Sociodemographic and clinical information of the patients, triage status, presence of forensic case, emergency call date, reason for calling an ambulance, response and intervention times were recorded. Response times were measured from the time of receiving an emergency call to the time that an ambulance arrived at the patient's location. The intervention time consisted of the time from the response of the teams at the scene until the patient was taken to the ambulance. Ethics committee approval was obtained from the Ankara City Hospital Clinical Research Ethics Committee-1 under number E1-20-1160.

Statistical analysis: All data were analyzed using IBM SPSS Statistics for Windows 20.0. (Armonk, NY: IBM Corp). To summarize the baseline demographic and clinical features, the descriptive statistics of the patients were analyzed. Data were expressed as the mean ± standard deviation for the quantitative variables or number and percentage for the categorical variables. Categorical variables were compared using the chi square test. Median values and ranges were used for ordinal scaled or quantitative parameters. The student t test was used to compare the normally distributed variables of the 2 groups. The Mann-Whitney U test was used to compare quantitative or ordinary scaled variables. To analyze the proportions accurately, the chi square or Fisher exact tests was used. Each of these tests was 2-sided. $p < 0.050$ was considered statistically significant.

RESULTS

During the study period, a total of 23.201 patients were transported by ambulance, comprising 50.4% in 2019 and

Table I: Demographical characteristics of the patients.

	2019 (n = 11704)	2020 (n = 11497)	p
Gender			
Male	6522 (55.7)	6237 (54.2)	0.024 [a]
Female	5182 (44.3)	5260 (45.8)	
Age (years)			
Mean ± standard deviation			
All	9.4 ± 6.3	9.4 ± 6.2	0.469 [b]
Male	9.3 ± 6.2	9.2 ± 6.1	0.600 [b]
Female	9.5 ± 6.4	9.7 ± 6.3	0.128 [b]
p	0.017 [b]	0.000 [b]	
Refugee patients	408 (3.5)	1067 (9.3)	<0.001 [a]
Forensic case (yes)	2040 (17.4)	1270 (11.0)	<0.001 [a]
Triage (red tag)	726 (6.2)	599 (5.2)	0.001 [a]

[a]: Chi square test (n, %), [b]: independent samples t test (mean ± SD)

Table II: Emergency call, response at scene, and intervention times

Emergency calls	2019 (n = 11704)	2020 (n = 11497)	p
Month			
May	4141 (35.4)	3718 (32.3)	<0.001 [a]
June	3648 (31.2)	3812 (33.2)	0.001 [a]
July	3915 (33.5)	3967 (34.5)	0.093 [a]
Day			
Weekdays	8772 (74.9)	7984 (69.4)	<0.001 [a]
Weekend	2932 (25.1)	3513 (30.6)	
Hour			
00:00–07:59	1741 (14.9)	2046 (17.8)	<0.001 [a]
08:00–15:59	4817 (41.2)	4169 (36.3)	<0.001 [a]
16:00–23:59	5146 (44.0)	5282 (45.9)	0.003 [a]
Response at scene time (min/s) mean ± SD	6.64 ± 8.67	7.73 ± 7.99	<0.001 [b]
Intervention time (min/s) mean ± SD	13.85 ± 20.32	15.12 ± 12.26	<0.001 [b]

[a]: Chi square test (n, %), [b]: independent samples t test (mean ± SD)

49.6% in 2020. Demographical characteristics of the patients are shown in Table I. Male gender was higher during both the pandemic and pre-pandemic periods, while there was no difference in terms of average age. The rate of refugee patients increased from 3.5% in 2019 to 9.3% in 2020 (p<0.001), and the increase in Syrian and Iraqi refugee children was remarkable. There was a statistically significant decrease between the pre-pandemic and pandemic periods in terms of forensic case frequency (p<0.001). The number of patients with higher acuity levels called red tag, tended to decrease (p= 0.001).

Emergency call, response at the scene, and intervention times are shown in Table II. The frequency of emergency calls tended to decrease in May and increase in June. There were more calls in the evenings and nighttime, and on weekends in 2020 than the previous year. Both the response at scene times and intervention times were prolonged (p<0.001).

Medical cause was the most common cause of emergency calls in both years; however, it increased significantly in 2020

Table II: Comparison of emergency call causes.

	2019 (n = 11704)	2020 (n = 11497)	p[a]
Call causes			
Medical	5342 (45.6)	8618 (75.0)	<0.001
Traffic accidents	1494 (12.8)	877 (7.6)	<0.001
Injuries	327 (2.8)	278 (2.4)	0.083
Suicides	132 (1.1)	60 (0.5)	<0.001
Other accidents	1842 (15.7)	1378 (12.0)	<0.001
Other causes	2567 (21.9)	265 (2.3)	<0.001

[a]: Chi square test (n, %)

Table IV: Comparison of final symptoms/affected systems.

Symptoms/diagnosis	2019 (n = 11704)	2020 (n = 11497)	p[a]
Suspected infection of COVID-19	-	1867 (16.2)	-
Infected with COVID-19	-	1554 (13.5)	-
Fever	750 (6.4)	357 (3.1)	<0.001
Respiratory system	912 (7.8)	400 (3.5)	<0.001
Cardiovascular system	713 (6.1)	372 (3.2)	<0.001
Gastrointestinal system	1042 (8.9)	866 (7.5)	<0.001
Neurological system	774 (6.6)	568 (4.9)	<0.001
Hematological system	145 (1.2)	143 (1.2)	0.973
Psychiatric causes	717 (6.1)	457 (4.0)	<0.001
Traumatic causes	4585 (39.2)	3306 (28.8)	<0.001
Poisoning	450 (3.8)	300 (2.6)	<0.001
Other causes	1548 (13.2)	1266 (11.0)	<0.001
Arrest	68 (0.6)	41 (0.4)	0.012

[a]: Chi square test (n, %)

(p<0.001). The reduction in traffic accidents and other accidents was statistically significant (p<0.001) (Table III). Although there was a numerical decrease in injuries, it was not statistically significant. The decrease in suicide cases in 2020 was also statistically significant (p = 0.001).

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

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

DISCUSSION

In this study, whether there was any difference in the use of ground ambulances for pediatric patients during the pandemic

period was evaluated. The total number of ambulance usage did not change due to the density of Covid infection patients. The need for ambulance transportation for trauma and high acuity level patients decreased. Also, there were significant differences in the demographic information, diagnosis, and call characteristics of the patients.

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

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

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

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

It has been reported that pediatric patients are most often transported due to breathing difficulties, trauma, and seizure (12-15). In studies conducted in Turkey regarding the use of pediatric ambulances in the pre-pandemic period, the most common symptoms have been trauma, fever, convulsion, and poisoning (16). Katayama et al. (17) reported that child traffic accident rates have decreased during the pandemic period (17). It was found that traffic accidents and other accidents decreased during the pandemic period when compared to the pre-pandemic period. The fact that all of the training activities were suspended, and curfews were implemented may have been effective in this decrease. The absence of a significant decrease in the number of injuries can be explained by domestic accidents.

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

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

LIMITATIONS

This study was a retrospective, observational study, and there could be some unknown confounding factors due to the study type. The final diagnoses and prognoses in-hospital were unknown. The characteristics of other accidents were not given in detail. Therefore, the frequency of possible domestic accidents could not be determined. Private ambulance data could not be evaluated because only Ankara Provincial Health Directorate Emergency Medical Service data were used in the study. The beginning of the study period was not the same as the beginning of the pandemic in our country. It would be

more appropriate to start the study on March 11, when the first case was seen in our country. However, due to the availability of data, the study could only be started on 11 May.

CONCLUSION

The impact of the COVID-19 pandemic on the emergency medical service system was assessed, and it was found that most of the ambulances have been used for transporting patients with minor illnesses that did not require immediate medical attention. Future studies may include in-ambulance interventions and hospital procedures.

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