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Effects of COVID-19 Pandemic on Emergency Medical Services

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Abstract

Introduction: In this study, we aimed to analyse the changes that occurred after the COVID-19 pandemic using the data of EMS of Ankara province.

Materials and methods: EMS data for the same time interval (March 11-April 24) in the last 3 years (2018, 2019 and 2020) were compared.

Results: While the number of calls increased by 90.9% during the pandemic period (from 2019 to 2020), the number of cases increased by 9.8%. Of all cases transported to hospital, 15.2% were suspected of and 2.9% were diagnosed with COVID-19. In the pandemic period, case frequency decreased in the 0-6 age group (−4.1%) and 7-18 age group (-39.9%) while the number of patients in the 19-65 age group (12.9%) and 65+ age group (21.5%) increased. There was a statistically significant difference between pre-pandemic and pandemic period in terms of rural area case frequency. During the pandemic period, case frequency of angina pectoris (−35.2%), myocardial infarction (−45%), acute abdomen (−23.8%) and cerebrovascular diseases (−2.9%) decreased contrary to pre-pandemic period (2019). During the same period, symptoms of fever (+14.1%) and cough (+956.3%) increased. There was a statistically significant difference between pre-pandemic and pandemic period in terms of forensic case frequency ($P < .05$). In addition, there was a statistically significant difference between these periods in terms of the frequency of patients who died at the scene.

Conclusion: Although the use of ambulances has increased in the pandemic process, the use of EMS for time-sensitive diseases has decreased.

1 | INTRODUCTION

In December 2019, cases of unknown pneumonia began to emerge in Wuhan, China. The clinical course of these cases resembled viral pneumonia.[1] It was determined that a virus named 2019-nCoV caused this clinic.[2] Coronavirus Disease 2019 (COVID-19) is a pandemic that has caused approximately 2 million confirmed cases and nearly 120 000 deaths worldwide as of 15 April 2020. The mortality rate ranges from 3% to 9% between continents.[3] The 2019-nCoV infection as a result of the SARS-CoV-2 agent has been named as COVID-19 and has spread rapidly worldwide causing a pandemic. The first case in Turkey was detected on 11 March 2020, and day-by-day, the number of cases has increased.

A pandemic is an epidemic occurring worldwide or over a wide area crossing international boundaries and affecting a large number of people. An epidemic anywhere in the world is now a threat to all countries as a result of easier transportation and increased globalisation. Many serious acute diseases occurring in a short time will push the capacities of health systems of both developing and developed countries.[4] Pandemic affects vital activities and ordinary life for societies.

Emergency Medical Services (EMS) include providing emergency care to individuals who need it as a result of disaster, accident or illness and transporting them to a hospital.[5,6] The main purpose of these services, which are an important part of modern health systems, is to increase morbidity and mortality as a result of major trauma, chronic disease and sudden health problems.[5,7] The main causes of death in adults are accidents, traumas, cardiovascular

diseases, chronic diseases, excessive drug intake and suicide.[8,9] The effect of EMS on reducing the mortality and morbidity of trauma and chronic diseases increases its importance worldwide.[10]

EMS usage rates of societies differ depending on local, socio-economic and cultural conditions. This study was carried out in Ankara province (the capital city of Turkey) to evaluate the rate of EMS use after the COVID-19 pandemic.

2 | MATERIALS AND METHODS

This study retrospectively evaluated the Ankara (Capital of Turkey) EMS data for the period after the pandemic was first seen in Turkey. The necessary permissions for the study were obtained from the Ankara Provincial Health Directorate. EMS data for the same time interval (March 11-April 24) in the last 3 years (2018, 2019 and 2020) were compared.

2.1 | Statistical analysis

All data were analysed using IBM SPSS for Windows version 25. In addition to descriptive statistics (frequency, percentage, mean, standard deviation, median, min-max), chi-squared (χ^2) test was used to compare qualitative data. The consistency of the data to normal distribution was evaluated by the Kolmogorov-Smirnov test. As a result of the tests, it was found that the data were consistent with the normal distribution. Independent samples t test was used for comparison between groups. A value of p <0.05 was considered statistically significant.

3 | RESULTS

The study interval was 11 March-24 April time period of the years 2018, 2019 and 2020. EMS data of the Ankara province for this study interval were evaluated in this study. While Ankara EMS received 128 954 calls in the 11 March-24 April time interval in 2018, for the same interval, it received 132 289 calls in 2019 and 252 519

What's known

- It is known that the use of EMS varies according to cultural, economic and sociocultural differences. The pandemic process is also thought to affect EMS use.

What's new

- EMS utilisation rates of the individuals increased during the COVID-19 pandemic process. Anxiety of transmission prevents individuals from using EMS for time-sensitive diseases such as acute myocardial infarction and stroke, and this leads to increased mortality rates.

calls in 2020. For the 11 March-24 April time interval, the number of calls increased by 2.6% from 2018 to 2019 while it increased by 90.9% from 2019 to 2020. For the 11 March-24 April time interval, the number of cases was 42 642 in 2018 while it was 43 851 in 2019 and 48 159 in 2020. In this study interval, the number of cases increased by 2.8% from 2018 to 2019, and by 9.8% from 2019 to 2020. For this same time interval, the arrival at scene time was 06.26 minutes in 2018 while it was 06.38 minutes in 2019 and 07.16 minutes in 2020 (Table 1).

EMS cases were most frequent on Thursdays and Fridays in the pre-pandemic period while it was on Saturdays and Sundays in the pandemic period. During the pandemic period, the number of cases increased by 24.3% on Saturdays and 26.8% on Sundays. During the pandemic period, the mean number of daily cases was 1063 on the days without curfew while it was 1116 on the curfew days. The number of cases increased by 5% in the curfew days compared with the non-curfew days (Table 1). For the 11 March-24 April time interval, the number of male patients was 21 500 (49%) in 2019 while it was 24 287 (50.4%) in 2020. While the number of male patients increased during the pandemic period, the number of female patients decreased. There was a significant difference between genders ($P < .05$). In the pre-pandemic period (11 March-24 2019), the mean age was 47.7 ± 25.0 for men and 50.8 ± 26.1 for women. In the pandemic

TABLE 1 Call and case statistics

		2018*	2019*	2018-2019 difference (%)	2020*	2019-2020 difference (%)
Number of calls	Total	128.954	132.289	2.6	252.519	90.9
	Daily Mean	2.866	2.940		5.612	
Number of tasks	Total	52.515	54.243	3.3	60.377	11.3
	Daily Mean	1.167	1.205		1.342	
Number of cases	Total	42.642	43.851	2.8	48.159	9.8
	Daily Mean	948	974		1.070	
Arrival at scene time (min/s)	Mean	06.26	06.38		07.16	

*Period from 11 March to 24 April.

period (11 March-24 2020), the mean age was 50.3 ± 23.7 for men and 54.0 ± 24.5 for women (Table 2).

In the pandemic period (11 March-24 April), the number of patients decreased in the 0-6 age group (−4.1%) and 7-18 age group (−39.9%) while the number of patients in the 19-65 age group (12.9%) and 65+ age group (21.5%) increased. There was a statistically significant difference between age groups ($P < .05$).

In the pre-pandemic period (11 March-24 April 2019), 5206 (11.9%) of 43 851 cases were forensic cases while 3053 (6.3%) of 48 159 cases were forensic cases in the pandemic period. There was a statistically significant decrease between pre-pandemic and pandemic period in terms of forensic case frequency (Table 2).

While the number of cases in the rural area was 2010 (4.6%) in the pre-pandemic period (11 March-24 April 2019), it was 2738 (5.7%) in the pandemic period (11 March-24 April 2020). There was a statistically significant difference between pre-pandemic and pandemic period in terms of rural area case frequency (Table 2).

The number of patients who died at the scene in pre-pandemic period (11 March-24 April 2019) was 907 (2.1%) while it was 1353 (%2.8) in pandemic period. There was a statistically significant difference between pre-pandemic and pandemic period in terms of frequency of patients who died at the scene. The most common cause of death at the scene, both in the pre-pandemic period and in the pandemic period, was "sudden death of unknown cause" and "cardiac sudden death" (Table 2).

Occupational accidents (−8.1%), suicides (−25.7%), injuries (−35.8%), traffic accidents (−47.7%), other accidents (−35.9%) and fire cases (−57.2%) decreased in pre-pandemic period contrary to pre-pandemic period. Cases with medical causes increased by 46.5% in the same period (Table 3).

During the pandemic period, frequency of angina pectoris (−35.2%), myocardial infarction (−45%), acute abdomen (−23.8%) and cerebrovascular diseases (−2.9%) decreased contrary to pre-pandemic period (2019). During the same period, symptoms of fever (+14.1%) and cough (+956.3%) increased (Table 3).

In the pandemic period, the number of patients suspected of COVID-19 was 7364 while the number of patients diagnosed with COVID-19 was 1437 (Table 3).

4 | DISCUSSION

As the day of the first COVID-19 confirmed case in Turkey (March 11), WHO declared the COVID-19 pandemic. Individuals were recommended not to visit health institutions except for compulsory cases, and to be supported by telephone calls instead.[11] With the effects of the pandemic in both social and print media, it changed the EMS usage of individuals. In this study, we aimed to analyse the changes that occurred after the COVID-19 pandemic using the data of Ankara EMS.

For the 11 March-24 April time interval, the number of EMS calls increased by 2.6% from 2018 to 2019 while it increased by 90.9% from 2019 to 2020. We think that the reason for this increase is the fact that scared and panicked individuals called EMS to find answers to their questions.

Despite the high increase in the number of calls, the number of ambulance assignments increased by 2.8% from 2018 to 2019, and by 9.8% from 2019 to 2020, in the 11 March-24 April time interval. The reason for the increased number of cases on Saturdays and Sundays may be that patients call EMS to be able to go to the hospital by ambulance because there is a curfew on the weekends. The

TABLE 2 Comparison of cases by years

		2019 (n = 43 851)	2020 (n = 48 159)	Annual Difference %	P
Gender	Male	21.500 (49.0%)	24.287 (50.4%)	13.0	.001[a]
	Female	22.351 (51.0%)	23.872 (49.6%)	6.8	
Age (years) Mean ± SD	All	49.3 ± 25.6	52.1 ± 24.2		.001[b]
	Male	47.7 ± 25.0	50.3 ± 23.7		.001[b]
	Female	50.8 ± 26.1	54.0 ± 24.5		.001[b]
Forensic case	No	38.645 (88.1%)	45.106 (93.7%)	16.7	.001[a]
	Yes	5.206 (11.9%)	3.053 (6.3%)	−41.4	
By operating area	Urban area	41 841 (95.4%)	45 421 (94.3%)	8.6	.001[a]
	Rural area	2.010 (4.6%)	2.738 (5.7%)	36.2	
Patient died at scene	No	42.944 (97.9%)	46.806 (97.2%)	9.0	.00[a]
	Yes	907 (2.1%)	1353 (2.8%)	49.2	
	Sudden death with unknown cause	503 (55.5%)	864 (63.9%)	71.8	
	Cardiac death	283 (31.2%)	295 (21.8%)	4.2	
	Others	121 (13.3%)	194 (14.3%)	60.3	

Note: a: Chi-squared test, b: Independent samples t test.

TABLE 3 Call causes, case results and selected diagnoses

		2019 (n = 43 851)	2020 (n = 48 159)	Annual difference %
Cause of call	Medical causes	29.142 (66.5%)	42.695 (88.7%)	+46.5
	Work accidents	173 (0.4 %)	159 (0.3%)	−8.1
	Suicides	327 (0.7%)	243 (0.5%)	−25.7
	Injuries	979 (2.2%)	629 (1.3%)	−35.8
	Other accidents	3.183 (7.3%)	2.039 (4.2%)	−35.9
	Traffic accidents	2.936 (6.7%)	1.536 (3.2%)	−47.7
	Other causes	279 (0.6%)	179 (0.4 %)	−35.8
	Fire cases	229 (0.5%)	98 (0.2%)	−57.2
Time-sensitive diseases	Myocardial infarction	1637 (3.7%)	900 (1.9%)	−45.0
	Cerebrovascular disease	789 (1.8%)	766 (1.6%)	−2.9
	Angina pectoris	358 (0.8%)	232 (0.5%)	−35.2
	Acute abdomen	151 (57.8%)	115 (42.2%)	−23.8
COVID-19-related symptoms	Fever	1.995 (4.5%)	2.277 (4.7%)	14.1
	Cough	160 (0.4 %)	1.690 (3.5%)	956.3
	Patients suspected of COVID-19	–	7.364 (15.3%)	–
	Patients diagnosed with COVID-19	–	1.437 (3.0%)	–

total number of calls and cases in Ankara EMS increased every year. However, the increase in the pandemic period (more in the number of calls) was higher than the previous ones. Also, despite the increase in the number of cases and calls in this period, there was no dramatic increase in the arrival at scene time. The ambulance arrival time may not have increased too much as the number of personnel has been increased by taking measures in the call centre, and EMS employees have worked devotedly. In addition, the reduced working time and the reduced traffic density as a result of the curfew contributed to this result.

Occupational accidents (−8.1%), injuries (−35.8%), traffic accidents (−47.7%), other accidents (−35.9%) and fire cases (−57.2%) decreased in pre-pandemic period contrary to pre-pandemic period. The fact that all the trainings activities were suspended, flexible working hours in the public and private sector performed and curfews implemented may have been effective in this decrease. There was a significant increase in fever, cough, joint pain and respiratory abnormalities during the pandemic period (P < .05). The most common symptoms in COVID-19 are fever, cough, fatigue, weakness, respiratory distress, nausea and diarrhea.[12,13] Therefore, we think that the increase in these symptoms is as a result of COVID-19. Of all cases transported to the hospital, 15.2% were suspected of and 2.9% were diagnosed with COVID-19. During the pandemic period, 18.1% of all EMS cases were as a result of COVID-19.

The increase in the number of cases was more in male patients. While 56% of COVID-19 patients were men in the study of Li et al, this rate was 58.1% in the study of Guan et al. Based on these results, we think that the increase in the number of male patients in our study was as a result of COVID-19.[14,15]

The distribution of cases to age groups changed during the pandemic period. In the pandemic period, the number of patients decreased in the 0-6 age group (−4.1%) and 7-18 age group (−39.9%). The decrease in the number of cases in the 7-18 age group was mostly in the diagnosis of undefined pain, falls, head injuries, nausea, vomiting and abdominal pain. In children who are concerned about going to school, abdominal pain, nausea, vomiting, headache and dizziness are the most common symptoms. In children, these symptoms usually appear in the morning or when they are asked to go to school.[16-18] As a result of the measures taken, we think that the closure of schools and the curfew imposed on individuals under the age of 20 caused this result. Cough symptom frequency increased in the 0-18 age group patients. Although only cough complaints do not require ambulance transport, we think this increase was as a result of COVID-19-suspected patients.

The number of cases in the 19-65 age group increased by 12.9%. In the age group over 65, the number of cases increased by 21.5%. We think this is mostly as a result of the suspected or diagnosed cases of COVID-19 and the occurrence of COVID-19 at an advanced age. In the study of Li et al., the median age of COVID-19 patients was 59 years.[13] The increase in the number of cases in these age groups also explains the mean age increase in both male and female patients.

There was a 36.2% increase in the frequency of the rural area cases. In this period, the transport of the cases from rural areas to the city centre was more than before. The reason for this may be the increase in the need for specialist physicians and intensive care in rural hospitals as a result of the pandemic.

One of the unexpected results of our study was related to suicide cases. Maris et al. reported that suicidal behaviour had various causes. Isolation, pessimism, unemployment and hopelessness

increase the frequency of the suicide cases.[19] Although suicide cases were expected to increase as a result of the negative environmental and quarantine conditions in the pandemic period worldwide, our study found that suicide cases decreased by 25.7% in Ankara EMS. We think that this result has occurred because the sense of social solidarity and unity is at a high level in Turkey, and people who stay at home because of curfew spend more time with their families.

In this period, forensic cases decreased by 41.4%. We think that the decrease in forensic cases is as a result of the decrease in traffic accidents, fire cases, injuries, occupational accidents and suicide cases.

We found that cardiac emergencies (myocardial infarction and angina pectoris), surgical emergencies (acute abdomen) and neurological emergencies (cerebrovascular disease) decreased during the pandemic period. Special measures were taken for cardiological, surgical and neurological emergencies in Ankara. In some hospitals, departments were reserved for patients in this group without COVID-19 contact. Despite these measures, the decrease in the number of patients in this group may be as a result of the fact that patients have postponed their healthcare needs and did not want to go to the hospital due to fear of COVID-19 transmission.

The number of patients who died at the scene increased by 19.4%. More patients died as a result of the "sudden death of unknown cause" and "cardiac sudden death" in the pandemic period. Ischemic heart disease and stroke are the biggest killers worldwide, resulting in 15.2 million deaths in 2016. These diseases are the leading causes of death globally over the past 15 years.[8] Even in Turkey, the most common causes of death are ischemic heart disease and cerebrovascular disease. Cardiovascular diseases caused 40.4% of the deaths in Turkey in 2014.[20] In addition, thrombosis as a result of COVID-19 can cause sudden cardiac deaths according to Liu et al.[21] The increase in the number of patients found dead at home during the pandemic process suggests that these patients may have been afraid of the COVID-19 pandemic and therefore did not want to go to the hospital. Therefore, sudden thrombosis as a result of COVID-19 may have caused an increase in the frequency of deaths at home.

5 | CONCLUSION

EMS utilisation rates of the individuals increased during the COVID-19 pandemic process. Anxiety of transmission prevents individuals from using EMS for time-sensitive diseases such as acute myocardial infarction and stroke, and this leads to increased mortality rates.

DISCLOSURE
None.

DATA AVAILABILITY STATEMENT
The data that support the findings of this study are available from the corresponding author upon reasonable request.

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REFERENCES

1. World Health Organisation. Novel coronavirus – China. http://www.who.int/csr/don/12-january-2020-novel-coronavirus-china/en Accessed April 25, 2020.
2. Zhu N, Zhang D, Wang W, et al. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med.* 2020 Feb 20;382:727-733.
3. World Health Organization. Corona virus disease (COVID-19) situation reports. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports/ Accessed April 25, 2020.
4. World Health Organization. Ethical considerations in developing a public health response to pandemic influenza, 2007. https://www.who.int/csr/resources/publications/WHO_CDS_EPR_GIP_2007_2c.pdf?ua=1 Accessed April 27, 2020.
5. Ekşi A. *Kitlesel Olaylarda Hastane Öncesi Acil Sağlık Hizmetleri Yönetimi.* İzmir: Kitapana; 2015.
6. Şişman A, Şişman Y, Terzi Ö. Samsun 112 Acil Çağrılarının ve Acil Sağlık Hizmet İstasyonlarının Konumlarının CBS ile Değerlendirilmesi. III. Uzaktan Algılama ve Coğrafi Bilgi Sistemleri Sempozyumu, 11–13 Ekim 2010, Gebze – Kocaeli, 2010: 523-532.
7. Bélanger V, Ruiz A, Soriano P. *Recent Advances in Emergency Medical Services Management.* Faculté des sciences de l'administration, Université Laval; 2015.
8. World Health Organization. The top 10 causes of death. http://www.who.int/mediacentre/factsheets/fs310/en/ Accessed April 25, 2020.
9. Johnson NB, Hayes LD, Brown K, et al. CDC National Health Report: leading causes of morbidity and mortality and associated behavioral risk and protective factors—United States, 2005–2013. *MMWR Suppl.* 2014 Oct 31;63:3-27.
10. Roudsari BS, Nathens AB, Arreola-Risa C, et al. Emergency Medical Service (EMS) systems in developed and developing countries. *Injury.* 2007 Sep;38:1001-1013.
11. Dikmen UA, Kına MH, Özkan S, et al. Epidemiology of COVID-19: what we learn from pandemic. *J Biotechnol Strat Health Res.* 2020;4:29-36.
12. Guan W-J, Ni Z-Y, Hu Y, et al. Clinical characteristics of 2019 novel coronavirus infection in China. *N Engl J Med.* 2020;382:1708-1720.
13. Wang D, Hu B, Hu C, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *JAMA.* 2020 Feb 7;323:1061-1069.
14. Chen N, Zhou M, Dong X, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet.* 2020 Feb 15;395:507-513.
15. Li Q, Guan X, Wu P, et al. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. *N Engl J Med.* 2020 Mar 26;382:1199-1207.
16. Egger HL, Costello EJ, Angold A. School refusal and psychiatric disorders: a community study. *J Am Acad Child Adolesc Psychiatry.* 2003 Jul;42:797-807.
17. Torma S, Halsti A. Factors contributing to school phobia and truancy. *Psychiatria Fennica.* 1975;75:209-220.
18. Bernstein GA, Massie ED, Thuras PD, et al. Somatic symptoms in anxious-depressed school refusers. *J Am Acad Child Adolesc Psychiatry.* 1997;36:661-668.

19. Maris RW, Berman AL, Silverman MM. *Comprehensive textbook of suicidology.* New York: Guilford Press; 2000:71–73.

20. TürkiyeİstatistikKurumu.Ölüm Nedeniİstatistikleri. 2016. http://www.tuik.gov.tr/PreHaberBultenleri.do?id=24572 Accessed May 01, 2020.

21. Liu PP, Blet A, Smyth D, et al. The science underlying COVID-19: Implications for the cardiovascular system. *Circulation.* 2020; 142:68-78.