Effect of COVID-19 on Emergency Service Trends

Cumali Bozkuş[1] iD , **Kubilay Özer**[2] iD

[1]Ereğli Devlet Hastanesi, Konya, Türkiye

[2]Karamanoğlu Mehmetbey Üniversitesi, Sağlık Bilimleri Fakültesi, Karaman, Türkiye

Cumali BOZKUŞ

Kubilay ÖZER

ABSTRACT

Purpose: The aim was to determine the variation in emergency service attendance occurring during the COVID-19 pandemic by assessing the monthly attendance distribution, monthly trends in emergency service attendance, hourly emergency service attendance trends and triage areas of patients attending the emergency service.

Material and Methods: This retrospective, descriptive research was completed based on records for 608,837 patients attending the emergency service of Eregli State Hospital in Konya from 11.09.2018 to 11.09.2021. Patient data for 18 months until the COVID-19 pandemic declaration on 11.03.2020 and 18 months after the pandemic declaration were assessed with the Joinpoint regression analysis program to analyze attendance. Analyses were completed at P<0.1 significance level.

Results: During this time interval, the highest number of attendances was 26,946 in December 2018, with the lowest number of attendances 6728 in April 2020 (N=608,837). Of attendances, 62% were in the period before the COVID-19 pandemic, while 38% occurred during the COVID-19 pandemic. There was a 39% reduction in monthly emergency service attendance during the COVID-19 pandemic and the pandemic caused a significant change in monthly attendance.

Conclusion: The COVID-19 pandemic caused significant changes in the emergency service attendance trends. Awareness of society by increasing health literacy levels, implementation of the referral chain, regulation of contributions and ensuring access to clinical services outside of office hours are predicted to lower the intensity of emergency service attendance.

Keywords: Emergency Service, COVID-19, Attendance Trend

Correspondence: Kubilay Özer
Karamanoğlu Mehmetbey Üniversitesi, Sağlık Bilimleri Fakültesi, Karaman, Türkiye
Phone: +905308848809
E-mail: kubilayozer@hotmail.com

Acil Servis Trendine COVİD-19 Etkisi

ÖZET

Amaç: Acil servise müracaat eden hastaların aylık müracaat dağılımı, aylık acil servis müracaat trendleri, saatlik acil servis müracaat trendleri, triyaj alanlarının değerlendirilerek Covid-19 pandemi süreci ile birlikte ortaya çıkan acil servis başvurularındaki değişimin belirlenmesi amaçlandı.

Gereç ve Yöntem: Konya'da Ereğli Devlet Hastanesi acil servisine 11.09.2018 ile 11.09.2021 tarihleri arasında müracaat eden 608 837 hastaya ait kayıttan yola çıkılarak retrospektif tanımlayıcı araştırma olarak gerçekleştirildi. 11.03.2020 tarihli Covid-19 pandemi öncesi 18 aylık ve pandemi sonrası 18 aylık hasta verileri Joinpoint Regresyon Analizi programı ile değerlendirilerek müracaatlara yönelik analizler yapıldı. Analizler P<0,1 anlamlılık düzeyinde değerlendirildi.

Bulgular: Belirlenen zaman aralığında en yüksek müracaat sayısının 26 946 müracaat ile 2018 Aralık ayında olduğu en düşük müracaat sayısına ise 6 728 müracaat ile 2020 Nisan ayında olduğu görüldü (N=608 837). Müracaatların %62 oranında covid-19 pandemi öncesi döneme ait olduğu, %38 oranında ise covid-19 pandemi süreci içerisinde meydana geldiği belirlendi. Covid-19 pandemisinin acil servis aylık müracaatları üzerinde %39 oranında azalmaya ve aylık müracaatlar üzerinde anlamlı değişime neden olduğu belirlendi.

Sonuç: Covid-19 pandemi sürecinin acil servis müracaat trendi üzerinde anlamlı değişimlere neden olduğu görüldü. Toplumun sağlık okuryazarlığı düzeyinin artırılarak bilinçlendirilmesi, sevk zinciri uygulanması, katkı paylarında düzenleme ve mesai saatleri dışında poliklinik hizmetlerine erişimin sağlanması acil servislerdeki yoğunluğu düşüreceği öngörülmektedir.

Anahtar Sözcükler: Acil Servis, COVİD-19, Müracaat Trendi

The emergency service is the first unit for hospital attendance by cases with sudden illness and injury (1,2). The emergency service treats and assesses acute illness and injury, and refers the patient to the relevant hospital department or an upper-level hospital (3). In Türkiye, the emergency service is shaped by the Anglo-American model. In this model, for patients to be able to receive better health services, they are transported to the hospital by land, air or sea ambulances. The target is to transfer the patient from the site of the event in the shortest time using a well-equipped ambulance (4). Additionally, emergency services are identified as a legal requirement to be offered to anyone who requires them, without regard to the person's income and health insurance. Along with emergency services being based on patient declaration, the principle emerges that every patient not examined is an emergency (5). Research by Yorulmaz et al. (6) about determining the emergency service intensity observed that patients attend the emergency service within the first 6 hours, with general patient density from 18:00 to 23:00. The basic reason for the intensity of emergency service attendance appears to be that services are offered without interruption 7 days a week, 24 hours a day and are free. When emergency service attendance is assessed, the majority of patients are treated as outpatients, while very few of the remainder are truly emergency patients and require admission for treatment. It appears emergency services are generally used inappropriately. The legal requirement to accept patients in the emergency service, increased population, internal migration, inadequacy of primary health services and inappropriate attendance cause the intensity of use of the emergency service (7). When the outcomes of inappropriate emergency service use are examined, the main negative outcomes include lengthened wait duration, reduced patient satisfaction, reduced efficiency of work by doctors and personnel, inadequate personnel numbers, dangers to patient health, increased cost of services provided, delays in laboratory and imaging services, need to refer emergency ambulances elsewhere, violence problems, and lengthened duration of patient complaints (2,8).

In this context, this research aimed to determine the variation in emergency service attendance occurring with the COVID-19 pandemic by assessing monthly attendance distribution, monthly emergency service attendance trends, hourly emergency service trends and triage areas.

Material and Methods

Research Type

The research was a retrospective descriptive study based on patient records for those attending the emergency service.

Population and Sample

The research accessed records for 609,687 patients attending Eregli State Hospital Emergency Service from 11.09.2018 to 11.09.2021 in the hospital information management system. Investigations of the records found information errors, triage errors, deficient information and records opened for trial purposes in records for 850 patients. After removal of these files, 608,837 patient records were used. A sampling method was not used in the research, as the target was to perform the study with the whole population.

Data Collection

Within the scope of the research, the monthly attendance distribution, monthly emergency service attendance trends, hourly emergency service attendance trends and which triage area was attended were recorded from the patient files (N=608,837). Recording of data was performed from April 2020 to December 2021.
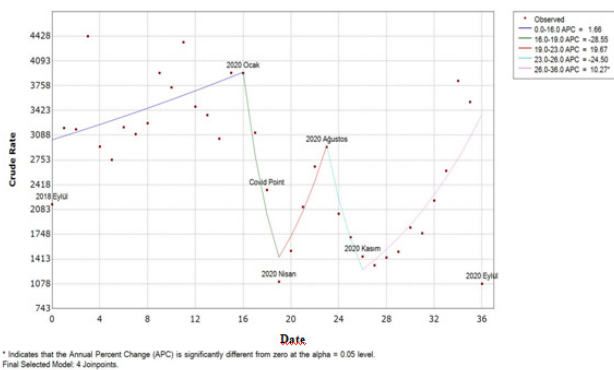
Analysis

Organization of data obtained inthe study used the Microsoft Excel 365 electronic table software program. Classification and summarization of data was provided by Microsoft Excel Power Pivot. After classification, the Joinpoint Trend Analysis Software 4.9.0.1 (February 2022) version was used to determine the breakpoints in attendance data. Joinpoint regression analysis is a method used with the aim of investigating variation trends occurring over time and investigating important trend points (9). Joinpoint regression analysis is used to determine groupings to explain the relationship between two variables (10).

Results

Within the scope of the research, when monthly attendance numbers are examined in patient records, the highest number of attendances was 26,946 in December 2018with lowest number of attendances of 6728 in April 2020 (N=608,837) (Table 1). Eleven days were included in September 2021. The linear breaks in the trend analysis graph calculated with the Joinpoint regression program for monthly emergency service attendance distribution are shown in Figure 1.

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Table 1. Monthly attendance numbers							
Pre-Covid-19 Applications		**%**	**Total**	**Total**	**%**	**Applications After Covid-19**	
2018	Sep	2,2	13105	6564	1,1	Sep	2021
2018	Oct	3,2	19394	21534	3,5	Aug	2021
2018	Nov	3,2	19277	23274	3,8	Jul	2021
2018	Dec	4,4	26946	15862	2,6	Jun	2021
2019	Jan	2,9	17859	13412	2,2	May	2021
2019	Feb	2,8	16770	10720	1,8	Apr	2021
2019	Mar	3,2	19450	11193	1,8	Mar	2021
2019	Apr	3,1	18880	9201	1,5	Feb	2021
2019	May	3,2	19787	8720	1,4	Jan	2021
2019	Jun	3,9	23925	8075	1,3	Dec	2020
2019	Jul	3,7	22736	8800	1,4	Nov	2020
2019	Aug	4,3	26459	10384	1,7	Oct	2020
2019	Sep	3,5	21152	12322	2	Sep	2020
2019	Oct	3,4	20458	17827	2,9	Aug	2020
2019	Nov	3	18507	16218	2,7	Jul	2020
2019	Dec	3,9	23932	12887	2,1	Jun	2020
2020	Jan	3,9	23916	9270	1,5	May	2020
2020	Feb	3,1	19004	6728	1,1	Apr	2020
2020	Mar	2,3	14289				
	1-10 Mar		6603	7686		11-31 Mar	

Figure 1. *Monthly emergency service referral trend*

The trend model with 4 breakpoints was suitable for monthly emergency service attendance according to trend analysis calculated by the Joinpoint regression program. When the MAPC for the monthly attendance trend is examined, it appears the COVID-19 pandemic created a significant difference in the monthly attendance trend (p>0.1) (Table 2).

Within the scope of the research, attendance at the emergency service was assessed in four 6-hour periods according to patient records. The data for the trend analyses calculated with the Joinpoint regression program for hourly attendance distribution is shown in Table 3. The COVID-19 pandemic created a significant difference in attendance trends (p>0.1).

Within the scope of the research, attendances from 11 September 2018 to 11 September 2021 were assessed in 4 groups according to triage as red, green, yellow and black areas. When the number of attendances are examined according to triage type, 78.97% of total attendances (n=480,777) were patients treated in the yellow area, 20.44% (n=124,450) were patients treated in the green area, 0.55% (n=3322) were patients treated in the red area and 0.05% comprised patients treated in the black area (N=608,837).

Table 2. Trend analysis calculated by the Joinpoint regression program

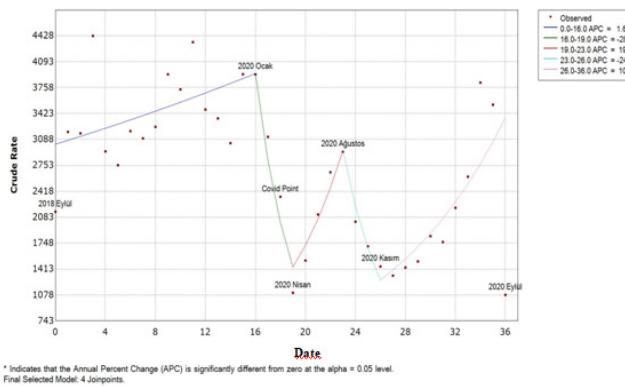| Segment	Lower Endpoint	Upper Endpoint	Date Range	APC	Lower CI	Upper CI	Prob>[t]	AAPC	P -Value
1	0	16	2018 Sep-2020 Jan	1.7	-0.7	4.1	0.158		
2	16	19	2020 Jan-2020 Apr	-28.5	-63.5	39.9	0.311		
3	19	23	2020 Apr-2020 Aug	19.7	-19.0	76.7	0.351		
4	23	26	2020 Aug-2020 Nov	-24.5	-66.4	69.4	0.479		
5	26	36	2020 Nov-2021 Sep	10.3*	3.4	17.6	0.005		
	0	36	2018 Sep-2021 Sep		-8.8	10.3		0.3	1
AAPC=Average Annua lPercent Change, APC= Annual Percent Change									

Table 3. The data for the trend analyses calculated with the Joinpoint regression program for hourly attendance distribution

Time Periods	Segment	Lower Endpoint	Upper Endpoint	DateRange	APC	Lower CI	Upper CI	Prob>[t]	AAPC	P -Value
00:00:00-03:59:59	1	0	11	2018 Sep-2019 Aug	4.8	-0.2	10.0	0.057		
	2	11	28	2019 Aug-2021 Jan	-4.9*	-7.7	-2.0	0.002		
	3	28	36	2021 Jan-2021 Sep	11.6*	11.6	1.7	0.023		
		0	36	2018 Sep- 2021 Sep		-1.3	4.4		1.5	<0.1
04:00:00-07:59:59	1	0	11	2018 Sep-2019 Aug	5.0*	0.1	10.1	0.044		
	2	11	28	2019-Aug-2021 Jan	-5.0*	-7.9	-2.1	0.002		
	3	28	36	2021 Jan-2021 Sep	11.9*	1.6	23.1	0.024		
		0	36	2018 Sep-2021 Sep		-1.3	4.5		1.6	<0.1
08:00:00-11:59:59	1	0	16	2018 Sep-2020 Jan	1.3	-1.3	3.9	0.310		
	2	16	19	2020 Jan-2020 Apr	-26.1	-65.2	57.0	0.415		
	3	19	23	2020 Apr-2020 Aug	22.9	-17.4	82.8	0.294		
	4	23	26	2020 Aug-2020 Nov	-26.3	-68.4	72.0	0.464		
	5	26	36	2020 Nov-2021 Sep	10.4*	3.3	18.0	0.005		
		0	36	2018 Sep-2021 Sep		-9.1	11.2		0.6	1
12:00:00-15:59:59	1	0	16	2018 Sep-2020 Jan	1.4	-0.7	3.4	0.177		
	2	16	19	2020 Jan-2020 Apr	-18.2	-53.8	45.1	0.476		
	3	19	31	2020 Apr-2021 Apr	-0.9	-5.3	3.7	0.688		
	4	31	34	2021 Apr-2021 Jul	29.2	-28.8	134.6	0.383		
	5	34	36	2021 Jul-2021 Sep	-35.2	-69.3	36.5	0.240		
		0	36	2018 Sep-2021 Sep		-9.0	6.3		-1.6	1
16:00:00-19:59:59	1	0	16	2018 Sep-2020 Jan	1.2	-1.0	3.5	0.281		
	2	16	20	2020 Jan-2020 May	-26.2	-52.3	14.2	0.163		
	3	20	23	2020 May-2020 Aug	31.4	-40.5	190.6	0.483		
	4	23	27	2020 Aug-2020 Dec	-18.7	-47.5	25.9	0.337		
	5	27	36	2020 Dec-2021 Sep	10.8*	2.3	20.0	0.014		
		0	36	2018 Sep-2021 Sep		-9.1	9.4		-0.3	1
20:00:00-23:59:59	1	0	11	2018-Sep-2019 Aug	4.7*	0.9	8.6	0.016		
	2	11	29	2019-Aug-2021 Feb	-7.2*	-9.4	-4.9	< 0.001		
	3	29	34	2021 Feb-2021 Jul	26.8*	1.2	58.8	0.039		
	4	34	36	2021 Jul-2021 Sep	-33.1	-69.5	46.8	0.303		
		0	36	2018 Sep-2021 Sep		-6.4	4.2		-1.3	1
AAPC=Average Annua lPercent Change, APC= Annual Percent Change										

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The trend analysis graph calculated by the Joinpoint regression program for distribution of emergency service attendance by patients treated in the green area is given in Figure 2. The data for the trend analysis calculated by the Joinpoint regression program for emergency service attendance by patients treated in the green area are shown in Table 4. When the MAPC for the emergency service attendance of patients treated in the green area is examined, the COVID-19 pandemic created a significant difference in attendance trends (p>0.1).

* Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05 level.
Final Selected Model: 4 Joinpoints.

Figure 2. *Green field referral trend*

Table 4. The data for the trend analysis calculated by the Joinpoint regression program for emergency service attendance by patients treated in the green area

Segment	Lower Endpoint	Upper Endpoint	Date Range	APC	Lower CI	Upper CI	Prob>|t|	AAPC	P-Value
1	0	15	2018 Sep-2019 Dec	0.8	-2.6	4.3	0.634		
2	15	28	2019 Dec-2021 Jan	-10.0*	-15.3	-4.3	0.001		
3	28	36	2021 Jan-2021 Sep	17.6*	3.4	33.7	0.015		
	0	36	2018 Sep-2021 Sep		-3.5	3.9		0.1	1

AAPC=Average Annua lPercent Change, APC= Annual Percent Change

Discussion

When the monthly distribution of emergency service attendance from 11 September 2018 to 11 September 2021, assessed within the scope of the study, is examined, the highest number of attendances was 26,946 (4.43%) in December 2018 and the lowest number of attendances was 6728 (1.11%) in April 2020. The results of the study identified that the COVID-19 pandemic caused significant differences in monthly emergency service attendance trends.

The COVID-19 pandemic has caused some changes in emergency department attendance in Turkey, as in the rest of the world. When the literature is examined, it should be seen that Görmeli Kurt & Güneş (11) Yılmaz Başer & Başer (12) Giamello et al. (13) and Muselli et al. (14) Tan and Lai (15) Cheng et al. (16) Kam et al. (17) when the general results of the studies were examined, the effects of the COVID-19 pandemic on emergency departments changed proportionally, but in general, there was a significant decrease in patient attendance.

Literature screening found limited numbers of studies investigating the direct correlation between emergency service and COVID-19 and as these were regional studies, the findings from studies related to indirect emergency service and attendance are included in the discussion. Giamello et al. (13) reported that 46,154 patients attended the emergency service of Santa Croce and Carle Hospital in Cuneo, Italy in 2018, while 45,395 patients attended in 2019. Compared with 2019, there was a 50% reduction in patientsuntil February 2020, while patient attendance reduced 68% since the start of the pandemic. Yılmaz Başer and Başer (12) compared 8 months of pandemic in 2020 with the same period in 2019 and identified a 31.05% reduction in emergency service attendance. Muselli et al. (14) identified a 60.4% reduction in patient numbers attending an emergency service and admissions department in Abruzzo, Italy from 9 March 2020 to 3 May 2020 for reasons other than COVID-19. They found a 66.6% reduction in emergency attendance with an increase from 30% to 39% for hospital admission rates. A study by Görmeli Kurt & Güneş (11) compared patients attending from 28 March 2020 to 28 April 2020 with the same period in 2019 and found 47,681 patients attended the emergency service in 2019, while 9455 patients attended during the pandemic in 2020. Tan & Lai (15) studied emergency service attendance during the new year holiday in Taiwan from 2017 to 2021 and identified a fall in emergency service attendance due to the COVID-19 pandemic.

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Cheng et al. (16) assessed emergency service attendance in 4 hospitals in Singapore from 7 April 2020 to 1 June 2020 as the pandemic period with the period from 7 April 2019 and 1 June 2019 and identified that 29,267 patients attended in 2020, while 36,370 patients attended in 2019. They stated that the rate of inappropriate use of the emergency services reduced during the COVID-19 pandemic in 2020 compared to 2019. Kam et al. (17) performed a study comparing emergency service attendance in the West Sydney local health region from 29 March 2020 to 21 May 2020 with the same period in 2019. They found 35,268 attendances in 2019, with 26,617 attendances in 2020 with a 25% fall in attendance numbers. They stated that 34% of patients were admitted to hospital in 2019 (11,838), while 30% (8047) were admitted in 2020. They stated that demand for emergency services reduced due to the impact of COVID-19 on the health services. In this study, a 39% reduction in the total number of attendances was observed after the COVID-19 pandemic. The COVID-19 pandemic caused a reduction in the monthly patient attendance in the emergency service, which appears to overlap with the general effect seen in other studies. When the differences between research are examined, accessibility of health services, general prevalence of health insurance systems in countries, economic opportunities and differences in the progression of the pandemic are thought to have caused changes in the results. When compared with regional studies, the population of the region served, density and proximity of health institutions, general lockdowns and transport restrictions in countries are considered to have impacted the results. Topaloğlu et al. (18) stated that the highest monthly attendance at the emergency service was 55,537 (10.2%) in August, with lowest monthly attendance of 37,674 (6.9%) in November. In the study by Çevik and Tekir (19), highest emergency service attendance occurred in October at rates of 9.29%, with lowest rates in February of 7.08%. Özer et al. (20) identified that highest attendance at the emergency service was 22,027 patients (11.2%) in August, with lowest attendance of 12,518 patients (6.3%) in April. Studies found as a result of literature screening do not overlap with the monthly attendance findings in this study. In the literature, studies about emergency services are generally retrospective, not all studies encompass the COVID-19 pandemic, the geographical distance between emergency service locations included in studies differs, and factors like tourism, agricultural activities, seasonal migration and education are thought to have impacts at different levels.

Study Limitations

The study is limited to Eregli State Hospital emergency service. The most basic limitation is that results emerging from this study completed in the emergency service of a single state hospital may remain inadequate to explain variations in the use of emergency services for the country in general.

Conclusion

The following conclusions were reached as a result of researching the impact of the COVID-19 pandemic in the long term on emergency service use by patients attending Eregli State Hospital Emergency Service from 11 September 2018 to 11 September 2021. The results of the study observed that the COVID-19 pandemic caused a significant difference in monthly emergency service attendance. A reduction in the number of patients attending the emergency service was identified during the COVID-19 pandemic. As the data do not contain adequate information about misuse of emergency services, overcrowding and inappropriate use of the emergency service, it is considered necessary to support and compare studies investigating the impacts of COVID-19 on the emergency service from different perspectives. With the aim of maintaining the positive impact of changes occurring in attendance trends due to the COVID-19 pandemic for patients attending the emergency service, it is necessary to support implementations like increasing health literacy about emergency service use, making primary health services more common and useable, and overtime work ensuring clinical services can be actively preferred. Financial models such as out-of-pocket pay and participation shares should be developed to prevent unnecessary uses. It is recommended to overcome emergency service crowding with implementation of the referral chain to increase the efficacy of primary health services.

Declarations

Ethical Consideration

An ethical permission was obtained from the Faculty of Health Sciences Non-Interventional Clinical Research Ethics Committee at Karamanoglu Mehmetbey University. (Numbered: 06-2021/33, dated: 27.10.2021)

Conflicts of Interest

The authors declare no conflict of interest.

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