DOI: 10.24938/kutfd.1094381 Kırıkkale Üniversitesi Tıp Fakültesi Dergisi 2022;24(2):350-356
Original Article *Özgün Araştırma*

EVALUATION OF THE DISTRIBUTION OF THIRD LEVEL EMERGENCY DEPARTMENT ADMISSIONS BY OFFICIAL HOLIDAYS

Üçüncü Basamak Acil Servis Başvurularının Resmî Tatil Günlerine Göre Dağılımının Değerlendirilmesi

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ABSTRACT

Objective: It is aimed to examine the numerical change in the emergency department patient admissions of a third-level hospital on public holidays and to offer solutions to the overcrowding in the emergency department with these data.

Material and Methods: The records of patients who were admitted to the emergency department between 01.01.2015 and 31.12.2018 were analyzed retrospectively. The age, gender, admission date data of the patients during the study period were recorded and compared by determining the official holidays and other working days.

Results: During the specified date range, 543,138 patient admissions were made, and 52% of them were men. The mean age of the patients was 41 years. August (10.2%) was the month with the highest number of patient admissions; Monday (15.5%) was the day with the highest number of patient admissions. It was observed that the admissions were mostly in the 12:00-18:00 time zone (33.6%). In the emergency department, where the average number of patients per day was 366, an average of 503 patients admissions were made on public holidays on weekdays ($p<0.001$).

Conclusion: Emergency department patient density exhibits temporal differences. Emergency department applications show a significant increase during public holidays that coincide with weekdays.

***Keywords**: Emergency department, crowded, patient density, holiday*

ÖZ

Amaç: Resmi tatil günlerinde üçüncü basamak bir hastanenin acil servis hasta başvurularında meydana gelen sayısal değişimin incelenmek ve bu veriler ışığında acil servisteki aşırı kalabalığa çözüm önerileri sunmak amaçlanmıştır.

Gereç ve Yöntemler: 01.01.2015 ile 31.12.2018 tarihleri arasında acil servise başvuran hastaların kayıtları geriye dönük incelenmiştir. Çalışma dönemi içindeki hastaların yaş, cinsiyet, başvuru tarihi verileri kaydedilmiş ve resmî tatil günleri ile diğer çalışma günleri belirlenerek karşılaştırılmıştır.

Bulgular: Belirlenen tarih aralığında gerçekleştirilen 543,138 hasta başvurusunun %52'sini erkekler oluşturmaktadır. Hastaların yaş ortalaması 41 yıldı. Ağustos (%10.2) en fazla hasta başvurusunun yapıldığı ay, pazartesi (%15.5) en fazla hasta başvurusunun yapıldığı gündü. Başvuruların çoğunlukla 12:00-18:00 saat diliminde (%33.6) olduğu görülmüştür. Günlük hasta sayısının ortalama 366 olduğu acil serviste hafta içi günlere denk gelen resmî tatil günlerinde ortalama 503 hasta başvurusu gerçekleşmiştir ($p<0.001$).

Sonuç: Acil servis hasta yoğunluğu zamansal farklılıklar sergiler. Hafta içi günlere denk gelen resmî tatillerde acil servis başvuruları belirgin artış göstermektedir.

***Anahtar Kelimeler**: Acil servis, kalabalık, hasta yoğunluğu, tatil*

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Received / Geliş Tarihi: 28.03.2022 **Accepted /** Kabul Tarihi: 27.06.2022

KÜ Tıp Fak Derg 2022;24(2):350-356
Doi: 10.24938/kutfd.1094381

INTRODUCTION

Emergency departments (ED) work according to the principle of uninterrupted work. The fact that hospitals do not provide outpatient services on weekends and public holidays increases the workload of ED (1).

As reflected in the annual increase in the number of patients, EDs are increasingly chosen as the primary access route to the health system. Patients often apply to ED because of the expectation of fast treatment. Regulations on the conduct of health services recommend taking measures to prevent serious disruptions in health services due to the expected increase in the workload and number of patients in ED during holidays (2). However, efforts to increase the satisfaction of every patient who applied to the ED cause more and more people to prefer ED every day. In fact, critically ill patients represent a very small percentage of ED admissions.

It has been shown that there is an increase in patient admissions to ED when regular clinical services are not provided or limited, such as during long public holidays (1,3-5). However, changes in patient admissions on weekdays during public holidays have not been sufficiently studied.

In this study, it was aimed to evaluate the numerical variation of the ED patient admissions of a third level hospital according to weekdays, weekends, and public holidays and to offer solutions to the overcrowding in the ED in the light of these data.

MATERIALS AND METHODS

This research was carried out by retrospectively examining the computer-based patient records of patients who applied to the ED of a third-level hospital between 01.01.2015 and 31.12.2018. Approval was obtained from the local ethics committee for the study (Recep Tayyip Erdoğan Medical Faculty, Non-interventional Clinical Research Ethics Committee, date: 17.07.2019, issue number: 2019/133). A schedule of public holidays (Feast of the Ramadan, Feast of the Sacrifice, New Year's Holiday, National Sovereignty and Children's Day, Labor and Solidarity Day, Commemoration of Atatürk, Youth and Sports Day, Victory Day, Republic Day, July 15 Democracy and Right to Resistance Day) dates in the years in which the research would be conducted was created. It was investigated whether there was a statistically significant difference in the number of emergency admissions and patient demographics between these dates and ordinary working days.

Statistical Analysis

The continuous data of the patients in our study were evaluated in terms of their distribution with histogram, Q-Q plot graphs, and Shapiro Wilk Test. Mean and standard deviation for normally distributed continuous data, median, quartile range, and minimum-maximum values were reported for non-normally distributed data. ‘‘Student t-Test’’ or ‘‘Mann-Withney U Test’’ was used according to their distribution for comparison of continuous data between pairs. In the comparison of continuous data of three or more independent groups, first of all, the prerequisite for normality was evaluated with the Shapiro Wilk Test, histogram, and Q-Q diagrams. Then, the existence of outliers and extremes was examined with the help of box line graphs. Due to the outliers (9.2%) and extreme (0.8%) values constituting approximately 10% of the data, the Anova prerequisites could not be complied with. One-way Anova test could not be used in statistical analysis in order not to exclude a significant part of the data such as 10%. Statistical analysis was performed with the Kruskal Wallis test to compare the data that were not parametric or did not meet the Anova prerequisites. If statistical significance was detected between groups, Dwass-Steel-Critchlow-Fligner tests were used for pairwise comparison analyses. Categorical data were reported as numbers (n) and frequencies (%). Pearson x^2 test or Fisher Exact test was used for statistical analysis of categorical data. If the p-value was less than 0.05 during the analysis, it was considered statistically

significant. All analyzes were performed with the R-based Jamovi statistical program.

RESULTS

This retrospective study was conducted on 543138 patients who applied to the ED of a third-level hospital between 01.01.2015 and 31.12.2018. Of the patients, 282.331 (52%) were male and 260.807 (48%) were female. The median age of the patients was 41 (25-57) years. August was the month with the highest number of admissions with 55537 (10.2%) patients; November was the month with the least application with 37674 (6.9%) patients. Monday was the day with the highest number of admissions with 84143 (15.5%) patients; Thursday was the day with the least application with 74.994 (13.8%) patients. In the distribution of patients according to time zones, the time zone with the highest number of admissions was between 12:00-18:00 with 182691 (33.6%) patients; the time zone where the least number of applications was made was 00:00-06:00 with 39235 (7.2%) patients. A statistically significant difference was found when the daily patient numbers were compared according to time zones (p<0.001) (Table 1).

Table 1. Number of patients by gender and time zones

Time	Female		Male		Total				
	n	%	n	%	n	%	m	IQR	p
2015	67142	12.40	73155	13.50	140297	25.80	377	340-432	**<0.001**
2016	66008	12.20	70593	13.00	136601	25.20	375	334-407	
2017	63968	11.80	69133	12.70	133101	24.50	362	322-393	
2018	63689	11.70	69450	12.80	133139	24.50	354	325-391	
Total	**260.807**	**48.00**	**282331**	**52.00**	**543138**	**100**	**366**	**330-405**	
January	20958	3.90	22576	4.20	43534	8.10	346	307-395	**<0.001**
February	18747	3.50	20408	3.80	39150	7.20	349	315-376	
March	25089	4.30	25089	4.60	48465	8.90	379	359-420	
April	23436	3.90	21404	4.30	44640	8.30	374	354-394	
May	22250	4.10	24061	4.40	46311	8.50	374	350-398	
June	19617	3.60	21478	4.00	41095	7.60	338	314-364	
July	25566	4.70	26766	4.90	52332	9.60	406	380-446	
August	27177	5.00	28360	5.20	55537	10.20	431	399-486	
September	23995	4.40	25522	4.70	49517	9.10	402	372-453	
October	20604	3.80	23412	4.30	44016	8.10	352	329-387	
November	17578	3.20	20096	3.70	37674	6.90	314	291-334	
December	19540	3.60	21127	3.90	40667	7.50	322	299-347	
Total	**260.807**	**48.00**	**282331**	**52.00**	**543138**	**100**	**366**	**330-405**	
Monday	40626	7.50	43517	8.00	84143	15.50	397	359-444	**<0.001**
Tuesday	37765	7.00	40860	7.50	78625	14.50	371	337-407	
Wednesday	36219	6.70	38941	7.20	75160	13.80	358	325-391	
Thursday	35950	6.60	39044	7.20	74994	13.80	357	319-389	
Friday	37418	6.90	40189	7.40	77607	14.30	368	334-405	
Saturday	36509	6.70	39965	7.40	76474	14.10	360	325-396	
Sunday	36320	6.70	39815	7.30	76135	14.00	358	326-395	
Total	**260807**	**48.00**	**282331**	**52.00**	**543138**	**100**	**366**	**330-405**	
00-06	16903	3.10	22332	4.10	39235	7.20	25	21-31	**<0.001**
06-12	66196	12.20	73121	13.50	139317	25.70	89	76-103	
12-18	88464	16.30	94227	17.30	182691	33.60	122	111-136	
18-24	89244	16.40	92651	17.10	181895	33.50	121	106-136	
Total	**260807**	**48.00**	**282331**	**52.00**	**543138**	**100**	**366**	**330-405**	

m: median, **IQR:** Interquartile range**, p:** Kruskal-Wallis Test, **n:** number of patients

When the distribution of daily patient number data according to official holidays is analyzed, it is seen that the days with the lowest number of patients are normal weekend days with the median value of 356 (322-390) people, and the days with the highest number of people are public holidays on weekdays with a median value of 503 (412-545) people. A statistically significant difference was found when the number of patients per day was compared according to public holidays ($p<0.001$) (Table 2).

A statistically significant difference was found between all pairs when the pairwise comparison of the daily patient number data according to the official holidays was examined (Table 3).

Table 2: Distribution of Daily Patient Numbers by Official Holidays

	m	**IQR**	**n**	**p**
Weekday	366	332-403	995	
Weekend	356	322-390	366	
Holiday (Weekend)	394	351-455	52	**<0.001**
Holiday (Weekday)	503	412-545	48	
Total	**366**	**330-405**	**1.461**	

m: *median,* ***IQR:*** *Interquartile range,* ***p:*** *Kruskal-Wallis Test,* ***n:*** *number of patients*

Table 3: Dual Comparisons of Daily Patient Numbers by Holidays

		Weekend	**Holiday (Weekend)**	**Holiday (Weekday)**
Weekday	W	-4.0235	4.2174	11.5368
	p	0.0231	0.0152	<0.001
Weekend	W	—	5.4345	11.8344
	p	—	0.0007	<0.001
Holiday (Weekend)	W		—	6.6206
	p		—	<0.001

W: *Dwass-Steel-Critchlow-Fligner Test*

DISCUSSION

With the increase in population, the number of patients admitted to hospitals and especially to ED is increasing. The number of applications to hospitals only in November 2015 in Turkey was approximately 28.5 million, while the number of applications to the ED was approximately 8 millions (27%) (6). The population in the city where the study was conducted was 348.608 in the same period. There are two main hospitals in the city, namely the Training and Research Hospital (TRH) and the State Hospital. TRH ED provides ED to an average of 350 patients per day, five doctors (specialists, assistants, and practitioners) in each shift, and to an average of 135784 patients per year. Similarly, in a 3-year study conducted by İncesu et al. in Konya Seydişehir State Hospital, the annual average number of ED admissions was found to be 104085 (7). Erenler et al., in Samsun Training and Research Hospital Emergency Department, determined that 163951 patients admitted to the ED during one year (8). The annual total number of patient admissions may vary according to the population of the region served by the hospital and the number of hospitals in the region. In our study, when the distribution of patients by gender was examined, it was seen that 52% were male (n=282331), 48% were female (n=260807). While there are studies showing that males admit to the ED more frequently (1.7-10), there are studies showing that females admit to the ED more often (11-13).

In our study, the highest rate of patient admission was in the summer months and especially in August. The reason for this increased number of people in the

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summer season can be associated with the increase in outdoor activities and touristic travels during the summer vacation period. According to the months, the applications to the ED may show regional differences (8-14). When the distribution of patients according to the days of the week is examined, it is seen that the day with the highest number of admissions is Monday (15.5%) and the day with the least admissions is Thursday (13.8%). Kılıçarslan et al., in a study evaluating the demographic characteristics of patients admitted to ED, have observed that the most frequently applied day was Monday (15.6%), and the least admission day was Wednesday (13.5%) (15). In a survey study evaluating the intensity of the ED, the most "dangerously crowded" answer given by the ED workers was on Mondays; it was seen that the most "not busy" answer was received on Sundays (5). This situation can be evaluated as the reflection of the patient density experienced throughout the hospital on the first day of the week to the ED since the polyclinics are closed at the weekend.

Considering the distribution of patients according to time zones, it was seen that the time zones with the highest number of referrals were 12:00-18:00 (33.6%) and 18:00-24:00 (33.5%). Similarly in a study conducted by Kılıçarslan et al., evaluating the demographic characteristics of patients who admitted to the ED in our country, it was seen that the most intense admission time was between 08:00 and 16:00 (42.9%), followed by the time interval of 16:00-24:00 (42.6%) (15). In a study by Yorulmaz et al., the time interval for the highest number of admissions was determined as 18:00-24:00 (14). In the study of Aydın et al., it was observed that the highest number of admission with 28.2% was between 12:00-16:00 (10).

Four years of (1461 days) patient records were reviewed within the scope of the study. While there was a 10.7% increase detected in the number of patients on weekend days of public holidays (n=394) compared to normal weekend days (n=356), there was a 37.4% increase in the number of patients when compared to weekdays (503/366). In a study conducted by Dağlar et al. in the ED of a secondary care hospital with a daily average of 600 patient admissions, a total of 6353 ED admissions were recorded, of which 3.523 (55.5%) were admitted on holidays and 2830 (45.5%) on non-holiday days ($p<0.001$). Considering the results of this study, it was shown that there was a 10% increase in the number of patients during the holidays (1). In a similar study conducted by Yıldırım et al., the increase in the number of patients admitted to the ED was found to be 32%, and the increase in the rate of those who admitted due to traffic accidents at a high rate was remarkable (4).

During the religious holidays that coincide with the weekdays, the duration of the official holidays is extended further, and the effects of this situation on the patient crowd become even more important. The reflection of the increase in the crowd, which causes longer waiting times for diagnosis and treatment for the patients, to the emergency workers is the vital decisions taken in more stressful working environments (3). Studies investigating the effects of short holidays, such as weekends, on patients have reported higher mortality rates on weekends. Explaining the reasons for this situation are various reasons such as lack of personnel, limitations in diagnostic methods, and medical personnel with limited experience on duty during vacation periods (16-19). However, there are studies showing that the weekend effect on mortality rates is due to differences in disease severity rather than reductions in hospital staff or services (20).

As in other ED around the world, there are many reasons for the overcrowding of ED in our country. In addition to the increase in population with those who come to the region from big cities for religious holidays during the long holiday periods, the reasons such as the hospitals not providing polyclinic services these days, the increase in patient referrals from the surrounding hospitals to the tertiary care hospitals during the holidays, the failure of the primary health care

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institutions to reduce the green area patient load of the ED makes third level hospitals overcrowded. Providing on-duty polyclinic service on holidays for certain clinics, ensuring coordination in patient referrals from other hospitals in the region, increasing the effectiveness of on-duty family medicine services, and taking holidays into account when clinics call patients for control are measures that can reduce the crowding of third-level hospitals. In our study, a classification of patient diagnoses was not made, and patient density was handled independently of diagnosis and triage categories. Data such as the length of stay of the patients in the ED, hospitalization and discharge rates, examination and consultation information, on the other hand, are the issues related to the inappropriate use of the ED and the cause of the density, rather than the intensity changes according to the days. Therefore, our study did not seek answers to the problems related to the inappropriate use of ED.

Considering the results of our study, the number of ED admissions has increased quantitatively on public holidays, but this increase is more evident, especially on holidays that coincide with weekdays.

Conflict of Interest: None

Support and Acknowledgment: None

Researchers' Contribution Rate Statement: Concept/Design: ET, MA; Analysis/Interpretation: MA, ET; Data Collection: ET, MA, AÇ; Writer: ET; Critical Review: ET, MA; Supervision: MA, AÇ.

Ethics Committe Aproval: Recep Tayyip Erdoğan Medical Faculty, Non-interventional Clinical Research Ethics Committee, date: 17.07.2019, issue number: 2019/133.

REFERENCES

1. Dagar S, Sahin S, Yilmaz Y, Durak U. Emergency department during long public holidays. Turk J Emerg Med. 2014;14(4):165-71.
2. Bayram Tatili Genelgesi, 2011. Accessed date: 25 February 2022: https://www.saglik.gov.tr/TR,11040/ramazan-bayrami-hakkinda-genelge-201148.html
3. Pekdemir M, Polat D, Mustafa Y, Kavalcı C. Uzun tatil dönemlerinde acil servise başvuran hastaların memnuniyet ve demografik analizi. Fırat Tıp Dergisi. 2003;8(3):149-52.
4. Yıldırım C, Sözüer EM, Yürümez Y, İkizceli İ. Uzun süreli tatillerde acil servis hizmetleri. Ulusal Travma Dergisi. 2000;6(2):106-10.
5. İlhan B. Acil Servis Yoğunluğunu değerlendirmede NEDOCS (National Emergency Department Overcrowding Study) skoru kullanımının etkinliği (tez). Ankara. Hacettepe Üniversitesi Tıp Fakültesi, 2016.
6. T.C Sağlık Bakanlığı. 2015 yılı Acil Müdahale Sayısı ve Oranı. Accessed date: 25 February 2022: https://rapor.saglik.gov.tr/istatistik/rapor/
7. İncesu E, Beylik U, Küçükkendirci H. Acil servis sağlık hizmetleride başvuru tekrarı sorunu: Türkiyede bir devlet hastanesi acil servis araştırması. Akademik Bakış Uluslararası Hakemli Sosyal Bilimler Dergisi. 2016;(53):1-13.
8. Erenler AK, Akbulut S, Guzel M, Cetinkaya H, Karaca A, Turkoz B et al. Reasons for overcrowding in the emergency department: Experiences and suggestions of an education and research hospital. Turk J Emerg Med. 2014;14(2):59-63.
9. Kose A, Kose B, Oncu MR, Tugrul F. Admission appropriateness and profile of the patients attended to a state hospital emergency department. European J Therapeutics. 2011;17(2):57-62.
10. Aydın T, Akköse Aydın Ş, Köksal Ö, Özdemir F, Kulaç S, Bulut M. Evaluation of features of patients attending the Emergency Department of Uludag University Medicine Faculty Hospital and Emergency Department Practices. JAEM. 2010;9(4):163-9.

11. Edirne T, Atmaca B. Yüzüncü Yıl Üniversitesi Tıp Fakültesi acil servis hastalarının özellikleri. Van Tıp Dergisi. 2008;15(4):107-11.
12. Oktay C, Cete Y, Eray O, Pekdemir M, Gunerli A. Appropriateness of emergency department visits in a Turkish university hospital. Croatian Med J. 2003;44(5):585-91.
13. Ersel M, Karcıoğlu Ö, Yanturalı S, Yürüktümen A, Sever M, Tunç A. Bir acil servisin kullanım özellikleri ve başvuran hastaların aciliyetinin hekim ve hasta açısından değerlendirilmesi. Türkiye Acil Tıp Dergisi. 2006;6(1):25-35.
14. Yorulmaz M, Karaalp F, Bükecik N, Özyılmaz AF. Acil servise tekrar başvuru oran değerlendirmesi. Selçuk Üniversitesi Sosyal ve Teknik Araştırmalar Dergisi. 2017;14:92-9.
15. Kılıçaslan İ, Bozan H, Oktay C, Göksu E. Türkiye'de acil servise başvuran hastaların demografik özellikleri. Türkiye Acil Tıp Dergisi. 2005;5(1):5-13.
16. Meacock R, Anselmi L, Kristensen SR, Doran T, Sutton M. Higher mortality rates amongst emergency patients admitted to hospital at weekends reflect a lower probability of admission. J Health Serv Res Policy. 2017;22(1):12-9.
17. Bell CM, Redelmeier DA. Mortality among patients admitted to hospitals on weekends as compared with weekdays. NEJM. 2001;345(9):663-8.
18. Aldridge C, Bion J, Boyal A, Chen YF, Clancy M, Evans T et al. Weekend specialist intensity and admission mortality in acute hospital trusts in England: a cross-sectional study. Lancet (London, England). 2016;388(10040):178-86.
19. An R. Impact of weekend admission on in-hospital mortality among U.S. adults, 2003-2013. Ann Epidemiol. 2017;27(12):790-5.
20. Walker AS, Mason A, Quan TP, Fawcett NJ, Watkinson P, Llewelyn M et al. Mortality risks associated with emergency admissions during weekends and public holidays: an analysis of electronic health records. The Lancet. 2017;390(10089):62-72.