ORIGINAL ARTICLE / ÖZGÜN ARAŞTIRMA MAKALESİ

Do Really Urgent Cases Present to the Emergency Department: What a Pandemic Has Shown

Gerçekten Acil Olan Olgular mı Acil Servise Başvuruyor: Bir Pandeminin Gösterdikleri

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ABSTRACT

Aim: The COVID-19 pandemic has had significant health and social impacts globally. This study aimed to describe the variance in emergency department admissions during the COVID-19 pandemic and to reveal the profile of patients admitted to the emergency department (ED).

Material and Methods: Data from patients in the ED between 11.03.2020-23.04.2020, which is a period of the pandemic, and 11.03.2019-23.04.2019, which is the non-pandemic period, was retrospectively analyzed. The frequency, demographic and clinical characteristics, and financial costs of patients admitted to the ED in those two periods were compared.

Results: While the ratio of patients presenting to the emergency department was 69.6% in the non-pandemic period, it was calculated to be 30.4% in the pandemic period ($p < 0.001$). A higher admission rate was found in patients aged 18-24 years during the non-pandemic period and in patients aged 45-64 years and ≥ 65 years during the pandemic period ($p<0.001$). It was determined that the rate of patients transferred by ambulance ($p<0.001$), the rate of "very urgent" patient admission ($p<0.001$), and requirements for consultation ($p<0.001$) and laboratory tests were higher during the pandemic period ($p<0.001$). During the pandemic period, the rates of patients who needed hospitalization and admission to intensive care units (ICU) were higher ($p<0.001$). While the mortality rate was 0.7% in the non-pandemic period, this rate was 1.6% in the pandemic period ($p<0.001$). The total invoice amount was higher in patients who presented during the non-pandemic period, and the mean invoice amount was higher in patients who presented during the pandemic period ($p < 0.001$). Patients who presented during the pandemic period had a higher risk of being transferred to the emergency department by an ambulance (OR 9.947, CI 8.65–11.44), being in the very urgent triage category (OR 1.892, CI 1.712–2.09), in-hospital mortality (OR 2.263, CI 1.69–3.03), and the total invoice amount increased by 1.004 times for each unit increase.

Conclusion: Although overall and non-urgent patient visits to the ED during the pandemic period were found to be decreased, "very urgent" patient visits, mortality, and costs per patient were found to be increased.

Keywords: Emergency department, COVID-19 pandemic, cost, patient characteristics

ÖZ

Amaç: COVID-19 salgınının dünya çapında büyük sağlık ve toplumsal etkileri oldu. COVID-19 pandemisinin acil servis başvurularındaki göreceli değişikliği tanımlamak ve acil servise (AS) başvuran hastaların profilini ortaya çıkarmak amaçlandı.

Gereç ve Yöntemler: Pandeminin belirli bir dönemi olan 11.03.2020-23.04.2020 tarihleri arası ve ona denk düşen pandemik olmayan 11.03.2019-23.04.2019 tarihleri arasında AS'e başvuran 18 yaş ve üstü hastaların verileri retrospektif olarak incelendi. İki dönemde AS'e başvuran hastaların sıklığı, sosyodemografik, klinik ve maliyet özellikleri karşılaştırıldı.

Bulgular: AS'e hasta başvuru oranı pandemi olmayan dönemde %69.6 iken, pandemi döneminde %30.4 olarak hesaplanmıştır ($p<0.001$). Pandemi olmayan dönemde 18-24 yaş ($p<0.001$), pandemi döneminde 45-64 ve ≥ 65 yaş gurubundaki hastaların başvuru oranlarının daha yüksek olduğu tespit edildi ($p<0.001$). Pandemi döneminde ambulansla transfer edilen hasta oranının ($p<0.001$), "çok acil" hasta başvuru oranının ($p<0.001$), konsültasyon ($p<0.001$) ve laboratuvar tetkik istenme oranlarının daha yüksek olduğu tespit edildi ($p<0.001$). Pandemi döneminde servis ve yoğun bakıma yatırılan hasta oranları daha fazlaydı ($p<0.001$). Pandemi olmayan dönemde ölüm oranı %0.7 iken, pandemi döneminde bu oran %1.6 tespit edildi ($p<0.001$). Pandemi olmayan dönemde başvuran hastalarda toplam fatura, pandemi döneminde başvuran hastalarda ise ortalama fatura tutarı daha yüksek tespit edildi ($p<0.001$). Pandemi döneminde başvuran hastaların ambulansla AS'e transfer edilme (OR 9.947, CI 8.65-11.44), çok acil triaj kategorisinde olma (OR 1.892, CI 1.712-2.09), hastanede ölüm (OR 2.263, CI 1.69-3.03) riskinin daha fazla olduğu ve toplam fatura tutarının her birimlik artış için 1.004 kat arttığı tespit edildi.

Sonuç: Pandemi dönemde AS'e genel hasta başvuru oranı ve acil olmayan başvuru oranları azalırken, "çok acil" olan hasta başvurusu, mortalite ve hasta başı maliyet artmıştır. Çalışmamızdan elde edilen bulgular acil servislerin yoğunluğunu azaltmak için gelecekteki müdahalelere rehberlik edebilir.

Anahtar Kelimeler: Acil servis, COVID-19 pandemisi, hasta özellikleri, maliyet

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Introduction

Over the course of several decades, the utilization of emergency departments (ED) has increased, leading to the overcrowding of EDs in several countries (1). Overcrowding of EDs can lead to extended stays in ED and worse outcomes for those who really need the ED (2). The number of presentations to ED is periodic, and patient density may vary depending on the day of the week, time of the year, local weather, and environmental factors (3).

The novel coronavirus (COVID-19) has spread the whole world; and was declared a pandemic on March 11, 2020. The COVID-19 pandemic has had huge health-related and societal effects worldwide (4-7). The impact of viral epidemics on ED presentations have yet to be sufficiently investigated in Turkey, and there is very limited information regarding the impact of the COVID-19 pandemic on ED. There have been varying results reported in the literature about this subject. A decrease in presentations to ED was detected in epidemics such as severe acute respiratory syndrome and Middle East respiratory syndrome (8,9). In contrast, it has been reported that there was an increase in presentations to the ED in a group of EDs in the United States of America (USA) in the early period of the H1N1 influenza epidemic in 2010 (10). Nourazari et al. reported in their study that the number of presentations to ED significantly decreased while the COVID-19 pandemic was spreading in the USA in 2020 (11).

In our study, we aimed to evaluate the effect of the COVID-19 pandemic on presentations to ED and to determine the profile of patients who presented to ED by comparing patients who presented to ED in a specific period of the pandemic and a corresponding non-pandemic period in terms of sociodemographic, clinical, and cost aspects. It also aimed to provide a brief overview of the impact of a pandemic on ED to set goals for improvements and future planning.

Material and Methods:

An observational and retrospective study was conducted in a tertiary hospital with data collected from patients presenting to the emergency department. Inclusion criteria: Patients aged ≥18 years who presented to ED between 11.03.2020 and 23.04.2020, which was a specific interval in the pandemic period, and during a corresponding non-pandemic period between 11.03.2019 and 23.04.2019, were included in the study. Exclusion criteria: Patients, who presented outside the time frame or had missing data, were excluded. Each presentation was evaluated as a separate visit if a patient presented more than once within the specified periods.

The patients were divided into two groups. Those who presented to ED between 11.03.2020 and 23.04.2020 were categorized as the COVID-19 pandemic period and those who presented between 11.03.2019 and 23.04.2019 as the non-pandemic period.

Health insurance refers to the assurance that hospital expenses are covered by the Social Security Institution (SSI) of the Republic of Turkey. Patients whose expenses are covered by the SSI were defined as patients with SSI, and those with no health insurance but covered the treatment costs by themselves were defined as self-paid patients. Triage categories were made according to the 3-stage (very urgent, urgent, and nonurgent) triage categorization. The number of radiological examinations refers to the number of imaging methods ordered for the patient among computed radiography (CR), computed tomography (CT), ultrasound, and magnetic resonance imaging (MRI) examinations at a single presentation.

In the power analysis performed for the study, it was assessed that the study should be conducted with a minimum of 1438 cases (Power of test: 80%, type 1 error: 5%, effect size = 2.82).

Our study was conducted after obtaining approval from the Presidency of Mersin University Clinical Research Ethics Committee (dated 13/05/2020 and numbered 2020/379).

Statistical analysis

Number and percentage values were given as descriptive statistics for categorical data. Mean, and standard deviation were given as descriptive statistics for age and invoice amount. Student's t-test was used to check whether there was a difference between the mean age and invoice amount in the pandemic and non-pandemic periods. The chi-square test was used to test the relationships between pandemic and non-pandemic periods and between the categorical variables. The z-test was used to check whether there was a difference between the two ratios. Binary logistic regression was used in risk calculations. Statistical significance was assumed at $p < 0.05$.

Results

A total of 19148 patients were included in our study, including 13334 patients from the non-pandemic period and 5814 patients from the pandemic period. The rate of patient presentation to ED in the non-pandemic period was 69.6%, and that during the pandemic period was 30.4% ($p < 0.001$). It was found that the presentation rates of the patients were higher in the age group of 18–24 years during the non-pandemic period ($p < 0.001$), whereas that in the age groups of 45–64 and ≥65 years were higher during the pandemic period ($p < 0.001$). The rate of patients presenting to the hospital by their own means was higher in the non-pandemic period, and the rate of patients presenting by ambulance was higher during the pandemic period ($p < 0.001$). There was a statistically significant relationship between the triage category and the period of presentation ($p < 0.001$). Based on the triage category, the rate of "very urgent" patient presentation was higher during the pandemic period ($p < 0.001$), whereas the rates of urgent and nonurgent patient presentation were higher during the non-pandemic period ($p < 0.001$). The number of very urgent patients decreased by 28%, and that of nonurgent patients decreased by 62% during the period corresponding to the pandemic period (Table 1).

The presentation rate of patients aged ≥65 years in the very urgent category was higher during the pandemic period, whereas that of patients in the age group of 18–24 years in the nonurgent category was higher during the non-pandemic period ($p < 0.001$) (Figure 1).

The rate of consultation and laboratory examination requests was higher during the pandemic period ($p < 0.001$). The rate of requesting one of the CT, CR, USG, or MRI

Data		Non-pandemic period (n = 13334) n (%)	Pandemic period (n = 5814) n (%)	p
Gender	**Male**	6180 (46.3)	3062 (52.7)	**<0.001**
	Female	7154 (53.7)	2752 (47.3)	
Mean age		41.11±18.63	44.64 ± 19.26	**<0.001**
Age group	**18-24**	2808 (21.1)	868 (14.9)	**<0.001**
	25-34	2945 (22.1)	1219 (21)	0.085
	35-44	2443 (18.3)	1055 (18.1)	0.772
	45-64	3105 (23.3)	1515 (26.1)	**<0.001**
	≥65	2033 (15.2)	1157 (19.9)	**<0.001**
	Turkish	13147 (98.6)	5756 (99)	
Health insurance	**SSI**	13151 (98.6)	5671 (97.5)	**<0.001**
	Paid	183 (1.4)	143 (2.5)	
Type of arrival	**By own means**	13068 (98)	4835 (83.2)	**<0.001**
	Ambulance	266 (2)	979 (16.8)	
Oncological diagnosis	**no**	12432 (93.2)	5304 (91.2)	**<0.001**
	yes	902 (6.8)	510 (8.8)	
Triage category	**Very urgent**	1746 (13.1)	1254 (21.6)	**<0.001**
	Urgent	8601 (64.5)	3426 (58.9)	
	Non-urgent	2987 (22.4)	1134 (19.5)	

Abbreviation: SSI: Social Security Institution

Table 1. Comparison of the basic characteristics at presentation pertaining to patients who presented during the non-pandemic period and the COVID-19 pandemic period

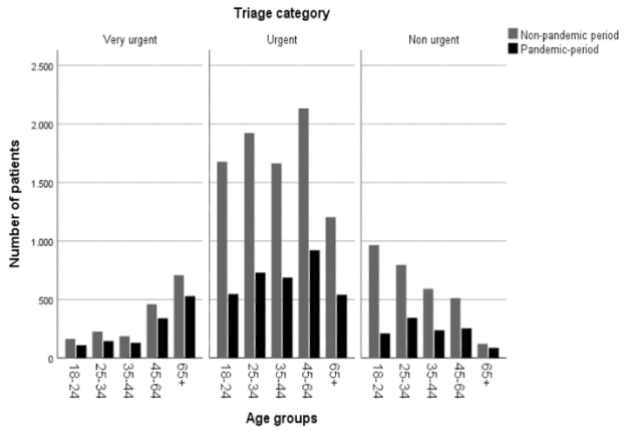

Figure 1. The presentation rate of the patients by age

radiological examinations was higher in the non-pandemic period ($p < 0.001$) (Table 2). It was determined that the patients' final diagnoses differed according to the periods. Diagnostic differences in the pandemic and non-pandemic periods are shown in Table 3.

During the pandemic period, the rates of patients admitted to ED and having an indication for hospitalization ($p < 0.001$) and the mortality rates in ED ($p = 0.008$) were higher. Considering the hospital outcomes database, it was found that the rate of patients discharged during the non-pandemic period ($p < 0.001$) and the mortality rate during the pandemic period were higher ($p < 0.001$). The total amount of invoices in the patients who presented during the non-pandemic period and the mean invoice amount in the pandemic period were found to be higher ($p < 0.001$) (Table 4).

According to the results of binary logistic regression analysis, patients who presented during the pandemic period had a higher risk of being transferred to the ED by an ambulance (OR 9.947), being in the very urgent triage category (OR 1.892), and in-hospital mortality (OR 2.263); the total invoice amount increased by 1.004 times for each unit increase (Table 5).

Discussion

In the last 30 years, the literature on emergency medicine has raised concerns regarding the increasing number of patients presenting to EDs with special attention to the use of EDs, access to care, and the “inappropriate” or “non-urgent” use of EDs (1). In a study, it was reported that the number of patients admitted to the ED increased faster than the population growth rate (12). Overcrowded EDs hinder the ability to provide timely critical services to patients in need of urgent care. The population of patients presenting to ED varies periodically (3). According to studies examining ED presentations during the COVID-19 pandemic period, the number of presentations decreased significantly (6,13-16). In our study, the number of patients decreased by 57.5%

ICD-10 code	Diagnosis	Non-pandemic period n (%)	Pandemic period n (%)	p
A00-B99	Certain infectious and parasitic diseases	117 (0.9)	33 (0.6)	0.025
C00-D48	Neoplasms	80 (0.6)	510 (8.8)	**<0.001**
D50-D89	Diseases of the blood and blood-forming organs and certain immune system disorders	60 (0.4)	42 (0.7)	0.017
E00-E90	Endocrine, nutritional and metabolic diseases	82 (0.6)	45 (0.8)	0.213
F00-F99 (except F10-19)	Mental and behavioral disorders	185 (1.4)	80 (1.4)	0.950
G43, G44, R51	Migraine and other headaches	1020 (7.6)	302 (5.2)	**<0.001**
G40, G41	Epilepsy and related conditions	63 (0.5)	40 (0.7)	0.061
G00-G99 (except G40,41,43,44)	Other central nervous system disorders	55 (0.4)	25 (0.4)	0.863
H00-H95	Eye and ear diseases	382 (2.9)	127 (2.2)	**<0.05**
I100-199 (except I60-69)	Circulatory system diseases	185 (1.4)	98 (1.7)	0.116
I60-I69	Cerebrovascular diseases	82 (0.6)	101 (1.7)	**<0.001**
J00-06, J30-39, R07.0	Upper respiratory tract diseases	1652 (12.4)	320 (5.5)	**<0.001**
J00-J99	Other respiratory diseases	34 (0.3)	18 (0.3)	0.504
KOO-93 (excluding hemorrhage)	Digestive system diseases	300 (2.2)	116 (1)	0.266
K92, K92.1, K92.2	Gastrointestinal system bleeding	80 (0.6)	31 (0.5)	0.576
L00-L99, R21	Skin and subcutaneous tissue disorders	339 (2.5)	102 (1.8)	**<0.001**
M00-M99	Musculoskeletal and connective tissue system disorders	931 (7)	360 (6.2)	0.045
N17-N19	Renal failure	58 (0.4)	51 (0.9)	**<0.001**
N00-N99, R31, R30.0	Other genitourinary system diseases	457 (3.4)	213 (3.7)	0.413
O00-O99	Pregnancy-related conditions	238 (1.8)	133 (2.3)	0.020
R07.4	Chest pain unspecified	967 (7.3)	419 (7.2)	0.911
R06.0	Dyspnea	609 (4.6)	382 (6.6)	**<0.001**
R00-R09 (except R06-07.4)	Other respiratory and circulatory symptoms	684 (5.1)	277 (4.8)	0.287
R10-R19	Digestive and abdominal signs and symptoms	2421 (18.2)	879 (15.1)	**<0.001**
R42	Vertigo and dizziness	376 (2.8)	120 (2.1)	**<0.001**
R50-R69	General signs and symptoms	1908 (14.3)	1425 (24.5)	**<0.001**
V00-V99	Transport-transportation accidents	202 (1.5)	98 (1.7)	0.382
W00-W19	Falls	613 (4.6)	289 (5)	0.262
W19-W99, Y28, T20-31, X85-Y09	Other injuries	878 (6.6)	378 (6.5)	0.831
F10-19, X20-29, X40-49, X69-84, T36-65	Intoxications	113 (0.8)	62 (1.1)	0.144

ICD: International Classification of Diseases

Table 2. Comparison of diagnoses made in the emergency department during the non-pandemic period and the COVID-19 pandemic period

during the pandemic period compared with that during the non-pandemic period. We believe that the reason for the decrease in presentations to ED is multifaceted. Issues such as concerns about the risk of COVID-19 transmission, restrictions imposed, and school holidays may have contributed to the decrease in injuries and accidents owing to reduced mobility and social distance measures. The ban on collective activities may be attributed to reduced presentations due to transmitted infections. Although this decrease in the number of patients can be explained by the fact that the people do not apply to ED unnecessarily as a result of being vigilant in combating COVID-19, it also raises the concern that patients in need of urgent care do not present to ED. In studies conducted during the pre-pandemic period, it has been reported that the majority of the patients who presented to ED were young individuals (17,18). In a study by Leow et al., it was reported that a gross reduction occurred in all patient age groups during the pandemic period, but it occurred more significantly in individuals aged <24 years (14). A similar result was obtained in our study. Although there was a decrease in all age groups, there was a higher rate of decrease in presentations of the young age group, who are generally considered healthy, which suggests that this group of patients presented to first-line healthcare services for their treatment needs or that a significant portion of them were not real emergency cases.

Various results have been reported in studies examining health insurance status in frequent presentations to the ED (17,19,20). It was reported by Nourazari et al. that during the COVID-19 pandemic, presentations of patients with medical care insurance decreased by 37% and that of self-paid patients by 15% (11). In our study, it was found that the number of patients with SSI decreased by 57% during the pandemic period. In addition, 99.8% of the patients had health insurance in non-urgent presentations. The presence of health insurance is a comforting cause because there are fewer economic and social barriers to access to healthcare for individuals, regardless of whether their condition is urgent. In our opinion, ED overcrowding will be reduced through arrangements for emergency medical care based on analyzing the data from our study for the pandemic period and data from further studies to be conducted. In the studies conducted in Turkey in the pre-pandemic period, the transfer rate of patients by ambulance was reported to be between 6.3% and 10.2% (21,22). Really urgent cases are usually transferred to hospitals by ambulance and are not expected to be affected by any pandemic or other factors. In a study conducted by Leow et al., it was reported that although the number of patients who presented during the pandemic period decreased, the rate of patients transferred by ambulance increased (14). In our study, the rate of patients transferred by ambulance during the non-pandemic period was 2%, whereas it was found to be 16.8% during the pandemic period. It was found that transfers by ambulance increased by 9.947 times during the pandemic period. This was believed to be related to the decrease in outpatient presentations of patients who use public transport or private vehicle owing to the risk of transmission during the pandemic period and the relative increase in the rate of urgent patients whose general condition is worse.

Outcome and cost		Non-pandemic period (n = 13334) n (%)	Pandemic period (n = 5814) n (%)	p
ED outcome	Discharge	12265 (92)	5090 (87.6)	
	Admission to the ward	716 (5.4)	507 (8.7)	**<0.001**
	Admission to the intensive care unit	344 (2.6)	205 (3.5)	
	Death	9 (0.1)	12 (0.2)	
Hospital outcome	Discharge	13242 (99.3)	5723 (98.4)	**<0.001**
	Death	92 (0.7)	91 (1.6)	
	Invoice amount (mean ± SD)			
Mean invoice amount		57,63 ± 66,92	83,37 ± 92,83	0.0001
Total invoice amount		768.424,64	484.733,85	
Mean invoice amount according to triage category	Very urgent	141.41±104.03	179.10 ± 119.62	0.0001
	Urgent	53.84 ± 52.95	68.72±67.48	0.0001
	Non-urgent	19.55±0.65	21.79±5.87	0.0001

SD: standard deviation

Table 3: Comparison of patient outcomes and costs during the non-pandemic period and the COVID-19 pandemic period

Non-urgent presentations to EDs are controversial; they have been negatively associated with overcrowding and costs. The rates of nonurgent ED visits were highly variable and were found to be 32% on average (2). A study conducted by Aydın et al. observed that 16.5% of the patients who presented to ED were very urgent, and 62.3% were non-urgent presentations (21). In a study conducted by Kılıçaslan et al., the rate of very urgent patients was reported to be 10.42%, and that of non-urgent patients was 47.24% (22). In a study assessing the factors influencing the presentations to ED in Turkey conducted on 36,641,816 cases, the rate of nonurgent patients (54.2%) was higher than the rate of the sum of very urgent and urgent patients, and it has been reported that the EDs are being used outside of their actual purpose (20). In a study by Scaramuzza et al., presentations to ED during the COVID-19 pandemic were examined, and it was reported that the rate of green area (nonurgent) patients decreased by 59% (13).

In this study, it was found that the rate of patient presentation in the "very urgent" category was higher during the pandemic period than during the non-pandemic period, and the probability of patient presentation in the very urgent category increased by 1.892 times during the pandemic period. It was found that the rate of the non-urgent patient presentation was higher in the non-pandemic period.

		OR	(95% CI)	P
Age group	18-24	Ref.		
	25-34	1.339	1.21-1.48	**<0.001**
	35-44	1.397	1.26-1.55	**<0.001**
	45-64	1.578	1.43-1.74	**<0.001**
	65+	1.841	1.66-2.05	**<0.001**
Arrival by an ambulance		9.947	8.65-11.44	**<0.001**
Triage category	Very urgent	1.892	1.712-2.09	**<0.001**
	Urgent	1.049	0.970-1.135	0.253
	Non-urgent	Ref.		
Presence of consultation		1.656	1.54-1.78	**<0.001**
Presence of laboratory examination		1.423	1.34-1.52	**<0.001**
Presence of radiological examination		1.028	0.965-1.09	0.395
In-hospital mortality		2.263	1.69-3.03	**<0.001**
Total invoice		1.004	1.004-1.004	**<0.001**

Table 4. Results of binary logistic regression analysis

During the pandemic period, the significant decrease in the number of patients, the high number of very urgent patient presentations, and the significant decrease in the number of urgent and nonurgent patients suggest that a significant number of patients who previously presented to ED were not real emergencies. All patients are being admitted after presenting to ED because patients do not require an appointment to enter the ED. All patients in the ED receive a comprehensive examination and are not subject to additional health insurance fees. These factors increase the number of non-urgent cases in EDs. However, the decrease in the very urgent category suggests that patients tend to delay care owing to concerns about catching or spreading COVID-19, even if they have an emergency (11).

In EDs, examination and consultation are requested according to the current characteristics of the patients. It was found that consultation was requested at 19.66% and 39.1% (21,22). In a present study, it was determined that consultation was requested in 18.3% of the patients who presented during the non-pandemic period and 27.1% of the patients who presented during the pandemic period. The likelihood of requesting consultation (OR: 1.656) and laboratory examination (OR: 1.423) was higher during the pandemic period. These rates have been associated with an increase in urgent and very urgent patients with more complicated clinical presentations.

The final diagnoses of patients who presented to the ED have been reported variably in the literature, including studies comparing the pandemic period (5,11,23-27). In our study, it was observed that presumably serious diagnoses such as CVD, malignancy, diseases of the blood and blood-forming organs, RF, and pregnancy-related diagnoses were more common in patients who presented during the pandemic period. In addition, although the number of patients diagnosed with neoplasm and CVD increased during the pandemic period, it was found that the number of patients with other diagnoses decreased.

EDs play a critical role in diagnosing and treating life-threatening conditions that can result in severe disability or death. Presentations to the ED by individuals with symptoms of serious life-threatening diseases are not expected to be affected by the pandemic. Across countries and hospitals, patients presenting to EDs may have various diagnoses. The difference in the diagnoses found in our study does not reflect whether there was a real decrease in the incidence of diseases; nevertheless, similar results obtained in other studies have shown that the pandemic affects the profile of

patients presenting to the ED. This may indicate that patients avoid going to ED due to infection risk.

Studies have reported that most patients presenting to ED are discharged, and 2.4%–17.6% of them are hospitalized (13,18,22,24,28). In a study conducted by Scaramuzza et al., the rate of patients hospitalized from the ED before the pandemic period was 2.4%, which increased to 7.5% during the pandemic period. In our study, it was observed that the hospitalization rate of patients from ED during the non-pandemic period was 8%, whereas this rate increased to 12.2% during the pandemic period. The rate of mortality in ED increased during the pandemic period. In addition, in our study, the in-hospital mortality risk was 2.263 times higher during the pandemic period. This can be explained by the increased number of patients in the "very urgent" category presenting to the ED, particularly patients with chronic illnesses not visiting for follow-ups owing to concerns of COVID-19, patients not coming to the hospital in the early stages of the disease and seeking solutions on their own, and coming to the hospital only at the advanced stage of the condition as a result of the delay in availing care.

Overcrowded EDs are a global problem with significant organizational and financial impacts (29). In our study, although the total amount of invoices was lower among patients who presented during the pandemic period owing to the decrease in the number of patients, the mean invoice amount per patient was higher. Costs include examinations, tests, consultations, and treatment procedures for patients presenting to the ED. Increased requests for tests, consultations, and treatment procedures raise the cost accordingly. The difference in the amount of mean invoice per patient indicates the difference in the examinations and consultations requested per patient. The number of examinations and consultations requested per patient is usually higher in patients with complications than in those without complications. The increased amount of invoices per patient during the pandemic period suggests that the patients who presented during this period had more complicated and urgent conditions.

Limitations

It was a retrospective study conducted in a single center covering a short period. In addition, our study is limited by the fact that the rate of presentation of very urgent or nonurgent cases to different institutions, at-home mortality rates, and the real reason underlying the decrease in the pandemic period are all unknown.

Conclusion

During the pandemic, most patients presenting to ED had health insurance. It was found that the patient presentations rate significantly decreased, the number of patients presenting to the emergency department by an ambulance increased, the number of presentations by the "very urgent" patient group according to the triage category increased, the rate of non-urgent presentations decreased, and the mean amount of invoice per patient increased. Findings from our study may guide future interventions to reduce the overcrowding of EDs. Identifying and implementing additional measures to prevent the use of EDs by patients who do not urgently require care, such as measures introduced to delay the spread of COVID-19, may reduce inappropriate presentations to EDs and overcrowding of EDs.

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