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Emergency Department Visits and Admissions Profile pre- and during COVID-19 Pandemic

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ABSTRACT

Introduction: COVID-19 pandemic has had catastrophic effects on the healthcare system. Emergency departments (EDs) are among the most affected areas. The purpose of our study is to explore the pandemic's effect on patients' ED visits and admissions.

Methods: This was a retrospective study using data from medical record system of King Hamad University Hospital. We examined ED visits and hospital admissions over two 12-month time spans before and during the pandemic. Monthly visits were classified according to several parameters, and ED revisits within 72 hours were also compared between both periods.

Results: There was an overall decrease of 11.05% in total ED visits during the pandemic. Disproportionate decrease was seen in visits by pediatric cases under 18 years (49.54%) and patients older than 65 years (1.41%). Conversely, there was a significant increase in visits among adults. Referrals from local health centers to the ED during the pandemic decreased significantly (23.92%), while ambulance visits increased by 13.35%. Patients triaged as levels 2 and 3 decreased. Total admission rate decreased by 8.39%. The decline in admission was noted in most specialties, the greatest being in pediatrics (51.81%), while increased highest in oncology admissions (6.9%). There was an increase in discharge against medical advice rate and a reduction in the ED 72-hour revisit rate.

Conclusion: Our study reveals a clear decline in the total number of ED visits and hospitalizations during COVID-19 for both pediatric and elderly patients. Further studies are needed to explain as well as evaluate the effect of such changes.

Key words: COVID-19, emergency department, healthcare, hospital

INTRODUCTION

COVID-19 pandemic originated in Wuhan, China after the discovery of several pneumonia cases caused by the novel coronavirus (2019-nCoV).¹ The World Health Organization (WHO) issued weekly

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reports, to state the rapidly increased cumulative cases and deaths globally.² In their policy briefs, the Organization for Economic Co-operation and Development (OECD) highlighted the major negative impacts of COVID-19 on the healthcare system, economic progression, and the psychosocial status.³ COVID-19 pandemic revealed catastrophic effects on the healthcare system in the United States (USA) and the need to reorganize the gaps in the system.⁴ In the healthcare structure, emergency departments (EDs) were among the most affected areas, as the role and value of emergency medicine has evolved over the years with increasing demands to provide diverse and complex care.⁵ Studies from

the USA and the United Kingdom (UK), showed a reduction in ED visits during the COVID-19 pandemic with the greatest impact affecting the pediatric population.^{6,7} The purpose of our study is to explore the pandemic effect on patients' ED visits and admissions.

MATERIALS & METHODS

Study Design and Setting

This was a retrospective, cross-sectional study using data from the electronic medical record (EMR) system of King Hamad University Hospital (KHUH). KHUH is the only tertiary care government facility in Muharraq Governate of Bahrain and it serves a population of about 270,000. The ED receives more than 90,000 patients annually with a capacity of 45 beds.⁸

Manchester Triage System (MTS)

The MTS is the triage score used at the ED of KHUH. MTS is 5-level color coded triage system and is based on 52 chief complaints algorithms with some key discriminators to select the triage level, in addition to a specific target time in which the patient must be seen by the ED physician.⁹

Data Collection, Statistical Analysis, and Outcomes

The study used data from the EMR to investigate the profile of ED visits and hospital admissions in a time span of twelve months before the pandemic (March 2019 to February 2020) and twelve months during the pandemic (March 2020 to February 2021). Monthly ED visits were classified as per

age, gender, mode of arrival, referrals from health centers, triage acuity, and hospital admissions. Admissions per specialty, discharge against medical advice (DAMA), and ED revisit within 72 hours were also compared across the two time periods. P-values of less than 0.05 were considered to indicate statistical significance. Statistical analysis was done using IBM SPSS Statistics, Version 25.0 (Armonk, IBM Corp).

Ethical Approval

The study was approved by the Institutional Review Board at KHUH (IRB number: 21-448), and informed consent was not required.

RESULTS

A total of 93,594 ED visits in the pre-pandemic period (March 2019 to February 2020) and 83,253 ED visits in the pandemic period (March 2020 to February 2021) were recorded. There was an overall decrease in total ED visits during the pandemic by 11.05% (p<0.05) (Figure 1). When analyzed on the basis of age categories, there was a significant decrease in ED visits among patients; less than 18 years' age group (49.54%, p<0.05), and above 64 years' age group (1.41%, p<0.05). Notably, there was a significant increase in ED visits among age groups 18 to 39 years (6.34%, p<0.05) and of age group 40 to 64 years (5.12%, p<0.05). There was a decrease in ED visit after the pandemic in both genders; with males having a significantly greater decline of ED visits compared to females (-12.4% versus -9.66%, p<0.05). Furthermore, there was a 13.35% increase in ambulance visits during the pandemic. Referrals from the local health centers to

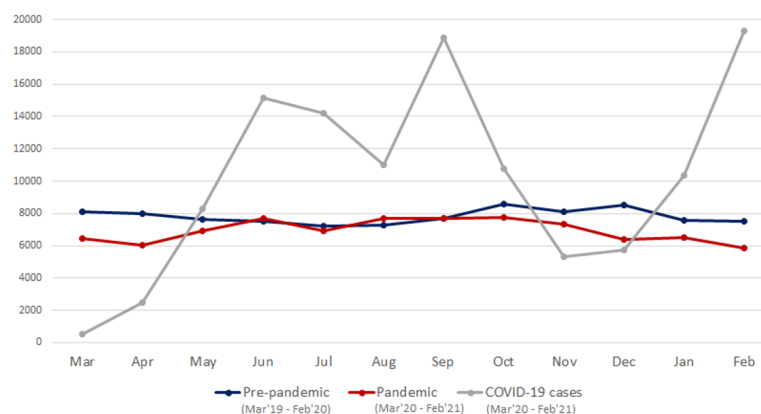


Figure 1 Total ED visit during pre-pandemic and pandemic periods and number of monthly COVID-19 cases during the pandemic

Table 1 Differences in ED visit and admission between pre- pandemic and pandemic period

	Pre-pandemic (Mar 2019- Feb 2020)	Pandemic (Mar 2020- Feb 2021)	Percentage Change (95% CI)
Total ED Visits	93594	83253	-11.05 % (- 11.53 % to – 10.57 %)*
Age			
<18	27409	13830	-49.54 % (-50.07 % to -49.01%)*
18 to <40	34926	37139	6.34 % (5.57 % to 7.10%)*
40 to <65	22446	23595	5.12 % (4.47 % to 5.76 %)*
≥ 65	8813	8689	-1.41 % (-1.84 % to -0.97 %)*
Gender			
Male	46237	40473	-12.47 % (- 12.92 % to -12.01 %)*
Female	47357	42780	-9.66 % (- 10.21 % to -9.12 %)*
Mode of arrival			
Walk-in	86934	75704	-12.92 % (-13.41 % to -12.42 %)*
Ambulance	6660	7549	13.35 % (12.27 % to 14.42 %)*
Health Center Reference	15100	11488	-23.92 % (- 24.39 to -23.45 %)*
Triage Acuity			
5	1858	9015	385. 20 % (367.14 % to 403.25 %)*
4	49062	38538	-21.45 % (- 21.94 % to -20.96 %)*
3	39026	31966	-18.09 % (- 18.46 % to -17.72 %)*
2	3420	3500	2.34 % (1.40 % to 3.28 %)*
1	228	234	2.63 % (0.86 % to 4.40 %)*
Admission Total	7569	6934	-8.39 % (- 8.84 % to -7.94 %)*
DAMA	2469	2686	8.79 % (7.77 % to 9.81 %)*
Revisit within 72 hours	5540	5175	-6.59 % (- 7.78 % to -5.40 %)*

*Denotes significant difference (p<0.05)

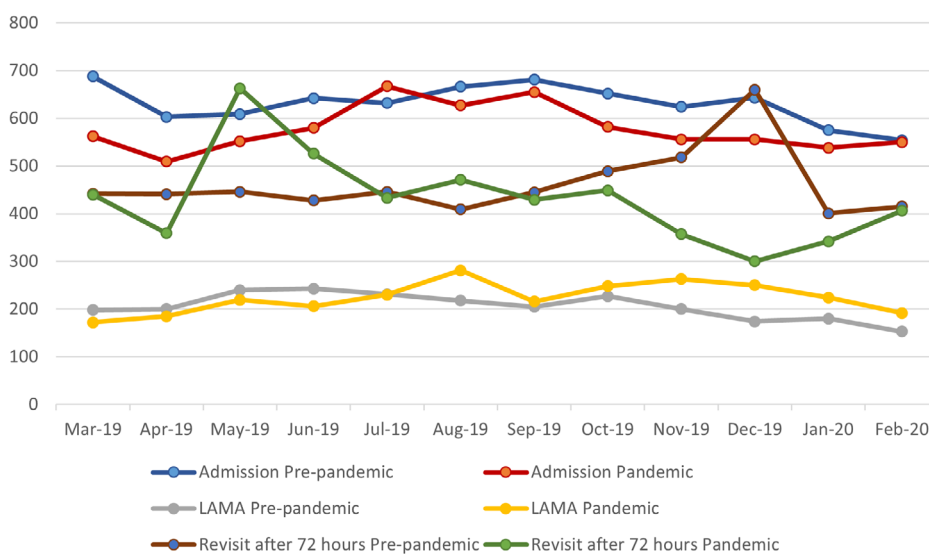


Figure 2 Total admissions, DAMA and 72-hours revisit cases during pre-pandemic and pandemic periods

the ED decreased significantly (-23.92 %, $p < 0.05$) (Table 1).

Segregating patients by triage category revealed a reduction in triage level-4 and 3 by -21.45% and -18.09% respectively. However, triage level-5 showed a steep increase in patients (385.20%), and triage level-2 and 1 were also increased by 2.34% and 2.63% respectively during the pandemic (Table 1).

The total admission rate decreased by 8.39% during the pandemic. The selected quality indicators related to admission; DAMA and ED revisit within 72 hours displayed an increase by 8.79% and decrease by -6.59% respectively. The monthly changes in ED admission, DAMA and 72-hours revisit cases across the pre-pandemic and pandemic period are shown in Figure 2.

Table 2, represents the number of admissions through the ED per specialty during the study period. The total admission rates decreased by 8.39% ($p < 0.05$), with the greatest decline being in the pediatric specialty (51.81%, $p < 0.05$). On the other hand, oncology cases reflected the greatest increase in admission (76.9%, $p < 0.05$).

DISCUSSION

In the Kingdom of Bahrain, the first case of COVID-19 was detected in a school bus driver on 21st February 2020,¹⁰ and like many other places the pandemic affected the healthcare system in the country and specially the EDs. In the current study,

the period of twelve months was selected to study the pre- and post-pandemic differences, and we observed an overall drop in total ED visits during the pandemic by 11.05% ($p < 0.05$) as compared to the pre-pandemic period. The greatest drop impact in ED visits were seen in the pediatric population less than 18 and those above 64 years of age group. The reduction in these numbers could be due to the strict measures implemented by the Bahraini government and the fear in the community of being exposed to COVID-19 patients and contracting the virus. However, the age groups 18 to less than 65 years showed a significant increase in their ED visits as compared to the other groups. This can raise the concern that the pediatric and elderly patients are susceptible populations and the decline in their ED visits could compromise their health status. Looking at the mode of arrival, an increase of 13.35% was observed in the utilization of the EMS by patients as compared to walk-ins, which can overwhelm the ambulance services, also and patients referred to the ED from the local primary health center declined by 23.92% ($p < 0.05$).

In regards to the triage categories, there was a sharp increase in triage level-5 patients by 385.20%. This could be explained by two reasons, the first reason is that our ED was a testing center for all patients coming with COVID-19 related cases, which include mild cases and cases who were in contact with COVID -19 patient and in need of PCR testing. The second reason was the partial closure of some local health centers which left ED's as the

Table 2 Number of admissions through the ED per specialty between pre- pandemic and pandemic period

Specialty	Pre-pandemic (Mar 2019 - Feb 2020)	Pandemic (Mar 2020 - Feb 2021)	Percentage Change (95% CI)
ENT	97	64	-34.02 % (-36.20 % to -31.84 %)*
Surgical	1319	1359	3.03 % (2.36 % to 3.71 %)*
Medical	3300	3158	-4.30 % (-4.93 % to -3.67 %)*
Orthopedics	333	280	-15.92 % (-17.39 % to -14.44 %)*
Obstetrics	528	412	-21.97 % (-22.83 % to -21.11 %)*
Pediatrics	1245	600	-51.81 % (-52.30 % to -51.31 %)*
ICU	424	502	18.40 % (17.06 % to 19.73 %)*
Oncology	303	536	76.9 % (74.30 % to 79.49 %)*
Ophthalmology	16	14	-12.50 % (-17.48 % to -7.52 %)*

*Denotes significant difference ($p < 0.05$)

only option for patients.

Patients with triage level-1 and level-2 were modestly increased by 2.63% and 2.34% respectively during the pandemic. The major decline in ED visits was related to triage level-3 by 18.09% and level-4 by 21.45%. Two quality indicators related to admission were selected for this study and the results indicated that the DAMA rate increased by 8.79% and the ED revisit within 72 hours decreased by 6.59%, thereby indicating that both these factors could contribute to the reduction in the total admission through the ED. A significant increase in ED admissions for oncology cases were seen during the pandemic. It is worth mentioning that all oncology patients from the Bahrain Oncology Center were seen and evaluated at the ED of KHUH.

The trend of ED visits and hospitalization decline during the COVID-19 pandemic had been observed in multiple studies in adults¹¹⁻¹⁶, pediatrics¹⁷⁻¹⁹, geriatrics²⁰, and in mixed populations.²¹ In the Gulf Cooperation Council countries, there is limited data on COVID-19 pandemic effects on the ED visits with only two studies; a multi-center study in Qatar and a single private hospital study in Saudi Arabia that demonstrated a decrease of ED visits during the pandemic.^{22,23} A Turkish prospective study conducted in the first six-month of the pandemic in an ED of a tertiary center showed an increase in DAMA rate, and 36.5% were due to fear of getting the infection from COVID-19.²⁴

The decline in ED visits is a serious issue as it might reveal that patients are unable to attend the ED for their acute medical and surgical conditions which are not related to COVID-19 disease, or they are avoiding to seek medical care for non-urgent conditions. In the USA, a large multicenter study showed a significant decline for of ED visits for acute cardiovascular disorders and in particular for non ST-segment elevation myocardial infarction, ischemic stroke and heart failure during the COVID-19 pandemic.²⁵ In another large study retrieving their data from the clinical ED registry (CEDR), elderly population with acute emergency conditions had the highest drop in ED visits during the pandemic.²⁰ During the pandemic, patients with chronic conditions had a substantial reduction in their ED visits and hospitalizations, suffered from sleep disturbance and had medications supply

deficiency.²⁶

Studies on the COVID-19 effect on EMS utilization are limited. In Switzerland, a study described a rise in the EMS use early in the pandemic²⁷, while another study from Finland demonstrated the opposite.²⁸

It is hard to compare the outcomes of many studies in this field due to the differences in; the timelines (early vs late pandemic), populations included (adult, pediatric, or mixed), type and setting of the hospitals (urban, suburban, or rural), and the measured outcomes.

Limitations

The results of the study should be considered with the following limitations. Firstly, this is a single hospital study which was carried within a certain time frame, and its findings cannot be generalized. Secondly, the study carries the limitations of being a retrospective analysis. Finally, it is difficult to compare the available studies in the same field because of differences in the; selected pandemic time, population included, hospital type and setting, and the concluding results.

CONCLUSION

Our study revealed a clear decline in the total number of ED visits and hospitalizations during the COVID-19 for both elderly and pediatric patients, with an increase in the DAMA rate and reduction in the ED 72-hours revisit rate. There were less referrals from the health centers and an increase in ambulance utilization. Further studies are needed to address the negative outcomes secondary to reduced ED visits and admissions in vulnerable patients, and to explain; the increased DAMA and reduced ED 72-hours revisit rates during COVID-19 pandemic.

Conflicts of Interest

The author declare no conflicts of interest or sources of funding.

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