ABSTRACT

Background: The COVID-19 pandemic has caused major disruption in the health care deliveries and activities worldwide including hospital admission.

Method: We used hospitals discharged coded data from January 1, 2019 to June 30, 2020 to examine the impact of COVID-19 outbreak on the pattern of cardiovascular admission among Hamad Medical Corporation hospitals in the State of Qatar.

Results: In this retrospective observational study, we documented significant changes in the pattern of cardiovascular admissions in our hospitals. There was a significant reduction in hospitalizations of various subsets of cardiac disease. Admissions for acute myocardial infarction dropped by 31%, acute decompensated dropped by 48%, unstable angina dropped by 79% and arrhythmia by 80%. Primary percutaneous coronary intervention procedures declined briefly. However, the total deaths remained the same despite the increase in mortality rate due to reduced admissions number.

Conclusion: We postulate the fear of contracting the disease and the lock-down mentality during COVID-19 outbreak contribute to reduction of cardiovascular admission to our hospital.

Key words: Admission, cardiovascular, COVID-19, mortality, primary percutaneous coronary intervention

INTRODUCTION

Hamad Medical Corporation (HMC) is the largest health system in the state of Qatar. Since the beginning of the outbreak in December 2019, many institutions worldwide have reported a significant decline in the number of cardiovascular admissions. For example, acute myocardial infarction admissions have declined by 40%–60%. This may partly be explained by the patient’s concern of contracting the infection during the hospital stay. Thus far, there is no report from the Middle East about the change in the pattern of hospital admissions due to cardiovascular causes during the COVID-19 outbreak. In this report, we summarize changes in hospital admissions pattern among Hamad Medical Corporation (HMC) hospitals in the state of Qatar.

METHODS

This is a retrospective analysis of discharge diagnosis of all cardiovascular admissions to HMC during and before the COVID-19 outbreak.

More than 95% of all hospital admissions including cardiovascular cases are admitted to HMC. This makes it a unique system for providing insight of the patterns of admissions in the state of Qatar. The onset of the outbreak is defined by the date of the first COVID-19 case diagnosed in the state of Qatar, which

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Received: 11-08-2020
Accepted: 18-08-2020
Published Online: 13-10-2020

How to cite this article: Arabi A, Ahmad F, Al-Suwaidi J, Al-Qahtani A, Asaad N, Rafie I, et al. The impact of COVID-19 outbreak on cardiovascular admissions. Heart Views 2020;21:153-6.
was on February 29, 2020. We used the discharge data coded by the International Classification of Diseases 10th revision to identify the primary diagnosis for admission. From these coded data, the four most common causes of cardiovascular admissions were grouped as acute myocardial infarction, acute heart failure, unstable angina, and arrhythmia.

Admissions for primary percutaneous coronary intervention (PPCI) were extracted directly from the catheterization laboratory database. All data from January 1, 2019, to June 30, 2020, were extracted and presented as per monthly. The results were displayed and compared using a run chart. t-test is used to determine the statistical significance difference of the mean before and after the COVID-19 outbreak. Chi-square test is used to determine significance in mortality rate. This study received approval from the Heart Hospital Quality Department and from the Local Institutional Review Board.

RESULTS

Total hospital admissions
A total of 1686 cardiology admissions (monthly mean: 421) during the COVID-19 outbreak (March to June 2020) were recorded, with a 58% reduction (P < 0.001) compared with the equivalent months in 2019. Over that period, 3,997 were admitted with a monthly mean of 999 [Figure 1]. Pre COVID-19, the monthly admission was consistently around 1000 from January 2019 to February 2020.

Causes of admission
We observed a decline in all the four most common causes of cardiovascular admissions [Figure 2]. Acute myocardial infarction admissions significantly dropped by 31% (P = 0.007) from 1252 total admissions (monthly mean: 313) during March to June 2019 compared to 859 total admissions (monthly mean: 215) during the equivalent period in 2020. Acute decompensated heart failure admissions also significantly declined by 48% (P = 0.01) during the outbreak. Total admission for acute decompensated heart failure was 315 (monthly mean: 73) from March to June 2020 compared to 605 admissions (monthly mean: 151) during the same months in 2019.

The most significant decline was observed among patients with unstable angina and arrhythmia (atrial fibrillation, supraventricular tachycardia, and palpitation of unknown cause) which dropped from almost 346 admissions per month to 57 admissions (~79%, P = 0.001) and from 143 admissions per month to 23 admissions (~80%, P < 0.001) respectively.

Changes in the pattern of admissions
During the outbreak, acute myocardial infarction became the single most common cause of cardiovascular admissions [Figure 3]. The average monthly proportion of patients who were admitted with acute myocardial infarction increased from around 33% of the total number of cardiovascular admissions (January 2019 to February 2020) to 61% in June 2020. There was no significant change in the proportion of patients admitted with acute heart failure. Both admissions with unstable angina and arrhythmia had declined significantly as a percentage of total admissions.

Admission for primary percutaneous intervention
The number of patients admitted for PPCI has decreased slightly by 13% (P = 0.3), with the monthly average of 81 PPCIs during March to June 2019, falling to 70 per month in the equivalent period in 2020 following the outbreak [Figure 4]. The main reduction was observed in April 2020 (44 PPCIs). The decline was reversed in May and June 2020, which showed similar numbers to 2019.

Figure 1: Total cardiology admissions across Hamad Medical Corporation – January 2019–June 2020
Mortality trend during the COVID-19 outbreak

We did not observe a significant change in myocardial infarction mortality during the COVID-19 outbreak (Chi-square 1.55, \( P = 0.21 \)) [Figure 5]. However, the overall cardiovascular mortality has increased significantly (Chi-square 5.8; \( P = 0.02 \)), but...
the actual number of deaths remains the same as before and after the COVID-19 outbreak. The increase in cardiovascular mortality rate can be attributed to the significant reduction in the number of admissions, especially for unstable angina.

**DISCUSSION**

Similar to the many previous reports, our study showed a significant decline in the number of cardiovascular admissions. This may partly be explained by the reluctance of patients to seek medical attention because of the concern about contracting COVID-19 infection.[1,5]

Furthermore, the instruction to restrict movements may make patients less inclined to seek help. The largest decline was observed among patients with unstable angina and arrhythmia. Acute myocardial infarction admissions dropped to a lesser extent as compared with unstable angina, but as a percentage of total cardiovascular admissions, it was actually higher.

We believe that the patients’ concern about the severity of symptoms in myocardial infarction overcame the fear from contracting COVID-19 infection, prompting them to seek medical attention. Acute decompensated heart failure hospitalization slightly declined during the outbreak, however, it remained the same as a proportion of the total number of cardiovascular admissions.

Admission for PPCI [Figure 4] decreased at the beginning of the outbreak (March and April 2020) but recovered during May and June 2020 to the similar numbers observed in 2019. This may indicate that the patients with STEMI become less reluctant to seek help and more tolerance toward COVID-19 risk as the pandemic progresses.[1] Cardiovascular inhospital mortality rate increased during the COVID-19 outbreak (because of reduced admission number), while myocardial infarction mortality rate remained the same.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

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![Figure 5: All causes in hospital mortality – All cardiovascular diagnoses vs. myocardial infarction](image-url)