Trends in acute myocardial infarction volume and related outcomes during the coronavirus disease 2019 pandemic in Turkey

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To The Editors

The Center for Disease Control had suggested that health care services for nonemergency and elective patients could be postponed in order to meet the increasing healthcare burden and to avoid new cases during the coronavirus disease 2019 (COVID-19) pandemic [1]. Prior reports from different countries, including the United States, Italy and Austria, reported a significant decrease in the number of acute myocardial infarction (AMI) hospitalizations during the pandemic [2–4]. In this study, we sought to answer to assess the volume trends in AMI during the COVID-19 pandemic in Turkey and whether there were any associated changes in mortality.

We included patients diagnosed with AMI based on the International Classification of Diseases, 10th Revision (ICD-10). Patients coded with I21.0, I21.1, I21.2 and I21.3 were classified as ST-elevated myocardial infarction (STEMI). All other I21 subcategories were classified as non-STEMI. Patients of age under 18 years were excluded. The data was provided by the Republic of Turkey, Ministry of Health as described previously [5]. The beginning of the COVID-19 era was defined as March 2020, since the first laboratory-confirmed COVID-19 case in Turkey was shown on 11 March 2020.

The outcome of this study was defined as 30-day all-cause mortality, where the admission index date was regarded as the first day. In addition, we also assessed the volume of AMI with volume trends in non-STEMI and STEMI patients plotted over the period from January to May by years 2018, 2019 and 2020.

A trend test was used to evaluate changes in unadjusted 30-day mortality rates according to months of each year in non-STEMI and STEMI patients. All statistical analyses were performed in STATA version 16.0 (STATA Corporation, College Station, Texas), using a two-tailed \( P \) value <0.05 to define significance. The study was approved by the Republic of Turkey, Ministry of Health, with a waiver of informed consent for retrospective anonymous data analysis.

A total of 169 443 hospitalizations were analyzed, of which 134 418 were non-STEMI and 35 025 were STEMI. In the pandemic era, there was a significant volume reduction compared to the same months in 2018 and 2019, in both non-STEMI and STEMI hospitalizations. The largest reduction was observed in April in non-STEMI (9780 in 2018, 9082 in 2019, and 5087 in 2020) and STEMI (2654 in 2018, 2536 in 2019 and 1481 in 2020) hospitalizations (Fig. 1). Trend analyses revealed that there was an increase in 30-day all-cause mortality during the pandemic (for 2020 non-STEMI hospitalizations; 6.8% in January and 7.1% in May, trend \( P \) value = 0.682, \( Z \)-score: 0.41, for 2020 STEMI hospitalizations; 5.6% in January and 8.1% in May, trend \( P \) value = 0.009, \( Z \)-score: 2.63) (Table 1).

The current study shows that the volume of AMI admissions declined during the COVID-19 pandemic. We also demonstrated that 30-day all-cause mortality rates increased when compared to the same period of prior 2 years. The largest volume decline was observed at the peak of the COVID-19 pandemic in Turkey (April 2020). Our study indicates that there was a similar reduction (35.7%) in AMI admissions (38.7% for non-STEMI and 22.8% for STEMI) in May 2020 when compared to January 2020 in Austria [4] and United States [6]. The reason for this decrease might be explained by many patients who were not present in the hospitals due to fear of the increased
risk of COVID-19 contagion, as well as public health measures such as self-isolation, quarantine and social distancing. We also observed that 30-day all-cause mortality rates were increased in AMI hospitalizations during the pandemic. Our findings might be due to delayed presentation by patients as well as less sick patients staying at home.

There are some limitations to this study. First, it is retrospective, and as it was based on electronic health records, there may be possible inaccuracies in coding. Second, our observed trends might be due to the secular trends of the disease.

In conclusion, a significant reduction in AMI admissions across the country has been detected in the current study, with a parallel increase in 30-day all-cause mortality. It is important to understand the reasons for the reduction in AMI admissions and increased mortality to prepare for the next surges in the COVID-19 pandemic as well as prepare for future pandemics.

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Conflicts of interest
There are no conflicts of interest.

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(a) Volume Trends in non-STEMI patients according to months across years. (b) Volume trends in STEMI patients according to months across years. STEMI, ST-elevated myocardial infarction.

| Year | Non-STEMI | STEMI |
|------|----------|-------|
| 2018 | 797/10415 (7.7%) | 203/2353 (8.6%) |
| 2019 | 675/9047 (7.5%) | 125/2157 (5.8%) |
| 2020 | 700/9916 (7.1%) | 179/2435 (7.4%) |

Table 1 Thirty-day all-cause mortality trends in non-STEMI and STEMI patients according to months among years

| Year | Non-STEMI | STEMI |
|------|----------|-------|
| 2018 | 621/9780 (6.3%) | 166/2536 (6.5%) |
| 2019 | 574/9433 (6.1%) | 132/2442 (5.4%) |
| 2020 | 700/9916 (7.1%) | 179/2435 (7.4%) |

STEMI, ST-elevated myocardial infarction.