Decrease in ST segment elevation myocardial infarction rates in the first and second peak periods of the SARS-CoV-2 pandemic and comparison of these periods – Single center experience

SARS-CoV-2 PANDEMİSİNİN İlk VE İKİNCİ PIK DÖNEMLERİNDE ST SEGMENT YÜKSELMELI MIYOKARD ENFARKTÜSÜ ORANLARINDA AZALMA VE BU DÖNEMLERİN KARŞILAŞTIRILMASI-TEK MERKEZ TECRÜBESİ,

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ABSTRACT
Objective: During the ongoing pandemic caused by serious acute respiratory syndrome coronavirus-2 (SARS-CoV-2), reports have suggested a decrease in the number of patients presenting to hospitals because of acute myocardial infarction around the world. In the “first wave” of the pandemic in Turkey (March 15-April 15, 2020), we found a substantial decrease in ST-segment elevation myocardial infarction (STEMI) cases in Dokuz Eylül University Hospital. In this study, we aim to investigate whether the number of STEMI cases decreased in the second wave as in the first wave of the pandemic.

Materials and Methods: We included patients with STEMI who admitted to our catheterization laboratory with the purpose of primary percutaneous coronary intervention (PCI) from May 1, 2020 to November 14, 2020 and from November 15, 2020 to December 15, 2020, in which the pandemic was exacerbated. This information was compared with a similar period from 2019.

Results: During the second wave of pandemic 14 cases were admitted to the catheterization laboratory due to STEMI. It was determined that 28 patients were admitted to the catheterization laboratory in the same period of 2019. PCI numbers were decreased by 50% due to STEMI. However, when comparing 2019 and 2020 (from May 1, 2020 to November 14, 2020), which we will call the year of the pandemic, the number of STEMI cases was similar.

Conclusion: We confirmed that the number of patients who admitted to the catheterization laboratory due to STEMI decreased in the second wave, as in the first pandemic wave, when the pandemic was exacerbated.

Keywords: COVID-19, acute myocardial infarction, ST elevation myocardial infarction
During the ongoing pandemic caused by serious acute respiratory syndrome coronavirus-2 (SARS-CoV-2), reports have suggested a decrease in the number of patients presenting to hospitals because of acute myocardial infarction around the world (1-3). In the “first wave” of the pandemic in Turkey (March 15-April 15, 2020), we found a substantial decrease in ST-segment elevation myocardial infarction (STEMI) cases in Dokuz Eylül University Hospital (4). There are some speculations and theories about this reduction. The general belief was that the fear of contagion at the hospital has discouraged the patients to admit emergency medical services. Another hypothesis is that true reduction in the incidence of acute cardiovascular disease because of low physical activity and the prevalence of resting state during quarantine may have partially contributed to the lower number of admissions with acute myocardial infarction (AMI) to hospitals (1). In this study, we aimed to investigate whether the reduction we showed in the first wave also occurred in the second wave.

**MATERIAL and METHODS**

The first COVID-19 case has been reported on March 11, 2020, in Turkey. As of March 16, 2020, elective cardiac invasive interventions were postponed at Dokuz Eylül University Cardiology Department. This period was called the first wave during the pandemic period in Turkey. After the first wave, restrictions in our country were mitigated and the elective cardiac procedures in our hospital were resumed. Nevertheless, in November 15, 2020, the number of coronavirus cases in our country increased substantially, so the elective cardiac procedures were suspended again in our hospital. This period was called the second wave of the pandemic in Turkey. In this study, we included the patients with STEMI who admitted to catheterization laboratory of Dokuz Eylül University Hospital with the purpose of primary percutaneous coronary intervention (PCI) between May 1, 2020 to October 14, 2020 and October 15, 2020 to December 15, 2020, in which the pandemic was exacerbated. This
information was compared with a similar period from 2019 (May 1, 2019 to November 14, 2019 and November 15, 2019 to December 15, 2019). Data were collected retrospectively in this study. Information of patients admitted with STEMI was obtained from the angiography archive of our hospital on the specified dates. All patients who met the definition of STEMI were treated with primary PCI. The Institutional Review Board of Dokuz Eylul University Faculty of Medicine, Turkey (February 2020; 2021/04-32) approved the study protocol.

RESULTS

During the first wave of pandemic period in Turkey (March 15, 2020, to April 15, 2020), eight cases were admitted to the catheterization laboratory for primary PCI, due to STEMI. It was determined that 32 patients were admitted to the catheterization laboratory in the same period of 2019 (March 15, 2019 to April 15, 2019). PCI numbers were decreased by 75% due to STEMI (Figure 1).

Similarly, during the second wave of pandemic period in Turkey (November 15, 2020, to December 15, 2020) 14 cases were admitted to the catheterization laboratory for primary PCI, due to STEMI. It was determined that 28 patients were admitted to the catheterization laboratory in the same period of 2019 (November 15, 2019 to December 15, 2019). PCI numbers were decreased by 50% due to STEMI (Figure 1).

However, when comparing 2019 and 2020, which we will call the year of the pandemic, the number of STEMI cases was similar. After the first wave, from May 1, 2020, to November 14, 2020, 135 consecutive patients with STEMI were admitted to the catheterization laboratory for primary PCI. In the same period of 2019 (May 1, 2019 – November 14, 2019) 134 patients were admitted to catheterization laboratory due to STEMI (Figure 1).

![Figure 1. Number of ST-segment elevation myocardial infarction cases](image)
DISCUSSION

The main finding of this study is the marked reduction in the number of STEMI patients during the first and the second waves of the pandemic. However, when comparing 2019 and 2020, which we will call the year of the pandemic, the number of STEMI cases was similar between these two peaks.

During the first wave of the pandemic, we showed a 75% reduction in primary PCI numbers when compared to the same period in the previous year (4). Similar to our finding, data from northern Italy showed a dramatic reduction in the number of ACS at the time of the COVID-19 pandemic (5). The identical results were observed in the United States of America (U.S.), there was a 38% reduction of PCI in STEMI patients (6). In the largest nationwide registry conducted in 50 cardiology centers capable of 24/7 service for primary PCI in Turkey, it has been shown that there is a significant delay in the treatment of patients presenting with acute MI in the COVID-19 pandemic and it was observed that the time of patient admission to the hospital from the onset of symptoms significantly increased compared to the pre-pandemic period. There was 31.8% reduction in patients with STEMI and 56.4% in patients with non-STEMI (7). In our study, there was 75% reduction in STEMI in the first wave and 50% reduction in the second wave. The selectivity of emergency medical services in referring STEMI patients in the COVID 19 pandemic and the single center experience might explain this more pronounced reduction in STEMI cases our study. In this nationwide registry (7), there was no significant decline in the frequency of primary PCI treatment in STEMI between the pre-pandemic and pandemic periods (94.9% vs 92.1% respectively; p=0.075). In our study, 22 patients who met the guideline definition of STEMI (8) in the first and second wave were treated with primary PCI as in the pre-pandemic period.

There are various hypotheses on the mechanisms for this decline. In some publications, it is suggested that patients avoid hospital admission because of the risk of infection and it is resulted in mortality in some patients before they reach the hospital (6). It is also thought that some patients are worried about unnecessary hospital admissions. Less exposure to environmental and psychosocial stress factors due to the policy of staying home during the pandemic period may have contributed in this decline. In addition, skipping the diagnosis of STEMI due to selectivity in the perception of clinicians during pandemics seems to be another possible factor.

One of the distinctive results of this study is that the number of patients between the two waves, in which the pandemic period continues, is similar to the previous year. It might be speculated that patients do not avoid hospital admissions, except during the pandemic peaks. Our results might demonstrate that the society’s fear of hospital admission is the main contributing factor in the decline during the first and second waves. This reduction in hospital admissions might cause substantial increase in case fatality and increased complication rates. The most worrying data from Italy were the three-fold increase in inhospital mortality STEMI patients during the pandemic (8). Additionally, the number of out-of-hospital cardiac arrest cases were increased in the time course of Covid-19 outbreak in Italy (10). Centers for Disease Control (CDC) data also revealed that in the U.S, after mid–March, the number of people who died from ischemic heart disease and hypertension increased dramatically when compared with historical controls from the year before (11). Hospitalization rates for other cardiovascular diseases such as heart failure, atrial fibrillation, device malfunction and pulmonary embolism were also reduced during the pandemic period. The society’s fear of hospital admission, especially in the peak periods, could be the major determinant of increased mortality in the future. A broad public health campaign is necessary to avoid these consequences. The media should have help to inform the public about the safety of hospitals and the potentially fatal consequences of acute myocardial infarction.

Limitations

The most important limitation of our study is that it is a single-center study and therefore the sample size is small. A second limitation is that our study does not provide prognostic, time to treatment delays and door-to-balloon time informations. Finally, NSTEMI patients were
not included in our study so our results may not be generalizable to all acute MI patients.

In conclusion, we confirmed that the number of patients admitted to the catheter laboratory due to STEMI decreased in the second wave, as in the first pandemic wave, where the pandemic was exacerbated in Turkey.

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