

COMPARISON OF THE NUMBER OF CARDIOVASCULAR ADMISSIONS BEFORE AND AFTER COVID-19: EXPERIENCE FROM TURKEY

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ABSTRACT

Background: The frequency of cardiovascular problems in patients with COVID-19 could be interpreted to suggest an increase in the number of cardiovascular admissions in the COVID-19 era. However, almost all countries announced social restrictions and distancing measures which could unintentionally lead to a decline in admissions to the hospital for acute disorders other than those associated with pneumonia. This study aimed to compare cardiovascular admissions before and after COVID-19 at the emergency department of secondary and tertiary centers in Turkey.

Methods: We analyzed emergency department referrals to secondary and tertiary centers in Ordu province, Turkey for subjects with acute chest pain, shortness of breath, palpitation, leg swelling, and acute limb ischemia from March 10, 2020 to April 30, 2020. Also, we recorded the number of diagnostic coronary angiographies, peripheral endovascular interventions, and cardiac surgeries performed at our institute. The difference in the frequency of emergency department referrals due to acute cardiovascular disorders before and after COVID-19 was the primary outcome measure of this study.

Results: Our findings show that, following the establishment of social restrictions 1918 patients were admitted to the emergency department with acute chest pain, shortness of breath, palpitation, leg swelling, and acute limb ischemia. Compared to the last five years (2015-2019) there was a decline in numbers of the patients admitted to the emergency department with acute coronary syndromes, and acute heart failure. There was also a dramatic decline in number of diagnostic coronary angiographies, peripheral interventions and cardiac surgeries. Finally, the number of lower extremity amputations from peripheral artery disease was increased.

Conclusion: Our findings show that, compared to the same intervals in the last five years, a critical decline has occurred in the number of patients admitted to our emergency department with cardiovascular symptoms, acute heart failure, acute coronary syndrome, STEMI, while the number of diagnostic angiographies, peripheral endovascular interventions and cardiac surgeries were also decreased. The state of alarm declared by many countries may have caused a higher threshold for hospital application in patients with cardiovascular problems, possibly due to social distancing measures and concerns of contracting COVID-19 in the hospital.

Keywords: COVID-19, acute cardiac care, acute coronary syndrome, Heart failure, endovascular intervention, deep vein thrombosis, cardiac surgery.

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Introduction

The COVID-19 pandemic started with several cases of pneumonia with unknown etiology in Wuhan, Hubei Province, China towards the end of the 2019⁽¹⁾. Fever and cough, which were seen before development of acute respiratory distress syndrome (in severe cases), were the most prominent initial symptoms⁽²⁾. Following the identification of a novel coronavirus in the throat swab sample of one patient by the Chinese Center for Disease Control

and Prevention (CDC), the World Health Organization (WHO) initially named the novel coronavirus as the 2019-nCoV⁽³⁾. In February 2020, the virus was renamed as severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) by the International Committee on Taxonomy of Viruses⁽⁴⁾.

Shortly after, the name of the disease caused by SARS-CoV-2 received its final name, coronavirus disease 2019 (COVID-19). Coronavirus disease 2019 is third coronavirus disease that emerged with a fast-paced spread within the last two decades.

The first two were: severe acute respiratory syndrome coronavirus (SARS-CoV) which resulted in more than 8000 infections and 774 deaths in 37 countries, and the Middle East respiratory syndrome coronavirus (MERS-CoV) which resulted in 2494 infections 858 deaths^(5,6). As of May 21, 2020, COVID-19 has been reported to affect about 5 million individuals and caused over 300.000 fatalities⁽⁵⁾. Although COVID-19 primarily affects the lung and leads to pneumonia, several other manifestations, including gastrointestinal disorders, neurological deficits, renal failure, myocarditis and acute coronary syndromes, have also been reported⁽⁷⁾. Among these, direct myocardial cell injury, myocardial oxygen supply/demand mismatch, acute plaque rupture leading to acute coronary syndrome as a part of systemic inflammation and catecholamine surge, increased thrombosis, and potential side effects of the current medications used for treatment have been considered to play role in the presentation of cardiac manifestations in COVID-19⁽⁸⁾. Moreover, patients with preexisting cardiovascular disease appear to have worse outcomes with COVID-19⁽⁹⁾. Such relationships could lead to the belief that there would be an increase in the number of patients applying with cardiovascular complaints; however, almost all countries announced social restrictions which could unintentionally lead to a decline in admissions to hospital for acute disorders other than pneumonia. In Turkey, individuals aged <20 years and >65 years were barred from leaving their homes since they were either vulnerable to COVID-19 or could facilitate the spread of disease.

Elective interventional and surgical procedures were also postponed due to the heavy burden on the healthcare system in relation with COVID-19 cases. These restrictions and fear of being infected by SARS-CoV-2 in hospitals, clinics, and emergency departments might have increased hesitation in seeking medical help, even in some patients that had acute cardiovascular complaints.

This study aimed to compare cardiovascular admissions to the emergency department of a tertiary center in Turkey in COVID-19 era with past years.

Materials and methods

This study was conducted following the approval of the local ethics committee. Ministry of Health, Turkey, recommended strict containment measures for the public and quarantining for individuals <20 years and >65 years and announced public messag-

es regarding the importance of staying at home at March 10, 2020. We analyzed emergency department referrals to secondary and tertiary centers in Ordu province, Turkey for subjects with acute chest pain, shortness of breath, palpitation, leg swelling, and acute limb ischemia who were finally diagnosed as acute ST-elevation myocardial infarction, Non-ST-elevation acute coronary syndrome, acute decompensation of heart failure, acute and subacute deep vein thrombosis from March 10, 2020 to April 30, 2020. Numbers of the diagnostic coronary angiographies, peripheral endovascular interventions, and cardiac surgeries performed in our institute were also analyzed. Subjects who were not diagnosed as an acute cardiovascular disorder were excluded.

Emergency department referrals due to an acute cardiovascular disorder within the past 5 years were also retrieved from the institutional digital database. The difference in emergency department referrals from acute cardiovascular disorders between the COVID-19 era and the past 5 years was the primary outcome measure of this study.

Statistical analysis

All analyses were performed on SPSS v21 (SPSS Inc., Chicago, IL, USA).. Data are given as frequency (percentage) for categorical variables.

Results

The results of flow cytometry showed that the NO proOur findings show that, a grand total of 1918 patients with acute chest pain, shortness of breath, palpitation, leg swelling, and acute limb ischemia, were admitted to the emergency department following the establishment of social restrictions. Compared to the same periods in the last five years (2015-2019) there was a decline in number of the patients admitted to the emergency department with cardiovascular symptoms (Figure 1).

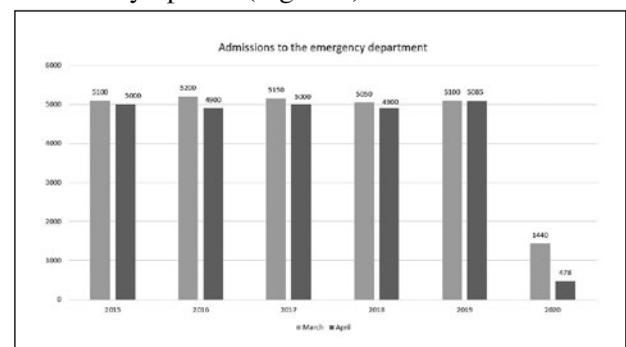


Figure 1: Decline of admissions to the emergency department form cardiovascular causes.

The number of patients admitted with ST elevation myocardial infarction (STEMI), non-ST elevation acute coronary syndrome (NSTEMI-ACS), and number of patients undergoing coronary angiography was also lower than that of the pre-COVID-19 era. Referrals from acute heart failure in post-COVID-19 era were also lower than that of the pre-COVID-19 era. The decline in number of the subjects admitted with acute coronary syndromes also influenced the decline in surgical revascularization procedures. In March and April 2020, the number of patients undergoing coronary artery bypass grafting was reduced when compared to the same time intervals in the past five years (Figure 2).

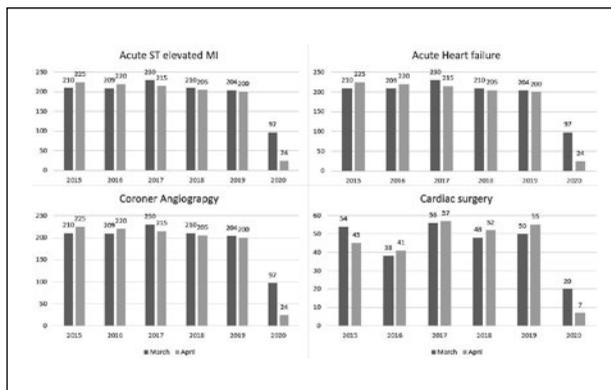


Figure 2: The number of subjects admitted to the emergency department with acute ST elevation myocardial infarction, Non-ST elevation acute coronary syndrome, acute heart failure and number of the subjects undergoing cardiac surgery for March-April, 2020 and for the last five years.

Moreover, there was also a decline in number of the endovascular interventions for acute manifestations of the peripheral artery disease and acute and subacute deep vein thrombosis (Figure 3).

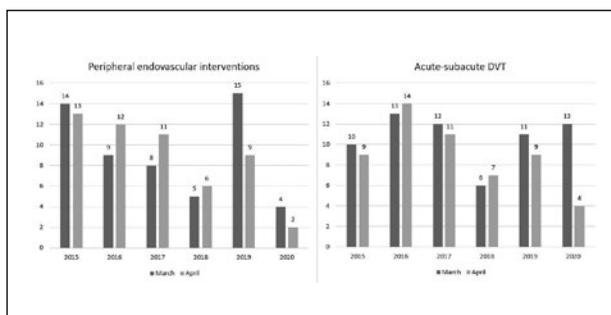


Figure 3: Decline in numbers of the patients undergoing endovascular interventions and admitted for acute-subacute deep vein thrombosis (DVT).

However, the number of patients undergoing amputation surgery as a consequence of peripheral artery disease increased in the post-COVID-19 era compared to the pre-COVID-19 era (Figure 4).

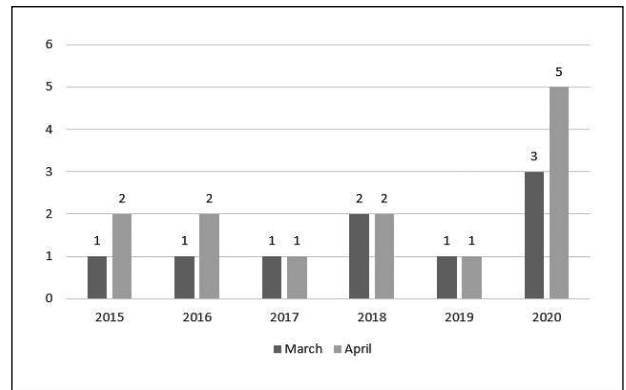


Figure 4: Increase in number of patients undergoing amputation as a consequence of the extensive peripheral artery disease.

Discussion

Comparison of cardiovascular admission and intervention frequencies show that cardiovascular-related admissions to the emergency department of our institute had declined in the COVID-19 era compared to the same time intervals in the last five years. The frequency of coronary angiographies, peripheral endovascular interventions and cardiac surgeries demonstrated significant decreases. Contrastingly, the number of amputations resulting from severe peripheral arterial disease increased, possibly due to late admissions.

Patients with history of cardiovascular disease are at high risk for complications of COVID-19⁽¹⁰⁻¹²⁾. The precise cause of increased complication rates from COVID-19 is not clear; however, the clustering effects of hypertension, diabetes, smoking, male gender, and obesity may have a role in poor outcomes of patients with COVID-19 in the presence of cardiovascular diseases^(13, 14). Nonetheless, the link between COVID-19 and cardiovascular diseases still remains unproven.

On the other hand, many of the individuals are observed to have hesitations in terms of seeking medical help in this period, even for emergency situations. The strict restrictions associated with social distancing, self-isolation, and quarantining recommended by the health authorities may have resulted in these hesitations, especially in terms of applying to primary care physicians, clinics, hospitals, and even emergency departments⁽¹⁵⁾. The rigorous public health measures appear to unintentionally influence the function and efficacy of existing integrated care systems. There are several recent reports demonstrating a dramatic decline in admissions to intensive cardiac care units for acute myocardial

infarction or acute heart failure after containment measures. A recent report from France has revealed that the number of subjects admitted to the nine participating intensive cardiac care units declined from 4.8 ± 1.6 patients per day to 2.6 ± 1.5 after establishment of containment measures⁽¹⁶⁾. Further, a multicenter, observational study from Italy (which has experienced an overwhelming peak of COVID-19 cases, has shown that there was a 48.4% reduction in admissions for acute myocardial infarction compared with the equivalent week in 2019⁽¹⁷⁾. A telematic survey for Spain has also shown a 40% decline in STEMI admissions and a 48% reduction in diagnostic procedures after the 'state of alarm' was declared compared to the pre-pandemic era⁽¹⁸⁾. Other data, for instance from Austria, have demonstrated that the response to COVID-19 was associated with a relative reduction of 39.4% in admissions for ACS from calendar week 10 to calendar week 13⁽¹⁹⁾. United States data from nine high-volume cardiac catheterization laboratories also indicates a 38% reduction in STEMI admissions after the pandemic compared to pre-pandemic numbers⁽²⁰⁾.

This is the first report from Turkey that has demonstrated alterations in cardiovascular caused by the COVID-19 pandemic and the response to the pandemic. Our findings largely confirm the results of previous reports from different countries demonstrating a dramatic decline in cardiovascular admissions after the COVID-19 outbreak. It simply appears that declaration of the state of alarm by many countries and related containment measures along with the public-health messages have created a self-containment that reduced hospital applications, possibly due to the fear that staying at hospitals could cause contamination. An integrated healthcare system should not only focus the COVID-19 outbreak but also consider the impact of containment measures and public-health messages on the psychology of individuals who are at high risk for cardiovascular diseases. Every effort, including structural and physical changes in hospitals and precautions regarding hospitalization of subjects with acute cardiac disorders, should be carried out to reduce possible collateral damage related with containment measures.

Conclusion

Our findings show that, compared to the same time intervals in the last five years, a critical decline has occurred in number of patients admitted to our emergency department with cardiovascular symp-

toms (acute heart failure, acute coronary syndrome, STEMI) which was paralleled by reduced interventions (diagnostic angiographies, peripheral endovascular interventions, cardiac surgeries). The state of alarm declared by many countries and public health messages may have led to avoidance among patients that would have normally sought medical help, most probably due to social distancing restrictions and concerns of contracting COVID-19 in the hospital. Besides containment measures, health authorities should warn the public that individuals must continue to seek professional medical care in case of signs of acute cardiovascular disease.

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Ethical approval:

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent:

Informed consent was obtained from all individual participants included in the study.

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