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COVID-19: A perspective from Iran

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Abstract

The coronavirus disease 2019 (COVID-19) pandemic has presented unique challenges to healthcare systems the world over. The management of the current pandemic places a huge strain on healthcare sectors and demands new strategies on a global level. We herein review the latest epidemiologic data on the COVID-19 pandemic, the Iranian healthcare system's response, and the impact on cardiac surgery practice in Iran.

KEYWORDS
cardiac surgery impact, coronavirus, COVID-19, Iran

1 | INTRODUCTION

The global pandemic caused by a novel coronavirus, termed "severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2)," emerged in Hubei Province in China in December 2019. Subsequently, the first official announcement of a patient diagnosed with coronavirus disease 2019 (COVID-19) in Iran was made on February 19, 2020.[1] By June 26, there were 338,825 cases confirmed via laboratory assessments, and 293,811 patients had recovered or had been discharged from hospitals.[2] Such substantial figures have indubitably impinged on the provision of healthcare to different healthcare sectors, including cardiac surgery. With the situation in a state of flux, it is not currently feasible to determine the exact impact, even now that limited services to our patients needing cardiac surgery have been resumed.

This article aims to reflect upon the restructuring of the Iranian healthcare system and in particular, cardiac surgery practice in response to the multilayered impact of COVID-19.

1.1 | How Iran has approached the pandemic

According to a recent census in 2020, the estimated population of Iran was 83,992,949.[3] The Iranian Ministry of Health and Medical Education (MoHME) has conducted 1,557,872 polymerase chain reaction (PCR) tests (19.2 PCR tests per 1000 people) since the beginning of the pandemic in Iran. The relative comparison of the cumulative number of tests performed per 1000 people in the region is demonstrated in Figure 1. By June 29, 2020, more than 10,000 PCR-confirmed deaths had been recorded among patients with COVID-19, and 2593 and 122 individuals per 1,000,000 people were infected with and subsequently died from COVID-19, respectively.[4] The highest number of newly diagnosed patients was recorded on March 30, 2020 (3186 patients), and a declining slope was observed consequently.

Many infected patients remained undiagnosed until the date of the first official report, February 19, 2020, owing to a lack of awareness of the virulence of the virus, paucity of proper diagnostic measures, and insufficient warnings. Indeed, some physicians and specialists around the country have been on record as stating that they encountered a series of patients with presentations of pneumonia and computed tomography (CT) scan findings similar to those in patients with COVID-19 before the release of official reports. Retrospective evaluations of the CT scans or body fluids from those patients, if available, would have helped to clarify the real figures. Nonetheless, this diagnostic negligence before the declaration of the World Health Organization (WHO) concerning "global pandemic warnings" is a scenario played out across the world.

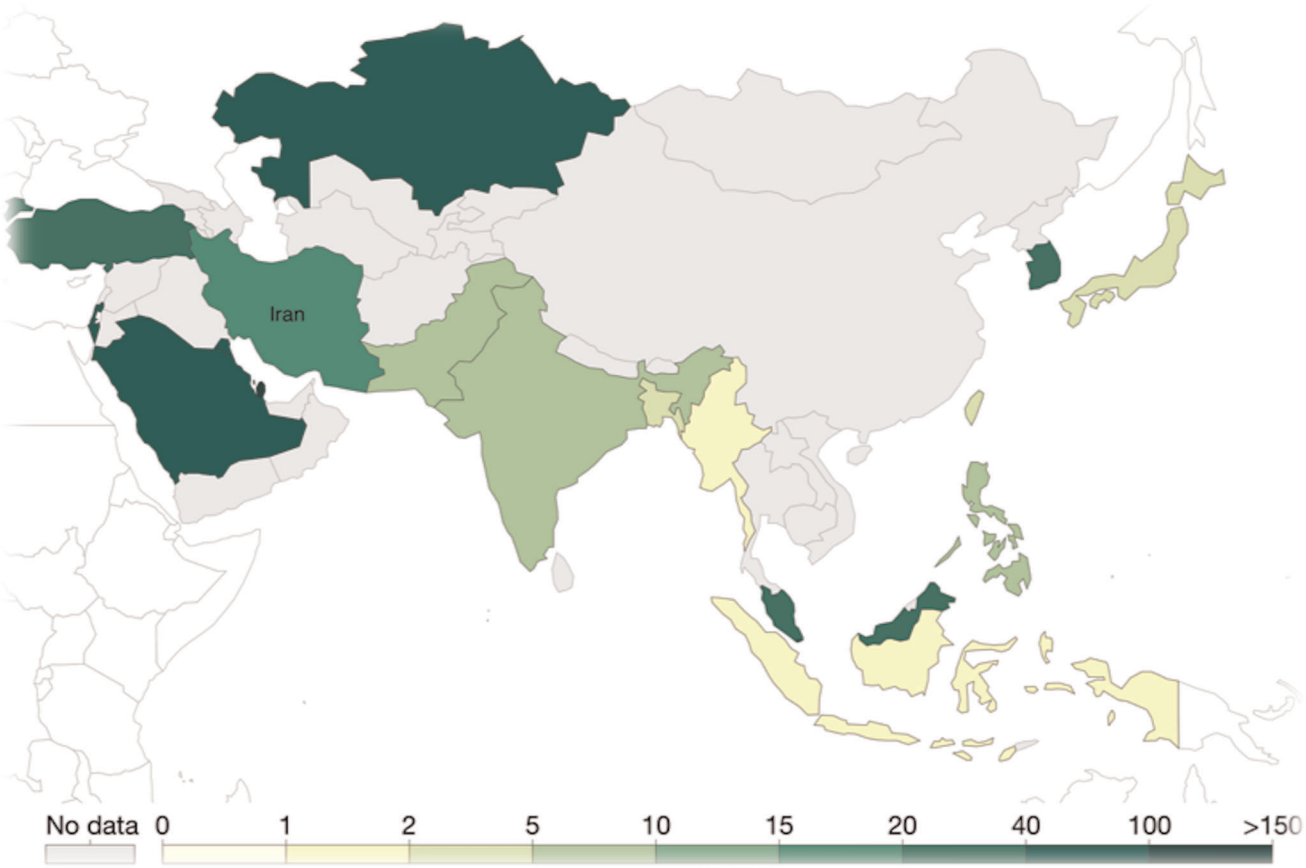

FIGURE 1 Total COVID-19 tests per 1000 people, June 29, 2020. *Source:* https://ourworldindata.org

The abovementioned data should be interpreted in light of the following points:

(i) After the first surge of the pandemic, the Iranian government not only banned public and religious events but also closed schools, universities, shopping centers, bazaars, and holy shrines. Serendipitously, the 2-week Iranian New year's (Nowruz) holidays, which start on the first day of spring, fell within the period of the restrictions of social activities, allowing policymakers more time to contain the spread of the virus.

(ii) The shortage of laboratory diagnostic modalities in the early period of the outbreak delayed the testing of COVID-19 extensively, compelling physicians to deal with patients with suspected infection by relying merely on physical examinations or chest CT scans, which were accessible across the nation. As is illustrated in Figure 1, Saudi Arabia and Turkey performed 45.7 and 39.5 tests per 1000 people, respectively, in comparison with 19.2 tests per 1000 people in Iran. Hence, the actual number of patients with COVID-19 may have been underestimated in Iran.

(iii) As is the case with other countries, it appears that a majority of infected individuals are either asymptomatic or mildly symptomatic and have not been referred to hospitals and labs by frontline physicians. Therefore, the daily figures of diagnosed patients must have been underestimated and the fatality rate may have been overestimated, consequently (Figure 2).

(iv) The negative economic impact caused by the spread of COVID-19 in Iran coincides with the highest ever politically motivated economic sanctions against the country by the United States.[5] The Iranian health sector, albeit among the most resilient in the region, has been affected by the sanctions.

(v) On the basis of recent statistics, inpatient healthcare services in Iran are now provided by more than 900 hospitals nationwide, almost 85% of which are public hospitals under insurance coverage.[6] This number approximately equals 117,000 hospital beds, producing a density of 1.62 beds per 1000 people among the Iranian population. Thus, patients with COVID 19 are prioritized to receive treatment.

1.2 | The impact

In the early stage of the pandemic, MoHME announced that all public and private hospitals were to cancel elective procedures and elective admissions as from February 29, 2020. In conjunction with the decree for the postponement of elective procedures, all faculties and hospitals were tasked to set up scientific and executive multidisciplinary committees. Additionally, all hospitals and clinics, except

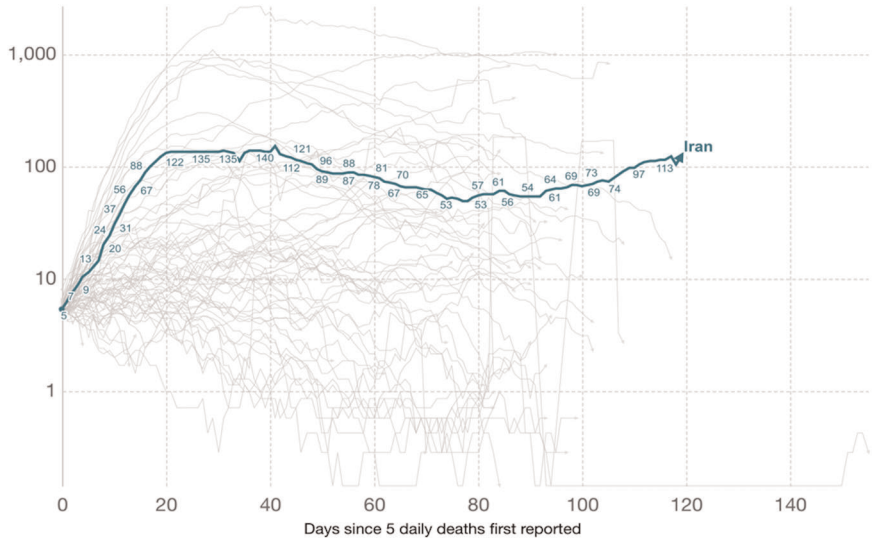

FIGURE 2 Daily confirmed COVID-19 deaths in Iran, from February 20 to June 28, 2020. *Source:* European Centre for Disease Prevention and Control; the chart is available at: https://ourworldindata.org

single-specialty tertiary centers, were to admit patients with COVID-19, including those requiring admission to the general unit or the intensive care unit (ICU).

On the strength of a nationwide network that was implemented decades earlier and was comprised of a referral system starting at primary care centers on the periphery of towns and leading to secondary-level hospitals in the provincial capitals and ultimately, tertiary hospitals in major cities, the healthcare system was able to withstand the initial impact of the rapid emergence of COVID-19 and provide primary response to the crisis.

With the exponential rise in the number of patients affected, internists, hematologists, nephrologists, general surgeons, and thoracic surgeons joined the multidisciplinary framework. Cardiac surgeons were also involved in the implementation of extracorporeal membrane oxygenation (ECMO). These initial actions, accompanied by the restrictions imposed by the government, resulted in a steady-state curve of newly diagnosed patients in March 2020.

Domestic pharmaceutical and medical device companies accelerated the manufacturing of personal protective equipment (PPE), drugs, diagnostic kits, and essential supplies to overcome major shortages as a consequence of the international sanctions against Iran in the past few years. Currently, all hospitals providing care to patients with COVID-19 are equipped with PPE for healthcare personnel.

1.3 | Cardiac surgery amid the COVID-19 pandemic

In the early stage of the COVID-19 pandemic in Iran, general hospitals furnished healthcare services to patients; nevertheless, the drastic rise in the number of infected cases in March 2020 gave rise to an overwhelming volume of referrals to tertiary centers. The additional strain on healthcare sectors rapidly led to the curtailment of elective cardiac and noncardiac surgeries in the lockdown period. The decline in the volume of elective cardiac surgeries was ineluctable given that a considerable portion of such surgical patients invariably needs postoperative ICU care. Procedures were, thus, limited to emergent and urgent scenarios, and even the number of patients with aortic dissections and left main coronary artery lesions admitted to cardiac surgery wards dropped significantly compared with a similar period last year.

The Iranian Society of Cardiac Surgeons published a statement in response to the postponement of elective cardiac procedures,[7] which depicted multiple situations for patients with or without positive tests for COVID-19. In patients with positive COVID-19 tests requiring urgent or emergent cardiac surgeries, the decision to perform surgeries should be based on the prognosis of the current disease and the underlying comorbidities (Figure 3). Moreover, the recommendations of the COVID-19 team, consisting of cardiovascular surgeons, cardiologists, cardiac anesthesiologists, intensive care specialists, infectious disease specialists, and pulmonologists, should be considered in the process. For patients not infected with COVID-19, it is generally recommended that cardiac surgeries be performed in tertiary cardiovascular centers such as Rajaie Cardiovascular Medical and Research Center rather than in general hospitals, which are directly involved with COVID-19 care.

Acute aortic dissection, mechanical heart valve thrombosis, and acute coronary syndrome (especially with the left main disease) are considered in need of prompt treatment even during the COVID-19 pandemic. However, the unpredictable nature of the outcome in patients candidated for cardiac surgery renders an appropriate allocation to specific categories impossible. As is highlighted by other researchers, there is a need for new clinical decision-making processes and frameworks that can assist in guiding patients to appropriate treatment strategies.[8]

Healthcare providers constitute any country's bulwark against such calamities as viral outbreaks, and their health and safety are crucial both for efficient patient care and for disease control. Previous experiences with the severe acute respiratory syndrome and

FIGURE 3 Algorithm for the management of patients undergoing cardiac surgeries during the COVID-19 outbreak. GDMT, Guideline-directed medical therapy. *Source:* https://sites.kowsarpub.com/mca/articles/104296.html

the Middle East respiratory syndrome outbreaks demonstrated that healthcare personnel was under extraordinary stress and susceptible to infection.[9] The number of infected healthcare providers is a reasonable index of the adequacy of PPE and the extent of their exhaustion in the healthcare environment. Only in the first 2 months of the outbreak, around 110 healthcare providers, particularly general physicians, died after COVID-19 infection.

1.4 | ECMO services during the COVID-19 outbreak

The actual number of patients with COVID-19 who might present with severe acute respiratory distress syndrome (ARDS) refractory to maximum medical treatment is unknown to a large extent. The WHO interim guidelines[10] for the management of patients with suspected COVID-19 infection recommend administering ECMO when such patients present with severe ARDS in expert centers with sufficient case volumes. Experience as regards previous emerging infectious outbreaks is evidence that further supports the efficacy of ECMO in the current evolving pandemic.[11] ECMO services should be provided in well-equipped centers with sufficient experience and dedicated multidisciplinary teams specially trained for the management of patients requiring ECMO. There are no published data on experience with ECMO in patients with COVID-19 in Iran; be that as it may, Masih Daneshvari Medical and Research Center, the main referral center in the COVID-19 pandemic, have invaluable experiences in this regard. From March 1, 2020, to May 8, 2020, ECMO was utilized for seven patients by that center. Three of these patients were weaned from ECMO successfully, but only one patient was discharged from the hospital in a stable condition. The remaining three patients had clot formation in the oxygenator, and it appears that a higher dose of heparin should be administered to achieve an activated clotting time of more than 250 s. Regrettably, only a few centers in Iran can provide ECMO services; the majority of cardiovascular centers are devoid of not only ECMO devices but also oxygenators and cannulae because large pharmaceutical companies have been forced out of Iran's market by the economic sanctions imposed on the country.

2 | CONCLUSIONS

The relatively large number of healthcare providers affected by COVID-19 indicates the deficiencies in protective measures utilized in hospitals and the need for their reassessment. Patients with cardiovascular diseases are potentially at high risk of death, not least if necessary, interventions are delayed. To avoid this life-threatening situation in this high-risk population, we suggest that tertiary cardiovascular centers or at least one hospital in every large city be kept COVID-19–free. We also recommend clear-cut and constantly updated interim guidelines on the management of cardiovascular diseases such as valvular, thoracic, aortic, and ischemic diseases

vis-à-vis priorities, the utilization of less invasive approaches, and the postponement of elective procedures.

AUTHOR CONTRIBUTIONS

ZHM, MB, and SH were responsible for concept and design, MM and AN for drafting the article and its critical revision, and SH and MB for approval of the article

ETHICS

The methods and objectives of the study have been reviewed and approved by the institutional review board of Rajaie Cardiovascular Medical and Research Center. There were no interventions on human in the present study.

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