
Aysha Zahidie¹, Meesha Iqbal²

Abstract

This paper aims to assess the effectiveness of strategies adopted by national health systems across the globe in different ‘geographical regions’ in the Northern Hemisphere to combat COVID-19 pandemic. Data is included since the first case was reported in November 2019 till mid-April 2020. Sources of information are COVID-19 case repositories, official country websites, university research teams' perspectives, official briefings, and available published research articles to date. We triangulated all data to formulate a comprehensive illustration of COVID-19 situation in each country included. It has been found that the 2002-2004 SARS outbreak experienced in China, Taiwan, and South Korea saw better strategies adopted by leadership to combat COVID-19 pandemic containment as compared to Iran, Italy, and the United States of America. Saudi Arabia has so far been successful in the implementation of containment strategies as there is no large outbreak in major cities or confined areas as prisons. The situation has yet to unfold in India and Pakistan, which exhibit their own weaknesses in policy formulation or implementation in response to health crises. This review provides conclusive evidence that timely travel bans, early detection of COVID-19 spread through exhaustive and reliable testing, and the establishment of a central, fully authorized body to foresee health trends and implement appropriate containment measures are essential to contain the spread of the virus.

Keywords: national health systems, response, COVID-19

Introduction

Pandemics progressing in a nonlinear fashion are exceptionally difficult to handle owing to the difficulties faced by health systems that are tasked with the timely and accurate decoding of real time situations. Novel coronavirus 2019 (COVID-19) has so far been the largest pandemic of the past century, costing hundreds of thousands of human lives in countries across the globe and sparing no race, ethnicity, or age group (1). On Dec. 31, 2019, China alerted the World Health Organization (WHO) about cases of a type of pneumonia of unknown origin in Wuhan City (2). Within the first three months, the virus has resulted in 42,309 deaths and 85,8361 people were tested positive round the globe (3). On Jan. 30, 2020, WHO declared COVID-19 a public health emergency of international concern (PHEIC) and on March 11, 2020, WHO declared COVID-19 a pandemic. Disease epicenters have been shifting from one country to another. The high death toll (global case fatality rate =3.4%) and morbidity related to this virus has challenged effective functioning of the world’s most resilient health systems (4). In the absence of effective prevention and treatment options, high fatality and transmissibility of infection calls for stringent public health measures and policy innovations to save human...
lives and the global economy. Countries have resorted to innovative strategies to combat the disease that suit their specific sociocultural and politico-economic context. Some plans and policies have brought forth mixed results in containing COVID-19.

The geographical distribution of the disease reveals that the spread of COVID-19 in the Southern Hemisphere has been relatively slow. With rapidly shifting epicenters, it is important to review the policies that have resulted in the successful control or unchecked spread of infection among countries in the Northern Hemisphere. In this paper, we briefly review policies, strategies, and plans adopted by included countries in WHO geographical regions to combat COVID-19 that have resulted in both successful or unsuccessful outcomes.

This review included countries from the northern hemisphere of the globe which were worst hit during the first wave of COVID 19 pandemic. In selecting countries to be included in this review, the WHO regions located in the Northern Hemisphere were initially demarcated. This was followed by choosing countries from each WHO region so that a geographical balance could be maintained and findings could be generalizable for other states of each geographical region. These included EMRO (Pakistan, Saudi Arabia and Iran), SEARO (India, China, South Korea, and Taiwan), Europe (Italy), and the Americas (USA). Countries were then categorized as per regional subclassifications for better comparison and generalizability such as Iran and Saudi Arabia in the Middle East and India and Pakistan in the Subcontinent.

To evaluate the effectiveness of COVID-19 mitigation strategies, our criteria for labeling a country as a good or poor performer has taken into consideration effectiveness of countries’ respective stepwise approach and preparation along with the timeline of COVID-19. (Panel 1)

For this purpose, effectiveness was defined as the ability to contain the pandemic despite earlier high potential of transmission (e.g. Taiwan) or quick mitigation as compared to other countries in a measurable period of time (e.g. China and South Korea).

National health systems were considered as among good or bad performers based on a pilot research that was conducted on the total number of cases within a month after the first case was reported in each of the countries included. We have made an exception to include China among good performers despite a high number of cases and fatalities initially. This decision was made based on the fact that as the country of origin of the disease, China could not have benefited from early warnings of disease spread and because the virus was identified after a considerable community transmission had taken place in the country.

Panel 1: Criteria of selection of countries

- Geographical location in the Northern Hemisphere
- WHO regional classification
- Periodical growth of cases since identification of first case
- Time taken in reaching peak number of new cases
- Proportion of recovered patients out of total infected
- Population per million affected
- Case fatality rate

Exception: China

Other countries reviewed in this paper for effectiveness of combating measures against COVID-19 include South Korea, Taiwan, Iran, Saudi Arabia, India, and Pakistan, Italy, and the USA.

We have carefully considered the date of the first reported case in the country in relation to the spread of COVID-19 timelines and subsequent growth of cases periodically given the maximum incubation period of the virus is two weeks (1). It indicated whether a country was prepared to detect its first case well before community transmission or discovered cases after significant community transmission had happened leading to a quick rise in cases after reporting the first case.

Number of mortalities and time taken to reach the maximum number of daily new cases followed by regression in new cases and new deaths have also been evaluated. Further, the number of recovered patients and mortality rate in each country and population per million infected was looked into. Careful interpretation
of new cases will be required in the context of the number of tests administered.

Table 1 demonstrates a comparison between demographic and economic indicators of countries included in this review. Global Health Security Index (GHSI) 2020 rankings in which countries are graded on their pandemic preparedness has also been included in Table 1 to compare countries’ actual performance in COVID 19 mitigation with their theoretical ranking. GHSI scoring is based on: (1) Prevention of the emergence or release of pathogens, (2) Early detection and reporting for epidemics, (3) Rapid Response capability, (4) Efficiency of health system, (5) Compliance with International norms, (6) Risk environment and country vulnerability to biological threats. The average GHS Index score is 40.2 out of a possible 100 for the countries in this study.

Table 2 presents a comparison of COVID-19 statistics across included countries. Results are also presented in graph form to show the trends (USA is excluded from graphs due to exceptionally large numbers skewing data from other countries included). Number of fatalities may have under-counting, similarly, countries that retrospectively discovered undetected cases before the date of the first reported case need a correction factor. However, such a correction factor is variable across time and countries and not available for all the countries included in this review.

Therefore, we had to rely on officially reported numbers available from repositories to maintain uniformity across the data. Country wise data were retrieved through Worldometer and official websites of each country. The present paper has included data till May 2020.

Overcoming COVID-19 by the earlier SARS survivors

China

The first case in China was reported on Nov. 17, 2019. It took nearly one month with 27 diagnosed cases for China to notify WHO about the outbreak. By that time, no such outbreak was reported outside China. The virus swiftly proliferated from Wuhan city to the entire country just in a few weeks’ time. In the absence of specific treatment and prevention options, China focused on traditional public health outbreak response procedures such as case isolation, quarantine, social distancing, and lockdown (5).

Despite the ability to “buy time” in contrast to the rest of the world, Chinese authorities proactively dealt with the epidemic and identified the virus within a week after notifying WHO, with subsequent development of testing kits and sharing genetic sequencing of the virus, while simultaneously disseminating results of empirical treatments carried out on COVID-19 patients. Potential treatments during the most important public holiday—the Chinese Lunar New Year—was halted and celebrations were cancelled to avoid large public gatherings. Within six weeks, around 40 to 60 million residents of Wuhan and 15 surrounding cities within Hubei province were subjected to strict lockdown measures (5,6).

Teams were formed for contact tracing and suspect isolation while national services and manufacturing were diverted toward producing medical supplies and developing equipment. Identified cases were already isolated in designated wards of existing health facilities; two new hospitals were quickly built for isolation and care for the increasing numbers of cases in Hubei province. Suspected contacts were asked to quarantine themselves at home or were taken to special isolation centers, where they were monitored for symptoms. With growing projections on estimates of virus exposure among its population, China resorted to a relatively loose case definition including clinical and imaging-based diagnosis, which eventually facilitated timely treatment and early contact tracing (5).

All these measures helped flatten the curve in around 4 weeks, so China was able to divert resources and relief efforts to newly affected countries around the world (Figure 4).

Lessons learned: When limited details are known about an epidemic, implementing conventional public health practices could be the best approach to control disease spread in the community. Simultaneous relevant measures such as enhancing care delivery capacity and hypothesis testing for innovative treatment strategies are useful approaches.

Taiwan

Taiwan is an island state, 81 miles from mainland China. The first domestic case of Taiwan was reported on Jan. 20 and less than 500 cases have been reported to date (1). The Central Epidemic Command Centre (CECC) was activated by the government on the day the first case was identified, giving full authority to enact necessary measures needed for the containment of the epidemic. Immediate measures were taken by the CECC, including screening incoming travelers for fever
and enforcing a law of rationing of face masks to avoid hoarding. From Feb. 6, anyone who had been in China or Hong Kong during the previous 14 days was prohibited from entering Taiwan. The restrictions were extended to other countries as the virus spread. The travel ban was imposed until March 19th to almost all foreign nationals without a Taiwanese residence certification; they were also required to self-quarantine for two weeks upon returning from abroad. Taiwan’s neighborhood warden system assisted in enforcement of the quarantines and delivering meals and other necessities to the needy (7).

**Lessons learned:** The mainstay of Taiwan’s response to the COVID-19 crisis was the lessons learned from the 2003 SARS epidemic during which 84 deaths occurred on the island out of 813 worldwide. It was inferred that an early response was delayed due to the absence of a central coordination mechanism during the SARS outbreak. Therefore, the CECC was created in 2004 to act as a liaison between numerous public divisions and resource mobilization for any future crises. Timely and strict execution of control measures through a central body during phase one of COVID-19 spread in the country is a key element of Taiwan’s success to date.

**South Korea**

In South Korea, confirmed cases of COVID-19 drastically increased from less than 100 to 5000 over a period of ten days in late February. A state of emergency was declared as the country’s second death was confirmed on Feb. 21 (1).

The authorities suspected the outbreak to sprout in the southern city of Cheongdo, where members of a religious sect attended a funeral. Around 9,000 members of that sect were told to self-quarantine, while southern cities of Daegu and Cheongdo were declared "special care zones." Schools and offices were shuttered, gatherings were cancelled, and social distancing was enforced. Wearing masks was made essential, and hand sanitizer was placed at public transport stops and residential buildings doorways. Warning signs for public awareness were broadly erected. Military bases were put under lockdown after three soldiers tested positive for COVID-19 (8).

Diagnostic testing and application of information technology remained the key elements in the South Korean strategy to contain COVID-19 domestically. Testing was made available to all residents through a network of 118 labs; 20,000 people were tested each day at 633 testing sites nationwide. Wide availability of testing kits was assured though biotech companies located within the country. Drive-through collection centers were operational to keep hospital facilities and health workers away from unnecessary exposure. Mobile applications were developed to trace GPS locations of COVID-19 confirmed patients—which were publicly accessible—so that people could avoid those neighborhoods. South Korea was able to flatten the disease curve in three weeks through timely and proactive measures.

**Lessons learned:** Appropriate use of information technology and high testing rates by indigenous kit manufacturing were prime reasons for South Korea’s ability to contain COVID-19 in a timely manner. Furthermore, these measures were strengthened by a comprehensive package of social distancing, quarantine, wearing face masks, and the lockdown of highly infected zones.

**The Subcontinent: The unfolding severity of COVID-19 in India and Pakistan**

**Pakistan**

Despite timely and vigilant policy measures such as an early travel ban on China, decisions of managing isolation for Wuhan-based Pakistanis, the establishment of a quarantine center at Pakistan-Iran border, as well as establishing labs for free COVID-19 testing, a rising number of diagnosed and suspected cases with limited testing capacity led to the implementation of an incremental lockdown approach. Preparations were made for maintaining essential supply chains and catering to the basic needs of the poorer segments of the population through an economic relief package. The country’s intelligence agencies were commissioned to map and cordon off high risk zones in many urban as well as rural areas. Procurement of testing kits was ensured in the subsequent days after the first detection of COVID-19 (9,10).

Despite appropriate decision making and clear policy directions, there were gaps at the implementation level. Ineffective quarantine procedures at the Pakistan-Iran border and a three-day religious congregation at Raiwind on March 10 (attended by at least 75,000 people including 3,000 delegates from 40 member states) are some examples of the administrative failures which led to the spread of virus through hundreds of positive cases linked to Iran or Raiwind (10,11,12).
India
India’s official response to COVID-19 started on Jan. 7 when a travel advisory was issued, particularly for Wuhan in China. However, active measures were taken in March when the government suspended the issuing of new visas and announced compulsory screening for all international passengers arriving to India. On March 14, COVID-19 was declared a "notified disaster," enabling states to access State Disaster Response Funds. An aid package of USD 2.1 billion was allotted for developing testing facilities, personal protective equipment (PPE), intensive care units (ICUs), ventilators, and training medical workers. The package had little compensation for laborers and daily workers. A sudden nationwide lockdown was implemented on March 24 for a period of 21 days (13).

The complete lockdown without preliminary arrangements has resulted in mass movement of unemployed immigrant workers back to their hometowns and villages. Many were stranded at places other than their home and unable to feed themselves. This massive movement of people may lead to rapid spreading of COVID-19 in the country. Moreover, there are reports about a lack of dependable contact tracing and patients fleeing from isolation centers. In terms of testing, India has conducted fewer tests than most countries with confirmed coronavirus cases. Private laboratories are charging $60 per test when just $7 per month has been offered as income support for those in poverty.

The Indian-occupied region of Jammu and Kashmir has reported 158 cases and 4 deaths on official Indian websites (14). However, there is no verifiable data available for these two regions, where people are under strict lockdown by the occupying Indian Army, with around one million soldiers, for the last seven months. Access to health and urgent care services are reportedly limited for the Kashmiri people who have been waiting to get the right to health protection and self-determination for decades.

Lessons learned: The gravity of the COVID-19 situation has yet to unfold in the subcontinent, however, apparently abrupt measures taken by the Indian government may lead to an alarming situation facilitating accelerated spread of the virus. At the same time, stringent enforcement of policy decisions in Pakistan was essential to successfully contain the epidemic. Furthermore, vulnerable and war-torn populations all over the world including Kashmiris are at the highest risk of being adversely affected by this pandemic.

Middle East: Iran and Saudi Arabia
Iran
Iran imposed travel bans on China in early February, but some private airlines were allowed to continue passenger flights. On Feb. 19, the first two cases of COVID-19 were announced in the religious city of Qom, declaring fatal outcomes for both cases the same day. On Feb. 21, Iran continued with its preplanned elections despite threats of virus spread. The Supreme Leadership Authority resisted organized quarantining from the beginning, calling the measures part of a foreign conspiracy meant to alter Iran’s religious identity. The political government’s appeal for the withdrawal of funds was approved after a delay of 11 days by the religious leadership. Traveling between cities was not restricted at the beginning of the Persian New Year of Nowruz on March 22. Despite warnings of community transmission, Qom was not locked down and the virus spread to the whole country. Some appropriate late measures were taken; subway cars in Tehran were disinfected, schools across the country were closed, and Friday Prayer services were revoked in most provinces (15,16).

Iran’s ability to contain the virus was also hampered by a shortage of medical equipment that can be linked to international sanctions and its economic downfall.

Saudi Arabia
The earliest reported cases in Saudi Arabia were mostly linked to members of the public and hiding the travel history to infected areas, especially Iran, appeared to be a common trait. However, the Saudi government was vigilant and measures were taken to stop the community transmission of the virus, even before the first case was reported in the country. On Feb. 6, Saudi Arabia announced a travel ban to China. The ban was extended to include Gulf Cooperation Council (GCC) citizens as well in the next three weeks. Main sites of Muslim pilgrimage were closed as early as Feb. 27. Special sterilization procedures were also taken in the Great Mosque of Makkah Mukarama and congregational prayers were suspended across the country. On March 8, the Saudi government announced complete a lockdown for the Qatif region bordering the Persian Gulf. With incremental measures in subsequent days, a majority of the country went into strict
lockdown and 24-hour curfew was implemented allowing only essential movement during the early hours of the day. All international flights were banned on March 15 and domestic traveling was also suspended (17).

Lessons learned: Iran and Saudi Arabia both centers of high-transit religious tourism and exhibit remarkable similarities of circumstances which can induce rapid spread of the virus in each country. It appears that in the backdrop of international sanctions and hostile foreign relations, Iran neglected expertise-based proposals to contain the virus. The most important lesson of the coronavirus crisis in Iran is that health policy must never be politicized, especially in terms of emergency medical response. Saudi Arabia is currently seeing a daily reporting of more than 100 cases; however, trends show that timely and vigilant measures have slowed down widespread transmission of the virus in communities.

Italy: A case of a faltering European health system to contain pandemics

Within weeks of reporting of first COVID-19 death on Feb. 21, the health system in Italy became overwhelmed with a high influx of infected patients and continuously surging deaths. On March 8, the Italian government resorted to extraordinary measures to reduce transmission of infection and kept accelerating restrictions, which ultimately led to complete a lockdown of the whole country. Despite efforts, the situation kept on deteriorating until the first week of April when the curve of new cases started to decrease slightly; by then the death toll had already reached alarming numbers and healthcare delivery had collapsed, reporting casualties among unprotected frontline health workers (18).

Despite incremental government measures to curtail the epidemic, the worsening situation in Italy can be attributed to mitigation policy failure. This failure is due to multiple factors involving decision makers on one hand and community members on the other.

A skeptical response by the public to heed early warnings by the government sabotaged mitigation efforts in the beginning (18).

The Italian government also seemed to lack a centralized information system for capturing data on anomalous infection peaks in some hospitals during the early days of 2020, which facilitated unchecked community spread of the virus. Different testing approaches in different regions of Italy also raises questions on comparability of data within and outside the country.

In the absence of reliable data and up-to-date information, policy measures might not be apt and timely. This could be one reason of failure on the part of the Italian government and using an incremental approach, as it was inconsistent with the rapid exponential growth of the pandemic. Moreover, it facilitated the spread of the virus by selectively closing northern Italy in the early stage, allowing for mass migration to continue to the southern part for the virus to spread there as well (19).

As the Italian healthcare system is highly decentralized, different regions in the country tried different approaches. Some experienced success locally while others failed and contributed to overburdening health staff and facilities all over the country. Lombardy and Veneto, two neighboring regions in Italy, are obvious examples of such contrasts. While Lombardy remained focused on testing symptomatic patients as per advisories from the central government, Veneto was proactive with the extensive testing of symptomatic as well as asymptomatic cases from the beginning. Further, rigorous tracing of contacts at home as well as among neighbors was performed in Veneto. Where tests could not be administered, self-quarantine was ensured for such contacts. Whenever possible, samples were collected directly from a patient’s home and then processed in regional and local university labs. In addition, the safety and protection of health staff was ensured in Veneto. These results showed a much better outcome for Veneto as compared to rest of Italy, namely Lombardy which became the most devastated region in the country (18,19).

Lessons learned: Lack of public participation in the beginning, unavailability of an epidemics early warning system, and decentralized containment policymaking could presumably be cited as the main causes of Italy’s catastrophic situation.

The United States of America (U.S.): Missed local and global response

For years, a number of organizations in the U.S. have been preparing it and other nations for epidemics and pandemics. The U.S. had displayed the highest capacity of responding to pandemics with the best ranking in Global Health Security (GHS) index (GHS score: 83.5/100). However, current regime’s decision to
dismantle a National Security Council directorate at the White House charged with preparing for pandemics suggested, along with proposed budget cuts for the Center Disease Control (CDC), that it did not see the threat of pandemics in the same way that many experts in the field did.

Therefore, the lack of early policymaking and a heedless attitude by the government toward the epidemic have brought a devastating fate to the country. The U.S. saw a throbbing rise of COVID-19 spread in the total number of cases, daily new cases, and daily new deaths compared to any other country so far.

The index case of locally transmitted COVID-19 in the U.S. appeared the same time South Korea reported its first case. On Jan. 29, the White House Coronavirus Task Force was established to "monitor, prevent, contain, and mitigate the spread" of COVID-19 domestically. In mid-February, the CDC opposed the entry into the U.S. of 14 passengers who tested positive for COVID-19 on the Diamond Princess cruise ship without a 14-day quarantine, but its recommendation was discarded by the U.S. State Department (20).

Like many European countries, the U.S. also relied on the development of herd immunity for the sake of sustaining economic activities at the cost of effective prevention. Although the U.S. imposed a travel ban on China on Jan 31, there was no foresight regarding other countries who were simultaneously emerging as new epicenters of the disease. The government initially disregarded the threat posed by COVID-19, repeatedly claiming the outbreak was under control. An extremely decentralized system of governance and health related policymaking also impaired timely action and implementation of uniform prevention activities across the country (20,21).

Among other causes of policy failures, a manufacturing defect rendered a supply of CDC-developed test kits unusable and regulatory rules prevented other laboratories from using their own kits. Large-scale testing could be available at a very late stage in the United States, and despite surpassing South Korea in the total number of tests performed, the U.S. had performed fewer tests per million than South Korea till mid-April 2020 (21,22).

In early March, advisories were issued to consider the cancellation of large gatherings, working from home plans, and closing of schools. Over the next few weeks, a number of states in the U.S. imposed lockdown measures of various scope and severity. By that time, widespread community transmission had already taken place, especially in the most populated triple states of the eastern coast, with New York City severely affected, becoming the world’s COVID-19 epicenter. Despite reporting the highest number of daily new cases, New York state was the last to impose lockdown measures at a large scale.

Recent plausible policy direction appears to involve a gradual plan to be implemented in phases to lift lockdown restrictions, but only after testing people at a mass level for COVID-19 as well as for antibodies indicating possible immunity, allowing for safe and immune people to resume normal life.

Lessons learned: Lack of a central policymaking authority and neoliberal capitalism of the U.S. has hampered its capacity to timely forecast and respond to the crisis. Due to the rapid spread of the virus in the U.S., potential international aid efforts and coordinated research-based input to defeat COVID-19 though science and evidence have been delayed or compromised.
Table 1. Comparison of demographic and economic indicators of countries included in this review

<table>
<thead>
<tr>
<th>Country</th>
<th>Total population (World Bank 2018)</th>
<th>Population density per Km2 (UN data)</th>
<th>Median age in years</th>
<th>World Bank Ranking</th>
<th>% of GDP spending on health (WHO)</th>
<th>*Health care ranking (WHO)</th>
<th>Score on pandemic preparedness</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>1,439,323,776</td>
<td>153</td>
<td>38.4</td>
<td>Upper middle income</td>
<td>4.98%</td>
<td>144</td>
<td>48.2</td>
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<tr>
<td>Taiwan</td>
<td>23,816,775</td>
<td>673</td>
<td>42.5</td>
<td>High income</td>
<td>6.40%</td>
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<tr>
<td>South Korea</td>
<td>51,269,185</td>
<td>510.96</td>
<td>41.8</td>
<td>High income</td>
<td>7.34%</td>
<td>58</td>
<td>70.2</td>
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<tr>
<td>India</td>
<td>1,380,004,385</td>
<td>464</td>
<td>26.8</td>
<td>Lower middle income</td>
<td>3.66%</td>
<td>112</td>
<td>46.5</td>
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<tr>
<td>Pakistan</td>
<td>220,892,340</td>
<td>277.47</td>
<td>22.8</td>
<td>Lower middle income</td>
<td>2.75%</td>
<td>122</td>
<td>35.5</td>
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<tr>
<td>Iran</td>
<td>83,992,949</td>
<td>52</td>
<td>32</td>
<td>Upper middle income</td>
<td>8.10%</td>
<td>93</td>
<td>37.7</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>34,813,871</td>
<td>16</td>
<td>29.9</td>
<td>High income</td>
<td>5.74%</td>
<td>26</td>
<td>49.3</td>
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<tr>
<td>Italy</td>
<td>60,461,826</td>
<td>206</td>
<td>45.4</td>
<td>High income</td>
<td>8.94%</td>
<td>2</td>
<td>56.2</td>
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<tr>
<td>U.S.</td>
<td>331,002,651</td>
<td>33.67</td>
<td>37.7</td>
<td>High income</td>
<td>17.07%</td>
<td>37</td>
<td>83.5</td>
</tr>
</tbody>
</table>

**2000 WHO report: Assessed performances of health systems based on: overall health improvement, responsiveness, and fairness in financing.**

Table 2. Comparison of COVID-19 statistics across included countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Reporting 1st case</th>
<th>Reporting 1st death</th>
<th>Total cases per million as of May 15, 2020</th>
<th>Currently infected as of May 15, 2020</th>
<th>Total recovered as of May 15, 2020</th>
<th>Total deaths as of May 15, 2020</th>
<th>Total deaths per million as of May 15, 2020</th>
<th>Mortality rate per 100 as of May 15, 2020</th>
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<tbody>
<tr>
<td>COVID-19 Successful Fighters</td>
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<tr>
<td>China</td>
<td>Nov. 17, 2019</td>
<td>Jan. 11, 2020</td>
<td>58</td>
<td>84</td>
<td>78,249</td>
<td>4,634</td>
<td>291</td>
<td>5.58</td>
</tr>
<tr>
<td>Taiwan</td>
<td>Jan. 21, 2020</td>
<td>Feb. 16, 2020</td>
<td>19</td>
<td>27</td>
<td>407</td>
<td>7</td>
<td>0.3</td>
<td>1.58</td>
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<tr>
<td>S. Korea</td>
<td>Jan. 20, 2020</td>
<td>Feb. 19, 2020</td>
<td>1249</td>
<td>723</td>
<td>10,135</td>
<td>264</td>
<td>5</td>
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<td>Indo-Pak sub-continent</td>
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</tr>
<tr>
<td>India</td>
<td>Jan. 30, 2020</td>
<td>March 12, 2020</td>
<td>86</td>
<td>66,089</td>
<td>48,553</td>
<td>3,584</td>
<td>3</td>
<td>3.0</td>
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<tr>
<td>Pakistan</td>
<td>Feb 26, 2020</td>
<td>March 18, 2020</td>
<td>218</td>
<td>32,919</td>
<td>14,155</td>
<td>1,017</td>
<td>5</td>
<td>2.1</td>
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<td>The Middle East</td>
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<tr>
<td>Iran</td>
<td>Feb. 19, 2020</td>
<td>Feb. 19, 2020</td>
<td>1542</td>
<td>21,528</td>
<td>100,564</td>
<td>7,249</td>
<td>86</td>
<td>5.6</td>
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<tr>
<td>Saudi Arabia</td>
<td>March 2, 2020</td>
<td>March 23, 2020</td>
<td>1873</td>
<td>28,686</td>
<td>36,040</td>
<td>351</td>
<td>10</td>
<td>0.5</td>
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<td>EU</td>
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<tr>
<td>Italy</td>
<td>Jan. 31, 2020</td>
<td>Feb. 21, 2020</td>
<td>3770</td>
<td>60,960</td>
<td>134,560</td>
<td>32,486</td>
<td>537</td>
<td>14.2</td>
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<tr>
<td>North America</td>
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<tr>
<td>USA</td>
<td>Jan. 19, 2020</td>
<td>Feb. 29, 2020</td>
<td>4890</td>
<td>1,139,899</td>
<td>381,611</td>
<td>96,184</td>
<td>291</td>
<td>5.9</td>
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Figure 1. Absolute number of COVID-19 testing in the included countries

Figure 2. Trends of increase in total number of COVID-19 patients after the appearance of the index case in the included countries

*Reference time for China is taken as 31st Dec 2019.*

*Figure 2. Trends of increase in total number of COVID-19 patients after the appearance of the index case in the included countries*
**Conclusion**

This review provides conclusive evidence that timely travel bans, early detection of COVID-19 spread through exhaustive and reliable testing, and the establishment of a central, fully authorized body to foresee health trends and implement appropriate containment measures (such as lockdowns) are essential to contain the spread of the virus. It is also determined that countries with autocratic rule such as China, were better able to implement lockdown measures compared to democratic countries. Furthermore, lockdown should not be attempted without prior sustainability systems in place for the public, or they can lead to even more disastrous situation, such as been the case in India. Moreover, active community participation, especially involving religious leaders, dissemination of accurate information generated through reliable data, and
compliance of social distancing can help combat the virus and minimize transmission opportunities. High transmissibility of infection requires an adequate system of surveillance to capture any possibility of future waves of the COVID-19 virus or any future pandemics as well.

References