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Regional lessons from the COVID-19 outbreak in the Middle East: From infectious diseases to climate change adaptation

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HIGHLIGHTS
• Global health threats know no political borders and effective response requires regional collaborations.
• We review the COVID-19 outbreak in Israel, Palestine and Jordan, in the context of regional demography and politics.
• As a lesson from COVID-19, health systems should be better prepared for climate change impacts.
• Stronger economies should take a leading role in developing regional resilience and promoting public health.
• Regional cooperation can be important for promoting cross-border collaborations to address future climate and public health challenges.

GRAPHICAL ABSTRACT

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Abstract
Global health threats including epidemics and climate change, know no political borders and require regional collaboration if they are to be dealt with effectively. This paper starts with a review of the COVID-19 outbreak in Israel, Palestine and Jordan, in the context of the regional health systems, demography and politics. We suggest that Israel and Palestine function as one epidemiological unit, due to extensive border crossing of inhabitants and tourists, resulting in cross-border infections and potential for outbreaks’ transmission. Indeed, there is a correlation between the numbers of confirmed cases with a 2–3 weeks lag. In contrast, Jordan has the ability to seal its borders and better contain the spread of the virus. We then discuss comparative public health aspects in relation to the management of COVID-19 and long term adaptation to climate change. We suggest that lessons from the current crisis can inform regional adaptation to climate change. There is an urgent need for better health
1. Introduction

Diseases in general, and especially infectious diseases, know no political borders. While globally public health responses to COVID-19 and similar outbreaks are coordinated, at the national level, nations are dependent on cross-border collaboration to achieve long-term control of infectious diseases transmission (Bozorgmehr et al., 2020). Such collaboration is especially challenging when there is a political conflict, as evident in the Israeli-Palestinian case. Despite the political conflict and restrictions on movement across borders, previous outbreaks of infectious diseases such as measles, brucellosis and leishmaniasis have shown that Israel and Palestine are one epidemiological unit, which has resulted in cross-border infections and disease transmission (Hermesh et al., 2019; Tulchinsky et al., 1992).

Social, economic and environmental conditions in the Middle East may further intensify infectious outbreaks. High population density and water shortage are among the main limiting factors in facing a disease such as COVID-19, where the key preventive measures are isolation of the sick, physical distancing and personal hygiene (Borgomeo et al., 2020). Many countries in the region, including Jordan and Palestine, are economically disadvantaged with relatively limited health systems. Israel, on the other hand, is considered a more advanced country economically with a relatively strong health system (Table 1). These economic and social gaps result in inequalities, which hinder the ability to effectively combat pandemics and other public health emergencies on a regional basis. Cross-border collaboration may reduce the adverse effect of such gaps will be beneficial for both Jordan and Palestine where resources are insufficient to provide wholly effective public health management. For example, regional monitoring of diseases may help plan seasonal vaccination and allocation of medical resources (Hochman et al., 2021). Such collaboration is made difficult in the East Mediterranean by political conflict. However, in the Eastern Mediterranean the turmoil of political unrest weakens the potential for regional response and collaboration.

The aims of this paper are to 1) review the COVID-19 outbreak status in Israel, Palestine and Jordan, in the context of the regional health systems, demography, politics and geographical borders, 2) discuss comparative public health aspects between the management of COVID-19 and adaptation to climate change, and 3) call for immediate political and scientific regional collaboration in dealing with global threats.

The need to treat Israel and Palestine as one epidemiological unit is evident in the patterns of the COVID-19 outbreak. In the West Bank, on the 5th of March 2020, the first case of COVID-19 was detected in a hotel in Bethlehem, where hotel employees were infected by a group of overseas tourists. Christian tourists, who visit Bethlehem, typically also visit holy sites in Israel during the same trip. Following that first case in Bethlehem, the Palestinian government immediately isolated the district to prevent the spread of the virus. The tourists left the region via Ben Gurion Airport in Israel. The Palestinian government imposed on March 8th a restriction of a 60% closure according to the Government Response Stringency Index (University of Oxford, 2020), which remained in place till October.

In the following two weeks, the increase in COVID-19 cases in the West Bank was very slow. However, numbers started increasing when Palestinian workers began returning home from Israel. Insufficient collaboration and exchange of information between the Israeli and Palestinian governments led to the spread of the virus among the families of the workers and into their towns and villages (Melhem, 2020). Nevertheless, the Israeli and Palestinian Ministries of Health did collaborate regarding medical training and laboratory tests (Jaffe-Hoffman, 2020).

However, the limited Israeli-Palestinian cross-border management of the pandemic that existed in the first wave of COVID-19, came to a halt due to the breakdown in cooperation between the parties over proposed annexation. The Palestinians cancelled COVID-19 testing of Palestinian workers returning home from Israel, and refused to accept tax revenues collected on their behalf by Israel, thus worsening the financial crisis and the ability to combat the outbreak (Besheer, 2020; OCHA, 2020). At such critical moments, it is imperative that Israel and the international community help Gaza and the West Bank to combat COVID-19, where medication, medical specialists and equipment are limited. Israel needs to maintain a steady supply of electricity and fuel so that Palestinian hospitals and the general population can maintain reasonable levels of healthcare treatment and hygiene measures. Indeed, this was recognised to some extent when several important initiatives were taken by the Israeli Ministry of Health to assist the health sector in Palestine in relation to Covid-19, yet the sustainability of these efforts should be encouraged.

The situation in Jordan is different and reflects better ability to seal the countries’ borders, and also its relative stability in a country which faces less political turmoil than Israel and Palestine. Jordan enforced a complete lockdown since 14th March 2020, shortly after a few positive COVID-19 cases were recorded around the country, and later exacerbated by a 450-person wedding in the northern city of Irbid where the bride’s father and sister had contracted COVID-19 causing a sharp spike in cases soon after. The country has imposed stricter measures when compared to most countries, including halting travel between cities, implementing strict emergency laws, deploying the Jordan Armed Forces and police to patrol streets, and enforcing a strict curfew where

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Table 1
Population and health system statistics (Central Intelligence Agency, 2019).

|                | Israel | Jordan | West Bank | Gaza |
|----------------|--------|--------|-----------|------|
| Population     | 8,675.475 | 10,820.644 | 2,900.034 | 1,918.221 |
| Land area km²  | 21,497 | 88,802 | 5640 | 360 |
| Population density (population divided by land area) | 404 | 122 | 514 | 3425 |
| Age distribution (years) | 27% | 33% | 35% | 43% |
| 0–14           | 61% | 63% | 61% | 54% |
| 15–64          | 12% | 4% | 4% | 3% |
| 65+            | 3.1 | 1.4 | 1.3 | 1.3 |
| Physicians per 1000a | 3.2 | 2.3 | 1.3 | 2.2 |
| Life expectancy at birth (years) | 83 | 75 | 76 | 75 |
| Infant mortality per 1000 | 3.3 | 12.8 | 12.8 | 14.9 |
| GDP - per capita (2017 USD) for West Bank and Gaza, 2018 | $36,400 | $9200 | $12,797 | $1458 |
| Annual GDP health expenditure (Central Intelligence Agency, 2019; Palestinian Central Bureau of Statistics, 2019) | 7.3% | 5.5% | 10.7% | 10.7% |
| Water consumption, in liters per capita per day (Palestinian Central Bureau of Statistics, 2020; Water Authority of Israel, 2020; Water Authority of Jordan, 2020) | 165 | 75 | 91 | 83 |

a Average for both West Bank and Gaza.
violators are fined and can face a prison sentence. During the first wave, all travel in and out of the country was banned in an effort to stop the pandemic’s spread, and persons crossing overland borders were tested for COVID-19 and quarantined. It is important to note that 74% of Jordanians approved of these measures (Roya News, 2020), suggesting that the general public has faith in the government (Santucci, 2020).

Such drastic measures would have been much more difficult to implement in Israel and Palestine where the two populations live and work in partially coinciding zones. However, once Jordan eased restrictions, including relaxing most public health restrictions and opening its borders, allowing truck drivers to bring goods from neighboring countries where the outbreak has been much larger, rates of infection increased, and restrictions were re-imposed (Safi and Al-Tahat, 2020).

As of December 1st, 2020, the number of confirmed COVID-19 cases in Jordan was over 21,9430, 15,500 of whom recovered. There were 2751 deaths, a 1.3% case fatality, and 27.63 deaths per 100,000 population, compared to Israel with 336,846 cases, 2865 deaths, 0.9% case fatality, and 32.25 deaths per 100,000 population, and the West Bank and Gaza with 85,647 cases, 732 deaths 0.9% case fatality, and 16.02 deaths per 100,000 population (Johns Hopkins University, 2020). The U.S. Centers for Disease and Control Prevention currently classifies all three countries as “Level 4: Very High Level of COVID-19.”

Despite differences in climate, testing procedures, border restrictions and number of confirmed cases, the first wave trends in March and flattening of the curve in April were similar across Israel, Palestine and Jordan (graphical abstract). In the so called second wave (June onwards), the curves rise similarly in Israel and Palestine with a sharp incline resulted from community spread of the virus, while the Jordan curve flattens until mid-August. This may again indicate that Israel and Palestine are one epidemiological unit. Jordan, on the other hand, has a better ability to seal borders: the airport was still closed and persons crossing overland tested for COVID-19 and quarantined if needed. The reason(s) for the 2-3 weeks lag between Palestine and Israel could be in part due to the fact that Palestinian workers were allowed to sleep over in Israel for 2-3 weeks before returning to their home or perhaps due to a delay in enforcing Palestinian closure measures following the emergence of the second wave in Israel. Gaza, which is sealed due to political reasons, had very few cases until August, followed by a sharp increase in cases, which can be attributed to that fact that as of June the government in Gaza ended the state of emergency and re-opened all facilities including schools and universities. Since November, trends in Covid-19 mortality and morbidity are similar to the region (Safi and Al-Tahat, 2020).

2. Lessons for climate change

COVID-19 and climate change are currently the two biggest global health threats, each exacerbating risks from the other (Salas et al., 2020). Climate change will remain a primary threat to global health in the 21st century, particularly in hotspots such as the Middle East (Cramer et al., 2018; Watts et al., 2019). An increase in temperature and in the intensity, length and frequency of heat waves, alongside a decrease in precipitation, have been observed, and longer summers and shorter winters are expected (Hochman et al., 2018). Indeed, alongside the increase in temperature, it is worth noting that there are no temperature decreases at all for the whole Middle East region in recent decades (Jones and Harris, 2008). In the Middle East, the hot and dry climate combined with urbanization trends, require timely adaptation of cities and nations to protect public health (Frumkin et al., 2020; Negev et al., 2020).

The COVID-19 crisis is a sobering call for the vulnerability of the region, with health inequalities and relatively poor preparedness of health systems. Adapting to these two major health threats in the Middle East requires a similar approach: intersectoral, regional and global collaborations are needed as resources available to each country or sector would not suffice for dealing with the short- and long-term impacts on health and wellbeing. Moreover, preparedness for both future pandemics and climate change shares many similar characteristics and can serve as a leverage for intersectoral reforms. The regional limiting factors for adaptation to climate change are similar to those limiting the response to COVID-19. These are: dense populations, water shortage, economic inequalities, health system deficiencies, limited sharing of data and resources, and limited solidarity. These factors are exacerbated by political conflict. For example, high population density and water shortage hinder the prevention of infectious diseases. Population and water issues have a regional impact, and should be addressed at the regional level. Population growth intensifies the stress on water and the ecosystem in an already sensitive region and does so inequably.

Table 2 presents some comparative public health aspects of COVID-19 and climate change in the Middle East, based on the authors’ discussions and opinions. The regional public health lessons from COVID-19 are relevant for climate change adaptation. These include the urgent need for better health surveillance and data sharing across borders, more resilient health systems that are prepared and equipped for emergencies (OECD, 2020), and recognition by Governments and civil society of the need for solidarity in the face of the challenge of climate change. For countries in the region which are already economically disadvantaged with health systems that are stretched to the limits, COVID-19 directly worsens the ability to deal with health impacts of climate change and other emerging health issues in the long term.

3. Conclusions

It is clear now that countries should prepare for the long-term management of the COVID-19 crisis, and more broadly for future pandemics. This is a good opportunity to reflect on a longer-term vision for public health and sustainability in the Middle East. Public health professionals and scientists have repeatedly recommended society to prepare for pandemics as well as for climate change, but adaptation in the region

| Table 2 | COVID-19 and climate change: comparative public health aspects in the Middle East. |
|---------|----------------------------------------------------------------------------------|
| Morbidity and mortality outlook | COVID-19: Major short-term, unknown long-term | Climate change: Minor short-term, major long-term |
| Preparedness of health systems | COVID-19: Lack of budget, low rate of physicians, nurses and beds per person. These gaps vary across nations | Climate change: Limited strategy, capacity and resources, and need for adaptation of infrastructure |
| Response of government | COVID-19: Quick drastic measures have been adopted. Long-term planning unclear | Climate change: Slow measures are being adopted, mostly recommendations. Long-term planning unclear |
| Data and surveillance | COVID-19: Poor | Climate change: Varies greatly across the Middle East; good coverage in Israel |
| Health inequalities | COVID-19: All sectors of society are influenced. But people living in poverty are undoubtedly the most vulnerable | Climate change: All sectors of society are and will be influenced, but, especially the poor and most vulnerable |
| Regional collaboration | COVID-19: Low, due to political conflict | Climate change: Limited and concerned mainly with water |
| Opportunities for regional collaboration | COVID-19: Reduce regional infection in a region with intensive human movement across borders, share data and plan health care provision jointly | Climate change: Regional sustainability can improve availability of water and food and prevent climate-related morbidity and mortality |
| Political will | COVID-19: High | Climate change: Low |
| Public awareness | COVID-19: Very high | Climate change: Generally low |
has been limited and fragmented. As a lesson from COVID-19, health systems should better prepare for climate change based on the up to date integrated scientific knowledge. The COVID-19 pandemic highlights the fundamental role of the public health sector, as well as the desirability of intersectoral, regional and global collaboration. This crisis offers an opportunity for improving regional collaboration on public health and sustainability despite ongoing conflicts. Israel, which has a stronger economy and greater capacity to deal with both health and climate crises, should take a leading role in developing collaborations for regional resilience.Governments in the region should develop more evidence-based and sustainable public health systems, which can serve as a bridge for the reconciliation and regional solidarity required to combat both infectious diseases and climate change. The scientific community has several important roles in advancing regional resilience to climate change: conduct research on climate change impacts on public health in the Middle East, conduct policy-oriented research to provide evidence on effective means for resilience of communities and health systems, and foster international interdisciplinary scientific collaboration.

CRediT authorship contribution statement
Maya Negev drafted the first version of the manuscript. Yara Dahdal, Haneen Khreis, Assaf Hochman and Nadav Davidovitch contributed to writing and provided comments and suggestions. Mohammed Shaheen, Madi Jaghibir, Pinhas Alpert and Hagai Levine reviewed the text and made comments and suggestions. All authors read the final version of the manuscript and approved it.

Declaration of competing interest
The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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