



Covid-19 Pandemic Situation In The Arab World Till June 11, 2020: Spatial Panorama Obtained Following The Response Plan Implemented

Fatine Hadrya (Professor)

University Hassan First of Settat, Higher Institute of Health Sciences, Settat,
Morocco

Ibn Tofail University, Faculty of Sciences, Kenitra, Morocco

Faiçal El Hattimy (PhD)

Hind Hami (Professor)

Abdelrhani Mokhtari (Professor)

Abdelmajid Soulaymani (Professor)

Ibn Tofail University, Faculty of Sciences, Kenitra, Morocco

[Doi:10.19044/esj.2021.v17n3p176](https://doi.org/10.19044/esj.2021.v17n3p176)

Submitted: 12 October 2020

Accepted: 30 December 2020

Published: 31 January 2021

Copyright 2021 Author(s)

Under Creative Commons BY-NC-ND

4.0 OPEN ACCESS

Cite As:

Hadrya F., El Hattimy F., Hami H., Mokhtari A. & Soulaymani A.. (2021). *Covid-19 Pandemic Situation In The Arab World Till June 11, 2020: Spatial Panorama Obtained Following The Response Plan Implemented*. European Scientific Journal, ESJ, 17(3), 176.

<https://doi.org/10.19044/esj.2021.v17n3p176>

Abstract

Background: The COVID-19 pandemic is a global health emergency of this century. The Arab region is not spared from this scourge. This paper focuses on describing the current epidemiological situation of Coronavirus Disease 2019 (COVID-19) in the Arab world, as of June 11, 2020.

Methods: An observational study of all laboratory-confirmed cases of COVID-19, reported in each Arab country since the appearance of the first case until June 11, 2020, was carried out.

Results: Twenty-two Arab countries have reported a total of 398,954 confirmed cases of COVID-19 and 5,241 deaths, with a cumulative incidence of 950 cases per 1,000,000 population and a cumulative mortality rate of 13 deaths per 1,000,000 population. Of all recorded cases, 240,137 (60.19%) have recovered from COVID-19. The highest incidence rate of COVID-19 was observed in Qatar (26,988 cases per 1,000,000 population) and the lowest

incidence was recorded in Libya (59 cases), Yemen (21 cases), and Syria (10 cases). Kuwait had the highest mortality rate for COVID-19 (67 deaths per 1,000,000 population). Eight countries had a case fatality rate (CFR) less than 1% (e.g., Bahrain, Oman and Qatar). The highest CFR was observed in Yemen (23.01%). Only three countries were ranked first in terms of remission (Morocco, Palestine and Tunisia). The rate of remission did not exceed 20% in Libya, Mauritania, and Yemen.

Conclusion: Some countries were more affected than others in terms of morbidity and mortality. The success of a national response plan against COVID-19 is closely linked to the devotion of health professionals and community engagement.

Keywords: COVID-19, Current Health Situation, Arab Region

Introduction

Background

The novel coronavirus (2019-nCoV) that emerged in the central Chinese city of Wuhan (Chan et al., 2020; WHO, 2020a) spread swiftly around the world in late 2019. The novel virus was identified on January 07, 2020 (WHO, 2020b), and the disease was named COVID-19 by the World Health Organization (WHO) (WHO, 2020c).

The transmission of virus causing COVID-19 from asymptomatic or oligosymptomatic cases makes COVID-19 much more difficult to control and manage. In front of this crisis, the WHO declared COVID-19 a public health emergency of international concern on January 30, 2020 (WHO, 2020d). The WHO urged countries to track and trace every COVID-19 case (suspect case and close contacts of confirmed case) and implement strict quarantine and other containment measures. Many countries and territories around the world implement strategic preparedness and response plan for COVID-19 (e.g., travel restrictions, quarantine measures and public education and awareness).

The coronavirus pandemic represents a great hazard in several Arab countries. Budget deficits and difficulties in securing essential resources can make it difficult to control the COVID-19 (Sawaya et al., 2020). Several Arab countries respond to the need to strengthen surveillance, provide effective rapid response to public health threats, and implement communication strategies for communities and individual's self-protection (Al Nsour et al., 2020).

The strategies that have been adopted for confronting the COVID-19 pandemic varied widely from one country to another. Some Arab countries have implemented diametrically opposed strategies. Consequently, the spread of the coronavirus is disparate in the Arab world. This paper focuses on

describing the current epidemiological situation of COVID-19 pandemic in the Arab world.

Methods

An observational study of all confirmed cases of COVID-19 reported in the Arab region since the appearance of the first case until June 11, 2020, was performed.

Study Region

The Arab region includes 22 countries: Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Palestine, Qatar, Kingdom of Saudi Arabia (KSA), Somalia, Sudan, Syria, Tunisia, United Arab Emirates (UAE), and Yemen. The Arab region is characterized by enormous demographic, geographic, political, and socio-economic diversity (Mirkin, 2010). Its total population accounts for 5.57% of the world's population. Geographically, the region stretches from the Mediterranean Sea in the north to the Horn of Africa and Indian Ocean in the southeast and from the Atlantic Ocean in the west to the Arabian Sea in the east, covering 10.2% of the planet's surface (Elbanna et al., 2020). The Arab countries are characterized by large numbers of young people (UNESCO, 2006; Ben Abdennaji & Chkoundali, 2012).

Data Collection

COVID-19 is a mandatory notifiable disease with requirements for immediate reporting. COVID-19 is followed by an epidemiological monitoring unit in each country. New cases of COVID-19 should be identified, reported, and data included in epidemiological analysis within 24 hours.

In this study, the COVID-19 data shared with the World Health Organization by countries (WHO, 2020e) was used.

Case Definitions

-Suspect Case: A person with acute respiratory infection and a history of travel to or residence in a location reporting community transmission of COVID-19 disease during the 14 days prior to symptom onset; or A person with any acute respiratory infection and having been in contact with a confirmed or probable COVID-19 case in the last 14 days prior to symptom onset; or A person with severe acute respiratory infection and in the absence of an alternative diagnosis that fully explains the clinical presentation.

-Probable Case: A suspect case for whom testing for the COVID-19 virus is inconclusive; or A suspect case for whom testing could not be performed for any reason.

-Confirmed Case: A person with laboratory confirmation of COVID-19 infection, irrespective of clinical signs and symptoms.

-*Contact*: A person who experienced any one of the following exposures during the 2 days before and the 14 days after the onset of symptoms of a probable or confirmed case:

- Face-to-face contact with a probable or confirmed case within 1 meter and for more than 15 minutes;
- Direct physical contact with a probable or confirmed case;
- Direct care for a patient with probable or confirmed COVID-19 disease without using proper personal protective equipment; or
- Other situations as indicated by local risk assessments (WHO, 2020f).

Data Analysis

The collected data were coded into Excel and analyzed using IBM SPSS Statistics (V25). Frequencies and rates for each parameter studied were calculated and then the correlation between cumulative infected cases and cumulative deceased cases was determined with significance set at 5%. The incidence and mortality rates for COVID-19 infections were calculated, using data from the 2018 population census of the countries concerned (WBG, 2020). ArcGIS 10.1 software was used to create maps illustrating incidence, mortality, case fatality rates (CFR), and recovery rates for COVID-19 pandemic calculated for each Arab country from January 29 to June 11, 2020.

Results

Since the first appearance of a confirmed case of COVID-19 in the Arab region at the end of January, the region recorded a total of 398,954 confirmed cases of COVID-19 and 5,241 deaths (CFR=1.31%), with a cumulative incidence of 950 cases per one million population and a cumulative mortality rate of 13 deaths per one million population. Of all reported cases, 240,137 (60.19%) recovered from COVID-19. The total number of active COVID-19 cases was 153,576 (38.50%).

Table 1 presents the total number of confirmed COVID-19 cases, active cases, recovered cases, and deaths reported in each Arab country until June 11, 2020, as well as the number of COVID-19 realized tests.

Table 1. COVID-19 situation updates in the Arab world as of June 11, 2020

Country	First confirmed case	Number of cases (%)	Deaths (%)	Recovered cases (%)	Active cases (%)	Number of tests
KSA	03/02/20	116,021 (29.08)	857 (16.35)	80,019 (33.32)	35,145 (22.88)	1,042,312
Qatar	02/29/20	75,071 (18.82)	69 (1.32)	51,331 (21.38)	23,671 (15.41)	274,793
UAE	01/29/20	40,986 (10.27)	286 (5.46)	25,234 (10.51)	15,466 (10.07)	2,582,000

Egypt	02/14/20	39,726 (9.96)	1,377 (26.27)	10,691 (4.45)	27,658 (18.01)	135,000
Kuwait	02/24/20	34,432 (8.63)	279 (5.32)	24,137 (10.05)	10,016 (6.52)	327,144
Oman	02/24/20	19,954 (5.00)	89 (1.70)	6,623 (2.76)	13,242 (8.62)	129,527
Iraq	02/24/20	16,675 (4.18)	457 (8.72)	6,568 (2.74)	9,650 (6.28)	339,868
Bahrain	02/24/20	16,667 (4.18)	34 (0.65)	11,487 (4.78)	5,146 (3.35)	393,910
Algeria	02/25/20	10,589 (2.65)	741 (14.14)	7,254 (3.02)	2,594 (1.69)	-
Morocco	03/03/20	8,546 (2.14)	212 (4.05)	7,589 (3.16)	745 (0.49)	372,591
Sudan	03/13/20	6,582 (1.65)	401 (7.65)	2,556 (1.06)	3,625 (2.36)	-
Djibouti	03/18/20	4,398 (1.10)	37 (0.71)	2,519 (1.05)	1,842 (1.20)	39,299
Somalia	03/16/20	2,513 (0.63)	85 (1.62)	532 (0.22)	1,896 (1.23)	-
Mauritania	03/13/20	1,439 (0.36)	74 (1.41)	250 (0.10)	1,115 (0.73)	7,654
Lebanon	02/21/20	1,402 (0.35)	31 (0.59)	845 (0.35)	526 (0.34)	101,676
Tunisia	03/02/20	1,087 (0.27)	49 (0.93)	995 (0.41)	43 (0.03)	56,210
Jordan	03/02/20	890 (0.22)	9 (0.17)	670 (0.28)	211 (0.14)	249,431
Palestine	03/05/20	665 (0.17)	5 (0.10)	570 (0.24)	90 (0.06)	44,876
Yemen	04/10/20	591 (0.15)	136 (2.59)	23 (0.01)	432 (0.28)	-
Libya	03/25/20	393 (0.10)	5 (0.10)	62 (0.03)	326 (0.21)	11,765
Syria	03/22/20	164 (0.04)	6 (0.11)	68 (0.03)	90 (0.06)	-
Comoros	04/30/20	163 (0.04)	2 (0.04)	114 (0.05)	47 (0.03)	-
Total		398,954	5,241	240,137	153,576	-

KSA: Kingdom of Saudi Arabia; **UAE:** United Arab Emirates; **-:** No available data

Until June 11, 2020, KSA and UAE performed more than one million diagnostic tests for COVID-19. Many Arab countries, such as Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Morocco, Oman and Qatar, conducted between 100,000 and 500,000 tests and less than 100,000 tests in some countries. For others (six of them), no data were available.

The cumulative number of cases by country indicated that the Gulf countries were the most affected countries by COVID-19 at the time of data collection. The maximum number of cases was registered in KSA (116,021 out of the 398,954 infections). In Africa, Egypt recorded the most cases of COVID-19 infection, with 39,726 cases. Less than 1,000 confirmed cases of COVID-19 were reported in Comoros, Jordan, Libya, Palestine, Syria, and Yemen. It should be noted that Comoros was the last country to report its first case of COVID-19 on April 30, 2020. More than half of coronavirus-related deaths were reported in Egypt (1,377 deaths), KSA (867 deaths), and Algeria (741 deaths). Several countries recorded less than 10 deaths from COVID-19 during the study period, like Jordan (9 deaths), Syria (6 deaths), Palestine (5 deaths), Libya (5 deaths), and Comoros (2 deaths).

On the 240,137 cases in remission, 33.32% were recorded in KSA (80,019 cases), followed by Qatar (21.38%, with 51,331 cases) and UAE (10.51%, with 25,234 cases). These numbers were proportional to the numbers

of confirmed COVID-19 infections in these countries. The fewest number of COVID-19 cases in remission was recorded in Yemen, with only 23 cases out of the total. Four countries, namely KSA, Qatar, Egypt and UAE, had the highest number of active cases exceeding 10,000 patients for each country in a descending order. Furthermore, less than 100 active cases were reported in Comoros, Palestine, and Tunisia.

Figure 1 displays the geographic distribution of confirmed COVID-19 cases and deaths by country.

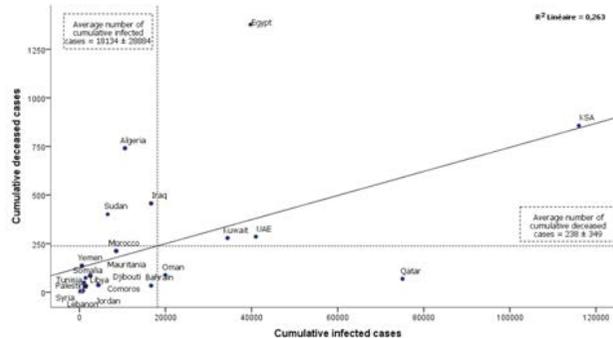


Figure 1. Distribution of COVID-19 cases and deaths in the Arab world till June 11, 2020

Figure 1 shows the positioning of each Arab country in relation to the average number of reported COVID-19 cases and deaths in the Arab region. Egypt, KSA, Kuwait, and UAE were the most affected countries by the coronavirus pandemic that were positioned above the average number of confirmed infections and deaths. Algeria, Iraq, and Sudan were also affected by COVID-19, with a high number of deaths. However, Oman and Qatar had a high number of COVID-19 infections. Therefore, it is quite visual that four groups can be distinguished:

- Group 1 with high cumulative infected cases and high deceased cases,
- Group 2 with high cumulative infected cases and low deceased cases,
- Group 3 with low cumulative infected cases and high deceased cases,
- Group 4 with low cumulative infected cases and low deceased cases.

The correlation between the number of confirmed cases of COVID-19 and deaths was significantly positive ($r = 0.51$; $p < 0.05$).

As confirmed cases of people infected with the novel coronavirus are reported in Arab countries, maps illustrating incidence (Figure 2), mortality (Figure 3), case fatality rates (Figure 4), and recovery rates (Figure 5) for COVID-19 pandemic, calculated for each Arab country, as of June 11, 2020, were created.

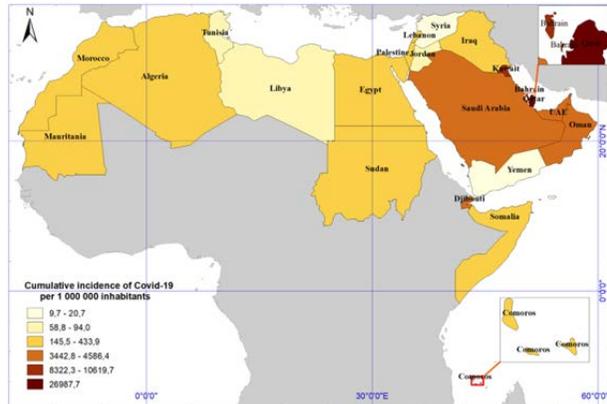


Figure 2. Cumulative incidence of COVID-19 pandemic in the Arab world till June 11, 2020

In the Arab region, Qatar had the highest incidence rate of COVID-19 (26,988 cases per 1,000,000 population), followed by Bahrain (10,620 cases per 1,000,000 population) and Kuwait (8,322 cases per 1,000,000 population). Arab African countries have shown an incidence of less than 500 cases per one million population, except Djibouti (4,586 cases). Low incidence rates were observed in fragile and conflict-affected countries where COVID-19 statistics were underestimated (Libya (59 cases), Yemen (21 cases) and Syria (10 cases)) (Figure 2).

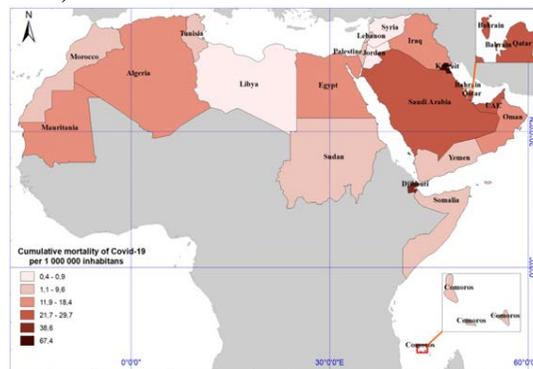


Figure 3. Cumulative mortality for COVID-19 pandemic in the Arab world till June 11, 2020

Kuwait, Djibouti, and UAE had the highest mortality rates for COVID-19, i.e., 67, 39 and 30 deaths per one million population, respectively. Mortality rate of less than 10 deaths per one million population was recorded in 10 countries, namely Lebanon, Morocco, Somalia, Tunisia, Yemen and others (Figure 3).

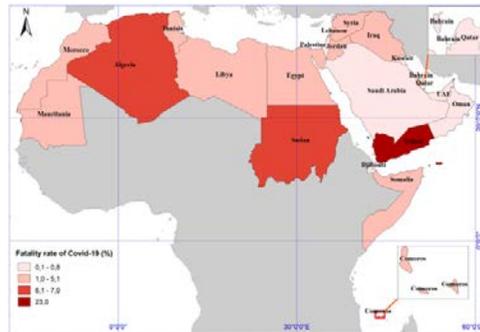


Figure 4. Case fatality rates for COVID-19 pandemic in the Arab world till June 11, 2020

Eight countries had a CFR less than 1% (e.g., Qatar (0.09%), Bahrain (0,20%) and Oman (0,45%)). Other countries had a CFR not exceeding 5% (e.g., Jordan (1,01%), Morocco (2.48%), Egypt (3.47%) and Tunisia (4.51%)). During the study period, the highest CFR was observed in Yemen (23.01%) (Figure 4).

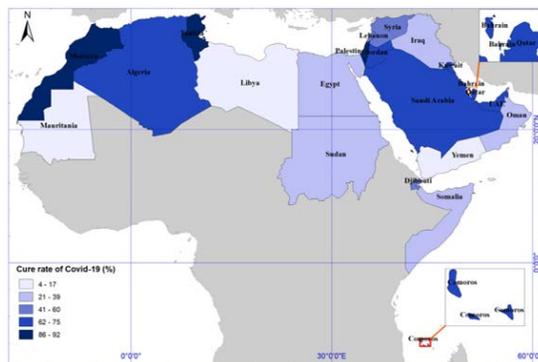


Figure 5. Recovery rates for COVID-19 pandemic in the Arab world till June 11, 2020

Only three countries were ranked first (around 90%) in terms of remission (Morocco, Palestine and Tunisia). The remission rates in the Gulf countries were between 60% and 70%, except Oman (33.19%). Unfortunately, these rates did not exceed 20% in Mauritania (17.37%), Libya (15.78%), and Yemen (3.89%) (Figure 5).

Discussion

The COVID-19 pandemic exerts significant pressure on healthcare systems across the Arab countries and around the world.

From the analysis of the results, the Arab region showed variable response capacities to COVID-19. It is evident that the region is extremely heterogeneous. Societies of Arab region are characterized by enormous demographic, geographic, political, and socio-economic diversity (Sawaya et al., 2020; Elbanna et al., 2020). Each country has prepared, according to its

means (infrastructure, material, economy ...), depending on what is deemed necessary or "prudent" to do by the health situation of the country in the face of COVID-19. The procedure taken by each country, the debates on the treatment to be recommended, among many other reasons, have resulted to different rates of incidence, mortality, and case-fatality. Carelessness and mismanagement have led to new infections and deceased cases.

The low-income countries, like Comoros, Djibouti, Mauritania, Somalia and Sudan, were not prepared to deal with this crisis. However, resource-rich countries, such as Algeria, Egypt, Jordan, Morocco and Tunisia, were affected no less than others countries (UNESCO, 2006; Ben Abdennaji & Chkoundali, 2012). The governments of these countries have taken specific measures to reduce the spread of COVID-19, from simple hygiene measures to confinement and curfew measures. The Gulf countries (Bahrain, Kuwait, Oman, Qatar, KSA and UAE), ranked among the top 50 countries in the world in terms of average income for their citizens, launched a massive COVID-19 screening based on positive experience of South Korea and Germany (UNESCO, 2006; Benaderette, 2020).

In Kuwait, the state had taken quarantine measures 75 days after the first case of COVID-19 appeared. The wearing of face masks in public was mandatory. The U.S. Food and Drug Administration-approved tests allowing rapid (in about 45 minutes) detection of novel coronavirus have been used. The other measures taken were partially respected or insufficient to control the pandemic (Gasana & Shehab, 2020).

In KSA, 30 day before the first appearance of a confirmed COVID-19 case, the first proactive decision was to suspend all flights between the Kingdom and China, then halt entry for Umrah pilgrims and tourists. Precautionary measures have been introduced. At the end of March, the Saudi government offered free healthcare to all citizens and residents, and started mass COVID-19 testing (Algaissi *et al.*, 2020; Yezli & Khan, 2020). Despite all the actions taken, the KSA had recorded significant incidence and mortality rates. The Kingdom is confronted with MERS-CoV infection, nosocomial infections and SARS-CoV-2, which create a great challenge for healthcare workers to combat both coronaviruses (Barry *et al.*, 2020).

Egypt imposed quasi-confinement measures in mid-March 2020. The wearing of face masks became mandatory in late May. Despite limited capacity of the health sector in Egypt, the Supreme Council of University Hospitals has ordered their health facilities to reduce non-emergency admissions by 70% for COVID-19 patients (Al-Monitor, 2020). A healthcare startup offers free phone consultation and conducts awareness campaigns on COVID-19 (OECD, 2020). Egypt had witnessed a rapid surge in the number of COVID-19 infections and deaths. The health system was ill-prepared to

deal with this novel coronavirus (Lynch, 2020; El-Khishin, 2020). Social distancing measures were less stringent (Abdelhafiz *et al.*, 2020; Ozili, 2020).

Morocco followed closely the COVID-19 evolution in the first affected countries by implementing national SARS-CoV-2 preparedness and response plan. The government focused on early case detection, communications and transparency, case management, and contact tracing for COVID-19. It has implemented a number of measures, including international flight suspension and closure of all borders, social distancing, national COVID-19 fund, health emergency status, and mandatory face mask. In addition, Morocco was one of the four countries that had used chloroquine/hydroxychloroquine for the treatment of COVID-19 (Hadrya *et al.*, 2020). The health situation in Morocco was better compared to other countries.

As of June 11, 2020, the world registered a total of 7,273,938 laboratory-confirmed cases of COVID-19 and 413,359 deaths (WHO, 2020g). The Arab world reported 398,954 confirmed COVID-19 cases (5.48% of the total) and 5,241 deaths (1.27% of the total). The first confirmed cases of COVID-19 in the Arab world were imported from the world's COVID-19 pandemic epicenter; France, Iran, and Italy (Sawaya *et al.*, 2020; Lau *et al.*, 2020). In some countries, such as Algeria and Egypt, the health emergency status has been tardily declared, which caused a large increase in the COVID-19 death rate (Sawaya *et al.*, 2020; Lounis, 2020).

Official statistics showed that the pandemic was progressing, but the spread of the new coronavirus seemed to be contained and is not following the trajectory of Europe. African countries were less affected than the others, however, the member states needed to manage the pandemic because of precarity of their systems. Asian countries are facing major political and socio-economic problems but tried to get by on the basis of previous experiences with past epidemics (1985-1990) (Lew *et al.*, 2003; Swar, 2020) in 2002-2003 and since 2012 (Zaki *et al.*, 2012; Algaissi *et al.*, 2020). Currently, restrictions are gradually lifted despite critical conditions linked to COVID-19 in some countries.

The second wave could completely change the picture described in the present study, and therefore a dizzying increase in infected cases, incidence, and mortality is to be expected in the Arab world.

Conclusion

Most Arab countries were strongly mobilized in the response to the COVID-19 immediately after the notification of the first confirmed case of COVID-19 in each state (from January 29 to April 30, 2020). Nonetheless, some countries were more affected than others. The success of a national response plan against COVID-19 is closely related to the devotion of health professionals and community engagement. A national response plan will be

better with improving the quality of data collected on the disease and patients, as well as with the adoption and application of clear and structured procedures in the management of the health crisis caused by COVID -19.

Competing interests

The authors declare that they have no competing interests.

Acknowledgements

This work is part of the PPR-B-FS-MOKHTARI UIT-Kenitra project.

References:

1. Abdelhafiz, A.S., Mohammed, Z., Ibrahim, M.E., Ziady, H.H., Alorabi, M., Ayyad, M. & Sultan, E.A. (2020). Knowledge, Perceptions, and Attitude of Egyptians Towards the Novel Coronavirus Disease (COVID-19). *Journal of Community Health*, 1-10.
2. Al-Monitor (2020). Egypt releases political prisoners amid coronavirus outbreak. https://www.al-monitor.com/pulse/originals/2020/03/egypt-release-opposition-activists-coronavirus.html?utm_campaign=20200330&utm_source=sailthru&utm_medium=email&utm_term=Daily%20Newsletter. Accessed 17 June 2020.
3. Al Nsour, M., Bashier, H., Al Serouri, A., Malik, E., Khader, Y., Saeed, K., Ikram, A., Abdalla, A.M., Belalia, A., Assarag, B., Baig, M.A., Almudarra, S., Argoub, K., Osman, S., Abu-Khader, I., Shalabi, D. & Majeed, Y. (2020). The Role of the Global Health Development/Eastern Mediterranean Public Health Network and the Eastern Mediterranean Field Epidemiology Training Programs in Preparedness for COVID-19. *JMIR Public Health and Surveillance*, 6(1), e18503.
4. Algaissi, A.A., Alharbi, N.K., Hassanain, M. & Hashem, A.M. (2020). Preparedness and response to COVID-19 in Saudi Arabia: Building on MERS experience. *Journal of Infection and Public Health*, 13(6), 834-838.
5. Barry, M., Al Amri, M. & Memish, Z.A. (2020). COVID-19 in the Shadows of MERS-CoV in the Kingdom of Saudi Arabia. *Journal of Epidemiology and Global Health*, 10(1), 1-3.
6. Ben Abdennaji, H. & Chkoundali, R. (2012). Human development and governance: the Arab world at a glance. *New Medit*, 11(2), 29-38.
7. Benaderette, S. (2020). Virus COVID-19 : les biologistes s'arment pour le dépistage de masse. *Option Bio*, 31(613), 1-3

8. Chan, J.F.-W., Yuan, S., Kok, K.-H., To, K.K.-W., Chu, H., Yang, J., Xing, F., Liu, J., Yip, C.C.-Y., Poon, R.W.-S., Tsoi H.-W, Lo, S.K.-F., Chan, K.-H., Poon, V.K.-M., Chan, W.-M., Ip J.D., Cai, J.-P., Cheng, V.C.-C., Chen, H., Hui, C.K.-M. & Yuen, K.-Y. (2020). A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. *The Lancet*, 395(10223), 514-523.
9. El-Khishin, S. (2020). Countermeasures for the COVID-19 Outbreak in Egypt: this time is really different. *ERF Policy Brief*, 51, 1-5.
10. Elbanna, S., Abdelzaher, D.M. & Ramadan, N. (2020). Management research in the Arab World: What is now and what is next? *Journal of International Management*, 26(2), 100734.
11. Gasana, J. & Shehab, M. (2020). Coronavirus Disease (COVID 19): Handling Challenges in Kuwait (Version 1, Original). *Sci*, 2(2), 40.
12. Hadrya, F., Soulaymani, A. & El Hattimy, F. (2020). Space-time COVID-19 monitoring in Morocco. *Pan African Medical Journal*, 35(2), 41.
13. Lau, H., Khosrawipour, T., Kocbach, P., Ichii, H., Bania, J. & Khosrawipour, V. (2020). Evaluating the massive underreporting and undertesting of COVID-19 cases in multiple global epicenters. *Pulmonology*.
14. Lew, T.W.K., Kwek, T.-K., Tai, D., Earnest, A., Loo, S., Singh, K., Kwan, K.M., Chan, Y., Yim, C.F., Bek, S.L., Kor, A.C., Yap, W.S., Chelliah, Y.R., Lai, Y.C. & Goh, S.-K. (2003). Acute respiratory distress syndrome in critically ill patients with severe acute respiratory syndrome. *JAMA*, 290(3), 374-380.
15. Lounis, M. (2020). COVID-19 in Algeria: Chronology and Evaluation of Preventive Actions. *European Journal of Medical and Educational Technologies*, 13(1), em2001.
16. Lynch, M. (2020). The COVID-19 Pandemic in the Middle East and North Africa. In: *The COVID-19 Pandemic in the Middle East and North Africa*. Project on Middle East Political Science (POMEPS) Studies 39, p. 3-6.
17. Mirkin, B. (2010). Population Levels, Trends^[1] and Policies in the Arab Region: Challenges and Opportunities. *Arab Human Development Report*.
<https://www.undp.org/content/undp/en/home/search.html?q=Mirkin+arab+report>. Accessed 17 June 2020.
18. Organisation for Economic Cooperation and Development (OECD) (2020). COVID-19 crisis response in MENA countries. <http://www.oecd.org/coronavirus/policy-responses/covid-19-crisis-response-in-mena-countries-4b366396/>. Accessed 17 June 2020.

19. Ozili, P.K. (2020). COVID-19 in Africa: socioeconomic impact, policy response and opportunities. *International Journal of Sociology and Social Policy*, 1-34.
20. Sawaya, T., Ballouz, T., Zaraket, H. & Rizk, N. (2020). Coronavirus Disease (COVID-19) in the Middle East: A Call for a Unified Response. *Frontiers in Public Health*, 8(209), 1-3.
21. Swar, MO. (2020). COVID-19 and lessons learned from the pandemic wave of meningococcal meningitis (1985-1990). *Sudanese Journal of Paediatrics*, 20(1), 77-88.
22. UNESCO (2006). Rapport de l'UNESCO sur la science - ISBN 92-3-203967-2.
http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/SC/pdf/sc_usr05_introduction_fr.pdf. Accessed 17 June 2020.
23. World Bank Group (WBG) (2020). 2018 population census. <https://data.worldbank.org/indicator/SP.POP.TOTL>. Accessed 12 June 2020.
24. World Health Organization (WHO) (2020a). Pneumonia of unknown cause – China. Disease outbreak news. Emergencies preparedness, response. <http://www.who.int/csr/don/05-january-2020-pneumonia-of-unknown-cause-china/en/>. Accessed 18 April 2020.
25. World Health Organization (WHO) (2020b). Novel coronavirus (2019-nCoV). Situation report – 1. <https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200121-sitrep-1-2019-ncov.pdf>. Accessed 17 June 2020.
26. World Health Organization (WHO) (2020c). Maladie à coronavirus 2019 (COVID-19): questions-réponses. <https://www.who.int/fr/emergencies/diseases/novel-coronavirus-2019/advice-for-public/q-a-coronaviruses#:~:text=symptomes>. Accessed 18 April 2020.
27. World Health Organization (WHO) (2020d). Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV). [https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-\(2005\)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-\(2019-ncov\)](https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov)). Accessed 17 June 2020.
28. World Health Organization (WHO) (2020e). Regional office for Africa. Coronavirus (COVID-19). <https://www.afro.who.int/health-topics/coronavirus-covid-19>. Accessed 12 June 2020.
29. World Health Organization (WHO) (2020f). Coronavirus disease 2019 (COVID-19). Situation Report-61. <https://www.who.int/docs/default->

- source/coronaviruse/situation-reports/20200321-sitrep-61-covid-19.pdf?sfvrsn=ce5ca11c_2. Accessed 12 June 2020.
30. World Health Organization (WHO) (2020g). Health Emergency Dashboard WHO (COVID-19). <https://covid19.who.int/>. Accessed 17 June 2020.
 31. Yezli, S. & Khan, A. (2020). COVID-19 social distancing in the Kingdom of Saudi Arabia: Bold measures in the face of political, economic, social and religious challenges. *Travel Medicine and Infectious Disease*, 101692.
 32. Zaki, A.M., van Boheemen, S., Bestebroer, T.M., Osterhaus, A.D., Fouchier, R.A. (2012). Isolation of a novel coronavirus from a man with pneumonia in Saudi Arabia. *The New England Journal of Medicine*, 367(19), 1814-1820.