The COVID-19 mortality rate: A comparison between Middle East and top-ten most affected countries

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Abstract

Although it seems that the COVID-19 is not as fatal as SARS and MERS, its highly contagious nature have made it a more serious health concern. This new pandemic has affected all aspects of human life, and due to the vast diversity in the nations around the world, it is not possible to adopt a single integrated policy aginst the disease. It is deemed that the outbreak of the COVID-19 potentially can affect the geopolitical dynamics of the world. Thus, considering the unique context of the Middle East, and its impact on many other countries, here we tried to compare the case fatality rate (CFR), the disease rate (DR), and the crude death rate (CDR) for all the countries located in this region with the top-ten most affected until April 25, 2020. Special attention was also paid to discuss the data obtained in our study with the existing literature. We aimed to explain the effect of significant cultural and ideological differences, the enormous differences among the health systems of the countries, and the efficacy of the governmental mitigation policies on the variability of the epidemiological factors among the 25 countries included in our list. Speed of action in disease control and high level of testing in Germany, a sizable population of homeless people in the U.S., the concurrencey of Influenza A, Influenza B, and the COVID-19 in France, a relatively low hospital capacity in the U.K., the numerous mass demonstrations in Spain, the effect of tough sanctions against Iran, the high number of tourists traveling to Turkey, the coincidence of Middle East respiratory syndrome (MERS) and COVID-19 in Saudi Arabia, the complicated military dominance in Egypt, as well as the effect of religious mass gathering in the Muslim countries were some factors which helped us to explain our results.

KEYWORDS

the case fatality rate, COVID-19, crude death rate, disease rate, Middle East, the recovery rate

1 INTRODUCTION

There are pieces of evidence indicating that the pandemic- and epidemic- related mortalities can vary considerably among different countries and populations. Genetic profile, age, sex, and immunological signature are among the essential factors that affect mortality rate in a disease outbreak (Luk, Gross, & Thompson, 2001; Shanks, Wilson, Kippen, & Brundage, 2018; Wu et al., 2018). Such a variation also occurs in the demographically similar groups in which measures of the health systems, type of the quarantine approach, thoroughness of enforcement (Crosby, 2003; Dennis Shanks et al., 2010; McLeod et al., 2008; Shanks et al., 2018), as well as social and economic contexts of a particular society (Curtis, 2004) are the critical determinants of the mortality rate. In any pandemic and epidemic, knowing about these determinants can help to take a more efficient control of the disease and reduce the unwanted disease burden; this is more critical in the case of new emerging pandemics and epidemics such as the recently emerged COVID-19.

From the first report of infection on December 31, 2019 in Wuhan City, Hubei province in China until the time of this writing (April 25, 2020), 210 countries and territories around the world and two international conveyances are affected by the Coronavirus 2 (SARS-CoV-2). Earlier on March 11, 2020, the World Health Organization (WHO) declared that the new COVID-19 is the latest pandemic of the world (Cucinotta & Vanelli, 2020; Stoffel et al., 2020). Until now, based on the first published reports on the epidemiological factors and mortality rates of the COVID-19 outbreak, it is evident that, like many other pandemics, the COVID-19 mortality also varies noticeably among different nations around the world (Grech, 2020; Lai et al., 2020; Q. Ruan, Yang, Wang, Jiang, & Song, 2020; Shojaee et al., 2020; Sun, Qiu, Huang, & Yang, 2020). As a noteworthy variation, we can mention the difference in the total confirmed death rate between the U.S., some European countries (e.g., Italy, Spain, France, and the U.K.), and the Middle East.

The Middle East, known as an oil-rich region, consists of about 17 countries located at the confluence of three continents (i.e., Asia, Africa, and Europe). This region has its specific cultural behavior and economic context, quite different from the U.S. and the Europian countries. Most of the people living in this region are Muslim, although Jew and Christians have also a noticeable population. Ethnic diversity is another noticeable catachrestic of this region, as well, where Arabs, Persians, Turks, and Kurds are the most populous inhabitants. Talking about these differences is not the topic of this writing, although some details can be found in the following references (Badr, Abdallah, & Mahmoud, 2005; Inhorn, Birenbaum-Carmeli, Tremayne, & Gürtin, 2017; Latzman et al., 2015; Madadin, 2015; Ourfali, 2015; Van Horne, Belkacem, & Al Fusail, 2013). As stated before, all these differences can affect the epidemiological features of any outbreak. Hence, it seems that in the new emerging COVID-19 pandemic, a comparison of the disease-related mortality rate between the Middle East region and the top ten most affected countries (the U.S., Spain, Italy, France, Germany, the U.K., Turkey, Iran, China, and Russia) can provide some helpful information. Moreover, it is deemed that the new pandemic has the potential to affect the geopolitical dynamics, which, in the case of the Middle East, is of a global concern (Woertz, 2020). At the time of this writing (April 25, 2020), Iran and Turkey were the only Middle East countries that were placed in the top ten most affected list. With this introduction, in the present study, we aimed to compare the COVID-19 mortality rates between the Middle East and top ten most affected countries using mortality-related epidemiolocal terms along with a comprehensive literature analysis.

MATERIALS AND METHODS

2.1 Data collection

The number of total confirmed cases, total confirmed deaths, and the overall recovered persons form COVID-19 until April 25, 2020 for the Middle East and top ten most affected countries were obtained from the Worldometer, which is a reference website that provides real-time statistics on different topics (https://www.worldometers.info/coronavirus/). All these data were further used to extract some of the related epidemiological terms as follows.

2.2 Calculation of the central mortality-related epidemiological terms

Based on the data obtained from the Worldometer, the three central mortality-related epidemiological terms (i.e., CFR, DR, CDR, as well as the recovery rate (RR).were calculated as follows:

$$\text{(Eq. 1)} CFR = \frac{\text{Number of deaths in a given time period}}{\text{Number of total confirmed cases in the same time period}} \times 100$$

$$\text{(Eq. 2)} DR = \frac{\text{Number of total confirmed cases in a particular population}}{\text{Total size of the population}} \times 100$$

$$\text{(Eq. 3)} CDR = \frac{\text{Number of deaths in a particular population}}{\text{Total size of the population}} \times 100$$

$$\text{(Eq. 4)} RR = \frac{\text{Number of recovered persons}}{\text{Number of total confirmed cases}} \times 100$$

Microsoft Excel 2016 was applied to obtain the relevant diagrams.

3 RESULTS AND DISCUSSION

Case fatality rate (CFR), also known as case fatality risk, is an epidemiological term which is used to describe a disease severity. CFR is calculated by dividing the number of deaths from a particular disease by the number of confirmed diagnosed cases in a specific duration. Hence, CFR certainty is highly affected by the accuracy of the reports provided by the corresponding national authorities. CFR is also varying substantially among different populations. As mentioned, many factors, including age and gender distribution, specific genetic profile, as well as the economic power of a particular community, which can both directly and indirectly influence the health system measures, can affect the CFR data. Considering the fact that the CFR reflects the hospitalization and lockdown requirements (especially in outbreaks, epidemics, and pandemics), this uncertainty is not desirable since having precise information about the CFR data is very critical to determine a disease burden in a country (Backhaus et al., 2016; Battegay et al., 2020; Rajgor, Lee, Archuleta, Bagdasarian, & Quek, 2020; S. Ruan, 2020).

Recently, Stafford published an article in the British Medical Journal (BMJ) to discuss the low COVID-19-associated mortality rate of Germany among the European countries. The author has discussed the statistics using the CFR data. This report reflects some other features and determinants that can affect the CFR data among countries. Stafford gathered the information until April 2 and showed that although at that time Germany was suffering from the highest number of COVID-19 infection (73533 confirmed cases), its COVID-19-related fatality rate (1.2%) was remarkably lower than those of other European countries such as Italy (11.9%), Spain (9%), Netherlands (8.6%), the U.K. (8%), and France (7.1%). According to Stafford, this difference can be attributed to the Germany's early and high level of testing, which was conducted in a large population. Speed of action in disease control, lockdowns, and quarantine policies are mentioned as the other determinants involved in the low fatality rate in Germany (Stafford, 2020). These findings were also confirmed in our study. According to Table 1, at the time of this writing, Germany was ranked fifth regarding the number of total confirmed cases (154999), while this country was ranked eighth based on the CFR values (CFR: 3.72%).

The long incubation period of the COVID-19 is another factor that some researchers believe in its related impact on the CFR data. This has inspired debates in the scientific literature. For example, Baud et al. questioned the accuracy and usability of the COVID-19 CFR values. They argued that for any given duration, the dead patients were infected earlier, with a time-lag bias of about 14 days, which was not included in the calculation of the CFR values (Baud et al., 2020). This argument was strictly rejected by Lipsitch (Lipsitch, 2020) and corrected by Spychalski and Kim (Kim & Goel, 2020; Spychalski, Blazynska-Spychalska, & Kobiela, 2020).

At the time of this writing (April 25, 2020), 2864370 confirmed cases and 199507 deaths from COVID-19 were reported worldwide (i.e., CFR value of 6.96%). We know that this is a rough estimation since the CFR values vary from country to country, mainly due to the national and regional differences in the health care and political systems, and variations in the prevention, control, treatment, and mitigation policies (Fig. 1) (S. Ruan, 2020). The CFR values for the Middle East and the top ten most affected countries on April 25, 2020 are presented in Table 1. As can be seen in this table, France has the highest CFR value (13.92%) for the COVID-19 infection,followed by the U.K.) CFR:13.60%) and Italy (CFR: 13.46%), respectively. However, regarding the total confirmed cases, these three countries are placed in the fourth, sixth, and third places.

Among the top ten most affected countries, the U.S. is the leading country regarding the total confirmed cases (925231), although its CFR (5.64%) is not too high in comparison with the world's record (CFR: 6.96%) and many other countries. Until now, New York City (N.Y.C.) is known as the most affected region in the U.S.. Recently, Bashir et al. described a strong correlation between some climate indicators and the outbreak of COVID-19 in N.Y.C. They showed that air quality and average temperature could significantly affect the

mortality rate among the N.Y.C. citizens, while the minimum temperature and also air quality affected the total number of confirmed cases. Hence, they recommended that the green environment support policies can help to fight the COVID-19 (Bashir et al., 2020). At present, there is not sufficient data to make a more general conclusion based on our observations, but we can mention a report published by Tsai and Wilson. In a comment by Tsai and Wilson, the authors reported the impact of the sizable population of homeless people who are living in North America. They believed that these homeless people could be efficiently involved in the transmission of the COVID-19 all over the country, which would result in an increased number of infected people (Tsai & Wilson, 2020).

Until the time of this writing, the highest number of COVID-19 CFR was recorded for France, although in terms of the total confirmed cases, this country was ranked fourth in the list of the top ten most affected countries (Table 1). The accuracy of these kinds of estimations for the COVID-19 in France has also been questioned in a research by Boelle et al. The authors focused on the co-incidence of Influenza A (H1N1), influenza B, and COVID-19 in France. They believed that this concurrencey had affected the accurate identification of the COVID-19 casesin this country (Boelle et al., 2020). In another research by Ghanchi, the author focused on the psychosocial and political factors which might result in a severe outbreak in France. According to Ghanchi, although France was the third European country that called for a nation-wide controlling policy against COVID-19, discordance between the national authorities and public perception weakened the effectiveness of the government and health system measures. The author also believed that this discordancy, along with populist opinions and local municipal elections exacerbated the inefficiency of the government measures in this country (Ghanchi, 2020).

After France, among the top ten affected countries, the U.K. was placed in the second position (Table 1) regarding the CFR values. There are several reports that have focused on the mathematical modeling of the COVID-19 spread in the U.K. Many of these reports have highlighted the efficacy of contact tracing and rigorous social distancing in preventing an uncontrollable outbreak of the COVID-19 in this country (Alwan et al., 2020; Ferguson et al., 2020; Keeling, Hollingsworth, & Read, 2020). In a correspondence published by Alwan et al., the authors referred to the study of Remuzzi and Remuzzi in which a comparison between the hospital beds per 1000 population indicated that the U.K. capacity was lower than Italy, France, and Germany. Alwan et al. stated that this report showed that more rigorous policies had to be applied to the U.K. (Alwan et al., 2020; Remuzzi & Remuzzi, 2020), while the U.K. stopped its social distancing and rigorous contact tracing strategies in the early days of the epidemic (Pollock, Roderick, Cheng, & Pankhania, 2020). An enormouly negative mental health impact of these policies on the U.K. inhabitants may be one of the dozens of reasons (Williams, Armitage, Tampe, & Dienes, 2020). At the time of this writing, the rigorous controlling policies were retaken after the explosion of the confirmed cases.

In the list of the top ten most affected countries, Italy was ranked third both in terms of the total number of the confirmed deaths and the CFR value (Table 1). In a study by Rubino et al., the authors compared the fatality rates between Italy and China. They raised doubts about the noticeable difference in the CFR values between these two countries. Like many other researchers (Lazzerini & Putoto, 2020), Rubino et al. believe that the CFR values are not reliable enough to make a definite conclusion. They mainly questioned the effect of the testing quality and quantity on the CFR data, which could be an essential source of uncertainty in the CFR values. As an example, they noticed the shortage of nasopharyngeal swabs in Italy in comparison with China. Another interesting point mentioned in the research of Rubino et al. is comparison of the total confirmed deaths between China and Italy. They believe that although the CFR values are not reliable, we can infer much more supporting information based on the total confirmed deaths. Similar to our research, they reported that the total number of confirmed deaths was also higher in Italy than many other countries. Rubino et al. believed that the demographic features of Italy could explain this observation since Italy has one of the oldest populations in the world, which is more susceptible to COVID-19-related death (Rubino, Kelvin, Bermejo-Martin, & Kelvin, 2020).

According to the Table 1, Spain is the second most affected country in the world and is ranked first given the DR and the CDR values. Perez-Bermejo et al. discussed the fast, unpredictable territorial expansion

of the COVID-19 in the second week of a nation-wide isolation. They noticed the astounding doubling of the death toll, which occurred just in three days. They stated that inefficient governmental intervention, numerous mass demonstrations, and the high number of Italian travelers to Spain (during the golden time for fighting the disease outbreak) were the major causes of such a territorial expansion of COVID-19 in Spain (Perez-Bermejo & Murillo-Llorente, 2020).

In the case of the last country of the top ten most affected list (Russia), the lowest CFR value (0.09%) along with the low RR value (8.11 %), is drawing the attention. The low CFR value of Russia has also previously been reported by Jouzdani (Jouzdani, 2020). In another study by Yuan et al. on April 9, 2020, which was based on the statistical analysis of the daily reports of confirmed cases, Russia was introduced as a country in which no clear perspective coulds be deemed about the state of its COVID-19 control (Yuan, Di, Gu, Qian, & Qian, 2020). We could not find any documentation to directly explain the low recovery rate of the COVID-19 in Russia, although there are a few general reports on the recovery duration of the COVID-19. For example, Xu et al. described some of the host factors which can affect the SARS-CoV-2 RNA shedding and hence influence the duration of the disease detection as well as its clearance. This study assessed and discussed, the effect of sex, age, hypertension, severe illness background, delayed hospital admission, corticosteroid treatment, and invasive mechanical ventilation on the SARS-CoV-2 RNA shedding (Xu et al., 2020).

Among the Middle East countries (Table 1, Figure 1 b), given the CFR values, Egypt (CFR: 7.18), Syria (CFR: 7.14), and Iran (CFR: 6.32) took the first three positions, respectively. Hence, the top three CFR values of the Middle East are higher than the U.S. (CFR: 5.64), Germany (CFR: 3.72), China (CFR: 5.59), and Russia (CFR: 0.90). On the other hand, Turkey, Iran, and Saudi Arabia (with 104912, 88194, 15103 total confirmed cases, respectively) are the top three most affected countries in this region. According to the total number of confirmed cases, Yemen and Syria (one and forty-two case, respectively) are placed at the bottom of the list, with a noticeable gap with the rest (Table 1); this may reflect a low testing capacity for these two war-torn countries.

The United Arab Emirates (U.A.E.) is known as the first country, affected by the COVID-19 in the Middle East. The first confirmed case of the U.A.E. was reported on January 29, 2020. Sixteen days later, on February 19, 2020, Iran announced its first report of the infection, when two persons in Qom city (which is the seventh-largest metropolis of Iran located near the capital, Tehran) were diagnosed with COVID-19. Soon after, until April 19, 2020 (when Turkey's COVID-19 cases overtook Iran), Iran was known as the epicenter of the COVID-19 in the Middle East (Aminian, Safari, Razeghian-Jahromi, Ghorbani, & Delaney, 2020; Zhuang et al., 2020). During this time, several countries such as Iraq, Afghanistan, Pakistan, Bahrain, Kuwait, New Zealand, Canada, and India reported that they have discovered the COVID-19 infection among travelers from Iran. Until March 2, 2020, Iran also kept the second position of the world's list of COVID-19 confirmed cases after China (Costa, 2020; Gabutti, d'Anchera, Sandri, Savio, & Stefanati, 2020; Zhuang et al., 2020).

On April 25, 2020, 89328 confirmed cases and 5650 deaths of COVID-19 were reported by Iran. These data correspond to the CFR value of 6.32%. Previously, other researches have also reported the CFR values of COVID-19 for Iran. Among them is the report of Hoseinpour Dehkordi, who calculated and used CFR data to compare the policies and behaviors of some different countries in combating the COVID-19. On March 3, 2020, (the time of the Hoseinpour Dehkordi's report), the CFR of COVID-19 for Iran was around 4.4% (Hoseinpour Dehkordi, Alizadeh, Derakhshan, Babazadeh, & Jahandideh, 2020), which is lower than today's value (6.32%). Such an increase is very questionable and must be discussed deeply. This increase in the CFR values has also been reported for many other countries. About two mounts ago, many researchers believed that the actual CFR value for COVID-19 was about 2-3%, which is far from today's reality. At that time, any CFR values which were reported higher than 2-3% were attributed to the low testing capacity as well as testing reliability in the early days of the disease, which comes with excessive deaths vs. confirmed cases.

Due to the tough sanctions against Iran, any study on the spread of the COVID-19 in this country can be of particular interest. Hence, although Iran's health system is among the most resilient in the Middle

East, it has been affected considerably by these sanctions and their associated total economic lockdown. The politically based economic collapse in Iran has directly or indirectly affected all aspects of the health measures (from prevention to treatment), applicability of the nation-wide mitigation policies, and inter-country travel restrictions. This fact can somehow explain the relatively high fatality rate in Iran (Raoofi, Takian, Olyaeemanesh, Haghighi, & Aarabi, 2020; Takian, Raoofi, & Kazempour-Ardebili, 2020). Like many other countries, the reliability of the data reported on the COVID-19 confirmed cases and deaths is questioned by some researchers (A. Tuite et al., 2020; Zhuang et al., 2020). For example, Imai et al. believed that the number of confirmed cases might be under-reported in the early days of the outbreak in this country due to the shortage of diagnostic kits (Imai, Dorigatti, Cori, Riley, & Ferguson, 2020). There are also some other reports (e.g., the report of Mounesan et al.) published on the strength of Iran's health system despite the pressure of the U.S. sanctions (Mounesan, Eybpoosh, Haghdoost, Moradi, & Mostafavi, 2020). An outstanding opportunity for Iran to fight the CIVID-19 spread was the coincidence of Iran's early days of the outbreak with the Persian' new year holiday (Nowruz), which began on March 20, 2020 and helped the government in the nation wide isolation. It seems that all these factors have contributed to the declining rates of total confirmed cases as well as total confirmed deaths in Iran, happening at the time of this writing.

At the time of this writing, Turkey (the Eurasian country of the Middle East) was ranked first among the Middle Eastern countries regarding the the total number of confirmed cases (104912); although its CFR value (2.48%) was lower than Egypt (7.18%), Syria (7.14%), Iran (6.32%), Iraq (5.04%), and Lebanon (3.16%). The first case of infection for this country was reported on March 11, 2020, i.e., twenty-one days after Iran's announcement of the disease on February 19, 2020 (Table 1). Studing the COVID-19 outbreak in Turkey also may be interesting because of its Mediterranean culture and the high number of tourists traveling to this country. Turkey is the sixth largest tourist destination in the world. It is also one of Iran's neighbors which is introduced as a critically infected country in the Middle East (Khan & Karataş, 2020). Hence, strict international control policies seem to be more crucial for this country to fight against the COVID-19 pandemic (PETERSEN & GÖKENGİN, 2020). The variable climate of Turkey encouraged Şahin to investigate the effect of meteorological parameters on the spread of COVID-19 in this country. According to Şahin, there is a strongly positive correlation between the temperature, wind speed, and infection rate of COVID-19 (Şahin, 2020). Similar findings have also been reported by other researchers from different countries around the world (Chen et al., 2020; Ma et al., 2020; Wang et al., 2020).

Saudi Arabia (the largest country of the Middle East) was the third most affected country according to the total confirmed cases of the COVID-19 (15102) at the time of this writing. The relatively low DR (0.04%) and CDR (0.04%) values for this country are worth noting. There are two critical points about the COVID-19 outbreak in Saudi Arabia. First, before the COVID-19 outbreak, this country was plagued by another respiratory syndrome known as the Middle East respiratory syndrome or MERS, which has continued untill now. The pathogen of the MERS (MERS-CoV) is very similar to that of the newly emerged COVID-19 (SARS-CoV-2); hence, these two infections have similar presentations, which bring about a more challenging situation for the health systems. Today, the majority of the MERS confirmed cases are reported in Saudi Arabia, while the number of this infected cases is continually growing due to lack of appropriate vaccination strategies (Barry, Al Amri, & Memish, 2020; Degnah et al., 2020; Mohamed, Aleanizy, Alqahtani, Alanazi, & Mohamed, 2020). The second point is the religious mass gathering events, which is very prominent in the Muslim countries. The holiest Muslim shrine (Kaaba) is located in Mecca, Saudi Arabia; hence many Muslims traveling to this country. Saudi Arabia is also known for the largest annual religious mass gathering in the world. Thus, this religious mass gathering is considered as another challenge for Saudi Arabia to fight against the new COVID-19 outbreak (Al-Tawfiq & Memish, 2020).

In contrast to Russia (among the top ten most affected countries), Egypt (the most populous country of the Middle East) shows relatively high values for both CFR and RR among the Middle East countries (Table 1). Although more specific research must be performed to explain this observation, again, we believe that the study of Xu et al. can provide some clues to explain the observations in Egypt (Xu et al., 2020). Exploring the data for the COVID-19 outbreak in Egypt is interesting since this country is the only African country in

the Middle East, the first African country reported for COVID-19, and according to the published reports, its economy has been dramatically affected by the new outbreak (Breisinger, Abdelatif, Raouf, & Wiebelt, 2020; A. R. Tuite et al., 2020). According to Ardovini, a lack of suitable preparation in many states of Egypt and the complicated military dominance in Egypt (which began in 1952) have made the control of the new outbreak challenging for this country (Woertz, 2020).

Until April 25, 2020, Syria has reported only forty-two confirmed cases, three confirmed deaths, and six recovered persons. These data correspond to the almost zero values for both DR and CDR, which is questionable and dubious. Recently, Gharibah and Mehchy published an article focusing on the Syria's healthcare capacity in response to fight against the COVID-19 outbreak. They believe that the health system of Syria is very fragile due to the long-term civil war. They also think that the outbreak of the COVID-19 has begun before the first officail announcement of the government (Gharibah & Mehchy, 2020). Published reports have also described a similar situation for Yemen (Daw, 2020a) (with only one confirmed case who recovered until April 25, 2020). Accordingly, the researchers warn that the situation of these two countries not only can result in a disastrous condition for their citizens but also can exert a severe impact on their neighboring countries (Daw, 2020a, 2020b).

At the time of our investigation, we find that Jordan (RR: 73.92%) and Iraq (RR: 70.49%) had recorded for the highest RR and relatively low DR and CDR values among the Middle Eastern countries. (Table 1). Iraq is among the countries enormously affected by the COVID-19 outbreak in its neighbor, Iran. It is worth noting that, like Saudi Arabia, Jordan has been also under the pressure of the MERS outbreak at the time of the new COVID-19 spread (Memish, Perlman, Van Kerkhove, & Zumla, 2020). However, unfortunately, we could not find any supporting document to describe our observation on the high recovery rate of the COVID-19 in these two countries.

As mentioned in the method section, DR is defined asthe ratio of the number of confirmed cases to the total size of a population. It is worth mentioning that the DR is not considered in the CFR calculation. Hence, although CFR is an essential epidemiologic term for evaluating the disease burden and adopting suitable health measures, it must be considered along with the DR (Hadler et al., 2010). For the COVID-19, this concept has been discussed in a report by Elisabeth Mahase. Given the official reports until February 17, 2020, Mahase compared the lethality of the COVID-19 (fatality rate 2%) with SARS (fatality rate 10%) and MERS (fatality rate 34%). Comparision of the fatality rates of these three diseases shows that the COVID-19 is not as lethal as either SARS or MERS, but the concern is the high DR of COVID-19. As Mahase noticed, on February 17, 2020, the number of COVID-19 deaths exceded both SARS and MERS (1871 and 1632, respectively). However, such a lethality for COVID-19 is related to the high DR of this new disease (Mahase, 2020). Accordingly, in the present study, we also tried to cover this concept while discussing the CFR values in the text.

4 SUMMARY LAYOUT AND CONCLUSION

Like any other contagious disease, spread dynamic and disease burden of the new pandemic of the highly contagious COVID-19 vary among different populations. The COVID-19 outbreak has affected all aspects of human life worldwide; hence, discussing the country to county variations of the COVID-19 outbreak can help to take more effective measures to fight against this new pandemic. According to the previously published reports, it seems that the new COVID-19 is not as lethal as its counterparts, i.e., SARS (Severe acute respiratory syndrome) and MERS. However, the higher contagious nature of the COVID-19, followed by a higher DR value of this pandemic, in comparison with the previous acute to respiratory syndromes, has led to a more difficult situation these days.

Considering the unique context of the Middle East, which can affect many other countries in the world, in this research, we focused on discussing any variations in the mortality-related epidemiological terms between all the countries located in this region and the top ten most affected countries worldwide. For this comparison,

we did best to consider the CFR, the DR, the CDR, and the RR values together and avoid any probable bias. We also tried to benefit from the previously published reports. Hence, a comprehensive literature review was performed, which helped a lot to come to a better understanding of the data we obtained in this research. In brief, our findings showed that, to the best of our present knowledge, the key factors causing the tody's country to country variations, in terms of the epidemiological indicators of the COVID-19, mainly originated from the significant cultural-ideological differences, the enormous differences between the health systems of countries, and the efficacy of the governmental mitigation policies.We also believe that many biological factors, including the regional genetic profile, age, sex, and immunological signature, can dramatically influence the epidemiological variations of the COVID-19. However, there was no sufficient information on this aspect at the time of this writing.

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ETHICAL STATEMENT

The authors confirm that they have adhered to the ethical policies of the journal of Transboundary and Emerging Diseases.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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DATA SHARING AND ACCESSIBILITY

The data that support the findings of this study were openly available from on the Worldometer, (https://www.worldometers.info/coronavirus/) on April 25, 2020.

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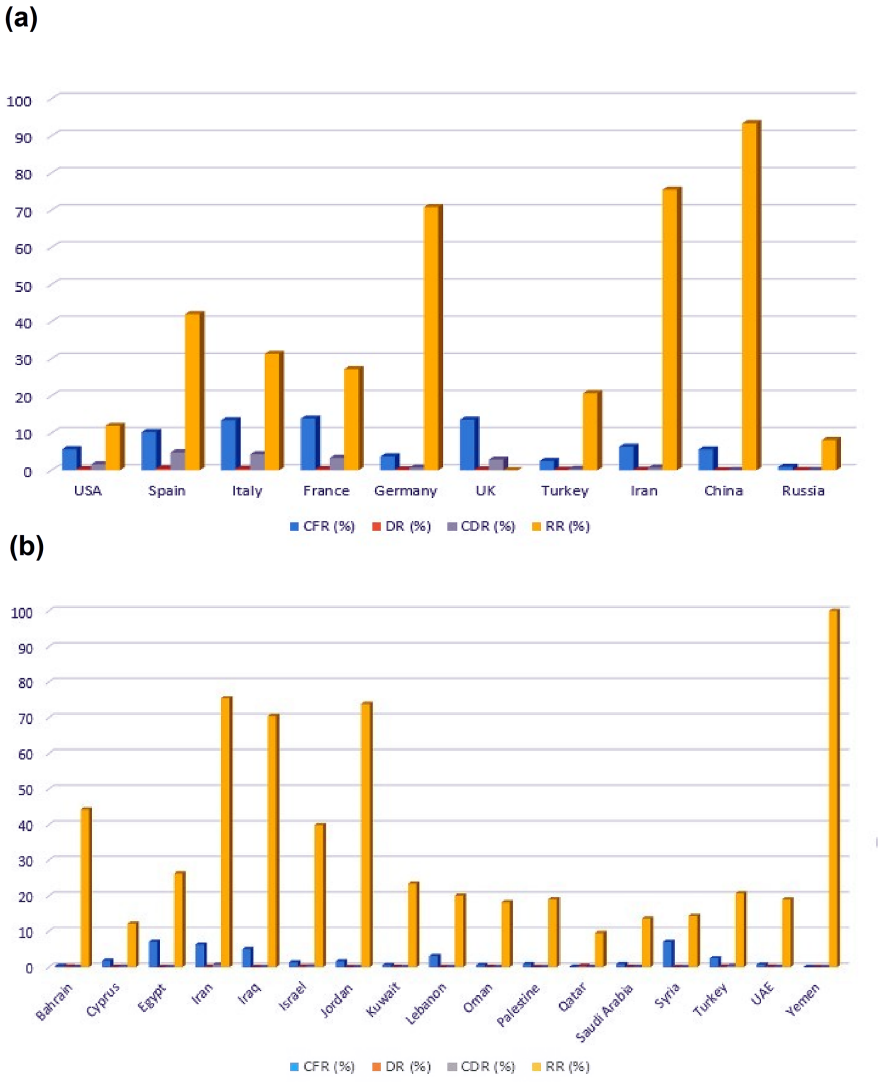
FIGURE AND TABLE LEGENDS

FIGURE 1 A graphical illustration of the case fatality rate (CFR), disease rate (DR), crude death rate (CDR), and disease recovery rate (RR) for the top ten most affected (A) and the Middle-East countries (B). Data are based on the latest reports on the COVID-19 outbreak, released on April 25, 2020.

TABLE 1 An overview of the case fatality rates, disease rates, crude death rates, and disease recovery rates for the Middle East and the top ten most affected countries by the COVID-19. The date of the first report of infection are also provided. Data are based on the latest reports released on April 25, 2020.



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Mortality of the COVID-19, TABLE 1; For TED.docx available at https://authorea.com/users/316940/articles/447050-the-covid-19-mortality-rate-a-comparison-between-middle-east-and-top-ten-most-affected-countries