

# The Second Wave of COVID-19 and Risk of the Third Wave: Factors Affecting the Continuous Transmission, Spread of, and Increased Mortality Associated With Coronavirus Disease 2019 (COVID-19)

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## ABSTRACT

The novel coronavirus disease (COVID-19) originated from China and spread globally within a short period. The spread of the first and second wave of COVID-19 were influenced by factors such as population density and weather changes. Areas that are densely populated have reported increased confirmed cases of COVID-19 compared to less populated areas. The main reason for this could be the fact that it is difficult to practice social distancing in overpopulated countries. With regards to temperature changes, most respiratory infections affect people when temperatures are low. This is exaggerated when there is increased air pollution in the environment. Economic factors have prevented countries to conduct a lockdown of epicentre towns and cities. This is in fear of an economic shut down because some cities are economic cornerstones of countries. Politically, most political leaders have failed to lockdown their countries for the fear of losing political support from their citizens. Further, some traditional and religious beliefs have also influenced the spread of COVID-19, thereby leading to increased morbidity and mortality globally. The spread of COVID-19 has been worsened by peoples negative perceptions and misinformation that COVID-19 is a myth, and thus relax to adhere to the recommended preventive measures. Besides, comorbidities, poor health-seeking behavior, and lack of vaccines, inadequate treatment modalities and test kits have worsened the failure to contain the COVID-19 pandemic. The initiation and implementation of COVID-19 vaccination programs will help reduce the disease burden. However, there is need to improve the awareness and uptake of COVID-19 vaccines globally. Low COVID-19 vaccine acceptability and uptake due vaccine hesitancy have been reported globally. Hence, there is a need for continuous community sensitisation and education programmes and campaigns on the benefits of vaccines in containing disease outbreaks.

**Keywords:** second wave, third wave, factors, spread, transmission, coronavirus disease, COVID-19, mortality, COVID-19 vaccines, vaccine acceptability, vaccine hesitancy

## INTRODUCTION

The novel coronavirus disease 2019 (COVID-19) was first reported in December 2019 (Liu et al., 2020). The first cases are believed to have originated from the Wuhan City of China (Andersen et al., 2020; Banda, Neene, and Mudenda, 2020; Kasanga et al., 2020; Mudenda et al., 2020a; Ullah et al., 2021). COVID-19 is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that is usually transmitted through inhalation of the virus (Mudenda et al., 2021; Shrestha et al., 2020). Patients present with a dry cough, headache, fever, diarrhea, fatigue, difficulty in breathing, and chest pain (Huang et al., 2020; Mudenda, 2020; Phiri et al., 2020).

Being a respiratory tract infection, COVID-19 airborne transmission is the major route of the spread of SAR-CoV-2 among different populations more especially in crowded environments (Zhang et al., 2020). However, provided that people abide by the preventive measures against COVID-19, the spread is likely to decline (Lahiri et al., 2020). Researchers warned of the possibility of the second wave of COVID-19, towards the end of the year 2020, the second wave of COVID-19 hit many countries (Cacciapaglia et al., 2020; Cousins, 2020; Looi, 2020; Tayech et al., 2020; Vaid et al., 2020; Xu and Li, 2020). This could have occurred due to several factors.

In this paper, some factors that influence the spread of COVID-19 have been discussed. Nevertheless, the factors that influence the spread of COVID-19 are not limited to the ones discussed in this paper.

## **ECONOMIC, POLITICAL, SOCIAL AND RELIGIOUS FACTORS AND MISINFORMATION ABOUT COVID-19**

Many countries, especially developing countries, cannot afford to go into complete lockdown due to fear of an economic meltdown. Many people depend on their daily earnings to survive in meeting their day-to-day needs (Yezli and Khan, 2020). Hence, practices such as social distancing may be difficult to implement as certain jobs or businesses require people to interact with others and be in crowded places (Yoosefi Lebni et al., 2020). Therefore, a total lockdown can mean that most people will have no jobs, no food, and no money to buy what they need, hence, adding a burden to already increased unemployment levels in low-income countries. Political leaders play important roles in curbing the transmission and spread of COVID-19 (Memish et al., 2020). However, political leaders may lead to the escalation of COVID-19 cases and deaths if they ignore science, set priorities other than curbing COVID-19, ignore preventive measures such as wearing of face masks and social distancing and ignoring transparent coordination of public health efforts in the fight against COVID-19 (Yezli and Khan, 2020). Political leaders must ensure they observe the COVID-19 preventive measures such as masking up at all times, reduction in group sizes to a maximum of 50 people, hand sanitizing, adequate handwashing, and social distancing.

In some areas, people lack materials such as antiseptics for using in the prevention of COVID-19 (Yoosefi Lebni et al., 2020). This may eventually lead to individuals contracting COVID-19 and damage to their respiratory tract, thereby increasing mortality rates associated with COVID-19. The continued religious gatherings in some countries are another factor fostering the transmission and spread of SARS-CoV-2 (Yezli and Khan, 2020). Besides, due to traditional and religious beliefs, some people still think COVID-19 is a myth and does not exist (Yezli and Khan, 2020). The negative perceptions about COVID-19 have continued being among the major factors leading to the escalation of COVID-19 infections. Therefore, measures must be taken into consideration to address all factors that are contributing to the continuous transmission and spread of SARS-CoV-2.

There has been a lot of misinformation about COVID-19, especially via social media like Facebook (Obiala et al., 2020). Inaccurate information is shared more easily and quickly than accurate one (CDC, 2020). Misinformation about the effectiveness of adhering to COVID-19 preventive measures negatively affects the containment of the pandemic (Obiala et al., 2020; van der Linden, Roozenbeek, and Compton, 2020). There is strong evidence that the recommended COVID-19 preventive measures (social and physical distancing, wearing of face masks and adequate washing of hands) reduce the risk of being infected (Chu et al., 2020; Obiala et al., 2020; Qian and Jiang, 2020). Conspiracy theories about COVID-19 and vaccines continue to be a global problem (Freeman et al., 2020). These conspiracy theories can reduce peoples' perceptions about the risk of being infected and increase their resistance to be vaccinated against COVID-19 (Duplaga, 2020; Freeman et al., 2020). Therefore, health authorities must

ensure that they monitor and address all the misinformation regarding COVID-19 prevention, treatment and vaccinations.

## **CHANGE IN WEATHER PATTERNS**

Despite a weak relationship between weather change and COVID-19 transmission, a temperature change has been reported to be among the reasons that affect the spread of COVID-19. Some studies have shown that there is a relationship between a decrease in temperature and an increase in the number of confirmed cases of COVID-19 (Le et al., 2020; Wang et al., 2020; Xie and Zhu, 2020). However, a study in Brazil reported that high temperatures did not reduce the number of COVID-19 confirmed cases (Núñez-Delgado, 2020). Other studies have reported that every 1°C increase in temperature leads to a decline in daily reported confirmed COVID-19 cases (Prata et al., 2020; Wu et al., 2020). This shows that warm weather leads to a decline in confirmed COVID-19 cases while cold weather leads to an increase in daily reported COVID-19 cases. Unfortunately, there is no confirmed evidence supporting that warm weather leads to a decline in the number of COVID-19 confirmed cases (Xie and Zhu, 2020). As a result of climate change, changes in weather patterns have influenced air pollution and thus the spread of respiratory tract infections (Borge et al., 2019).

## **POPULATION DENSITY**

COVID-19 has been reported to spread faster in high-density populations (Roy and Ghosh, 2020). Population density plays a vital role in the spread of COVID-19 in that it increases air pollution (Liu et al., 2020). Therefore, if a geographical area is overpopulated, the chances of continuous spread of COVID-19 are very high. Overpopulation has been reported to make it difficult for people to practice social distancing (Wilkinson et al., 2020). Studies have reported a positive correlation between population density and the number of COVID-19 confirmed cases. In Iran (Ahmadi et al., 2020) and Turkey (Şahin, 2020), it was confirmed that areas that were highly populated reported higher cases of COVID-19 than less populated areas.

Highly populated rooms with less ventilation also influence the transmission and spread of COVID-19 (Tantrakarnapa et al., 2020). It is evident that even in crowded sports events, the transmission of COVID-19 is very high (Cao et al., 2021). Therefore, to reduce the transmission and spread of COVID-19, social gatherings and crowds must be minimized.

## **PREMATURE RELAXATION OF INTERVENTIONS**

During the peak of the first wave of COVID-19, the majority of people adhered to preventive measures. Unfortunately, towards the end of the year 2020, most people relaxed and never paid attention to the COVID-19 preventive measures (Leung et al., 2020; Tayech et al., 2020). Governments (policy

interventions) also relaxed and never enforced public health preventive measures (Vaid et al., 2020). As a result, the second wave of COVID-19 was reported in different countries and it claimed a lot of lives. Relaxation in adhering to the recommended COVID-19 guidelines has put the globe at risk of the third wave of the pandemic.

## FACTORS INFLUENCING INCREASED MORTALITY RATE ASSOCIATED WITH AND DUE TO COVID-19

Studies have reported that mortality due to and associated with COVID-19 has been worsened by the existence of concurrent or chronic infections in COVID-19 positive patients. Among the commonest conditions that lead to increased mortality among COVID-19 patients include myocardial infarction, chronic pulmonary disease, renal disease, congested heart disease, liver disease, dementia, and metastatic solid tumors (Harrison et al., 2020). The death rate is high in elderly patients because of the history and comorbidities such as diabetes, cardiovascular and lung disease (Zhou et al., 2020). Other comorbidities leading to increased mortality rates among COVID-19 patients include hepatitis B and human immunodeficiency virus (HIV), other respiratory illnesses, renal disease, and immunodeficiencies (Paudel, 2020). Poor health-seeking behavior also increases mortality and thus many deaths have been reported as brought-in dead (Chileshe et al., 2020). People choose to self-medicate while their condition worsens (Mudenda et al., 2020b). This may lead to exacerbation of COVID-19 infections and mortality.

Lack of vaccines and no proven treatment modalities have led to failure to contain the COVID-19 pandemic (Jean et al., 2020; Vijayvargiya et al., 2020). The good news is that, many pharmaceutical companies are now developing vaccines for use against COVID-19. The vaccines will protect people against the deadly virus, SARS-CoV-2 (Li et al., 2020; Randolph and Barreiro, 2020). However, access to quality, safe and effective COVID-19 vaccines remain a global challenge (Wouters et al., 2021). Besides, the low acceptability and uptake of the COVID-19 vaccines in some countries poses a danger in the fight against COVID-19 (Barello et al., 2020; Sallam et al., 2021). Vaccine hesitancy remains a global challenge and may affect the goal of reaching community herd immunity (Kanyike et al., 2021; Skjefte et al., 2021). In resource-constrained countries, a lack of COVID-19 testing kits and accuracy has been reported (Giri and Rana, 2020; Vandenberg et al., 2020). This may affect the diagnosis of COVID-19 and thus delay treatment or interventions.

## CONCLUSION

The second wave of COVID-19 has led to increased morbidity and mortality rates more especially in the developing countries. There is a risk of experiencing a third wave of COVID-19 in many countries due to many factors. Factors such as weather patterns, politics, economics, population density, and comorbidities have led to the

continuous transmission and spread of the SARS-CoV-2. Lack of vaccines, treatment modalities and COVID-19 test kits are among contributing factors to the worsening and continuous transmission, spread and increased morbidity rates associated with COVID-19. There is a need to promote the awareness of COVID-19 vaccination programs globally in order to increase the acceptability and uptake of the vaccines. Therefore, containment of the COVID-19 pandemic requires a multisectoral approach. Strategies that address vaccine hesitancy must be developed so that the majority of people are vaccinated and herd immunity reached.

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**Availability of data and materials:** All data generated or analyzed during this study are available for sharing when appropriate request is directed to the author.

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