Journal of Experimental Biology and Agricultural Sciences

<http://www.jebas.org>

ISSN No. 2320 – 8694

EMERGENCE OF SECOND WAVE OF SARS-COV-2 INFECTIONS DURING THE ONGOING COVID-19 PANDEMIC: A MINI REVIEW

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Received – September 05, 2020; Revision – October 02, 2020; Accepted – October 18, 2020

Available Online October 25, 2020

DOI: [http://dx.doi.org/10.18006/2020.8\(Spl-1-SARS-CoV-2\).S57.S65](http://dx.doi.org/10.18006/2020.8(Spl-1-SARS-CoV-2).S57.S65)

KEYWORDS

SARS-CoV-2

COVID-19

Pandemic

Second Wave

ABSTRACT

The COVID-19 outbreak originated from Wuhan, China has spread over the world, causing a “Global Pandemic”. We analyzed daily confirmed cases and deaths from different countries to understand the progression of the ongoing pandemic in different parts around the world. The data indicated that the pandemic is in different stages in different countries, where they are either at the end of the second wave or middle or early phase of it or still in the middle of the first wave of infection, and they can be divided into four groups. Type 1 countries such as UK, France, Spain, and the Netherlands are currently witnessing the second wave of infection with an exponential increase in daily cases. Countries such as Australia, United States, Japan, and Poland are currently in the declining stage of second-wave, grouped as Type 2 countries. Type 3 countries such as Germany, Italy, Belgium, and Russia are recently seeing the second wave with slowly rising of confirmed cases. Type 4 countries including India, Brazil, Argentina, and Mexico are currently fighting against the first wave of COVID-19. These countries have a chance to learn from the countries which have overcome the second wave successfully. To be ahead of the epidemic curve and preventing it, countries need to make future plans on family, hospital, and community levels. Isolation of the highly vulnerable elderly people and young children, preventing social or public gathering, following the guidelines of COVID-19 prevention including wearing face masks regularly can save countries from devastating effects of the second wave of pandemic COVID-19.

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Peer review under responsibility of Journal of Experimental Biology and Agricultural Sciences.

Production and Hosting by Horizon Publisher India [HPI]
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1 Introduction

The outbreak of the coronavirus disease 2019 (COVID-19) which was initiated from Wuhan, China at the end of 2019 has impacted the entire world as an ongoing “Global Pandemic” (Al-Dadah & Hing, 2020; Dhama et al., 2020). The entire human society has been adversely affected socio-economically due to a rapid increase in the COVID-19 cases and the number of deaths. As of 6th October, 2020, more than 35.5 million people have been infected by the causative virus – severe acute respiratory syndrome coronavirus -2 (SARS-CoV-2), out of which 1.05 million have died (<https://www.worldometers.info/coronavirus/>). Pandemics are known to have multiple waves before they die down which is applicable regionally as well as globally (Xu & Li, 2020). The second wave of the pandemic cannot be distinctly defined. However, it can be considered a stage when the infection appears to be contained in its spread before it starts shooting up from a different group of the population or in a different locality (Ali, 2020). One of the common misconceptions about the contagious diseases is to assume that it cannot reoccur following the subsidence of the first wave. This false perception makes people neglect the necessary protocols and encourage them to engage in routine socializing, travel, or public gathering. This kind of condition can put a high burden on medical staff and many other corona warriors as well as threaten the lives of many people around the world. Many countries have observed two waves of the pandemic to the date. In this review, we are focused on analyzing the existing data on the occurrence and severity of the first and second wave of COVID-19 infections in different countries around the globe.

2 Different types of the second wave in different countries

By analyzing the progression of the daily cases and mortality in different countries, we could observe a different pattern of rising and fall of infections. Based on the pattern of pandemic COVID-19 progression, we could observe a second wave of infection that is spreading across the globe and different countries are at the different stages of the wave. Based on the stage of the wave, we could classify the countries into four different types.

2.1 Type 1 Wave

Many countries showing type 1 wave had a clear rise and fall of daily cases during the first wave and a continued rise in the cases of second wave (Figure 1). As the coronavirus cases continue to surge worldwide, recently on 19th September 2020, the British Prime Minister declared in press news regarding the “coming in” phase of the second wave of COVID-19 in Britain. As shown in Figure 1, in the UK, COVID-19 was firstly reported at the end of January 2020, and the lockdown was imposed on 23rd March 2020. During the period of late January to mid-April, there was an exponential increase in the daily confirmed cases of COVID-19 with around 5000-6000 cases per day in the UK.

In the UK, the first wave of COVID-19 was started at the start of March 2020 and lasted up to the end of May 2020 with an exponential increase in the daily diagnosed new cases with an average of 4000 cases per day. By end of May 2020, the COVID-19 epidemic in the UK revealed an indication of suppression as the daily rise in cases started to enter a slow phase of decline. Due to strict restrictions and imposition of lockdown since March 2020 had decreased the new admissions and deaths in the UK (Horton, 2020). Again the rise in daily new cases has been observed with the highest of 6208 cases in a single day. However, the death rate was reported only 37 on the same day. Therefore, we can say that the second wave in the UK is just started with an increased number of newly diagnosed cases but it is expected to be less deadly than the first wave.

In France, the outbreak of COVID-19 has started at the start of March 2020 with a peak of around 4000-5000 daily new cases and around 600-700 daily deaths in April 2020 (Figure 1). The lockdown and restrictions on public movement, social gatherings, transport, etc. were imposed by the French government as early as in March 2020 to curb the spread of the virus. After April 2020, France showed a gradual decrease in the daily diagnosed new cases and deaths with the lowest number in June 2020. The government had started gradually opening public places, schools, restaurants, and bars. Now the second wave of the coronavirus pandemic has hit France with a significant increase in daily new cases and death since August 2020. Around 13,000 new cases were reported in a single day which is thought to be twice in number compared with the highest noted cases in the first wave. However, despite a significant increase in daily cases, the death rate is still under control with only 43 deaths in a day in a second wave. Spain has reported similar scenarios like France in the second wave of the COVID-19 pandemic. It has been started since the start of July 2020 with a gradual increase in daily diagnosed cases with the highest of around 14000 cases in a single day which is considered as a twice number compared to the first wave of infection. Even though the death rate is much lesser compared with first wave infection, it is again considerably increasing since the start of September 2020 which is an alarming situation for the government.

The Netherlands has experienced the start of the second wave of infection since the start of August 2020 with twice the number of newly diagnosed cases in a single day compared with the first wave of an infection, however, the death rate is still under control. After analyzing the statistics from these countries, the mortality associated with COVID-19 infection has been declining even though the cases are rising in the second wave of infection. Reports are suggesting that the majority of cases in the second wave in these countries involve an increasing number of younger and a decline in older individuals so having the disease less lethal for each person having it (Fan et al., 2020).

Figure 1 : Scenario of the new COVID diagnosed cases (A) and deaths (B) on daily bases in type-1 countries. The European countries such as UK, France, Spain and Netherlands, which are the raise specter of the second wave of COVID-19 is labeled as Type-1 countries.

2.2 Type 2 Wave

The countries showed type 2 wave had a clear rise and fall of the first and second wave during the ongoing pandemic (Figure 2). Australia's initial response to the coronavirus was among the most successful worldwide. It was started in March 2020 and was under control till the start of April 2020 with an average of few hundreds of cases per day. Due to strict lockdown and precautionary measures, the COVID-19 was found to be eliminated from the country with very few new cases added till the end of June 2020. Australia had fought against its first COVID-19 outbreak but was badly hit by a new wave in July that has even bigger and deadliest effects. In the first wave, very few such as 1-2 deaths were reported per day while in the second wave, the highest of 59 deaths were reported in a single day. Australia's quick action of closing borders, timely social distancing, and contact tracing has made it successful in combating the second wave of an infection (Baker, 2020; Worthington, 2020). Now the second wave of COVID-19 in Australia appears to be finally subsiding but the country is not out of the danger yet. Like Australia, Japan has also suffered and recovered from the second wave of SARS-CoV-2 infection. The first wave was at the peak in April 2020 with a few hundred new cases on daily basis later it was found to be declining up to the end of June 2020 (Hasan et al., 2020). Afterward, the new daily cases were popping up again at a significant rate (twice than the first wave) with a few thousand new cases per day in mid of August 2020. However, the death rate was higher in the first wave of infection compared to the second wave (Figure. 2)

In the United States (US), the first wave of infection was not eliminated at such a level that the new phase of the infection can start. The fluctuation in the curve of new daily cases in the US shows that some of the parts of the country are in the first wave while some are in the second wave of infection. One recent report stated that states, including Georgia, California, and Texas, had an exponential increase in case of number since the start of the pandemic which is considered to be still in their first wave (Chappell, 2020). Thirty-one other states including Ohio and Florida, exhibit the signature pattern of a second wave. While New York and New Jersey completely flattened their curves by the end of July, which indicates that these states just experienced the first wave of infection. Just like the US, Poland is also under the effect of both waves of infection. However, after observing the case curve, we can say that Poland is still experiencing its first wave of a COVID-19 pandemic.

2.3 Type 3 Wave

Type 3 wave showed a pattern of no clear peak of second wave following the first week. It is characterized by the prolonged suppression of the pandemic without any second wave of infection (Figure 3). The fresh COVID-19 cases initiated to surge in a few

European countries such as Spain, France, and the UK. However, the Italy-the epicenter of Europe's first outbreak in spring and Germany, which is Europe's largest economy were not showing a similar increase. Throughout the pandemic, during the first wave of infection, Germany was often referred to as a positive example for managing the COVID-19 pandemic. After the first wave, they were successful in preventing the overload of the health care system. The infection curve was flattening from May 2020 to the end of August 2020, while severity and mortality were lower in Germany than in many other countries (Weinthal, 2020). The German government is in a dilemma whether the country is in a "second wave" or the first one has never ended.

2.4 Type 4 Wave

In another set of countries, a clear peak of the first wave is not observed and it is characterized by a prolonged first wave without any end (Figure 4). It is observed mainly in countries with large populations such as India and Brazil. The first case of COVID-19 was reported on January 30, 2020 in India. Presently, India represents the highest number of confirmed cases in Asia and second highest cases (6.7 million) in world after the USA (7.7 million), and then on the third number is Brazil to report rising cases (4.9 million) (Krishnan, 2020; Mohammed, 2020). There is a significant exponential increase in the confirmed cases breaching from May, 2020 to July 2020. In the mid of September month (16th September), India recorded the highest single-day spike in the world near to 100,000 cases. Presently, the number of cases increasing per day is highest in India. Also, the overall worldwide cumulative numbers of rise in cases per day is highest presently, however, the case fatality rate (CFR) has been reduced to nearly 3% as compared to earlier months. The CFR in India is nearly half that of USA and Brazil, the lowest among other countries with 1.55% as of the first week of October 2020, and is steadily declining (<https://www.worldometers.info/coronavirus/>). As a whole, India is considered in the first wave of COVID-19 pandemic, but some of the cities like Delhi seem to be experiencing a second wave of the pandemic. Recently, the Director of All India Institute of Medical Sciences (AIIMS), New Delhi has ended the speculation about the country being in the second wave of the pandemic. He mentioned that India is seeing a resurgence of cases and the start of the second wave in several parts of the country, not entire India. The significant wake of a fresh sharp jump in confirmed cases of COVID-19 has been observed from states such as Delhi, Maharashtra, Andhra Pradesh, Kerala, Telangana, and Odisha, among others. Therefore, we can say that the second wave has arrived at least in some of the states of India.

The first virus exposure in Brazil was found in late February 2020. Later, the disease was spread to every state by late March 2020. By mid-June, 2020, the country had reported at least 1 million

Figure 2: Scenario of daily confirmed new (A) and deaths (B) in Type-II countries: The global countries like Australia, United States (US), Japan and Poland, which have already faced the effect of the second wave of COVID-19 pandemic.

Figure 3: Scenario of daily confirmed new cases (A) and deaths (B) in Type-III countries: The European countries like Germany, Italy and Belgium and Russia, which have experienced and managed to fight against first and second wave of the COVID-19 pandemic.

Figure 4: Scenario of daily confirmed new cases (A) and deaths (B) in Type-IV countries: The countries like India, Brazil, Argentina and Mexico, which are still under the effect of the first wave of an infection. The India and Brazil is currently facing the major threat of the COVID-19 in the first wave only.

confirmed cases and around 50,000 deaths (Baloch et al., 2020; Lobo et al., 2020). As of the current time, Brazil has third-highest number of COVID-19 confirmed cases followed by India and the US. However, the country has reported a higher number of COVID-19 related deaths as compared to India, thus, making it one of the worst affected countries in the world. Brazil is reeling under the onslaught of a pandemic that shows no signs of slowing down since the pandemic has been started. As shown in Figure 4, Argentina has reported its first confirmed COVID-19 case on 3rd March 2020, and then the virus was spread to each part of the country. As of September 2020, a total of around 0.7 million people were confirmed to have been infected with the virus and around 15 thousand people have been died because of the pandemic. The nation-wise lockdown was imposed by the government in March 2020 only and extended up to Late April 2020. With the ease in the movement and restrictions after April 2020, the country has reported a further spike in the daily confirmed cases and is still continuously popping up later then. However, the death rate curve related to COVID-19 in Argentina is exhibiting fluctuations to the date. The first exposure to the virus was reported in late February 2020 in Mexico (Figure 4). Later the new confirmed cases of coronavirus were exponentially increased till the start of August 2020. Now Mexico's confirmed COVID-19 caseload has risen to 0.76 million with a reported death toll of nearly 79,000.

3 Prevention of the second wave of COVID-19

The fear of the second wave is very serious and it can cost people their lives as well as economic well-being. To escape from it, people should take recommended precautionary measures in their minds. As per the reports suggesting, almost in each country around the globe has experienced an exponential increase in the number of cases after enforcement of stay home order ends (<https://www.ecdc.europa.eu/en/>). This could be a major point to be remembered. One recent study from Cambridge suggests that everyone wearing a mask all of the time would dramatically cut the virus transmission (Stutt Richard et al., 2020). The countries such as Australia and Japan, which have experienced the second wave of the pandemic can be a good example for the countries which have yet not faced it. The last three to four months of the period has already exhibited massive effects on economies, health system, social and political landscapes which can be observed at national as well as global levels. The emotional, physical, and physiological health of the people has been severely affected. They feel themselves at their breaking points and trying to violate the constant isolation and quarantine rules. The health care workers are exhausted, even in well-developed countries like Italy and the US. The Governments of the respective countries around the world are trying with their best efforts to stop the local and community-based transmission of the virus. We should understand the effects of viral

pandemics through the history of the Spanish flu of 1918, which was similar to COVID-19 affecting the respiratory systems and leading to pneumonia. It resulted in the death of millions of peoples (20-50 million) which is far more than COVID-19 is causing presently (Trilla et al., 2008). It lasted for about 2 years and was very difficult to eradicate because of its multiple waves of the infection around the globe. Importantly, the second wave of Spanish flu caused more mortality than the first wave. The effect of the COVID-19 is also expecting the same as Spanish flu according to the public health experts. Till we have effective vaccines and drugs against COVID-19, the best way is to strictly follow appropriate preventive measures to avoid SARS-CoV-2 infection viz., wearing of face mask, sanitization and disinfection practices including regular washing of hands, social distancing, and other mitigation strategies, as well as enhancing the immunity of the body via dietary intake of balanced foods, nutraceuticals, herbal medicines and being physically fit by doing exercises and yoga (Chu et al., 2020; Infusino et al., 2020; Malik et al., 2020; Panyod et al., 2020).

4 Conclusion and future prospects

The imposition of the lockdown is not an answer to prevent the spread of the virus due to the country's economic issues. Despite waiting for the vaccine development and availability, people should take self-responsibility for preventing the highly contagious disease. They should avoid direct contact with other people, practice hand hygiene, frequent use of sanitizer, and wearing a mask outdoors, particularly in a large gathering in any closed confined spaces. Prevention of second-wave in the coming months by following all the precautionary measures is very critical to overcoming the ongoing COVID-19 pandemic.

Acknowledgments

The authors acknowledge their Institutes and Universities.

Conflict of Interest

The authors declares that there is no conflict of interest.

Authors' Contribution

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

Funding

None.

Ethics Statement

Not Applicable.

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