



Review Article

COVID-19: Third Wave Feared as Cases Soar and Precautionary Measures

Hina Afzal Sajid¹, Ahmad Ali^{2*}, Yasir Razzaq Khan², Ameer Hamza Rabbani³, Kashif Hussain², Nayab Arshad⁴, Rabia Liaquat Khan⁵

¹Centre of Excellence in Molecular Biology, University of Punjab, Lahore, Pakistan

²Department of Medicine, Cholistan University of Veterinary and Animal Sciences, Bahawalpur, Pakistan

³Department of Surgery, Cholistan University of Veterinary and Animal Sciences, Bahawalpur, Pakistan

⁴Livestock and Dairy Development Department, Punjab, Pakistan

⁵Department of Pathology, University of Agriculture, Faisalabad, Pakistan

Email address:

hinaafzal_17@yahoo.com (H. A. Sajid), ahmadali@cuvas.edu.pk (A. Ali), yasirrazzaq@cuvas.edu.pk (Y. R. Khan), ameerhamzarabbani@cuvas.edu.pk (A. H. Rabbani), kashifhussain@cuvas.edu.pk (K. Hussain), nayab32@gmail.com (N. Arshad), rabialiaqatkhan@gmail.com (R. L. Khan)

*Corresponding author

To cite this article:

Hina Afzal Sajid, Ahmad Ali, Yasir Razzaq Khan, Ameer Hamza Rabbani, Kashif Hussain, Nayab Arshad, Rabia Liaquat Khan. COVID-19: Third Wave Feared as Cases Soar and Precautionary Measures. *American Journal of Life Sciences*. Vol. 9, No. 2, 2021, pp. 19-24. doi: 10.11648/j.ajls.20210902.11

Received: March 11, 2021; **Accepted:** April 16, 2021; **Published:** April 29, 2021

Abstract: A novel coronavirus has become a major health issue worldwide, initially founded in Wuhan city, province of china, in the end of December 2019. Now it has widely spread across 215 countries. On 30th of January 2020, World Health Organization (WHO) declared sixth public health emergency of international concern (PHEIC) to be COVID-19 outbreak as pandemic. Easing up on lockdowns and mandatory precautionary strategies has led to a sharp increment in mortalities across the world. Fear of third wave in different countries, World health organizations (WHO) and governments have to give the Standard Operation Protocols SOPs for coming wave of pandemic. Countries have not yet achieved the complete control of the spread of COVID-19 and third wave of infection is already beginning throughout the world. Many experts are predicting that COVID-19 may extend its stay and countries need to continue exercise stringent quarantine, lockdown, social-distancing and use of face masks as well as personal and environmental hygiene is very important to evade the risk of this virus. Countries will need strict actions like smart lockdown, restrict the gathering of peoples, self-isolation, social-distancing, health measures including COVID-19 vaccines, better adherence towards quarantine, responsible mass and social media, and implement mitigating measures to combat COVID-19.

Keywords: COVID-19, Third Wave, Pandemic, Precautionary Measures

1. Introduction

At the culmination of December 2019 in Wuhan city of Hubei province deadly pandemic outbreak was observed for the first time which exhibited signs of pneumonia in early phases leading to apnea and dyspnea [1]. The disease was reported to be caused due to mutated strain of corona virus namely COVID-19. Due to extreme respiratory distress and

progressive degenerative nature of the disease, World Health Organization (WHO) in February 2020, designated the disease caused by COVID-19 to be severe acute respiratory syndrome [2]. Initially the syndrome presented itself as pneumonia however multi organs failure along with septic shock in myriad of cases. Despite the fact that mortalities are not as progressive as a spread of disease, yet the threat of asymptomatic carrier has been made this disease into an emergency concern for public health organization around the

world [3]. By the end of the March 2020, WHO announced COVID-19 outbreak to be global pandemic and implored political leadership and scientific community to take necessary step for prevention and early detection against its spread [2, 4].

1.1. World's Pandemics

Pandemics are scourge of humanity for the last many centuries. It is defined as epidemic of infectious disease, which spreads worldwide. Major pandemics have been diseases such as smallpox, tuberculosis, cholera, and plague which was responsible for 75-200 million deaths in 14th century, the plague continued as various epidemics until end of 19th century [5]. Vaccinations, improvement in sanitation and better nutrition helped us conquer these diseases. Last pandemic known as Spanish Flu caused 50-100 million death in 1918 and infected one third of the world population. Europeans causing vast destruction and deaths carried smallpox and syphilis to American continent [6]. Recently, we have pandemics of HIV/AIDS and COVID-19. Severe respiratory RNA virus causes the coronavirus pandemic. So far, more than 35 million people have been affected; more than 1 million people have died and affected 215 counties of the world [2].

1.2. Public Health Emergency of International Concern (PHEIC)

On 30th of January 2020, World Health Organization (WHO) declared sixth public health emergency of international concern (PHEIC) to be COVID-19 outbreak as pandemic [7]. Since 2009 there have been six PHEIC declarations: the 2018-20 Kivu Ebola epidemic, the 2015-16 Zika virus epidemic, pandemic the 2014 polio declaration, the 2014 Ebola outbreak in Western Africa, the 2009 H1N1 (swine flu), and the ongoing pandemic outbreak of coronavirus (COVID-19) which has been declared a PHEIC [8]. Similar outbreaks included Middle East Respiratory Syndrome (MERS-CoV) and severe Acute Respiratory Syndrome (SARS-CoV) has been reported in preceding years [9].

1.3. Corona Virus

Corona Virus is a family of viruses, which are large, enveloped, single-stranded RNA viruses found in humans and other mammals and birds; causing illnesses from common cold to Middle East Respiratory syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS CoV-1) [10, 11]. The current pandemic is caused by SARS-CoV-2. The present COVID-19 infection is characterized by rapid transmission mainly by droplet infection from human to human transmission within six feet. Coughing, sneezing, and talking are main conduit for transmission [12]. The surface contamination followed by touching the face can transmit infection. There are reports of transmission by air within closed condition. Aerosols can also transmit. Human saliva and eyes have been responsible for transmission of disease.

Maternal COVID-19 is associated with low risk vertical transmission. The incubation period for majority of patients is 5-7 days but can be of 15 days. The main symptoms are temperature (70-90%) dry cough (60-80%) shortness of breath (53-80%). Other symptoms are losing of taste and smell 1. A number of patients have cardiac manifestation like ST elevation and myocarditis. The Neurological symptoms may include large strokes [13].

2. Epidemiology

2.1. Global Situation

In the last month of 2019, WHO obtained samples from cases of pleuropneumonia in Wuhan city of china and by mid of January corona virus was successfully isolated and identified from these samples [14-17]. Globally, as of 6:00pm CEST, 25 April 2021, there have been 146,054,107 confirmed cases of COVID-19, including 3,092,410 deaths, reported to WHO. As of 22 April 2021, a total of 899,936,102 vaccine doses have been administered [2].

Table 1. Region wise cases and deaths due to COVID-19 (25th April, 2021).

Region	Confirmed Cases	Deaths
Globally	146,054,107	3,092,410
Americas	60,950,456	1,481,263
Europe	50,702,775	1,061,137
South-East Asia	19,965,648	254,958
Eastern Mediterranean	8,822,942	176,950
Africa	3,274,714	81,870
Western Pacific	2,336,827	36,219

2.2. Waves of COVID-19

When disease transmission is cyclical by nature and incremental by progression the arbitrary wave like pattern is termed as waves of disease spread. The initial spike in number of cases is termed as 1st wave, while cases observed immediately afterwards as disease progression apparently plummets are identifiable as second and third wave cases [18]. Frustration and anxiousness have become so palpable by people being cooped up in their home spaces during lockdown that any sorts of relaxation in social distancing or isolation calls are completely disregarded [19, 20]. It took weeks for governments to shift the paradigm but now as the countries start to reopen for businesses and schools, the practices and control measures ingrained into populaces through public service messaging, penalties and good old fear have been overlooked or in certain cases even questioned. The situation all over the world from an epidemiological standpoint is quite similar to how it was back in April as the number of infected continue to rise and mistrust amongst masses in regards to safety measures grow. Scientists have employed data regarding spread of prior pandemics namely 1918 flu pandemic and the 2009 H1N1 flu epidemic to plot projections and develop policies regarding COVID-19 [21]. Similar pandemics have followed a comparable trend of resurgence during winter season.

Countries such Iran, Italy and China, which were hit hard during the initial emergence of the disease and experienced respite during last couple of months have been showing an upward trend in case reporting. Interestingly enough, even countries like China which have continued strict lockdown have failed to impede the spread this outbreak [22].

COVID-19 spreads in a similar fashion as any other respiratory virus would. It spreads from one person to another. However, unique factor that makes it ever more dangerous is to produce asymptomatic carriers [23]. When corona began its spread last year, it started from a couple of people being infected thereby it took longer for it to spread. But since then, so many people came into contact with this virus and have become its carriers unknowingly. It is postulated this large population base could start an exponential spread of corona waves and increase risk of transmission. Another inference regarding reemergence of this disease in fall is attributed to people staying indoor, in close proximity to each other due to cold weather. Previously several countries were able to tackle threat of this disease by identification and isolation through contact tracing but now that the disease is widespread such strategies have been rendered useless as there are just too many threads to pull on [24].

3. Facts about COVID-19

3.1. Re-infection of COVID-19

It can't be categorically and scientifically justified to comment on the question of COVID-19 reinfection as to this date researchers don't have an empirical answer however if the virus behaves similar to other coronaviruses possibility of reinfection remains after a few months of recovery [25].

3.2. Other Diseases That Could Worsen the Situation Along with COVID-19

Since the COVID-19 pandemic, a serious concern is that fewer children have been vaccinated against measles, whooping cough and flu. Furthermore, a surge in cases of flu along with escalating situation regarding coronavirus may wreak havoc on hospitals and patients [26].

3.3. Herd Immunity

It is believed in epidemics and public health medicine that when a large percentage, about 70% of a populace become immune to a disease in a community it starts to hamper the spread of that disease. But proponents of this theory in regards to COVID-19 make an unjustified assumption that infected people can retain immunity against this disease which to this day has not been scientifically established [27].

4. Trends and Waves of Past Pandemics

In the past, American states experienced a terrifying respiratory infection namely Spanish influenza brought on by soldiers travelling across state lines and had an overwhelming repeated wave causing mass mortalities. Moreover, as people

were experiencing ineptness of government to create a viable strategy to control spread of disease which had already claimed 3,000 lives, mandatory use of masks in 1918 exasperated an already volatile situation leading to Anti-Mask protests. Researchers have urged authorities that present pandemic might last for more than two to three years but could exhibit slowdown as more than 65% of the population around the world achieves immunity [19]. Following past trends, they have also urged the authorities to be equipped for a minimum of 18-24 months activity of COVID-19 and have explained that the current wave of pandemic might be followed by repeated smaller waves which are supposed to appear consistently. Similarly, the expected future waves could be geographically different, and their intensity might be dependent on the local control measures. As SARS-CoV-2 circulates human population, its severity is expected to wane similar to beta coronaviruses HKU1 and OC43 and influenza pandemics [28].

Epidemiologist have maintained that although trends and projections of past epidemics may prove useful there still is much to be learnt about SARS-CoV-2 as it is a new virus and expecting conformity to past outbreak patterns would not be scientifically justified [29]. Most scientists believe that until herd immunity is achieved waves of pandemic will continue to cause daily mortalities. Though being a sound principle theoretically, herd immunity seems to be unlikely without a widely available vaccine.

5. Reasons behind COVID-19's Waves

Easing up on lockdowns and mandatory precautionary strategies have led to a sharp increment in mortalities across the world, the situation has become so dire that certain countries have had to clamp down hard on public as their health facilities continue to get swarmed by patients.

5.1. Seasonal Effect

A lower level of humidity in chillier conditions assists the viral spread. Despite the greatest of efforts most researchers believe that COVID-19 will be the part of our future however, our ability to weather this tsunami hinges upon sustained social distancing and widespread testing strategies [30].

5.2. Ease in Lockdowns

Up until strict lockdowns were kept in place people stayed apart, but as the conditions are relaxed risk disease transmission has also increased. Obliviousness on part of general public in following preventive measures has also contributed to making the third wave even more disastrous [31]. Scientists are afraid that if precautionary measures such as prohibiting social gathering, hand washing, using masks and symptom monitoring are not sustained, there might be a greater number of incidents that could contribute to the re-imposition of self-quarantine policies.

6. Precautionary Measures

Unfortunately, no particular medication for use has been recommended against this disease but regular advancements are made to develop adequate therapeutic practices to combat the disease's symptoms. The most effective tool to prevent the spread of this virus is socio-economic by nature [32]. Currently, to curtail the risks only preventive measures such as primary screening, identification, separation, and treatment are being implemented which are essential to avoid further spread [33]. Most countries are doing vaccination after successful trials, but getting 100% results of vaccine is still challenging. However, research into development of efficacious drugs and fast-tracked clinical trials for manufacturing are paramount to control this pandemic [34].

6.1. Physical Distancing

To help prevent spread of COVID-19, public needs to be informed on the effectiveness of social distancing and how just by staying at home we can curb the spread of disease. As an alternative to in-person contact the practice of social distancing inspires use of online platforms for communication. But there is a limit to their usefulness especially in primitive economies. As the need to open things up has become imperative communities need to understand the term "physical distancing" as well and maintain at least 6 feet from each other and wearing face masks [35].

6.2. Face Mask

Face masks aid in containing respiratory droplets that transmit SARS-CoV-2 from asymptomatic carriers so if you are in a public place for instance inside a store, office or school you must wear a mask. It is important to wear a mask even when you are exercising or walking outdoors near others as it is a matter of public health safety. Research has proved that a mask can be fairly effective in thwarting contagions from getting into your nose and mouth [36, 37].

6.3. Hand Hygiene

It is quite easy to wash your hands and face regularly, and it's one of the most efficient ways to prevent germs from spreading. Clean hands will stop germs from spreading from one person to another [38, 39].

It is recommended by medical professionals to follow these five steps to properly scrub your hands:

Firstly, dampen your hands with clean, running water then turn off the tap and apply soap.

Lather your hands by rubbing them together with the soap and make sure to scrub clean back of your hands, between your fingers, and under your nails.

It is recommended to scrub your hands for at least 20 seconds.

Rinse your hands well under clean, running water.

Dry your hands using a clean towel or air dry them.

There is no substitute to washing hands with soap and water but in situations where it is not feasible alcohol-based hand

sanitizer with at least 60% alcohol are permissible as well. However, sanitizers have limited efficacy as they do not get rid of all types of germs and cannot function very well when hands are visibly dirty or greasy [40].

6.4. Lock Down (Full/ Smart)

Depending upon the situations and economic situation of a country complete or smart lockdown can be imposed to break the transmission of COVID-19. Lockdowns disrupt the transmission cycle of disease by confining maximum number of infected personnel to an identified disease hotspot with an aim to contain or retard spread of COVID-19 in that specific locality. This would also entail increased epidemiological interventions as testing, tracing, quarantine and isolation of suspected and confirmed cases in an identified hotspot [41].

6.5. Vaccination

Vaccines are being introduced in the World's market against COVID-19. Till now it is being considered as a best method to remain safe against this deadly pandemic. Every country is trying to do step wise vaccine. Although all the vaccines have been produced at record speed, with processes run in parallel to save time, there have been many checks and balances to ensure their safety, including being subject to the same scientific and regulatory rigour as any other vaccine [42].

7. Conclusion

COVID-19 has widely spread across 215 countries and territories across the world including the worst-hit countries like U.S., UK, Italy, and Spain. In this pandemic situation of COVID-19 and fear of different waves World health organizations (WHO), other international and national agencies, governments have to give the Standard operation protocols SOPs for coming waves of pandemic. Countries have not yet achieved the complete control of the spread of COVID-19 and third wave of infection is already beginning throughout the world. Many experts are predicting that COVID-19 may extend its stay and countries need to continue exercise stringent quarantine, lockdown, social-distancing and self-isolation with heightened vigilance and continue controlling and preventive strategies towards curbing COVID-19 especially within hospitals and amongst healthcare staff who are at forefront and frontline defense against COVID-19 pandemic outbreak. Countries will need stringent actions like lockdown, curfew, quarantine, self-isolation, social-distancing, health measures including vaccination, behavior modification, better adherence towards quarantine, responsible mass and social media, and implement mitigating measures to combat COVID-19.

Acknowledgements

We greatly appreciate the efforts of all institutes, NGOs and all other people for their dedication and efforts in this outbreak.

References

- [1] Wu Z, McGoogan JM. Characteristics of and Important Lessons from the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases from the Chinese Center for Disease Control and Prevention. *JAMA* 2020; 323 (13): 1239–1242.
- [2] World health organization (WHO). Available at <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>
- [3] Guan W, Ni Z, Hu Y, Liang W, Ou C, He J, et al. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med*. 2020; 382 (18): 1708–20.
- [4] Kumar, Dharmendra, Rishabha Malviya, and Pramod Kumar Sharma. "Corona virus: a review of COVID-19." *Eurasian Journal of Medicine and Oncology* 4 (2020): 8-25.
- [5] Vohra, E. COVID-19 Pandemic in Pakistan and Its Decline—An Overview. *Pakistan Journal of Medicine and Dentistry* 2020, Vol. 9 (04).
- [6] Wiersinga WJ, Rhodes A, Cheng AC, Peacock SJ, Prescott HC. Pathophysiology, transmission, diagnosis, and treatment of coronavirus disease 2019 (COVID-19): a review. *JAMA*. 2020; 324 (8): 782-793.
- [7] Rodriguez-Morales A, Tiwari R, Sah R, Dhama K. COVID-19, an emerging coronavirus infection: current scenario and recent developments-an overview. *J Pure Appl Microbiol*. 2020; 14: 6150 <https://doi.org/10.22207/JPAM.14.1.02>
- [8] D. S. Hui et al. The continuing 2019-nCoV epidemic threat of novel coronaviruses to global health - The latest 2019 novel coronavirus outbreak in Wuhan, China. *Int. J. Infect. Dis*. 2020; 91: 264-266. <https://doi.org/10.1016/j.ijid.2020.01.009>
- [9] Zhou P, Yang XL, Wang XG, Hu B, Zhang L, Zhang W, Chen HD. A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature*. 2020; 579 (7798): 270-3. <https://doi.org/10.1038/s41586-020-2012-7>
- [10] Surveillances V. The epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19) — China, 2020. *China CDC Wkly*. 2020; 2 (8): 113–22.
- [11] Liu J, Liao X, Qian S, Yuan J, Wang F, Liu Y, et al. Community transmission of severe acute respiratory syndrome coronavirus 2, Shenzhen, China, 2020.
- [12] Baghizadeh Fini M. Oral saliva and COVID-19. *Oral Oncol*. 2020; 108 (104821): 256-260.
- [13] The Lancet. COVID-19: fighting panic with information. *Lancet*. 2020; 395 (10224): 537. [https://doi.org/10.1016/S0140-6736\(20\)30379-2](https://doi.org/10.1016/S0140-6736(20)30379-2)
- [14] Sajid, H. A., Ali, A., & Afzal, A. (2020). COVID-19: Recent Trends in the World and Precautionary Measures. *American Journal of Life Sciences*, 8 (3), 41-44.
- [15] Zhu, N., Zhang, D., Wang, W., Li, X., Yang, B., Song, J., Zhao, X., Huang, B., Shi, W., Lu, R. and Niu, P., 2020. A novel coronavirus from patients with pneumonia in China, 2019. *New England journal of medicine*.
- [16] Li, Q., Guan, X., Wu, P., Wang, X., Zhou, L., Tong, Y., Ren, R., Leung, K. S., Lau, E. H., Wong, J. Y. and Xing, X., 2020. Early transmission dynamics in Wuhan, China, of novel coronavirus–infected pneumonia. *New England journal of medicine*.
- [17] Zhou, P., Yang, X. L., Wang, X. G., Hu, B., Zhang, L., Zhang, W., Si, H. R., Zhu, Y., Li, B., Huang, C. L. and Chen, H. D., 2020. Discovery of a novel coronavirus associated with the recent pneumonia outbreak in humans and its potential bat origin. *BioRxiv*.
- [18] Xu, S., & Li, Y. (2020). Beware of the second wave of COVID-19. *The Lancet*, 395 (10233), 1321-1322.
- [19] Kissler SM, Tedijanto C, Goldstein E, Grad YH, Lipsitch M. Projecting the transmission dynamics of SARS-CoV-2 through the postpandemic period. *Science*. 2020; 368: 860-868.
- [20] Saunders-Hastings PR, Krewski D. Reviewing the history of pandemic influenza: understanding patterns of emergence and transmission *Pathogens*. 2016; 5: 66.
- [21] Iuliano AD, Roguski KM, Chang HH, et al. Estimates of global seasonal influenza associated respiratory mortality: a modelling study. *Lancet* 2018; 391: 1285-300.
- [22] La, V. P., Pham, T. H., Ho, M. T., Nguyen, M. H., P Nguyen, K. L., Vuong, T. T.,... & Vuong, Q. H. (2020). Policy response, social media and science journalism for the sustainability of the public health system amid the COVID-19 outbreak: The vietnam lessons. *Sustainability*, 12 (7), 2931.
- [23] Keni, R., Alexander, A., Nayak, P. G., Mudgal, J., & Nandakumar, K. (2020). COVID-19: emergence, spread, possible treatments, and global burden. *Frontiers in public health*, 8, 216.
- [24] Wise, J. (2020). Covid-19: Risk of second wave is very real, say researchers. *BMJ: British Medical Journal (Online)*, 369.
- [25] To, K. K. W., Hung, I. F. N., Ip, J. D., Chu, A. W. H., Chan, W. M., Tam, A. R., Fong, C. H. Y., Yuan, S., Tsoi, H. W., Ng, A. C. K. and Lee, L. L. Y., 2020. COVID-19 re-infection by a phylogenetically distinct SARS-coronavirus-2 strain confirmed by whole genome sequencing. *Clinical infectious diseases*.
- [26] Cacciapaglia, G., Cot, C. and Sannino, F., 2020. Second wave COVID-19 pandemics in Europe: a temporal playbook. *Scientific reports*, 10 (1), pp. 1-8.
- [27] Renardy, M., Eisenberg, M. and Kirschner, D., 2020. Predicting the second wave of COVID-19 in Washtenaw County, MI. *Journal of theoretical biology*, 507, p. 110461.
- [28] Din M, Asghar M, Ali M. COVID 19 and dengue coepidemics: A double trouble for overburdened health systems in developing countries. *J Med Virol*. 2020.
- [29] Albery GF, Eskew EA, Ross N, Olival KJ. Predicting the global mammalian viral sharing network using phylogeography. *Nature Commun*. 2020; 11: 1-9.
- [30] Asghar M, Din M. The expected second wave of COVID-19. *Int J Clin Virol*. 2020; 4: 109-110.
- [31] Peckham R. The COVID-19 outbreak has shown we need strategies to manage panic during epidemics. 2020. In: *The BMJ Opinion*.
- [32] Khan, Tarek Mahbub. "Preventive and Control Measures of COVID-19 Patients: A Review." *Bangladesh Journal of Infectious Diseases* (2020): S41-S44.

- [33] Sajed, Ahmad Naeem, and Kapil Amgain. "Corona Virus Disease (COVID-19) Outbreak and the Strategy for Prevention." *Europasian Journal of Medical Sciences* 2.1 (2020): 1-3.
- [34] Munster VJ, Koopmans M, van Doremalen N, van Riel D, de Wit E. A novel coronavirus emerging in China—key questions for impact assessment. *N Engl J Med*. 2020; 382 (8): 692–4.
- [35] Prem K, Liu Y, Russell TW, et al. The effect of control strategies to reduce social mixing on outcomes of the COVID-19 epidemic in Wuhan, China: a modelling study. *Lancet Public Health* 2020.
- [36] Organization WH. Coronavirus disease (COVID-19) advice for the Public: When and how to use mask. 2020. Available from: <https://covid19.who.int/>
- [37] Wang, J., Pan, L., Tang, S., Ji, J. S. and Shi, X., 2020. Mask use during COVID-19: A risk adjusted strategy. *Environmental Pollution*, p. 115099.
- [38] Cavanagh, G. and Wambier, C. G., 2020. Rational hand hygiene during the coronavirus 2019 (COVID-19) pandemic. *Journal of the American Academy of Dermatology*, 82 (6), p. e211.
- [39] Rundle, C. W., Presley, C. L., Militello, M., Barber, C., Powell, D. L., Jacob, S. E., Atwater, A. R., Watsky, K. L., Yu, J. and Dunnick, C. A., 2020. Hand hygiene during COVID-19: recommendations from the American contact dermatitis society. *Journal of the American Academy of Dermatology*.
- [40] Ferreira-Júnior, João B., Eduardo DS Freitas, and Suene FN Chaves. "Exercise: A Protective Measure or an “Open Window” for COVID-19? A Mini Review." *Frontiers in Sports and Active Living* 2 (2020): 61.
- [41] Lau, H., Khosrawipour, V., Kocbach, P., Mikolajczyk, A., Schubert, J., Bania, J. and Khosrawipour, T., 2020. The positive impact of lockdown in Wuhan on containing the COVID-19 outbreak in China. *Journal of travel medicine*, 27 (3), p. taaa037.
- [42] Graham, B. S., 2020. Rapid COVID-19 vaccine development. *Science*, 368 (6494), pp. 945-946.