Prevalence and Global Impact of 2019-nCoV Zoonotic Viruses on China and World: Consequences of Chaotic and Stressed Environment

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Abstract:

The Corona-virus (2019-nCoV) is a kind of zoonotic virus that has been first proclaimed in one of the major cities of China i.e. Wuhan. The major business players located in Wuhan have been greatly affected due to the shutdown of Wuhan. The objective of this work is to accentuate the prevalence and impact (social, economic, psychological) in China and the world. More than a hundred countries have been affected with the 2019-nCoV pandemic. After China, South Korea, Italy, Iran and Germany are on the side of highest hit list. The global infection rate of this pandemic virus is close to the figure of one and a half lakh. The number of casualties crosses five thousand. In spite of business and economical impacts, 2019-nCoV has significantly affected human psychology around the world. There is a global fear of 2019-nCoV and most of the people are distressed from this epidemic. The stressed environment leads to chaos and scrambling effects on local and global industries (transportation, entertainment, healthcare, steel) and the stock market. The drastic changes in the Indian and International stock market (lower circuit) have been observed. The GDP of China seems to face a momentous dropout due to 2019-nCoV. The restricted transmission and isolation strategy for infected persons is assisting in controlling the growth rate of 2019-nCoV. Fortunately, the global rate of recovery is close to 50%. A hybrid diagnostic framework based on different artificial intelligence techniques like deep learning, nature-inspired computing, fuzzy logic, and fog computing for the effective management of nCOV is required. This paper attempts to examine the critical parameters ranging from prevalence, causality rate and recovery rate from the pandemic.

Keywords: Corona-virus; 2019-nCoV; Stress; Economy; Stock Market; Artificial Intelligence;

1. Introduction

Viruses are microscopic DNA or RNA based particles that generally affect the plants, birds, animals, reptiles as well as humans. Generally, they are wrapped in a protein coat. However, some of the viruses are surrounded by a fatty envelope coating. It needs to be noted that all of the viruses are not harmful to human beings. Some virus agents protect the human body from other infections or disorders. In general, the viruses infect the respiratory, reproductive and nervous systems of humans. The human virus is not a new epidemic, earlier various viruses like Tobacco Mosaic virus [1], Swine (H1N1) [2], Bird flu [3], Chickenpox [4], Ebola [5], SARS [6], MERS 7], Human-Immunodeficiency Virus (HIV)[8], etc. have also affected humans. To date, more than two hundred virus species have affected the health and mental state of human beings [9].

Corona-virus is an unfortunate event that has again tremendously affected folks. 2019-nCoV is a new hassle that has not been observed in humans earlier. It is infecting people of all age's viz. children, teens, adults, and older people. Till now, different generations of corona-viruses have been identified. The humans, birds and mammals are the major victims of these viruses. These viruses normally affect the respiratory, liver and

neurological systems of human beings [10]. Earlier, SARS and MERS (version of CoV) has created respiratory problems. Some of the major versions of corona-virus are SARS-CoV [11], MERS-CoV[12], MERS-CoV [13], MERS-CoV [14] and 2019-nCoV [15].

The 2019-nCoV (zoonotic virus) has been first recorded in Wuhan, one of the major cities of China. The first infected case has been identified in December 2019[16] [17].On 10th March 2020, this zoonotic virus has been disseminated into most of the countries of the globe. The major countries like the USA, Spain, Italy, South Korea, Iran, Hong Kong, Thailand, Singapore, India, France, Sweden, Australia, Malaysia, Vietnam etc. are all infected with 2019-nCOV[18]. Surprisingly, to date, the root cause behind the transmission of 2019-nCoV in humans is still a mystery. Till now, more than one lakh cases have been detected in which the major contribution is from China, Italy, South Korea and Iran. The rate of infected cases is regularly growing. Earlier, an exponential growth (infected cases) has been found in China. A similar trend is now seen in Italy. To date, more than five thousand global fatalities have been recorded. However, a good rate of recovery (close to 50%) has also been witnessed. The consequences of this pandemic have been globally seen. The complete world is facing a chaotic and stressful environment. This stress environment has momentously affected the lives and lifestyles of people across the globe. The consequences of this chaotic and stressed atmosphere are explicitly seen in the transportation, tourism, entertainment and steel industry. In addition, owing to this zoonotic virus, the national and international stock markets have also faced the lower circuit. Due to this stressed environment and to reduce the dissemination of this pandemic virus, various schools, colleges, offices, organizations and even cities/states in most of the countries have been shut down.

The major symptoms of 2019-nCoV are headache, dry cough, vomiting, nausea, sore throat, joint pain, breath shortness. In a critical situation, it may cause high fever, kidney and lung failure and reduces white blood cells. The 2019-nCOV Wuhan outbreak has significantly affected the lives of Chinese and global individuals.

The main contribution of this work is to assert the prevalence of 2019-nCoV across China and the World. The rate of causality, recovery, and prevalence across the globe has been examined and highlighted. The business and economical effects of 2019-nCoV are investigated. The effects of 2019-nCoV on Indian and international stock markets are also analyzed. Additionally, the major global impacts of 2019-nCoV across China and the world are also emphasized. The chaotic and stressed environment and its impact on individuals, family, organization and state are illustrated. The Google trend related to 2019-nCOV has also been examined to determine the prevalence and impact of it.

2. Related Works

Phan, Tung (2020) has briefly described the facts related to discovery and clinical diagnostic of 2019-NCoV. The pairwise sequence analysis revealed that the nucleotide similarity of 2019-nCoV with MERS and HCoV is less than 50%. Authors stated that a number of hidden factors are associated with 2019-nCoV, therefore, there is a need to examine this issue in a more comprehensive manner [19]. Al-qaness et al. (2020) have used nature-inspired computing methods to forecast the number of confirmed cases of 2019-nCoV using the amalgamation (FPASSA-ANFIS) of flower pollination algorithm (FPA), neuro-fuzzy inference system (ANFIS) and salp swarm algorithm (SSA). The performance of the FPASSA-ANFIS found to be more precise than other optimization techniques [20]. Tang, Biao (2020) have devised a mathematical model to estimate the risk and implications of 2019-nCoV. The model reveals that with the imposed travel restrictions the growth of the

infection will decrease more than 90% in a week. The sensitivity analysis proved that the quarantine and isolation effects will surely reduce the risk of infection [21].

3. Prevalence and Impacts of the Corona Virus

The prevalence and global impacts of 2019-nCoV are presented in the remaining part of this section.

3.1 Global Prevalence till 14th March 2020

As per the statistics taken on14th March 2020, around one lakh and forty-six thousand worldwide cases have been diagnosed. More than five thousand (5436) casualties have been globally recorded. Out of 1, 45810 cases, 72,531 were successfully recovered. However, a significant number of victims (6082) found to be in critical condition [18]. The statistics of China for 2019-nCoV is depicted in Figure 1. The rate of causality and recovery for the infected victims of China is 3.94% and 81.09% respectively. A good rate of recovery has been observed.

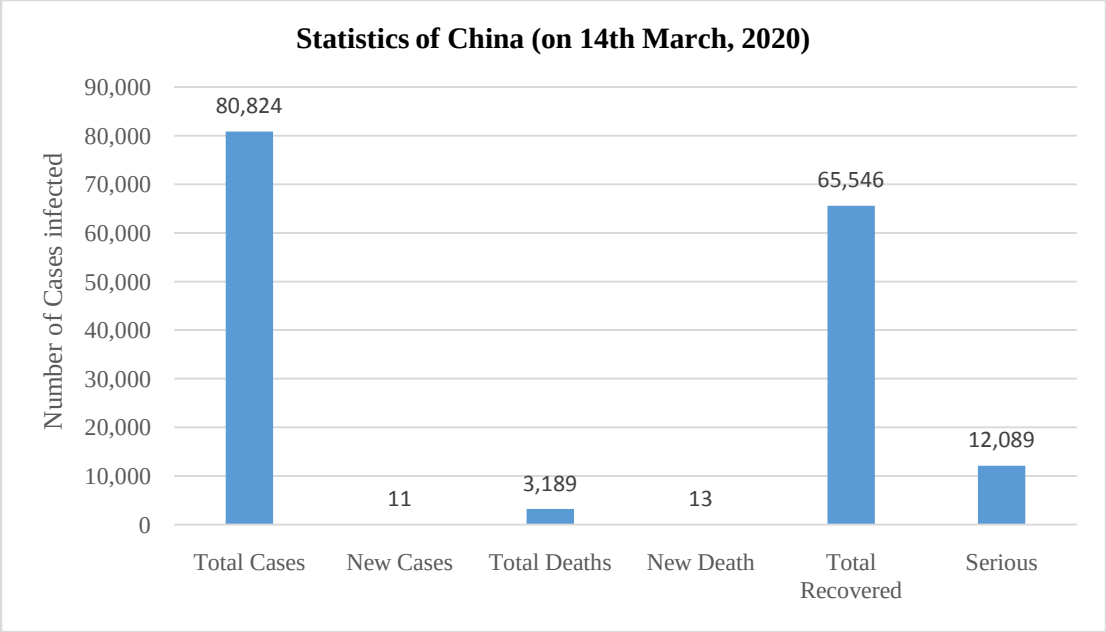

Figure 1: Statistics of China (14th March 2020

As stated earlier, most of the countries are infected with 2019-nCoV. The country-wise rate of infection is depicted in Figure 2. As per the statistics available, the countries like Italy, Iran, South Korea, Spain are also significantly affected by this new version of corona-virus. The countries viz. Kenya, Jordan, Nepal, Togo, Ukraine, Turkey found to be comparatively safer as the prevalence of corona-virus (number of an infected victim) is below five [18].

As per record, the number of casualties has been crossed the level of five thousand and four hundred (Figure 3). Till the 14th of March 2020, more than three thousand cases were recorded for China (3189) only, followed by Italy (1266) and Iran (514). The facts are depicted in Figure 3.

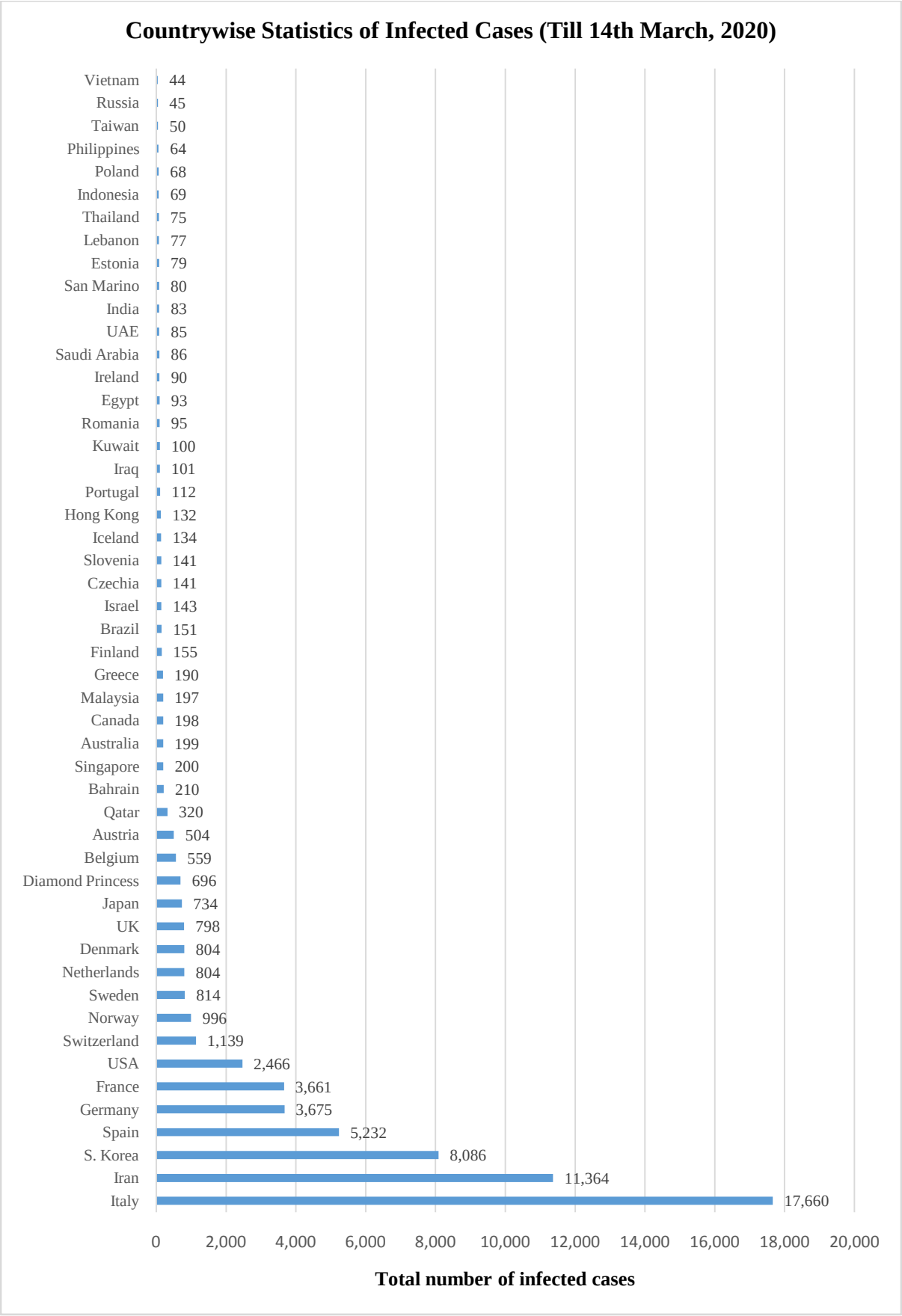

Figure 2: Country-wise Statistics of Infected Cases (Till 14 March 2020) [18]

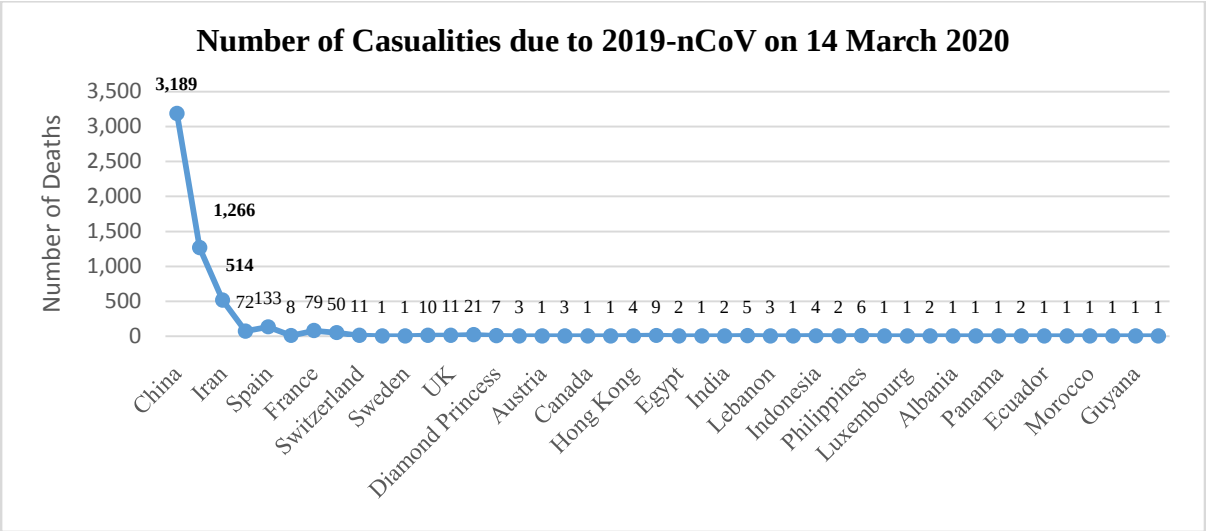

Figure 3: Number of Causalities due to 2019-nCoV [18]

As far as the rate of recovery is considered, on 14th March 2020, 65546, 1439, 3529 and 714 cases have been recovered in China, Italy, Iran and South Korea respectively. The recovery details of other countries are depicted in Figure 4.

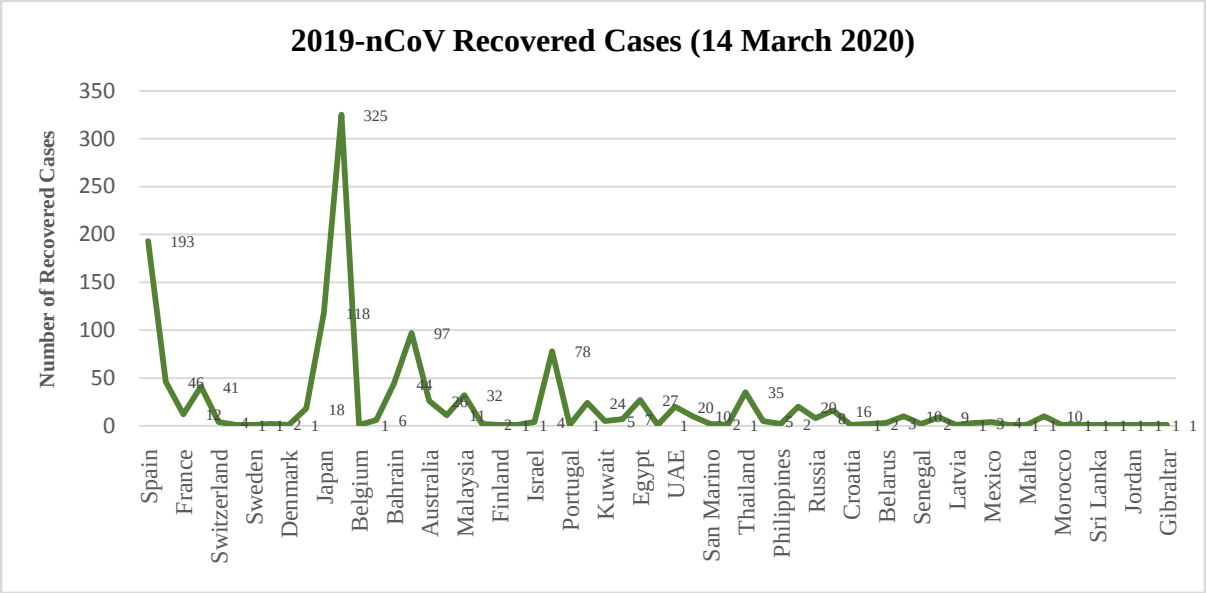

Figure 4: Number of Recovered Cases [18]

From Figure 5, it is found the rate of recovery of 2019-nCoV for Macao, Jordon, Nepal, and Gibraltar, is 100%. For China, Italy, Iran, South Korea the rate of recovery of 2019-nCoV is 81.10%, 8.15%, 31.05, and 8.83 respectively. Unfortunately, on 14th March 2020, the rate of recovery for Qatar, Czechia, Iceland, Ireland, Poland, Chile Serbia, Tunisia, Bolivia, Armenia, Ukraine, Monaco, Nigeria, Guyana, Sudan is zero[18].

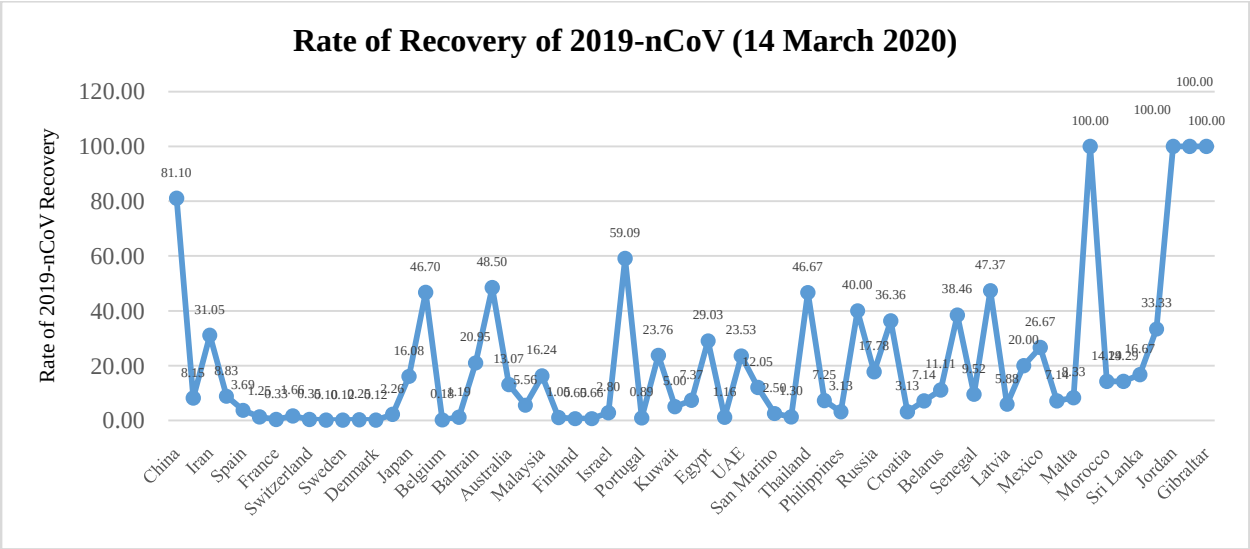

Figure 5: Number of Recovered Cases [18]

3.2 Weekly Analysis of nCoV-2019 (8-Mar-20 to 14-Mar-20)

To gain deeper insights, the trend of seven days (8-Mar-20 to 14-Mar-20**)** has been critically examined. From Figure 6, it is observed that between 8-March-2020 to 14-March-2020, the global rate of registered, dead, recovered and active cases are increasing on a daily basis.

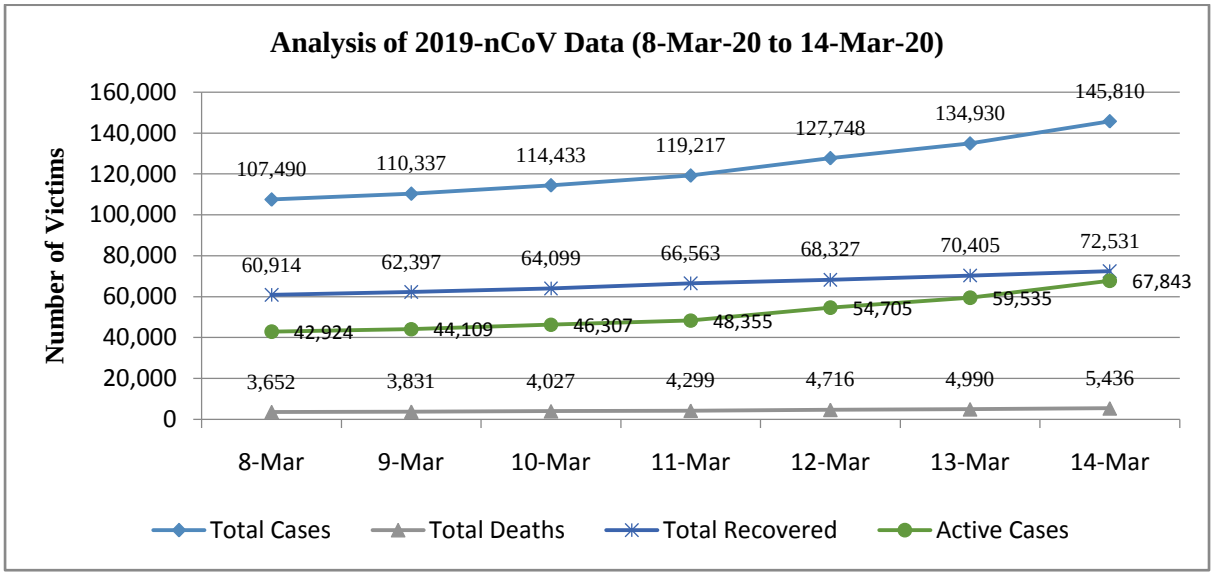

Figure 6: Analysis of 2019-nCoV Data (8-Mar-20 to 14-Mar-20) [18]

Figure 7 (a) presents the seven days statistics of the four (China, South Korea, Iran, and Italy) the most infected countries. The high rate of casualties has been found in Italy. However, the rate of growth (Causality) in China seems to be more controlled. Fortunately, Iran is on the safer side as far as a number of deaths is concerned.

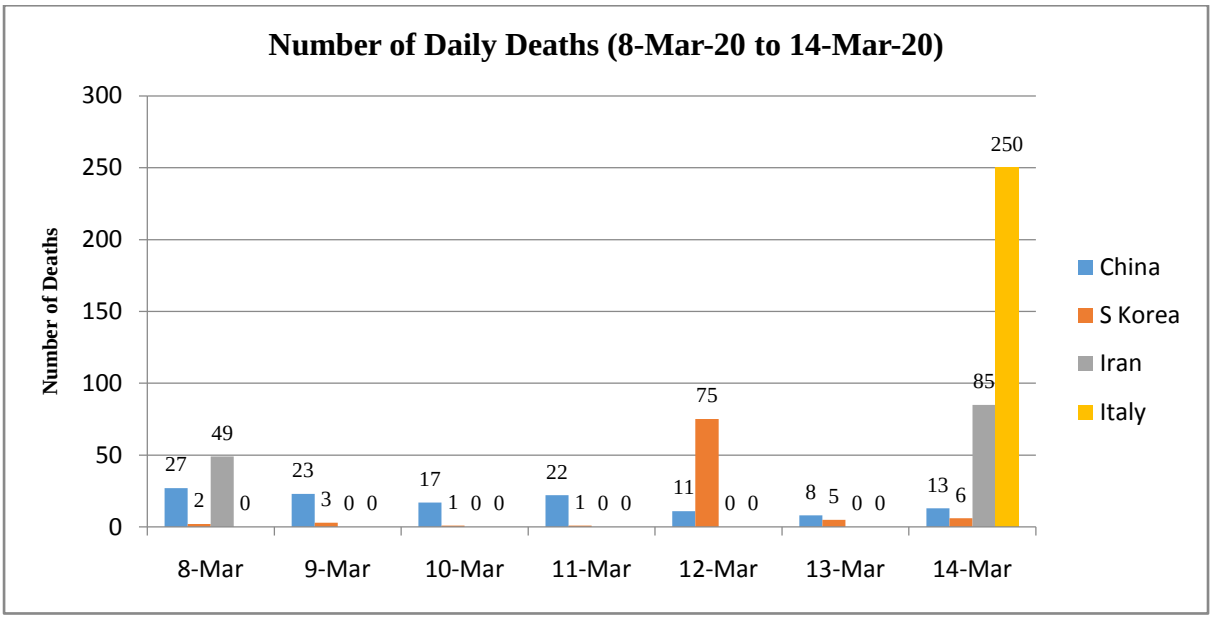

Figure 7 (a): Number of casualties for major infected countries [18]

Figure 7(b) witnessed a dramatic change in seven days (8-Mar-20 to 14-Mar-20). Unfortunately, the number of new cases (diagnosed) has been exponentially shoots up in Italy and Iran.

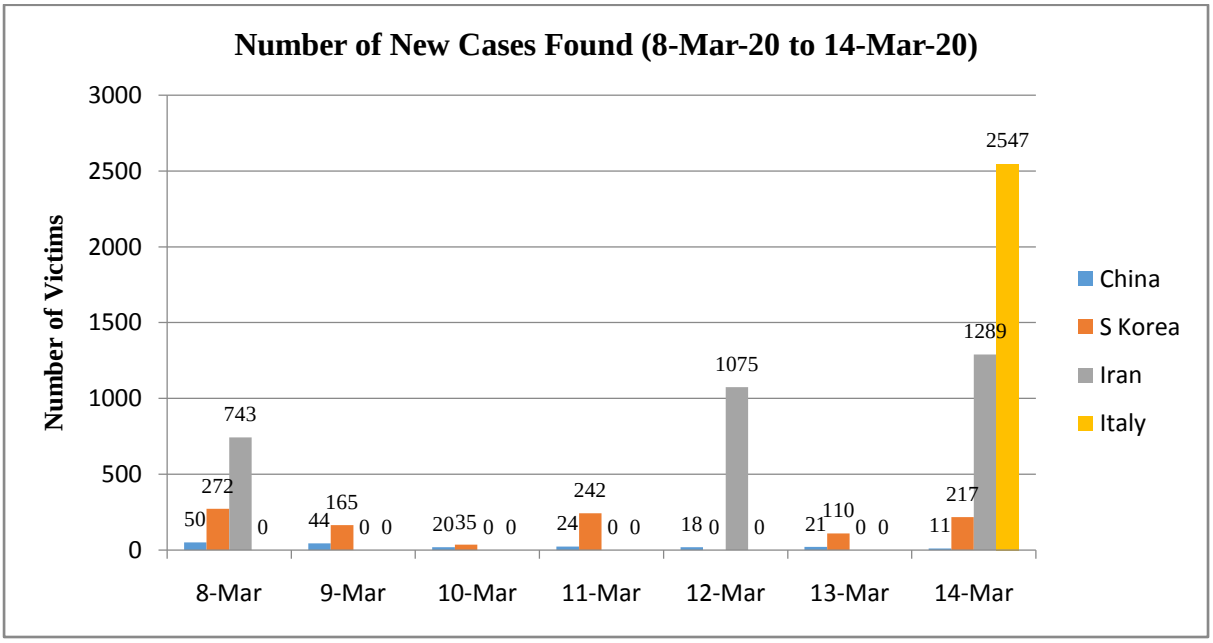

Figure 7 (b): Number of new cases registered for major infected countries [18]

3.3 Economic impacts of 2019-nCoV

Chinese and world trade has been tremendously affected by 2019-nCoV. The overall business and the daily routines of around 500 major industry players located in Wuhan (IT Industry, Car-makers, and Steel Industry) have been badly affected by this unfortunate event. Almost every sector has been affected by this pandemic. The most affected sectors are depicted in Figure 8.

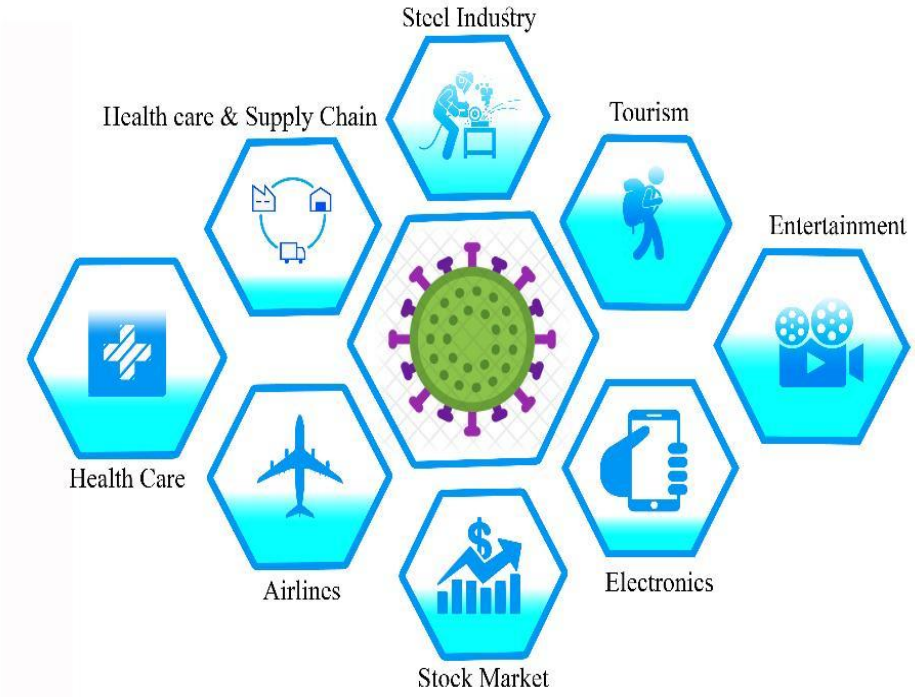

Figure 8: 2019-nCoV affected domains

Moreover, due to the temporary shutdown of Wuhan city, a heavy loss has been observed for both the local and global entertainment and tourism industry. Ripple consequences across the neighbour cities of Wuhan and across the globe have also been witnessed. These facts are reflected in the rattled stock market. Not only China, but this outbreak also has a tremendous effect on global airlines as a number of journeys have been aborted or rescheduled. As per the expert economist opinion, China has to face a significant dropout in the first quarter of GDP growth [22][23]. The effect of 2019-nCoV on Indian and international stock markets has also been accessed.

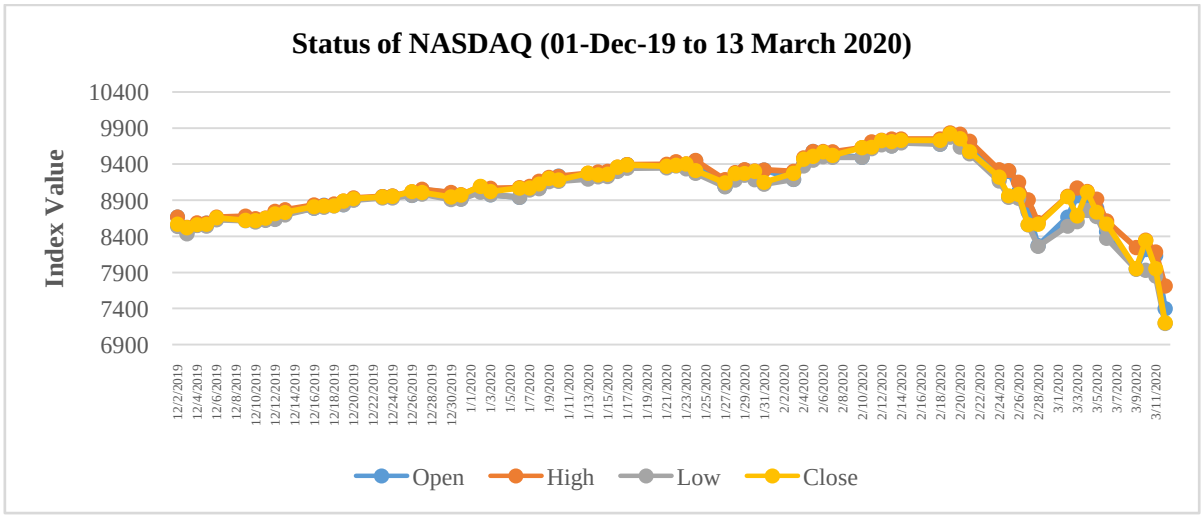

Figure 9 (a): Status of NASDAQ (01-Dec-19 to 13 March 2020)

From Figure 9(a) and (b), it has been observed that overall in the last three months the rate of NASDAQ index has been significantly decreased. The statistics clearly indicate that the rate of infection is surely affecting the international market [24]. The declaration of 2019-nCoV as pandemic has stumbled the national and international stock market.

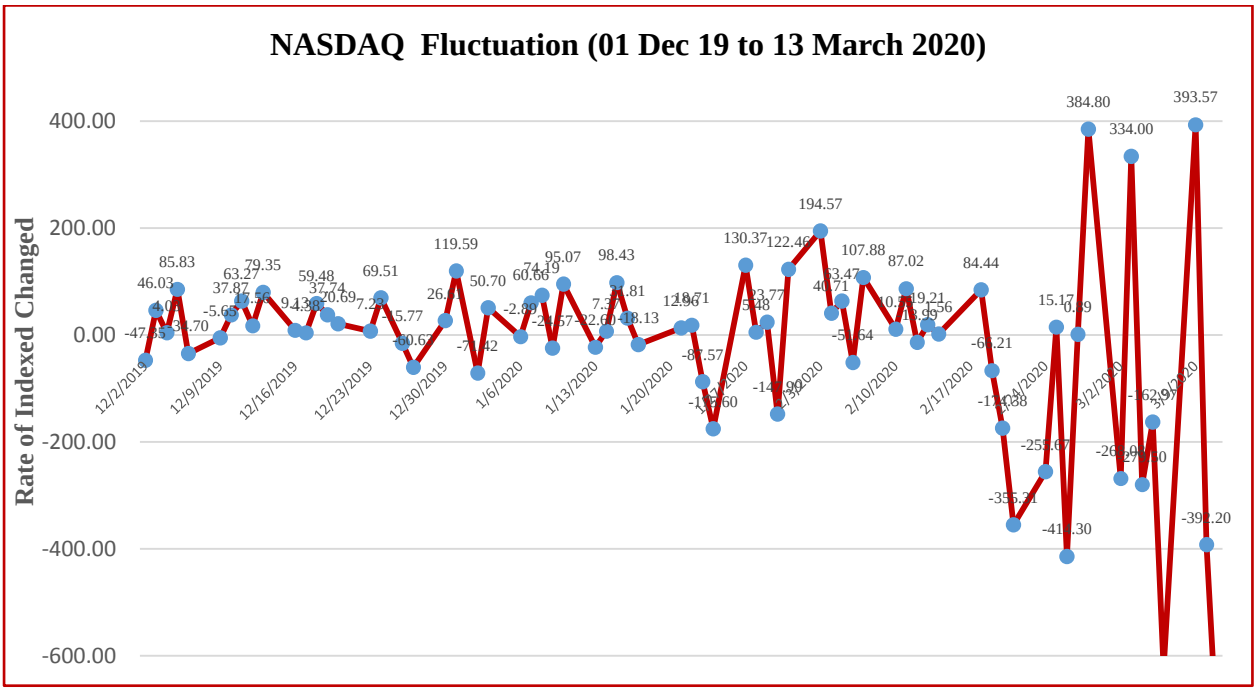

Figure 9 (b): NASDAQ Fluctuation (01-Dec-19 to 13 March 2020) [24]

Like the international market, similar consequences have also been observed on the Indian stock market (BSE and NSE). On 12th March, a tremendous change has been observed. The 2019-nCoV pandemic inflicted havoc on Indian and International markets. Unfortunately, the Indian market has to face the lower circuit as the Sensex has been observed a collapse of approximately 3000 points [25]. The picture of BSE and NSE for a specified time period (01-Dec-19 to 13 March 2020) is explicitly presented in Figure 9 (c), 9 (d) and 9 (e).

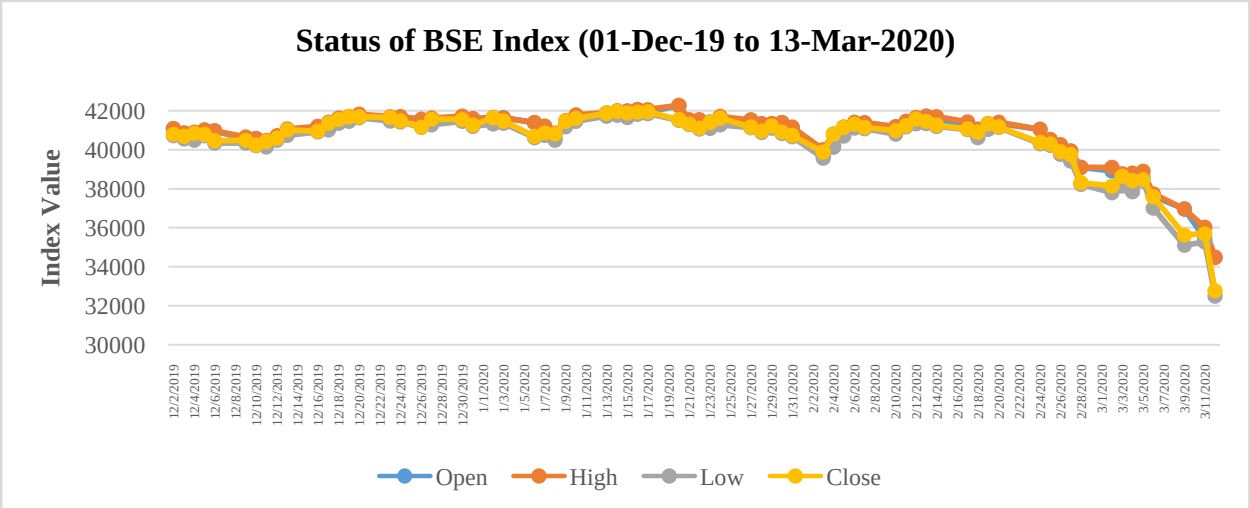

Figure 9 (c): Status of BSE Index (01-Dec-19 to 13-Mar-2020)

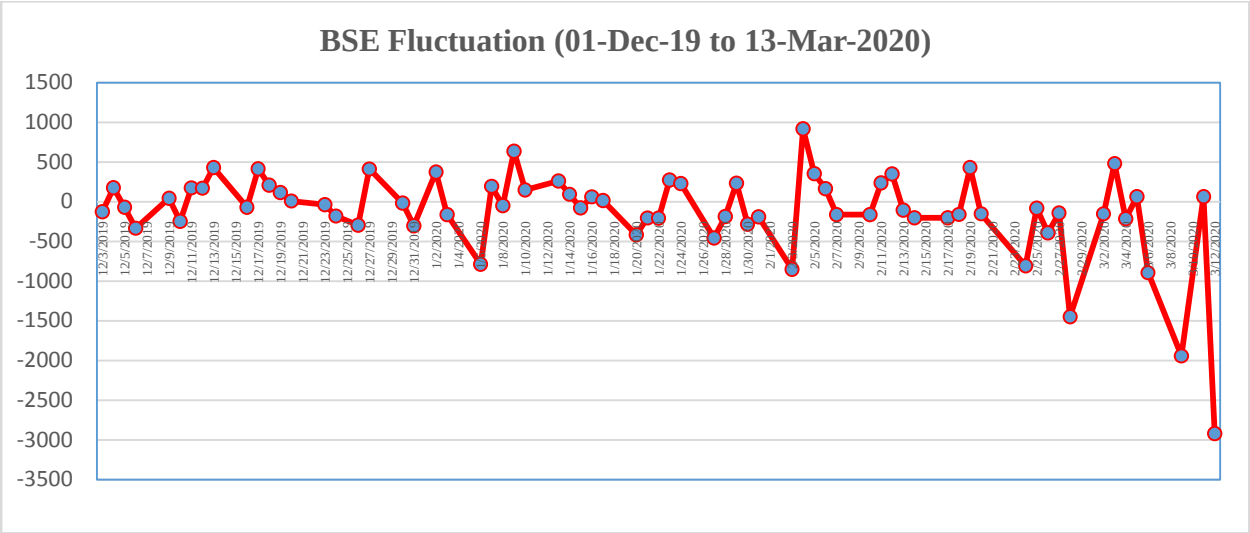

Figure 9 (d) : BSE Fluctuation (01-Dec-19 to 13-Mar-2020)

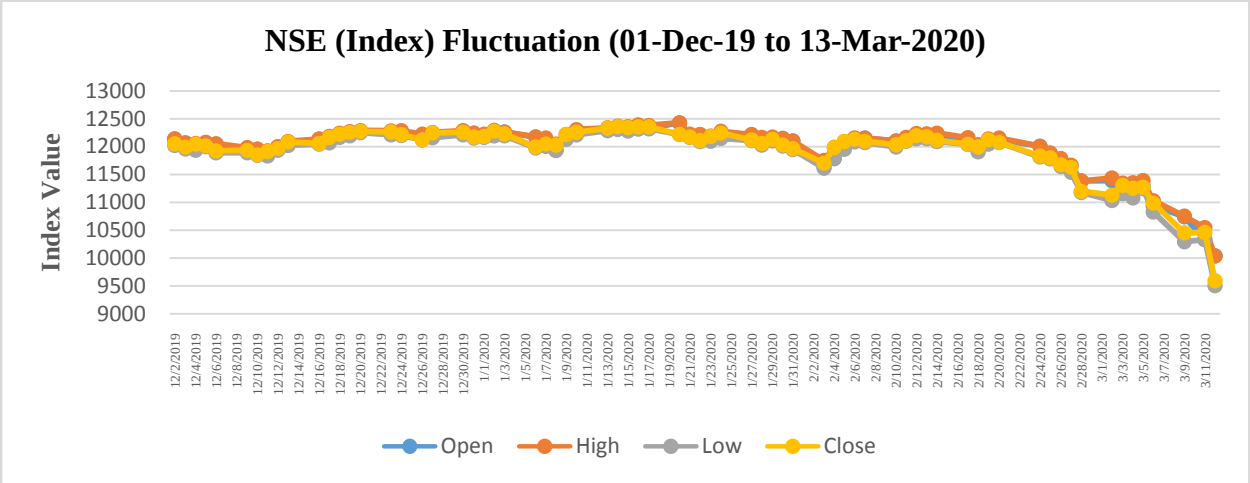

Figure 9 (e): NSE (Index) Fluctuation (01-Dec-19 to 13-Mar-2020)

3.4 2019-nCoV and Healthcare Supply Chain

The 2019-nCoV proceeds to wreak havoc on the healthcare supply markets. The healthcare industries of most of the countries rely on foreign suppliers for equipment and other healthcare-related supplies. The global healthcare supply chain industry is going through disruption in these days. Due to this disruption, there will be a shortage of different healthcare supplies. The ripple effect of these facts can be seen in the sales and shortage of hand sanitizers and the face masks [26].

3.5 General Global Impacts of 2019-nCoV

- The Wuhan has been temporarily but completely shutdown.
- The 2019-nCoV has been declared as a pandemic.
- Several primary schools, colleges, and universities across different countries (China, India, and Italy) have been shut down for the safety of the students and their nation.
- Canadian Prime Minister's Wife found to be 2019-nCoV positive.
- The biometric attendance has been suspended across government and private organizations across the globe.
- The stock market has been significantly affected and faced a lower circuit.
- The momentous volume of data related to 2019-nCov has been regularly transmitted.

- International tourism has been greatly affected.
- A high alert has been made for healthcare professionals.
- International travelers have to undergo thermal scanning.
- Several travel restrictions have been posed. However, the rate of detection seems to be 30% for 2019-nCov infected persons [27].
- In spite of price slashed, the sale of Indian poultry farms (eggs/chickens) has been dropped to 50% [28].
- The overall business of the cinema halls, multiplex theatres, and shopping malls has been dropped due to the 2019-nCOV outbreak.
- The sales of masks have incredibly increased and lead to a shortage of the same.
- Several national and international workshops, symposiums, meetings and conferences have been canceled or postponed.
- The IPL (Cricket Tournament) has been postponed.
- An international cricket match (India v/s South Africa) was organized without spectators.
- During this pandemic time period, only high priority cases will be handled by the Indian high and supreme court[29]

3.6 Google Trend

The Google trend related to the 2019-nCoV of eight major infected countries has been examined. The relative search interest of 2019-nCoV (Corona Virus) has been accessed and depicted in Figure 10. The Google database has been mined with respect to the search of "Corona Virus" for a period of 01/12/2019 to 10/03/2020. After 20th February 2020, a striking rise in Google trend (for corona-virus) for these deeply infected countries China, Italy, South Korea, Iran, France, Germany Spain and the United States has been found.

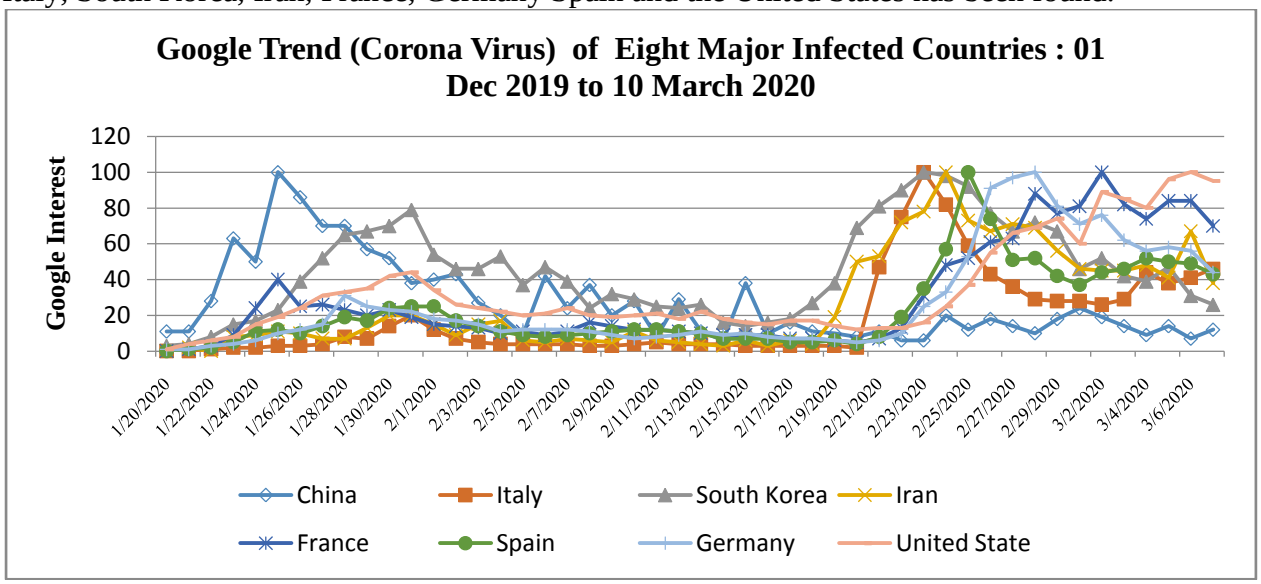

Figure 10: Google trend (Corona Virus) of eight deeply infected countries

The region-wise Google Trend interest for the most infected countries viz. China, Italy and Iran are depicted in Figure 11, 12 and 13 respectively.

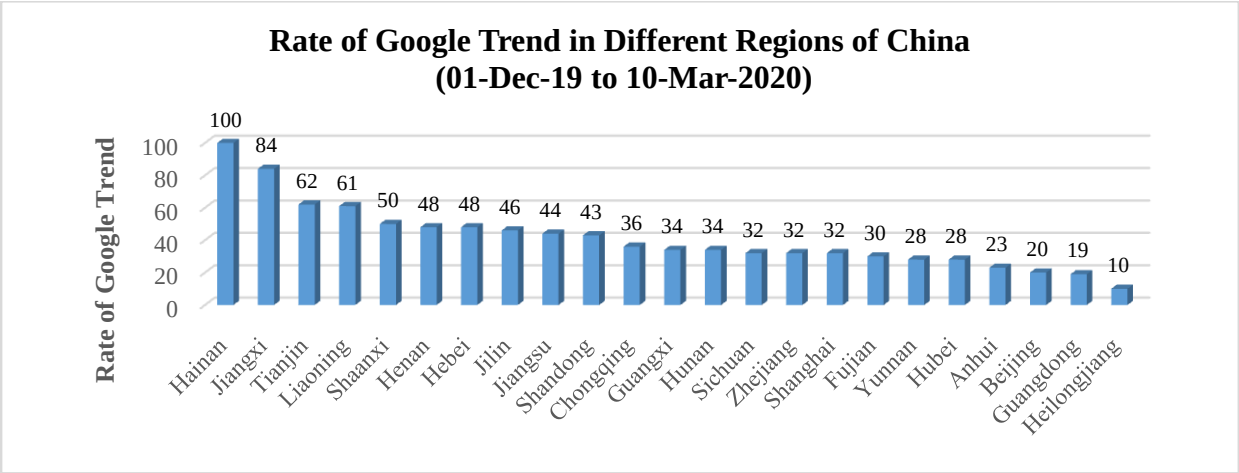

Figure 11: Rate of Google Trend in Different Regions of China

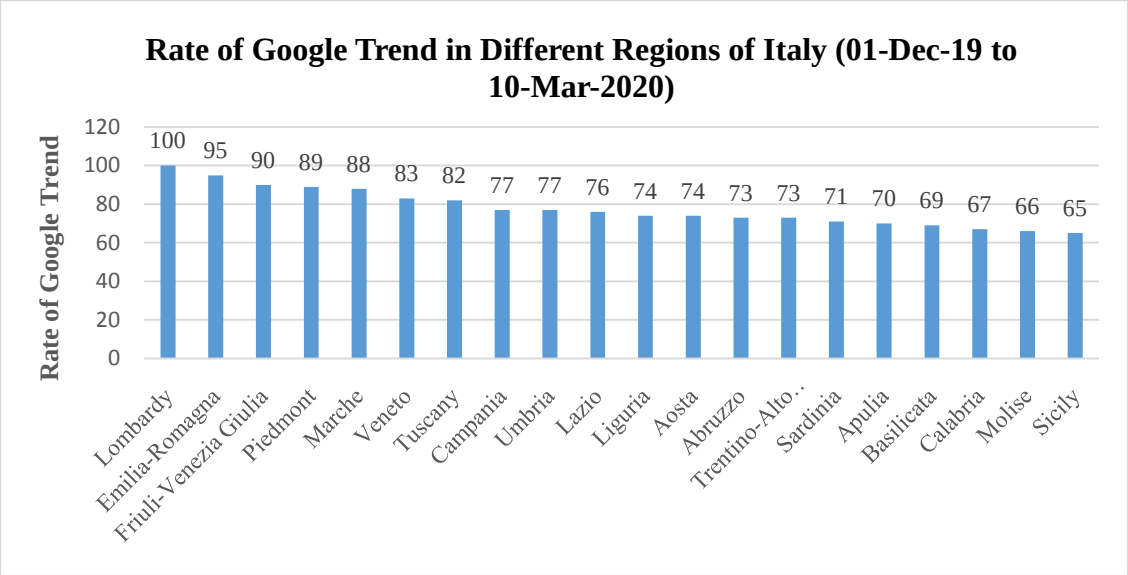

Figure 12: Rate of Google Trend in Different Regions of Italy

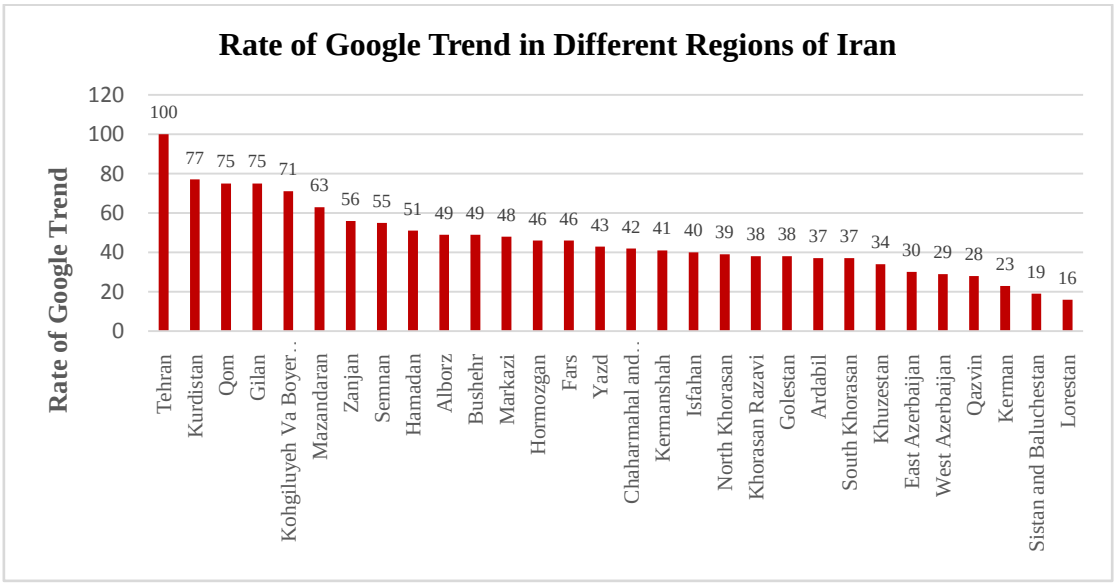

Figure 13: Rate of Google Trend in Different Regions of Iran

4. Consequences of 2019-nCoV Stress

This global prevalence of zoonotic virus (2019-nCoV) has created a chaotic environment for individuals, families, professionals, organization as well as for the state. Stress, fear, boredom, confusion, anxiety, anger are the common rejoinders of this chronic outbreak[30] The repeated transmission (over WhatsApp, Facebook, Instagram, and other social networking apps) related to the prevalence and consequences of the outbreak is making persons more distressed. No doubt, some of the anxiety assists in dealing with this unfortunate incident, however, an extreme level of anxiety can become coronavirus panic. Consequently, one will suffer himself/herself and even may create stressful and a chaotic environment for his / her friends and family. The 2019-nCoV global stressed atmosphere is affecting the work productivity. Moreover, one is more likely to make mistakes and indulge in irrational decisions and conduct. In spite of the adults, the distressing effect of 2019-nCov can also be seen on the innocent faces of the children. Some of the psychological impacts of 2019-nCoV are[31][32]:-

- Every state is worried about their nation as well as the globe.
- People feel worried about the health status of their families.
- Parents are more worried in regard to the safety of their children from 2019-nCoV.
- People avoid hug and handshake to their near and dear ones.
- 2019-nCoV has also affected the personal (romance, sex) life of the married couples.
- The gathering in the marriages, functions, or similar events has been curtailed.
- The employees, professionals and other individuals feel to be stressed while traveling through publication transportation.
- People are becoming more distressed as they are continuously watching and listening to the media coverage about COVID-19. The media conjecture may increase mental discomfort.
- Bedwetting, excessive irritation, lack of concentration and avoiding school are common effects on 2019-nCoV threatened children.
- The threat of isolation makes people worried.
- A threatening and stressed period for the healthcare professionals as the rate of probability of their contamination is significantly high because of their immediate contact with the patients. Moreover, in some cases, symptoms of common cold or flu are mistaken as COVID-19 which is also the major source of stress among doctors. Additionally, the youngsters that are new to the medical profession are also suffering from stress, anxiety and intricacy as they are lacking the experience of their field [33].
- Moreover, quarantine is also causing stress among people.

To deal with this stressed phase, one should discourage excessive exposure of 2019-nCoV on social media. Try to be calm, drink plenty of water, have sound sleep and do meditation [34]. Avoid taking alcohol or smoking. Take a balanced and healthy diet. The level of stress among children can be reduced when parents start to talk calmly and assertively about the Wuhan outbreak. One should talk to their children and make assure them that they are safe, everything will be settled down. Moreover, People should talk to their friends and family as it can help in reducing the stress level.

Human corona-virus remains contagious on the abiotic surfaces for nine days at room temperature [35]. As per WHO commendation 70% of ethanol concentration is essential for fumigating small surfaces. Additionally, the use of a nominal concentration of sodium hypochlorite with an exposure time of one minute on the surface also minimizes the corona-virus effect. It is suggested to use alcohol-based hand sanitizers for disinfecting their hands.

Taiwan has installed hand wash stations at the exigency department for protecting employees from the virus.

5. Conclusions and Future Directions

Corona-virus (2019-nCoV) is a sort of zoonotic virus that has been first recorded in one of the major metropolis of China i.e. Wuhan. Starting from China, the 2019-NCoV has been disseminated into several major countries like Italy, South Korea, Iran, Hong Kong, Thailand, Singapore, India, Globally, around one lakh and forty-six thousand people have been globally contaminated with this deadly virus. Unfortunately, the number of fatalities due to 2019-nCoV crossed the figure of five thousand. The rate of causality and recovery for the infected victims of China is 3.94% and 81.09% respectively. After China, the countries viz. South Korea, Iran and Italy are the most affected with this pandemic virus. The effects of 2019-nCoV have been globally seen and observed. This global prevalence of zoonotic virus (2019-nCoV) has created a chaotic environment for individuals, professionals, families, organization as well as for the state. This chaotic and stressed atmosphere has significantly affected transportation, entertainment, steel and the stock market. A number of schools, colleges, offices, enterprises have been shut down which will ultimately affect the business and economy of the state and globe. The stock market has repeatedly faced a lower circuit due to this pandemic virus. Ripple consequences across the neighbor cities of Wuhan and across the globe have also been witnessed. As per expert economist opinion, China has to face a significant dropout in the first quarter of GDP growth. Artificial Intelligence (AI) has been effectively employed to solve different healthcare problems [36][37][38]. The massive volume, variety, veracity, and velocity of data can be effectively used to train a predictive model so that a good rate of predictive precision can be accomplished. A hybrid diagnostic framework based on different artificial intelligence techniques like deep learning, nature-inspired computing, fuzzy logic, fog computing, entropy is needed to access the consequences and input on human survival after the pandemic reduces its pangs[39][40].

In future, the artificial intelligence based novel and innovative diagnosistic model will be implemented and the performance of the model will be evaluated based upon different performance metrics.

Compliance with Ethical-Standards

Conflict-of-Interest

Authors proclaim that they have no dissension of interest.

Ethical-approval

This article does not contain any studies with human participants or animals performed by any of the authors.

References

1. Gierer, Alfred, and Gerhard Schramm. "Infectivity of ribonucleic acid from tobacco mosaic virus." Nature 177.4511 (1956): 702-703.
2. Coburn, Brian J., Bradley G. Wagner, and Sally Blower. "Modeling influenza epidemics and pandemics: insights into the future of swine flu (H1N1)." BMC medicine 7.1 (2009): 30.
3. Abbott, Alison, and Helen Pearson. "Fear of human pandemic grows as bird flu sweeps through Asia." (2004): 472.

4. Takahashi, Michiaki. "Chickenpox virus." Advances in virus research. Vol. 28. Academic Press, 1983. 285-356.
5. Groseth, Allison, Heinz Feldmann, and James E. Strong. "The ecology of Ebola virus." Trends in Microbiology 15.9 (2007): 408-416.
6. Cinatl, J., et al. "Treatment of SARS with human interferons."The Lancet 362.9380 (2003): 293-294.
7. Azhar, Esam I., et al. "Evidence for camel-to-human transmission of MERS coronavirus." New England Journal of Medicine 370.26 (2014): 2499-2505.
8. Oliveira, Alexandra, et al. "Data mining in HIV-AIDS surveillance system." Journal of medical systems 41.4 (2017): 51.
9. Woolhouse, Mark, et al. "Human viruses: discovery and emergence." Philosophical Transactions of the Royal Society B: Biological Sciences 367.1604 (2012): 2864-2871.
10. Zhu, Na, et al. "A novel coronavirus from patients with pneumonia in China, 2019." New England Journal of Medicine (2020).
11. Zhong, N. S., et al. "Epidemiology and cause of severe acute respiratory syndrome (SARS) in Guangdong, People's Republic of China, in February 2003." The Lancet 362.9393 (2003): 1353-1358.
12. Gastanaduy, Paul A. "Update: severe respiratory illness associated with Middle East respiratory syndrome coronavirus (MERS-CoV)—worldwide, 2012–2013." MMWR. Morbidity and mortality weekly report 62.23 (2013): 480.
13. Cowling, Benjamin J., et al. "Preliminary epidemiologic assessment of MERS-CoV outbreak in South Korea, May–June 2015." Euro surveillance: bulletin Europeensur les maladies transmissibles= European communicable disease bulletin 20.25 (2015).
14. Chafekar, Aasiyah, and Burtram C. Fielding. "MERS-CoV: understanding the latest human coronavirus threat." Viruses10.2 (2018): 93.
15. Munster, Vincent J., et al. "A novel coronavirus emerging in China—key questions for impact assessment." New England Journal of Medicine 382.8 (2020): 692-694.
16. Chinazzi, Matteo, et al. "The effect of travel restrictions on the spread of the 2019 novel coronavirus (COVID-19) outbreak."Science (2020).
17. Perlman, Stanley. "Another decade, another coronavirus." (2020): 760-762.
18. https://www.worldometers.info/coronavirus/(Accessed on 05 March 2020)
19. Phan, Tung. "Novel coronavirus: From discovery to clinical diagnostics." Infection, Genetics, and Evolution (2020): 104211.
20. Al-qaness, Mohammed AA, et al. "Optimization Method for Forecasting Confirmed Cases of COVID-19 in China." Journal of Clinical Medicine 9.3 (2020): 674.
21. Tang, Biao, et al. "Estimation of the transmission risk of the 2019-nCoV and its implication for public health interventions." Journal of Clinical Medicine 9.2 (2020): 462.
22. Ayittey, Foster Kofi, et al. "Economic Impacts of Wuhan 2019-nCoV on China and the World." Journal of Medical Virology(2020).
23. Luo, Shaowen, and Kwok Ping Tsang. "How Much of China and World GDP Has The Coronavirus Reduced?." Available at SSRN 3543760 (2020).
24. https://in.finance.yahoo.com/
25. https://www.thehindubusinessline.com/markets/stock-markets/stock-market-updates-for-march-12-2020/article31046636.ece
26. https://www.pymnts.com/news/b2b-payments/2020/tractmanager-coronavirus-potential-change-hospital-healthcare-supply-chains/
27. https://www.lshtm.ac.uk/newsevents/news/2020/how-effective-thermal-scanning-airports
28. https://www.scmp.com/week-asia/economics/article/3065227/coronavirus-chicken-indias-poultry-industry-takes-steps-stop

29. https://www.bloombergquint.com/law-and-policy/how-indian-courts-are-adapting-in-the-times-of-covid-19 [Accessed on 17th March 2020]
30. https://www.nctsn.org/sites/default/files/resources/fact-sheet/outbreak_factsheet_1.pdf
31. Sharma, Samriti, Manik Sharma, and Gurvinder Singh. "A chaotic and stressed environment for 2019-nCoV suspected, infected and other people in India: fear of mass destruction and causality." *Asian journal of psychiatry* 51 (2020): 102049.
32. Gautam, Ritu, and Manik Sharma. "2019-nCoV pandemic: A disruptive and stressful atmosphere for Indian academic fraternity." *Brain, Behavior, and Immunity* (2020).
33. Xing, Jun, et al. "Study of the mental health status of medical personnel dealing with new coronavirus pneumonia."
34. https://www.cdc.gov/coronavirus/2019-ncov/about/coping.html (stress mental health)
35. Kampf, Günter, et al. "Persistence of coronaviruses on inanimate surfaces and its inactivation with biocidal agents."*Journal of Hospital Infection* (2020).
36. Gautam, Ritu, and Manik Sharma. "Prevalence and Diagnosis of Neurological Disorders Using Different Deep Learning Techniques: A Meta-Analysis." Journal of Medical Systems44.2 (2020): 49.
37. Long, Justin B., and Jesse M. Ehrenfeld. "The Role of Augmented Intelligence (AI) in Detecting and Preventing the Spread of Novel Coronavirus." (2020): 59.
38. Gautam, Ritu, Prableen Kaur, and Manik Sharma. "A comprehensive review of nature-inspired computing algorithms for the diagnosis of chronic disorders in human beings." Progress in Artificial Intelligence (2019): 1-24.
39. Sharma, Manik, Samriti Sharma, and Gurvinder Singh. "Remote monitoring of physical and mental state of 2019-nCoV victims using social internet of things, fog and soft computing techniques." *Computer methods and programs in biomedicine* 196 (2020).
40. Sharma, Manik, et al. "Analysis of DSS queries using entropy based restricted genetic algorithm." *Applied Mathematics & Information Sciences* 9.5 (2015): 2599.