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Comparative Review of the COVID-19 Outbreak in Bigger Affected Countries Vis-à-vis Lesser Affected Countries

Unprecedented outbreak of COVID-19 resulted in declaration of Public Health Emergency of International Concern by the World Health Organization (WHO). China, the USA and some European countries are the most effected economies. By the end of May (2020) more than six million people were virus infected and several thousands people lost their lives. Empirical data show that the infection rate is not uniform across the nations; for example, the infection rate was slower in African countries and India as compared to other fast infected countries like China, the USA, Italy, Spain, Iran, Russia and so on. It is attempted to explore rationale behind the slower spread of COVID-19 in some countries vis-à-vis faster infection in other countries. For comparing spreading pattern two small groups comprising were considered (i) India, China, the USA, Italy, Spain, Iran & Russia and (ii) Egypt, Kenya, Nigeria, South Africa and Ethiopia It was observed that precatory measures like social distance and lockdown were the found helpful to contain constrain the transmission. Data also indicates that transmission of COVID-19 was faster with more urban population as compared to less urban countries.

Keywords: COVID-19, social distancing, epidemic curve.

Introduction

Novel Coronavirus infection was observed in Wuhan city of China in the late December of 2019 [*Li Q. et al.*, 2020] and was termed as coronavirus disease (COVID-19) by the World Health Organization (WHO)[1] that affects the lower respiratory tract of infected patients. The COVID-19 disease is a result of unprecedented outbreak of corona virus rapidly expanding in China and beyond. Despite enormous efforts governments have failed to contain the infection. Uncontrolled outbreak has created a menace to health, due to unavailability of vaccine, and economic crisis across the globe. Efforts to stabilize the economy will be enormously costly because of delay in measures in some countries. Since, COVID-19 is rapidly expanding so for understanding transmission

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[1] WHO, Novel Coronavirus−China. 2020. Available at: https://www.who.int/csr/don/12-january-2020-novel-coronavirus-china/en/ (date accessed: 15.04.2020).

pattern of the virus real-time analyses of epidemiological data are needed to increase situational awareness and inform interventions [*Rivers et al.*, 2019]. Studies suggest that analyses of detailed line lists of patients are particularly useful to infer key epidemiological parameters, such as the incubation and infectious periods, and delays between infection and detection, isolation, and reporting of cases [*Chowell et al.*, 2009; *Sun et al.*, 2020]. Infected number of cases indicates that the COVID-19 is spreading quickly and countries like China, USA, Russia, Brazil and some European countries are most effected economies (Fig. 1)[2].
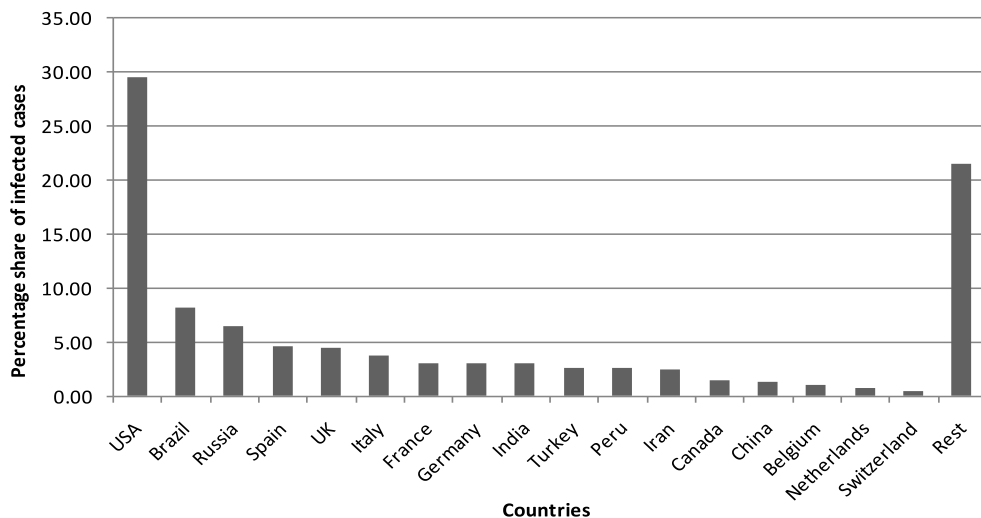

Fig. 1: Country-wise distribution of infected cases as on 31 May 2020

Transmission pattern under uncontrolled Vs controlled phase

The challenges of COVID-19 transmission are frightening and needed to control immediately without shuttering the economy. For flattering the curve of corona infected cases many countries are imposing social distancing measures — including lockdown and shelter in place or isolation centre. The growth pattern of contagious disease outbreaks has been widely studied using the models that assume exponential growth dynamics in the uncontrolled interventions (e.g., classical compartmental models [*Anderson, May*, 1991; *Kermack, McKendrick*, 1937; *Viboud et al.*, 2016]. Classical compartmental transmission models assume exponential growth during the early phase of a well-mixed population. Empirical data of COVID-19 shows that the transmission rate of growth follows an exponential or sigmoid pattern in general; however, behavior of transmission of infected cases curve depends upon factors such as mobility of people, social distancing and isolation etc. which is illustrated in Fig. 2.

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[2] Available at: https://www.worldometers.info/coronavirus/ (date accessed: 31.05.2020).
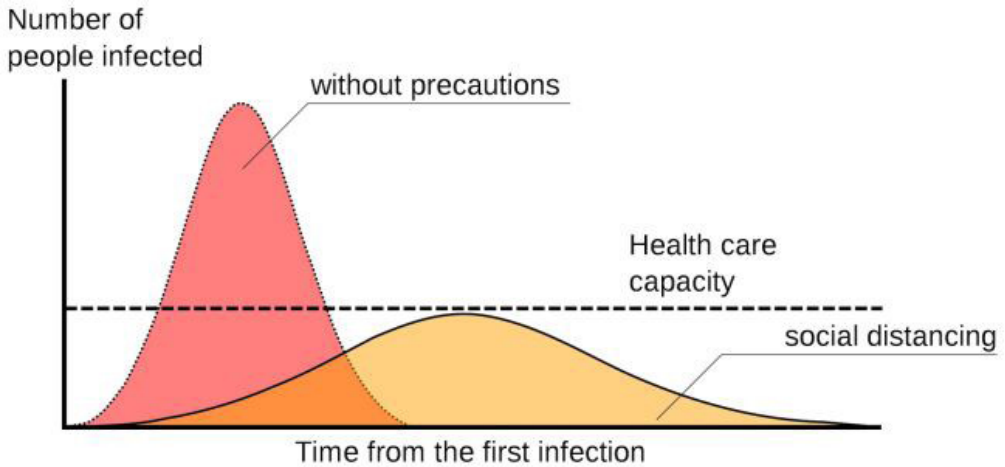
Fig. 2: A sample epidemic curve, with and without social distancing
(Image credit: Johannes Kalliauer/ CC BY-SA 4.0); Andres Villa Rivas (27.03.2020)

Since, inception of COVID-19, China's response to the virus has included stringent social distancing, more than a month of city-wide lockdowns of Wuhan and surrounding areas, extensive public monitoring of citizens, as well as various methods of punishment and rewards to encourage adherence to such measures[3]. The bold approach had changed the course of rapidly escalating and deadly pandemic as praised by the WHO. The critical factor contributing to China's containment of the virus has been the aggressive use of quarantines which goes with the sample epidemic curve. This reflects that the growth of corona contagious cases in China deceased continuously. Similarly, India has taken proactive measures such as *Janta* curfew and lockdown to control contagious rate and yielded favorable results. These preventive measures were focused to encourage the people to maintain social distancing and isolation to break the chain of infection. Such measures supported the theory that the spread of COVID-19 infection follows the sample epidemic curve and social distancing was the effective measure to reduce the infection rate of Corona transmission. Countries like Hong Kong, Taiwan and Singapore took rapid and uncompromising action against the COVID-19 transmission and as a result they successfully managed to contain the outbreak faster. All affected countries imposed nation-wide lockdown to contain spread of the virus apart from common preventive measures— practicing good hygiene, folk remedies, and masks were also used to prevent the disease. However, some European countries and USA took precautionary measures late that triggered the transmission faster.

Comparative pattern of virus transmission

Though the virus infection has been expanded across the world and transmission of the virus is contagious, as experts say. Since, initial outbreak emerges as it seems to spread

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[3] How did China get to grips with its coronavirus outbreak? Available at: https://www. theguardian.com/world/2020/mar/09/how-did-china-get-grips-with-coronavirus-outbreak (date accessed: 14.04.2020).

more easily among people living under the same place or roof. Among the fast growing corona infected countries, the stringent response to virus by Indian Government shows that daily growth of infected cases are less in India which is comparable to post lockdown effect in China. The pattern of infected cases explains that affected countries imposed lockdown contain as effective precautionary measure for flattening corona curve. The patterns of infected cases among some faster and slow countries are presented in Fig. 3.
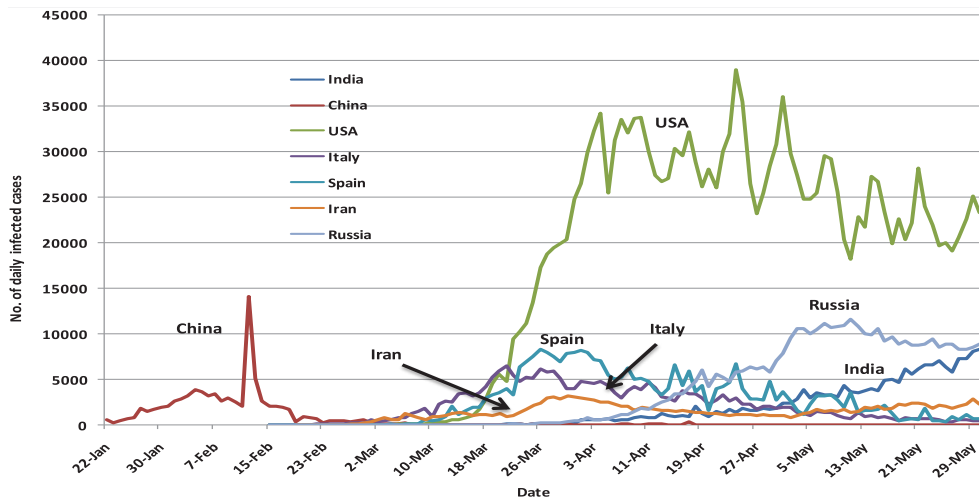

Fig. 3a: Daily infected cases in some countries with higher urban population
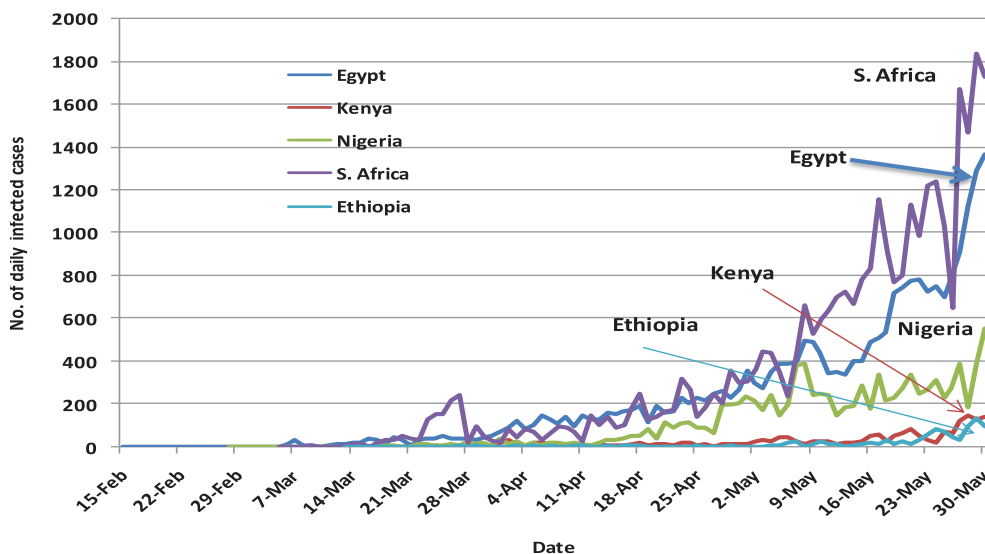(except India with urban population 34%)

Fig. 3b: Daily infected cases in some countries with lower urban population
(except S. Africa with urban population 66%)

Further, data[4] (Fig. 3) of infected cases highlights that infection rate is higher in those countries with higher urban population[5] while transmission is slower in the countries with lower urban population. For example China (59%), USA (82%), Italy (70%) Spain (80%), Iran (75%) and South Africa (66%) has more urban population as Egypt (43%), Kenya (27%), Ethiopia (21%), Nigeria (21%) and India (34%) where infection rate is observed slower. However, in the early phase of transmission the infection was slow in Russia with urban population 74 percent (Table 1).

Table 1: Percentage urban population v/s average daily infected cases

Country	% urban population	Avg. daily inf. cases (average cases for first 30 days appx.)
China	59	2572
USA	82	148
Italy	70	824
Spain	80	266
Iran	75	613
Russia	**74**	**6**
India	34	4
Egypt	43	4
Kenya	27	6
Nigeria	50	3
S. Africa	66	49
Ethiopia	21	2

In the case of China, USA, Italy, Spain, Iran and South Africa the correlation coefficient between percentage of urban population and average daily infected cases was calculated 0.78 while in the India, Egypt, Kenya, Ethiopia and Nigeria the correlation coefficient was calculated 0.39. Therefore, statistically inferences can be drawn that the infection rate is more significant with higher urban population or density of population. This can be argued that higher urban population have more chances of interaction or mobility of people which is a substantial factor responsible for faster transmission of corona. This further established that to reduce infection effectively isolation or lockdown is an effective measure to contain the Corona pandemic.

Concluding remarks

However, challenges and uncertainty surrounding as stated by Harvard Professor that 40—70% of the global population might be infected in the coming year[6] which confirms Chancellor Angela Merkel's warning regarding the effects of the novel coronavirus

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[4] Available at: https://www.worldometers.info/coronavirus/ (date accessed: 31.05.2020).

[5] Available at: https://data.worldbank.org/indicator/sp.urb.totl.in.zs (date accessed: 12.04.2020).

[6] Nash C. Mediaite. Harvard Professor Sounds Alarm on 'Likely' Coronavirus Pandemic: 40% to 70% of World Could Be Infected This Year. Available at: https://www.mediaite.com/news/harvard-professor-sounds-alarm-on-likely-coronavirus-pandemic-40-to-70-of-world-could-be-infected-this-year/ (date accessed: 18.02.2020).

in Germany[7]. Also objective forecasts for the confirmed cases of COVID-19, are required for potential implications for planning and decision making process[8]. The major problem is to contain the infection in congested and rural areas, particularly in developing and poor countries, where large numbers of poor living in crowded, unsanitary conditions and a weak public health infrastructure. So, there is need to expand and speed up the testing process and provide required kits and supplies, as well as medical devices needed for care, protective equipment for health care workers, and expanded facilities for treating the virus infected case. Simultaneously, accelerate the use of digital and mobile technologies to make remote work and other activities easier. There is a need to bring communities together and highlights what is required to control this enormous challenge by means of effective increases.

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[7] BBC News. Coronavirus: Up to 70% of Germany could become infected—Merkel. Available at: https://www.bbc.co.uk/news/world-us-canada-51835856 (date accessed: 15.03.2020).

[8] Petropoulos, F., Makridakis, S., Forecasting the novel coronavirus COVID-19. Available at: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0231236 (date accessed: 31.03.2020).

Сравнительный обзор вспышки COVID-19 в странах с большим и меньшим уровнями инфицирования

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Беспрецедентная вспышка COVID-19 привела к объявлению Всемирной организацией здравоохранения (ВОЗ) чрезвычайной ситуации в области общественного здравоохранения, имеющей международное значение. Китай, США и некоторые европейские страны оказались наиболее пострадавшими экономиками. К концу мая 2020 г. более шести миллионов человек были инфицированы вирусом и несколько тысяч человек погибли. Эмпирические данные показывают, что уровень инфицирования в разных странах неодинаков; например, уровень инфицирования был ниже в африканских странах и Индии по сравнению с другими странами, такими как Китай, США, Италия, Испания, Иран, Россия и т. д. В статье предпринята попытка изучить причины более медленного распространения COVID-19 в некоторых странах по сравнению с более быстрым распространением в других странах. Для сравнения модели распространения были рассмотрены две небольшие группы, включающие (1) Индию, Китай, США, Италию, Испанию, Иран и Россию и (2) Египет, Кению, Нигерию, Южную Африку и Эфиопию. Автор указывает, что такие меры предосторожности, как социальная дистанция и всеобщий карантин, оказалась полезными для сдерживания передачи инфекции. Данные также показывают, что передача COVID-19 происходила быстрее в более урбанизированных странах с большим количеством городского населения.

Ключевые слова: COVID-19, социальная дистанция, кривая эпидемии.