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Original Article

Analysing COVID-19 pandemic through cases, deaths, and recoveries

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A B S T R A C T

Background and aims: The novel Coronavirus disease (COVID-19) in Wuhan, China, became a pandemic after its outbreak in January 2020. Countries one after the other are witnessing peak effects of the disease, and they need to learn from the experience of others already affected or peaked countries. Thus, this paper aims to analyse the effect of the COVID-19 pandemic on different countries through COVID-19 cases, resulting in deaths and recoveries.

Methods: This study analyses quantitatively the lethal effects of the pandemic through the study of infections, deaths, and recoveries on the 13 most-affected COVID-19 countries as of 1 s t June. The daily change in cases, deaths, and recoveries for all the 13 countries were considered. Combined analysis for comparison and separate analysis for the detailed study were both taken for every country. All the graphs were made in RStudio using the R programming language, as it is best for statistical analysis.

Results: The casual and ignorant behaviour of people is a major reason for such a large scale spread of the coronavirus. The government of every country should be strict as well as considerate to all sections of people while making policies. There is no room for mistakes, as one wrong decision or one delayed decision can worsen the situation. However, some countries which were once the epicentre of this pandemic are now corona-free, proving that this global threat can be tackled and we should all keep our morale high.

Conclusions: The coronavirus disease is not any ordinary viral infection; it has become a pandemic as it has an impact on health, mortality, economy and social well being of the entire world. Qualitative and Quantitative analysis of the statistics related to COVID-19 in different countries is done based on their officials' data. The primary objective of this analysis is to learn about the relationships of various countries in containing the spread of COVID-19 and the various factors such as government policies, the cooperation of people, economy, and tourism.

1. Introduction

The ongoing COVID-19 pandemic has become a matter of serious concern, and the world is under a public health emergency. Till now, almost all the countries have been under the grip of the virus. As this disease has a rapid transmission, every country should increase its attention towards the disease scrutiny systems and improve country preparation to implement response operations like improving the quality of the national laboratory system. Even after five months of the outbreak, there is no available vaccine, but even if one was available, uptake might not be of the highest quality. So, qualitative analysis of the spread of coronavirus can help the countries to assess what further measures can be taken. However, its impact on the socio-political and economic fronts cannot be overlooked. Gatherings have been cancelled,

thereby impacting the mental health of people. It mainly affects societies that value physical displays of affection. These people do not believe in the concept of virtual gatherings. Perhaps the most damaging interruption is the COVID-19 impact on the economy. It is bringing the world economy to its knees, there is bankruptcy, and employees are being laid off, depriving them the ability to earn for their families.

2. COVID-19 pandemics, origin, transmission

2.1. Origination of COVID-19 pandemic

China was the first country to be affected by a coronavirus, and it experienced the first case in Wuhan, Hubei around December 2019. It earlier considered it as an unusual case of pneumonia and alerted the

World Health Organization (WHO) about the same.[1] An investigation was launched subsequently in early January. On January 30, 2020, it was declared that the world was under a public health emergency and by that time there were more than 7,500 cases globally, and the virus had already hit five countries belonging to different regions. Scientists are trying to know the exact origin of COVID-19 and about the nature of the virus that causes it: SARS-CoV-2.

Initially, scientists believed that the virus originated from bats, but later they believed it was developed in pangolins. However, genomic comparisons suggest that the SARS-Cov-2[2] virus is different from the virus, causing SARS disease, resulting in recombination between two different viruses. The scientific unanimity is that COVID-19 is of a natural origin. Relative genomic analyses exhibited that SARS-CoV-2 belongs to the group of Beta Coronaviruses and it is very similar to SARS-CoV, a virus of acute pneumonia responsible for a 2002 Chinese province epidemic, which originated in Guangdong and then infected 29 countries in 2003. The reservoir of this virus is known to be bats of the genus Rhinolophus (potentially several cave species). The host between humans and bats was the palm civet (Paguma larvata).

Moreover, these genomic comparisons propose that the SARS-Cov-2 virus is the result of recombination of 2 viruses, one close to RaTG13 and the other closer to the pangolin virus. COVID-19 was recognised and declared as a pandemic by the World Health Organization (WHO) on March 11, 2020.[3] The first countries which were hit by the virus after China were Iran, Italy, South Korea, and Japan. After that, many countries suffered from this pandemic, surpassing China's total number of cases and deaths.

2.2. The transmission of COVID-19 pandemic

The transmission of coronavirus pandemic[4] is through people who get infected from the virus and thus can transmit the infection. The viruses majorly attack the epithelial cells. They are transferred from one host body to another by either a faecal-oral route, aerosol, or through fomites.

2.2.1. Droplet transmission
It is related to drops, which gets transferred from one host to another through coughing or sneezing[5]

It is transmitted mainly from the patient showing respiratory symptoms, and he is near within a distance of 1 m.

2.2.2. Airborne transmission
It is transmitted through the microbes present inside the nucleus of the droplet. The droplets have a nucleus diameter of size less than 5 μm. This mode of transmission is more severe as it occurs within proximity of more than 1 m and for a long time, the particles remain floating in the air.

2.2.3. Transmission through fomites
This type of transmission is through direct and indirect contact with the corona positive person

Indirect contact is through touching the surfaces that were in contact with the infected person.

2.3. Diagnosis and treatment

2.3.1. Diagnosis
Currently, there are two methods of confirming positive COVID-19 cases:

Viral Testing - The standard testing technique for the viral infection caused by the SARS-CoV-2 virus is done by using the RNA analysis of respiratory secretions like mucus. A nasopharyngeal swab collects the mucus, essentially a swab inserted through the nose or buccal cavity to enter the pharynx, where infected mucus is situated. This test detects the presence of viral RNA fragments[6] using rRT-PCR, which stands for a reverse transcription-polymerase chain reaction.

Imaging Techniques - The first identified diagnosis method by the doctors in China is through CT imaging techniques[7] comprising an asymmetric peripheral ground-glass opacities without pleural effusions. People having symptoms of the virus can use this technique which uses the characteristic imaging features on computed tomography (CT) or chest radiographs of people.

2.3.2. Treatment
As of now, there is no treatment approved explicitly for COVID-19. Scientists and healthcare officials are trying their best to find the specific treatment for this pandemic. However, treatment of people is being done by providing vaccines based on the symptoms.

The current mode of treatment for patients is symptomatic and therapeutic support. However, many drugs and vaccines are undergoing trials for the treatment of COVID-19. Antimalarial drugs such as hydroxychloroquine and chloroquine are being used in some cases and tested for efficacy.

2.4. Preventive measures

As suggested by health experts, maintaining personal hygiene, not touching the eyes, mouth or nose with unwashed hands, washing hands, and while coughing or sneezing, covering the mouth with a tissue, and throwing the tissue directly into a trash bin are the steps which can mitigate and inhibit infections from spreading. The use of masks is also encouraged to prevent transmission through droplets. Health care workers are following standard protection, contact protection and eye protection such as face shield, gloves and PPE kits. Social and physical distancing is enforced and encouraged to prevent spread.[8]

2.4.1. Travel restrictions
Many governments have put restrictions on non-essential travels,[9] both domestic and international, as large scale spread of this disease has taken place in communities where infected people are not aware of their infection, and hence it puts the whole population at risk if travelling was unhindered throughout.

2.4.2. Washing hands
The health experts recommend that we should all wash our hands because the virus can get transferred by indirectly coming in contact with the infected person by touching an infected surface. We should avoid touching the eyes, nose, or mouth with unwashed hands. It is recommended by CDC to wash hands by either using soap and water or an alcohol-based hand sanitiser consisting of 60% alcohol for at least 20 seconds it breaks the outer protective layer of the virus.

2.4.3. Cleaning exposed surfaces
The basic recommendation is to disinfect all the areas commonly used areas, such as beds, tables, chairs, ATMs, reception desks, waiting areas, wheelchairs, benches, vehicles, walls etc. Surfaces can be decontaminated using 62–71% ethanol, 0.5% hydrogen peroxide, 0.1% sodium hypochlorite, 50–100% isopropanol, and 0.2–7.5% povidone-iodine (with an exposure of around 1 min).
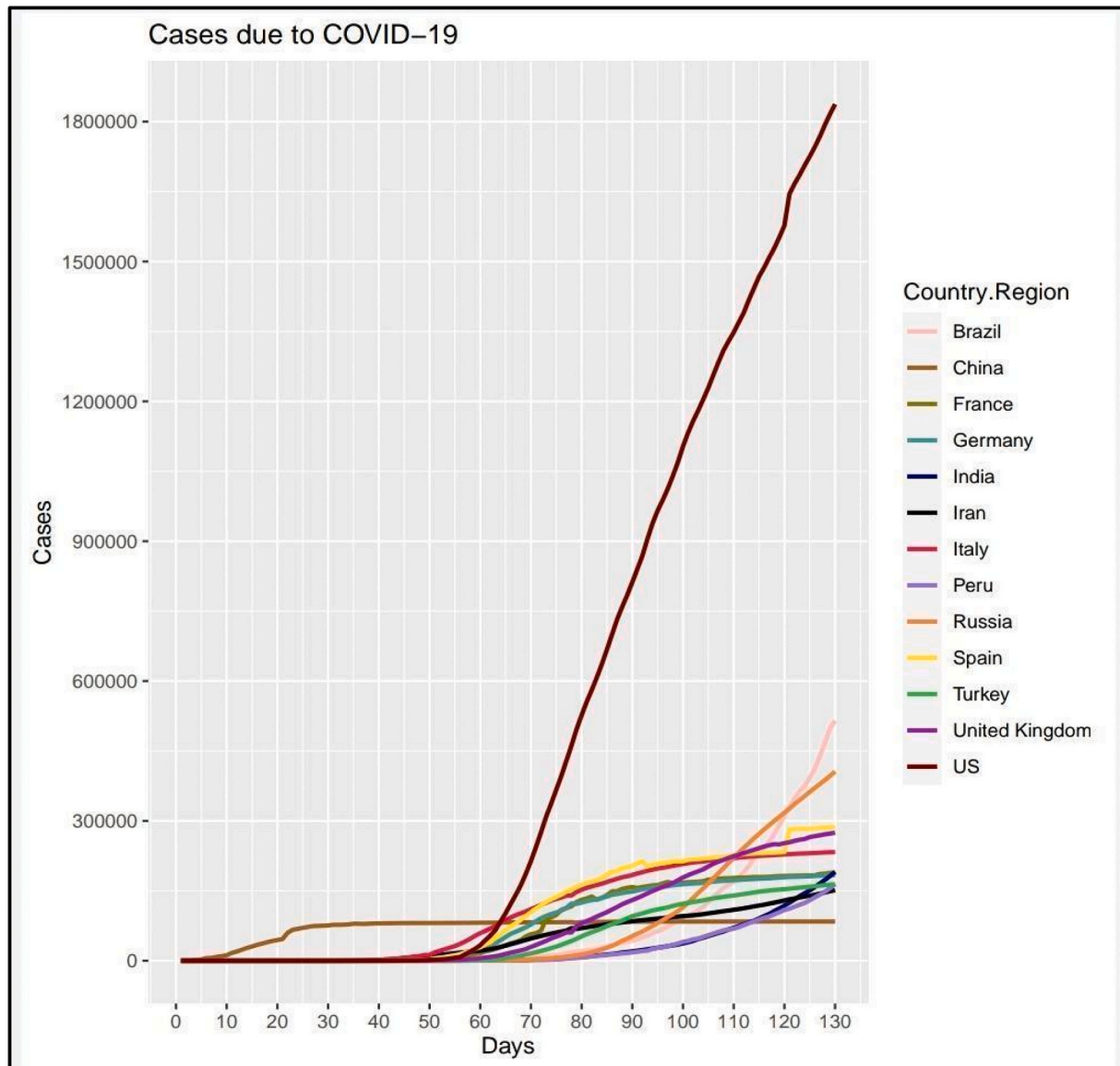
Fig. 1. Cases v/s Days.

2.4.4. Face masks and respiratory hygiene

Many countries have encouraged and, at some places, made mandatory, using face masks[10] or cloth face coverings to prevent infection in public places by asymptomatic infected members. The primary aim is to limit the transmission of the virus through droplets, and for this purpose, surgical face masks have ample functionality as well as availability.

2.4.5. Social distancing

Social distancing aims to control the spread of disease by minimising the contact between people, especially in public places and gatherings. It involves imposing restrictions on movement and gathering; including quarantines; travel restrictions; schools, stadiums, theatres, gyms and malls may be closed to limit the social interaction.[11] Many governments are now making it compulsory or recommending measures for social distancing in regions prone to an outbreak or affected by the outbreak.

2.4.6. Self-isolation

Transmission of COVID-19 is dependent on physical proximity. Being isolated from everyone, also known as "Self-isolation" is one of the major recommendations for those diagnosed with COVID-19 and the ones showing symptoms of the infection.[12] People who have travelled from one place to another are required to stay in quarantine for 14 days, as a precautionary measure in case the person is infected and asymptomatic.

3. Research gaps

We need to understand the effect of COVID-19 pandemic on human life. This pandemic is travelling worldwide across different countries. It started in China but has taken over the globe. However, there is not a
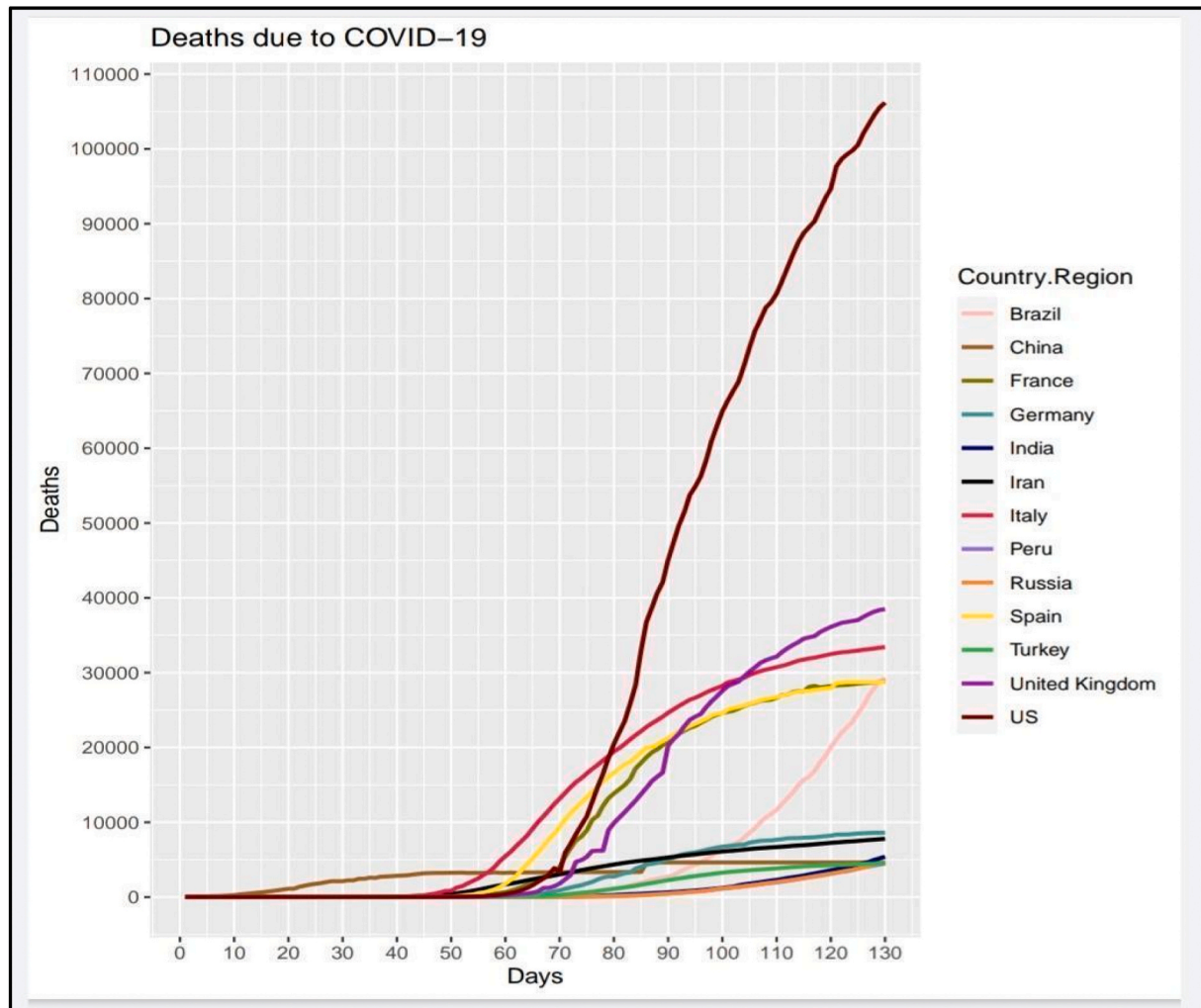
Fig. 2. Deaths v/s Days.

complete analysis available. So, we need to analyse country-wise response and effect because this will help us in understanding what has ensued in other countries. This way, we are creating a historical database and consolidating our views. The need is to identify the pandemic's effect through observation and analysis and formulate tailored policies to prevent further spread and damage.

4. Problem definition and research objectives of the paper

This paper analyses the datasets of the COVID-19 hit countries across the globe. The focus was to consider the 12 most-affected countries with the highest number of COVID-19 cases as of June 1. However, we have also considered China in our study as it was the first country where coronavirus emerged. The number of cases, deaths and recoveries were taken into account. We have analysed the performance curves of various countries in fighting this pandemic. From the mistakes of these countries, we can learn to improve our methods in containing.

5. Research methods with tools, data and assumptions

5.1. Research method

The programming language used is R and the tool used is R Studio. We have also analysed the graphs depicting the cases, deaths and recoveries separately for each of the 13 countries.

5.2. Tools used

The tool used for the analysis of datasets in R Studio and the programming language used is R, which is the best programming language for statistical computing and it includes tools for plotting, debugging, showing history and workspace management. It is not just a code editor; instead, it is a development environment. Rstudio is a free and open-source integrated development environment (IDE) for R.

R source code can be found here (GitHub).

Libraries used in the R program for our analysis.

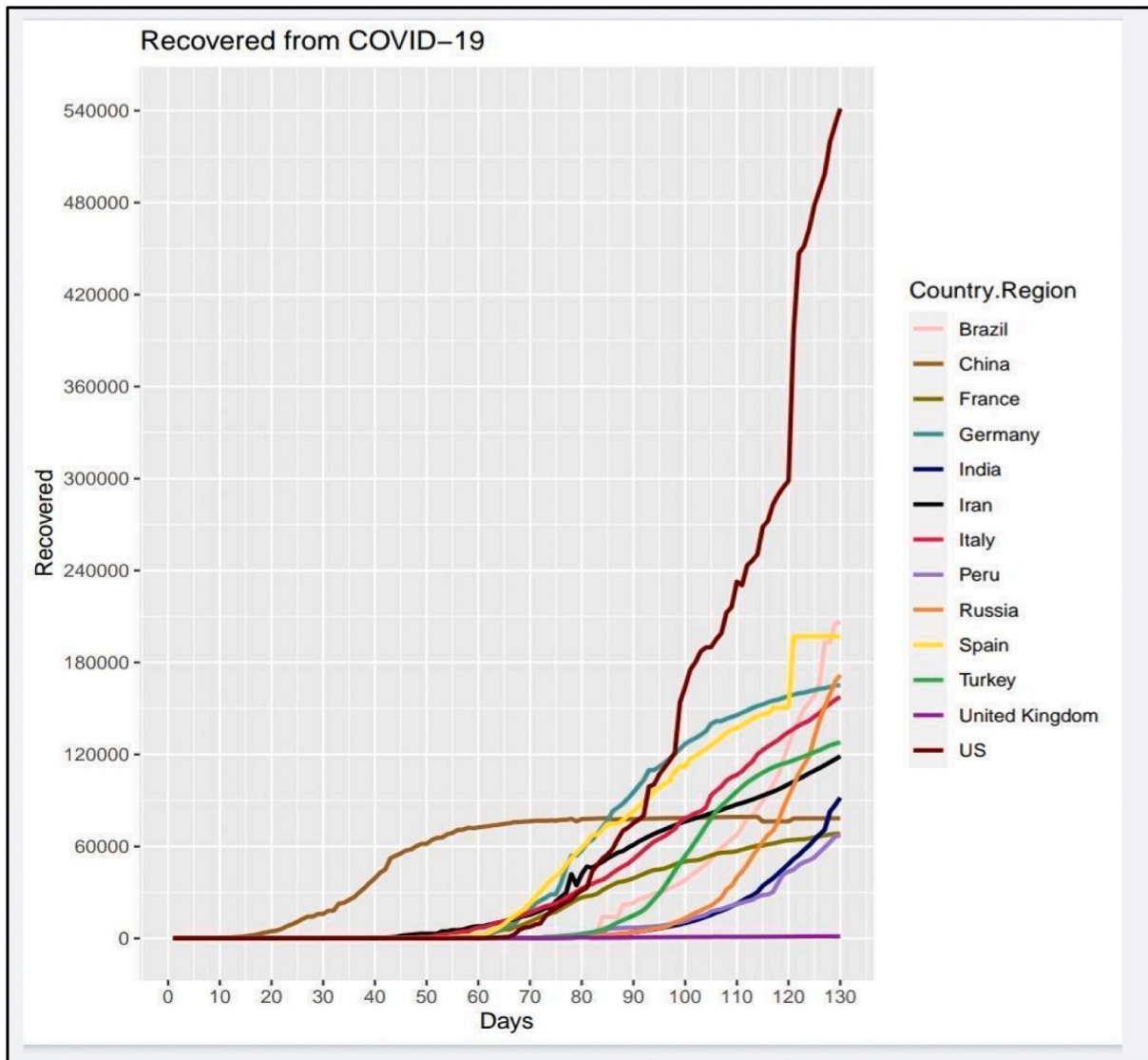**Fig. 3.** Recovered v/s Days.

- library (ggplot2)
- library (dplyr)
- library (viridisLite)
- library (viridis)
- library ("gridExtra")

5.3. Data

The data is from 23 -Jan-2020 till 31-May-2020 and the change in Cases, Deaths and Recoveries of various countries was analysed.

- Cases, Deaths, and Recoveries Data
- WHO. Aggregated Data (for Validation)
- WHO. Portal for COVID-19 Information

5.4. Assumption of the study

Datasets available on the internet have been used, assuming it to be accurate. We have overlooked to the inaccuracy of the data provided by some countries, as every country follows its protocols in reporting data and analysing the statistics related to the COVID-19 pandemic.

6. Results and analysis of COVID-19 cases

Quantitative analysis of the 12 most-affected countries helped to assess what further measures can be taken by the government to lower the spread of the virus. It shows to what extent the lockdown was effective so that further implementation can be done accordingly, and the right steps can be taken by the government to lower the spread of the virus. One can view the extent to which the lockdown was effective so that further implementation can be done accordingly and the right steps can be taken to contain the infection as well as balance the economic activities to ensure the protection of jobs and livelihoods.
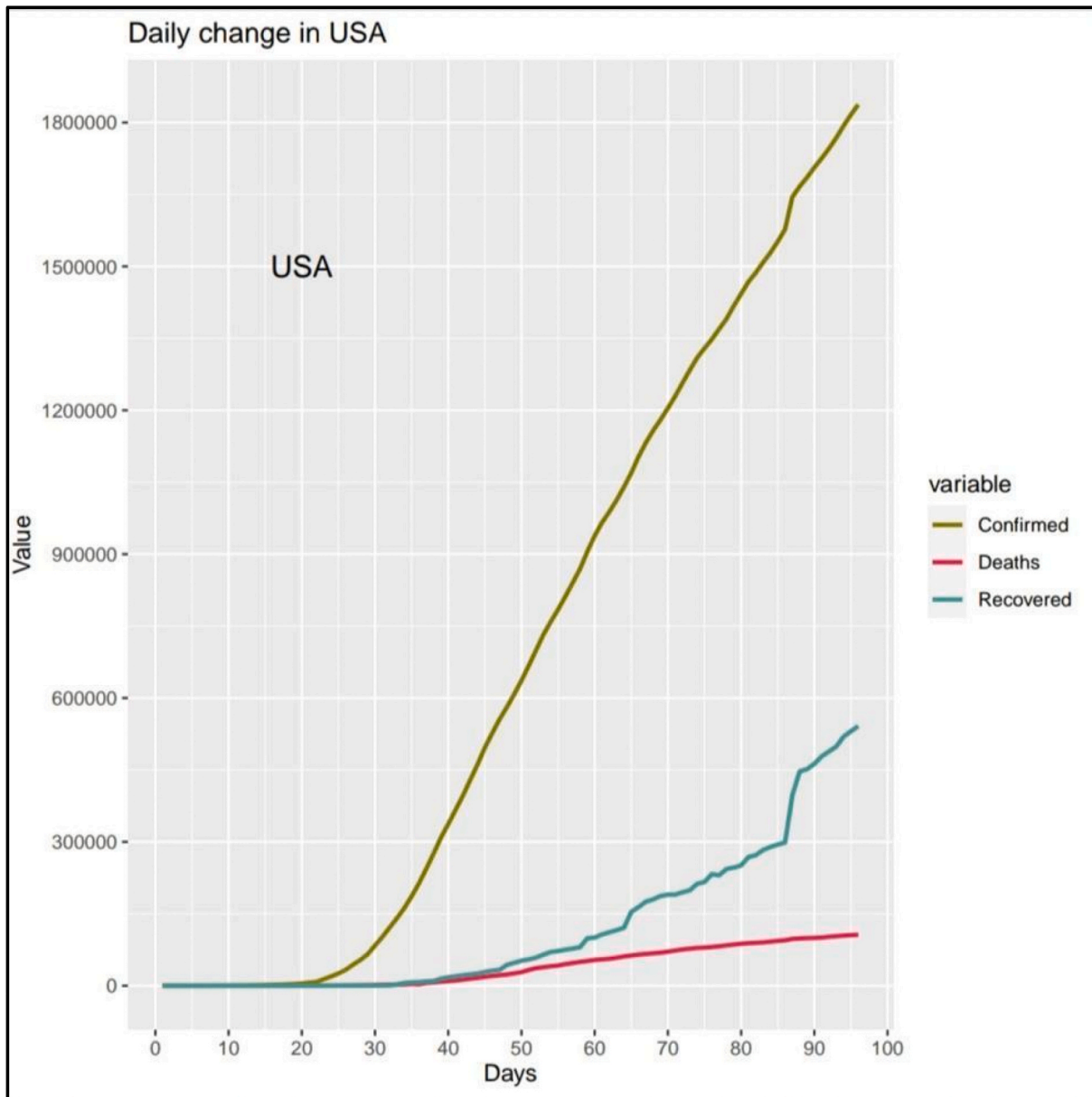
Fig. 4. Cases, Deaths and Recoveries in USA over 100 days.

6.1. Total cases vs. time graph

The Fig. 1 is used to depict the number of COVID-19 cases for various countries over 130 days. Cases are recorded from 23-Jan-2020 to 31-May-2020.

Fig. 1, clearly depicts that USA is the most affected country with more than 1800000 cumulative corona cases. The initially unaffected countries experienced an exponential rise in the corona positive cases almost after two months of the pandemic. China which was the epicentre of this disease, was somewhat successful in handling the pandemic as the graph remains close to 80000 cases for a major portion of the graph. Countries like Brazil, Russia, India, Peru, and Turkey experienced a major hike in cases quite late. Iran, Italy, Germany, Spain were better at handling the pandemic as the cases did not have a major

hike in the latter section of the graph. France, United Kingdom have not been efficient in their way of handling the situation as they were initially hit and are still on the most affected countries list.

6.2. Total deaths vs. time

The Fig. 2 is used to depict the number of COVID-19 deaths for various countries over 130 days. Deaths were recorded from 23-Jan-2020 till 31-May-2020.

It is clearly in Fig. 2 depicted that the USA is the most affected country with more than 100000 cumulative corona deaths. Excluding the USA, the UK is worst affected, and the least number of deaths among them is in Russia, which has many active cases. The initially unaffected countries experienced an exponential rise in the number of
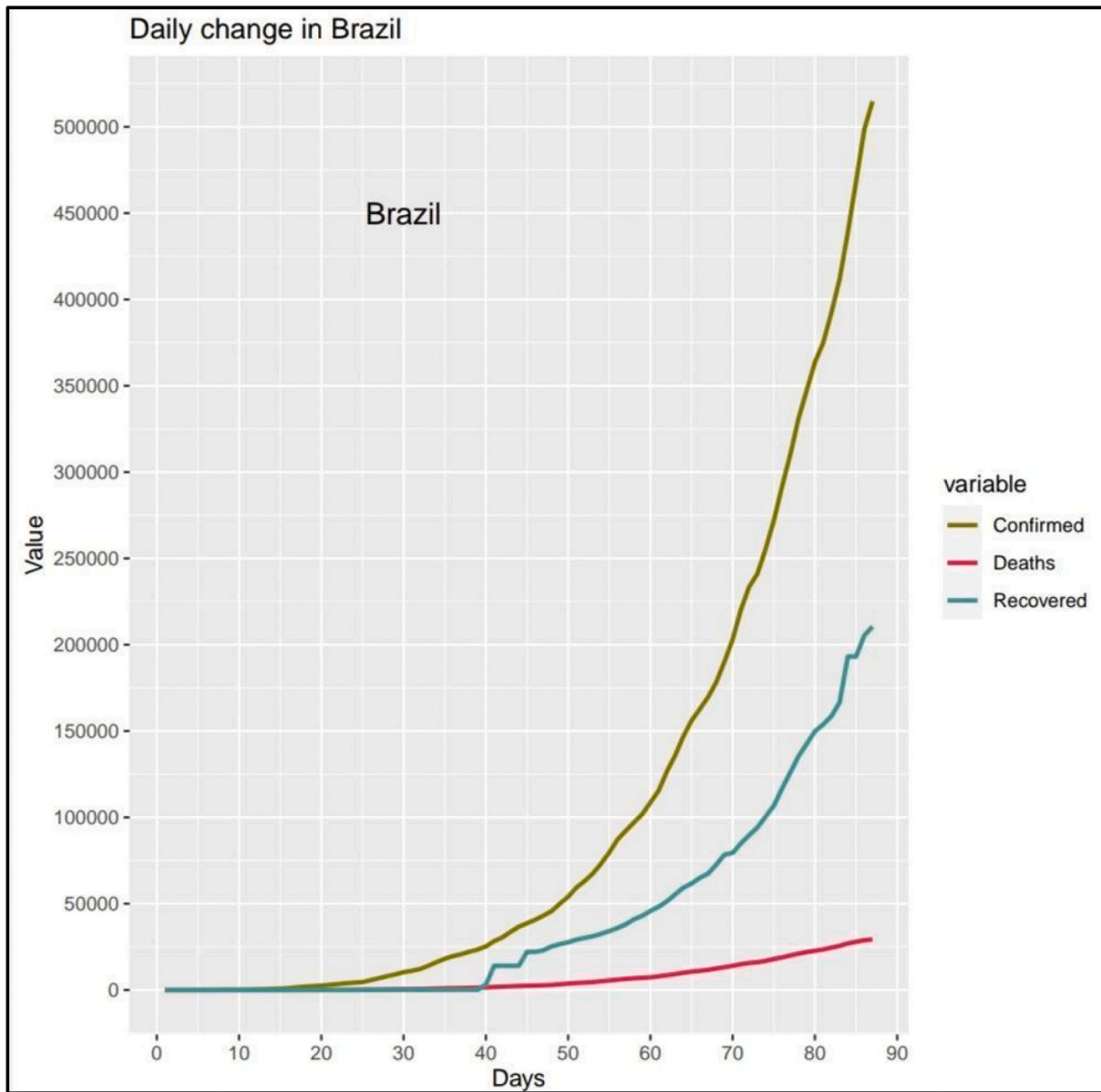
Fig. 5. Cases, Deaths and Recoveries in Brazil over 100 days.

deaths almost after two months of the pandemic. Peru, Italy, Spain, Brazil, the United Kingdom and France experienced a significant fatality rate in the latter section of the graph. There are various countries like Russia, India, Iran, Turkey, Germany and China having less than 10000 deaths.

6.3. Total recoveries vs. time graph

The Fig. 3 is used to depict the number of recovered people from COVID-19 for various countries over a period of 130 days. The recoveries were recorded from 23-Jan-2020 to 31-May-2020.

It is clearly depicted in Fig. 3 that even though the USA is the most affected country with more than 1800000 cumulative corona cases, it is also the country having the most recoveries. Excluding the USA, Brazil has the most number of recoveries and thus shows a positive trend. The

countries which were initially having less recovery rate experienced an exponential rise in the number of recoveries. Countries like Russia, Spain, Italy, India, Iran, Turkey, Germany and China have a high recovery rate. The United Kingdom, Peru and France do not have a high recovery rate.

6.4. Country-wise analysis

A country-wise analysis is done to have more clarity about the effect of the pandemic on every country. This way we can analyse the performance of every country in order to contain this pandemic.

6.4.1. United States of America

The Fig. 4 depicts the daily change in the number of cumulative cases, deaths and recoveries for 100 days in the USA. The United States
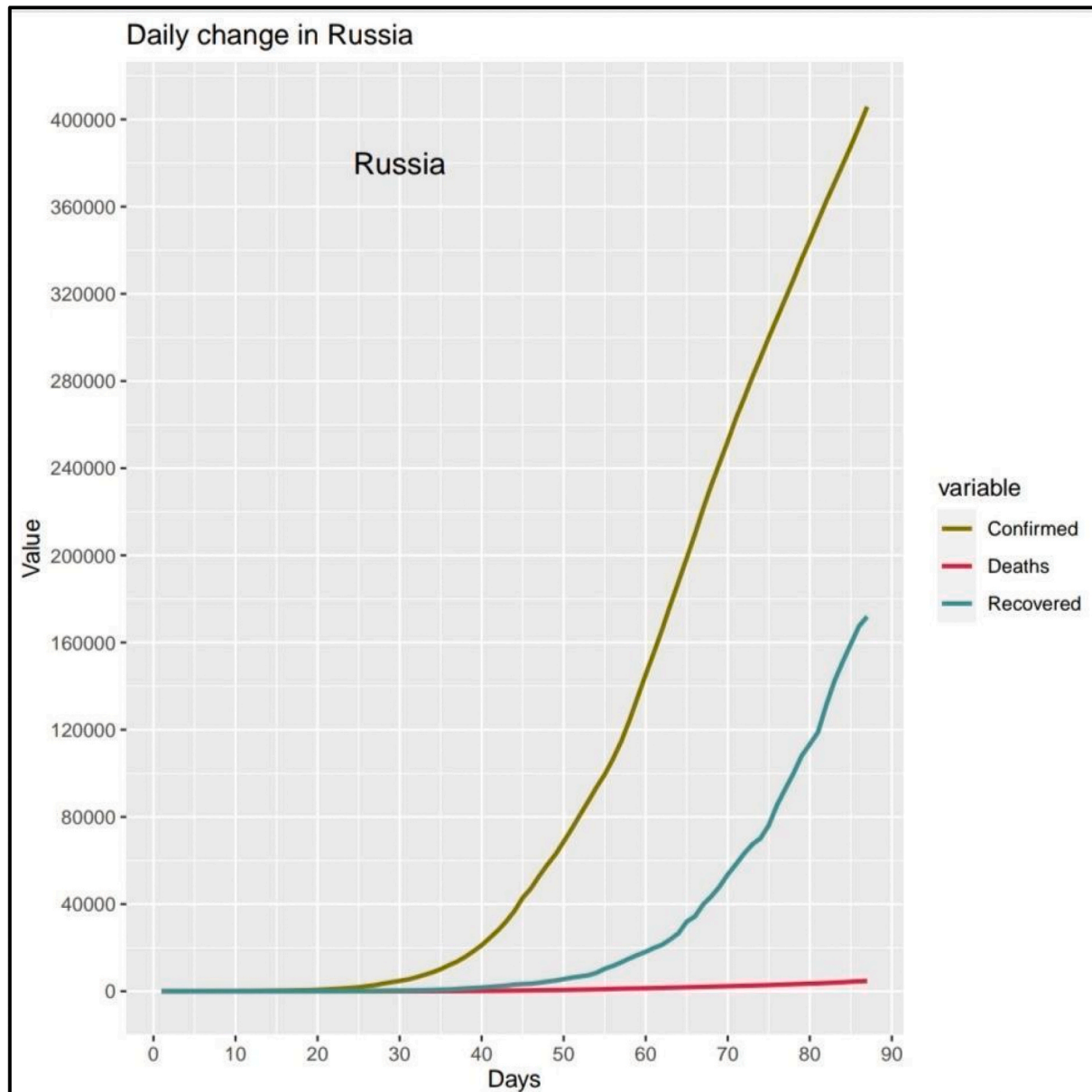
Fig. 6. Cases, Deaths and Recoveries in Russia over 100 days.

of America is worst hit by the coronavirus pandemic with over 18 lakhs cases and over 1 lakh deaths till June 1.

The negative approach, use of incorrect policies and delay in actionsled to the making of the US, a country that has been worst hit by the COVID-19 outbreak in the world. The casual behaviour of people and the government led to this severe condition of the country. After almost a month of coronavirus outbreak, the cases in the US took an exponential rise. If they had taken precautions from the beginning, the condition would have been different.

The cumulative number of recoveries is over five lakhs, which is 27.7% of the total cases, thereby contributing to the fact that the healthcare facilities are trying their best to fight this pandemic.

6.4.2. Brazil

The Fig. 5 depicts the daily change in the number of cumulative cases, deaths and recoveries for 100 days in Brazil. It is the second worst-hit country by the coronavirus pandemic with over five lakhs cases till June 1.

There was a casual behaviour of people as the president himself openly denied the severity of the pandemic.Brazil is not in a stable economic condition as a few years back it had an economic crisis, and even now there are more than 13 million people in "Favelas" (slum areas) where social distancing and maintaining proper hygiene is very difficult.Earlier the lack of testing in the country has been the reason for a few cases, and reports are stating that hiding of the real numbers is going on and actual data is likely to be 15 times higher. Brazil is also suffering from other diseases such as dengue in which patients take the
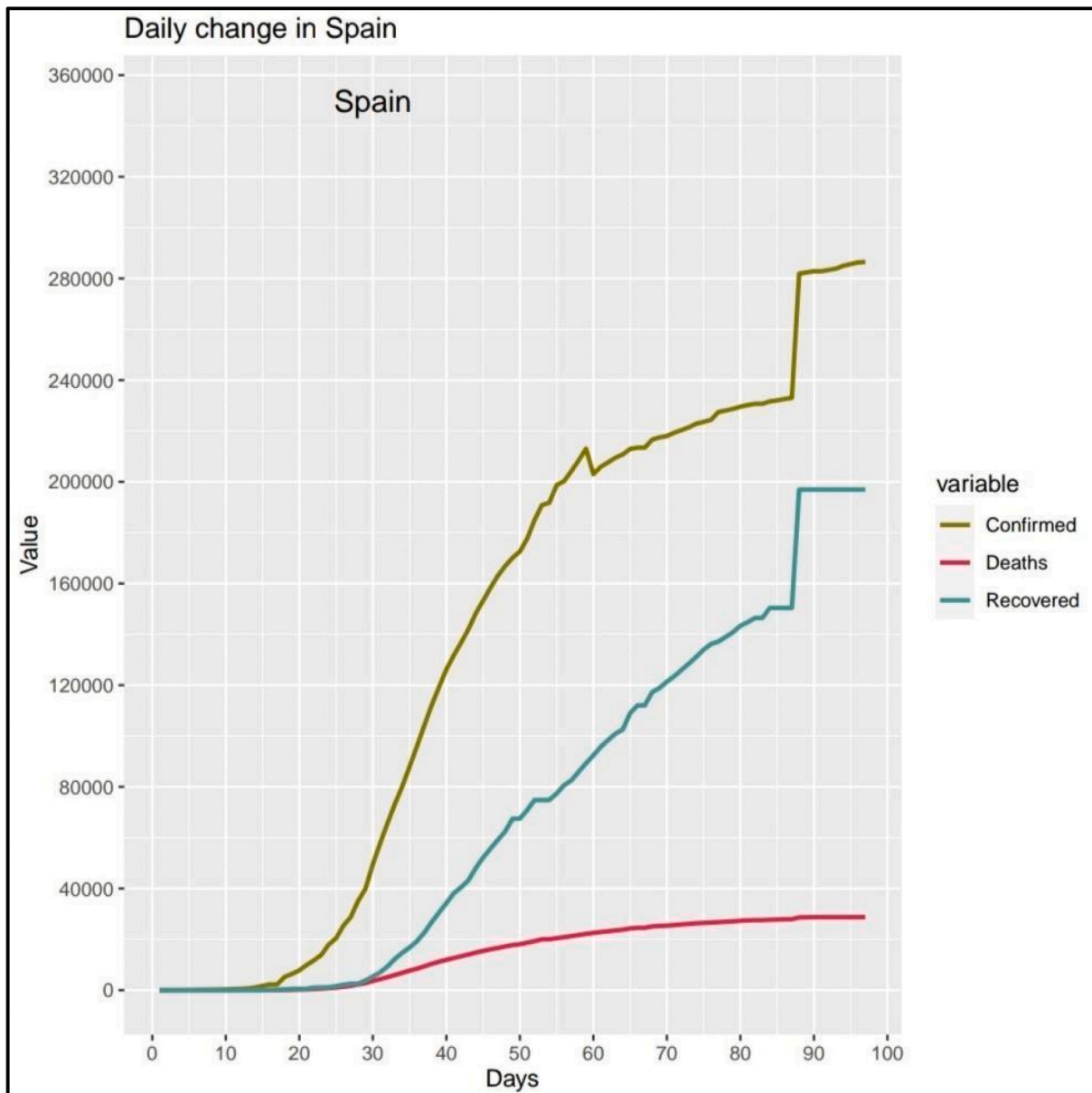
Fig. 7. Cases, Deaths and Recoveries in Spain over 100 days.

majority of hospital beds during the period January–May.

However, there are around 25000 deaths till June 1, which is only 5% of the total cases. The recovery rate is higher than the death rate showing us all a ray of hope.

6.4.3. Russia

The Fig. 6 depicts the daily change in the number of cumulative cases, deaths and recoveries for 100 days in Russia. It is the third worst-hit country by the coronavirus pandemic with over four lakhs cases till June 1.

Just after the outbreak of the virus, Russia was quick to respond. The 2,500 mile-long border with China was closed by the authorities on January 30 and in early February there was even a quarantine facility arranged in Siberiafor Russian nationals evacuated from Wuhan.

However, the lockdown was not on the plan, and it was introduced very late. By the time it was brought in, Moscow was already in the grip of the virus. Inadequate testing blinded the authorities in tracking how far the virus had spread.

Even though Russia has an unusually low fatality rate of 0.9%, it is still among the worst-hit countries.

6.4.4. Spain

The Fig. 7 depicts the daily change in the number of cumulative cases, deaths and recoveries for 100 days in Spain. It is the fourth worst-hit country by the coronavirus pandemic with over 2.8 lakhs cases till June 1.

Spain was hit by this virus quite early compared with other countries. In the initial days, the main reason behind the spread of this virus
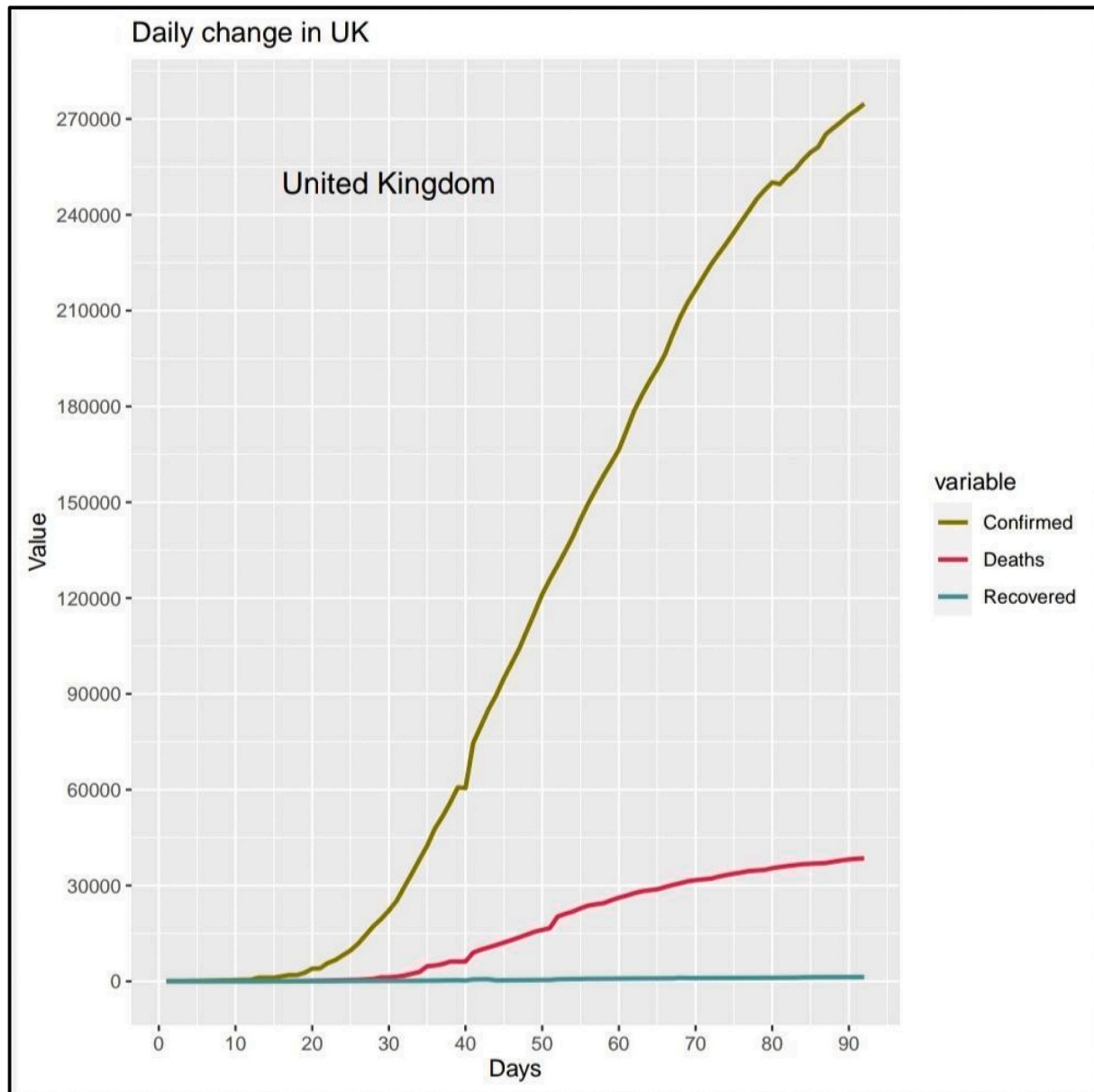
Fig. 8. Cases, Deaths and Recoveries in the United Kingdom over a period of 100 days.

is that Spain thought the virus was far enough away and they will not have many cases. A week before the lockdown, there were political party conferences held, sports events were conducted, and massive demonstrations were witnessed to mark International Women's Day. The government responded late and in an unskilled manner as even after knowing all the guidelines; they lacked essential equipment.

The recovery rate is 68%, and the death rate is 10% of the total cases as Spain has a magnificent primary care system.

6.4.5. United Kingdom

The Fig. 8 depicts the daily change in the number of cumulative cases, deaths and recoveries for 100 days in the United Kingdom. It is the fifth worst-hit country by the coronavirus pandemic with over 2.7 lakhs cases till June 1.

The number of confirmed coronavirus positive cases increased at an exponential rate in early March, and proved Britain's failure, even when they obtained the testing kits in February. Public health officials say the UK's strategy by conducting a "Herd Immunity" policy turned out to be a failure as in the initial phase, the hospitals got overflowed, and the number of deaths surpassed the estimated number. The decision of not implementing a lockdown allowed the virus to spread fast and un-detected.

In pursuit of the success of "Herd Immunity", the government failed to follow the testing and tracking systems which were quite successful in countries like South Korea, Germany, and New Zealand. This led to a death rate and a very low recovery rate.
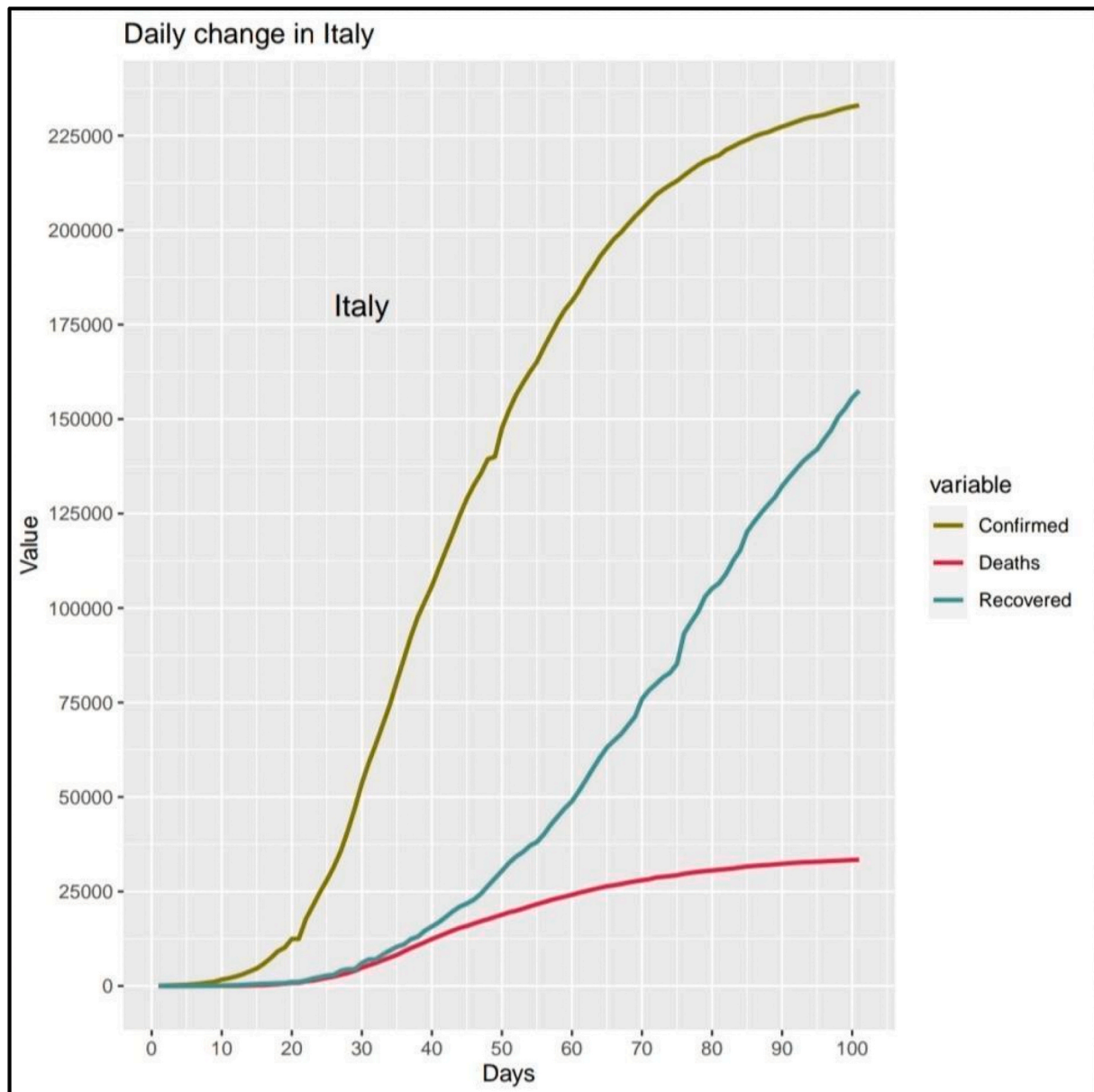
Fig. 9. Cases, Deaths and Recoveries in Italy over 100 days.

6.4.6. Italy

The Fig. 9 depicts the daily change in the number of cumulative cases, deaths, and recoveries for 100 days in Italy. It is the sixth worst-hit country by the coronavirus pandemic with over 2.3 lakhs cases till June 1.

There are several reasons why Italy is one of the worst-hit countries: In Italy, there is the sixth-longest life expectancy of the world, 84 years old. The majority of the people in Italy are elderly, and according to medical researchers, the coronavirus is more severe in older people compared to the young population. Italians are not used to social distancing, and most of the time, Italy is crowded with people, and workers from around the world come to attend meetings in northern Italy, thus contributing to spreading the virus.

The recovery rate is 67.59% of the total cases contributing to the fact that Italy has struggled throughout this time and is continuing to tackle the unprecedented crisis.

6.4.7. India

The Fig. 10 depicts the daily change in the number of cumulative cases, deaths, and recoveries for 100 days in India. It is the seventh worst-hit country by the coronavirus pandemic with over 1.9 lakhs cases till June 1.

Initially, the situation was under the control of the government, and for almost two months, there were very few corona positive cases as compared to the 1.3 billion population. However, because of the poverty in many areas of the country, there was no food for daily wage workers, and even though the government tried to provide food and money to the people in need, it was not enough. About 60–70% of the
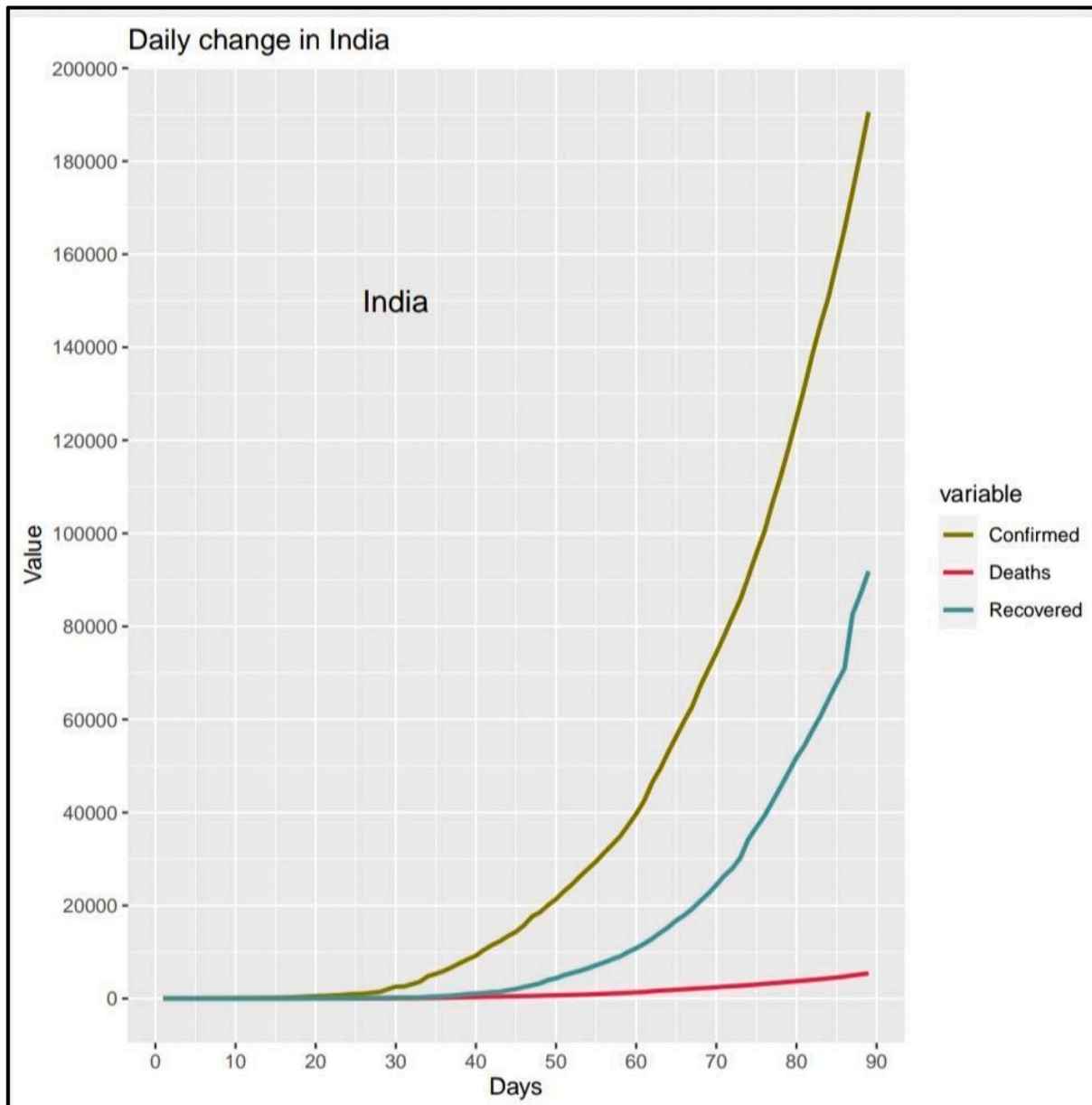
Fig. 10. Cases, Deaths and Recoveries in India for 100 days.

workers did not get food and money, so they decided to go back to their native places during the lockdown. Earlier there were no means of transport services, so they decided to walk or ride a bicycle back home. This was the reason which led to the deaths of many people because of accidents and starvation. This also contributed to the spread of the virus throughout the country. The numbers began to rise exponentially by the mid of May, and the situation is getting worse.

However, the recovery rate of India is one of the best among the worst-hit countries, and the death toll is low because the immune system of Indians is better, and there are moderate healthcare facilities.

6.4.8. France

The Fig. 11 depicts the daily change in the number of cumulative cases, deaths, and recoveries for 100 days in France. It is the eighth

worst-hit country by the coronavirus pandemic with over 1.88 lakhs cases till June 1.

France was the first country in Europe to detect a coronavirus positive case, but the French government was not serious about the whole situation as they took weeks to decide for imposing strict social distancing measures, there was no province for large-scale testing. This led to the massive spread of the virus throughout the country. The country's average life expectancy is 82.52 years, which is quite high and could be the reason for a high infection rate. The average age of an infected person is about 62.5 years old in France, and this shows that there was a threat to vulnerable people, and the death toll became high.

However, the country has experienced its peak, and the situation has become better since then. The lockdown is also getting uplifted slowly.
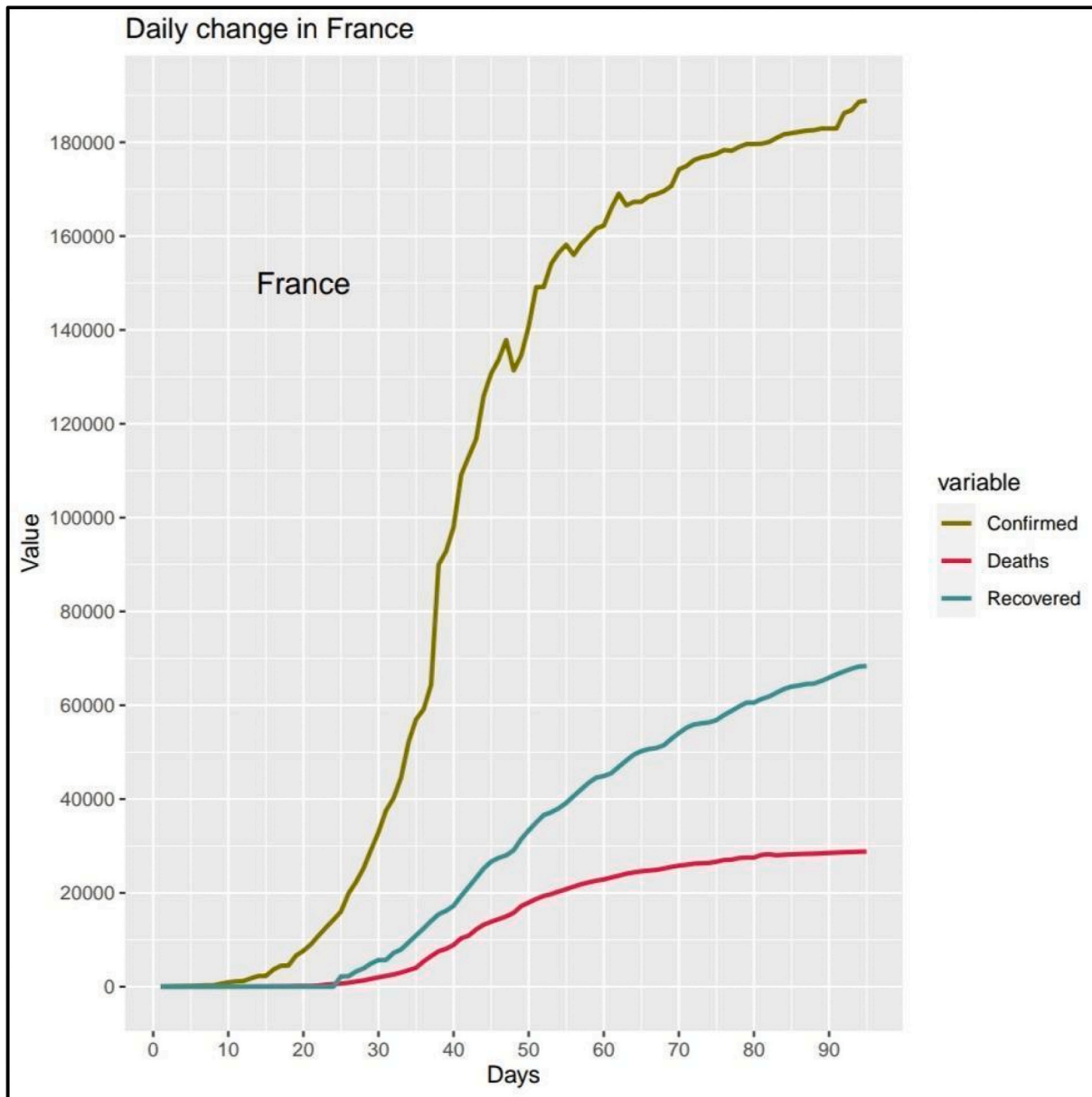
Fig. 11. Cases, Deaths and Recoveries in France over a period of 100 days.

6.4.9. Germany

The Fig. 12 depicts the daily change in the number of cumulative cases, deaths, and recoveries for 100 days in Germany. It is the ninth worst-hit country by the coronavirus pandemic with over 1.83 lakhs cases till June 1.

Initially, the country was among the five worst-hit countries, but with a constant struggle for three months, it was finally successful in handling the pandemic. There was a very low death rate in the country as the average age of a person diagnosed from the virus is 49 years old, which is not the vulnerable age to die from coronavirus.

Compared to many other countries, Germany has managed to handle the COVID-19 crisis well, as it has a properly funded health system making the treatment process free of charges, the country has a high technological edge, and the leaders are quick in making decisions.

Also, this country belives in a strong commitment in order to build public trust.

6.4.10. Peru

The Fig. 13 depicts the daily change in the number of cumulative cases, deaths, and recoveries for 100 days in Peru. It is the tenth worst-hit country by the coronavirus pandemic with over 1.64 lakhs cases till June 1.

Towards the end of May, Peru had nearly 150 thousand cases of COVID-19, and the death toll was around 4,099. It is the third-highest toll in Latin America, a region that has become the new epicentre of the pandemic. The problem is in the lifestyle of people of this region as they do not believe in self-isolation and social distancing. Staying home for long periods is impossible for families who leave their houses regularly
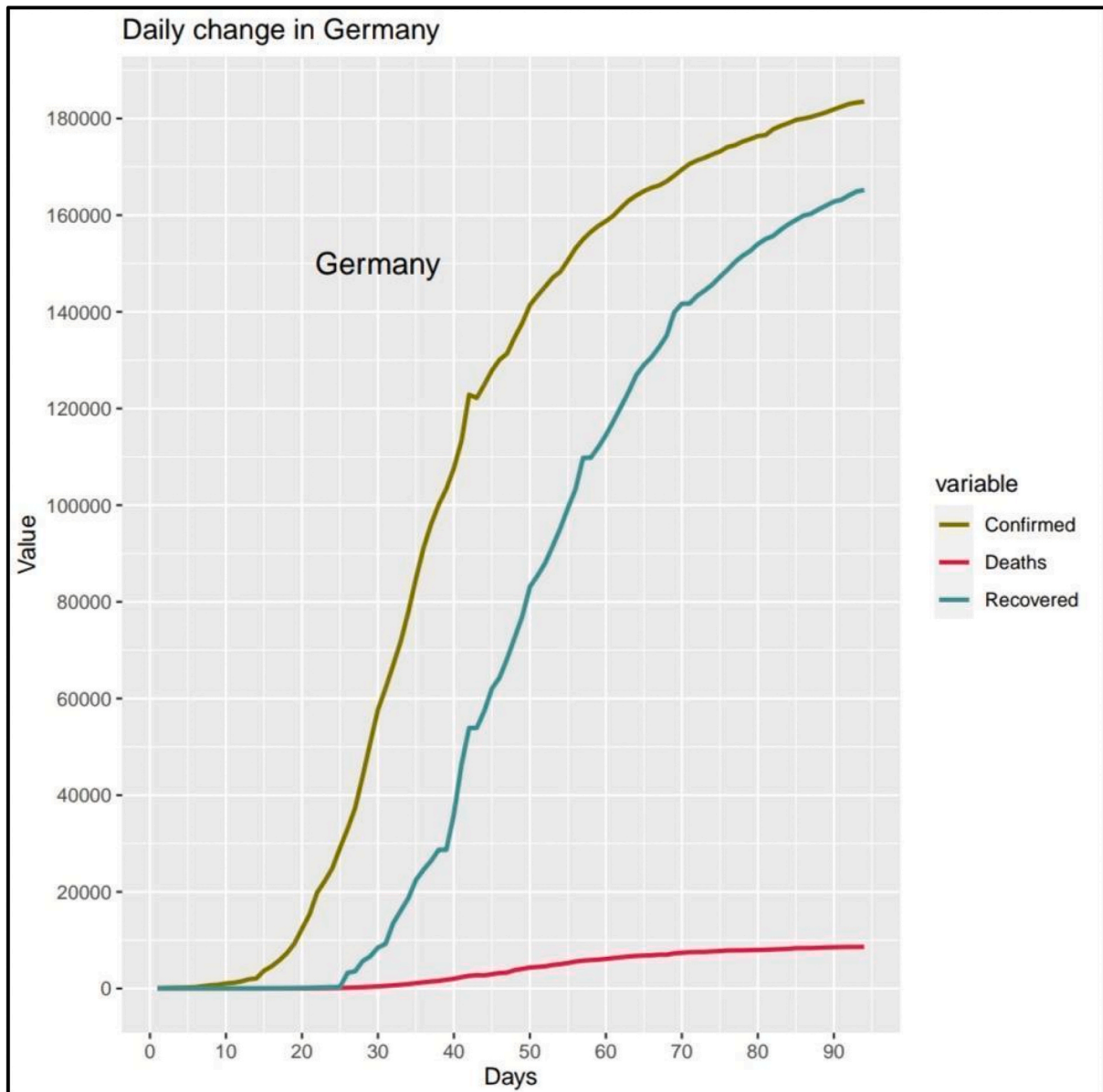
Fig. 12. Cases, Deaths and Recoveries in Germany over a period of 100 days.

to access food. As a consequence, busy markets and crowded places became a reason for such a condition of the country.

Healthcare officials are trying their best to handle this pandemic. However, because of the lack of PPE (personal protection equipment), thousands of officers have fallen sick themselves.

6.4.11. Turkey

The Fig. 14 depicts the daily change in the number of cumulative cases, deaths, and recoveries for 100 days in Turkey. It is the eleventh worst-hit country by the coronavirus pandemic with over 1.63 lakhs cases till June 1.

Initially, in Turkey, the coronavirus outbreak was even worse than China. There were fears that the death toll would increase like Italy, which was then the hardest-hit country. However, Turkey responded reasonably quickly with testing and tracing techniques, and there were

movement restrictions. As the spread increased, the authorities ordered-no gatherings at cafes, no shopping in crowded markets, and no communal prayers at the mosque. The elderly people over-65s and the young generation under-20s were locked down completely. Despite lockdown, weekend curfews were imposed, and major cities were sealed off. Turkey has advantages in the fight against COVID-19, it has a young population, and there are a large number of ICU beds.

Despite this, 1000 new cases are getting recorded every day. Still, the death toll remains relatively low as there is a majority of the young population living in the country.

6.4.12. Iran

The Fig. 15 depicts the daily change in the number of cumulative cases, deaths, and recoveries for 100 days in Iran. It is the twelfth worst-hit country by the coronavirus pandemic with over 1.51 lakhs cases till
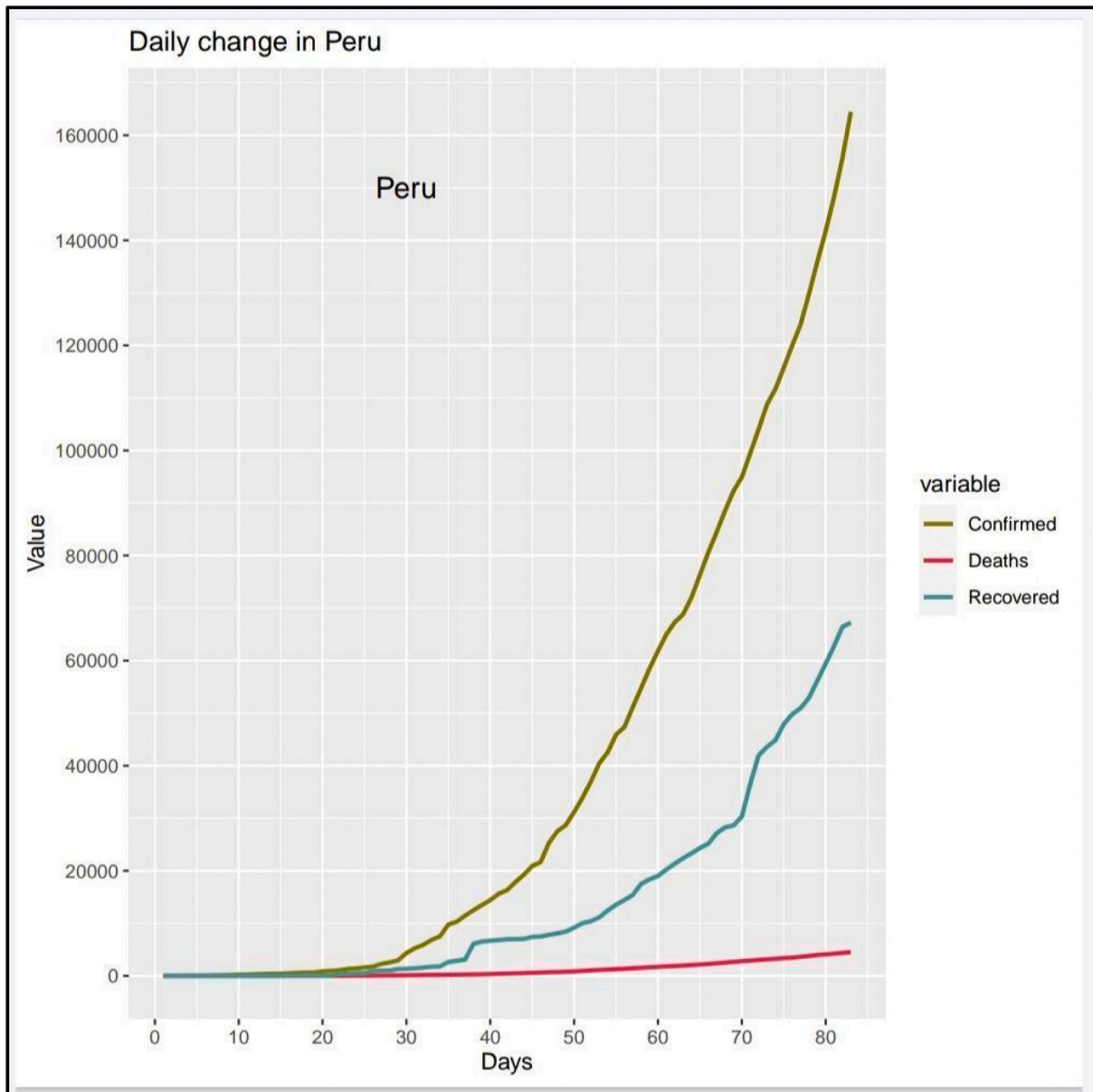
Fig. 13. Cases, Deaths and Recoveries in Peru over a period of 100 days.

June 1.

Iran was the first country after China, ravaged by the coronavirus and, for some time, the second most affected country. Coronavirus cases in Europe and the US have risen rapidly since then. No quarantine arrangements were declared, though educational institutions were shut down. The Iranian government also revoked permission for Doctors without Borders to set up a field hospital to treat virus-affected patients in Isfahan, apparently on the suspicion that the team of foreign doctors will steal the genomes of the Iranian strain of COVID-19. However, WHO experts agree that Iran's infection rate is understated, and with such a high infection rate, it is difficult to fight this pandemic.

According to the WHO, Iran has scaled up to all elements of its response to the crisis and improved coordination between government agencies and municipal bodies.

6.4.13. China

China is not among the worst-hit countries, but it was once the epicentre of this pandemic. That is the reason we have included China in our analysis.

Beginning January 23, Wuhan, which was the epicentre of this deadly virus, was put under a lockdown of 76 days. In Wuhan, many hospitals were allotted to the coronavirus patients, and, within a month, there were 16 temporary hospitals built, increasing the number of hospital beds to 60,000 to meet the surging demand. Around 45,000 medical workers, key medical supplies such as ventilators, protective suits, masks, and daily necessities were sent to Hubei, from across the country (See Fig. 16).

This shows the strategy followed, and the results were no positive cases. However, Wuhan must take precautions to prevent the
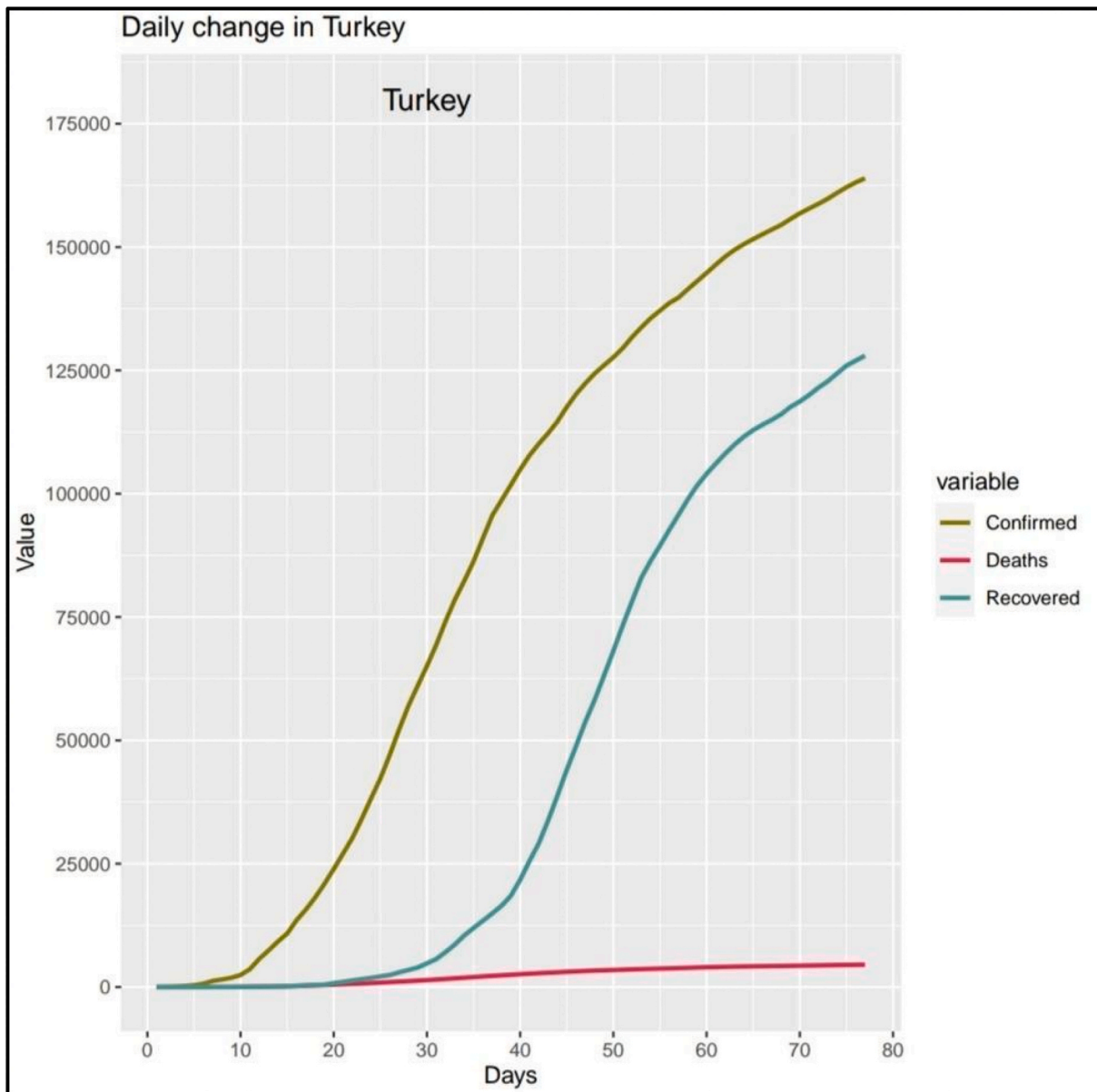
Fig. 14. Cases, Deaths and Recoveries in Turkey over a period of 100 days.

resurgence of the outbreak.

7. Major inferences and discussion on the result

The qualitative and quantitative analysis is stated in table. 1.

7.1. Summary of the results

Table 1 gives a summarised results of the analysis. Here it states, country wise, infection rate, death rate, recovery rate, and then primary reasons what went wrong and what was the right and support condition.

● Infection Rate = 100 * (Number of Cases/Population of the Country)

● Death Rate = (Number of Deaths/Number of Cases)
● Recovery Rate = (Number of Recoveries/Number of Cases)

7.2. Results and discussion

The countries which were initially unaffected like Brazil and Russia experienced an exponential rise in the corona positive cases almost after two months of the pandemic majorly because of the casual behaviour of people and the government.

● There are also success stories in handling the pandemic as countries like China, Turkey, and Germany which were once the epicentre of this disease were successful in handling the pandemic as in China and Turkey there is flattening of the curve of the case in the graph, while in Germany the death toll is quite low.
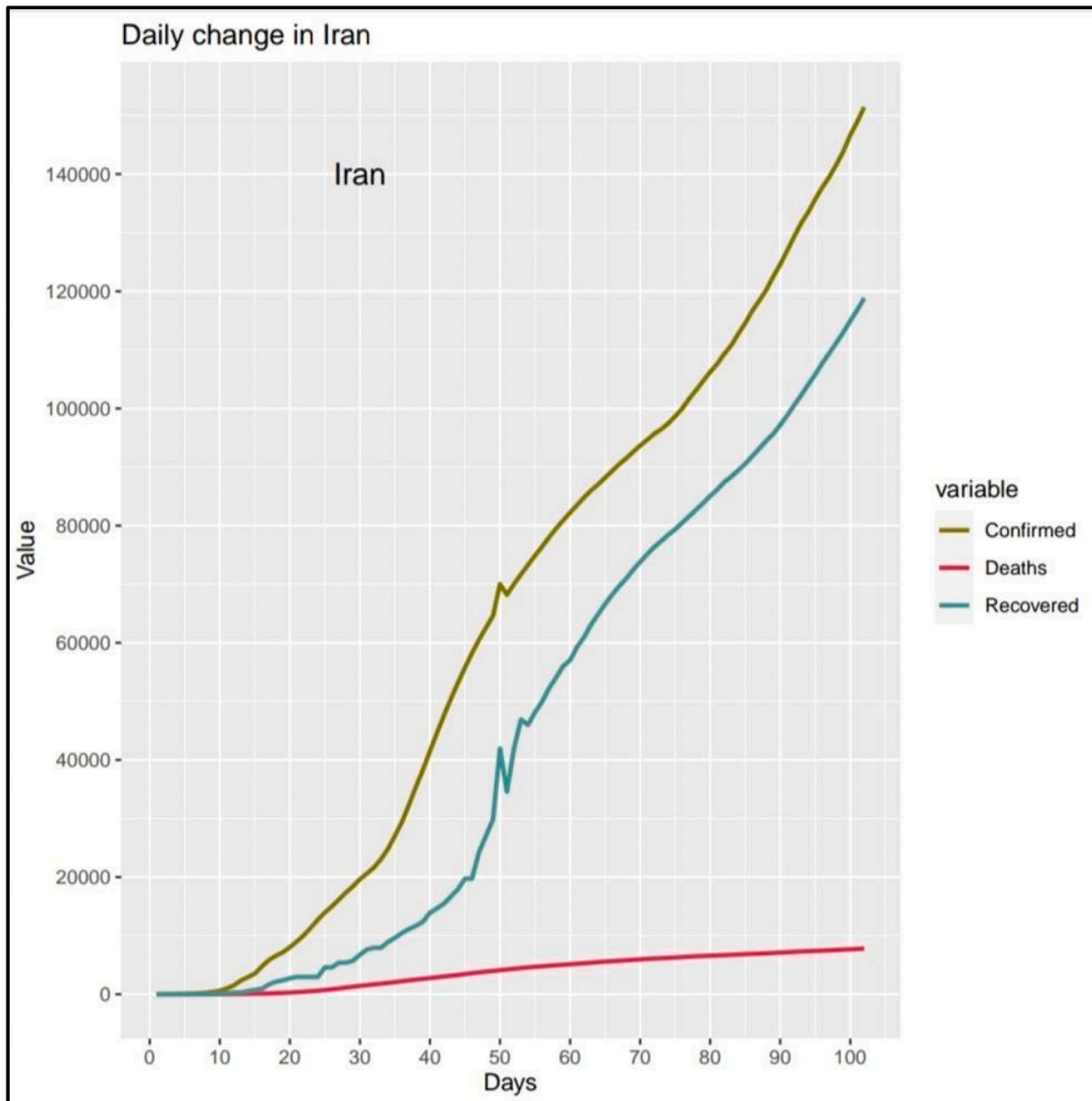
Fig. 15. Cases, Deaths and Recoveries in Iran over a period of 100 days.

● Countries with having a high life expectancy rate like Italy and France experienced a significant fatality rate as elders are most vulnerable to this pandemic.

● The failures of the government policies in countries like the United States of America and the United Kingdom led to the severe condition of the countries.

● The poverty of people and their need to get out of their houses for food became a contributing factor in the rise of positive cases in India and Peru.

● The main reason behind the spread of this virus in Spain and Iran is that both of their leaders thought that the virus was far enough away, and they will only have a handful of cases. The ignorance of their leaders led to this severe condition.

7.3. Inference from the study

This research infers the following:

● The casual and ignorant behaviour of people is a major reason for such a large-scale coronavirus spread.

● Government of every country should be strict as well as considerate to all sections of people while making policies. For example, the country should not implement lockdown without having proper schemes to provide food for the daily wage workers, as people will then fear starvation rather than the virus.

● Countries should learn from the success of other countries and try to implement their policies for the betterment of the people.

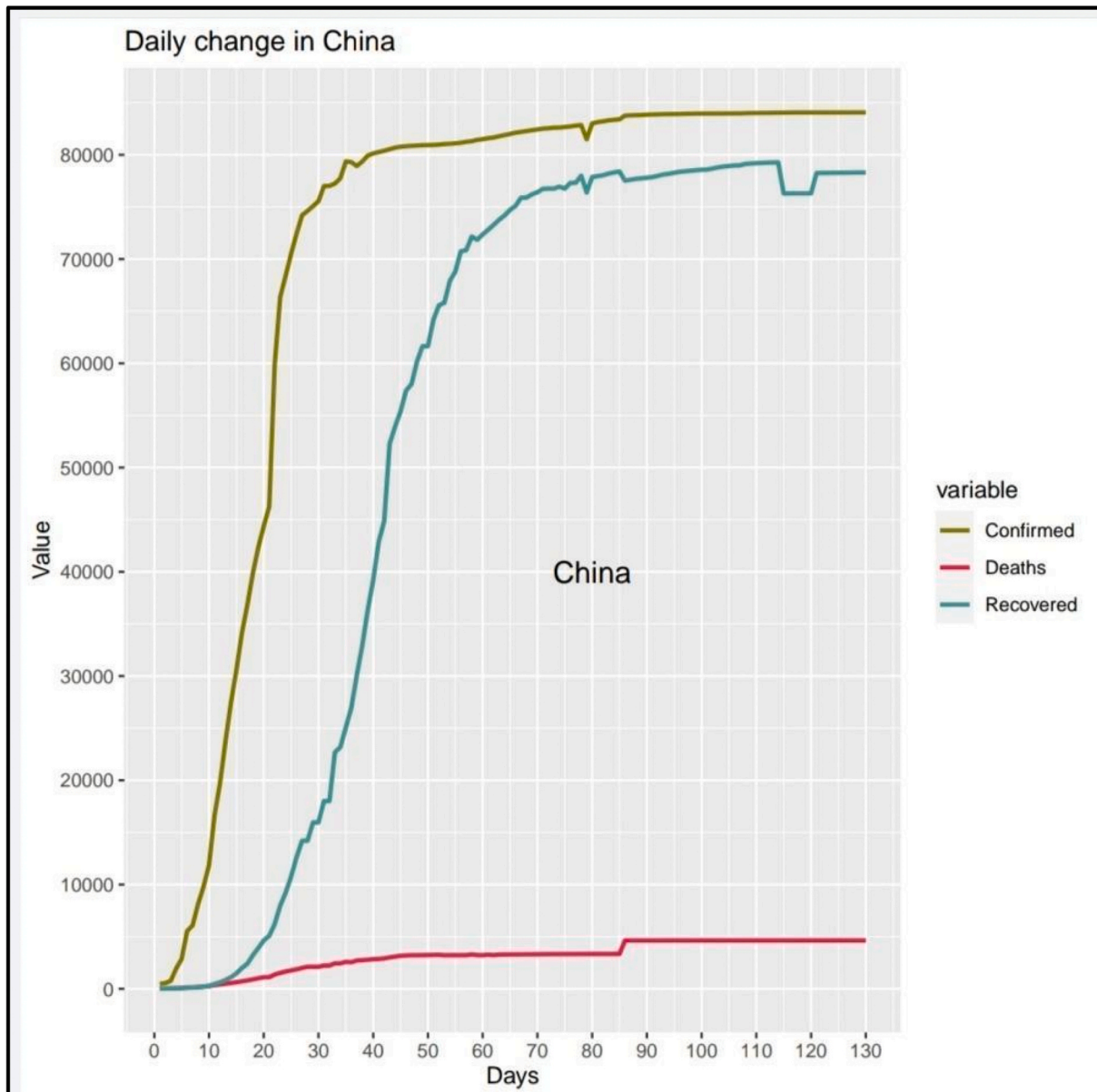● There is no room for mistakes, as one wrong decision or one delayed

Fig. 16. Cases, Deaths and Recoveries in China over a period of 130 days.

decision can worsen the situation.

● Some countries which were once the epicentre of this pandemic are now corona-free, proving that this global threat can be tackled, and we should all keep our morale high.

7.3.1. Inference on infection rate

An infection rate is the probability of risk of an infection in a population. It measures the frequency of occurrence of infection within a population.

Infection Rate = k * (Number of Cases/Population of the Country).

k = constant, with a value of 100.

The infection rate due to coronavirus as of June 1 is in the following order:

Iran > Turkey > Spain > Peru > Uk > Italy > France >

Russia > Brazil > Germany > India.

7.3.2. Inference on cases

The number of cases due to coronavirus as of June 1 is in the following order:

USA > Brazil > Russia > Spain > UK > Italy > India > France > Germany > Peru > Turkey > Iran.

The casual and ignorant behaviour of people is a major reason for such a large-scale coronavirus spread. There is no room for mistakes, as one wrong decision or one delayed decision can worsen the situation.

7.3.3. Inference on death rate

The death rate due to coronavirus as of June 1 is in the following order:

Table 1
A summarised result of the analysis.

Country	Infection Rate (%)	Death Rate (%)	Recovery Rate (%)	What went wrong	What went right
United States of America	0.55	5.77	29.46	The casual behaviour of people and the government led to this severe condition of the country.	The USA has an excellent healthcare system and has conducted the most number of tests in the world.
Brazil	0.24	5.69	40.11	There was a casual behaviour of people as the president himself openly denied the seriousness of the disease.	The immunity of people because of the proper diet is the reason behind a decent recovery rate.
Russia	0.27	1.15	42.35	The lockdown was introduced too late, and the inadequate testing blinded the officials. By the time it was brought in, Moscow was already in the grip of the virus.	Russia has very few older people who are vulnerable to the virus. Thus, the recovery rate is high.
Spain	0.61	10.03	68.74	The government responded late, and in an unskilled manner as even after knowing all the guidelines they lacked essential equipment	Spain has a magnificent primary care system, and that is why it has such a high recovery rate
United Kingdom	0.40	14.01	0.48	In pursuit of the success of "Herd Immunity," the government failed to follow the testing and tracking systems.	The United Kingdom's healthcare system is ranked 6 in the world, and it is trying its best to tackle this pandemic.
Italy	0.38	14.34	67.59	They have a long life expectancy rate, and the virus is more lethal to older people.	The constant struggle and contribution of the entire country led to a high recovery rate.
India	0.001	2.83	48.18	Poverty and a high population led to the massive spread of the virus.	Immunity of people and food enriched with nutrients improves the recovery rate.
France	0.28	15.24	36.189	It took weeks to decide for imposing strict social distancing measures, and there was no province for large-scale testing	After the lockdown was imposed, the pandemic was handled with utmost sincerity by both people and the government.
Germany	0.21	4.68	90.03	As it was a western European country and thus it was among the worst-hit countries.	It has a properly funded health system and a high technological edge, and the leaders are quick to make decisions.
Peru	0.49	2.73	40.86	Lack of PPE (personal protection equipment) and less social distancing.	The healthcare officials are trying their best to handle this pandemic.
Turkey	6.68	2.76	78.05	Turkey was a little late in imposing the lockdown.	It has a young population, and there are a large number of ICU beds.
Iran	13.42	5.14	78.46	No quarantine arrangements were declared, and the government also revokedpermission for Doctors without Borders to set up a field hospital to treat virus-affected patients in Isfahan.	According toWHO, Iran has scaled up its response to the crisis. Now there is better coordination between government bodies
China	0.005	5.51	93.14	They realised the severity of the virus quite late.	The system was efficient.

France > Italy > UK > Spain > USA > Brazila > Iran > Germany > India > Turkey > Peru > Russia.

A high death rate is mostly in countries with a high life expectancy rate, as coronavirus poses a more serious threat to older people than to younger ones.

7.3.4. Inference on recovery rate

The number of recoveries from coronavirus as of June 1 is in the following order:

Germany > Iran > Turkey > Spain > Italy > Russia > Peru > Brazil > France > USA > UK.

Countries with a higher recovery rate are proof of better healthcare facilities and a higher immune system of people.

8. Limitation of the study

In this study, we saw no international standards for data collection, aggregation and reporting. Here, every country follows its protocols for reporting data and statistics related to the COVID-19 pandemic. Furthermore, the protocols may be different for subdivisions in the country. Different states, districts, jurisdictions, etc. may have different methods of counting. This lack of consistency in reporting protocols may result in inaccurate data, which imparts inaccuracy to the analyses that make use of that.

The biggest problem is the manipulated data. We identified that countries like Russia, Belarus, Chile, and China were accused of manipulating their COVID data to make their situation look better. In a global health emergency like the coronavirus, countries need to realise that cooperation is necessary for us to come out of this with minimal deaths and economic loss. There must be a more significant international oversight to ensure that countries are reporting actual numbers and not manipulating valuable data.

9. Future suggestions on the study

Qualitative and Quantitative analysis of the statistics related to COVID-19 in different countries will help to assess what further measures can be taken by the government to lower the spread of the virus. One can view the extent to which the lockdown was effective so that further implementation can be done accordingly, and the right steps can be taken to contain the infection as well as balance the economic activities to ensure the protection of jobs and livelihoods. As death figures show a higher number in the older population, strict preventive measures should be taken by individuals. The graphs can help in highlighting the faults in the healthcare system and the governing body of countries with higher cases. Additional financial support for health services is required, including sufficient resources to ensure adequate staffing and testing facilities in countries with high cases. The analyses could be more detailed as we still do not have answers for many questions like What exactly a country should do to tackle this pandemic, what is the role of lockdown in this entire process as some countries have been successful and for others, it is not. Also, the impact of coronavirus on factors like the economy of the nation, mental health of people in handling this pandemic and the loss of goods and resources in various countries could be addressed in the future. We will be able to learn lessons, especially in terms of public and global health for any future similar pandemics and the governing body will be able to prepare accordingly.

10. Action plan

The action plan[10] for all countries should have the following measures:

- Suppress community transmission by implementing strict rules on lockdown and social gatherings. The major issue in handling the virus is that it is communicable and to break the chain, we must avoid social gatherings.Reduce mortality rate by improving the healthcare facilities and by providing all kinds of vaccines and treatment to the patient. This can be done only by providing resources to the hospitals.•Develop safe and effective treatment processes so that the world can be corona free. As even now, there is no specific vaccine for the treatment of COVID-19.

11. Conclusion

The coronavirus disease is not any ordinary viral infection, and it has become a pandemic as it has an impact on health, mortality, economy and social well being of the entire world. Qualitative and Quantitative analysis of the statistics related to COVID-19 in different countries is done based on their officials' data. The primary objective of this analysis is to learn about the relationships of various countries in containing the spread of COVID-19 and the various factors such as government policies, the cooperation of people, economy and tourism.

The number of cases in a country is dependent on two major factors, no. of tests and preventive measures. Therefore countries such as South Korea and Denmark where mass testing was done are now under less risk. The fatality of COVID-19 increases exponentially with an increase in age. Hence, countries with older populations will show a higher no. of deaths. Therefore, fewer deaths were there in Germany as compared to other European countries. Despite having considerable average life expectancy, a lower fatality rate means that the preventive measures are significantly effective and successful.

From this analysis, we understood the impact of lockdown and the implementation of government policies in various countries is different for every country. It can be concluded that countries having high corona positive cases do not necessarily have a high death rate, as the death rate depends on the immunity of people and the healthcare facilities.

Through the assessment of these graphs, one can learn lessons especially in terms of countrywide health with global perspective and can gear up its facilities to fight any new upcoming similar pandemic.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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