Analysis of Health-Care Capabilities of Different Countries in Order to Determine their Preparedness for COVID-19 Virus

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Abstract – *The World Health Organization (WHO) has declared Coronavirus (COVID-19) as a pandemic. As of 25th March 2020 more than four lakh people are already infected from this outbreak. The Mortality rate of this virus is 3.4%, according to WHO, but this figure is determined by simply performing division between numbers of people who have died with total number of confirmed cases, hence this mortality rate cannot be trusted as many countries have performed a small number of tests. The most important thing that a country can do is perform proper testing of as many citizens as possible. The ability of a country to control the spread of this virus is directly proportional to Health-Care capabilities of that country. Therefore, in this research we analysed the Health-Care Capabilities of countries in order to determine their Preparedness for COVID-19.*

Keywords – Health-Care, COVID-19, Pandemic, Hospital, Medical Tests, Medical Facilities, Data Analysis.

1. Introduction

The COVID-19 is an infectious disease which has become an outbreak and it is declared as a pandemic by the World Health Organization [1]. The infection is spreading rapidly. Usually symptoms of this infection includes shortening of breath, mild fever and Dry cough. Sore throat and pain in muscles are rare symptoms [5]. In some cases, there are only few of the above mentioned symptoms [6] whereas in some cases the patient may not have any symptoms until 14 days after being infected [7]. The mortality rate of this infectious disease in 3.4% but this figure is not an accurate representation of the problem as the total number of tests performed in developing countries is very less [8]. The problem is that this outbreak will become an adverse clinical threat for the citizens because knowledge and resources required to deal with this kind of an infection is limited [9]. As of 25 March 2020 there are more than four lakh cases. Out of these more than eighteen thousand people have died and more that hundred thousand patients have successfully revived from this infection, now these statistics are not a correct representative measure of the outbreak of the virus because in developing countries the number of tests being performed is very less. The Health-Care facilities of a country can give us a correct picture of preparedness of that country. These Health care facilities have been analysed in this research work.

1.1 Number of Tests

The Number of tests performed play a major role in determining a countries preparedness of a country. Number of tests performed by a developing country are less and hence and hence the number of confirmed cases are less whereas in a developed country the number of tests performed is more and hence the number of cases confirmed is also more. This is why it is essential to analyze this relation in order to get a correct picture of the spread of this outbreak in a country [2].

1.2 Number of Beds and Ventilators

Number of beds and ventilators are also an important attribute for measuring the spread of this infection in a country. Once a test has been performed and the test comes out to be positive then the patient needs to be kept and isolated somewhere so that the virus does not spread from one person to another [3]. The problem is that the beds and ventilators are limited and if the number of positive cases exceed the number of beds and ventilators available then isolation of the patient and also the treatment of the patient is not possible. Hence in order to measure the degree to which this pandemic can spread we need to take into account the number of beds and ventilators available. If the number of beds and ventilators is less, then countries should focus in allocating resource to increase this number.

1.3 Other Medical Resources

In order to determine the preparedness of a country we need to take into account other medical resources. These resources can include the number of doctors, nurses, medicine and medical equipment. If a country has sufficient amount of place for the patients it still needs these other resources. Country needs enough doctor to treat the patients. It needs enough nurses to take care of the patients. It needs to have enough medicines and medical equipment as well. Hence these factors affect country's ability to deal with this situation and are an important attribute for the analysis [4]

2. METHODOLOGY

For analysis of data we use Data Analysis and Data Analysis is a part of Data Science and Data Science is one of the most trending topics these days. Big Data Analysis can also be one of the approaches for analyzing the data, both Big Data and Data Analysis is used to extract useful information

from huge amount of data that is extracted from various resources. In this paper we have used Data Science technique. Data Analysis provides more benefits and gives a considerable performance as there are large number of libraries present to analyze the data using Python. The various steps involved for analyzing the data for the analysis task are as follows:

2.1 Data Import: The relevant dataset of number of tests and total confirmed cases of COVID-19 for various countries is "test-vs-confirmed-cases-covid-19.csv" and the dataset containing the information regarding the beds in hospital is "beds.csv". Both of these are a CSV file i.e. Comma Separated Values file. This dataset has been provided by "Our World in Data" and for analysis purpose we are using both these datasets.

2.2 Data Cleaning: The process of data cleaning is very time consuming. However, this step cannot be ignored as it is one of the most important steps in preparing the data for the analysis task. Data cleaning also becomes important because the data is collected from various resources and it is very noisy i.e. contains unwanted or coarse data. This unwanted data can lead us into various difficulties like wrong analysis therefore we tend to clean the data. The data can be noisy in the form of null values so we can either replace null values by a global constant or we can entirely remove the columns that are not useful for analysis task. After the cleaning the step, the dataset contains only useful data that can be used for analysis process.

2.3 Wrangling Data: The process of mapping data in its raw form and transform this data too many other forms such that this data is different from previous version of data is called Data Wrangling.

2.4 Data Visualization: The main feature of data analysis is data visualization. Without visualization we cannot perform data analysis. The data present in the dataset can be visualized by various graphs. We can use various libraries that are present in python like matplotlib or seaborn for building various graphs. The analysis can be made from these graphs. Therefore, data visualization is one of the key feature for data analysis process.

2.5 Modeling Data: The relationship between various diagrams and data can be determined by the data modeling step. The various types of diagrams which include scatter-plot, histogram, replot, pie chart, catplot, bar-plot, and etc. are used in data modeling.

The dataset had a lot of categorical data. This categorical data included the names of countries and hospital and as these names were large enough so better visualization, all the categorical data was encoded to numeric data by using the library "sklearn.preprocessing.OneHotEncoder."

The main use of this library is to transform the categorical data into numeric array which is also known as one hot numeric array. These inputs are transformed into arrays of integer or characters which are denoting the values that were taken from discrete features [9].
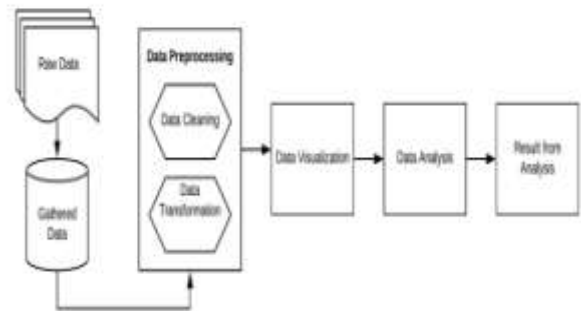

Fig. 1. Methodology.

Table I: Attributes of the data set.

Attribute Value	Data Type	Representation	Summary
Entity	String	Entity	Stores the country name
Code	String	Code	Country Code
Year	Integer	Year	Store the year
Total test	Integer	Total COVID tests	Store total no. of tests
Confirmed Cases	Integer	Total COVID confirmed cases	Stores the total no. of confirmed cases
Confirmed	Integer	Confirmed	Total confirmed cases
Indicator	String	Indicator Name	Total beds
Indicator Code	String	Indicator Code	Code for Hospital

3. Proposed Work

In this paper we propose to analyze the dataset of COVID-19 and find out the major findings by analyzing the various graphs.
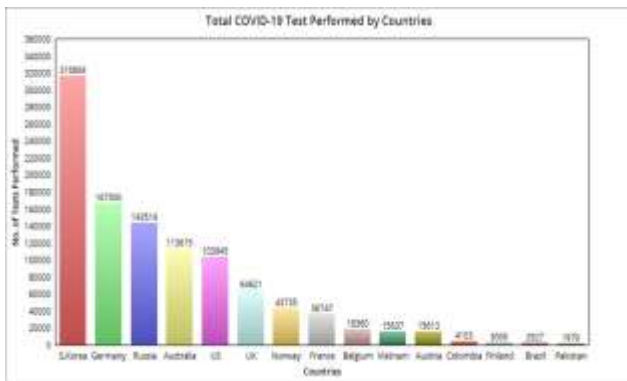
Fig. 2. Countries VS. No. of Tests Performed.

Figure 2 is a graph for number tests performed by various countries and we can analyze that highest number of tests of COVID-19 are performed in South Korea i.e. three lakh sixteen thousand six hundred and sixty four and least number of tests are performed in Pakistan according to the used dataset. The analysis form the above figure is that as the maximum tests are performed in South Korea, therefore we can say that South Korea is one of those countries that have very good medical facilities including the testing facilities for COVID-19 whereas other countries lack these facilities for testing the COVID-19 test.
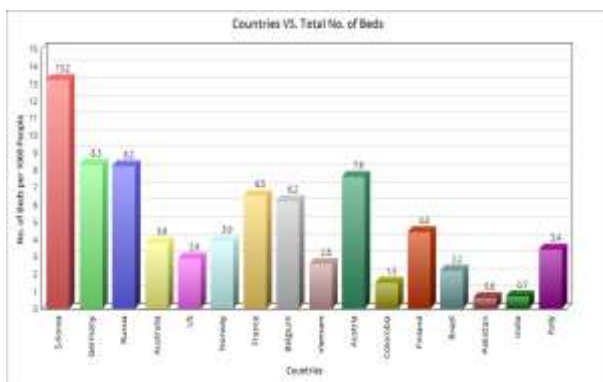

Fig. 3. Countries VS. Total No. of Beds.

From figure 3 it can be analysed that, South Korea was the country with the maximum number of tests performed for COVID-19, therefore we can analyse that maximum number of beds for patients are available in South Korea. We can also analyse that Austria had only fifteen thousand tests performed but it has good number of beds. Therefore, it can accommodate the patients affected by COVID-19.
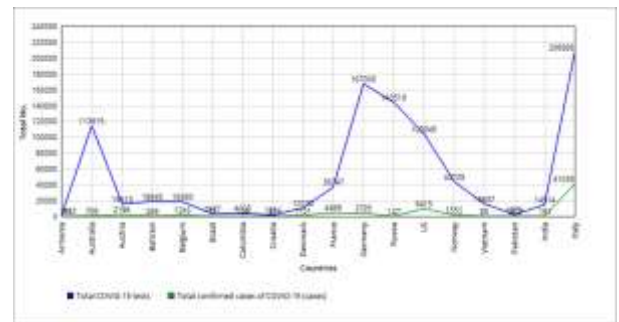

Fig. 4. Total No. of Tests and Total Confirmed Cases for COVID-19.

Figure 4 is a graph that shows the countries along with the number of COVID-19 tests performed and total confirmed cases of COVID-19.
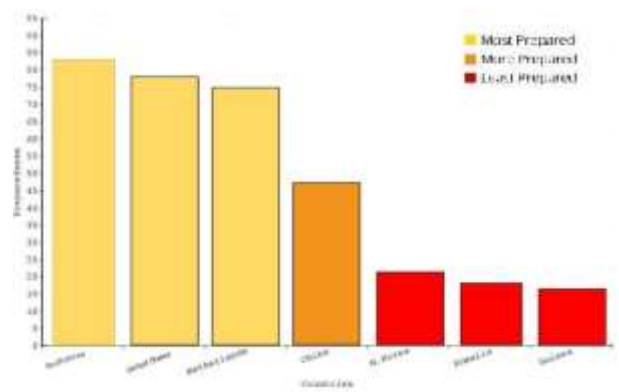
4. RESULT

Fig. 5. Countries VS Preparedness.

We can conclude the final analysis from the dataset as the result. After the analysis process we find that mortality rate depends on number of tests, but as in many countries people are not getting themselves tested therefore the mortality rate cannot be trusted. This leads us to trust the preparedness of various countries to determine their ability with dealing such viruses.

The main factor here is that how can we measure the preparedness for various countries and for this we need to analyse the heath care facilities like whether the country has sufficient infrastructure for various tests, or the country has the medical kits required for the tests and whether the country has the required number of hospitals, beds the various other equipment like ventilators.

5. Conclusion

From figure 5 we can analyse that South Korea is the most prepared country and it has the maximum medical facilities. We have also seen that maximum number of tests for COVID-19 were performed in South Korea therefore this also leads us to the conclusion that South Korea has most developed medical facilities. Whereas other countries like

Somalia and Guinea should develop their medical facilities or they would not be able to face any such future pandemic.

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