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Study of factors correlating with pandemic COVID-19 cases globally

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***Abstract*:** The pandemic COVID -19 has affected almost all countries without any discrimination, forcing the world to believe that in this high end technology equipped world we are not at all safe. This study is to correlate well defined parameters like life expectancy, population density, literacy rate & average temperature with the number of corona virus affected cases and deaths. It is observed that some of these factors show positive correlation giving an alarm about the safety in countries with good healthcare system.

Keywords: COVID-19, correlation coefficient, life expectancy, literacy rate, population density, average temperature

I. INTRODUCTION

The pandemic COVID -19 has affected the entire globe and is still not showing signs of reducing its severity. It has affected almost all countries without any discrimination forcing the world to believe that in this high end technology equipped world we are not at all safe. Right from developed countries to developing countries it has affected all and no country is able to do much except for forcing people to maintain distance by implementing lockdowns and creating high awareness of hygiene. Italy, Spain, France, Iran & USA are among the most affected countries. This study is to correlate well defined parameters like life expectancy, population density, literacy rate & average temperature with the number of corona virus affected cases and deaths. The study uses the statistics of 25 Countries most hit by the virus.

As of 21st April 2020, there have been about 2,536,673confirmed cases of COVID-19 and about 175,759 reported deaths globally[1]. Almost all affected countries have implemented lockdown to overcome spread of this virus. Currently COVID-19 which is caused by the novel coronavirus SARS-CoV-2 has no Vaccination or Medication. This disease is transmitted by inhalation or contact with infected droplets or fomites, and the incubation period may range from 2 to 14 days [3].

Most people infected with the COVID-19 virus experience mild to moderate respiratory illness and recover without requiring special treatment. Elderly people, and the one with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness. The best way to prevent and slow down transmission is with awareness of COVID-19 virus disease and how it spreads [4].

The COVID-19 virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes. Presently, there are no specific vaccines or treatments for COVID-19. However, there are many ongoing clinical trials evaluating potential treatments [4].

It is evident that the maximum deaths are of elderly people, giving an alarm to the countries with high life expectancy. Apart from lockdown countries have

implemented international travel bans and other strict measure. Countries like India are at a greater risk because of a very large population density, limited infrastructure and healthcare systems to cater to very large demands [7].

Though researchers are primarily working on developing best fits models to predict future of this virus related disease [6], we study the factors correlated to it with an aim to understand which factors should be analyzed and re worked in order to maintain good Health conditions. A few factors are considered here to study the association. In the next section we list the considered factors and reasons for choosing them.

II. Factors & Statistics

In the present study, we assessed the effects of parameters like life expectancy, population density, literacy rate & average temperature with the confirmed cases and deaths of COVID -19. Here we list them and the possible reasons for their consideration,

Life expectancy: This parameter highlights the average life expectancy of a person in a country and also indirectly represents the healthcare system of the country. Basically higher the life expectancy relates to a good health care system for example a country like US or Italy are known to have excellent health care services. But COVID -19 has made it clear that this is not enough just to have high life expectancy it should be accompanied with strong immunity and less underlying medical issues to fight against such a novel virus.

Population density: Social distancing is the only solution presently to avoid the infection of this highly contagious virus. Thus countries with high population density could find it difficult to main social distance, that's the reason we try to assess association of this with the pandemic.

Literacy rate: Since the disease spread could be restricted with social distance, awareness and discipline plays an important role. Literate population can have more understanding & awareness of the disease and can be expected to be more disciplined.

Average temperature: As possibly it is difficult for the virus to survive at high temperature, the effect of temperature of the country may have some association.

Following are some graphs and visualizations to go through the current statistics related to the pandemic in various countries,

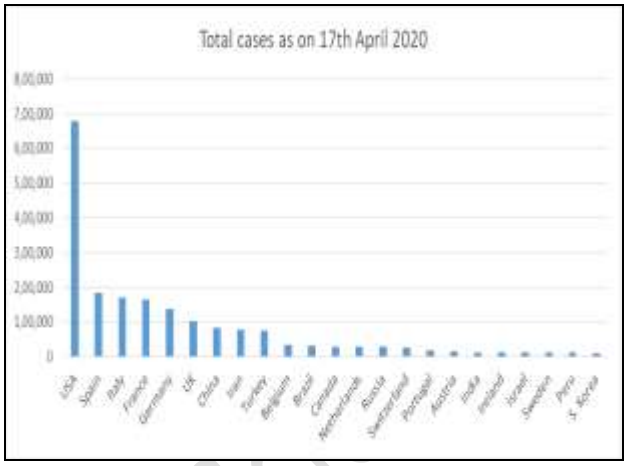

Fig 1: confirmed cases

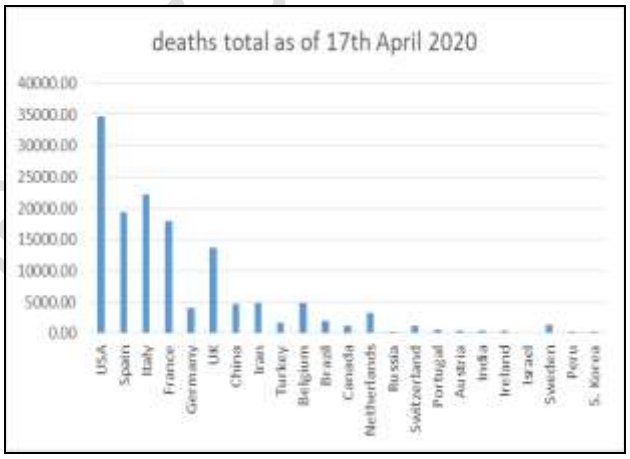

Fig 2 : deaths

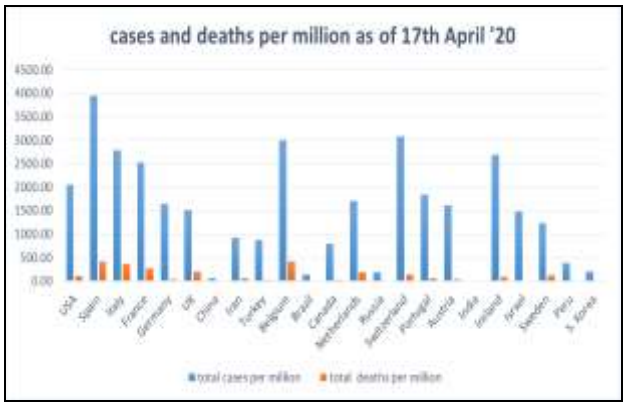

Fig 3: Confirmed cases & death per million

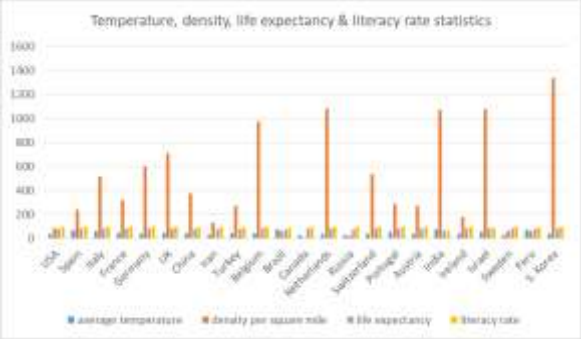

Fig 4: Countrywise details

III. Analysis

The correlation between two variables describes the likelih
ood that a change in one variable will cause a proportional change in the other variable. A high correlation between two variables suggests they share a common cause or a change in one of the variables is directly responsible for a change in the other variable. Pearson's r value is used to quantify the correlation between two discrete variables. We use the correlation option in data analysis plugin from the Analysis toolpak add on in Microsoft Excel to find the following results.

Correlation values:

	total cases	death total	total cases per million	total deaths per million
average temperature	-0.065876294	0.05799001	-0.073367618	0.03712469
density per square mile	-0.221077525	-0.14924866	0.016433927	0.131628701
life expectancy	0.006822125	0.161513962	0.653159914	0.47731514
literacy rate	0.169317762	0.210910766	0.409204626	0.30357115

The results suggest that life expectancy is positively correlated to total cases per million & total deaths per million, literacy rate expectancy is positively correlated to total cases per million & total deaths per million, average temperature of the country has no correlation with total cases per million & total deaths per million & also density per square mile has no correlation with total cases per million & total deaths per million.

We also obtained Spearman's Rank correlation coefficient (r) for the pairs which showed positive correlation to confirm the significant association.

- Correlation between Total cases per million and & life expectancy.

The value of r is: 0.62648. p (2-tailed) = 0.00138

- Correlation between Total deaths per million and & life expectancy.

  r = 0.53162, p (2-tailed) = 0.00904.

  By normal standards, the association between the two variables would be considered statistically significant.

- Correlation between Total cases per million and & literacy rate.

  r = 0.45844, p (2-tailed) = 0.0278.

  By normal standards, the association between the two variables would be considered statistically significant.

- Correlation between Total deaths per million and & literacy rate.

  r = 0.42599, p (2-tailed) = 0.04268.

  By normal standards, the association between the two variables would be considered statistically significant.

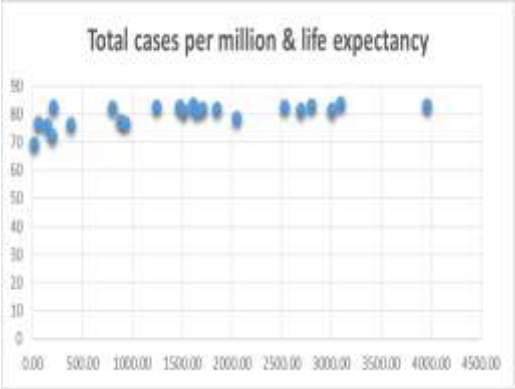

Fig 5: Scatter diagram of Total cases per million & life expectancy

IV. CONCLUSION

The correlation analysis suggest that the association between Life expectancy with total cases per million and deaths per million statistically significant. Also the association between Literacy rate with total cases per million and deaths per million statistically

significant. Which suggest that raising the life expectancy and literacy are not enough to fight a pandemic. Countries should re assess the life expectancy along with the immunity of elderly and the underlying medical conditions this could give a deeper picture of the population.

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