ANALYSIS OF COVID VACCINES AND THEIR SOCIAL IMPACTS USING MACHINE LEARNING TECHNIQUES

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Abstract: *The corona virus disease - COVID 19 - is caused by SARS-Cov-2 group of RNA viruses. The RNA molecules are comparatively unstable and therefore it undergoes mutations. Vaccination process helps the human system in generating antibodies against viruses. Vaccines are generally composed of weakened or dead microorganisms that help the immune system understand the composition of that particular microorganism and further make it ready to fight against that type of microorganism. Research has shown that vaccinating the population will build herd immunity among people which is one of the solutions to fight against COVID-19. Vaccine development has taken a spur across the world and various vaccines available in the market today. In this paper, the properties of vaccines and its nature of developing the immune system is analyzed using machine learning techniques.*

Keywords*: **Pandemic, Covid -19, Infection, Vaccine, Alpha, Beta, Gamma, delta, omicron***

1. INTRODUCTION

Covid-19 has had a significant impact on our life, whether economically, mentally, or otherwise. For the past year, everyone has been waiting for immunizations in order to continue living our lives as they had before. This examination of the vaccination movement will benefit and save millions of people. In most cases, COVID-19 causes mild illness, while it can make some people quite sick. The current circumstance demonstrates the importance of finding a quick and effective solution to vaccine development. The focus of this study will be on the enhancement of COVID-19 vaccination utilizing machine learning methods. These vaccinations reduce dispatch by 70-95 percent for specific people. Furthermore, if anybody comes into contact with the virus, they are much less likely to pass it on to their family or social contacts. Vaccines reduce the risk of death by the disease by close to 100%. The goal of this research is to apply machine learning techniques to display some key data about vaccination rates and vaccine impact.

1.1 Vaccines Available in the Market

There are many different kinds of vaccines on the market. The following table lists the vaccines' names, manufacturers, dates of introduction, and mechanisms. The use of these vaccines has been authorized and approved.

Table 1. Vaccines available in the market

S. No	Name of the Vaccine	Mechanism	Manufactured By
1	Comirnaty (BNT162b2)	mRNA-based	Pfizer,BioNTech; Fosun Pharma
2	Moderna COVID-19 Vaccine (mRNA-1273); also called Spikevax	mRNA-based	Moderna,BARDA, NIAID
3	COVID-19 Vaccine AstraZeneca (AZD1222); also known as Vaxzevria and Covishield	Adenovirus vaccine	AstraZeneca
4	Sputnik V	Recombinant adenovirus vaccine (rAd26 and rAd5)	Gamaleya Research Institute, Acellena Contract Drug Research and Development
5	Sputnik Light	Recombinant adenovirus vaccine (rAd26)	Gamaleya Research Institute, Acellena Contract Drug Research and Development
6	COVID-19 Vaccine Janssen (JNJ-78436735; Ad26.COV2.S)	Non-replicating viral vector	Janssen Vaccines (Johnson & Johnson)
7	CoronaVac	Inactivated vaccine (formalin with alum adjuvant)	Sinovac
8	BBIBP-CorV/NVSI-06-07	Inactivated vaccine	Beijing Institute of Biological Products; China National Pharmaceutical Group (Sinopharm)
9	EpiVacCorona	Peptide vaccine	Federal Budgetary Research Institution State Research Center of Virology and Biotechnology
10	Convidicea(PakVac, Ad5-nCoV)	Recombinant vaccine (adenovirus type 5 vector)	CanSino Biologics
11	Covaxin BBV152	Inactivated virus based	Bharat Biotech, Indian Council of Medical Research - National Institute of Virology.

It is clear from this table that these vaccines differ in a number of ways, the most notable of which being the method of action. mRNA-based vaccines try to teach our cells how to generate proteins, allowing the immune system to mount a response. A portion of the gene sequence of Sars-Cov-2 that forms the spike protein is usually included in adenovirus-based vaccinations so that the immune system can recognise the composition when infected after vaccination. Vaccines based on viral vectors use a weakened DNA virus capable of transferring a portion of the genetic code to our cells. Peptide vaccines, as the name implies, are constructed up of peptides that mimic the features of a specific antigen in order to elicit an immune response. Small doses of weakened or dead viruses are used in inactivated vaccinations to help our immune system understand their makeup.

2. IMPACT OF VACCINES

When a vaccine is injected into a human's bloodstream, the immune system recognizes it as an antigen and produces antibodies against it, allowing the immune system to grasp the mechanism of disease prevention when sick. Fever, chills, general discomfort, and swelling at injection sites could be signs of an immunological reaction. Various immunological responses are elicited in response to COVID vaccinations. Some patients may have moderate fever, discomfort, or other side effects, like with other immunizations. Vaccines inhibit virus transmission across the population, eventually delaying each time the virus bounces from one person to the next. The smaller the bounce, the less likely the virus is to evolve.

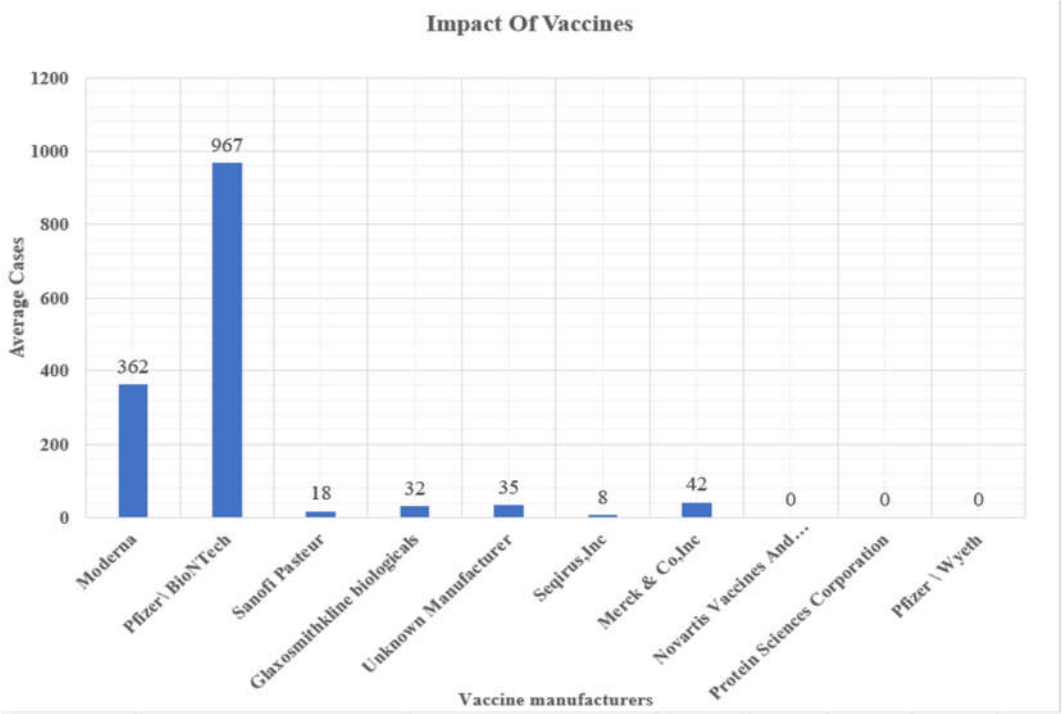

Figure 1. Impact of Vaccines

The information was gathered from the Vaccine Adverse Effects Reporting System, and the graph above depicts the number of adverse events recorded for each vaccine.

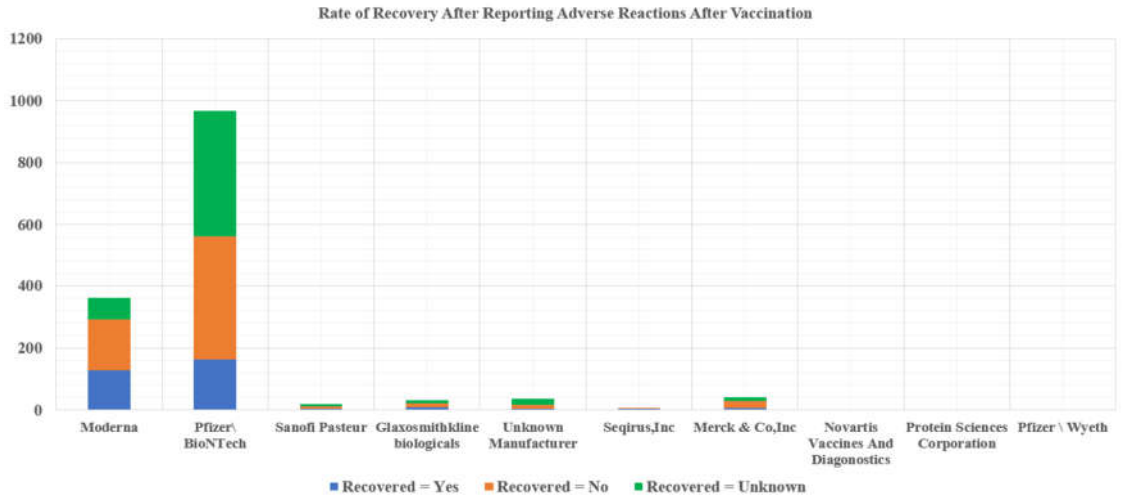

Figure 2. Rate Of Recovery After Reporting Adverse Reactions After Vaccination

The recovery rate of reported adverse events with vaccine manufacturers is depicted in this graph. COVID vaccinations, like any other vaccine, exhibit reactions when injected, as shown in the above graphical representations.

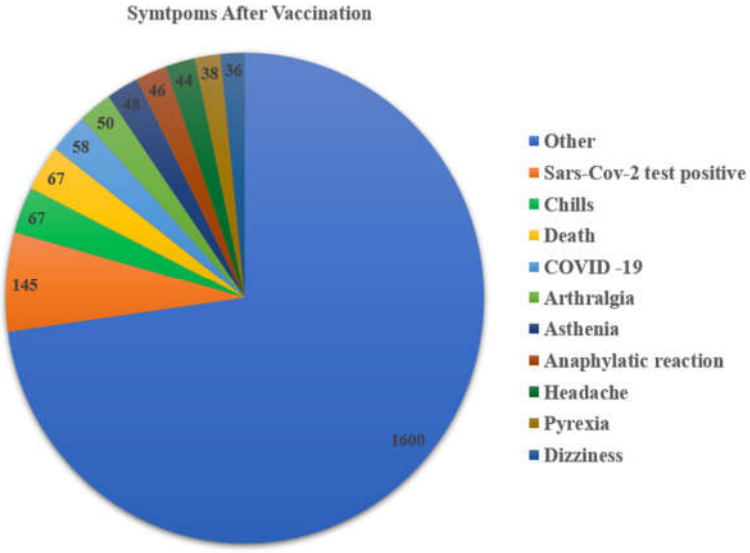

Figure 3. Symptoms after Vaccination

These are the symptoms that people have reported after vaccinating themselves.

3. COVID VACCINE HESITANCY AMONG PEOPLE

People are also hesitant to get the vaccine because of varied accusations of side effects following inoculation. People analyze stuff on social media, such as tweets on Twitter, and then come to a judgment. So, in this study, we'll see if there's any vaccine apprehension among the general public. We'll

use Reddit postings about vaccines for this, and analyze the positivity, negativity, and neutrality of the posts about the vaccines.

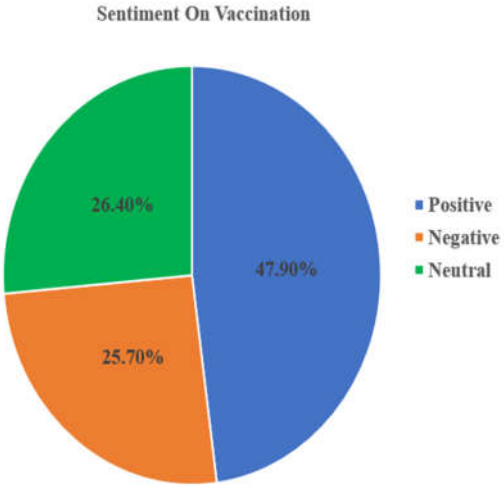

Figure 4. Sentiment on Vaccination

Only 47.9% of individuals are ready and willing to be vaccinated, according to this pie chart, while the remaining people either believe the vaccine is hazardous or are unsure about its safety.

4. RELATIONSHIP BETWEEN VACCINES AND MORTALITY RATES

Vaccines have dramatically lowered death rates, despite a spectrum of immune responses that vary from severe to average. We used a dataset from kaggle to investigate this, which includes variables such as death rate, vaccination coverage across nations, total vaccination, and other variables. We obtain the dataset in order to investigate the association between vaccination rate and mortality rate. We get new fatalities data from the WHO website, as well as vaccination progress statistics and population data from the kaggle website.

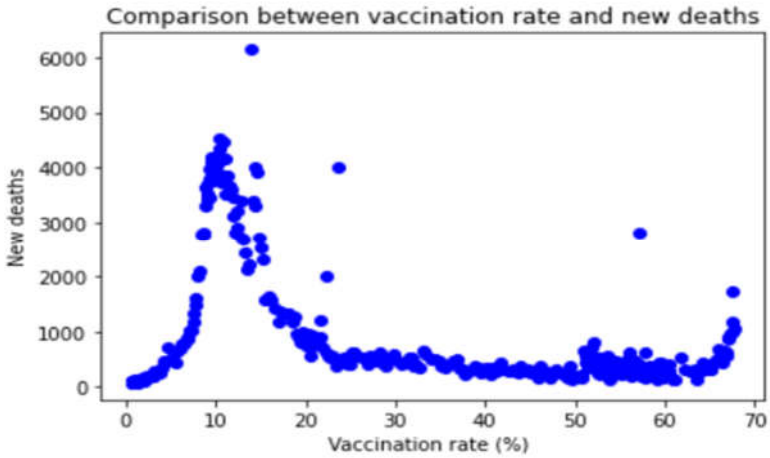

Figure 5. Comparison between vaccination rate and new deaths

A comparison of the vaccination rate and new fatalities in India is shown in the visualization above. With the increased vaccination rate, we may witness a rapid decrease in the number of deaths. When the immunization rate is approximately 70%, the numbers have dropped below 3000. One of the main reasons the government is urging its citizens to get vaccinated as soon as possible is because of this.

5. CONCLUSION

COVID 19 has, in some ways, made people aware of all the hygienic measures that we must adhere to, such as hand sanitization and hand washing when we return home. The pandemic that accompanied the lockdown also provided new opportunities for learning, working, and living. First and first, each individual must take care of his or her own health and hygiene, as well as consciously follow suitable food and exercise habits. No germ can damage humanity if everyone on the planet is healthy and immune. Another aspect that may be regarded as a remedy in this global pandemic is the COVID-19 vaccine, which can be seen as a safe precaution for protecting human lives and preventing COVID-19 deaths. Different methodologies and approaches to forecasting the implications of this vaccination may be valuable in the future. Furthermore, this proposed method might be utilized with a different dataset to predict the effect on other challenging domains. We are currently unaware of the post-COVID disorders that a person who has been infected with the virus may encounter. This could be a new area of study in which researchers try to figure out what additional difficulties and disorders people who have recovered from COVID are experiencing.

6. FUTURE WORK

Administering vaccines therefore needs to be done with utmost care.People need to monitor and check their body conditions both before and after the administration of vaccines.They should also be aware of all the possible reactions that they could experience after administering the vaccine.Therefore, a predefined system that predicts the requirement of vaccines based on various parameters would be one of the solutions to avoid adverse reactions post-vaccination administration.

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