

Efficacy of Vaccines Before and During Fourth Wave of COVID-19 in Pakistan - A Comparative Study

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Abstract

Background: Covid-19 is caused by SARS-CoV-2 that effect human respiratory system. This has led to create pandemic situation throughout the world and became the reason for millions of deaths worldwide. For securing the lives of people pharmaceutical companies has rushed to develop vaccines. Some of the notable vaccines being developed include Sinopharm, Sinovac Pfizer, Moderna, Astrazeneca and Cansino. The efficacy of these vaccines varies however the companies claim 70-80% efficacy rate of these vaccines. The current study aims to determine and compare the efficacy of Covid-19 vaccines before and during the fourth wave of Covid-19 in Pakistan. The questionnaire-based survey throughout Pakistan was conducted via google survey form and data was recorded. 1050 responses were recorded in total. The data reveals that most commonly used vaccines in Pakistan were Sinopharm and Sinovac, Cansino. The overall efficacy of all vaccines was 96% before the fourth wave of Covid-19. Whereas, the efficacy of these vaccines got a major drop to 72.4% as soon as the fourth wave emerged in Pakistan.

Keywords: Covid-19, Efficacy, Vaccines, Pakistan.

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INTRODUCTION

SARS COV-2 is the causative agent for the Coronavirus disease (COVID-19) that belongs to the class of Human Respiratory Infections. It is potentially fatal and is of great importance to the Global health care concerns and to everyone around the globe. After a number of people infected with SARS COVID-19 were reported in December 2019 in the wet animal market of Wuhan City in China, the world has seen an explosion of the cases, spreading to almost every country, corner of the earth, WHO declaring the disease a Pandemic in March 2020, coronavirus affecting millions of people's health and billions of lives [1]. The world, global health community, governments, academics rushed towards containing the disease and gathering as much information and working on the vaccine at a never-seen-before speed to combat the disease and bring the world back to normalcy.

The rush to develop vaccine by the Drug companies, and the alliance of the world economies, WHO, and stakeholders seen a remarkable speed with hundreds of vaccines in the pipelines and around 16 vaccines going for the phase 1 - 2 trails for testing different approaches to navigate the different aspects of the virus and develop best modalities to either fully eliminate this virus or contain it to an extent where it's no longer remained a global health pandemic². Some of the notable vaccines developed include Pfizer, Moderna, AstraZeneca, Johnson & Johnson, Sinopharm, Sonivac, Cansino, Sputnik with some vaccines having much higher efficacy than others [3]. This study by Bartch *et al.*, found that the vaccine has to have an efficacy of at least 70% to prevent an epidemic and of at least 80% to largely extinguish an epidemic without any other measures (e.g., social distancing) [2].

The vaccine development in different countries and by different Companies and the rush of the Governments to provide the vaccine and protect their citizens first gave rise to the term of “Vaccine Nationalism” and thus different vaccines were available in different countries [4].

Different vaccines available in Pakistan and most of them are from donations from other countries (China, America) or being purchased by the Government and by the COVAX project of WHO. The Sinopharm and Sinovac were first to be available and were available for free to its citizens at various vaccination points around the country. The private sector started providing the vaccination to Pfizer, Cansino. The Hesitancy of the general population to get vaccinated is a major concern amid various other conspiracy theories to get vaccinated such as for the eradication of polio [5]. Now Pakistan is in the fourth wave of the coronavirus infection since the start of July, and reached a peak positivity rate of over 9% on 4th, august and is beginning to decline [6]. The number of the vaccinations has risen substantially, with 59,384,758 total doses being administered as of 5th of september, 2021 and 1,228,044 being administered in the last 24 hours [7]. The efficacy of vaccination in the 3rd wave (march to june) was very alarming with only

0.4% of the population receiving at least 1 dose and now it’s on an accelerated pathway to 20% having being administered at least 1 dose as of 5th september, 2021 [8].

MAERIALS AND METHODS

This study was conducted before and during the fourth wave of Covid-19 in Pakistan. The data collecting tool was an online Google survey questionnaire. The study was carried out throughout Pakistan. We used random sampling technique for data collection. This survey was conducted on 40 respondents who were not reluctant to participate in this study. Later on, a comprehensive survey was conducted throughout Pakistan. A structured online questionnaire having close ended questions was used to collect data.

RESULTS

The survey was conducted randomly among the people of Pakistan by a Google survey form and 1050 responses were recorded. The response rate of vaccination before fourth wave of Corona was 89.5 percent positive which means 940 respondents got vaccinated while 10.5 percent responded with no for being vaccinated (Figure 1).

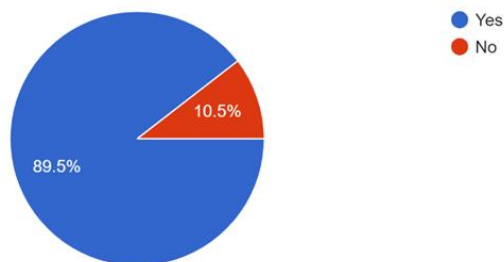


Figure 1: Forms response chart. Question title: Are You vaccinated? Number of responses: 1050 responses. 940 yes, 110 No

The 89.5 percent respondents that reported yes were further questioned that they become covid positive after first dose of vaccine or not. 94.7 percent people

reported that they did not become positive after first dose of vaccination while only 5.3% reported with yes that they did have covid-19 after first dose (Figure 2).

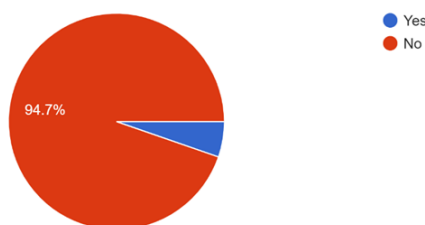


Figure 2: Forms response chart. Question title: Did you become covid positive after 1st dose? Number of responses: 945 responses. 895 no, 50 yes

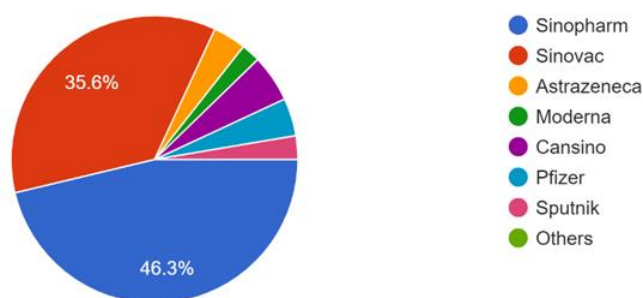
The people that became positive after 2nd dose of vaccine were only 3.7% while 96.8% didn’t have covid-19 (Figure 3).



Figure 3: Forms response chart. Question title: Did you become covid positive after second dose? Number of responses: 940 responses. 910 no, 30 yes

The respondents got vaccinated by different vaccines brands like Sinopharm, Sinovac, Astrazeneca and Pfizer. The data shows that 46.3 % have Sinopharm

followed by 35.6 percent have Sinovac. The details of respondents regarding vaccination type are given in pie chart (Figure 4).



Sinovac (n)=335
Sinopharm (n)= 435
Astrazeneca (n)=35
Moderna (n)=20
Cansino (n)=50

Figure 4: Forms response chart. Question title: Name of covid vaccine? Number of responses: 940 responses

This data shows that most of respondents in Pakistan have Sinopharm and Sinovac vaccine. The efficacy of these vaccines varies among respondents.

The data being gathered during fourth wave of covid-19 depicts that 72.4% respondents didn't become positive after vaccination but 27.6% did get covid-19 (Figure 5).

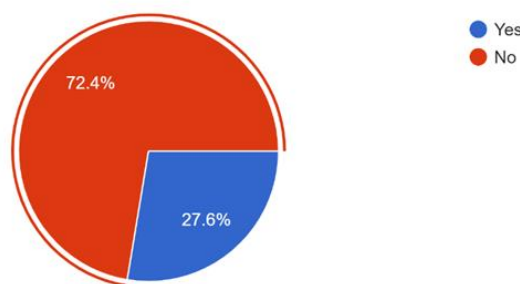
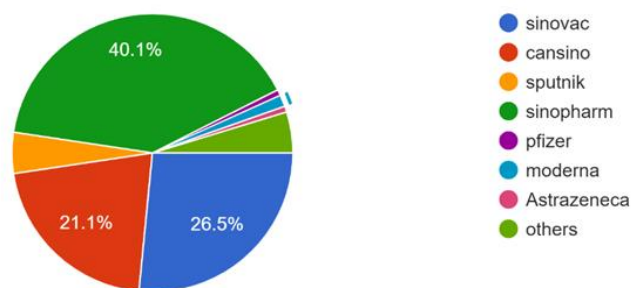


Figure 5: Forms response chart. Question title: did you become covid positive after vaccination? Number of responses: 1050 responses

The response rate about vaccination brand was 40.1% for Sinopharm followed by 26.5% for Sinovac

and 21.1 percent for Cansino. 12.3% were other brands. The related details are given in pie chart (Figure 6).



Sinopharm (n)=118
Sinovac (n)=78
Cansino (n)= 62
Sputnik (n)= 14
Pfizer (n)=2
Moderna (n)=4
Astrazeneca (n)= 2

Figure 6: Forms response chart. Question title: if yes covid vaccine name. Number of responses: 294 responses

DISCUSSION

Since the outbreak of SARS CoV-2 in december 2019, the development of Vaccine against the Novel Coronavirus SARS Cov-2 started right away. Since the publication of the SARS-CoV-2 viral sequence on January 10, 2020, an unprecedented global collaboration among governments, vaccine manufacturers, and researchers has been mounted to develop COVID-19 vaccines. Various vaccines have been rolled out throughout the world, after various security, biosafety and clinical trials, with each vaccine having different efficacies evaluated in their clinical trials under different settings.

Vaccine efficacy is considered a particularly critical outcome of these trials and subsequently evaluated by regulatory bodies such as the U.S. Food and Drug Administration (FDA) The vaccine efficacy criteria was set by FDA and due to the magnanimity of the pandemic, adopted a very broad definition of vaccine efficacy that included both transmission effects (i.e., the ability of the vaccine to prevent the spread of SARS-CoV-2 from an infected person to a susceptible person) and disease-modifying effects (i.e., the ability of the vaccine—among those vaccinated but who nonetheless become infected—to slow or prevent progression of illness, to speed recovery, to decrease utilization of critical-care resources, and/or to reduce mortality) [10].

Three aspects of vaccine efficacies were mentioned by FDA, First, a preventive vaccine that decreases susceptibility to infection in uninfected persons. Second, a disease-modifying vaccine that improves the course of disease in infected persons, slowing progression, speeding recovery, reducing mortality, and decreasing infectiousness. Finally, a

composite vaccine that combines the attributes of both the preventive and disease-modifying vaccines [10].

The benchmark for the efficacy of vaccines was set at a minimum of 50%, considerably lower efficacy standard than those of virtually all other approved and widely used vaccines, to ensure that the vaccine is effective for use. This controversially low levels of efficacy for approval could be in part of the magnanimity of the pandemic situation [10]. Different vaccines target different unique structures and pathologies of SARS CoV-2. Like Pfizer/Moderna is an mRNA vaccine and Sinopoharm is an Inactivated vaccine and works on the principle of immunization. Vaccine efficacy generally encompasses the strength and duration of adaptive immune response to SARS-CoV-2. Paltiel *et al.*, using a mathematical simulation model showed that efficacy of a vaccine also defends on the vaccine hesitancy, or greater epidemic severity [11]. The mutations in the SRAS-Cov-2 are also emerging and are more deadly than the original coronavirus due to the increased transmissibility, ability to evade the immune response, and reduced neutralization by antibodies. Currently, there is a concern that these strains may impact the efficacy of already developed vaccines [3].

The Coronavirus Vaccination rollout Pakistan started with the Chinese vaccine, Sinopharm (with efficacy 76%) [24] for the health care workers and with the rollout of vaccine for the general population, the program was very sluggish and met with lots of challenges and myths ranging from, biological effects of Vaccine, ability to alter the DNA, microchip implants and Religious scholars opposing the vaccination in Pakistan, As happened with the Polio eradication program [22]. Pakistan is already prone to conspiracy theories due to lack of public health

education, easy access to misinformation, poor compliance and poor health care system [21].

Pakistan is going through a 4th wave, and is testing the limits of the Pakistani health care system, affecting business and travel. The vaccination is crucial in decreasing the number of infections, Deaths and delaying the onset of further waves in Pakistan. Vaccine hesitancy poses a major threat to the vaccination efforts and affects the Coronavirus waves and the severity of the infections, lockdowns and time till normalcy and is contributed by various religious beliefs and conspiracy theories.

As of 3rd September, Pakistani health authorities awarded emergency use authorization to 7 COVID-19 vaccines including Moderna (mRNA-1273), Pfizer/BioNTech (BNT162b2), CanSino (Ad5-nCoV), Gamaleya Sputnik V, Oxford/AstraZeneca (AZD1222), Sinopharm (BIBBP-CorV), Sinovac (CoronaVac) [23].

Possible effect of timing of Clinical trial on Vaccine Efficacy

It is particularly difficult to make a direct relation of the efficacies of different vaccines because the clinical trials represent different settings, timings, and measures different aspects of the efficacy.

We conducted a study in Pakistan before the third wave (before March) and found the vaccine to have an efficacy of 96% and after the wave, the vaccine efficacy dropped to 72.4%.

CONCLUSION

Vaccines show good efficacy results before wave as compared to efficacy results during wave. So, it is concluded that efficacy of vaccine also depends on the time when trials/study is done. And people vaccinated against COVID-19 had less percentage to have COVID and if even if they acquired infection very few percentages need hospitalization.

Conflict of Interest: None Declared

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