



Comparative Study on Covid-19 Vaccines

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ABSTRACT

The outbreak of COVID-19 was declared as the Public Health Emergency of International Concern by the World Health Organization on 30th January 2020. On 16th March 2020 in India, Maharashtra government went for the first lockdown, while the second lockdown started from 12th April 2021 and latest because of new Corona variant 'Omicron' we are in the semi lockdown state. The clinical trials of Covid -19 vaccines and finding suitable biomarkers for immunity against Corona virus became a race for the survival of the world. Many vaccinations were launched for immunity against the corona virus and its variants. All manufacturers claiming their vaccines to be safe and effective. A research study survey on Male and Female Post Graduate of Chemistry residing in Mumbai and its suburbs was conducted to find out their perspective regarding available Corona -19 vaccines.

In the survey it was found out that female participants were more sceptical regarding various parameters such as safety and efficacy of the available Covid-19 vaccines as compared to their male counterparts. There is an urgent need to make people aware of the Covid-19 vaccines and importance of mass vaccination drive.

Keywords: Covid-19 vaccines, efficacy, research study, safety,

INTRODUCTION

In response to the pandemic, the global efforts to develop multiple vaccines to protect against COVID-19 disease have been unrivalled in the history of public health. Many COVID-19 vaccines have received Emergency Use Approval/Listing (EUA/EUL) by maturity level 4 regulatory authorities, based on reaching predefined criteria for safety and efficacy, and at least several dozen more are in clinical trials. (Draft landscape and tracker of COVID-19 candidate vaccines. Geneva: World Health Organization; 2021

- The main ingredients in a vaccine are: (WHO: how-are-vaccines-developed)
- i) **Antigen:** All vaccines contain an active component (the antigen) which generates an immune response, or the blueprint for making

the active component. The antigen may be a small part of the disease-causing organism, like a protein or sugar, or it may be the whole organism in a weakened or inactive form.

- ii) **Preservatives:** Preservatives prevent the vaccine from becoming contaminated once the vial has been opened, if it will be used for vaccinating more than one person. Some vaccines don't have preservatives because they are stored in one-dose vials and are discarded after the single dose is administered. The most commonly used preservative is 2-phenoxyethanol.
- iii) **Stabilizers:** Stabilizers prevent chemical reactions from occurring within the vaccine and keep the vaccine components from

sticking to the vaccine vial. Stabilizers can be sugars (lactose, sucrose), amino acids (glycine), gelatine, and proteins (recombinant human albumin, derived from yeast).

- iv) **Residuals:** Residuals are tiny amounts of various substances used during manufacturing or production of vaccines that are not active ingredients in the completed vaccine. Substances will vary depending on the manufacturing process used and may include egg proteins, yeast or antibiotics. Residual traces of these substances which may be present in a vaccine are in such small quantities that they need to be measured as parts per million or parts per billion.
- v) **Diluent:** A diluent is a liquid used to dilute a vaccine to the correct concentration immediately prior to use. The most commonly used diluent is sterile water.

Vaccine trial phases includes (who.int/emergencies/diseases/novel-coronavirus-2019):

- Pre-clinical: Vaccine development in laboratory animals (Pharmacokinetic studies)
- Phase 1 Clinical trial (small number of participants): Assess vaccine safety, immune response and determine right dosage to be given (short duration).
- 2 Clinical trial (few hundred participants): Assess safety and the ability of the vaccine to generate an immune response in the participants (short duration).
- Phase 3 Clinical trial (thousands of participants): Determine vaccine effectiveness against the disease and safety in a larger group of people (duration 1-2 years).

The first mass vaccination programme started in early December 2020. As of 12 January 2022, the following vaccines have obtained Emergency Use Listing⁴:

- The Pfizer/BioNTech Comirnaty vaccine, 31 December 2020.
- The SII/COVISHIELD and AstraZeneca/AZD1222 vaccines, 16 February 2021.
- The Janssen/Ad26.COV 2.S vaccine developed by Johnson & Johnson, 12 March. 2021.
- The Moderna COVID-19 vaccine (mRNA 1273), 30 April 2021.
- The Sinopharm COVID-19 vaccine, 7 May 2021.
- The Sinovac-CoronaVac vaccine, 1 June 2021.

- The Bharat Biotech BBV152 COVAXIN vaccine, 3 November 2021.
- The Covovax (NVX-CoV2373) vaccine, 17 December 2021.
- The Nuvaxovid (NVX-CoV2373) vaccine, 20 December 2021

Covid-19 vaccine helps our body to develop immunity towards the virus. Below is a description of how each type of vaccine prompts our bodies to recognize and protect us from the virus that causes Covid-19⁵.

- **mRNA vaccines (Pfizer-BioNTech or Moderna)** contain material from the virus that causes COVID-19 that gives our cells instructions for how to make a harmless protein that is unique to the virus. After our cells make copies of the protein, they destroy the genetic material from the vaccine.
- **Protein subunit vaccines (vaccines under development)** include harmless pieces (proteins) of the virus that causes COVID-19 instead of the entire germ.
- **Vector vaccines (Johnson & Johnson's Janssen)** contain a modified version of a different virus than the one that causes COVID-19. Inside the shell of the modified virus, there is material from the virus that causes COVID-19. This is called a "viral vector." Once the viral vector is inside our cells, the genetic material gives cells instructions to make a protein that is unique to the virus that causes COVID-19. Using these instructions, our cells make copies of the protein.

The vaccines which have received emergency use authorisation (EUA) in India are all made using different platforms. Covishield (Oxford-Astrazeneca) vaccine is a viral vector vaccine that uses an adenovirus found in Chimpanzees, ChAD0x1, to deliver spike proteins and mount a tolerable immune response in response to a live virus. Covaxin, developed and manufactured in India uses a similar inactive viral strain. Both of them are made using traditional vaccine-build platforms. Sputnik V uses a weakened strain of the common cold virus, adenovirus, which is then used to spike a tolerable immune response⁶.

However, from what has been seen, clinical trials and real-time usage have suggested that all the vaccines, while effective against the SARS-COV-2 strain, have different efficacy rates. The higher the efficacy rate may promise a corona virus vaccine more favourability and usage as well. In the current scenario we have, the three Covid 19 vaccines offer different efficacy rates. A detailed comparison of the three vaccines is given in the table ⁷.

| Vaccine | Efficacy | Side Effects | Dosage |
|-------------|--|---|---|
| Covidshield | The phase-3 trials in December 2020 displayed an efficacy of 70.4%. But upon taking the second dose, the efficacy of Covidshield went up to 90%. These results were observed from international clinical trials conducted on 11,636 volunteers from the United Kingdom and Brazil. | The most common side effects of this vaccine are Pain or tenderness at the injection site, Headache, Tiredness, Muscle or joint aches, Fever, Chills and Nausea. Some of the more uncommon side effects include feeling dizzy, abdominal pain, decreased appetite, enlarged lymph nodes, excessive sweating and rashes. | 2 doses of Covidshield should be taken at an interval of 4 to 12 weeks. The vaccine should be stored at a temperature of 2-8 degrees Celsius. |
| Covaxin | Based on their Phase-3 trials, Bharat Biotech conducted an interim analysis. The results of this showed that Covaxin has an efficacy rate of 81%. | The most common side effects reported include injection site pain, headache, fatigue, fever, body ache, abdominal pain, nausea and vomiting, dizziness-giddiness, tremor, sweating, cold, cough and injection site swelling. | 2 doses of Covaxin should be taken. The 2 nd dose should be taken after 28 days of taking the 1 st one. |
| Sputnik V | Sputnik V has been observed to display 91% efficacy rate as per its phase-3 clinical trials. | The side effects reported are Fatigue, Joint pain, Headache, Muscle ache, Chills, Fever, Nausea and vomiting. | 2 doses of Sputnik should be taken. The 2 nd dose should be administered 21 days after the 1 st . |

OBJECTIVE OF THE STUDY:

This research study survey was conducted on Male and Female Post Graduate students of Chemistry residing in Mumbai and its suburbs to observe their differences in opinion and perspective regarding Covid-19 vaccines and the mass vaccination drive.

METHODOLOGY:

The Online survey was conducted in January 2022. A google form questionnaire was developed, which included two main sections. The first section (A) includes socio-demographic characteristics to collect basic information about the participants. All the participants were fully vaccinated. The second section (B) consisted of the questions which were related to the survey. The participants were randomly selected using the snowball sampling technique⁸. In total, 17 & 49 online questionnaires of each category were collected.

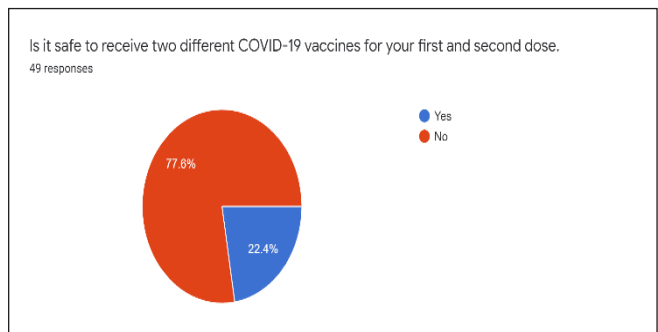
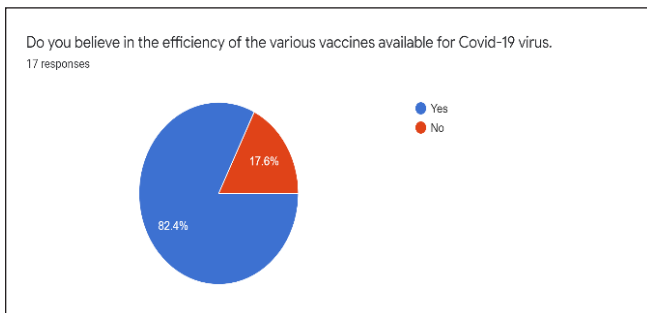
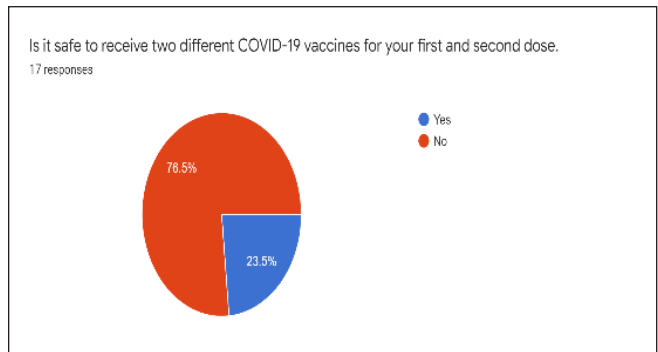
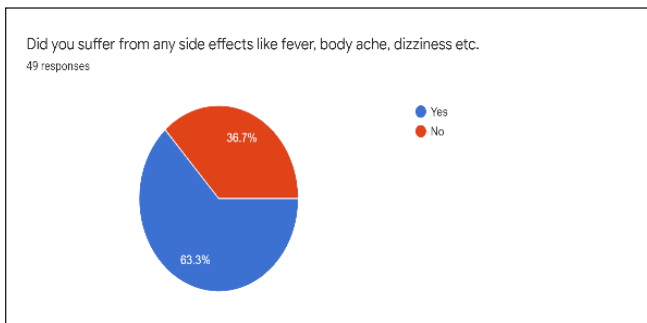
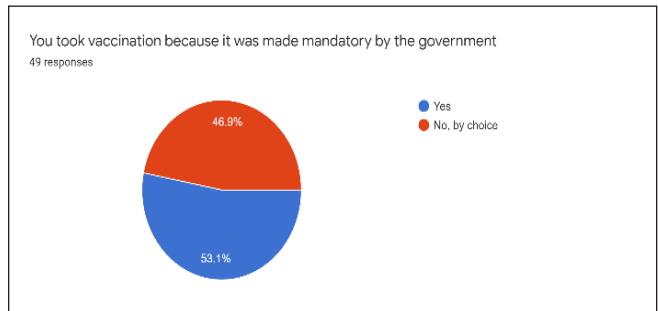
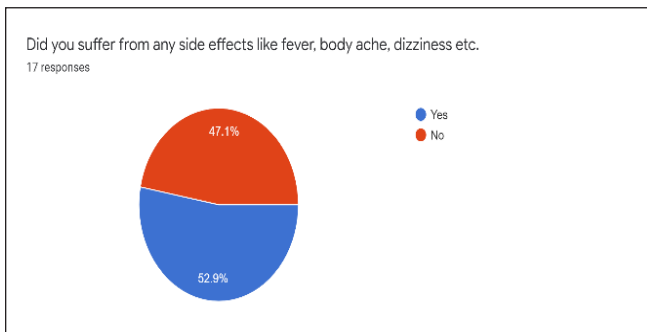
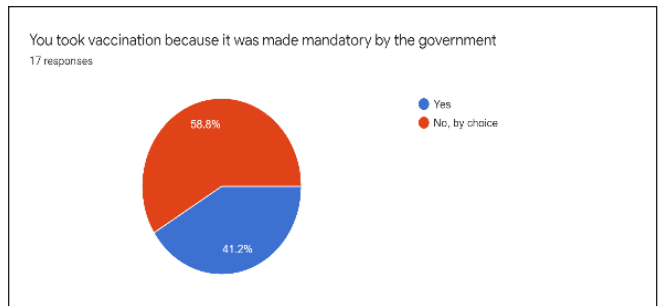
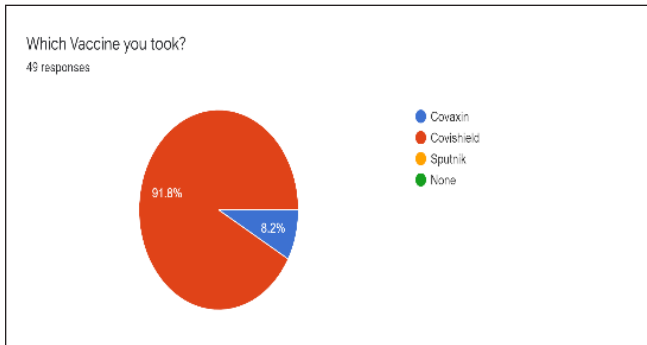
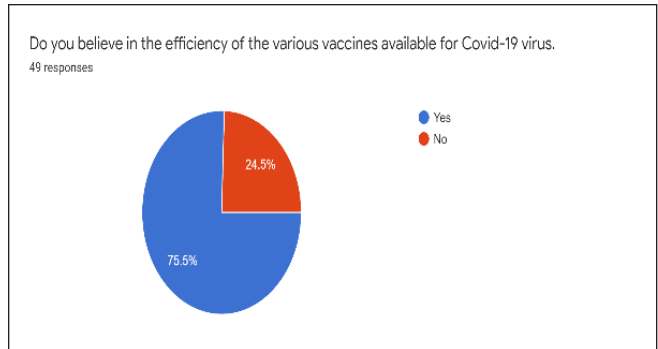
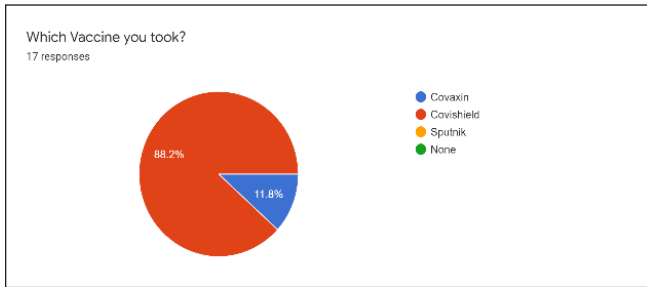
| Variable | Category | N | % |
|----------|----------|-----|------|
| Age | 22-23 | 42 | 85.7 |
| | 24-25 | 05 | 10.2 |
| | Above 25 | 02 | 4.1 |
| Variable | Category | N | % |
| | Male | | |
| | Age | | |
| Age | 22-23 | 14 | 82 |
| | 24-25 | 03 | 17.6 |
| | Above 25 | Nil | 00 |

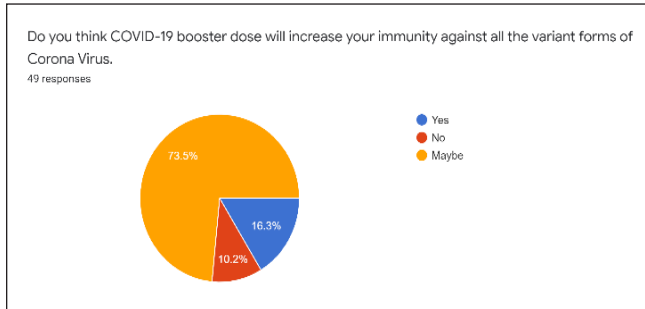
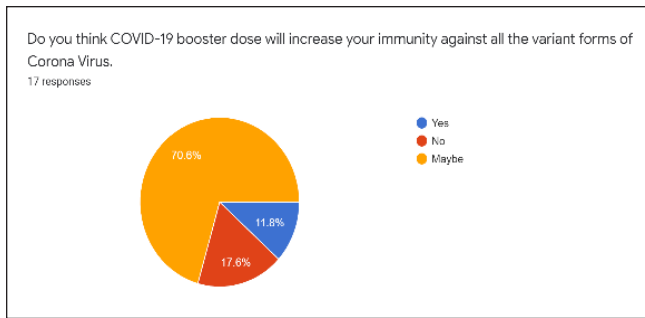
Section A Questions included in the questionnaire wherein participant was requested to fill. The summarization is as follows:

| Which Vaccine you took? | Covidshield | Covaxin | SputnikV |
|---|-------------|---------------|----------|
| Males | 15 | 04 | - |
| Females | 45 | 02 | - |
| Did you suffer from any side effects like fever, body ache, dizziness etc. | Yes | No | |
| Males | 09 | 08 | |
| Females | 31 | 18 | |
| Do you believe in the efficiency of the various vaccines available for Covid-19 virus? | Yes | No | |
| Males | 14 | 03 | |
| Females | 37 | 12 | |
| You took vaccination because it was made mandatory by the government. | Yes | No, by choice | |
| Males | 07 | 10 | |
| Females | 26 | 23 | |
| Is it safe to receive two different COVID-19 vaccines for your first and second dose? | Yes | No | |
| Males | 04 | 13 | |
| Females | 11 | 38 | |
| Do you think COVID-19 booster dose will increase your immunity against all the variant forms of Corona Virus. | Yes | No | Maybe |
| Males | 02 | 03 | 12 |
| Females | 08 | 05 | 36 |

Section (B) Charts & Graphs

Male Response Female Response





RESULTS & DISCUSSIONS

As it can be clearly seen from the survey results maximum number of participants took Covidshield vaccine, few took Covaxine while Sputnik V was not taken by any of the participants. Around 50% of the participants of each category suffered side effects after taking the vaccines. Female participants were more sceptical regarding the efficiency, of the vaccines as compared to their male counterparts. The same pattern was observed where more than 50% of the female participants admitted that they had taken vaccination as it was made mandatory by the government. While maximum number of participants agreed that it was not safe to take different Covid -19 vaccines for each dose. More than 70% participants of each category are not sure whether these vaccines will protect

them from the variants of Covid-19. The participants of both the categories were rather confused with the various parameters of the vaccines.

CONCLUSION

Most female participants in the research study were found to be less comfortable with the idea of the vaccination drive. They do also not trust the safety, efficacy and efficiency of the vaccines they have taken; rather they took because it was made mandatory by the Government. However, the male participants were more trusting towards the vaccination drive and were also responding positively regarding the safety and efficacy of the vaccines. However, both categories have misconception that hybrid vaccines cannot be taken for the two doses. There is an urgent need to make the people aware of the importance of vaccination and the trustworthiness of the available vaccines as each vaccine was approved by FDA of India.

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The author expresses her gratitude for the participants who took part in the research survey.

CONFLICT OF INTEREST: The author declares there is no conflict of interest regarding this research paper.

REFERENCES:

- Draft landscape and tracker of COVID-19 candidate vaccines. Geneva: World Health Organization; 2021
- www.who.int/news-room/feature-stories
- who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/detail
- who.int/news-room/feature-stories/detail/how-are-vaccines-developed
- cdc.gov/corona-virus/2019-ncov/vaccines/different-vaccines
- coverfox.:choosing-between-covaxin-covishield-sputnik-V-and-pfizer