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## Contextualization of the trends in number of beneficiaries vaccinated at a COVID-19 vaccination centre in Delhi, India



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### ABSTRACT

**Background and aims:** India started vaccination against COVID-19 on 16<sup>th</sup> January 2021. Present study was conducted to describe the trends in the number of beneficiaries vaccinated at a tertiary care hospital in India against the dynamic background of changing contextual factors.

**Methods:** This was a descriptive records-based study conducted at one of the COVID vaccination centre from January 2021 to June 2021. Data on dose-wise daily number of beneficiaries in various categories were collected and analyzed using Excel. The website of the Ministry of Health and Family Welfare (MoHFW), India, press releases and news reports of major media houses were reviewed.

**Results:** The peaks observed in number of beneficiaries vaccinated were mainly due to opening up of program for new categories of beneficiaries in a phased manner, announcements made to complete the vaccination coverage within a stipulated time for some categories and publication of trial results by vaccine manufacturers. The dips could be attributed to essential requirement of certain documents, major festivals, disastrous second wave and resulting lockdown in state.

**Conclusion:** The time-trend may not remain uniform across the course, but can be predicted in advance to some extent by analyzing past trends. Minimizing the avoidable dips and peaks and managing the unavoidable ones will help in improving the service delivery and beneficiary satisfaction.

### 1. Introduction

Coronavirus disease (COVID-19), caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has crippled the countries across the globe. Most commonly identified symptoms of COVID-19 are fever, altered sense of taste and/or smell, cough, sputum, sore throat, dyspnea, myalgia and fatigue. The main modes of transmission for SARS-CoV-2 are through direct contact and droplet route while airborne transmission has been recognized during aerosol generating procedures in healthcare settings [1].

To fight against COVID-19, a race against time started to develop and roll out the vaccines for protection against COVID-19. India started one of the world's largest COVID-19 vaccination program in phased manner from 16<sup>th</sup> January 2021. The eligibility criteria were expanded from healthcare workers (HCWs) to first include frontline workers (FLWs), and then elderly and adults. The government issued guidelines regarding the number of beneficiaries to be vaccinated at each site, and infrastructure and manpower requirements [2]. But the immunization programme faced many challenges. The demand supply gap in vaccine production, problems in planning leading to mass gatherings at vaccination centres, technical issues, emergence of new variants of the virus, misinformation and myths

about vaccine fueling vaccine hesitancy, etc. were the major challenges and they kept evolving with time [3]. With passage of time, there were other additional guidelines from the Government of India, various media reports, and research publications along with the changing scenario of the pandemic and its control measures.

In this paper, we describe the trends in the number of beneficiaries vaccinated at a tertiary care hospital in India against this dynamic background of changing contextual factors. Reviewing the pattern and putting it in context will help us in suggesting recommendations for further expansion of the program and in similar pursuits in future. This could also aid other low and middle income countries in designing their policies for vaccination of eligible population.

### 2. Methods

#### 2.1. Study design, setting and duration:

This was a descriptive records-based study conducted at one of the COVID-19 vaccination centre (CVC) of Delhi, India from the month of January 2021 to June 2021.

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2.2. Data collection:

We collected data on dose-wise daily number of beneficiaries in the following categories –HCWs, FLWs, senior citizens, and people in age group of 45-59 years. We reviewed the website of the Ministry of Health and Family Welfare (MoHFW), India, press releases and news reports of major media houses to identify the contextual factors.

The contextual factors considered in this study were:

- a. Relevant government guidelines and announcements
- b. Relevant media reports related to vaccines
- c. Research publications related to vaccines
- d. Changes in pandemic scenario
- e. Changes in prevention and control measures

2.3. Statistical analysis:

Data were entered and analyzed using Excel. We drew line diagrams to describe the time trends of the number of beneficiaries vaccinated at the center.

2.4. Ethics

As the study didn't incorporate any patient-related data, ethics committee approval wasn't required. The study was conducted within the boundaries of Helsinki declaration.

3. Results and discussion

3.1. Peaks: (Fig. 1, Table 1)

First upward trend was noticed between 13–19<sup>th</sup> February and peaked between 20-26<sup>th</sup> February. This was similar to the vaccination trends of

first dose observed in Delhi [4]. (Supplementary Fig. 01) The possible reason for the same could be announcements made on 6<sup>th</sup> and 19<sup>th</sup> February 2021 to complete first dose of registered HCWs and FLWs before 20<sup>th</sup> February and 1<sup>st</sup> March, respectively, and thereafter mop-up rounds to be organized to cover missed out HCWs by 25<sup>th</sup> February and FLWs by 6<sup>th</sup> March [5]. This might have instilled a sense of urgency amongst beneficiaries. On 19<sup>th</sup> February, the Union Health Minister of India urged HCWs and FLWs to take vaccine and not believe myths and misinformation [5]. However, at national level, no peak was observed in first dose trends during same duration (Supplementary Fig. 02) [4].

The next peak occurred between 6-12<sup>th</sup> March mainly due to peak in first dose of HCWs (Fig. 1, Table 1). Similar peaks were observed in vaccination trends at National as well as state (Delhi) level [4]. (Supplementary Figs. 01 and 02) The vaccination program opened up for >60years and 45–59 years people with co-morbidities from 1<sup>st</sup> March [6]. Phase 3 interim results were announced for Covaxin on 3<sup>rd</sup> March 2021 showing 81% efficacy [7], and phase 2 results were published online on 8<sup>th</sup> March [8]. At the same time, various European countries halted the use of Astrazeneca (Covishield in India) vaccine amid concerns related to blood clotting [9]. These factors could have possibly increased the eagerness for Covaxin among HCWs.

From 1<sup>st</sup> April 2021, the vaccination program opened for all people in age group of 45-59 years in addition to pre-existing eligible population. The central government decided to run the program on all days for the month of April including Sundays and other holidays [10]. Therefore, the number of days available for vaccination as well as number of beneficiaries increased causing upsurge in number of beneficiaries between 3<sup>rd</sup> to 16<sup>th</sup> April. The peak was observed among general population from 3<sup>rd</sup> to 9<sup>th</sup> April and among HCWs and FLWs from 10<sup>th</sup> to 16<sup>th</sup> April (Table 1 and Fig. 1). First dose vaccination trends for Delhi and India were akin to our results [4]. (Supplementary Figs. 01 and 02)

The pandemic scenario changed during the same time as India started witnessing a resurgence of COVID-19 cases marking beginning of the

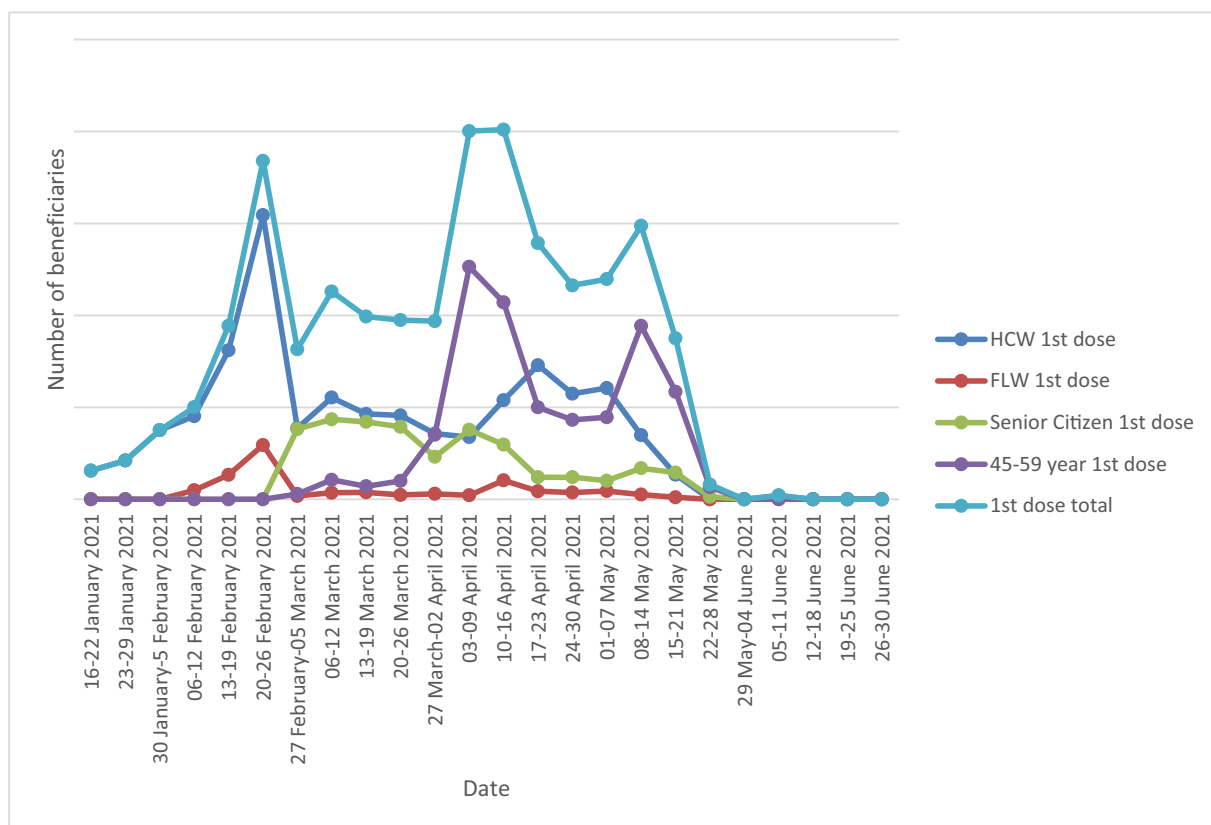


Fig. 1. Trends in first dose of COVID-19 vaccination.

**Table 1**  
Week-wise distribution of peaks in number of beneficiaries in different sub-groups for first dose.

Dates of peaks	Total 1 <sup>st</sup> dose	HCWs	FLWs	Senior Citizens	45-59years
20-26 <sup>th</sup> February 2021	Yes	Yes	Yes	NA	NA
6-12 <sup>th</sup> March 2021	Yes	Yes	No	No	No
3-9 <sup>th</sup> April 2021	Yes	No	No	Yes	Yes
10-16 <sup>th</sup> April 2021	Yes	Yes	Yes	No	No
8-14 <sup>th</sup> May 2021	Yes	No	No	No	Yes

**Table 2**  
Week-wise distribution of dips in number of beneficiaries in different sub-groups for first dose.

Dates of dips	Total 1 <sup>st</sup> dose	HCWs	FLWs	Senior Citizens	45-59years
27 <sup>th</sup> February-5 <sup>th</sup> March 2021	Yes	Yes	Yes	NA	NA
27 <sup>th</sup> March-2 <sup>nd</sup> April 2021	No	Yes	No	Yes	No
3-9 <sup>th</sup> April 2021	No	Yes	No	No	No
17-23 <sup>rd</sup> April 2021	Yes	No	No	Yes	Yes
15-21 <sup>st</sup> May 2021	Yes	Yes	No	Yes	Yes

second wave which was much disastrous than the first one. This could have encouraged people to take the vaccine to prevent the disease and safeguard themselves to some extent. On 7<sup>th</sup> April European Medicines Agency concluded that unusual blood clots with low blood platelets should be listed as very rare side effects of Vaxzevria (AstraZeneca) [11]. This could have played a role in inclining the people towards Covaxin.

On 3<sup>rd</sup> April, central government passed an order to stop fresh registrations of HCWs and FLWs for first dose. Another order was passed on 5<sup>th</sup>

April stating HCWs/FLWs can be registered on spot only at government CVCs for vaccination provided they produce employment certificate [12]. The consecutive orders created confusion among HCWs/FLWs leading to a dip in vaccination among HCWs/FLWs between 3<sup>rd</sup> to 9<sup>th</sup> April. This chain of events might have instilled a sense of urgency among HCWs and FLWs to take the first dose as soon as possible, anticipating discontinuation of vaccination in future, resulting in peak between 10<sup>th</sup> to 16<sup>th</sup> April in total first doses driven mainly by peak in number of HCWs and FLWs. No such peak was observed in other categories including senior citizens and 45-59 years population (Table 1, Fig. 1).

Between 8-14 May, the program opened up for 18+ age group but at selected centres only. Vaccine supply became erratic and reports of vaccine shortage started surfacing in media [13,14]. The centres offering vaccination to both 18+ and 45+ must have faced overcrowding [15]. The pricing policy changed for the vaccines and the private hospitals increased the vaccination charges while it was free of cost at our CVC [16]. Our centre didn't start vaccinating 18+ people, except HCWs and FLWs. The population above 45 years of age might have preferred our centre to avail free vaccination and avoid long waiting lines at centres for 18+ population. This could have caused peak in first dose trends mainly because of 45-59 year population (Table 1, Fig. 1).

3.1.1. Implications of peaks:

The peaks resulted in increased waiting time for beneficiaries, overcrowding at session sites [17] leading to compromised COVID appropriate behavior, increasing the risk of transmission and sometimes conflict situations. The peaks overburdened the existing infrastructure and enhanced the need of additional manpower.

These peaks could have been avoided with active communication strategy from the beginning to decrease hesitancy among HCWs and FLWs. Sharing the vaccine related data including trial results and AEFI profile timely and in a transparent manner might have helped convincing the

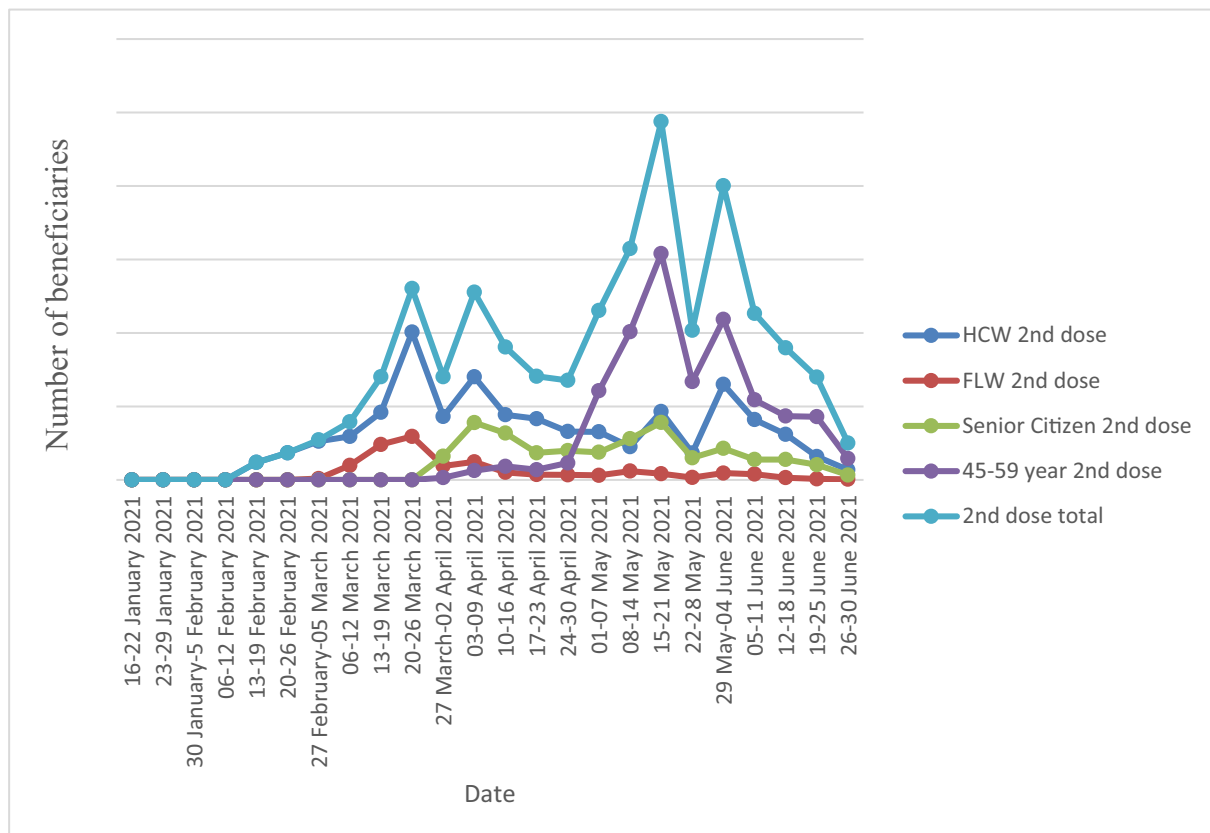


Fig. 2. Trends in second dose of COVID-19 vaccination.

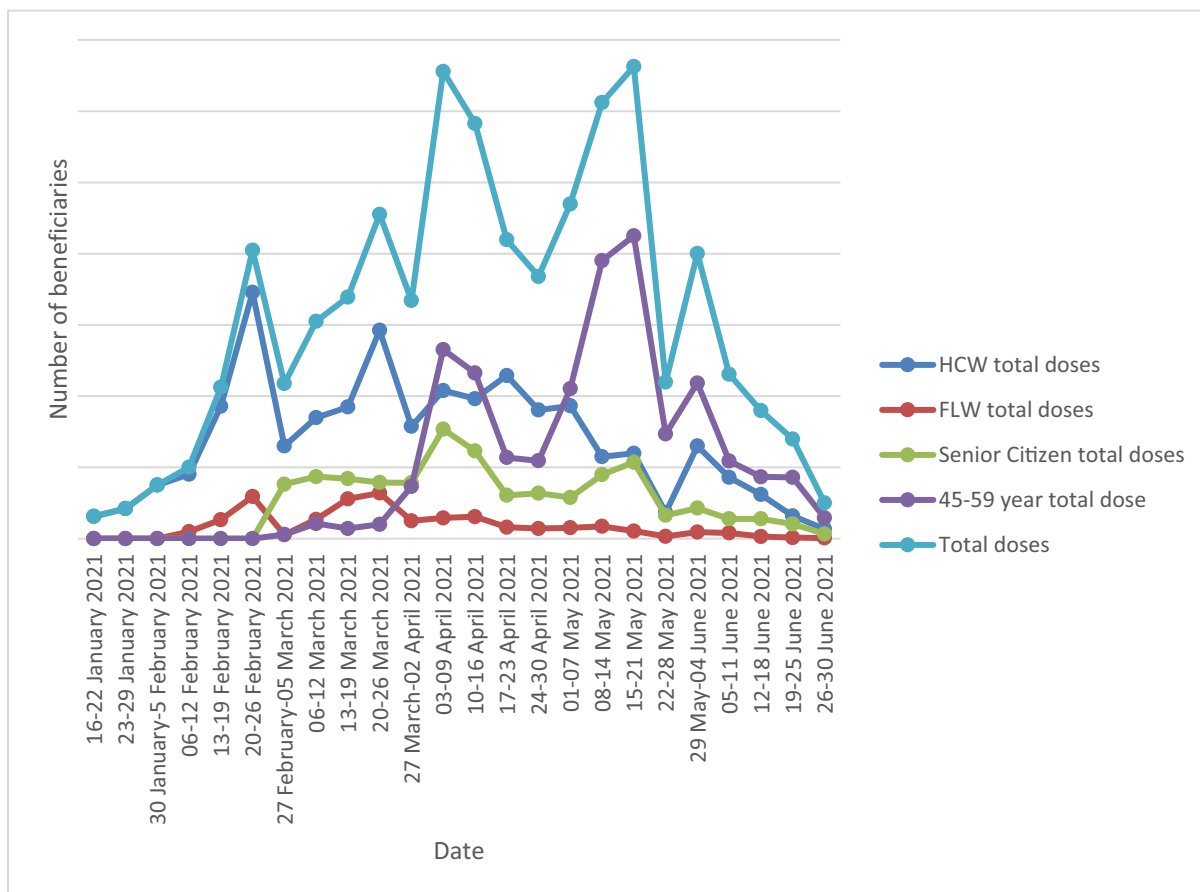


Fig. 3. Trends in total doses of COVID-19 vaccination.

majority HCWs and FLWs to take the vaccine of their choice before March. If these groups were vaccinated timely in the designated duration, the transition to general public would have been much smoother. Irregularities in vaccine supply must have been avoided and vaccination of 45+ with first dose should have been ensured before opening up the program for 18+.

3.2. Dips: (Fig. 1, Table 2)

The first dip in vaccination trend for first dose among HCWs and FLWs was observed from 27<sup>th</sup> February to 5<sup>th</sup> March 2021 (Table 2, Fig. 1). Delhi vaccination trends for first dose showed a similar result with a dip during 27<sup>th</sup> February to 5<sup>th</sup> March 2021 [4] (Supplementary Fig. 01). The program was to be opened up for 60+ and 45-59 year with co-morbidities population from 1<sup>st</sup> March 2021. The Co-WIN update for the same was scheduled on 27<sup>th</sup> and 28<sup>th</sup> February, due to which no vaccination took place on these days [6], and on 1<sup>st</sup> March, the program started after 12pm due to an inaugural ceremony resulting in less number of days available for vaccination from 27<sup>th</sup> February to 5<sup>th</sup> March 2021.

On 25<sup>th</sup> February an announcement was made allowing HCWs and FLWs to get vaccinated at the centre of their choice in future also which could have decreased the urgency to take the vaccine, resulting in the dip [6].

We noticed a downward trend between 27<sup>th</sup> March to 2<sup>nd</sup> April 2021 among HCWs and people more than 60 years of age (Fig. 1, Table 2). National level trends in first dose were in line with our findings [4]. (Supplementary Fig. 02). This could be due to a major festival Holi and a long weekend during which people prefer going to their hometowns or on vacations. The downward trend in first dose vaccination of HCWs continued between 3<sup>rd</sup> to 9<sup>th</sup> April due to confusion regarding essential requirements of employment certificate [12].

The next dip started between 17<sup>th</sup> to 23<sup>rd</sup> April 2021 and continued till 30<sup>th</sup> April 2021. Both national and Delhi's vaccination trends showed the

similar findings [4]. (Supplementary Figs. 01 and 02) The dip was mainly observed in the general population's vaccination trends. (Fig. 1, Table 2) Delhi was reporting close to 25,000 daily new cases and the state was put under complete lockdown [18]. This could have posed difficulties to beneficiaries in reaching the vaccination centres. There is also a possibility that some proportion of the eligible population or their family members were getting infected with COVID-19 as the second wave of the disease had hit the country. Another plausible explanation could be religious reasons as the festival of Navratri was being celebrated in the country during which people keep fast and avoid any medication.

The first dose was discontinued for all the eligible beneficiaries from 18<sup>th</sup> May, causing a dip from 15<sup>th</sup> May onwards [19,20].

3.2.1. Implications of dips

The dips in the number of beneficiaries resulted in a wastage of resources in terms of infrastructure, facilities and manpower deployed. These dips could have been avoided by ensuring a regular supply of vaccines, and consistency in guidelines as frequent changes caused confusion about eligibility for vaccination.

3.3. Second dose trends

The trends in first dose vaccination resulted in similar trends for second dose after 28-30 days (Fig. 2). Erratic vaccine supply ensuing days with no vaccination is also responsible for the dips observed in second dose trends.

3.4. Total doses' trends

The peaks and dips in total doses administered in a day could have been avoided by analyzing the first dose trends and accordingly adjusting dose-wise available slots on the Co-WIN portal (Fig. 3).

#### 4. Conclusion and recommendations

The trends might not stay similar across the course due to various contextual factors, but can be predicted in advance to some extent by analyzing past trends. Minimizing the avoidable dips and peaks and managing the unavoidable ones will help in improving the service delivery and beneficiary satisfaction.

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#### Contribution details

The manuscript has been read and approved by all the authors, the requirements for authorship have been met, and each author believes that the manuscript represents honest work.

All authors meet the ICMJE criteria for authorship and have made:

Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND

Drafting the work or revising it critically for important intellectual content; AND

Final approval of the version to be published; AND

Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

#### Declaration of Competing Interest

None.

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#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.dialog.2022.100012>.

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