What is the impact of COVID-19 pandemic years on Deliveries and Home Based New Born Care in India? A cross-sectional comparative research study, Jan 2018-2021Dec

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Research Article

Keywords: Home delivery, Institutional delivery, newborn, care, pandemic year, covid-19

Posted Date: March 2nd, 2022

DOI: https://doi.org/10.21203/rs.3.rs-1314021/v3

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Abstract

The COVID-19 pandemic caused by SARS-CoV-2 has led to disruption of health services globally. I assessed the effect of the ongoing pandemic on the Deliveries and Home Based New Born Care (HBNC) in India. The author is curious and suspects a rise in maternal and neonatal mortality due to possible negative effects of COVID-19 on maternal institutional delivery and HBNC. Hence author decided to find out answer to the research question mentioned as title above. I conducted a retrospective cross-sectional comparative study among total numbers of women and newborn who have received delivery and HBNC care at different health facilities in 36 states and union territories across India during the pandemic years with pre-pandemic years (comparing 2020 and 2021 (forecasted up to December 2021 with available data from January 2021 to May 2021) with previous two years of pre-pandemic era i.e. 2018-2019). The data for the research study is extracted from electronic records of HMIS (health management information system) of MoHFW (ministry of health and family welfare), Govt. of India and analysed with stata and Microsoft office. This research study revealed that during covid-19 era there is increase in prevalence of 1. Total No. of Deliveries-TD (HD+ ID) registered per 100000 ANC registered, 2. Total Number of Institutional Deliveries (ID) conducted (Including C-Sections) per 100000 Total deliveries, 3. Total Number of Home Deliveries attended by SBA per 100000 HD, 4. Total Number of newborns received 6 HBNC visits after Institutional Delivery per 100000 ID, 5. Total Number of newborns received 7 HBNC in HD per 100000 HD. This research study revealed that pandemic years have less number of home deliveries attended by SBA [(Skill Birth Attendant) (Doctor/Nurse/ANM/ Midwife)] as well as there is also decrease in HD. This research study revealed that pandemic years have less number of home deliveries attended by SBA [(Skill Birth Attendant) (Doctor/Nurse/ANM/ Midwife)] may be due to less number of deliveries. There is a (projected) decrease of 37.28% in mean number of home deliveries attended by SBA in 2021 as compared to 2018. This novel research study revealed that during pandemic years 2020 and 2021 all the variables reduced quantitatively except Number of PW given Tablet Misoprostol during HD which increased in 2020 (first pandemic year). The ongoing COVID-19 pandemic has had negative effects on Deliveries and Home Based New Born Care (HBNC) in India. More research is required to investigate the direct and indirect consequence of the pandemic on birth and provision of HBNC as well as the health facility type which are not performing well in providing respectful maternity care and newborn services during pandemic period. The facility based research analysis is under process by the author which will be available in next version of this article.

Introduction

Background/Rationale

As per the previous estimates of UNICEF (United Nations International Children’s Emergency Fund) about 116 million babies will be born within 40 weeks of ongoing COVID-19 pandemic, straining health systems as well as medical supply chains globally – was declared as a pandemic on March 11[1]. Pregnant mothers as well as babies born during the ongoing COVID-19 pandemic are continued to be threatened by strained health systems involved in fighting with this novel disease. I assessed the effect of the ongoing pandemic on the Deliveries and Home Based New Born Care (HBNC) in India. The author is curious and suspects a rise in maternal and neonatal mortality due to possible negative effects of COVID-19 on maternal institutional delivery and HBNC. Hence author decided to find out answer to the research question mentioned as title above. Global containment measures like lockdowns etc; health centres overwhelmed with covid-19 response efforts added with supply and equipment shortages and a lack of sufficient skilled birth attendants because health workers, including midwives, are redeployed to treat
COVID-19 patients [1]. During this ongoing pandemic years countries expected with highest numbers of births during the 9 months since the declaration of pandemic are 1. India (20.1 million), 2. China (13.5 million), 3. Nigeria (6.4 million), 4. Pakistan (5 million) and 5. Indonesia (4 million). As per available data most of these countries listed above had a high neonatal mortality rates (NMR) even before the covid-19 pandemic and these levels may increase with COVID-19 situations [1]. Every year 25 million children are born in India accounting for one fifth of the global child births and every minute one baby dies. It is a fact that 46 per cent of all maternal mortality and 40 per cent of neonatal mortality happen during labour or in the first 24 hours after birth [2]. This research study is significant as death can be reduced by provision of good delivery care at institution/health facilities by enabling access to SBA (skilled birth attendants) and EMOC (emergency obstetric care) services. Home based newborn care (HBNC) in the post-new-born period can improve survival rates with early and exclusive breastfeeding and immunizing newborn against vaccine preventable diseases.

Objective

The key aim of this research study was to find out the impact of COVID-19 pandemic years on Deliveries and Home Based New Born Care in India. To fulfil the aim of study the objective was to collect, analyse, interpret the data for the research question.

Methods

Study Design

The researcher conducted a retrospective cross-sectional comparative study among total numbers of women and newborn who have received delivery and HBNC care in different ways at different health facilities in 36 states and union territories across India during the pandemic (comparing 2020 and 2021 (forecasted up to December 2021 with available data from January 2021 to May 2021) with previous two years of pre-pandemic era i.e. 2018-2019).

Setting

Location – All India across 36 states and union territories.

Study period – 1st January 2018 to 31st December 2021 (forecast)

Exposure - To know the impact of COVID-19 pandemic years on delivery and HBNC the following indicators of mentioned period are included as operational definition to assess impact on Deliveries and Home Based New Born Care in this research analysis (see – table – 1):

Table – 1 – Indicators inclusion for operational definition to assess impact of covid-19 on delivery and HBNC
| Variable                                                                 | Period                           |
|-------------------------------------------------------------------------|----------------------------------|
| Number of Home Deliveries attended by Skill Birth Attendant(SBA) (Doctor/Nurse/ANM/ Midwife) | 1st Jan 2018-31st Dec 2021       |
| Number of Home Deliveries attended by Non SBA (Trained Birth Attendant (TBA) /Relatives/etc.) | 1st Jan 2018-31st Dec 2021       |
| Number of PW given Tablet Misoprostol during home delivery              | 1st Jan 2018-31st Dec 2021       |
| Number of newborns received 7 Home Based Newborn Care (HBNC) visits in case of Home delivery | 1st Jan 2018-31st Dec 2021       |
| Number of Institutional Deliveries conducted (Including C-Sections)     | 1st Jan 2018-31st Dec 2021       |
| Out of total institutional deliveries number of women discharged within 48 hours of delivery | 1st Jan 2018-31st Dec 2021       |
| Number of newborns received 6 HBNC visits after Institutional Delivery  | 1st Jan 2018-31st Dec 2021       |

Follow up – The data is continuously extracted, observed and investigated for specificity, measurability, accuracy, reproducibility and timeliness. The available data is forecasted with excel to reduce bias arising due to lack of data availability up to December 2021 from HMIS.

Data collection - The data is extracted from electronic records of HMIS (health management information system), MoHFW (ministry of health and family welfare), and Government of India. For this retrospective cross-sectional study, available online data from HMIS is collected from January 2018 to May 2021 forecasted up to December 2021 with Microsoft excel utilizing available data of 2021. Newborn who utilized HBNC and deliveries reported during this period were included in this study. Data analyses including statistical analysis were done with stata and Microsoft office software.

Participants

Eligibility Criteria – The eligibility criteria is listed below in table – 2 – for participants in this research study. All the eligible participants are those who are reported by electronic records of HMIS (health management information system), MoHFW (ministry of health and family welfare), and Government of India for variables mentioned in table – 2 below.

Table – 2 – Eligibility criteria or criteria for inclusion

| Variable                                                                 | Period                           |
|-------------------------------------------------------------------------|----------------------------------|
| Home Deliveries attended by Skill Birth Attendant(SBA) (Doctor/Nurse/ANM/ Midwife) | 1st Jan 2018-31st Dec 2021       |
| Home Deliveries attended by Non SBA (Trained Birth Attendant (TBA) /Relatives/etc.) | 1st Jan 2018-31st Dec 2021       |
| PW given Tablet Misoprostol during home delivery                        | 1st Jan 2018-31st Dec 2021       |
| Newborns received 7 Home Based Newborn Care (HBNC) visits in case of Home delivery | 1st Jan 2018-31st Dec 2021       |
| Institutional Deliveries conducted (Including C-Sections)               | 1st Jan 2018-31st Dec 2021       |
| Out of total institutional deliveries number of women discharged within 48 hours of delivery | 1st Jan 2018-31st Dec 2021       |
| Newborns received 6 HBNC visits after Institutional Delivery            | 1st Jan 2018-31st Dec 2021       |
Sources – Secondary data available from the electronic records of HMIS of MoHFW (Ministry of Health and Family Welfare), Government of India.

Method of Selection – A purposive sampling is done by the author for the research question mentioned in title above. The sample is collected continuously from accredited national source of HMIS of MoHFW (Ministry of Health and Family Welfare), Government of India.

Variables

The variables for this research study are mentioned in table 1 and 2 above.

Data sources / Measurements

Data Availability - For this novel study, accredited data is obtained from electronic records of HMIS of MoHFW (Ministry of Health and Family Welfare), Government of India. The link for the source is available below:-

https://hmis.nhp.gov.in/#/standardReports

Bias – To reduce the bias the data is projected up to December 2021 with the Microsoft excel software utilizing available data for 2021. For further reduction of Bias the total number of pregnancy / HD / ID is taken into account (see – table-3). This will also show the trends of delivery and HBNC in the study period.

Table – 3 – Total and Mean of Pregnancy and Delivery

| Period          | Total No. of pregnant women registered for ANC- Taken as total number of pregnancy | Mean- No. of pregnant women | Total HD | Total ID | Total No. of Deliveries (HD+ ID) | Mean- Total Number of Deliveries |
|-----------------|----------------------------------------------------------------------------------|-----------------------------|----------|---------|----------------------------------|----------------------------------|
| Jan to Dec 2018 | 28715284                                                                         | 7178821                     | 1453777  | 19388411 | 20842188                        | 1736849                          |
| Jan to Dec 2019 | 29239176                                                                         | 7309794                     | 1243190  | 20328254 | 21571444                        | 1797620                          |
| Jan to Dec 2020 | 27331061                                                                         | 6832765                     | 1077371  | 19298327 | 20375698                        | 1697975                          |
| Jan to Dec 2021 | 21891305                                                                         | 1824275                     | 807260   | 16057132 | 16864392                        | 1405366                          |

Study Size – This research study size for different years are listed in above table number 3.

Quantitative Variables – All the quantitative variables are listed in tables 1, 2, 3 above.

Statistical Methods - Linear regression is used to forecast 2021 to predict future values from available past values of 2021.
Results

Numbers of individuals at each stage of study

The Total No. of pregnant women registered for ANC- Taken as total number of pregnancy for Jan to Dec-2018, Jan to Dec 2019, Jan to Dec 2020, and Jan to Dec 2021 was 28715284,29239176,27331061,21891305; respectively see table-4. This research study revealed that before start of pandemic in 2020, in which first case of COVID-19 was reported in India [3], year 2019 reported an increase in total number of pregnancy. During pandemic years this research study revealed a decrease in this numbers of several variables under study (see table – 4 and 5 and figure 1).

Table – 4 – Total Numbers of quantitative variables under study in different years

| Period                                                                 | Jan to Dec 2018 | Jan to Dec 2019 | Jan to Dec 2020 | Jan to Dec 2021 |
|------------------------------------------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Total No. of pregnant women registered for ANC- Taken as total         | 28715284        | 29239176        | 27331061        | 21891305        |
| number of pregnancy                                                   |                 |                 |                 |                 |
| Total No. of Deliveries (HD+ ID)                                       | 20842188        | 21571444        | 20375698        | 16864392        |
| Total Number of Institutional Deliveries conducted (Including C-        | 19388411        | 19388411        | 19298327        | 16057132        |
| Sections)                                                              |                 |                 |                 |                 |
| Total HD                                                               | 1453777         | 1243190         | 1077371         | 807260          |
| Total Number of Home Deliveries attended by SBA                       | 255814          | 228079          | 197151          | 160443.4        |
| Total Home Deliveries attended by Non SBA                             | 1197963         | 1015111         | 880220          | 646816.6        |
| Total (Out of total ID) women discharged within 48 hours               | 6803202         | 6890913         | 6483022         | 5382451         |
| Total Number of PW given Tablet Misoprostol during HD                  | 80621           | 74416           | 78722           | 63822.13        |
| Total Number of newborns received 7 HBNC in HD                         | 938660          | 936941          | 891089          | 802483.6        |
| Total Number of newborns received 6 HBNC visits after                  | 6405013         | 7981529         | 8651475         | 8355130         |
| Institutional Delivery                                                |                 |                 |                 |                 |

There is a declining trend in No. of pregnant women registered for ANC- Taken as total number of pregnancy during pandemic years 2020 and 2021 as compared to pre-pandemic years. A similar trend was observed in all other variables in this research study except in 2020 1. Number of PW given Tablet Misoprostol during HD increased in number compared to previous year 2019 by 4306 and 5.78639 percent (%) 2. number of newborns received 6 HBNC visits after Institutional Delivery HD increased in number compared to previous year 2019 by 669946 numbers and 8.393705 percent (%).

Table – 5 – Increase and decrease in numbers and percentage of different variables taking 2018 base year
| Period                                                | Increase / Decrease 2019 to previous year 2018 - Numbers | Increase / Decrease 2020 to previous year 2019 - Numbers | Increase / Decrease 2021 to previous year 2020 - Numbers | Increase / Decrease 2019 to previous year 2018 - percent | Increase / Decrease 2020 to previous year 2019 - percent | Increase / Decrease 2021 to previous year 2020 - percent |
|-------------------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------|
| Total No. of pregnant women registered for ANC - Taken as total number of pregnancy | 523892                                                    | -190815                                                  | -5439756                                                 | 1.824436074                                               | -6.52588                                                  | -19.9032                                                 |
| Mean - No. of pregnant women                          | 130973                                                    | -477029                                                  | -5008490                                                 | 1.824436074                                               | -6.52589                                                  | -73.3011                                                 |
| Total HD                                              | -210587                                                   | -165819                                                  | -270111                                                  | -14.48550913                                              | -13.3382                                                  | -25.0713                                                 |
| Total ID                                              | 939843                                                    | -1029927                                                 | -3241195                                                 | 4.84744727                                               | -5.06648                                                  | -16.7952                                                 |
| Total No. of Deliveries (HD + ID)                     | 729256                                                    | -1195746                                                 | -3511306                                                 | 3.498941666                                               | -5.54319                                                  | -17.2328                                                 |
| Mean - Total Number of Deliveries                     | 60771                                                     | -99645                                                   | -292609                                                  | 3.49892247                                               | -5.54316                                                  | -17.2328                                                 |
| Number of Home Deliveries attended by SBA             | -27735                                                    | -30928                                                   | -36707.6                                                 | -10.84186167                                              | -13.5602                                                  | -18.619                                                  |
| Home Deliveries attended by Non SBA                   | -182852                                                   | -134891                                                  | -233403                                                  | -15.26357659                                              | -13.2883                                                  | -26.5165                                                 |
| Number of PW given Tablet Misoprostol during HD       | -6205                                                     | 4306                                                     | -14899.9                                                 | -7.696505873                                              | 5.78639                                                   | -18.9272                                                 |
| Number of newborns received 7 HBNC in HD              | -1719                                                     | -45852                                                   | -88605.4                                                 | -0.183133403                                              | -4.8938                                                   | -9.9435                                                  |
| Number of Institutional Deliveries conducted (Including C-Sections) | 900000                                                   | -1000000                                                 | -3200000                                                 | 4.639175258                                               | -4.92611                                                  | -16.5803                                                 |
| Out of total ID women discharged within 48 hours       | 87711                                                     | -407891                                                  | -1100571                                                 | 1.289260557                                               | -5.91926                                                  | -16.9762                                                 |
| Number of newborns received 6 HBNC visits after Institutional Delivery | 1576516                                                  | 669946                                                   | -296345                                                  | 24.61378299                                               | 8.393705                                                  | -3.42537                                                  |

All variables have shown an increase in 2019 except 1. Total HD 2. Number of newborns received 7 HBNC in HD 3. Home Deliveries attended by Non SBA 4. Number of PW given Tablet Misoprostol during HD 5. Number of Home Deliveries attended by SBA.  This novel research study revealed that during pandemic years 2020 and 2021 all the variables reduced quantitatively except 1. Number of PW given Tablet Misoprostol during HD 2. Number of newborns received 6 HBNC visits after Institutional Delivery 3. Total HD 4. Home Deliveries attended by Non SBA which increased little in 2020 see- table 5 and figure 1 (first pandemic year). The statistical analysis of observation for years 2021, 2020, 2019 and 2018 is given in table- 6, 7, 8, and 9 and data for each year is given in 10, 11, 12, and 13.
The mean number of home deliveries attended by SBA [(Skill Birth Attendant) (Doctor/Nurse/ANM/ Midwife)] during the pandemic year 2021 with total number of observation of 5 months forecasted up to December 2021 across India was 13370.28, for years 2020, 2019, 2018 it was 16429.25, 19006.58, 21317.83 respectively with total number of observation of 12 months across India for these three years.
This research study revealed that pandemic years have less number of home deliveries attended by SBA [(Skill Birth Attendant) (Doctor/Nurse/ANM/ Midwife)]. There is a decrease of 37.28% in mean number of home deliveries attended by SBA in 2021 as compared to 2018. The details of data and statistical analysis are mentioned in table-6, 7, 8, 9, 10, 11, 12, 13, 14 and the comparisons of various indicators are displayed in figures 1. The mean number of Number of Home Deliveries attended by Non SBA (Trained Birth Attendant (TBA) /Relatives/etc during the pandemic year 2021 with total number of observation of 5 months forecasted up to December 2021 across India was 53901.39, for years 2020, 2019, 2018 it was 73351.66, 84592.58, 99830.25 respectively with total number of observation of 12 months across India for these three years. This research study revealed that pandemic years have less number of home deliveries attended by Non SBA (Trained Birth Attendant (TBA) /Relatives/etc. during the pandemic year 2021 with total number of observation of 5 months forecasted up to December 2021 across India was 53901.39, for years 2020, 2019, 2018 it was 73351.66, 84592.58, 99830.25 respectively with total number of observation of 12 months across India for these three years. This research study revealed that pandemic years have less number of home deliveries attended by Non-SBA in 2021 as compared to 2018.

The mean number of Number of PW given Tablet Misoprostol during home delivery during the pandemic year 2021 with total number of observation of 5 months forecasted up to December 2021 across India was 5318.511, for years 2020, 2019, 2018 it was 6560.16, 6201.33, and 6718.42 respectively with total number of observation of 12 months across India for these three years. This research study revealed that pandemic years have less number of home deliveries attended by Non-SBA in 2021 as compared to 2018.
PW given Tablet Misoprostol during home delivery. There is a decrease of 9.72 % in mean Number of PW given Tablet Misoprostol during home delivery in 2021 as compared to 2018.

Table – 8-Summary- statistics-2019 (Jan to Dec)

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|----------|-----|------|-----------|-----|-----|
| No. of HD by SBA | 12 | 19006.58 | 1652.682 | 16387 | 20793 |
| No. of HD by non SBA | 12 | 84592.58 | 6727.217 | 70630 | 91917 |
| No. given Misoprostol-HD | 12 | 6201.333 | 531.5118 | 5253 | 6959 |
| No. received7 HBNC-HD | 12 | 78078.42 | 7856.47 | 63616 | 87138 |
| No. of ID (including C-secn) | 12 | 1694021 | 168219.1 | 1409794 | 1895697 |
| ID discharged <48hrs | 12 | 574242.8 | 72415.95 | 443409 | 671254 |
| No. received 6 HBNC-ID | 12 | 665127.4 | 85338.78 | 542151 | 781203 |

Total estimation -2019 Number of obs = 12

| Variable | Total | Std. Err. | [95% Conf. Interval] |
|----------|-------|-----------|---------------------|
| No. of HD by SBA | 228079 | 5725.058 | 215478.2 240679.8 |
| No. of HD by non SBA | 1015111 | 23303.76 | 963819.8 1066402 |
| No. given Misoprostol-HD | 74416 | 1841.211 | 70363.52 78468.48 |
| No. received7 HBNC-HD | 936941 | 27215.61 | 877039.8 996842.2 |
| No. of ID (including C-secn) | 2.03e+07 | 582158 | 1.90e+07 2.16e+07 |
| ID discharged <48hrs | 6890913 | 250856.2 | 6338782 7443044 |
| No. received 6 HBNC-ID | 7981529 | 295622.2 | 7330869 8632189 |

C.I (confidence interval) means - 2019

| Variable | Obs | Mean | Std. Err. | [95% Conf. Interval] |
|----------|-----|------|-----------|---------------------|
| No. of HD by SBA | 12 | 19006.58 | 477.0882 | 17956.52 20056.65 |
| No. of HD by non SBA | 12 | 84592.58 | 1941.98 | 80318.31 88666.85 |
| No. given Misoprostol-HD | 12 | 6201.333 | 153.4342 | 5863.627 6539.04 |
| No. received7 HBNC-HD | 12 | 78078.42 | 2267.964 | 73086.65 83070.18 |
| No. of ID (including C-secn) | 12 | 1694021 | 48505.67 | 1587140 1800902 |
| ID discharged <48hrs | 12 | 574242.8 | 20904.68 | 528231.8 620253.7 |
| No. received 6 HBNC-ID | 12 | 665127.4 | 24635.18 | 610905.7 719349.1 |

The mean number of newborns who received 7 Home Based Newborn Care (HBNC) visits in case of Home delivery during the pandemic year 2021 with total number of observation of 5 months forecasted up to December 2021 across India was 66873.63, for years 2020, 2019, 2018 it was 74257.42, 78078.42, and 78221.67 respectively with total number of observation of 12 months across India for these three years. This research study revealed that pandemic years have decreased number of newborns received 7 Home Based Newborn Care (HBNC) visits in case of Home delivery. There is a decrease of 6.47 % in mean Number of newborns received 7 Home Based Newborn Care (HBNC) visits in case of Home delivery in 2021 as compared to 2018.

- The researcher is pointing out the fact that less number of different variables during pandemic years may be due less number of pregnancy and resultant deliveries during covid-19era. The prevalence rate discussed at end will clear the scenario.

The mean number of Institutional Deliveries (ID) conducted (Including C-Sections) during the pandemic year 2021 with total number of observation of 5 months forecasted up to December 2021 across India was 1338094, for years 2020, 2019, 2018 it was 1608193.92, 1694021.12, and 1615700.92 respectively with total number of
This research study revealed that pandemic years have less number of institutional deliveries conducted (including C-sections). There is a decrease of 8.34% in mean number of institutional deliveries conducted (including C-sections) in 2021 as compared to 2018.

| Table - 9 - Summary statistics-2018 (Jan to Dec) |
|-----------------------------------------------|
| **Variable** | **Obs** | **Mean** | **Std. Dev.** | **Min** | **Max** |
| No. of HD by SBA | 12 | 21317.83 | 1730.307 | 19091 | 24266 |
| No. of HD by non SBA | 12 | 99830.25 | 9646.946 | 84554 | 116307 |
| No. given Misoprostol-HD | 12 | 6718.417 | 657.5543 | 5411 | 7564 |
| No. received7 HBNC-HD | 12 | 78221.67 | 7188.477 | 68640 | 87132 |
| No. of ID (including C-secn) | 12 | 1615701 | 1363935 | 185681 |
| ID discharged <48hrs | 12 | 566933.5 | 73511.3 | 448374 | 660925 |
| No. received 6 HBNC-ID | 12 | 533751.1 | 63534.34 | 440685 | 624944 |

The mean number of women discharged within 48 hours of delivery out of total ID during the pandemic year 2021 with total number of observation of 5 months forecasted up to December 2021 across India was 448537.5, for years 2020, 2019, 2018 it was 540251.83, 574242.75, and 566933.5 respectively with total number of observation of 12 months across India for these three years. This research study revealed that pandemic years have less number of women discharged within 48 hours of delivery out of total ID. There is a decrease of 12.32% in mean number of women discharged within 48 hours of delivery out of total ID in 2021 as compared to 2018.

The mean number of newborns received 6 HBNC visits after Institutional Delivery during the pandemic year 2021 with total number of observation of 5 months forecasted up to December 2021 across India was 448537.5, for years 2020, 2019, 2018 it was 540251.83, 574242.75, and 566933.5 respectively with total number of observation of 12 months across India for these three years. This research study revealed that pandemic years have less number of newborns received 6 HBNC visits after Institutional Delivery within 48 hours of delivery out of total ID. There is a decrease of 12.32% in mean number of newborns received 6 HBNC visits after Institutional Delivery within 48 hours of delivery out of total ID in 2021 as compared to 2018.
have less number of newborns received 6 HBNC visits after Institutional Delivery. There is an increase of 40.03 % in mean number of newborns received 6 HBNC visits after Institutional Delivery in 2021 as compared to 2018.

### Table- 10- Prevalence of different study variables per 100000 in different years

| Period | Jan to Dec 2018 | Jan to Dec 2019 | Jan to Dec 2020 | Jan to Dec 2021 |
|--------|-----------------|-----------------|-----------------|-----------------|
| Total No. of pregnant women registered for ANC- Taken as total number of pregnancy | 28715284 | 29239176 | 27331061 | 21891305 |
| Total No. of Deliveries-TD (HD+ ID) registered per 100000 ANC registered | 72582.21092 | 73775.82734 | 74551.43436 | 77036.94229 |
| Total Number of Institutional Deliveries(ID) conducted (Including C-Sections) per 100000 Total delivery | 93024.83501 | 89879.98671 | 94712.47071 | 95213.22797 |
| Total HD per 100000 TD | 6975.164987 | 5763.128328 | 5287.529291 | 4786.772034 |
| Total Number of Home Deliveries attended by SBA per 100000 HD | 17596.50896 | 18346.27048 | 18299.26738 | 19875.05884 |
| Total Home Deliveries attended by Non SBA per 100000 HD | 82403.49104 | 81653.72952 | 81700.73262 | 80124.94116 |
| Total (Out of total ID) women discharged within 48 hours per 100000 ID | 35089.01271 | 35541.40151 | 33593.6996 | 33520.62498 |
| Total Number of PW given Tablet Misoprostol during HD per 100000 HD | 5545.623572 | 5985.891135 | 7306.860868 | 7906.019126 |
| Total Number of newborns received 7 HBNC in HD per 100000 HD | 64566.98655 | 75635.87328 | 82709.5773 | 99408.3195 |
| Total Number of newborns received 6 HBNC visits after Institutional Delivery per 100000 ID | 33035.26524 | 41166.49374 | 44830.18139 | 52033.76294 |

The prevalence of total No. of Deliveries-TD (HD+ ID) registered per 100000 ANC registered was 72582.21092, 73775.82734, 74551.43436, 77036.94229, for 2018, 2019, 2020 and 2021 respectively whereas prevalence for total number of Institutional Deliveries (ID) conducted (Including C-Sections) per 100000 total delivery was 93024.83501, 89879.98671, 94712.47071, 95213.22797 for the years 2018, 2019, 2020 and 2021 respectively see table-10 figure-2 and 3. Regarding total HD per 100000 TD the prevalence was 6975.164987, 5763.128328, 5287.529291, 4786.772034, and total Number of Home Deliveries attended by SBA per 100000 HD the prevalence were 17596.50896, 18346.27048, 18299.26738, and 19875.05884 for 2018, 2019, 2020 and 2021 respectively. Total Home Deliveries attended by Non SBA per 100000 HD was 82403.49104, 81653.72952, 81700.73262, 80124.94116, and total (Out of total ID) women discharged within 48 hours per 100000 ID were 35089.01271, 35541.40151, 33593.6996, 33520.62498 for 2018, 2019, 2020 and 2021 respectively. Total Home Deliveries attended by Non SBA per 100000 HD was 82403.49104, 81653.72952, 81700.73262, 80124.94116, and total (Out of total ID) women discharged within 48 hours per 100000 ID were 35089.01271, 35541.40151, 33593.6996, 33520.62498, for 2018, 2019, 2020 and 2021 respectively. Total Number of PW given Tablet Misoprostol during HD per 100000 HD for 2018, 2019, 2020 and 2021 respectively was 5545.623572, 5985.891135, 7306.860868, and 7906.019126. The total Number of newborns received 7 HBNC in HD per 100000 HD was 64566.98655, 75635.87328, 82709.5773, and 99408.3195 respectively see table-10 figure-2 and 3. The total Number of newborns received 6 HBNC visits after Institutional Delivery per 100000 ID was 33035.26524, 41166.49374, 44830.18139, 52033.76294, for 2018, 2019, 2020 and 2021 respectively. This research study revealed that during covid-19 era there is increase in prevalence of following:

- Total No. of Deliveries-TD (HD+ ID) registered per 100000 ANC registered
- Total Number of Institutional Deliveries (ID) conducted (Including C-Sections) per 100000 Total deliveries
• Total Number of Home Deliveries attended by SBA per 100000 HD
• Total Number of newborns received 6 HBNC visits after Institutional Delivery per 100000 ID
• Total Number of newborns received 7 HBNC in HD per 100000 HD
• Total Number of PW given Tablet Misoprostol during HD per 100000 HD

There is decrease in prevalence of following during covid-19 era:

• Total Home Deliveries attended by Non SBA per 100000 HD
• Total HD per 100000 TD and Total (Out of total ID) women discharged within 48 hours per 100000 ID.

**Discussion**

Urgent attention and measures should be taken by government and policy makers to continue to provide maternal and newborn health services during ongoing COVID-19 pandemic. Government, policy makers should develop special need based guidelines, interventions for the pregnant women and newborn. Continuous monitoring and routinely checking the existing facilities health service in different levels of hospitals i.e. from local to tertiary specialised and rural-urban-public-private clinics. Legal regulations and strict enforcements so that healthcare institutions cannot deny providing maternal and newborn services. Training and capacity building of the health workers including everyone and to sort out the barriers to access maternal-newborn health services during ongoing COVID-19. Raising awareness among PW and relatives about visiting health care facilities along with the positive behavioural change of the health workers to work in pandemic situations can help in mitigation of negative impacts of covid-19.

**Study Strength and Limitation**

This is a novel cross-sectional retrospective research study based on accredited secondary data which was one of the limitations of this research study. Another limitation is data availability is not for latest time and date, hence it is forecasted using standard statistical method using excel. Accredited and established source of data recognized worldwide is not available for the same study anywhere else. The main strength is that the whole study is based on real time based accredited government data sources and this kind of research study is unique and not available for the context of India or other countries as found by the researcher of this novel study.

**Conclusion And Recommendation**

The ongoing COVID-19 pandemic has had less number of Deliveries and hence less Home Based New Born Care (HBNC) in India. More research is required to investigate the direct and indirect consequence of the pandemic on birth and provision of HBNC as well as the health facility type which are not performing well in providing respectful maternity care and newborn services during pandemic period. The facility based research analysis is under process by the author which will be available in next version of this article. The author recommends following:

• Establishment of exclusive specialised birth centres as pregnant women feels usually worried about giving birth in multipurpose hospitals.
• Helping pregnant women to receive ANC checkups, delivery care, postnatal care, COVID-19 care as needed;
• Ensuring availability of skilled health workers with PPE (personal protective equipment), priority testing and vaccination so that they can deliver care to all pregnant women and newborn babies without spreading
infection during the pandemic;

- Application of infection prevention and control measures in health facilities during childbirth and care immediately after;
- Raising awareness among pregnant women through home visits,
- Encouraging women and their relatives in remote areas to use maternal health facilities and HBNC
- Training, protecting and capacity building of health workers with clean birth kits for home births when health facilities are not available or closed;
- Allocating more resources to maternity and newborn services and supplies.
- Educating PW to protect themselves from exposure to covid-19, and take advice from the designated health facility if experience symptoms;
- Seek medical care timely from accredited health facility and avoid jhola-chaap(fake medical practioners) as well as quacks if they live in remote areas and have fever, cough or difficulty breathing;
- Continue breastfeeding their baby as the virus has not been found in samples of breast milk [4]. Wear a mask while feeding baby; wash hands; and routinely clean and disinfect surfaces; if not Covid positive continue to hold the newborn as well as perform skin-to-skin care;
- Ask designated doctor and health staff the safest place to give birth;
- Have a birth plan in advance to reduce stress and to ensure place on time;
- Routine immunizations, after the baby is born.

Declarations

Funding

The author declares that no funds are taken from any individual or agency-institution for this research study.

Note: - This article is available only as pre-print and not published by any peer-reviewed journals. The author has written previously on this research which is available as preprint. There are chances of text and data overlapping with my previous works available as preprints mentioned below in the references [5, 6, 7, 8, and 9, 10]

-This version of paper has not been previously published in any peer reviewed journal and is not currently under consideration by any journal. The document is Microsoft word with English (United States) language & 3500 words excluding reference and declaration etc. (7027 words Total including all).

- Ethics approval and consent to participate: Not applicable. This study has not involved any human or animals in real or for experiments. The submitted work does not contain any identifiable patient/participant information.

-Consent for publication: The author provides consent for publication.

-Availability of data and materials: Electronic records from HMIS (health management information system) of MoHFW (ministry of health and family welfare), Government of India.

-Conflicts of Interest/ Competing Interest: There are no conflicts / competing of interest
- **Funding**: Self sponsored. No aid taken from individual or agency etc.

- **Authors’ contributions**: The whole work is done by the Author - Dr Piyush Kumar, M.B.B.S., E.M.O.C., P.G.D.P.H.M., - Senior General Medical Officer- Bihar Health Services- Health Department- Government of Bihar, India.

- **Acknowledgements**: I am thankful to Advocate Anupama my wife and daughters Aathmika-Atheeva for cooperation. **This article is available only as pre-print and not published by any peer-reviewed journals. The author has written previously on this research which is available as preprint. There are chances of text and data overlapping with author previous works available as preprints only mentioned above in the references [5, 6, 7, 8, and 9, 10]**

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**Abbreviations**

Home Based New Born Care (HBNC); COVID-19- corona virus disease 2019; SARS-CoV-2- severe acute respiratory syndrome coronavirus 2; SBA [(Skill Birth Attendant); HMIS (health management information system); MoHFW (ministry of health and family welfare); HD – home delivery; PW- pregnant women; ID- institutional delivery; PPE (personal protective equipment); ANC – antenatal care; EMOC - emergency obstetric care;

**Annexure**

Annexure—Table –11, 12, 13, 14 (Total Observations)

Table- 11 – Total Observation with forecast (Jun to Dec) for the year - 2021
| 2021   | Number of Home Deliveries attended by Skill Birth Attendant (SBA) (Doctor/Nurse/ANM/Midwife) | Home Deliveries in no. attended by Non SBA (Trained Birth Attendant (TBA) /Relatives/etc.) | Number of PW given Tablet Misoprostol during home delivery | Number of newborns received 7 Home Based Newborn Care (HBNC) visits in case of Home delivery | Number of Institutional Deliveries conducted (Including C-Sections) | Out of total institutional deliveries number of women discharged within 48 hours of delivery | Number of newborns received 6 HBNC visits after Institutional Delivery |
|--------|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------------------|---------------------------------------------------------------------|
| Jan-21 | 17301                                                                                           | 75810                                                                                  | 6629                                                     | 81396                                                    | 1615041                                                         | 551895                                                                     | 829656                                                              |
| Feb-21 | 15975                                                                                           | 70376                                                                                  | 6434                                                     | 78307                                                    | 1452146                                                         | 517895                                                                     | 781658                                                              |
| Mar-21 | 15791                                                                                           | 68104                                                                                  | 5826                                                     | 77450                                                    | 1826745                                                         | 589308                                                                     | 817272                                                              |
| Apr-21 | 13263                                                                                           | 53151                                                                                  | 5251                                                     | 62140                                                    | 1247082                                                         | 422764                                                                     | 656825                                                              |
| May-21 | 15125                                                                                           | 63284                                                                                  | 6189                                                     | 66498                                                    | 1263285                                                         | 403324                                                                     | 651878                                                              |
| Jun-21 | 13336.22747                                                                                     | 53727.38473                                                                           | 5353.22939                                               | 64972.17675                                              | 1290810.996                                                    | 436629.3658                                                              | 684528.3665                                                          |
| Jul-21 | 12899.79742                                                                                     | 50847.59968                                                                           | 5191.408807                                              | 63609.23421                                              | 1252172.47                                                    | 423582.2049                                                              | 669984.7213                                                          |
| Aug-21 | 12356.961                                                                                       | 47832.20161                                                                           | 5067.426715                                              | 63168.86238                                              | 1224416.143                                                   | 409968.2942                                                              | 655277.1404                                                          |
| Sep-21 | 12169.6793                                                                                      | 46936.77135                                                                           | 4893.840417                                              | 62427.89444                                              | 1241652.183                                                   | 414920.7519                                                              | 659632.6303                                                          |
| Oct-21 | 11122.22832                                                                                     | 41081.52452                                                                           | 4468.987951                                              | 61464.34617                                              | 1227940.099                                                   | 408929.0559                                                              | 655365.6287                                                          |
| Nov-21 | 10827.71983                                                                                     | 39329.68095                                                                           | 4376.97079                                               | 60834.50528                                              | 1208184.943                                                   | 402083.8468                                                              | 646895.6104                                                          |
| Dec-21 | 10275.73918                                                                                     | 36336.45906                                                                           | 4141.266552                                              | 60215.56907                                              | 1207656.2                                                     | 401150.9866                                                              | 646157.2941                                                          |

Table- 12 - Observation for the year 2020
| Indicator                                                                 | Number of Home Deliveries attended by SBA | Home Deliveries attended by Non SBA | Number of PW given Tablet Misoprostol during HD | Number of newborns received 7 HBNC in HD | Number of Institutional Deliveries conducted (Including C-Sections) | Out of total ID women discharged within 48 hours | Number of newborns received 6 HBNC visits after Institutional Delivery |
|--------------------------------------------------------------------------|------------------------------------------|------------------------------------|-----------------------------------------------|------------------------------------------|---------------------------------------------------------------|-------------------------------------------------|--------------------------------------------------------------------------------|
| Total Jan 2020                                                           | 17364                                    | 81458                              | 6452                                         | 86904                                    | 1686421                                                       | 564526                                         | 765405                                                                 |
| Total Feb 2020                                                           | 17321                                    | 75444                              | 5690                                         | 84736                                    | 1534676                                                       | 518676                                         | 738549                                                                 |
| Total Mar 2020                                                           | 14060                                    | 67611                              | 5134                                         | 76170                                    | 1527869                                                       | 511141                                         | 695368                                                                 |
| Total April 2020                                                         | 8047                                     | 33185                              | 4251                                         | 28639                                    | 1219729                                                       | 364659                                         | 461874                                                                 |
| Total May 2020                                                           | 14364                                    | 66359                              | 5763                                         | 60682                                    | 1395381                                                       | 435889                                         | 584777                                                                 |
| Total Jun 2020                                                           | 14946                                    | 67389                              | 6253                                         | 64834                                    | 1409429                                                       | 442182                                         | 618175                                                                 |
| Total Jul 2020                                                           | 15200                                    | 71088                              | 6724                                         | 66954                                    | 1576238                                                       | 517349                                         | 665568                                                                 |
| Total Aug 2020                                                           | 19355                                    | 80333                              | 7479                                         | 75412                                    | 1725793                                                       | 603254                                         | 740827                                                                 |
| Total Sep 2020                                                           | 20183                                    | 86457                              | 8580                                         | 85804                                    | 1811424                                                       | 648151                                         | 798730                                                                 |
| Total Oct 2020                                                           | 19388                                    | 84215                              | 7991                                         | 86738                                    | 1849115                                                       | 643160                                         | 852982                                                                 |
| Total Nov 2020                                                           | 18412                                    | 85274                              | 7567                                         | 87890                                    | 1813584                                                       | 627710                                         | 860193                                                                 |
| Total Dec 2020                                                           | 18511                                    | 81407                              | 6838                                         | 86326                                    | 1748668                                                       | 606325                                         | 869027                                                                 |

Table-13 - Observation for the year 2019
| Indicator                                   | Number of Home Deliveries attended by SBA | Home Deliveries attended by Non SBA | Number of PW given Tablet Misoprostol during HD | Number of newborns received 7 HBNC in HD | Number of Institutional Deliveries conducted (Including C-Sections) | Out of total ID women discharged within 48 hours | Number of newborns received 6 HBNC visits after Institutional Delivery |
|--------------------------------------------|------------------------------------------|------------------------------------|-------------------------------------------------|----------------------------------------|----------------------------------------------------------|------------------------------------------------|-------------------------------------------------|
| Total Jan 2019                             | 20559                                    | 90459                              | 6959                                           | 77446                                  | 1660316                                                   | 586521                                           | 609397                                           |
| Total Feb 2019                              | 19620                                    | 89852                              | 6239                                           | 77616                                  | 1472340                                                   | 523286                                           | 578978                                           |
| Total March 2019                            | 20325                                    | 91917                              | 6504                                           | 80964                                  | 1717500                                                   | 566155                                           | 614187                                           |
| Total April 2019                            | 16395                                    | 70630                              | 5253                                           | 63616                                  | 1409794                                                   | 443409                                           | 542151                                           |
| Total May 2019                              | 16387                                    | 75644                              | 5370                                           | 67538                                  | 1544936                                                   | 494842                                           | 581991                                           |
| Total Jun 2019                              | 17670                                    | 78944                              | 5556                                           | 70976                                  | 1548487                                                   | 501656                                           | 614269                                           |
| Total Jul 2019                              | 17582                                    | 82948                              | 6255                                           | 72506                                  | 1710352                                                   | 567274                                           | 662672                                           |
| Total Aug 2019                              | 20793                                    | 90982                              | 6288                                           | 82663                                  | 1895697                                                   | 671254                                           | 727880                                           |
| Total Sep 2019                              | 20572                                    | 88290                              | 6305                                           | 85882                                  | 1871061                                                   | 660643                                           | 760083                                           |
| Total Oct 2019                              | 20213                                    | 88023                              | 6681                                           | 85424                                  | 1879063                                                   | 652288                                           | 781203                                           |
| Total Nov 2019                              | 19661                                    | 85232                              | 6490                                           | 85172                                  | 1848889                                                   | 624935                                           | 752457                                           |
| Total Dec 2019                              | 18302                                    | 82190                              | 6516                                           | 87138                                  | 1769819                                                   | 598650                                           | 756261                                           |

Table- 14 - Observation for the year 2018
| Indicator                                                                 | Number of Home Deliveries attended by SBA | Home Deliveries attended by Non SBA | Number of PW given Tablet Misoprostol during HD | Number of newborns received 7 HBNC in HD | Number of Institutional Deliveries conducted (Including C-Sections) | Out of total ID women discharged within 48 hours | Number of newborns received 6 HBNC visits after Institutional Delivery |
|-------------------------------------------------------------------------|-------------------------------------------|------------------------------------|-----------------------------------------------|----------------------------------------|-------------------------------------------------|-----------------------------------------------|------------------------------------------------------------------|
| Total Jan 2018                                                         | 24266                                    | 116307                             | 7564                                          | 85372                                  | 1537515                                         | 580841                                         | 495132                                                          |
| Total Feb 2018                                                         | 22174                                    | 105130                             | 6770                                          | 81164                                  | 1414812                                         | 533569                                         | 480260                                                          |
| Total March 2018                                                       | 22682                                    | 104756                             | 6826                                          | 83942                                  | 1559206                                         | 556698                                         | 505544                                                          |
| Total April 2018                                                       | 19091                                    | 84554                              | 5411                                          | 68640                                  | 1363935                                         | 448374                                         | 440685                                                          |
| Total May 2018                                                         | 19981                                    | 89514                              | 5599                                          | 69383                                  | 1479816                                         | 485796                                         | 478596                                                          |
| Total Jun 2018                                                         | 19993                                    | 91476                              | 6225                                          | 70263                                  | 1455342                                         | 478528                                         | 492563                                                          |
| Total Jul 2018                                                         | 20255                                    | 95981                              | 7194                                          | 74076                                  | 1590046                                         | 543513                                         | 512433                                                          |
| Total Aug 2018                                                         | 21100                                    | 100816                             | 7054                                          | 76342                                  | 1795922                                         | 643962                                         | 551799                                                          |
| Total Sep 2018                                                         | 23731                                    | 110616                             | 7066                                          | 87132                                  | 1845585                                         | 660925                                         | 596423                                                          |
| Total Oct 2018                                                         | 22394                                    | 105652                             | 7189                                          | 85570                                  | 1856881                                         | 660268                                         | 622508                                                          |
| Total Nov 2018                                                         | 21046                                    | 103762                             | 7084                                          | 85039                                  | 1802810                                         | 641385                                         | 624944                                                          |
| Total Dec 2018                                                         | 19101                                    | 89399                              | 6639                                          | 71737                                  | 1686541                                         | 569343                                         | 604126                                                          |

Figures
Figure 1

Comparisons and trends of different variables during pandemic and pre-pandemic years
Figure 2

Comparison and trends of Prevalence of different study variables per 100000 in different years
Figure 3

Comparison and trends of Prevalence of different study variables per 100000 in different years