International Journal of Contemporary Pediatrics
Agrawal AD et al. Int J Contemp Pediatr. 2021 Feb;8(2):219-224
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: https://dx.doi.org/10.18203/2349-3291.ijcp20210073

Original Research Article

Impact of COVID-19 pandemic on routine childhood immunisation services post lockdown in a tertiary care centre in Meerut district of western U.P.

Archana D. Agrawal[1]*, Gaurav Gupta[2], Ashu Bhasin[1], Abhishek Singh[1], Alpa Rathi[1]

[1]Department of Pediatrics, LLRM Medical College and SVBP Hospital, Meerut, Uttar Pradesh, India
[2]Department of Surgery, LLRM Medical College and SVBP Hospital, Meerut, Uttar Pradesh, India

Received: 20 December 2020
Accepted: 05 January 2020

***Correspondence:**
Dr. Archana D. Agrawal,
E-mail: drarchu1232@gmail.com

ABSTRACT

Background: The severe acute respiratory syndrome corona virus-2 (SARS CoV-2) disease pandemic has been a threat to public health and health care system world-wide including routine immunization which has been greatly disrupted putting children at risk for vaccine-preventable diseases (VPDs). A study with an aim to analyse the impact of COVID-19 pandemic on routine immunization coverage post lockdown at a tertiary care centre of western UP.
Methods: A retrospective analytical study was conducted at LLRM Medical College, Meerut comparing 3 periods of year 2020, each of 4 weeks viz: 1-28th of February, 1-28 of August and 1-28 of December.
Results: Total number of vaccine beneficiaries decreased significantly post lockdown from 646 in February to 275 and 419 in August and December respectively. The percent reduction was maximally seen in booster vaccines while birth dose group was least affected. There was 76.2% and 39.3% reduction in number of children receiving primary doses of combination vaccines in August and December period respectively as compared to February 2020. We found 68.42% and 54.39 % reduction in MR-1 beneficiaries in August and December respectively as compared to February 2020.
Conclusions: Significant reduction is found in total number of children receiving immunization during un-lockdown period, compared to pre-COVID level. This difference was more significant in booster doses compared to birth doses. We did not find any significant catch up in vaccine beneficiaries by December 2020 despite 7 months of un-lockdown raising significant concern for public health.

Keywords: COVID-19, Pandemic, Lockdown, VPD, Routine childhood immunisation

INTRODUCTION

The novel coronavirus disease 2019 (COVID-19), which has affected more than 200 countries globally including India, has been declared as pandemic by World Health Organization (WHO) on 11 march 2020 prompting governments to implement numerous interventions such as total or partial lockdown, restrictions over public transport, shutdown of schools and routine health services to prevent the further spread of COVID-19.[1]

On 24 March 2020, in response to COVID-19 pandemic, lockdown was imposed in Meerut district of Uttar Pradesh (UP) as a part of nationwide lockdown. The Government of India ordered a nationwide lockdown for 21 days which kept extended in phases till May17.[2] As per containment plan of Ministry of Health and Family Welfare (MoHFW), the Meerut district was declared as high transmission red zone area, so complete lockdown continued further for few weeks till 31st May 2020.[3] Being in red zone routine immunization practices were also stopped in Meerut.

The immunization services had to bear the brunt of these unprecedented circumstances and various on-site and community immunization services were severely affected. Delayed or missed vaccination can make children susceptible to preventable diseases and may also affect herd immunity.[4] Vaccine-preventable diseases (VPD) remains an important issue that requires adherence to recommendations to prevent severe illnesses in children. According to WHO, VPD is a threat to 80 million children under one year worldwide because of disruption in healthcare services due to COVID-19 pandemic.[5] To avoid the impact of disruption in immunization, as per MoHFW guidelines, vaccination of institutionally delivered newborn was started.[6] Further since July 2020, proper routine immunization sessions were started on daily basis. Multiple factors like phasic unlock down, fear of catching COVID-19 infection from hospitals, unavailability of public transport and lack of awareness regarding priority of routine immunization have adversely affected health seeking behaviour and routine immunization visits to health care facilities. Some data regarding the impact of lockdown on immunisation coverage is available but published data showing immunisation coverage during post lockdown period is still scarce. So, we conducted a study with an aim to analyse the impact of COVID-19 pandemic on routine childhood immunization during the post lockdown period over last 6 months in phasic manner in a tertiary care centre of district Meerut of western UP.

METHODS

It was a retrospective analytical study carried out at SVBP hospital attached with LLRM Medical College Meerut in the state of UP, a centre catering COVID as well as non-COVID patients during this pandemic. We divided the study group in 3 phases over an equal duration of 4 weeks-

Pre-COVID phase: 1-28th February 2020.

Unlockdown-1: two months after the lockdown was withdrawn i.e. 1-28th August 2020.

Unlockdown-2: six months after the end of lockdown i.e.1-28th December 2020.

All children attending immunization clinic of paediatric OPD age 0 days to 5 years were included in the study group. Data was collected from hospital records including name, date, age, sex, vaccine administered and entered in Microsoft excel version 2016. Calculations were done and data was analysed to see total number of children receiving vaccines for all the three periods on weekly basis to study any change in trend of number of vaccine beneficiaries over time and also aggregated count over 4 weeks duration.

The hospital follows National immunization schedule which targets 11 VPDs beginning at birth and subsequently at 6, 10 and 14 weeks, 9 months, 16-24 months and 5 years. The vaccines are against tuberculosis, hepatitis B, diphtheria, tetanus, pertussis, Polio, H. influenza B, rotavirus, pneumococcus, measles and rubella.[7]

We divided the vaccines in 5 groups as below.

Children receiving birth dose vaccine including BCG, Hepatitis B and OPV- 0 dose. Children receiving primary doses of combination vaccine including pentavalent, OPV, IPV, PCV and rotavirus vaccine. Children receiving MR-1 and vitamin A. Children receiving MR-2 with DPT 1 booster and vitamin A. Children receiving DPT booster 2.

Comparative study was done between February and August data that is pre COVID and unlockdown-1 and February and December i.e., unlockdown-2 and appropriate statistical tests were applied.

RESULTS

The present study shows that during the un-lockdown period the absolute number of children receiving routine immunization was significantly lower in August 2020 (n=275) and also in December 2020 (n=419) as compared to the pre COVID period of February 2020 (n=646); with the p-value of 0.0002 and 0.007 respectively using unpaired t test of equal variance (Table 1, Figure 1). Table 2 shows the comparison among different vaccines group between February 2020 and August 2020 with percent reduction and p value. Table 3 shows the comparison among different vaccines group between February 2020 and December 2020 with percent reduction and p value.

Table 1: Vaccination received during February, August and December study period.

Variables	February	August	December
Birth dose*	258	186	217
Combination vaccine**	257	61	156
MR-1	57	18	26
MR-2+DPT-1	51	8	12
DPT-2	23	2	8
Total	646	275	419

*Birth dose includes BCG, OPV and Hepatitis B.
**Combination Vaccine includes Pentavalent, IPV, Rota Virus and Pneumococcal vaccines

There was 27.91% reduction in number of children receiving birth dose in August 20 (n=186) as compared to February 20 (n=258) with the p value of 0.002. Whereas, in December 2020 the number of infants (n=217) receiving birth those approached nearly to pre COVID time of February 2020 (n= 258) with reduction of just 15.89% (p=0.15).

Similarly, there was an alarming decline in the number of beneficiaries receiving primary doses of combination vaccines, with a 76.26% reduction in number of children

in August 2020 (n=61) as compared to February 2020 (n=257) with p value of 0.00001.

Although the number of vaccines started showing increase in trend in December 2020 as compared to August 2020, still there was significantly lower vaccination with reduction of 39.3% in December 2020 (n=156) as compared to February 2020 (n=257) and the difference is a still statistically significant (p value=0.002) (Figure 2, Figure 3).

Table 2: Vaccine comparison between February and August study period.

	February	August	% change	P value#
Birth dose*	258	186	27.91 (↓)	0.026
Combination Vaccine**	257	61	76.264 (↓)	0.00001
MR-1	57	18	68.42 (↓)	0.01
DPTb1+MR-2	51	8	84.31 (↓)	0.0005
DPTb2	23	2	90.90 (↓)	0.003
Total	646	275	57.43 (↓)	0.0002

*Birth dose includes BCG, OPV and Hepatitis B.
**Combination Vaccine includes Pentavalent, IPV, Rota Virus and Pneumococcal vaccines. #P value determined by unpaired t test of equal variance.

Table 3: Vaccine comparison between February and December study period.

	February	December	% change	P value#
Birth dose*	258	217	15.89 (↓)	0.15
Combination vaccine**	257	156	39.30 (↓)	0.0012
MR-1	57	26	54.38 (↓)	0.042756
DPTb1+MR-2	51	12	76.470 (↓)	0.0045
DPTb2	23	8	65.22 (↓)	0.02
Total	646	419	35.13 (↓)	0.007

*Birth dose includes BCG, OPV and Hepatitis B. **Combination Vaccine includes Pentavalent, IPV, Rota Virus and Pneumococcal vaccines. # P value determined by unpaired t test of equal variance

There was 68.42% reduction in August 2020 (n=18) for MR-1 beneficiaries as compared to February 2020 (n=57) (p=0.01). Similar trend was observed in December 2020 (n=26) also with percentage reduction of 54.39% from February 2020 and it was still statistically significant (p=0.04).

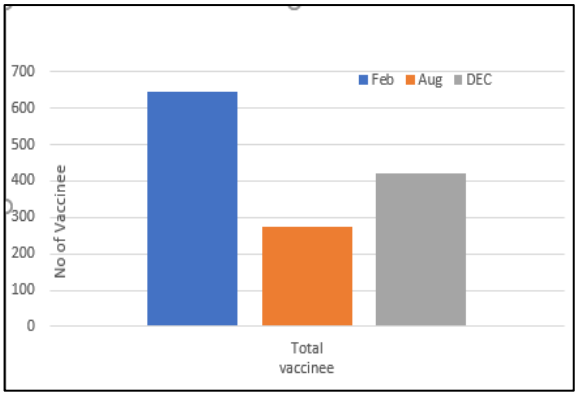

Figure 1: Total vaccines during February, August and December 2020 study period.

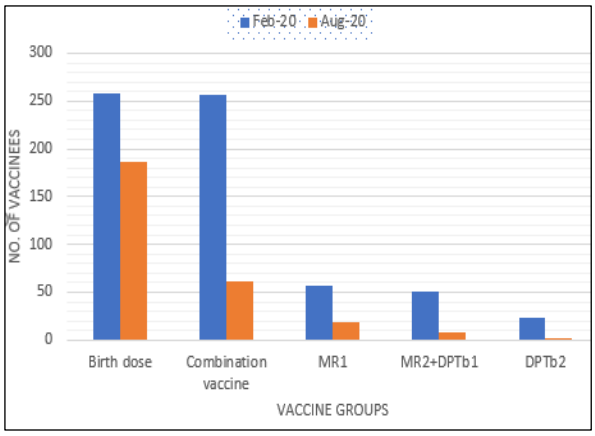

Figure 2: Comparison of vaccination status between February 2020 and August 2020.

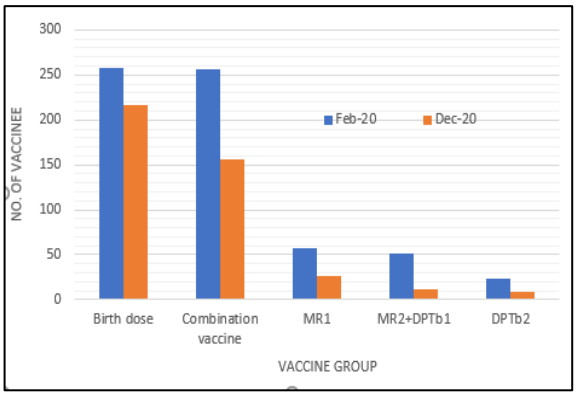

Figure 3: Comparison of vaccination status between February 2020 and December 2020.

It was observed that for the primary booster doses of DPT with MR-2 there was a drastic reduction in the number of vaccine beneficiaries in August 2020 which was not picked up even by the end of this year. Percentage reduction in August was 84.3% (n=8) compared to February (n=51) with the p value of 0.0005. In December also the percent reduction was 76.4% (n=12) and p=0.0004. (Figure 2, Figure 3)

While studying weekly trends in the total number of children receiving vaccines, the four weeks of August depict a gradual decline in the number of children which may actually reciprocate to increasing fear due to flare up of COVID positive cases in the community (Figure 4).

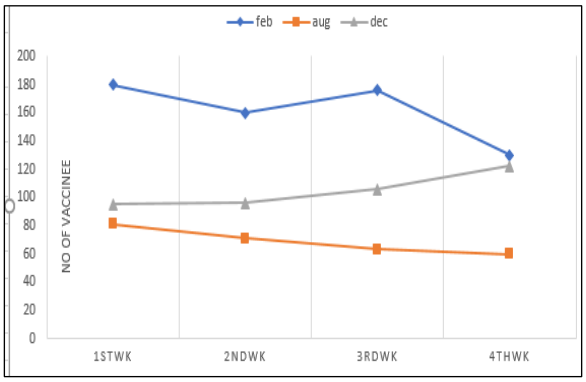

Figure 4: Comparison of Weekly trend of number of vaccines between February, August and December 2020.

There is increasing trend in the number of children attending immunization clinic in the last month of the year but still it is far from the pre-COVID targets.

DISCUSSION

The present study shows that during the unlock-down period absolute number of all beneficiaries receiving routine immunization was lower in August as well as in December in the year 2020 as compared to February 2020.Similar results were shown by a study conducted in Gujarat by Patel et al where they compared the period of lockdown with same period of previous year.[8] Also, similar results have been documented in a study of Saudi Arabia, Pakistan and England.[9-11]

The least affected group was children receiving birth doses as after the guidelines of Ministry of Health and Family Welfare on 15th April, our hospital resumed administration of birth doses to all institutionally delivered babies and by December end it has reached almost to the Pre-COVID numbers. Our hospital being a referral centre for COVID deliveries too and also as many private practitioners were not conducting deliveries at their place, number of deliveries were not significantly decreased because of lockdown in our centre.[6]

Patel et al has also shown a significant decrease in vaccination of birth doses in the month of May 2020 during lockdown compared to May 2019.[8]

From our study it is clear that there was massive decline in the number of beneficiaries receiving primary doses of combination vaccines in August (n=61) as compared to February (n=257) and also as compared to BCG beneficiaries in the month of August (n=186) itself. While in February these number were almost same (BCG=258 versus combination vaccine=257). This was in coherence with the finding of Patel et al in Gujrat.[8]

Whereas, Helen et al in England studied change in trend of aggregated weekly counts of first hexavalent and MMR vaccine, found a general decrease in hexa-valent vaccinations delivered in 2020 compared with 2019, but without any evidence of further rate of decline with the introduction of physical distancing measures and in later weeks this number even increased as compared to 2019.[11]

In all 8 out of 34 (23.52%) infants received BCG along with their first pentavalent dose in August month as against 3 of 114 babies (2%) during pre-COVID period. Later during December, this delay improved and only 3 of 59 (5%) babies received BCG with first pentavalent vaccine. It is again highlighted that after so much of work in immunization field, birth dose vaccination coverage is still lacking in many peripheral regions. In comparison to August, the children receiving combination vaccine increased in December by 60%; still the gap was statistically significant in comparison to pre-COVID (February) levels.

A major setback has been there for measles and rubella (MR-1) vaccine as the coverage dropped to only 18 beneficiaries during the entire four weeks of August with reduction of 68.42% in comparison to February, it later improved in December in comparison to August period (26 versus 18) but still far from pre-COVID target. Helen et al found 19% reduction in first 3 weeks of lockdown compared to 2019 which rose later despite continuation of lockdown.[11] Similarly, Patel et al showed reduction of MR vaccination count by 78.57% in the month of May 2020 compared to 2019.[1,8] Also surprisingly, we found 4 of 18 (22.2%) children receiving MR-1 in August month were so delayed for vaccination that they received pentavalent vaccination along with MR-1 dose, while in December 2 of 26 children received pentavalent vaccine with MR-1.

The worst hit category was of the children receiving booster doses of DPT-b1 and MR-2 with a decline of 84% in the month of August and 76% in the month of December showing that there was poor catch up even till the last four weeks of the year. Whereas, other vaccines like BCG and combination vaccines have shown improving trend to a larger extent by the end of this year.

It also highlights that for the children of older age group, the parents are still avoiding routine immunization (RI) sessions which is a cause of great concern for the resurgence of VPD epidemics as well as it is mitigating the positive impact of MR campaign conducted in 2018-19 in India. Similar findings were also observed during ebola outbreak in 2014.

Sun et al, conducted a study in West Africa post EBV outbreak and compared vaccination coverage of pentavalent and Measles pre outbreak, during the outbreak and post MCHW campaign found a decrease of 29.6% in

Penta-3 and decrease of 25.9% in measles coverage during pandemic which rose post campaign but not to statistically significant level.[12]

A massive decrease has been found in DPT 2nd booster coverage which is due at 5 years of age as per National immunization schedule, re-emphasizing the parents lack of concern for booster doses as against the fear of exposure to COVID infection. Similar findings were reported by Patel et al.[8]

Many studies have shown that VPD outbreaks especially measles epidemics often follow humanitarian crises. Measles is one of the most transmissible infections, and immunization rates tend to be lower than for other Extended Program of Immunization (EPI) vaccines, due in part to the older age at which measles vaccine must be administered i.e. 9 months versus 6 weeks or younger for the first dose of other vaccines. For this reason, explosive measles outbreaks are often an early result of health system failure. Outbreaks have followed disruptions due to war, natural disasters and any other calamities.[13] Analyses from the 2014-2015 Ebola outbreak suggests that the increased number of deaths caused by measles, malaria, HIV/AIDS and tuberculosis attributable to health system failures exceeded deaths from Ebola.[14,15]

The benefits of immunization far outweigh the risk associated with it. In a benefit-risk analysis of health benefits versus excess risk of SARS-CoV-2 infection, in Africa, it was estimated that in a high mortality scenario, for every one excess COVID-19 death attributable to SARS-CoV-2 infections acquired during routine vaccination clinic visits, 84 (95% CI; 14-267) deaths in children could be prevented by sustaining routine childhood immunization.[16] WHO and thereafter MoHFW has declared immunization as an essential health care activity even during covid-19 pandemic.[17]

Advisory Committee on Vaccine and Immunization Practises (ACVIP) recommends even for practitioners that all routine vaccinations be administered as scheduled, even during the COVID-19 pandemic as it is an essential health activity.[18]

Limitations

Our centre being a tertiary level referral centre for both COVID and non COVID in western UP, parents may be afraid of catching COVID infection and so might have diverted to some other periphery centres for vaccination. During lockdown as routine OPD and immunization services were not available, people may not be aware of restarting immunization services and so turnover might be low in the month of August. This was taken care by repeatedly informing the society through telemedicine and newspaper. Also, the services were restarted since July and we collected data for analysis in the month of August to avoid this gap. We collected and analyzed the data for December month too for the same reason and to study further change in the number of vaccine beneficiaries.

CONCLUSION

There has been a significant negative impact of COVID-19 pandemic on attendance of children availing routine immunization services even after 6 months of un-lockdown. The major setback has been seen for booster doses of Measles, Rubella, and DPT followed by pentavalent vaccines. BCG and other vaccines administered at birth are nearly approaching pre-COVID levels.

Studies are further needed to estimate the number of susceptible cohort of under-5 children who urgently need catch up vaccination. This surveillance data will further guide for planning and implementation of strategies to bridge the existing vaccination gap and to prevent the risk of upcoming VPD epidemics. This is need of hour that high-quality supplementary immunization activities should be conducted at district level and nationwide and routine immunization should be strengthened to protect the hard-earned positive impact of MR campaign conducted in India in 2018-19.

ACKNOWLEDGEMENTS

Our sincere thanks to Dr Vanya, Dr. Sujata, Dr. Sunil and sister Poonam for making available to us, all the past hospital records.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Cucinotta D, Vanelli M. WHO Declares COVID-19 a Pandemic. Acta Biomed. 2020;91(1):157-60.
2. COVID-19 pandemic lockdown in India. https://en.wikipedia.org/wiki/COVID19_pandemic_lockdown_in_India. Accessed on 28 December, 2020.
3. Containment plan-MoHFW. www.mohfw.gov.in. Last accessed on 16 May, 2020.
4. Centers for Disease Control and Prevention: Risks of Delaying or Skipping Vaccines. Available at: https://www.cdc.gov/vaccines/parents/why-vaccinate/risks-delaying-vaccines.html. Accessed on 28 December, 2020.
5. World Health Organization. At least 80 million children under one at risk of diseases such as diphtheria, measles and polio as COVID-19 disrupts routine vaccination efforts warn GAVI, WHO, and UNICEF. Available at: https://www.who.int/news-room/detail/22-05-2020-at-least-80-million-children-under-one-at-risk-of-diseases-such-as-diphtheria-measles-and-polio-as-covid-19-disrupts-

routine-vaccination-efforts-warn-gavi-who-and-unicef. Accessed on 15 June, 2020.
6. https://www.mohfw.gov.in/pdf/EssentialservicesduringCOVID19updated0411201.pdf. Last accessed on 28 December, 2020.
7. National Immunization Schedule (NIS) for Infants, Children and Pregnant Women. https://nhm.gov.in/New_Updates_2018/NHM_Components/Immunization/report/National_%20Immunization_Schedule.pdf. Last accessed on 28 December, 2020.
8. Patel P, Vasavada H, Patel SV, Patel K, Rathva P. A Study of the Impact of Lockdown on Vaccination Coverage at a Tertiary Care Center. Ped infec dis. 2020;2(2):43-50.
9. Alsuhaibani M, Alaqeel A. Impact of the COVID-19 Pandemic on Routine Childhood Immunization in Saudi Arabia. Vaccines (Basel). 2020;8(4):581.
10. Chandir S, Siddiqi DA, Setayesh H, Khan H. Impact of COVID-19 lockdown on routine immunisation in Karachi, Pakistan. 2020;8(9):e1118-120.
11. McDonald HI, Tessier E, White JM, Woodruff M, Knowles C, Bates C et al. Early impact of the coronavirus disease (COVID-19) pandemic and physical distancing measures on routine childhood vaccinations in England, January to April 2020. Euro Surveill. 2020;25(19):2000848.
12. Sun X, Samba TT, Yao J, Yin W, Xiao L, Liu F et al. Impact of the Ebola outbreak on routine immunization in western area, Sierra Leone - a field survey from an Ebola epidemic area. BMC Public Health. 2017;17(1):363.
13. Takahashi S, Metcalf CJE, Ferrari MJ, Moss WJ, Truelove SA, Tatem AJ et al. Bryan T. The growing risk from measles and other childhood infections in the wake of Ebola. Science. 2015;347(6227):1240-42.
14. Elston JWT, Cartwright C, Ndumbi P, Wright J. The health impact of the 2014–15 Ebola outbreak. Public Health. 2017;143;60-70.
15. Parpia AS, Ndeffo-Mbah ML, Wenzel NS, Galvani AP. Effects of response to 2014–2015 Ebola outbreak on deaths from malaria, HIV/AIDS, and tuberculosis, West Africa. Emerging infectious diseases. 2016;22(3):433.
16. Abbas K, Procter SR, van Zandvoort K, Clark A, Funk S, Mengistu T et al. COVID-19 Working Group. Routine childhood immunisation during the COVID-19 pandemic in Africa: a benefit-risk analysis of health benefits versus excess risk of SARS-CoV-2 infection. Lancet Glob Health. 2020;8(10):e1264-e1272.
17. World Health Organization. Guiding principles for immunization activities during the COVID-19 pandamic. https://apps.who.int/iris/handle/10665/331590. Last accessed on 25 December, 2020.
18. Indian Academy of Pediatrics. Advisory Committee onVaccinesand Immunization Practices (ACVIP). ACVIP Guidelines on Immunization during COVID 19 Pandemic. https://iapindia.org/pdf/1455-FINAL-ADVISORY-ACVIPGuidelines-on-Immunisations-during-COVID-19-Pandemic-skd.pdf. Last accessed on 25 September, 2020.

Cite this article as: Agrawal AD, Gupta G, Bhasin A, Singh A, Rathi A. Impact of COVID-19 pandemic on routine childhood immunisation services post lockdown in a tertiary care centre inmMeerut district of western U.P. Int J Contemp Pediatr 2021;8:219-24.